PERMIT APPLICATION
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-13-277A

Prepared For:

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FACILITY PLAN
[RULES .0537 (d)(1), (e)(1), (e)(2), and (e)(3)]

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FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT# 33-01)
EDGECOMBE COUNTY, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Facility Plan presents a summary of the various waste operations performed at the Edgecombe County Solid Waste Facility in Tarboro, North Carolina. The Facility Plan contents address requirements as specified in the Solid Waste Management Rules, Section .0537 (d)(1), (e)(1), (e)(2), and (e)(3). The purpose of the Facility Plan is to provide details of the comprehensive development of the property. The information contained in this plan shall be used to assist Edgecombe County in the long-term, general concepts related to construction, operation, and closure of the facility. Included in this plan are sections concerning waste stream, landfill capacity, and special engineering features.

1.2 General Facility Description

The Edgecombe County C&D Landfill is located at 2872 Colonial Road (State Route 1601) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill footprint is approximately 68 acres and is bounded to the north by Jerry's Creek, to the east by State Route 1601 and to the west and south by undeveloped agricultural land. The County-owned property on which the landfill site and various waste operations are located is 274.31 acres and is shown on **Figure 1**, Vicinity Map. Beyond Jerry's Creek to the north is the northern old landfill, a pre-Subtitle D landfill, approximately 23 acres, which stopped receiving waste in 1979. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory. North of the northern old landfill is Wright's Creek, which merges with Jerry's Creek near the northeast corner of the C&D Landfill downstream of the site.

The existing construction and demolition (C&D) landfill is operated on top of a closed municipal solid waste (MSW) unit (hereafter referred to as the southern MSW landfill). The southern MSW landfill consists of two sections, an eastern section, and a western section. The eastern MSW section is approximately 33 acres, began receiving waste in 1979, and was closed in 1991. The cap in this area consists of a minimum 2 feet of vegetated soil cover. The western MSW section is approximately 35 acres, began receiving waste in 1991, stopped receiving MSW waste in 1997, and was closed in 2000. The cap consists of a minimum 2.5 feet of vegetated soil cover.

The North Carolina Department of Environment and Natural Resources (NCDENR) issued Permit No. 33-01 to construct and operate a C&D landfill unit over the closed southern MSW landfill on December 30, 1997. The County has continued to operate the

C&D landfill in accordance with that permit since that time. The landfill receives an average of approximately 43 tons of C&D waste per day based on waste receipts over the past five (5) years (fiscal years 2009-2013), although it received as much as 600 tons per day of waste in 1999-2000 following Hurricane Floyd. The C&D landfill will have a total proposed acreage of 21.2 acres with a top elevation of 158 feet.

Operations on the facility property located west of Colonial Road (State Route 1601) include:

- C&D Landfill which operates under Permit No. 33-01;
- Tire Collection Area;
- Mercury Containing Products Facility;
- Electronics and Oil Filter Collection Building;
- Storage Buildings, and
- Employee Break Trailer.

Operations on the facility property located east of Colonial Road (State Route 1601) include:

- MSW Transfer Facility operated under Permit No. 33-02T;
- Convenience Center;
- Concrete Disposal Area;
- Pesticide Container Storage Building;
- Yard Waste Processing Area;
- White Goods Staging Area;
- Wood Pallet Staging Area;
- Borrow areas for landfill cover soils;
- Scale and Scale House; and,
- Employee Break Trailer.

A water supply well is located on-site at the County-owned property on the east side of Colonial Road; however, this well is only used for irrigation. Potable water for the facility is supplied from the County-wide municipal water distribution system.

1.3 Buffers

The existing C&D waste placement maintains a minimum 50-foot buffer from the property line. Proposed C&D waste placement shall be no closer than 200 feet from the property line. The limit of C&D waste shall be a minimum 500 feet from existing residential structures and wells. There is a minimum 50-foot buffer between the C&D waste and any stream, lake, pond, or other waters of the state as defined in G.S. 143-121. See **Figure 2** for buffer locations.

2. WASTE STREAM

2.1 Waste Disposal Types

2.1.1 Waste Acceptance

The Edgecombe County C&D Landfill shall only accept those wastes it is permitted to receive, which includes the following:

- Land-clearing debris as defined in North Carolina General Statutes (G.S), 130A-290, specifically, solid waste which is generated solely from land-clearing activities, such as stumps, trees, etc.;

- Inert debris defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil;

- Asphalt in accordance with G.S. 130A-294(m);

- Construction and demolition debris defined as solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings, or other structures;

- Solid waste that is generated by mobile or modular home manufacturers and asphalt shingle manufacturers in Edgecombe County: the waste must be source separated at the manufacturing site and must exclude municipal solid waste, hazardous wastes, and other wastes prohibited from disposal in a C&DLF. It must be transported to the Edgecombe County C&DLF in a shipment or container that consists solely of the separated waste to be disposed. Edgecombe County C&DLF will not accept this waste if it has not been separated and transported as specified; and

- Asbestos waste as described in Section 2.1.2 below.

Other wastes may be approved by the Division upon receipt of a written request with the specific waste type, how its generated, how much is generated; along with any additional information the Division may request to render a final decision on the disposal options for the waste.

Yard trash, as defined in G.S. 130A-290, shall not be disposed in the landfill area. However, yard trash, along with land-clearing debris, may be accepted for processing in the Yard Waste Processing Area. Any manufactured home arriving at the landfill will be handled in accordance with the Manufactured Home Deconstruction Plan presented in Appendix IV of the Operation and Waste Acceptance Plan.

2.1.2 Asbestos Waste

Regulated asbestos waste received at the landfill shall be managed in accordance with 40 CFR 61. Edgecombe County requires a 24 hour notice prior to receiving any shipment of

asbestos. Each shipment will include the current North Carolina Asbestos Waste Shipment Record from North Carolina Department of Health and Human Services, Division of Public Health, Health Hazards Control Unit. The regulated asbestos waste will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause airborne conditions. Non-regulated asbestos waste may be comingled with other waste and disposed of in the landfill. If non-friable asbestos is identified by the County's waste screening and acceptance program and is separated from other wastes, it will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause a fiber release that adversely impacts airborne conditions.

2.1.3 Wastewater Treatment Sludge

The landfill shall not accept wastewater treatment sludge as waste for disposal in the landfill. However, the landfill may accept wastewater treatment sludge, with prior approval of the Division, for utilization as a soil conditioner and incorporated into or applied onto the vegetative growth layer. The wastewater treatment sludge shall neither be applied at greater than agronomic rates nor to a depth greater than six (6) inches.

2.1.4 Waste Exclusions

The following waste shall not be accepted by the facility for disposal:

- Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous or municipal solid waste is contained therein;
- Garbage as defined in G.S. 130A-290(a)(7);
- Hazardous waste as defined in G.S. 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators;
- Industrial solid waste unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A);
- Liquid wastes;
- Medical waste as defined in G.S. 130A-290(a)(18);
- Municipal solid waste as defined in G.S. 130A-290(a)(18a);
- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761;
- Radioactive waste as defined in G.S. 104E-5(14);
- Septage as defined in G.S. 130A-290(a)(32);
- Sludge as defined in G.S. 130A-290(a)(34);
- Special wastes as defined in G.S. 130A-290(a)(40);
- White goods as defined in G.S. 130A-290(a)(44); and
- Yard trash as defined in G.S. 130A-290(a)(45).

The following wastes shall not be accepted if separate from C&D landfill waste:

- Lamps or bulbs including, but not limited to, halogen, incandescent, neon or fluorescent; lighting ballast or fixtures;
- Thermostats and light switches;

- Batteries including but not limited to those from exit and emergency lights and smoke detectors;
- Lead pipes;
- Lead roof flashing;
- Transformers;
- Capacitors; and
- Copper chrome arsenate (CCA) and creosote treated woods.

Waste accepted for disposal in a landfill unit shall be readily identifiable as C&D waste. C&D waste that has been shredded, pulverized, or otherwise processed shall not be accepted for disposal from a facility unless that facility has received a permit from an authorized regulatory authority which specifies such activities are inspected by the authority, and whose primary purpose is recycling and reuse of the C&D material.

Edgecombe County shall not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste or requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

2.2 Disposal Rate

The 5-year average tonnage received from fiscal years 2009 through 2013 is 12,965 tons/year. This results in an average daily tonnage for the landfill of 43 tons per day.

2.3 Service Area

The service area for the facility includes the following North Carolina counties:

- Edgecombe
- Nash
- Halifax
- Wilson
- Pitt
- Martin

2.4 Other Facility Waste Operations

The locations of other facility waste operations are shown on **Figure 2**. The amounts of wastes handled in association with these other operations shall be documented in the Operating Record. Edgecombe County's list of off-site vendors with agreements in place for waste operations is summarized in **Appendix I-A**.

2.4.1 MSW Transfer Facility

The Edgecombe County MSW Transfer Facility (Transfer Facility) is located east of Colonial Road and is positioned northeast of the scale. The scale is used to weigh the loads delivered to the solid waste facility. Records of the tonnages of waste received at the facility are maintained in the scale house. The maximum daily tonnage for the Transfer Facility is 210 tons per day.

The Transfer Facility consists of a 4,200 square foot covered tipping floor with a depressed truck-loading bay for top loading transfer trailers. Once a transfer trailer is full, it is moved to the trailer staging area where the top of the trailer is covered with a tarp. The transfer trailer is then weighed at the scales and driven to a permitted MSW facility (**Appendix I-A**) for disposal. Waste shall not be stored on the tipping floor after operating hours. Waste may be stored at the facility after hours in covered transfer trailers no longer than 48 hours. The transfer trailers are staged in two open gravel parking areas adjacent to the Transfer Facility.

Leachate from the Transfer Facility tipping floor flows to a floor drain in the loading bay where it is directed to an oil/water separator with grit chamber for treatment. Treated leachate is stored in a leachate tank. The leachate tank and oil/water separator grease trap are pumped out as necessary and the material is disposed of at a permitted wastewater treatment facility (WWTF). The Transfer Facility building graded floor as well as the positive grading sloped away from the Transfer Facility are measures that limit surface water contact with the waste.

2.4.2 Tire Collection Area

The Tire Collection Area is located northwest of the entrance to the C&D Landfill site which is west of Colonial Road. Tire transporters visit the scale house to document the load of used tires and to complete a scrap tire certification form for submittal to NCDENR, Division of Waste Management. A copy of the current North Carolina Scrap Tire Certification form, used to document disposal of scrap tires, is included in **Appendix II-A**. Tires are stored in an open-top trailer which is packed down using a front-end loader on the backhoe. When the trailer is approximately 90 percent full, an off-site vendor (**Appendix I-A)** replaces the full trailer with an empty trailer. Use of the open-top trailers limits the exposure of the tires to overland flow of surface water during storm events. Edgecombe County processed an average of 1,316 tons of tires during the 2011-2012 and 2012-2013 reporting periods.

2.4.3 Mercury Containing Products Facility

The Mercury Containing Products (MCP) Facility trailer is located west of the C&D Landfill site entrance from Colonial Road near the Tire Collection Area. The MCP recycling facility is a closed trailer for handling, collecting, and temporarily storing spent mercury containing products is located at the site **(Figure 2)**. MCPs include:

- Fluorescent Lamps - 4 and 8 feet tubes.
- Compact Fluorescent Light Bulbs (CFLs).
- U-shaped/circular lamps.
- High intensity discharge bulbs (HIDs).
- UV lamps.
- Mercury containing thermostats.

All mercury products collected are sorted and packaged for pickup by an off-site vendor (**Appendix I-A**).

2.4.4 Electronics and Oil Filter Collection Building

The Electronics and Oil Filter Collection Building is located west of the C&D Landfill site entrance from Colonial Road and is west of Storage Buildings 1 and 2. Oil filters are collected in two 55-gallon drums. When one drum is full and other drum is ½ full, an off-site vendor (**Appendix I-A**) replaces the full drums with empty drums. Edgecombe County processed two 55-gallon drums, or approximately 300 filters during the period from the start of the oil filter collection program in September 2008 through February 2009. Electronics that are recycled include old computers, hard drives, monitors, keyboards, speakers, printers, adding machines, copy/fax machines, cell phones, and telephones, which are stored in a 4-foot by 4-foot wire basket. Once the basket is approximately 90 percent full, an off-site vendor (**Appendix I-A)** replaces the full basket with an empty basket. The building used for storage of the used oil filters and electronics reduces the potential for surface water contact with the stored wastes.

2.4.5 Convenience Center

The convenience center is located east of Colonial Road and is accessed through Gate 2. The convenience center collects the items listed below.

MSW

The convenience center uses a stationary compactor with replaceable roll-off containers to collect MSW waste. Once a roll-off is full, it is weighed on the scale and dumped at the MSW transfer facility. Use of the roll-off container reduces the potential for surface water from contacting the MSW.

Recyclables

Glass, plastic, and paper are collected in separate roll-off containers. Once a roll-off is full, it is weighed at the scale and taken to a recycling center (**Appendix I-A**). Use of the roll-off container reduces the potential for surface water from contacting the recyclable materials.

Cardboard

Cardboard is collected in a separate roll-off container. Once the roll-off is full, it is weighed at the scale and taken to a recycling center (**Appendix I-A**). Use of the roll-off container reduces the potential for surface water from contacting the cardboard.

Scrap Metals

Scrap metals are collected in a separate roll-off container and taken to the White Goods Staging Area when it is full. Accumulated scrap metal is transported by an off-site vendor (**Appendix I-A**). Use of the roll-off container reduces the potential for surface water from contacting the scrap metals.

White Goods Pad

The White Goods Pad is a 10-foot by 20-foot concrete pad used to temporarily store white goods and large metal items prior to taking them to the White Goods Staging Area. Material is removed from the Convenience Center White Goods Pad twice a week. The

area around the convenience center white goods pad is graded with a positive slope away from the pad to divert surface water around the pad.

Oyster Shells

The County participates in the North Carolina Oyster Shell Recycling Program. Shells are collected in two 55-gallon yellow plastic containers marked with the Program's logo. When one container is full and the second container is ½ full, an off-site vendor (**Appendix I-A**) replaces the full drums with empty drums. Use of the 55-gallon plastic containers reduces the potential for surface water from contacting shells.

Cooking Oil

Cooking oil is collected in an industrial 300-gallon plastic container. When the container is approximately 90 percent full, an off-site vendor (**Appendix I-A**) replaces the full container with an empty container. Use of the 300-gallon plastic container reduces the potential for surface water from contacting the oil.

Bulk Waste

Bulk waste, which includes furniture, sofas, mattresses, chairs, and other similar items, is collected in a separate roll-off container. Once the roll-off is full, it is weighed at the scale and then dumped at the MSW transfer facility. Use of the roll-off container reduces the potential for surface water from contacting the bulk waste.

Battery Collection

Car, light truck, and tractor batteries are stored on pallet. The batteries are taken to an off-site vendor (**Appendix I-A**) four times a year for recycling. Use of the pallet reduces the potential for surface water from contacting the batteries.

Oil Product Collection

Motor oil, diesel fuel, transmission fluid, hydraulic fluid, gear oil, and kerosene are collected in a 500-gallon drum. When the drum is approximately 90 percent full, an off-site vendor (**Appendix I-A**) replaces the full drum with an empty drum. Use of the 500-gallon drum reduces the potential for surface water from contacting the oil products.

Antifreeze

Antifreeze is collected in a 55-gallon drum. When the drum is approximately 90 percent full, an off-site vendor (**Appendix I-A**) replaces the full drum with an empty drum. Use of the 55-gallon drum reduces the potential for surface water from contacting the antifreeze. Edgecombe County processed an average of 30 gallons of antifreeze during the 2011-2012 and 2012-2013 fiscal years.

2.4.6 Concrete Disposal Area

The Concrete Disposal Area is located east of Colonial Road, east of Gate 3 and north of the transfer trailer staging area and is approximately 0.40 acres. This area is a beneficial fill area, as set forth in 15A NCAC 13B .0562, to increase the size of the transfer trailer staging area. The fill consists of inert debris strictly limited to concrete, brick, concrete block, uncontaminated soil, rock, and gravel. Silt fence is used as an erosion and

sediment control measure around the disposal area to limit potential impacts of surface water run-off.

2.4.7 Pesticide Container Storage Building

The Pesticide Container Storage Building is located east of Colonial Road and east of the scale house. The building is a metal structure with a concrete floor that is used to store pesticide containers. Containers delivered to the facility are inspected that they are thoroughly rinsed with labels removed and holes punched in them prior to being taken to the building. An off-site vendor (**Appendix I-A)** observes the contents of building to schedule site visits when the containers are shredded and then taken off-site. On average, this occurs yearly. Storing the waste containers in the building reduces the potential for surface water contact. Edgecombe County processed an average of 1,912 tons for the 2011-2012 and 2012-2013 fiscal years.

2.4.8 Yard Waste Processing Area

The Yard Waste Processing Area is located east of Colonial Road, within the limits of Borrow Area 1. Yard trash and land-clearing debris that are less than 6 inches in diameter and less than 4 feet long are accepted. The materials are weighed at the scale and then transported to the processing area where they are unloaded. A backhoe is used to push the material into one pile and reduce that area used. The yard waste area is limited to a 2-acre area located within Borrow Area 1. A soil berm maintained around the yard waste area serves to divert surface water away from the stockpile in this area. An off-site vendor (**Appendix I-A**) grinds up the stockpiled material and hauls it away annually. Edgecombe County processed 816 tons of yard waste during the 2007-2008 reporting period.

2.4.9 White Goods Staging Area

The White Goods Staging Area is located east of Colonial Road, within the limits of Borrow Area 1. A 180-foot by 120-foot concrete pad is used to temporarily store white goods and scrap metal prior to shipment to an off-site vendor (**Appendix I-A**). Properly trained Edgecombe County personnel recover Freon from white good units delivered to the staging area for recycling. White goods are weighed and then shipped off-site by the vendor when the concrete pad is full. The soil around the concrete pad is graded with a positive slope to divert surface water around the white goods pad. Edgecombe County processed an average of 158 tons of white goods based on the 2011-2012 and 2012-2013 reporting periods.

2.4.10 Wood Pallet Staging Area

Edgecombe County has constructed a 120-foot by 20-foot concrete pad to temporarily store wood pallets. The Wood Pallet Staging Area is located within Borrow Area 1, adjacent to the White Goods Staging Area. Once the area is full of pallets, they will be ground into mulch and hauled away by a vendor (**Appendix I-A**). The soil around the concrete pad is graded with a positive slope to divert surface water around the wood pallet staging area.

2.5 Equipment

Equipment currently utilized at the C&D landfill includes the following:

- Landfill Compactor
- Wheel Tractor Scraper
- Backhoe Loader
- Two Tractors (used for mowing)

Other equipment currently utilized at the facility includes the following:

- Yard Dog (Transfer Facility)
- Wheeled Front-end Loader (Transfer Facility)
- Knuckle Boom Truck
- Roll-off Trucks

3. LANDFILL CAPACITY

3.1 Gross Capacity

The gross capacity of the landfill was calculated between the base grades of the C&D landfill (final cap grades of southern MSW landfill) and the top of the proposed final cover grades of the C&D landfill. AutoCAD Civil 3D 2008 software was used to calculate this volume. The gross capacity of the C&D landfill (waste, cover, and soil cap system) is approximately 1.7 million cubic yards (cy). The remaining gross airspace as of October 26, 2008 is approximately 1,094,500 cy.

3.2 Phased Gross Capacity

AutoCAD Civil 3D 2008 software was used to calculate the landfill filling phases, originally based on filling volumes of approximately 5-year increments, as presented in Table 1 below. Phase 1 represents the C&D capacity initially placed by October 26, 2008.

Table 1: Filling Sequence Phases Gross Airspace

PHASE	GROSS AIRSPACE	ACCUMULATIVE AIRSPACE	GROSS AIRSPACE FILLED AS OF 2013
1	605,500 cy	605,500 cy	605,500 cy
2	111,500 cy	717,000 cy	717,000 cy
3	112,000 cy	829,000 cy	18,487 cy
4	115,000 cy	944,000 cy	
5	167,500 cy	1,111,500 cy	
6	174,800 cy	1,286,300 cy	
7	156,400 cy	1,442,700 cy	
8	178,600 cy	1,621,300 cy	
9	78,700 cy	1,700,000 cy	

PHASE	GROSS AIRSPACE	ACCUMULATIVE AIRSPACE	GROSS AIRSPACE FILLED AS OF 2013
TOTAL	**1,700,000 cy**	**1,700,000 cy**	

Figure 3 depicts the proposed final grading of the C&D Landfill. **Figure 4** depicts the plan view of the phases of landfill development for Phases 1 and 2, Phase 3, Phase 4 and Phase 5. **Figure 5** depicts the plan view of the landfill development for Phases 6, 7, and 8. Phase 9 is the final contours as shown in **Figure 3**.

3.3 Soil Required for Landfill Operation and Closure

The weekly/intermediate cover soil required for the operation of the C&D landfill is assumed to be approximately 10 percent of the remaining airspace minus the volume of the cap. The total cap thickness is 3 feet parallel to the slope. A plan view of the landfill site development at final closure is shown on **Figure 3**. The volume of soil required for the cap was calculated from the plan view area of the cap and multiplying by the cap thickness adjusted for the slope. The area of the final cap at a 4 horizontal to 1 vertical slope (4H:1V) is 1,514,500 square feet (sf). The volume of soil required for the cap on the 4H:1V slopes is calculated as follows:

1,514,500 sf x 3 ft x 1.031 ÷ 27 cy/cf = ***173,500 cy***

The area of the final cap at a 10 percent slope is approximately 341,600 sf. The volume of soil required for the cap on the 10 percent slopes is calculated as follows:

341,600 sf x 3 ft x 1.005 ÷ 27 cy/cf = ***38,200 cy***

The total volume of soil required to construct the cap is calculated as follows:

173,500 cy + 38,200 cy = ***211,700 cy***

The remaining airspace minus the volume of the cap is calculated as follows:

1,094,500 cy - 211,700 cy = ***882,800 cy***

The volume of soil required to operate the landfill is calculated as follows:

882,800 cy x 10% = ***~88,300 cy***

The total soil required for landfill operations and closure is calculated as follows:

211,700 cy + 88,300 cy = ***300,000 cy***

3.4 Operational Life

The remaining operational life of the landfill is calculated by taking the remaining gross airspace (as of 2013) minus the soil cap volume and multiplying that by the waste density. This volume is then divided by the average filling rate for the last five years.

Table 2 below presents the tons of C&D waste received at the landfill and the calculated density to determine the average airspace used each year.

Table 2: Airspace Used Over Last 5 Years

YEAR	AIRSPACE USED (tons)	CALCULATED DENSITY (tons/cy)	AIRSPACE USED (cy)
2009	13,377	0.440	30,403
2010	10,065	0.197	20,252
2011	14,854	0.540	27,507
2012	15,930	0.522	30,517
2013	10,601	0.524	20,232
Average	12,966	0.505	25,782

The gross airspace of the landfill is reduced by the volume of soil required for the closure cap (see Section 3.3 above). The net volume of airspace for the entire C&D Landfill is calculated as follows:

1,700,000 cy - 211,700 cy = 1,488,300 cy

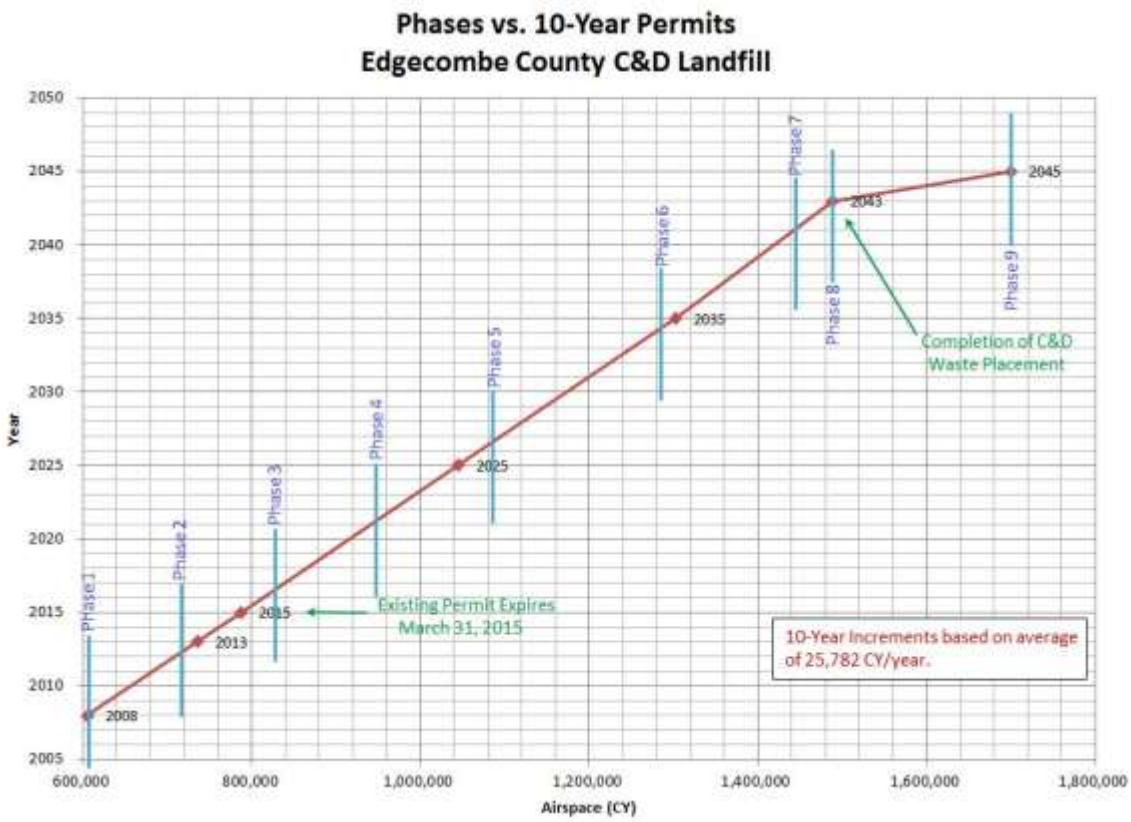
Topographic survey records indicate that from 1997 to 2008 a total of 605,500 cy of airspace was placed. The 2013 topographic survey indicates that from 2008 to 2013 a total of 129,987 cy of airspace was used. The remaining airspace of the landfill in tons is calculated as follows:

1,488,300 cy - (605,500 cy + 129,987 cy) = 752,813 cy

With an average of 12,966 tons per year and an average 0.505 tons/cy, the airspace used for the last 5 years of operations was an average of 25,782 cy/year. The remaining operational life of the landfill as of **2013** is calculated as follows:

752,813 cy ÷ 25,782 cy/year = ***29.2 years***

The following chart shows the expected landfill filling rate with the existing permit Phases and the corresponding 10-year permit increments following expiration of the existing permit, March 31, 2015.



3.5 Available On-site Soils

Soil material for the operation and closure of the C&D landfill will be obtained from Borrow Area 1 and Borrow Area 2 as shown on **Figure 2**. From the *Borrow Area, Wetland and Geotechnical Evaluation, Edgecombe County Landfill* report dated May 30, 2008 (included as Appendix I of the Closure and Post-Closure Plan), there is approximately 275,000 cy, in-place, of available soil in Borrow Area 1, and approximately 80,000 cy, in-place, of available soil in Borrow Area 2. The total soil available in-place from these two borrow sources is approximately **355,000 cy**. The shrink factor from excavating soil material in-place to placing them during operation and closure is estimated to be 15 percent. The total amount of in-place soil required for operation and closure is calculated as follows:

$$300{,}000 \text{ cy} \div (1-0.15) = 353{,}000 \text{ cy}$$

The net soil available for operation and closure is calculated as follows:

$$355{,}000 \text{ cy} - 353{,}000 \text{ cy} = 2{,}000 \text{ cy}$$

Therefore, there is net surplus of approximately **2,000 cy**. In addition, the County is exercising its option to purchase the property directly south of the C&D landfill on the west side of Colonial Road. The soil materials from this property may be used as an additional source of borrow material.

4. SPECIAL ENGINEERING FEATURES

4.1 Leachate Management System

No leachate management system is proposed for this facility.

4.2 Containment and Environmental Control Systems

4.2.1 Cap System

The cap system will be installed after the contours of the C&D landfill reach the final grades. The cap has been designed to minimize storm water infiltration into the landfill and to resist erosive forces. The surface of the landfill will be sloped to a minimum post-settlement grade of 5 percent [20 horizontal to 1 vertical (20H:1V)] and maximum grade of 25 percent (4H:1V). The proposed cap system will consist of the following:

- 18-inch thick Low-Permeability Barrier; and
- 18-inch thick Vegetation/Erosion Layer.

If the landfill must be closed prior to reaching the final contours, the surface of the landfill will be sloped to a minimum post-settlement grade of 5 percent and maximum grade of 25 percent.

4.2.2 Erosion and Sedimentation Control

An Erosion and Sediment Control Plan (ESC Plan) has been prepared for the site and was approved by the NCDENR, Division of Land Resources, Land Quality Section in a letter dated May 20, 2009. The ESC Plan will be updated as necessary based on current operating conditions. Temporary erosion control measures, such as silt fences, slope drains, and check dams, will be installed as necessary to reduce erosion and sedimentation leaving the site in general accordance with the ESC Plan. Currently, the facility is not required to be covered under a site-specific NPDES Permit.

4.3 Base Liner Systems

No base liner system is proposed for this facility.

4.4 Landfill Gas Venting System

The existing landfill gas (LFG) system is located in the western and central portion of the closed southern MSW landfill. Prior to March 2012, the LFG system included 60 passive LFG vents. These vents consist of perforated 6-inch diameter high density polyethylene (HDPE) pipe surrounded by gravel. The gas vents were extended vertically prior to placing C&D waste in an area. Prior to placing the soil layers of the cap system, the gas vents shall be extended, as necessary, so that there is a minimum 3 feet of stick-up above the vegetation/erosion layer. Any new gas vents installed shall consists of perforated 6-inch diameter HDPE pipe or Schedule 80 PVC pipe surround by gravel. The perforations shall end 10 feet below the final ground surface elevation and the remainder of the pipe shall be solid. One bentonite plug shall be installed within the annular space of the boring along the solid section of the pipe. Details of the new active LFG Collection and Control system are presented in Section 4.5 below.

4.5 Active Landfill Gas Collection System

A landfill gas collection and control system (LFGCCS) was constructed in 2012 at the Edgecombe County landfill and consists of a series of biogas wells, LFG piping and valves, condensate sumps, condensate tanks, and a blower/flare system (BFS), which directs the collected biogas to a blower flare system. The system will be connected to a Containerized Landfill Gas to Energy (LFGTE) Facility for electricity generation in the near future. In the meantime, excess biogas will be combusted in the candlestick flare of the BFS.

LFG Extraction Wells

In the spring of 2012, Edgecombe County converted 24 passive Landfill Gas (LFG) vent wells to active LFG extraction wells and installed 24 new landfill gas extraction wells. A total of 48 active LFG extraction wells are currently installed at the Southern Landfill. Nine of the LFG extraction wells are installed in the C&D landfill waste while the remaining 39 LFG extraction wells are installed in MSW. Passive vent wells not being used were either abandoned or capped for potential future use. The LFGCCS began operation on September 7, 2012.

LFG Blower-Flare System Skid

The LFGCCS features a 4-inch diameter candlestick flare system, manufactured by Product Recovery Management (PRM). The flare is supplied with up to 300 standard cubic feet per minute (scfm) of LFG by two centrifugal, regenerative vacuum blowers, manufactured by Gardner-Denver, Incorporated® (GDI). Each blower is equipped with a 25 hp electric motor and can achieve a maximum flow rate of 300 scfm. The vacuum blower speeds are controlled by variable frequency drive (VFD).

The flare is 20 feet tall and the top three feet are equipped with a wind shroud to protect the propane pilot ignition assembly. A propane gas train provides gas for start-up procedures, when necessary.

A stainless-steel moisture separator (MS-80) removes moisture and any debris from the LFG stream before the LFG enters the vacuum blowers. LFG discharged from the blowers passes through a second stainless steel moisture separator (MS-60) before being sent to either the two LFG-fueled generators or to the flare. Moisture removed by the MS-80 and MS-60 are collected in moisture knock-out pots and subsequently gravity drain to a condensate storage sump.

The BFS is fully automated and is capable of shut-down and start-up. The blower-flare system operation is monitored at a programmable logic controller (PLC) panel adjacent to the flare. The PLC, equipped with a data logger, and monitors critical operating parameters such as gas flow, gas temperature, gas pressure and flare temperature.

LFG Control and Monitoring Devices

The concentration of methane in the LFG is continuously monitored by a Landtec® FAU-TDL model gas analyzer (Serial Number: 1045). The gas analyzer is mounted on

the main LFG header upstream of the flare. The continuous gas analyzer measures methane concentration on a wet basis.

The volumetric flow rate of LFG is measured continuously by a Veris Verabar V100 (serial number: V19929-01.1) in-line flow meter mounted upstream of the flare on the main LFG header. The flow meter uses averaging pitot flow technology.

Figures 6 and 8 show landfill gas collection and control system. Construction details for the vertical extraction wells, the nested vertical extraction wells, and the wellhead and well bore details are shown in **Figure 7**. The former gas vent system used "V" and "CV" designations. The "CV" designated wells were the recently installed active gas vent wells. The "V" designated wells were the existing passive vent wells. To avoid confusion in the future, all active vent wells were redesignated as "EW" for extraction well. All remaining wells, whether abandoned, capped or inactive, maintained the "V" designation for vent well. An inventory of the system wells is presented in **Appendix III-A**.

4.6 Corrective Measures

The NCAC 2L Groundwater Quality Standards (2L Standard) or the Solid Waste Section, Groundwater Protection Standard (GWPST) have been exceeded for several target constituents in groundwater near the north-northeastern property boundary at the facility. The nearest receptor north-northwest of the facility is Jerry's Creek.

A Nature and Extent Study (NES) and an Assessment of Corrective Measures (ACM) were performed to characterize the nature and extent of the release and identify several potential solutions or corrective measures which could be implemented to address the migration of groundwater contaminants beyond the compliance boundary.

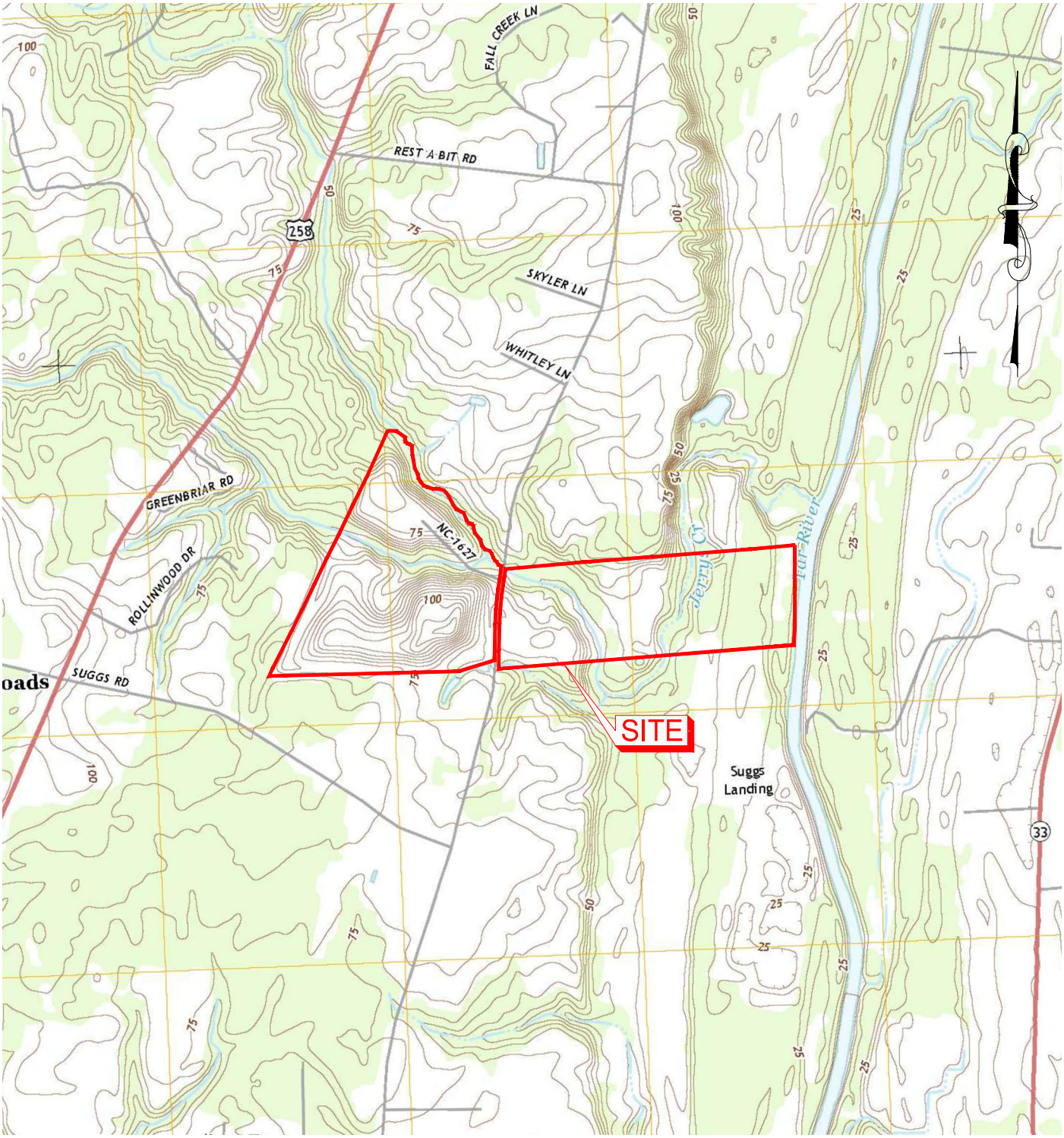
Following meetings for public questions and input, in-situ isolation combined with monitored natural attenuation (MNA) were selected to remediate the constituents of concern (CoCs). In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the COCs at the landfill. As described in the Corrective Action Plan (CAP), the in-situ isolation and MNA remedies selected at the Edgecombe County Landfill will involve the following:

(1) In-situ Isolation: Upgradient groundwater barrier/containment
(2) In-situ Isolation: Maintain consistent contour with pre-1998 waste area elevations
(3) In-situ Isolation: Increase slopes over the closed MSW unit
(4) In-situ Isolation: Stormwater improvement on the western portion of landfill
(5) Monitored Natural Attenuation (MNA)

Analysis of MNA parameters and groundwater level monitoring has been incorporated into the facility's updated WQMP to evaluate the effectiveness of the remedial measures.

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

FIGURES



GRAPHIC SCALE

1000 0 500 1000 2000

(IN FEET)

RIVER BASIN: TAR-PAMLICO

TOPO SOURCE: NCGS DRG
OLD SPARTA, DATED 2013
CONTOUR INTERVAL 5 FEET

A-4505

SCALE:	1" = 2000'
DATE:	AUG 2014
DRAWN BY:	
PROJECT NO:	1054-13-277A

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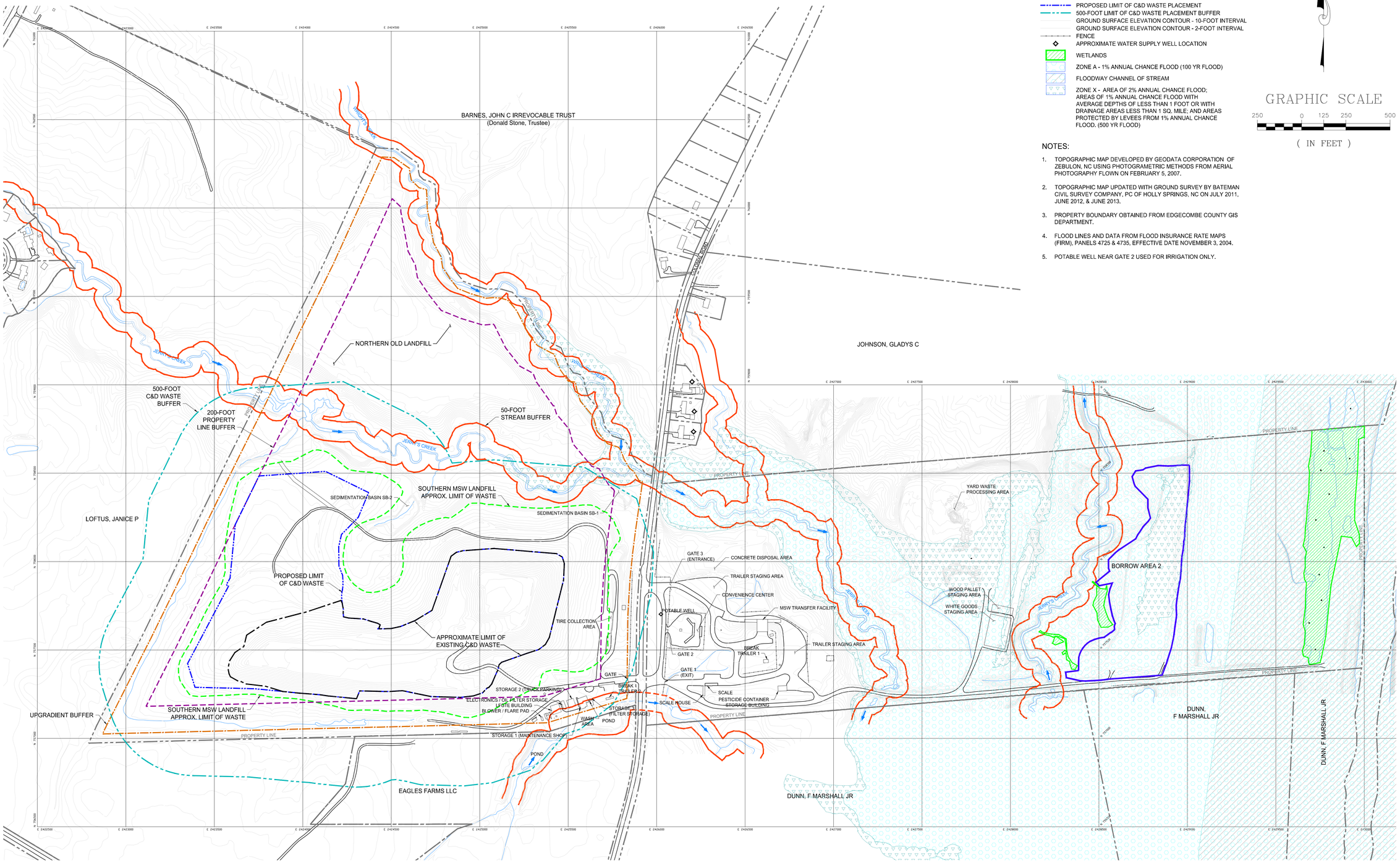
VICINITY MAP

FACILITY PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.

1

T:\Projects\2013\ENV\13-277A Edgecombe Permit Applications\CAD\Drawings from KSO\Facility Plan\A4505.dwg, FIG1, 9/3/2014 10:22:51 AM, 1:1



LEGEND

- LIMIT OF MSW WASTE
- PROPERTY LINE
- APPROXIMATE LIMIT OF C&D WASTE
- 200-FOOT PROPERTY LINE BUFFER
- 50-FOOT PROPERTY LINE BUFFER
- 50-FOOT STREAM BUFFER
- PROPOSED LIMIT OF C&D WASTE PLACEMENT
- 500-FOOT LIMIT OF C&D WASTE PLACEMENT BUFFER
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- APPROXIMATE WATER SUPPLY WELL LOCATION
- WETLANDS
- ZONE A - 1% ANNUAL CHANCE FLOOD (100 YR FLOOD)
- FLOODWAY CHANNEL OF STREAM
- ZONE X - AREA OF 2% ANNUAL CHANCE FLOOD; AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQ. MILE; AND AREAS PROTECTED BY LEVEES FROM 1% ANNUAL CHANCE FLOOD. (500 YR FLOOD)

GRAPHIC SCALE

250 0 125 250 500

(IN FEET)

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
4. FLOOD LINES AND DATA FROM FLOOD INSURANCE RATE MAPS (FIRM), PANELS 4725 & 4735, EFFECTIVE DATE NOVEMBER 3, 2004.
5. POTABLE WELL NEAR GATE 2 USED FOR IRRIGATION ONLY.

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NO.	DATE	DESCRIPTION	BY
1	6-20-2014	June 2014 Permit Renewal	

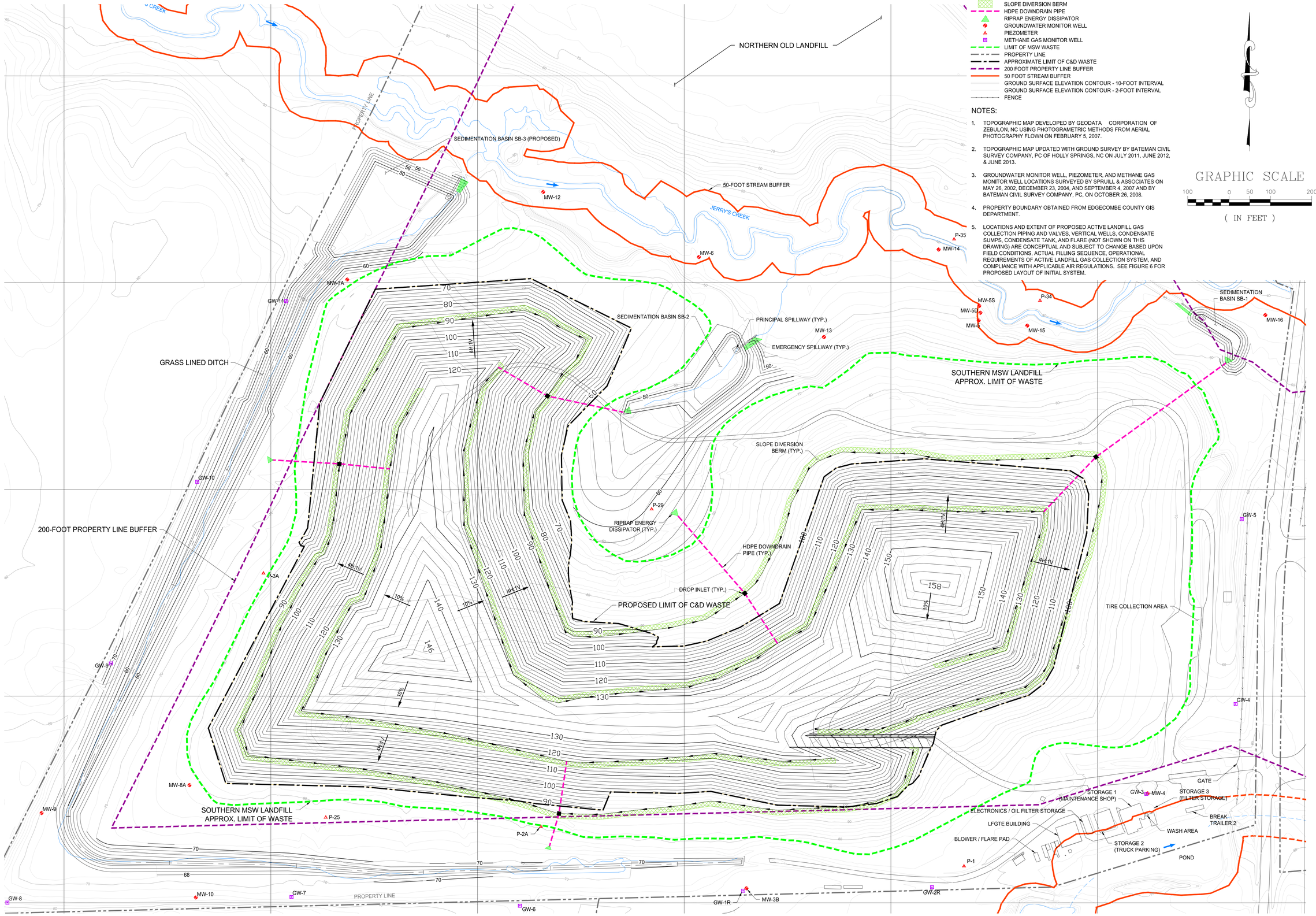
GENERAL REVISIONS

SITE DEVELOPMENT
EXISTING CONDITIONS

FACILITY PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 250'	DATE: AUG 2014
DRAWING NUMBER: D-1372	
DRAWING: 2	OF: 8

T:\Projects\2013\EN\13-277A Edgecombe Permit Applications\CAD\Drawings from HSO\Facility Plan\D1372.dwg, FIG2, 8/3/2014 10:22:28 AM, 1:1



LEGEND

- SLOPE DIVERSION BERM
- HDPE DOWNDRAIN PIPE
- RIPRAP ENERGY DISSIPATOR
- GROUNDWATER MONITOR WELL
- PIEZOMETER
- METHANE GAS MONITOR WELL
- LIMIT OF MSW WASTE
- PROPERTY LINE
- APPROXIMATE LIMIT OF C&D WASTE
- 200 FOOT PROPERTY LINE BUFFER
- 50 FOOT STREAM BUFFER
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
3. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. LOCATIONS AND EXTENT OF PROPOSED ACTIVE LANDFILL GAS COLLECTION PIPING AND VALVES, VERTICAL WELLS, CONDENSATE SUMPS, CONDENSATE TANK, AND FLARE (NOT SHOWN ON THIS DRAWING) ARE CONCEPTUAL AND SUBJECT TO CHANGE BASED UPON FIELD CONDITIONS. ACTUAL FILLING SEQUENCE, OPERATIONAL REQUIREMENTS OF ACTIVE LANDFILL GAS COLLECTION SYSTEM, AND COMPLIANCE WITH APPLICABLE AIR REGULATIONS. SEE FIGURE 6 FOR PROPOSED LAYOUT OF INITIAL SYSTEM.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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NO.	DATE	DESCRIPTION	BY
1	6-30-2014	June 2014 Permit Renewal	

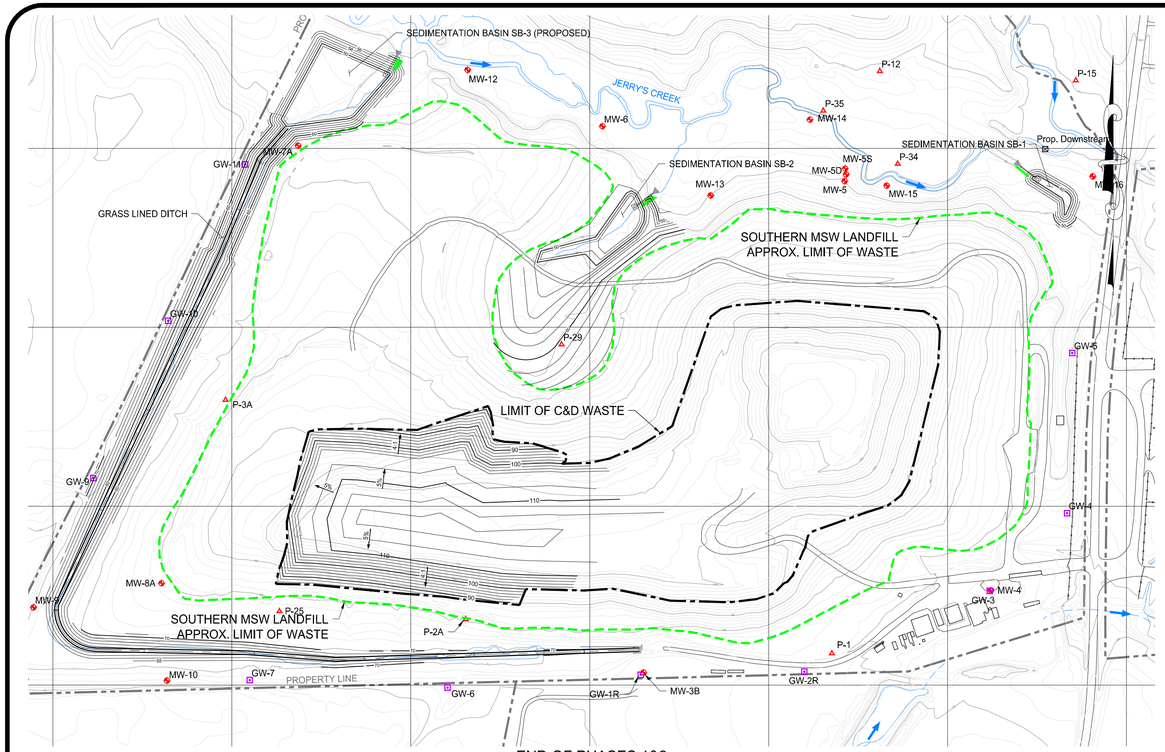
GENERAL REVISIONS

SITE DEVELOPMENT
FINAL CLOSURE

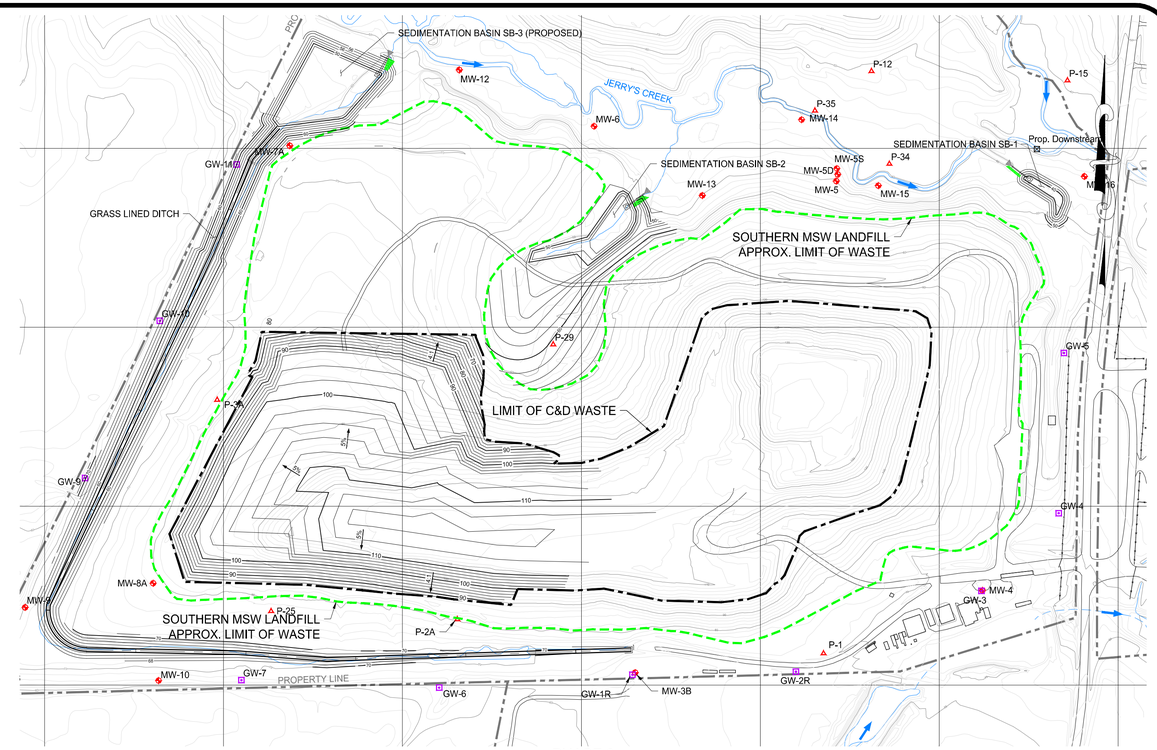
FACILITY PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1373	
FIGURE: 3	OF: 8

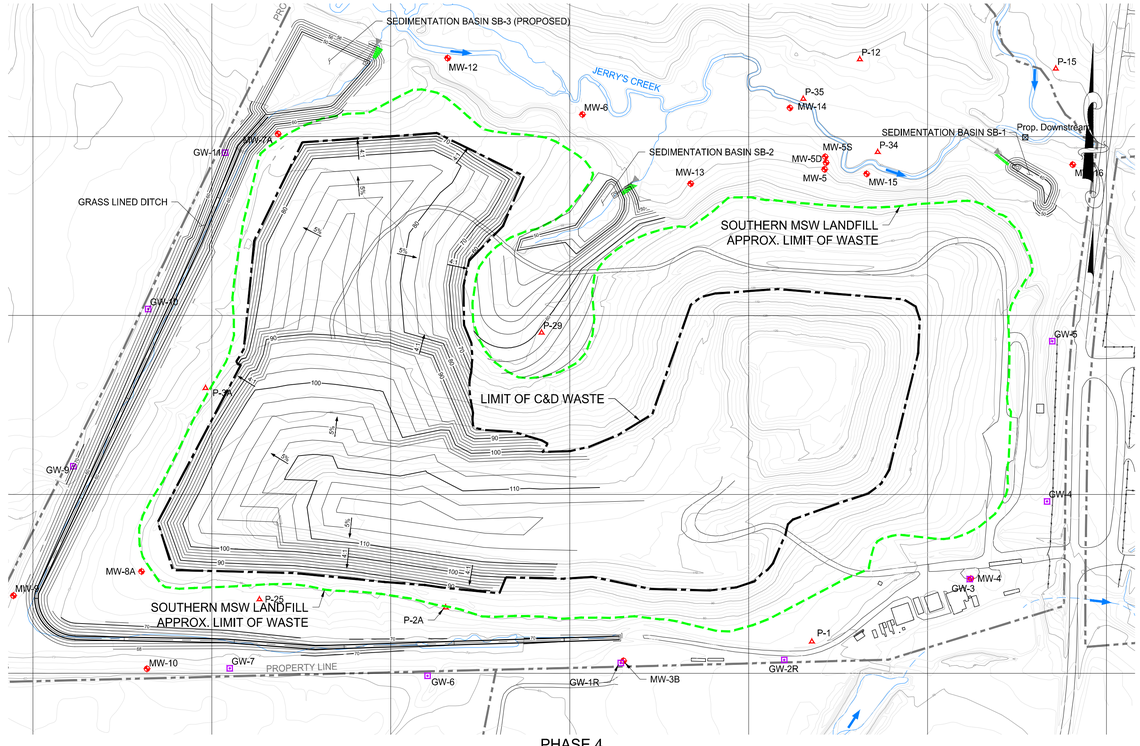
T:\Projects\2013\EN\1313-277A Edgecombe Permit Application\CAD\Drawings from KSO\Facility Plan\D1373.dwg, FIG3, 9/3/2014 10:22:09 AM, 1:1



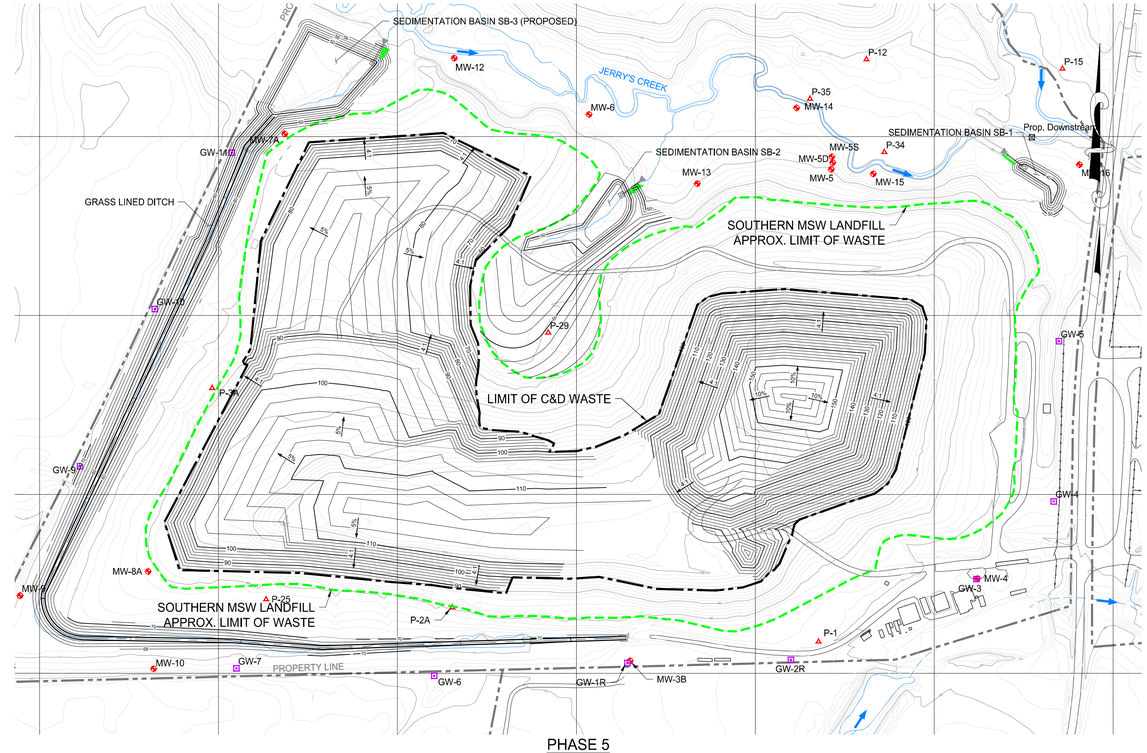
END OF PHASES 1&2



PHASE 3



PHASE 4



PHASE 5

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
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4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- METHANE GAS MONITOR WELL
- PIEZOMETER
- GROUNDWATER MONITOR WELL
- LIMIT OF MSW WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

400 0 200 400

(IN FEET)

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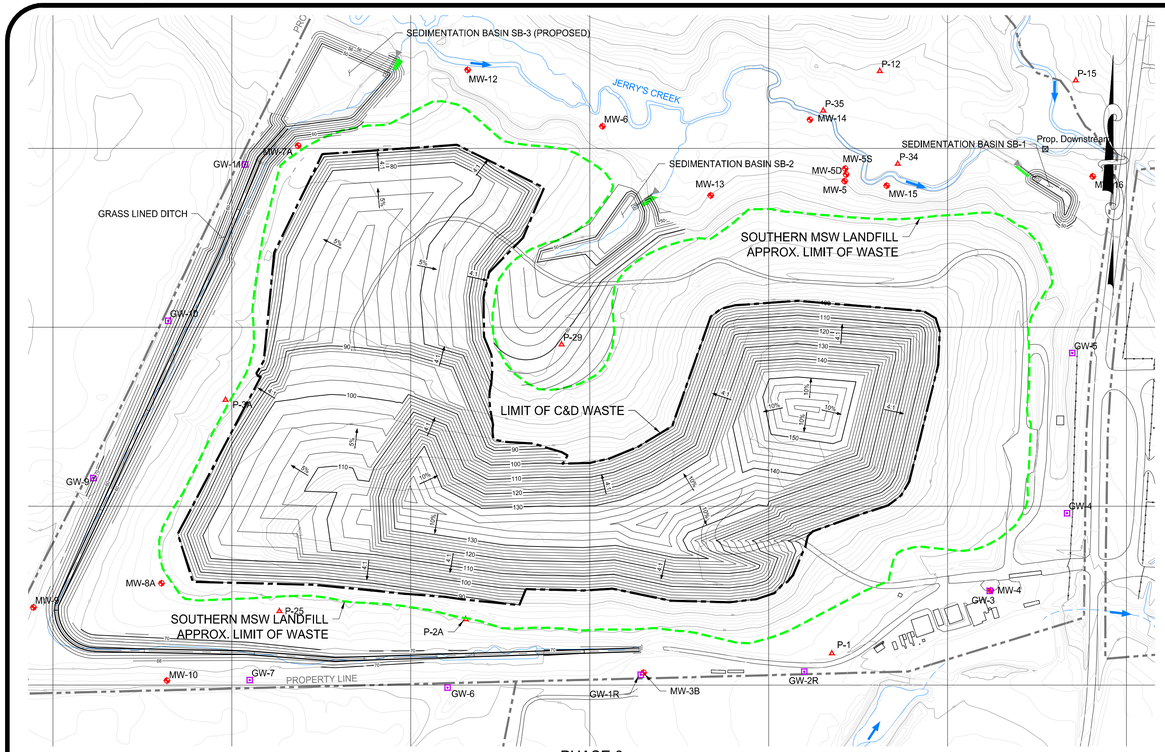
NO.	DATE	DESCRIPTION	BY
1	6-30-2014	Indicate Phases	

5-YEAR DEVELOPMENT - YEARS 5, 10, 15, AND 20

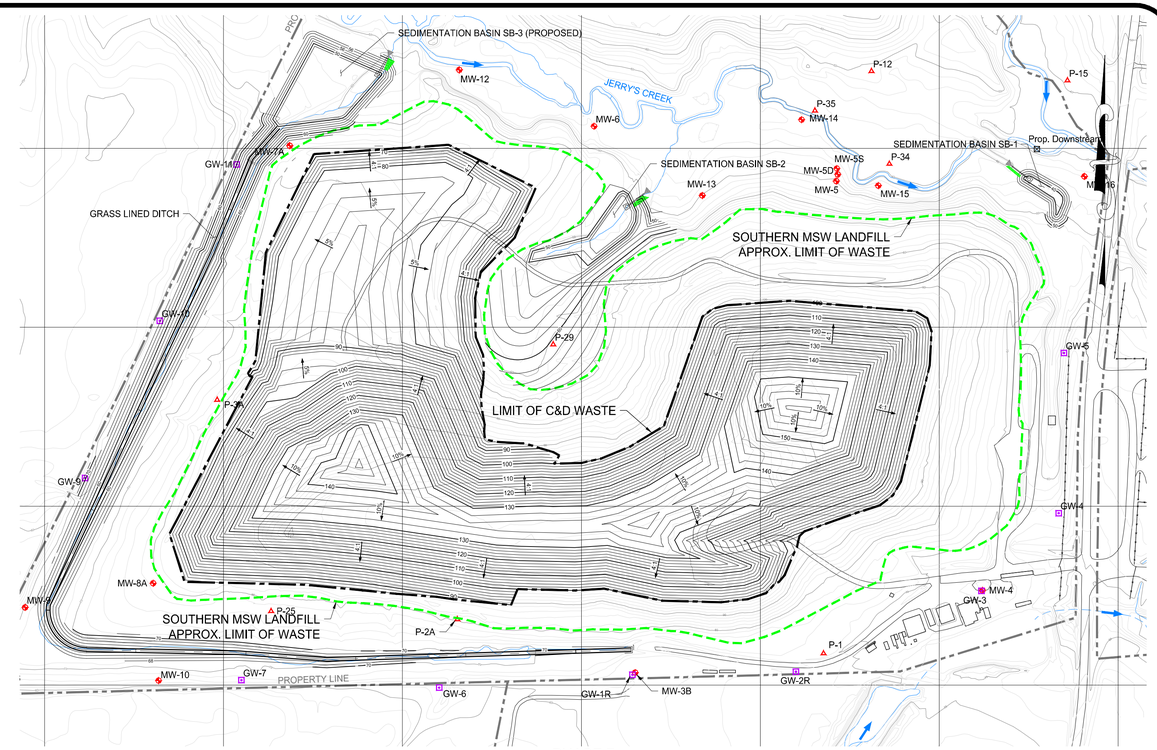
FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1374-01	
DRAWING: 4	OF: 8

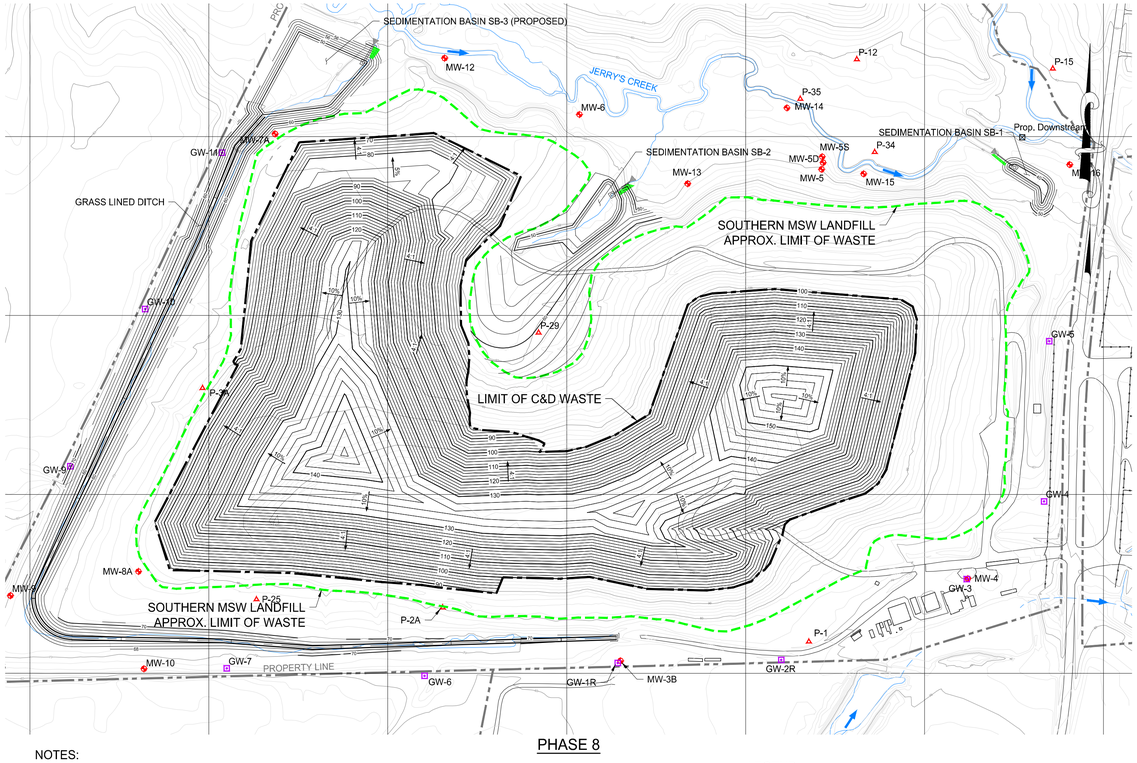
T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from HLD\Facility Plan\D1374.dwg, FIG4, 8/29/2014 10:21:19 AM, 1:1



PHASE 6



PHASE 7



PHASE 8

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
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4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- METHANE GAS MONITOR WELL
- PIEZOMETER
- GROUNDWATER MONITOR WELL
- LIMIT OF MSW WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

400 0 200 400

(IN FEET)

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NO.	DATE	DESCRIPTION	BY
1	6-30-2014	Indicate Phases	

5-YEAR DEVELOPMENT - YEARS 25, 30, AND 35

FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1374-02	
DRAWING: 5	OF: 8

T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Facility Plan\D1374.dwg, FIG5, 6/30/2014 10:21:29 AM, 1:1

LEGEND

- MONITOR WELL
- PIEZOMETER
- GAS PROBE
- GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- 8" HDPE HEADER
- 6" HDPE LATERAL
- 4" HDPE LATERAL
- APPROXIMATE LIMIT OF MSW WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
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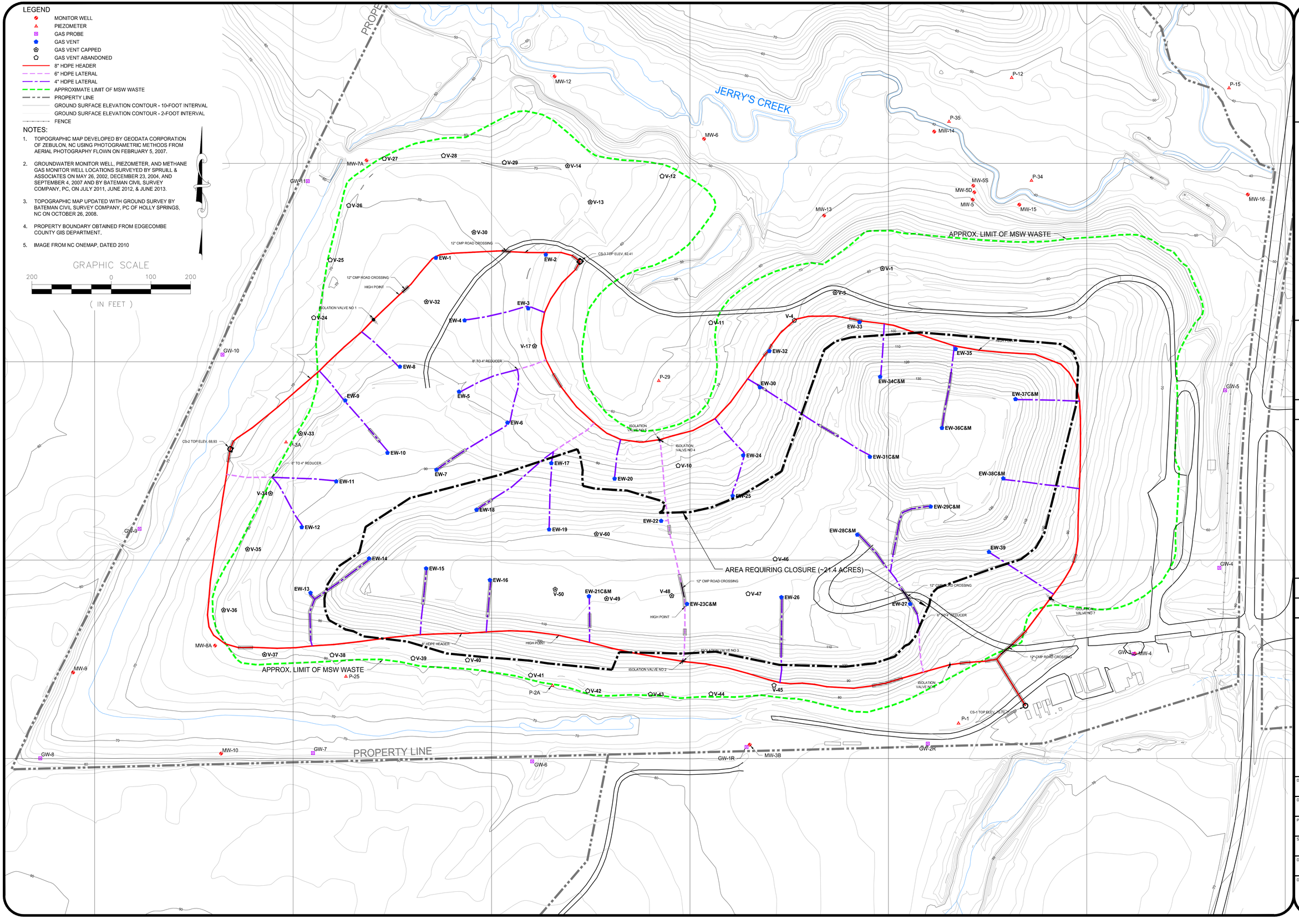
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. IMAGE FROM NC ONEMAP, DATED 2010

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-20-2014	June 2014 Permit Renewal	

ACTIVE LANDFILL GAS COLLECTION AND CONTROL SYSTEM

FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1375	
DRAWING: 6	OF: 8

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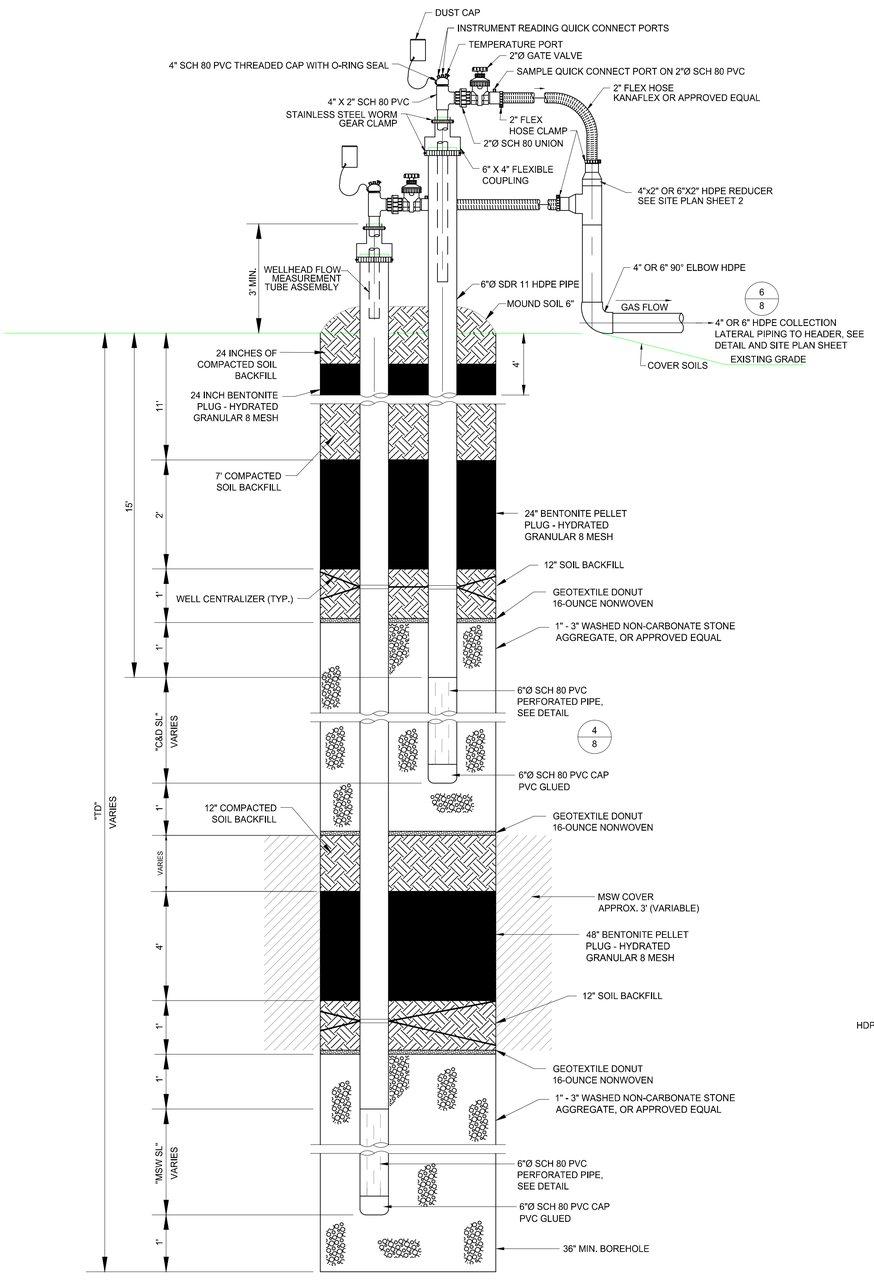
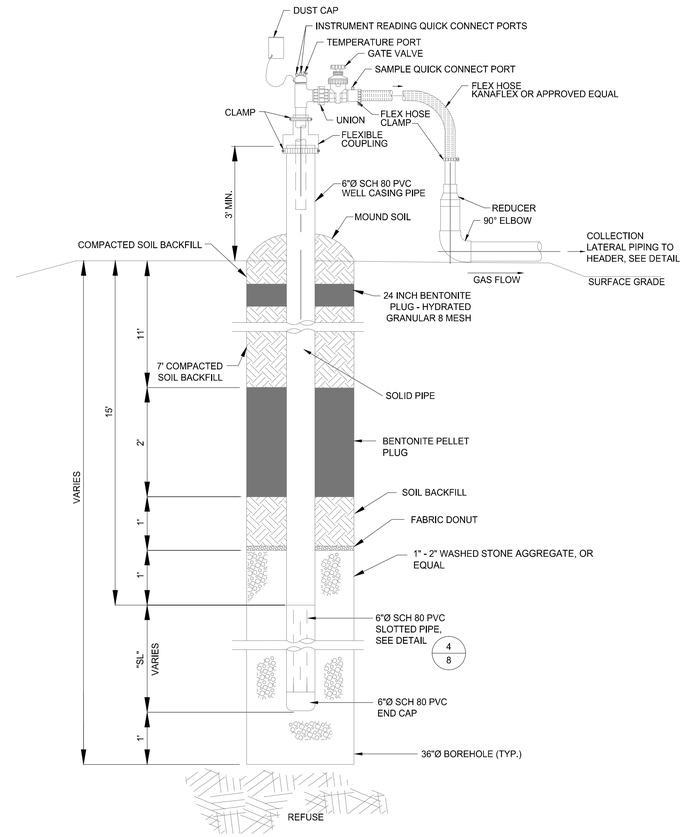
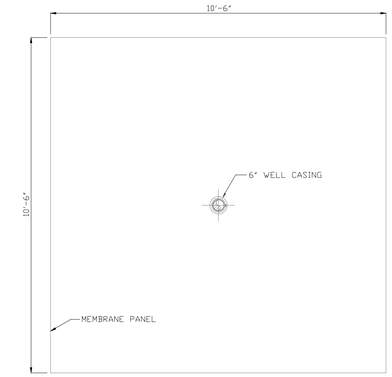


NOTES:
1. WELLHEAD ASSEMBLY SHOWN REPRESENTS 2" LANDTEC ACCU-FLO MODEL AF2V WELLHEAD ASSEMBLY, TEL. 1-800-LANDTEC, FAX 213-895-5866.
2. WELL CENTRALIZERS TO BE INSTALLED AT EVERY 25' OF BORE DEPTH TO KEEP WELL CASING CENTERED IN BORE HOLE.

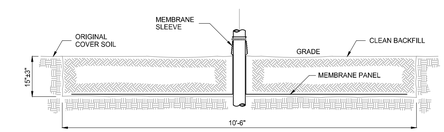
1/8 NESTED VERTICAL EXTRACTION WELL DETAIL
NOT TO SCALE



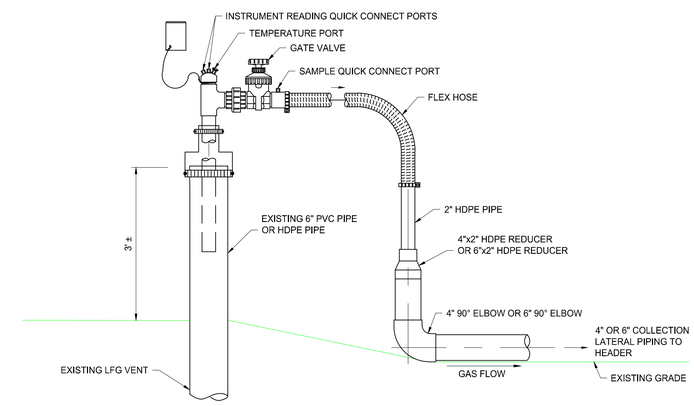
2/8 VERTICAL EXTRACTION WELL DETAIL
NOT TO SCALE



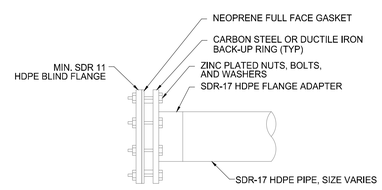
8/8 WELLBORE SEAL - TOP VIEW
NOT TO SCALE



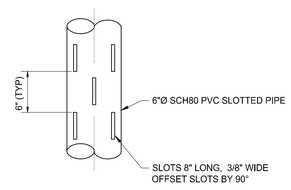
7/8 WELLBORE SEAL - ELEVATION VIEW
NOT TO SCALE



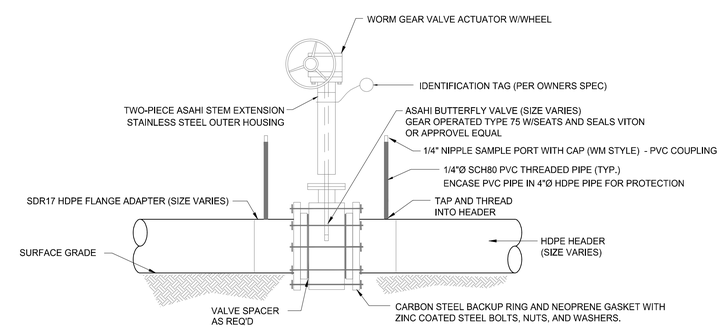
6/8 TYPICAL WELLHEAD DETAIL
NOT TO SCALE



3/8 HEADER PIPE BLIND FLANGE
NOT TO SCALE



4/8 SLOTTED PIPE FOR VERTICAL WELLS DETAIL
NOT TO SCALE



5/8 BELOW GRADE LFG COLLECTION SYSTEM BUTTERFLY VALVE DETAIL
NOT TO SCALE

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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-30-2014	June 2014 Permit Renewal	

ACTIVE LANDFILL GAS COLLECTION AND CONTROL SYSTEM DETAILS

FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1376	
DRAWING: 7	OF: 8

T:\Projects\2013\EN\1054-13-277A Edgecombe Permit Applications\CAD\Drawings from KSO\Facility Plan\D1376.dwg, FIG7, 9/3/2014 10:19:50 AM, 1:1

18" CMP (3" PVC PIPE RUNS THOUGH)
INV. ELV:62.79'

18" CPP
INV. ELV:64.43'

18" CMP (3" PVC PIPE RUNS THOUGH)
INV. ELV:63.33'

18" CPP (BURIED)
INV. ELV:64.93'

EXIST. UNDERGROUND TELEPHONE

EXIST. AIR LINE

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. UNDERGROUND ELECT.

EXIST. LANDFILL GAS HEADER
(BELOW GROUND)

LFGTE BUILDING

CONDENSATE SUMP CS-1

LIQUID CONDENSATE LINES

AIR LINE

LIQUID TRANSFER PUMP

EXIST. ELECTRIC
TRANSFORMER PAD

EXIST. BLOWER
FLARE PAD

EXIST.
CONDENSATE PAD

H-FRAME SUPPORT

EXIST. SILT FENCE

EXIST. TREE PROTECTION

EXIST. FRENCH DRAIN

EXIST. POND

70

LEGEND

	EXIST. FRENCH DRAIN
	LIQUID CONDENSATE LINE
AIR	EXIST. AIR LINE
LFG	EXIST. LANDFILL GAS HEADER
XSF	EXIST. SILT FENCE
SD	EXIST. STORM DRAIN
XTP	EXIST. TREE PROTECTION
UT	EXIST. UNDERGROUND TELEPHONE
UE	EXIST. UNDERGROUND ELECTRIC
W	EXIST. WATER

GRAPHIC SCALE

40 0 20 40

(IN FEET)

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NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-30-2014	June 2014 Permit Renewal	

BLOWER FLARE SYSTEM AREA

FACILITY PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSI
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 20'	DATE: AUG 2014
DRAWING NUMBER: D-1377	
DRAWING: 8	OF: 8

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APPENDIX I-A

(LIST OF VENDORS)

List of Vendors
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Vendor	Vendor Address	Vendor Phone Number	Material
East Carolina Regional Landfill Permit No. 08-03	1922 Republican Road Aulander, NC 27805	(252) 348-3322	MSW (Primary)
Sampson County Disposal, LLC Permit No. 82-02	7434 Roseboro Highway Roseboro, NC 28382	(910) 525-4132	MSW (Alternate)
Central Carolina Tire Disposal	1616 McKoy Town Road Cameron, NC 28326	(919) 499-2301	Tires
Resource Reformers, LLC Clean Green Waste Oil & Filters	P.O. Box 11443 Durham, NC 27703	800-656-6361 919-596-3500	Motor Oil, Antifreeze, Oil Filters
Creative Recycling	3110 Cherry Plam Drive Suite 330 Tampa, FLA 33619	813-621-2319 919-941-5001	E-Waste
Eastern Carolina Vocational Center, Inc.	P.O. Box 1686 Greenville, NC 27835	(252) 758-4188	Recyclables, Cardboard
Omni Source	PO Box 578 Lyman, SC 29365	919-270-8750	White Goods, Scrap Metals
NC Oyster Shell Recycling Program	P.O. Box 769 Morehead City, NC 28557	(800) 682-2632	Oyster Shells
Triangle Biofuels Industries, Inc.	1724 Baldree Road Wilson, NC 27893	(252) 360-4274	Cooking Oil
NSB Inc.	437 Ward Boulevard Wilson, NC 27893	(252) 237-3938	Batteries
Southeast Recycling	906 Chase Drive Johnson City, TN 37604	864-579-8276	CFL Bulbs, Mercury Thermostats
USAg Recycling, Inc.	18330 Penick Road Waller, TX 77484	(800) 654-3145	Pesticide Containers
Guy Shavender Trucking, Inc.	P.O. Box 206 Pantego, NC 27860	(252) 943-3379	Yard Waste, Wood Pallets

Note: Updated Vendor List Provided to S&ME by Edgecombe County Solid Waste Department May 2014.

APPENDIX II-A

(NORTH CAROLINA SCRAP TIRE CERTIFICATION FORM)

NORTH CAROLINA SCRAP TIRE CERTIFICATION

REQUIRED FOR FREE DISPOSAL AT PUBLIC COLLECTION FACILITIES

Parts I and II must be completed to qualify for free disposal. Used tires and casings obtained from out-of-state by retreaders or used tire dealers are not eligible for free disposal. County may require proof that tires originated in NC. Used tire dealers, wholesalers, brokers, retreaders, and others who sort, grade, or cull loads of tires which were removed from vehicles by another NC dealer must provide the original certification from the individual who first removed the tire from a vehicle. Tires stockpiled before January 1, 1994 are not eligible for free disposal.

PROVIDING FALSE OR INCOMPLETE INFORMATION ON THIS FORM IS SUBJECT TO A CIVIL PENALTY OF UP TO $15,000 PER VIOLATION PURSUANT TO N.C.G.S. 130A-22. FALSIFYING THIS REPORT IS A CLASS 2 MISDEMEANOR AND SUBJECT TO A FINE OF UP TO $10,000 PURSUANT TO N.C.G.S. 130A-26.2

PART I: CERTIFICATION BY RETAILER OR OTHER PERSON DISPOSING OF SCRAP TIRES

This section is to be completed by the generator of the tires.

Must have ORIGINAL signature.

Name of retailer or other person disposing of scrap tires: _____

Address: _____ Phone Number: _____

City: _____ State: _____ Zip Code: _____

CERTIFICATION: I hereby certify that these _____ (total number) tires were collected for disposal as indicated below, and these tires originated in _____ County, _____ State, during the time period _____ / _____ to _____ / _____, 20 ____.

_____ NUMBER OF TIRES REMOVED FROM VEHICLES WHEN REPLACEMENT TIRES WERE SOLD IN NC
(Provide copies of documentation, IF required by county).

_____ NUMBER OF TIRES REMOVED WHEN VEHICLES WERE REPAIRED OR JUNKED IN NC
(Provide proof of eligibility for free disposal, IF required by county).

_____ NUMBER OF TIRES REMOVED FROM FLEET VEHICLES IN N.C. (e.g. School bus shop, trucking company garage)
(Provide proof tires were purchased in NC and proof of payment of disposal tax, IF required by county).

_____ NUMBER OF TIRES COLLECTED BY MEANS OTHER THAN THE NORMAL COURSE OF BUSINESS
(e.g. Cleanup projects, pre-1994 stockpiles from businesses and junkyards) ☐ *Disposal fees paid* ☐ *Fees waived by county*
(check one)

_____ NUMBER OF TIRES THAT ORIGINATED OUT OF STATE ☐ *Disposal fees paid* ☐ *Fees waived by county*

Signature _____ Date _____

PART II: CERTIFICATION BY SCRAP TIRE HAULER

This section is to be completed by the hauler of the tires.

Must have ORIGINAL signature.

Name of scrap tire hauler: _____

Scrap tire hauler identification #: _____ or Merchant identification #: _____ (sales tax #)

Address: _____ Phone Number: _____

City: _____ State: _____ Zip Code: _____

CERTIFICATION: I hereby certify that this load contains _____ (number) of the same tires that were received from the person disposing of scrap tires in Part I of this form AND NO OTHERS.

Signature _____ Date _____

PART III: CERTIFICATION BY COLLECTOR, PROCESSOR, OR DISPOSER

This section is to be completed by the collector of the tires.

Facility Name: _____ Number of tires received: _____

Received by: **Signature** _____ Date _____

THIS FORM IS TO BE RETAINED BY THE COLLECTOR, PROCESSOR OR DISPOSER FOR THREE YEARS.

INSTRUCTIONS & REQUIREMENTS FOR SCRAP TIRE HAULERS COMPLETING THE N.C. SCRAP TIRE CERTIFICATION

These instructions are to help haulers in correctly completing your portion of the Scrap Tire Certification. Part II is the section to be filled in by the hauler.

1. When you pick up a load of scrap tires from a retailer or other person disposing of scrap tires (the generator), they will give you a Scrap Tire Certification form with Part I completed and signed by them. If you are hauling scrap tires generated by you or the company you work for, Part I should be fully completed and signed by you or another representative of your company.

*****IMPORTANT***** - Only the generator may fill in the information requested in Part I.

2. Check Part I to be sure all the information has been included. The landfill or other collector can refuse to accept the load of tires for disposal if information is missing from Part I or Part II on the form.

3. Fill in all the information in Part II:

(a) Enter your name.

(b) Enter your hauler identification number.
Do not enter anything next to Merchant Identification number (this is to be used by a tire retailer if they their own tires).

(c) Enter your mailing address, phone number, city, state and zip code.

(d) In the Certification, enter the number of tires from the load you received from the Generator that you are taking to the landfill for disposal.

*****IMPORTANT***** - No other tires besides the ones you received from the Generator in Part I may be included in the load. If you remove any tires from the load (usable tires for resale), *BE SURE* to enter the lower number in the certification to indicate the correct number you are disposing. It is very important to have a correct number listed on the certification form.

(e) Sign and date the certification. The certification must have an original signature. Photo-copied signatures are not allowed.

4. Take the completed certification form with the load of tires to the landfill for disposal.

APPENDIX III-A

(INVENTORY OF LANDFILL GAS WELLS)

Table 1
Edgecombe County Landfill
Landfill Gas Extraction Well Identification Key
S&ME Project No. 1054-12-322

ORIGINAL "V" and "GV" DESIGNATIONS	INTERIM "F" DESIGNATIONS	FINAL "EW" DESIGNATIONS	WELL DETAILS	Coordinate Locations *	
Oct 11-2012	Oct 12-2012	Feb 18-2013		X	Y
GV-1	F-39	EW-39		2425253.48	757520.7423
GV-2	F-29	EW-29 (C&M)	nested	2425106.64	757634.8542
GV-3	F-38	EW-38 (C&M)	nested	2425289.56	757705.954
GV-4	F-37	EW-37 (C&M)	nested	2425320.26	757905.798
GV-5	F-35	EW-35		2425169.49	758032.1291
GV-6	F-34	EW-34 (C&M)	nested	2424979.17	757962.0008
GV-7	F-36	EW-36 (C&M)	nested	2425135.03	757833.245
GV-8	F-31	EW-31 (C&M)	nested	2424953.43	757760.4537
GV-9	F-28	EW-28 (C&M)	nested	2424921.61	757564.2113
GV-10	F-27	EW-27		2425054.78	757389.7088
GV-11	F-26	EW-26		2424730.32	757406.5172
GV-12	F-23	EW-23 (C&M)	nested	2424492.73	757389.554
GV-13	F-21	EW-21 (C&M)	nested	2424245.45	757408.9586
GV-14	F-13	EW-13		2423543.83	757417.556
GV-15	F-4	EW-4		2423932.21	758104.1618
V-1	F-75	V-1	capped	2424984.92	758234.9459
V-2	F-33	EW-33		2424927.24	758099.814
V-3	F-74	V-3	capped	2424865.79	758173.8157
V-4	F-49	V-4	abandoned	2424763.18	758104.2942
V-5	F-32	EW-32		2424700.13	758026.8856
V-6	F-30	EW-30		2424676.09	757935.6024
V-7	F-24	EW-24		2424634.23	757764.039
V-8	F-25	EW-25		2424607.58	757661.8881
V-9	F-22	EW-22		2424427.43	757598.952
V-10	F-48	V-10	abandoned	2424470.22	757738.2224
V-11	F-47	V-11	abandoned	2424552.42	758098.49
V-12	F-46	V-12	abandoned	2424429.84	758467.7752
V-20	F-20	EW-20		2424310.1	757705.2869
V-50	F-71	V-50	capped	2424160.38	757426.475
V-51	F-19	EW-19		2424145.04	757577.427
V-52	F-18	EW-18		2423962.13	757626.9587
V-19	F-17	EW-17		2424150.66	757744.4858
V-18	F-6	EW-6		2424040.19	757846.4594
V-53	F-71	EW-7		2423861.15	757727.7741
V-21	F-5	EW-5		2423918.16	757924.506
V-17	F-64	V-17	capped	2424108.3	758039.36
V-16	F-3	EW-3		2424092.47	758134.4023
V-15	F-2	EW-2		2424136.77	758269.637
V-31	F-1	EW-1		2423543.83	757417.556
V-13	F-61	V-13	capped	2424248.55	758402.43
V-14	F-60	V-14	capped	2424191.55	758493.71
V-29	F-45	V-29	abandoned	2424032.28	758502.0612
V-30	F-62	V-30	capped	2423955.67	758326.34
V-28	F-44	V-28	abandoned	2423878.87	758519.5062
V-27	F-43	V-27	abandoned	2423729.81	758511.9013

V-26	F-42	V-26	abandoned	2423640.28	758393.9903
V-25	F-41	V-25	abandoned	2423593.46	758256.5288
V-24	F-40	V-24	abandoned	2423551.94	758110.988
V-22	F-8	EW-8		2423769.26	757987.6117
V-23	F-9	EW-9		2423631.31	757902.3688
V-54	F-10	EW-10		2423737.79	757770.5033
V-55	F-11	EW-11		2423608.65	757698.385
V-56	F-12	EW-12		2423521.76	757583
V-34	F-66	V-34	capped	2423443.02	757668.43
V-35	F-67	V-35	capped	2423385.17	757527.583
V-36	F-68	V-36	capped	2423324.8	757374.13
V-37	F-69	V-37	capped	2423427.96	757262.087
V-38	F-59	V-38	abandoned	2423598.06	757260.8227
V-39	F-58	V-39	abandoned	2423802.14	757252.7784
V-40	F-57	V-40	abandoned	2423939.45	757248.1287
V-41	F-56	V-41	abandoned	2424098.38	757209.9929
V-42	F-55	V-42	abandoned	2424242.36	757170.5283
V-43	F-54	V-43	abandoned	2424400.2	757161.9923
V-44	F-53	V-44	abandoned	2424552.89	757162.8867
V-45	F-52	V-45	abandoned	2424711.82	757184.7185
V-57	F-14	EW-14		2423691.33	757504.225
V-58	F-15	EW-15		2423834.99	757479.0552
V-59	F-16	EW-16		2423995.85	757449.8156
V-60	F-70	V-60	capped	2424264.2	757565.8984
V-49	F-72	V-49	capped	2424289.99	757403.021
V-48	F-73	V-48	capped	2424454.06	757410.281
V-47	F-51	V-47	abandoned	2424646.39	757415.366
V-46	F-50	V-46	abandoned	2424714.64	757502.7717

Note: * LFG wells surveyed by Bateman Civil Survey Co. Gas Collection and Control System As-Built Survey, dated 04/02/12

	Totals	
No. of Active Single Extraction Wells	30	
No. of Active Nested Extraction Wells	18	(2 wells in each of 9 nested locations)
Total No. of Active Extraction Wells	48	
No. Wells Capped	14	
No. Wells Abandoned	20	

SECTION B

LOCAL GOVERNMENT APPROVAL
[RULE .0536(c) (11)]

SECTION B-1

Edgecombe County Commissioners Approval

Approval of the C&D Landfill Permit Application

Section B-1: Edgecombe County Commissioners Approval

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit #33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on April 7, 2014, and the public meeting was listed on the agenda for the following County Commissioners meeting held on May 5, 2014. The public meeting was held, Monday, May 5, 2014, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m.

At the May 5, 2014 meeting, the proposed C&D Landfill Permit Application was discussed, reviewed, and **approved** by the Edgecombe County Commissioners. **Approval** of the C&D Landfill Permit Application is in the form of a resolution. A copy of the resolution is included in accordance with Title 15A NCAC 13B.0536(c)(11)(A).

A RESOLUTION OF THE EDGECOMBE COUNTY BOARD OF COMMISSIONERS TO APPROVE THE CONTINUED OPERATIONS OF THE C&D LANDFILL

WHEREAS, Edgecombe County, herein referred to as COUNTY, owns and operates an existing facility for disposal of construction & demolition (C&D) waste known as the Edgecombe County Landfill, herein referred to as LANDFILL; and

WHEREAS, the LANDFILL consist of an active construction & demolition (C&D) unit on top of the closed municipal solid waste (MSW) unit operated under Permit No. 33-01 issued by the North Carolina Division of Waste Management (DWM) for operation in compliance with North Carolina Solid Waste Management Rules 15A NCAC 13B .0547(4); and

WHEREAS, the permit to operate the LANDFILL is due to be renewed; and

WHEREAS, the COUNTY conducted a public information meeting on May 5, 2014, to inform the community of the proposed waste management activities; and

WHEREAS, the placement of construction and demolition (C&D) waste over top of the closed MSW unit has the benefit of reducing water infiltrating into the closed MSW landfill unit, and possibly minimizing future groundwater contamination at the LANDFILL.

NOW, THEREFORE, BE IT RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY approves the submittal of a renewal landfill permit application for the issuance of a landfill permit by the North Carolina Division of Waste Management (DWM) for continued operations of the LANDFILL.

Motion was made by Commissioner Harris *and duly seconded by Commissioner* Powell *to approve the resolution pending review by the County Attorney. Motion unanimously approved, this* 30th *day of* June, *2014.*

Leonard Wiggins, Chairman
Edgecombe County Commissioners

Attest:

Frangie Mungo, Clerk to the Board

SECTION B-2

Public Notice Documentation

Approval of the C&D Landfill Permit Application

Section B-2: Public Notice Documentation

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit #33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County Construction and Demolition (C&D) Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on April 7, 2014, and the public meeting was listed on the agenda for the following County Commissioners meeting held on May 5, 2014. The public meeting was held Monday, May 5, 2014, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m.

Edgecombe County Landfill provided a public notice of the meeting at least 30 days prior to the meeting. Public notice included a legal advertisement placed in *The Daily Southerner* newspaper which serves Edgecombe County. Public notice included time, place, and purpose of the meeting. The application and other documentation was placed at a location that is accessible by the public and this location was noted at the April 7, 2014 Edgecombe County Commissioners meeting in the public notice. Notification of the public meeting was completed in accordance with Title 15A NCAC 13B.0536(c)(11)(C).

A copy of the published advertisement is enclosed.

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PUBLIC MEETING

To Inform the Community of the Proposed Waste Management Activities at the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County is holding a public meeting to inform the community of the proposed future operating plans for the Edgecombe County Construction and Demolition (C&D) Landfill. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, North Carolina. The meeting will be held, *Monday, May 5, 2014* in the Commissioners Room on the 2nd Floor of the County Administration Building located at: *201 St. Andrews Street, Tarboro, North Carolina* at *7:00 p.m.*

10| Date	11| Newspaper Reference	12|13|14| Description-Other Comments/Charges	15| 16| SAU Size Billed Units	17| 18| Times Run Rate	19| Gross Amount	|20| Net Amount
		PREVIOUS BALANCE				0.00
04/02	OCD DS	PUBLIC MEETING	3x4.00	1	69.00	69.00
		6958	12.00	5.750		

V#162

A#60-4720-5499-00

54374

Statement of Account • Aging of Past Due Amounts

EDGECOMBE COUNTY, TARBORO, NC

Warrant #: 052314 Check Number: 00347403 Page 1 of 1

Invoice Date	Invoice Number	Description	Invoice Amount
05/21/2014	-71	ACCT # 4503	$69.00

Vendor No.	Vendor Name	Check No.	Check Date	Check Amount
162	THE DAILY SOUTHERNER	00347403	05/23/2014	69.00

EDGECOMBE COUNTY
CENTRAL DEPOSITORY
TARBORO, NC 27886

Vendor Number	Check Date	Check Number
162	05/23/2014	00347403

$69.00

Pay Sixty Nine Dollars and 00 cents ******

To The Order Of THE DAILY SOUTHERNER

FILE COPY
NON-NEGOTIABLE

RBC Bank
RBC Bank (USA)

⑈00347403⑈

AP

EDGECOMBE COUNTY
FINANCE DEPARTMENT
PO BOX 10
TARBORO, NC 27886

ADDRESS SERVICE REQUESTED

00347403

THE DAILY SOUTHERNER
P. O. BOX 1199
TARBORO NC 27886

SECTION B-3

Adjacent Property Owner Notifications Documentation

Approval of the C&D Landfill Permit Application

Section B-3: Notification to Adjacent Property Owners

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit #33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on April 7, 2014, and the public meeting was listed in the agenda. The public meeting was held, Monday, May 5, 2014, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m.

Edgecombe County has notified the property owners of all properties that share a common border with the Edgecombe County Landfill by means of a U.S. Postal Service registered letter, return receipt requested. Letters were sent to the following individuals:

- John C. Barnes Irrevocable Trust at 302 Bend of the River Road, Spring Hope, North Carolina 27882
- Ms. Janice Loftis at 6006 Wiss Drive, Laurel, Maryland 20707
- Edgecombe County, A Municipal Corporation, at PO Box 10, Tarboro, North Carolina 27886
- Gladys C. Johnson at 2833 NC 42 East, Macclesfield, North Carolina 27852
- F. M. Dunn, Jr. at P.O. Box 512, Pinetops, North Carolina 27864
- F. Marshall Dunn, Jr. at P.O. Box 306, Pinetops, North Carolina 27864

The letters included a site map and listed the date, time and place of the public meeting, and described the facility plan for the landfill, including the area location and final elevation of all waste disposal units, the type and amount of waste to be disposed at the landfill, other waste management activities to be conducted at the facility, and the existing location of the entrance to the facility. Mailings were postmarked April 2, 2014, a minimum of 30 days prior to the public meeting which was being noticed. The documentation of the content and mailing of the notices are included in this permit application in accordance with Title 15A NCAC 13B.0536(c)(11)(C).

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Edgecombe County
Attn: Lorenzo Carraden
PO Box 10
Tarboro, NC 27886

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Margaret M Stokes ☐ Agent ☐ Addressee

B. Received by (Printed Name) Margaret M Stokes C. Date of Delivery 7/3/14

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7006 0100 0000 8549 8350

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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City, State, ZIP+4 Tarboro, NC 27886

PS Form 3800, June 2002 See Reverse for Instructions

April 1, 2014

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Attn: Lorenzo Carmen, County Manager

Reference: Edgecombe County Landfill Public Hearing
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Dear Mr. Carmen:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) facility. The Edgecombe County C&D landfill is located on State Road 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B§ 0.536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road and consists of a C&D landfill operated on top of a closed municipal solid waste (MSW) landfill regulated under Permit #33-01. The facility is bounded by woodlands to the east, west and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973 – 1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the active C&D landfill in relation to the other component of the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the ongoing operations at buildings or structures. The C&D landfill contains approximately 371,400 tons of C&D waste as of June 30, 2013.

A summary of the existing C&D landfill is as follows:

- Total acreage of the property: 271 acres

- Total acreage of C&D landfill: 21.6 acres
- 5-year average annual tonnage rate (fiscal years 2009 -2013): 13,000 tons/year
- In-place tonnage of C&D waste: 371,400 tons Total remaining volume of waste (as of June 30, 2007): 964,500 cubic yards or 487,079 tons
- Remaining life expectancy (based on 5-year average annual tonnage rate as of June 2013): 29.2 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located west of Colonial Road), which operates under Permit No. 33-02T);
- Yard waste compost area (located waste of SR 1601);
- Tire collection area (located east of SR 1601) for shipment offsite;
- White goods collection area (located east of SR 1601) for offsite shipment;
- Used Cooking oil and oil filters (located east of SR 1601) for offsite shipment;
- Mercury bulbs (located east of SR 1601) for offsite shipment; and
- Electronics recycling (located west of SR 1601) for offsite shipment.

The public meeting will be held on Monday, May 5, 2014 in the Commissioners Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m. A "fact sheet" summarizing the C&D landfill permit is available for public inspection at the following located during business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Road
Tarboro, North Carolina 27886

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Claudia B. Irvin
Staff Professional

Samuel P. Watts, P.G.
Senior Project Manager

Attachment: Figure 1

S:\PROJECTS\2013\13-277A Edgecombe Permit Applications\CAD\B2320.dwg, FIG1, 3/31/2014 2:30:10 PM, 1:1

FIGURE NO. 1	FACILITY INFORMATION	S&ME WWW.SMEINC.COM	SCALE: 1" = 600'
	EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA		PROJECT NUMBER: 1054-13-277A
			DRAWING NUMBER: B-2320
			DATE: MARCH 2014
			DRAWN BY:
			CHECKED BY:

SENDER: COMPLETE THIS SECTION

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

John C. Barnes Irrevocable
302 Bend of River Trust Rd
Spring Hope, NC 27882

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) John C Barnes
C. Date of Delivery 4/8/14

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☒ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
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4. Restricted Delivery? (Extra Fee) ☐ Yes

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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Sent To John C. Barnes Irrevocable Trust
Street, Apt. No.; or PO Box No. 302 Bend of River Road
City, State, ZIP+4 Spring Hope, NC 27882

PS Form 3800, June 2002 See Reverse for Instructions

S&ME

April 1, 2014

John C. Barnes Irrevocable Trust et al
302 Bend of River Road
Spring Hope, North Carolina 27882

Reference: Edgecombe County Landfill Public Hearing
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Dear Sir:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) facility. The Edgecombe County C&D landfill is located on State Road 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B§ 0.536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road and consists of a C&D landfill operated on top of a closed municipal solid waste (MSW) landfill regulated under Permit #33-01. The facility is bounded by woodlands to the east, west and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973 – 1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the active C&D landfill in relation to the other component of the facility. You have one parcel located adjacent to the facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the ongoing operations at buildings or structures. The C&D landfill contains approximately 371,400 tons of C&D waste as of June 30, 2013.

A summary of the existing C&D landfill is as follows:

- Total acreage of the property: 271 acres
- Total acreage of C&D landfill: 21.6 acres
- 5-year average annual tonnage rate (fiscal years 2009 -2013): 13,000 tons/year
- In-place tonnage of C&D waste: 371,400 tons

- Total remaining volume of waste (as of June 30, 2007): 964,500 cubic yards or 487,079 tons
- Remaining life expectancy (based on 5-year average annual tonnage rate as of June 2013): 29.2 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located west of Colonial Road), which operates under Permit No. 33-02T);
- Yard waste compost area (located waste of SR 1601);
- Tire collection area (located east of SR 1601) for shipment offsite;
- White goods collection area (located east of SR 1601) for offsite shipment;
- Used Cooking oil and oil filters (located east of SR 1601) for offsite shipment;
- Mercury bulbs (located east of SR 1601) for offsite shipment; and
- Electronics recycling (located west of SR 1601) for offsite shipment.

The public meeting will be held on Monday, May 5, 2014 in the Commissioners Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m. A "fact sheet" summarizing the C&D landfill permit is available for public inspection at the following located during business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Road
Tarboro, North Carolina 27886

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Claudia B. Irvin
Staff Professional

Samuel P. Watts, P.G.
Senior Project Manager

Attachment: Figure 1

S:\PROJECTS\2013\13-277A Edgecombe Permit Applications\CAD\B2320.dwg, FIG1, 3/31/2014 2:30:10 PM, 1:1

FIGURE NO.	FACILITY INFORMATION	S&ME WWW.SMEINC.COM	SCALE: 1" = 600'	DATE: MARCH 2014
1	EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA		PROJECT NUMBER: 1054-13-277A	DRAWN BY:
			DRAWING NUMBER: B-2320	CHECKED BY:

SENDER: COMPLETE THIS SECTION

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- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

F. Marshall Dunn Jr
PO Box 306
Pinetops, NC 27864

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Wanda Kyles ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery 4-3-14

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
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☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7006 0100 0000 8549 8343

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

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Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

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Street, Apt. No.; or PO Box No. PO Box 306
City, State, ZIP+4 Pinetops, NC 27864

PS Form 3800, June 2002 See Reverse for Instructions

April 1, 2014

F. Marshall Dunn, Jr.
P.O. Box 306
Pinetops, North Carolina 27864

Reference: Edgecombe County Landfill Public Hearing
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Dear Mr. Dunn:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) facility. The Edgecombe County C&D landfill is located on State Road 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

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The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the ongoing operations at buildings or structures. The C&D landfill contains approximately 371,400 tons of C&D waste as of June 30, 2013.

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- Mercury bulbs (located east of SR 1601) for offsite shipment; and
- Electronics recycling (located west of SR 1601) for offsite shipment.

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Edgecombe County Landfill Office/Weigh Station
2872 Colonial Road
Tarboro, North Carolina 27886

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Claudia B. Irvin
Staff Professional

Samuel P. Watts, P.G.
Senior Project Manager

Attachment: Figure 1

S:\PROJECTS\2013\13-277A Edgecombe Permit Applications\CAD\B2320.dwg, FIG1, 3/31/2014 2:30:10 PM, 1:1

FIGURE NO.	FACILITY INFORMATION	S&ME	SCALE: 1" = 600'	DATE: MARCH 2014
1	EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	WWW.SMEINC.COM	PROJECT NUMBER: 1054-13-277A	DRAWN BY:
			DRAWING NUMBER: B-2320	CHECKED BY:

SENDER: COMPLETE THIS SECTION

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1. Article Addressed to:

Janice B. Lofhs
6006 Wiss Dr
Laurel, MD 20707

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X Janice B. Lofhs ☐ Agent ☐ Addressee

B. Received by (Printed Name)
X Janice B. Lofhs

C. Date of Delivery
4-5-14

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number
(Transfer from service label) 7006 0100 0000 8549 8336

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

☐ Agent
☐ Addressee
Date of Delivery
☐ Yes
☐ No
for Merchandise
☐ Yes
102595-02-M-1540

CERTIFIED MAIL

7006 0100 0000 8549 8336

7006 0100 0000 8549 8336

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Postage	$
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Return Receipt Fee (Endorsement Required)	
Restricted Delivery Fee (Endorsement Required)	
Total Postage & Fees	$

Postmark Here

Sent To Janice B. Lofhs
Street, Apt. No.; or PO Box No. 6006 Wiss Dr
City, State, ZIP+4 Laurel, MD 20707

PS Form 3800, June 2002 See Reverse for Instructions

April 1, 2014

Janice B. Loftis
6006 Wiss Drive
Laurel, Maryland 20707

Reference: Edgecombe County Landfill Public Hearing
Edgecombe County C&D Landfill (Permit # 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Dear Ms. Loftis:

The Edgecombe County Department of Solid Waste is holding a public meeting to inform the community of the planned re-permitting of the County's construction and demolition (C&D) facility. The Edgecombe County C&D landfill is located on State Road 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina.

In accordance with Title 15A of the North Carolina Administrative Code (NCAC), Chapter 13B§ 0.536, the information below is being provided to the community in regards to the existing and proposed waste management activities at the Edgecombe County C&D Landfill.

The existing landfill is accessed off Colonial Road and consists of a C&D landfill operated on top of a closed municipal solid waste (MSW) landfill regulated under Permit #33-01. The facility is bounded by woodlands to the east, west and south. Some residential single-family homes are located to the north and east. Jerry's Creek runs along the northern property boundary of the facility. A former landfill, which received waste from 1973 – 1979, is located adjacent to the active facility, just north of Jerry's Creek. **Figure 1** is a site map of the facility showing the active C&D landfill in relation to the other component of the facility. You have one parcel located adjacent to the active facility.

The C&D landfill is permitted to receive waste generated from the construction, remodeling, repair or demolition operations on pavement and buildings or structures. C&D waste accepted at the landfill does not include municipal or industrial wastes that may be generated by the ongoing operations at buildings or structures. The C&D landfill contains approximately 371,400 tons of C&D waste as of June 30, 2013.

A summary of the existing C&D landfill is as follows:

- Total acreage of the property: 271 acres
- Total acreage of C&D landfill: 21.6 acres
- 5-year average annual tonnage rate (fiscal years 2009 -2013): 13,000 tons/year
- In-place tonnage of C&D waste: 371,400 tons

- Total remaining volume of waste (as of June 30, 2007): 964,500 cubic yards or 487,079 tons
- Remaining life expectancy (based on 5-year average annual tonnage rate as of June 2013): 29.2 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations on the County facility include:

- MSW Transfer Facility (located west of Colonial Road), which operates under Permit No. 33-02T);
- Yard waste compost area (located waste of SR 1601);
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- Used Cooking oil and oil filters (located east of SR 1601) for offsite shipment;
- Mercury bulbs (located east of SR 1601) for offsite shipment; and
- Electronics recycling (located west of SR 1601) for offsite shipment.

The public meeting will be held on Monday, May 5, 2014 in the Commissioners Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m. A "fact sheet" summarizing the C&D landfill permit is available for public inspection at the following located during business hours:

Edgecombe County Landfill Office/Weigh Station
2872 Colonial Road
Tarboro, North Carolina 27886

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Claudia B. Irvin
Staff Professional

Samuel P. Watts, P.G.
Senior Project Manager

Attachment: Figure 1

S:\PROJECTS\2013\13-277A Edgecombe Permit Applications\CAD\B2320.dwg, FIG1, 3/31/2014 2:30:10 PM, 1:1

FIGURE NO.	FACILITY INFORMATION	S&ME WWW.SMEINC.COM	SCALE: 1" = 600'	DATE: MARCH 2014
1	EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA		PROJECT NUMBER: 1054-13-277A	DRAWN BY:
			DRAWING NUMBER: B-2320	CHECKED BY:

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Gladys C. Johnson
2833 NC 42 East
Macclesfield, NC 27852

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☐ Agent
☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☒ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? *(Extra Fee)* ☐ Yes

2. Article Number
(Transfer from service label)
7006 0100 0000 8549 8367

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

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Street, Apt. No.; or PO Box No. 2833 NC 42 East
City, State, ZIP+4 Macclesfield, NC 27852

PS Form 3800, June 2002 See Reverse for Instructions

April 1, 2014

Gladys C. Johnson
2833 NC 42 East
Macclesfield, North Carolina 27852

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Tarboro, North Carolina
S&ME Project No. 1054-13-277A

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2872 Colonial Road
Tarboro, North Carolina 27886

Please call us at (919) 872-2660 if you have any questions or comments, or if we can be of further assistance.

Sincerely,
S&ME, Inc.

Claudia B. Irvin
Staff Professional

Samuel P. Watts, P.G.
Senior Project Manager

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			DRAWING NUMBER: B-2320	CHECKED BY:

SECTION B-4

Public Meeting Documentation

Approval of the C&D Landfill Permit Application

Section B-4: Public Meeting Documentation

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D landfill currently operates under Solid Waste Permit #33-01 from the North Carolina Department of Environmental and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with Title 15A NCAC 13B.0536(c)(11), the Solid Waste Department of Edgecombe County held a public meeting to inform the community of the proposed future operating plans for the Edgecombe County C&D Landfill. The schedule for this public meeting and review of the renewal of the permit was announced at the Edgecombe County Commissioners meeting on April 7, 2014, and the public meeting was listed on the agenda for the following County Commissioners meeting held on May 5, 2014. The public meeting was held, Monday, May 5, 2014, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 7:00 p.m.

Public notice of the meeting was documented and is being submitted to the Division in Section A-2. Enclosed is an excerpt of the meeting minutes regarding the C&D Landfill Permit, all written material submitted representing community concerns, and all other relevant written material distributed or used at the meeting in accordance with Title 15A NCAC 13B.0536(c)(11)(D).

A copy of the "fact sheet", which the County provided during the public meeting held May 5, 2014 is enclosed. The "fact sheet" summarizes the C&D landfill permit. Since April 7, 2014, the "fact sheet" was made available for public inspection at the Edgecombe County Landfill Office/Weigh Station located at 2872 Colonial Road, Tarboro, North Carolina, 27886.

MINUTES
REGULAR SCHEDULED MEETING OF THE BOARD OF COMMISSIONERS
OF EDGECOMBE COUNTY
MAY 5, 2014 AT 7:00 P.M.
IN THE COMMISSIONERS' ROOM, COUNTY ADMINISTRATIVE BUILDING
TARBORO, NORTH CAROLINA

****

1. **MEETING CALLED TO ORDER BY MR. LEONARD WIGGINS, CHAIRMAN, AT 7:00 P.M.**

MEMBERS PRESENT: Mr. Leonard Wiggins, Chairman, Mr. Jonathan Felton, Vice-Chairman, Mrs. Viola Harris, Rev. E. Wayne Hines, Mr. Donald Boswell, Mrs. Evelyn Powell and Mr. William Wooten.

MEMBERS ABSENT: None.

OTHERS PRESENT: Mr. Lorenzo Carmon, County Manager, Mr. Mahlon DeLoatch, County Attorney and Ms. Frangie Mungo, Clerk to the Board.

2. **PRAYER.**
Provided by Rev. E. Wayne Hines.

3. **MINUTES OF PREVIOUS MEETING PRESENTED FOR APPROVAL.**
Mr. Boswell moved to approve the minutes of the April 7 Budget Presentations meeting and the April 28, 2014 Joint Meeting with the Board of Education as presented. Mr. Felton seconded the motion, which carried by unanimous vote.

4. **PUBLIC HEARING(S):**

(1) **Mr. Wiggins called a public hearing to order for the purpose of obtaining a Closeout Report on the County's 2011 Community Development Block Grant (CDBG) for Economic Development for Superior Essex Energy and to receive citizen comments concerning the project.**

Mr. DeLoatch, County Attorney, read the public notice as published.

Mr. Carmon stated that Superior Essex Energy spent $3,624,000 in renovations to their facility located on Anaconda Road in Tarboro. He stated that a total of 64 people were hired as a result of this project.

Mr. Wiggins called for public comments. There being none the public hearing was adjourned.

No action was required.

(2) **Mr. Wiggins called a public hearing to order to inform the community of the planned re-permitting of the County's construction and demolition (C&D) facility located on Colonial Road.**

Mr. DeLoatch read the public notice as published.

Mr. Carmon stated that the County is required to have the construction and demolition part of the landfill re-permitted. He stated that the:

- total acreage of the landfill is 271 acres
- C&D acreage being 21.6 acres.
- 5-year average annual tonnage rate: 13,000 ton/year
- In-place tonnage of C&D waste; 371,400 tons total remaining volume of waste as of June 30, 2007: 964,500 cubic yards or 487,079 tons
- Remaining life expectancy (based on 5-year average annual tonnage rates as of June 2013): 29.2 years
- Proposed top elevation of existing C&D landfill: 158 feet

Other waste operations in the County facility include:

- Municipal Solid Waste facility
- Yard waste compost area
- Tire collection area
- White goods collection area
- Used cooking oil and oil filters
- Mercury bulbs
- Electronics recycling

Mr. Wiggins called for public comments. There being none the public hearing was adjourned.

No action required.

5. SCHEDULED APPOINTMENT:

A. Mr. John Chaffee, NC Eastern Region, presented a Work Ready Award to Edgecombe County. He stated that the pilot program is funded by the North Carolina Rural Center and the Eastern Region ran the pilot program along with the Eastern Carolina Work Force Development Board and other partners. Mr. Chaffee stated that the program was established to promote a community wide effort to elevate the quality of the work force in the region and individual counties.

Mr. Wiggins asked the partners that were present to come forth and accept the award: Dr. Lamm, Edgecombe Community College, Eric Evans, Workforce Development Board, Oppie Jordan, Carolinas Gateway Partnership and John Gessaman, Carolinas Gateway Partnership.

6. BOARD OF EQUALIZATION AND REVIEW.

****

MRS. HARRIS MOVED TO RECESS THE REGULAR BOARD OF COMMISSIONERS MEETING AND CONVENE AS BOARD OF EQUALIZATION AND REVIEW. REV. HINES SECONDED THE MOTION, WHICH CARRIED BY UNANIMOUS VOTE.

****

A. Mr. Wiggins, Chairman, called the meeting to order.
B. There were no scheduled appointments.
C. Adoption of a Resolution of Certification of Tax Records.
Mr. Felton moved to adopt the Resolution of Certification of Tax Records as presented. Mrs. Powell seconded the motion, which carried by unanimous vote.

****

MRS. POWELL MOVED TO ADJOURN AS BOARD OF EQUALIZATION AND REVIEW AND

RECONVENE REGULAR BOARD OF COMMISSIONERS MEETING. MR. WOOTEN SECONDED THE MOTION, WHICH CARRIED BY UNANIMOUS VOTE.

****

7. PUBLIC PETITIONS:

Rev. Roosevelt Higgs, Speed, NC, stated that he hoped that the Board was still moving forward with recreation in the County. Rev. Higgs stated that it is hard to make argument with losing tax dollars to the Charter School when you look at the number of kids that live on the Edgecombe County side that's going over to Nash. He asked the Board to consider appointing a study committee to see what it would look like if the kids on Edgecombe County side could come to the Edgecombe County schools to fill up some of the gap of the declining enroolment. Lastly, Rev. Higgs stated that he would like to be considered for the vacant position on the Human Relations Commission.

8. OTHER BUSINESS:

A. Approval of budget amendments.

Mrs. Harris moved to approve the budget amendments as presented. Mrs. Powell seconded the motion, which carried by unanimous vote.

B. Approval of a proclamation declaring the month of May as Mental Health Month.

Mr. Boswell moved to adopt a proclamation declaring the month of May as Mental Health Month as presented. Rev. Hines seconded the motion, which carried by unanimous vote.

C. Approval of the Centennial Proclamation presented by Cooperative Extension.

Mr. Art Bradley, County Extension Director, recognized the celebration of 100 years of Extension in North Carolina. He stated that 2017 will make 100 years for Edgecombe County. Mr. Bradley recognized current and past Extension staff members: Regina Mosely, Tanya Heath, Lesa Walton, Gloria Morning, Jamilla Hawkins and retirees: Connie Sherill, Evelyn Wilson, and James Pearce,

Mr. Wiggins moved to approve the Centennial Proclamation presented by Cooperative Extension as presented. Mrs. Powell seconded the motion, which carried by unanimous vote.

D. Approval of release of Edgecombe County's unused portion of reserved funds from Eastern Region.

Mr. Carmon presented a resolution allowing cross-allocation of reserved trust funds held by the Eastern Region Development Commission. He stated that Edgecombe County's portion of the one-time State appropriation is $576,923.08 and as of this date we do not have a project that will generate revenue to pay back this loan. Mr. Carmon recommended adoption of the resolution as presented.

Mr. Felton moved to approve the resolution allowing cross-allocation of reserved trust funds held by North Carolina's Eastern Region Development Commission as presented. Mr. Boswell seconded the motion, which carried by unanimous vote.

E. Approval of Sepro Building Reuse and Restoration Grant.

Mr. Carmon stated that the County received an additional $180,000 grant from the North Carolina Department of Commerce Rural Economic Development Division to

assist Sepro in renovating its property located at 1245 Atlantic Avenue in Rocky Mount. He stated that we received a $60,000 grant earlier to support this project; however, the company has committed to create 15 new full time jobs with an average salary of $30,000, plus benefits, and Sepro will pay 60% of employee health insurance premiums. Mr. Carmon stated that the total project cost is $2,364,859.00 and recommended that the Board authorize the Chairman and staff to execute the required documents to move this project along.

Mrs. Harris moved to authorize the Chairman and staff to execute the required documents for the additional $180,000 grant from the North Carolina Department of Commerce Rural Economic Development Division to assist Sepro in renovating its property. Mrs. Powell seconded the motion, which carried by unanimous vote.

9. PLANNING BOARD REPORT.

Mr. Brian Hassell, Planning Director, presented the Planning Board report.

A. Scheduled Items.

1. UDO Amendment 14-UDO-41

Mr. Felton moved to call for and hold a public hearing of the Board of Commissioners at the June 2, 2014 regular meeting to amend the Unified Development Ordinance that will reduce the lot width requirements for interior subdivision roads in all residential districts from 100 feet to 80 feet. Mr. Boswell seconded the motion, which carried by unanimous vote.

B. Other Business.

1. CTG Grant Project.

Mrs. Harris moved to call for and hold a public hearing of the Board of Commissioners at the June 2, 2014 regular meeting to act on the Land Use Plan update. Mr. Boswell seconded the motion, which carried by unanimous vote.

C. Draft minutes.

D. Next meeting scheduled for Monday, May 19, 2014 at 6:00 p.m.

Mrs. Harris stated that she received calls regarding Princeville and E-911 addresses. She stated that the citizens are upset about not being able to use Princeville as their address would have to use Tarboro instead.

Mr. Hassell stated that mailing addresses and E-911 are all about zip codes and Tarboro's zip is 27886.

10. APPOINTMENTS.

A. Edgecombe Community College Board of Trustees.

Mr. Wiggins asked that Vice-Chairman Mr. Felton assume the Chair and that he be excused from the vote due to the nominee being his sister. Mrs. Powell moved to excuse Mr. Wiggins from the vote. Mr. Wooten seconded the motion, which carried by unanimous vote.

Rev. Hines moved to reappoint Mrs. Gloria Wiggins-Hicks to the Edgecombe Community College Board of Trustees as recommended. Mrs. Powell seconded the motion, which carried by unanimous vote.

B. Human Relations Commission.

Rev. Hines moved to appoint Mrs. Viola Harris. Mr. Felton seconded the motion, which carried by unanimous vote.

C. Upper Coastal Plain Council of Governments Board. ***Deferred***

11. AFTERLISTS AND RELEASES FOR REVIEW AND APPROVAL.
Mr. Boswell moved to approve the afterlists and releases as presented. Mrs. Powell seconded the motion, which carried by unanimous vote.

12. DEPARTMENTAL REPORTS FOR REVIEW. ***Received***
A. Water Services.
B. Veterans Service.
C. Nursing and Adult Care Home Community Advisory Committees Annual Report 2013

13. MANAGER'S REPORT.***Received***
A. Audit and Budget Update.
B. Water and Sewer District No. 4 Ribbon Cutting Ceremony.
May 22, 2014 at 11 a.m.
117 Mill Pond Road, Speed, NC

14. COMMISSIONERS' REPORT.

15. ATTORNEY'S REPORT.

16. CLOSED SESSION.
Rev. Hines moved to go into closed session to discuss economic development. Mr. Boswell seconded the motion, which carried by unanimous vote.

Rev. Hines moved to go out of closed session and resume the regular meeting. Mr. Felton seconded the motion, which carried by unanimous vote.

17. MR. FELTON MOVED TO RECESS THE MEETING UNTIL MAY 22, 2014 AT 2:00 P.M. FOR THE BUDGET WORK SESSION.

Leonard Wiggins

Leonard Wiggins, Chairman
Board of Commissioners

Frangie Mungo

Frangie Mungo, Clerk to the Board

PERMIT APPLICATION FACT SHEET

Edgecombe County Construction & Demolition Landfill
2872 Colonial Road
Tarboro, North Carolina
(Permit #33-01)

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Please contact Mr. Mike Cummings, Edgecombe County Solid Waste Director, at (252) 827-4253 if you have any questions or require additional information regarding this public hearing.

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			DRAWING NUMBER: B-2320	CHECKED BY:

SECTION B-5

Edgecombe County Zoning Approval

Edgecombe County

Planning: (252) 641-7803
Inspections: (252) 641-7802
Fax: (252) 641-6913

PLANNING & INSPECTIONS

April 7, 2014

S&ME, Inc.
3201 Spring Forest Road
Raleigh, NC 27616

Attention: Mr. Sam Watts

Reference: Zoning Approval Letter for Edgecombe County Construction & Demolition Landfill

Dear Mr. Watts:

The Edgecombe County Solid Waste Construction and Demolition Landfill is located on Colonial Road in Tarboro, NC. The property is zoned AR-30, where lot sizes are to be a 30,000 square foot minimum. The AR-30 zoning district does allow solid waste disposal and landfill activities. The site is in compliance with all zoning regulations (9-1.2) and development standards (11-4.79).

If you have any questions or concerns please contact me at (252) 641-7803.

Sincerely,

Brian D. Hassell
Edgecombe County Planning Director

SECTION C

OPERATION AND WASTE ACCEPTANCE PLAN
[RULE .0542]

OPERATION AND WASTE ACCEPTANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-13-277A

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

August 2014

NORTH CAROLINA PROFESSIONAL SEAL 038223 ENGINEER KENNETH S. OBENAUF

9/3/2014

Kenneth S. Obenauf, P.E.
Senior Engineer
NC Licensed Engineer No. 038223

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS

9/5/14

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

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OPERATION AND WASTE ACCEPTANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT# 33-01)
EDGECOMBE COUNTY, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Operation Plan is presented to provide the necessary requirements as specified in the Solid Waste Management Rules, Section .0542. The purpose of the Operation Plan is to provide details of the facility procedures and policies of the Edgecombe County C&D Landfill in a single document for use at the facility. The information contained in this plan shall be used to assist Edgecombe County in the day-to-day operations and the periodic maintenance and monitoring requirements during the operation of the landfill. Included in this plan are sections concerning waste acceptance, landfill and site operations and maintenance, and recordkeeping.

1.2 Project Information

The Edgecombe County C&D Landfill is located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill site is bounded to the north by Jerry's Creek, to the east by State Route 1601 and to the west and south by undeveloped agricultural land. The landfill site is shown on the Site Vicinity Map (Title Sheet, **Drawing 1**). Beyond Jerry's Creek to the north is the "old landfill", a pre-Subtitle D landfill which stopped receiving waste in 1979. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory. North of the northern old landfill is Wright's Creek, which merges with Jerry's Creek east (downstream) of the site.

The existing construction and demolition (C&D) landfill is operated on top of a closed municipal solid waste (MSW) unit. The MSW unit consists of two sections, an eastern section and a western section. The eastern section is approximately 33 acres, began receiving waste in 1979, and was closed in 1991. The cap in the eastern section consists of 2 feet of soil. The western section is approximately 35 acres, began receiving waste in 1991, stopped receiving MSW waste in 1997, and was closed in 2000. The cap in the western section consists of 2.5 feet of soil.

The North Carolina Department of Environment and Natural Resources (NCDENR) issued Permit No. 33-01 to construct and operate a C&D landfill unit over the existing closed MSW unit on December 30, 1997. The County has continued to operate the C&D landfill in accordance with that permit since that time. The landfill currently receives an average of approximately 43 tons of C&D waste per day based on waste receipts over the past five years (2009-2013), although it received as much as 600 tons per day of waste in 1999-2000 following Hurricane Floyd.

Waste operations on the facility property, which are located west of State Route 1601 (Colonial Road) include:

- Tire Collection Area for shipment to an off-site vendor;
- Electronics and Oil Filter Collection building for shipment to an off-site vendor;
- Storage Buildings, and
- Employee Break Trailer.

Other waste operations on the facility property, which are located east of State Route 1601 (Colonial Road) include:

- MSW Transfer Facility which operates under Permit No. 33-02T;
- Convenience Center;
- Concrete Disposal Area;
- Yard Waste Processing Area;
- Pesticide Container Storage Building for shipment of collected materials to an off-site vendor;
- White Goods Staging Area for shipment of collected materials to an off-site vendor;
- Wood Pallet Staging Area;
- Scale and Scale House;
- Borrow areas for landfill cover soils; and
- Employee Break Trailer.

A landfill gas collection and control system (LFGCCS) was constructed in 2012 at the Edgecombe County landfill and consists of a series of biogas wells, LFG piping and valves, condensate sumps, and a blower/flare system (BFS), which directs the collected biogas to a blower flare system (**Drawings 2 and 3**). The system is connected to a Containerized Landfill Gas to Energy (LFGTE) Facility for electricity generation.

<u>LFG Extraction Wells</u>
In the spring of 2012, Edgecombe County converted 24 passive Landfill Gas (LFG) vent wells to active LFG extraction wells and installed 24 new landfill gas extraction wells. A total of 48 active LFG extraction wells are currently installed at the Southern Landfill. Nine of the LFG extraction wells are installed in the C&D landfill waste while the remaining 39 LFG extraction wells are installed in MSW. The LFGCCS began operation on September 7, 2012.

<u>LFG Blower-Flare System Skid</u>
The LFGCCS features a 4-inch diameter candlestick flare system, manufactured by Product Recovery Management (PRM). The flare is supplied with up to 300 standard cubic feet per minute (scfm) of LFG by two centrifugal, regenerative vacuum blowers, manufactured by Gardner-Denver, Incorporated® (GDI). Each blower is equipped with a 25 hp electric motor and can achieve a maximum flow rate of 300 scfm. The vacuum blower speeds are controlled by variable frequency drive (VFD).

The flare is 20 feet tall and the top three feet are equipped with a wind shroud to protect the propane pilot ignition assembly. A propane gas train provides gas for start-up procedures, when necessary.

A stainless-steel moisture separator (MS-80) removes moisture and any debris from the LFG stream before the LFG enters the vacuum blowers. LFG discharged from the blowers passes through a second stainless steel moisture separator (MS-60) before being sent to either the two-LFG-fueled generators or to the flare. Moisture removed by the MS-80 and MS-60 are collected in moisture knock-out pots and subsequently gravity drain to a condensate storage sump.

The BFS is fully automated and is capable of shut-down and start-up. The blower-flare system operation is monitored at a programmable logic controller (PLC) panel adjacent to the flare. The PLC, equipped with a datalogger, and monitors critical operating parameters such as gas flow, gas temperature, gas pressure and flare temperature.

Prior to placing the soil layers of the cap system, the gas collection piping shall be temporarily disconnected and moved out of the way for construction. The gas wells will be extended, as necessary, so that there is a minimum 3 feet of stick-up above the cap system vegetation/erosion layer. New gas wells installed shall consist of perforated 6-inch diameter HDPE pipe or Schedule 80 PVC pipe surrounded by gravel. The perforations in the HDPE or PVC pipe shall end 15 feet below the final elevation of the cap system and the remainder of the pipe shall be solid. A bentonite plug shall be installed along the solid section of the pipe. The detail drawings for the single and the nested gas wells is provided on **Drawing 9**.

The other facility waste operations are discussed in detail in **Section 2.4** of the Facility Plan. The existing site conditions are shown on **Drawing 2.**

A water supply well is located on-site at the County-owned property on the east side of Colonial Road; however, this well is only used for irrigation. The water for the facility is supplied from the County-wide municipal water distribution system.

2. WASTE ACCEPTANCE AND DISPOSAL

2.1 General Requirements

2.1.1 Waste Acceptance

The Edgecombe County C&D Landfill shall only accept those wastes it is permitted to receive, which includes the following:

- Land-clearing debris as defined in North Carolina General Statutes (G.S), 130A-290, specifically, solid waste which is generated solely from land-clearing activities, such as stumps, trees, etc.;

- Inert debris defined as solid waste which consists solely of material that is virtually inert, such as brick, concrete, rock and clean soil;

- Asphalt in accordance with G.S. 130A-294(m);

- Construction and demolition debris defined as solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings, or other structures;

- Solid waste that is generated by mobile or modular home manufacturers and asphalt shingle manufacturers in Edgecombe County: the waste must be source separated at the manufacturing site and must exclude municipal solid waste, hazardous wastes, and other wastes prohibited from disposal in a C&DLF. It must be transported to the Edgecombe County C&DLF in a shipment or container that consists solely of the separated waste to be disposed. Edgecombe County C&DLF will not accept this waste if it has not been separated and transported as specified; and

- Asbestos waste as described in Section 2.1.2 below.

Other wastes may be approved by the Division upon receipt of a written request with the specific waste type, how its generated, how much is generated; along with any additional information the Division may request to render a final decision on the disposal options for the waste.

Yard trash, as defined in G.S. 130A-290, shall not be disposed in the landfill area. However, yard trash, along with land-clearing debris, may be accepted for processing in the Yard Waste Processing Area. Any manufactured home arriving at the landfill will be handled in accordance with the Manufactured Home Deconstruction Plan presented in **Appendix IV-C**.

The landfill operator shall notify the Division within 24 hours of any attempt to dispose of any waste products not approved by the Division for disposal at the facility.

2.1.2 Asbestos Waste

Regulated asbestos waste received at the landfill shall be managed in accordance with 40 CFR 61. Edgecombe County requires a 24 hour notice prior to receiving any shipment of asbestos. Each shipment will include the current North Carolina Asbestos Waste Shipment Record from North Carolina Department of Health and Human Services, Division of Public Health, Health Hazards Control Unit. The regulated asbestos waste will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause airborne conditions. Non-regulated asbestos waste may be comingled with other waste and disposed of in the landfill. If non-friable asbestos is identified by the County's waste screening and acceptance program and is separated from other wastes, it will be disposed of at the bottom of the working face and covered immediately with soil in a manner that will not cause airborne conditions.

2.2 Wastewater Treatment Sludge

The landfill shall not accept wastewater treatment sludge as waste for disposal in the landfill. However, the landfill may accept wastewater treatment sludge, with prior approval of the Division, for utilization as a soil conditioner and incorporated into or applied onto the vegetative growth layer. The wastewater treatment sludge shall neither be applied at greater than agronomic rates nor to a depth greater than six inches.

2.3 Waste Exclusions

The following waste shall not be accepted by the facility for disposal:

- Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure that no liquid, hazardous or municipal solid waste is contained therein;
- Garbage as defined in G.S. 130A-290(a)(7);
- Hazardous waste as defined in G.S. 130A-290(a)(8), to also include hazardous waste from conditionally exempt small quantity generators;
- Industrial solid waste unless a demonstration has been made and approved by the Division that the landfill meets the requirements of Rule .0503(2)(d)(ii)(A);
- Liquid wastes;
- Medical waste as defined in G.S. 130A-290(a)(18);
- Municipal solid waste as defined in G.S. 130A-290(a)(18a);
- Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761;
- Radioactive waste as defined in G.S. 104E-5(14);
- Septage as defined in G.S. 130A-290(a)(32);
- Sludge as defined in G.S. 130A-290(a)(34);
- Special wastes as defined in G.S. 130A-290(a)(40);
- White goods as defined in G.S. 130A-290(a)(44); and
- Yard trash as defined in G.S. 130A-290(a)(45).

The following wastes shall not be accepted if separate from C&D landfill waste:

- Lamps or bulbs including but not limited to halogen, incandescent, neon or fluorescent; lighting ballast or fixtures;
- Thermostats and light switches;
- Batteries including but not limited to those from exit and emergency lights and smoke detectors;
- Lead pipes;
- Lead roof flashing;
- Transformers;
- Capacitors; and
- Copper chrome arsenate (CCA) and creosote treated woods.

Waste accepted for disposal in a landfill unit shall be readily identifiable as C&D waste. C&D waste that has been shredded, pulverized, or otherwise processed shall not be accepted for disposal from a facility unless that facility has received a permit from an authorized regulatory authority which specifies such activities are inspected by the authority, and whose primary purpose is recycling and reuse of the C&D material. A waste screening and acceptance program is provided below.

Edgecombe County shall not knowingly dispose any type or form of C&D waste that is generated within the boundaries of a unit of local government that by ordinance prohibits generators or collectors of C&D waste from disposing that type or form of C&D waste or requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

2.4 Waste Screening and Acceptance Program

The County conducts a waste screening and acceptance program at the facility for detecting and preventing disposal of hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as land clearing and inert debris (LCID) or C&D. The program consists of random inspections of incoming loads. One inspection is performed on a minimum weekly basis for commercial and industrial waste. The selection of the vehicle that will have its load inspected is the responsibility of the Operations Manager or a person he designates. The selection is made at the scales. The hauler is required to sign the Pre-Acceptance Agreement as shown in the **Appendix I-C**. The Scale Technician notifies the landfill facility's Screening Inspector (chosen by Operations Manager and adequately trained) to meet the designated hauler at an area specifically set aside for conducting screening inspections away from the working face and any on-going landfill operations. The hauler dumps the load of waste, and then the Screening Inspector sorts through the waste using a loader or other similar equipment for handling bulky materials and by hand with a rake or shovel. Once the waste is spread thin enough to observe the

entire load, the inspector records the information required on the Detailed Screening Report form and Waste Screening Check List as shown in **Appendix I-C**. If hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as LCID or C&D are not found in the inspected load, then the waste is disposed of on the working face in the cell immediately after completion of the inspection.

If hazardous waste, liquid waste, MSW, industrial waste or waste not characterized as LCID or C&D are identified in the load, the Screening Inspector shall immediately notify the Operations Manager. If hazardous waste is identified, the Edgecombe County Emergency Services shall also be notified. If liquid waste is discovered, it shall be contained temporarily until an absorbent can be placed or until proper containers are available for pumping. The saturated absorbent or containers will then be disposed of at an appropriate facility. The hazardous waste shall be contained in the same manner as the liquid waste and will be disposed of at a suitable facility for hazardous waste as determined by the Edgecombe County Emergency Services or a qualified environmental/hazardous waste consultant. If MSW, industrial waste or waste not characterized as LCID or C&D are identified in the load, the material will be removed by the responsible party for disposal at an appropriate facility. The landfill staff will record the identity of the hauler and generator of the unauthorized waste.

In addition, the scale personnel and operators shall be educated to recognize probable violations to the acceptable waste guidelines. Personnel will attempt to halt the disposal of unauthorized waste and have the material removed by the responsible party if non-hazardous. If the waste is thought to be hazardous, the procedures described above will be implemented. If the presence of excluded waste is discovered only after spreading and compaction has commenced, the operator will contact the scale house to establish the hauler and generator responsible for the load so that they can be made aware of their mistake and their future loads inspected more carefully.

Records of the inspections shall be maintained in the Operating Record for the facility. Sample forms for the screening inspections are provided in **Appendix I-C**. Facility personnel involved with the screening inspections shall be trained for identification of hazardous and liquid wastes through programs offered by the State or by SWANA. Records of the training shall be maintained in the Operating Record for the facility and include the following:

1. Date of training.
2. A statement asserting that the training included:
   A. Recognition of regulated hazardous waste, liquid waste, PCBs and banned items.
   B. Hazardous waste safety precautions.
3. Written acknowledgement of training by facility personnel.

The landfill operator shall notify the Division within 24 hours of any attempt to dispose of any waste products not approved by the Division for disposal at the facility.

2.5 Phasing

In accordance with the Corrective Active Plan (CAP) the slopes in the western half of the landfill will be increased by filling with C&D waste. The County placed a 10-foot to 15-foot thick lift of C&D waste starting at the western edge of the existing C&D waste area and then worked to the west and then north to the proposed limits of C&D waste (see **Drawing 5**). The County then returned to the eastern edge of the C&D waste and began filling up to the proposed final grades (see **Drawings 3, 4, 5** and **6**). The gross remaining airspace (including cap) is approximately 964,513 cubic yard (cy), and an estimated remaining life of approximately 29.2 years as of 2013 (see **Section 3** of the Facility Plan). The original landfill filling plan was based on phases which were approximately 5 year increments. A summary of the gross airspace of the filling Phases are as follows:

Table 1: Filling Sequence Phases Gross Airspace

PHASE	GROSS AIRSPACE	ACCUMULATIVE AIRSPACE	GROSS AIRSPACE FILLED AS OF 2013
1	605,500 cy	605,500 cy	605,500 cy
2	111,500 cy	717,000 cy	717,000 cy
3	112,000 cy	829,000 cy	735,487 cy
4	115,000 cy	944,000 cy	
5	167,500 cy	1,111,500 cy	
6	174,800 cy	1,286,300 cy	
7	156,400 cy	1,442,700 cy	
8	178,600 cy	1,621,300 cy	
9	78,700 cy	1,700,000 cy	
TOTAL	**1,700,000 cy**	**1,700,000 cy**	

A cross section of the landfill is depicted in **Drawing 7**.

3. COVER MATERIAL

3.1 General Requirements

The solid waste disposed of in the landfill shall be covered with six inches of earthen material, or approved alternate cover material and thickness, when the waste disposal area exceeds one-half acre and at least once weekly. Cover shall be placed at more frequent intervals if necessary to control disease vectors, fires, odors, blowing litter, and scavenging. A notation of the date and time of the cover placement shall be recorded in the Operating Record. Any asbestos waste received at the landfill shall be covered immediately with cover material in a manner that will not cause airborne conditions. The borrow area where the cover material is obtained is depicted on **Drawing 8**. The addition of the LFGCCS will not generate additional noise or odor nuisances.

3.2 Inactive Areas

Areas which will not have additional wastes placed on them for three months or more, but where final termination of disposal operations has not occurred, shall be covered and stabilized with vegetative ground cover or other stabilizing material.

3.3 Alternate Cover Material and Thickness

Currently, Edgecombe County does not utilize alternate cover materials or thicknesses. However, the landfill may utilize alternative materials or an alternative thickness of cover for the landfill units following approval by the Division. A demonstration shall be performed to show that the alternative material or thickness controls disease vectors, fires, odors, blowing litter, and scavenging without presenting a threat to human health and the environment. Once approval by the Division is given, this approval will extend to all units at the facility.

4. WASTE SPREADING AND COMPACTING

Edgecombe County shall restrict solid waste placement to the smallest area feasible for operations. The solid waste shall be compacted as densely as practical using landfill compactors and dozers. Fencing and/or diking shall be provided within the landfill area to confine solid waste which is subject to be blown by the wind. At the conclusion of each operating day, windblown material resulting from the operation shall be collected and disposed.

5. DISEASE VECTOR CONTROL

Control of vectors, such as rodents, flies, mosquitoes, or other animals or insects, capable of transmitting disease to humans, is an important environmental control. Control is accomplished by denying them a source of food and water through the use of cover, proper grading, and only accepting waste the facility is permitted to receive.

6. AIR CRITERIA AND FIRE CONTROL

6.1 Compliance

The following State Implementation Plan (SIP) applies to Edgecombe County:

> Edgecombe County Redesignation Demonstration and Maintenance Plan for the Rocky Mount, North Carolina 8-hour Ozone Nonattainment Area

The SIP includes federal and state control measures. The measures which directly affect the Landfill include the on-board diagnostic vehicle inspection and maintenance program and an open burning ban during ozone action days. Currently, the Landfill is in general compliance with this SIP.

6.2 Open Burning

Open burning of solid waste, except for the approved burning of land clearing debris generated on-site or debris from emergency clean-up operations, shall be prohibited at the landfill. Prior to any burning which meets the above criteria, a request shall be sent to the Division for review and approval. A notation of the date of approval and the name of the Division personnel who approved the burning shall be included in the Operating Record.

6.3 Equipment

Equipment and stockpiled soil is available to control accidental fires. Edgecombe County has made arrangements with the Edgecombe County Fire Marshall to immediately provide fire-fighting services as needed. A copy of the memo is attached as **Appendix V-C**. All facility equipment is equipped with fire extinguishers.

6.4 Notification

Any fires or explosions that occur at the facility shall be verbally reported to the Division within 24 hours and written notification provided within 15 days. Written notification shall include the suspected cause of fire or explosion, the response taken to manage the incident, and the action(s) to be taken to prevent the future occurrence of fire or explosion. The addition of the LFGCCS in 2012 does not alter the notification process in case of fire or explosion.

7. ACCESS AND SAFETY

7.1 Site Access

Edgecombe County's Solid Waste operations are located on both the east and west side of Colonial Road. Access to the entrances to the site is controlled by means of gates. During operation, vehicles entering the site are directed to the east side of the facility (east of Colonial Road) to pass through the security check station and weigh scales. After loads have been weighed and approved for disposal by the scale personal, vehicles disposing of C&D Waste are directed to the landfill located on the west side of Colonial Road. The eastern boundary of the landfill, along Colonial Road, and the southeast boundary of the landfill are fenced. Access to the unfenced portions of the southern and western landfill boundary is prevented by dense woods and a deep perimeter ditch. Access to the unfenced northern landfill boundary is prevented by dense woods and Jerry's Creek.

Fencing has been installed around the blower flare station, condensate sump, and the containerized generators for safety and system security purposes.

7.2 Personnel

An individual trained in landfill operations shall be on duty at the site while the facility is open for public use and at all times during active waste management operations to ensure compliance with operational requirements.

Edgecombe County will hire a Landfill Gas Operator once the Landfill Gas To Energy System is in full operation. The Operator will be required to take the Landfill Gas System Operations and Maintenance class offered by SWANA. In the interim S&ME is operating the system on Edgecombe County's behalf.

7.3 Access Roads

Access roads to the site are of all weather construction and shall be maintained in good condition.

7.4 Dust Control

Dust generated due to landfill activities will be controlled through the application of water by truck or other approved dust control procedures, if necessary. Removal of mud and dirt from the roads will also be a part of the dust control measures and be accomplished with a motor grader. Additionally, cover will be stabilized, as required, which will minimize the blowing of dust on-site.

7.5 Facility Signs

Signs providing information on disposal procedures, the hours that the site is open for public use, the permit number, and other pertinent information, such as scale location, are posted at the site entrance. A sign is posted at the landfill entrance which states that liquid, hazardous, and municipal solid wastes are excluded from the C&D Landfill.

7.6 Traffic Signs

Traffic signs and markers are provided as necessary to promote an orderly traffic pattern to and from the disposal area and maintain efficient operating conditions

7.7 Waste Removal

The removal of solid waste from the C&D landfill is prohibited. The general public is prohibited from removal activities on the working face.

7.8 Power Outage/Increment Weather

Backup generators have been purchased and delivered to the landfill to operate the scale house in a power outage situation.

8. EROSION AND SEDIMENTATION CONTROL

8.1 Control Measures

Erosion/sedimentation control structures, which include sediment basins, check dams, and diversion ditches, are used to prevent excessive on-site erosion and prevent sediment from leaving the site. Vegetative cover is also used to reduce erosion and prevent off-site transportation of sediment. Installation and maintenance of the control structures will be in accordance with the approved Erosion and Sedimentation Control Plan for the site.

Sedimentation basins shall be checked after periods of significant run-off. Sediment shall be removed from the basin to its original dimensions when sediment accumulates to one

half of the design depth. The sedimentation basins, embankments, spillways and outlets shall also be inspected for erosion damage. Necessary repairs shall be made immediately. Any trash or debris within the sedimentation basin riser pipe shall be removed.

Existing check dams and diversion ditches shall be inspected for damage after each significant rainfall event. Any sediment accumulated behind check dams shall be removed. Check dams, riprap-lined channels and outlet protection used to prevent damage to channel vegetation shall be inspected for wash-outs. Riprap shall be added to these areas as needed to maintain integrity of the structure. Siltation that has accumulated in diversion ditches shall be removed periodically to maintain adequate flow capacity. Stormwater management and erosion and sedimentation control details are shown in **Drawings 10, 11, 12 and 13**.

Borrow areas shall be graded to promote positive drainage of surface water out of the area (**Drawing 8**).

8.2 Vegetative Cover

Embankment slopes shall be periodically monitored for erosion and shall be mowed at least once a year. The embankment slopes shall be refertilized in the second year unless vegetation growth is fully adequate. Any damaged areas shall be reseeded, fertilized, and mulched immediately. Seeding, fertilizing and mulching shall be in accordance with the North Carolina Erosion and Sedimentation Control Guidelines.

9. DRAINAGE CONTROL AND WATER PROTECTION

9.1 Surface Water Diversion

Surface water will be diverted from the operational area. A drainage feature at the center of the active area collects the surface water run-off and directs the flow toward Jerry’s Creek.

Other surface drainage features collect surface water run-off from an area of the eastern side of the landfill. Surface water from this portion of the site flows around the eastern end of the landfill through drainage ditches that flow into Jerry's Creek and eventually to the Tar River.

9.2 Surface Water Impoundment

Surface water shall not be impounded over or in the waste. The waste surface shall be graded and soil berms used as necessary to divert surface water away from the operational area and away from the waste.

9.3 Waste Disposal

Waste shall not be disposed of in water. The waste surface shall be graded and soil berms used as necessary to divert surface water away from the operational area and away from the waste.

9.4 Leachate Handling

Leachate at the facility is currently contained on-site. If it becomes necessary to collect leachate, methods for leachate handling will be evaluated at that time. Leachate handling methods will be submitted to NCDENR and other relevant and appropriate agencies for review and approval at that time.

9.5 Pollution Discharge

Edgecombe County shall operate the landfill in ways to prevent the discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including the National Pollutant Discharge Elimination System (NPDES) requirements, pursuant to Section 402.

Edgecombe County shall also operate the landfill in ways to prevent the discharge of a nonpoint source of pollution to waters of the United States, including wetlands, that violates any requirement of an area-wide or State-wide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

10. WATER QUALITY MONITORING PLAN

A Water Quality Monitoring Plan (WQMP) was prepared to summarize the activities and protocols recommended to perform groundwater and surface water monitoring at the landfill in general accordance with the requirements as specified in the NCDENR Solid Waste Management Rules, Sections .0600 and .1637(a)(1) of Chapter 15A of the North Carolina Administrative Code (NCAC) Subchapter 13B. The WQMP is designed to monitor groundwater and surface water quality in order to detect a release from the landfill into the uppermost aquifer [.1623(b)(3)(C)] as well as to monitor the effectiveness of the corrective action plan (CAP) being implemented to remediate constituents released from the MSW landfill that were detected downgradient from the MSW unit. The last version of this WQMP was January 2010. The WQMP has been revised to incorporate information detailed in a September 17, 2012 letter from NCDENR-DWM, which addressed S&ME's request to modify the Sampling and Analysis Plan (SAP) by reducing the Monitored Natural Attenuation (MNA) parameters and modifying the sampling schedule. The sampling schedule modification request was approved by NCDENR. In an April 19, 2013 letter from S&ME on behalf of Edgecombe County to NCDENR-DWM regarding modifying the SAP as a result of the *Baseline Sampling and Monitored Natural Attenuation (MNA) Report* dated July 2012 and a meeting between S&ME and NCDENR where the NCDENR approved modifications to the SAP, in which geochemical parameters are to be temporarily discontinued until corrective measures detailed in the CAP are implemented. Once the corrective measures in the CAP are in place, the revised SAP for MNA and the geochemical parameters will be implemented. The revised WQMP dated August 2014 as well as copies of the letters mentioned above are included in **Appendix II-C**.

11. GAS MONITORING PLAN

A Gas Monitoring Plan was prepared to meet the requirements of Solid Waste Management Rules, Sections .0544(d) and .1626(4). These rules present the criteria for

explosive gas control as it relates to the operational requirements for the C&D and MSW landfills. The purpose of the Plan is to provide details of the gas monitoring procedures and policies of the Edgecombe County Landfill. The Gas Monitoring Plan, prepared in June 2008, is included in **Appendix III-C**.

12. LANDFILL GAS COLLECTION AND CONTROL SYSTEM

The Landfill Gas Collection and Control System (LFGCCS), which includes the extraction wells, piping, sumps, blower flare station and condensate tanks, will be maintained in accordance with the prepared LFGCCS *Operations and Maintenance Manual* dated May 2013. Included in the Operations and Maintenance Plan are charts showing the frequency of calibration, inspections and maintenance to be performed on the various components of the system. Inspection forms are included in the Manual. The operations and maintenance schedule for the components of the LFGCCS is included in included in Appendix H of the Construction Completion Report (**Appendix VI-C**).

Prior to placing the soil layers of the cap system, the gas collection piping shall be temporarily disconnected and moved out of the way for construction. The gas wells will be extended, as necessary, so that there is a minimum three feet of stick-up above the cap system vegetation/erosion layer. New gas wells installed shall consist of perforated 6-inch diameter HDPE pipe or Schedule 80 PVC pipe surrounded by gravel. The perforations in the HDPE or PVC pipe shall end 15 feet below the final elevation of the cap system and the remainder of the pipe shall be solid. A bentonite plug shall be installed along the solid section of the pipe. The detail drawings for the single and the nested gas wells is provided on **Drawing 9**. The gas collection piping shall be reconnected following completion of the cap system. Logs of the gas collection wells are located in **Appendix VI-C.**

12.1 Wastewater Discharge Permit

Condensate from the LFGCCS is collected in on-site condensate sumps CS-2 and CS-3 located in the landfill area and CS-1 near the condensate tanks, which eventually pump the condensate into two 2,500 gallon polyethylene storage tanks. The two condensate storage tanks are located in a concrete secondary containment area. When the tanks are near capacity the condensate will be transferred by Edgecombe County vacuum truck to the Town of Tarboro's sewer collection system (as authorized by November 13, 2013 Wastewater Discharge Permit). The Town of Tarboro issued wastewater discharge permit is contained in the appendix to the Construction Completion Report located in **Appendix VI-C**.

S&ME, on behalf of Edgecombe County, monitors the system remotely on a daily basis and received alarms when problems with the system arise. S&ME personnel also visit the facility on a monthly basis or more frequently as needed to collect well field data, to check leachate levels in the traps and sumps and the condensate levels in the tanks, and to adjust the system manually.

12.2 Air Permit

The Edgecombe County Landfill was issued Air Permit No. 10196R01 on January 16, 2013. Three emission sources, one flare (ES-01) and two landfill gas-fired engine generators sets (ES-02 and ES-03), are identified in the permit. A copy of the permit is included in Appendix E of the Construction Completion Report (**Appendix VI-C**). A summary of the operational, recordkeeping, monitoring, testing and reporting requirements of the air permit applicable to the facility is also included in Appendix E of the Construction Completion Report (**Appendix VI-C**).

13. SURVEY FOR COMPLIANCE

In accordance with Solid Waste Management Rules, Section .0542(m), within 60 days of Edgecombe County's receipt of the Division's written request, Edgecombe County shall conduct a survey of active or closed portions of unit or units at the facility in order to determine whether operations are being conducted in accordance with the approved design and operational plans. The survey shall be performed by a registered land surveyor (RLS) duly authorized under North Carolina law to conduct such activities. Edgecombe County shall then report the results of such survey, including a map produced by the survey, to the Division within 90 days of receipt of the Division's request.

Operations personnel will periodically monitor landfill top and side slope elevations with a level or through construction staking by a land surveyor. When top and side slope elevations approach design grades, the final waste grades will be staked to provide filling operations consistent with the approved Drawings.

14. OPERATING RECORD AND RECORDKEEPING

14.1 Recorded Information

Edgecombe County shall maintain on-site the following information:

- Records of random waste inspections, monitoring results, certifications of training, and training procedures required by the Solid Waste Management Rules, Section .0544;
- Amounts by weight of solid waste received at the facility to include, consistent with G.S. 130A-309.09D, county of generation;
- Any demonstration, certification, finding, monitoring, testing, or analytical data required by the Solid Waste Management Rules, Sections .0544 through .0545;
- Any closure or post-closure monitoring, testing, or analytical data as required by the Solid Waste Management Rules, Section .0543;
- Any cost estimates and financial assurance documentation required by the Solid Waste Management Rules, Section .0546;
- Notation of date and time of placement of cover material; and
- All audit records, compliance records and inspection reports.

14.2 Information Availability

Information contained in the Operating Record shall be furnished to the Division according to the permit or upon request, or be made available for inspection by the Division.

14.3 Additional Items Included in Operating Record

The Operating Record shall also include:

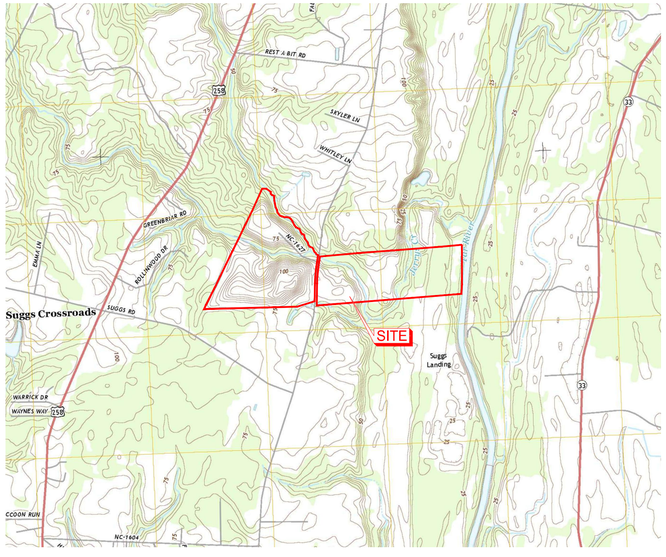
- A copy of the approved operation plan;
- A copy of the current Permit to Construct and Permit to Operate; and
- The Monitoring Plan included as appendices to the Operation Plan.

DRAWINGS

OPERATION AND WASTE ACCEPTANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
PERMIT # 33-01

EDGECOMBE COUNTY
TARBORO, NORTH CAROLINA

AUGUST 2014



SITE VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

DRAWING	TITLE
1.	TITLE SHEET
2.	EXISTING CONDITIONS
3.	PROPOSED FINAL GRADING
4.	FILLING PLAN - YEARS 1 THROUGH 4
5.	FILLING PLAN - PHASES 1&2, 3, 4, AND 5
6.	FILLING PLAN - PHASES 6, 7, AND 8
7.	LANDFILL CROSS-SECTIONS
8.	BORROW AREA PLAN
9.	FINAL COVER AND GAS WELL DETAILS
10.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS I
11.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS II
12.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS III
13.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS IV

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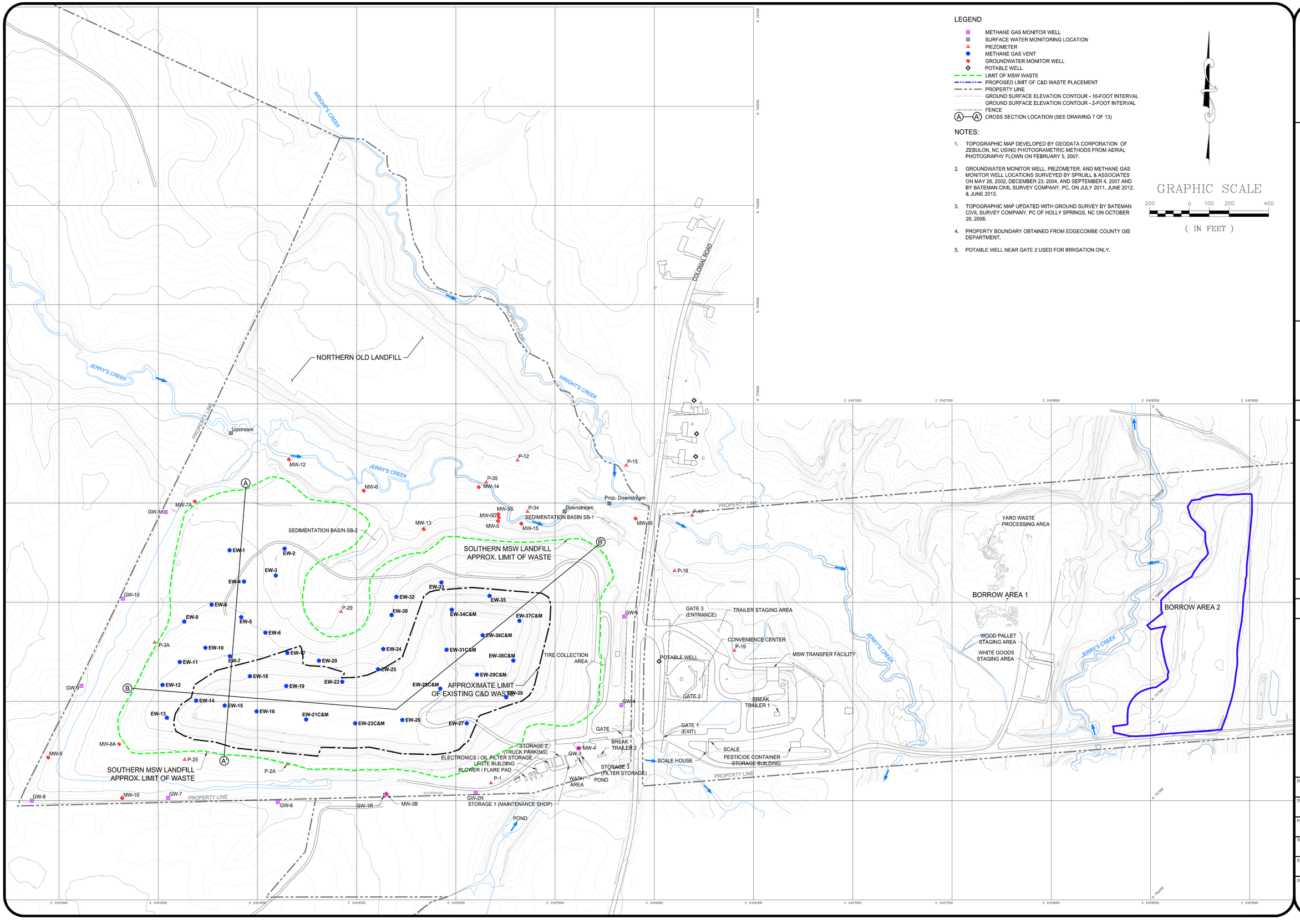
NO.	DATE	DESCRIPTION	BY
1	8-6-2014	Change titles of Drawings 4, 5, and 6	KSO

TITLE SHEET

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: JAM
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1378	
DRAWING: 1	OF: 13

T:\Projects\2013\ENV\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Operations Plan\D1378.dwg, FIGL, 9/3/2014 10:24:18 AM, 1:1



LEGEND

- METHANE GAS MONITOR WELL
- SURFACE WATER MONITORING LOCATION
- PIEZOMETER
- METHANE GAS VENT
- GROUNDWATER MONITOR WELL
- POTABLE WELL
- LIMIT OF MSW WASTE
- PROPOSED LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- (A)—(A') CROSS SECTION LOCATION (SEE DRAWING 7 OF 13)

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON JULY 2011, JUNE 2012, & JUNE 2013.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. POTABLE WELL NEAR GATE 2 USED FOR IRRIGATION ONLY.

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

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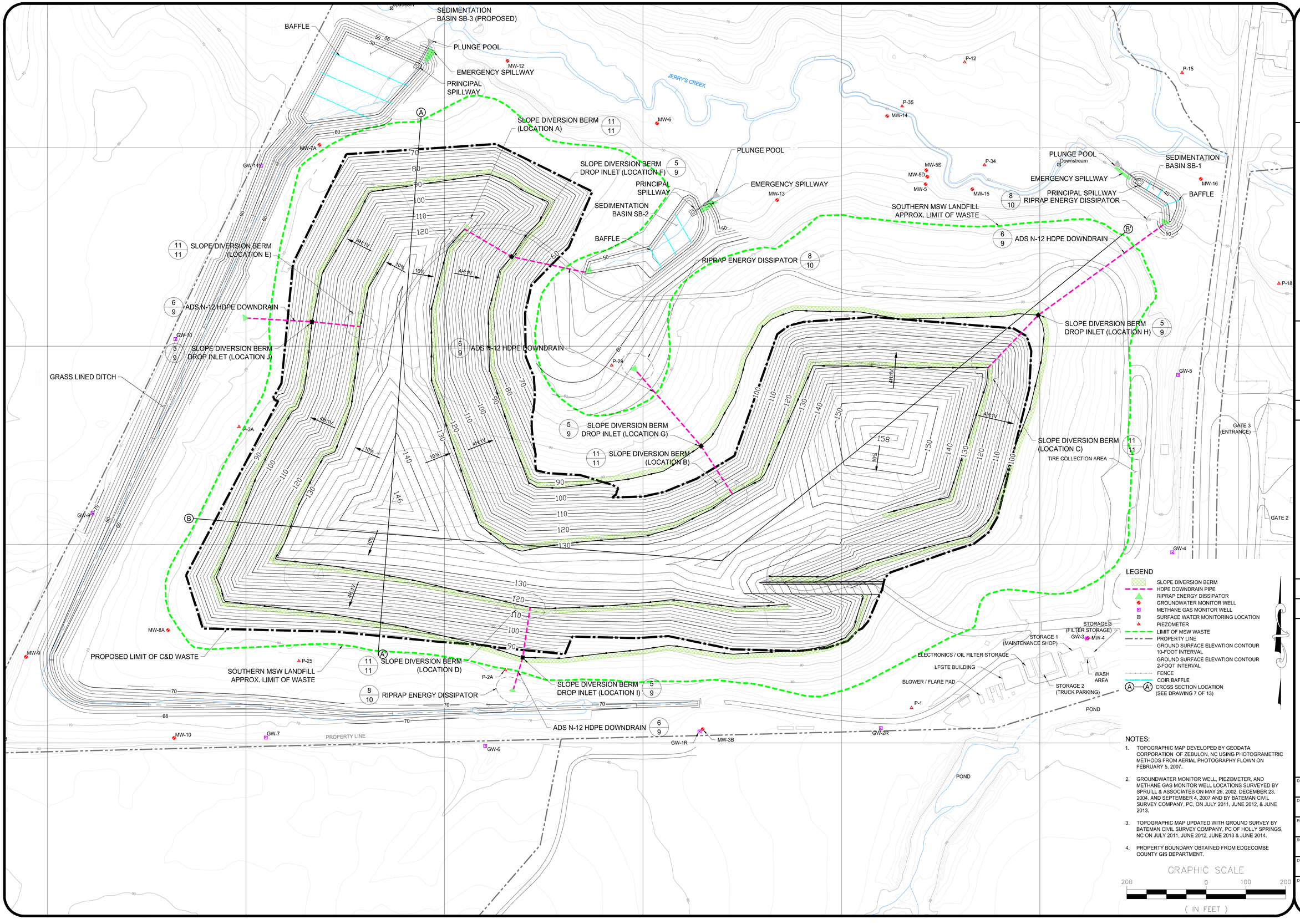
NO.	DATE	DESCRIPTION	BY
1	04-2014	June 2014 Permit Renewal	

EXISTING CONDITIONS

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1379	
DRAWING: 2	OF: 13

I:\Projects\2013\EW\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Operations Plan\D1379.dwg, FIG2, 9/3/2014 10:25:36 AM, 1:1



NOTES:

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3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, JUNE 2013 & JUNE 2014.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

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NO.	DATE	DESCRIPTION	BY
1	6-6-2014	June 2014 Permit Renewal	

PROPOSED FINAL GRADING

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: JAM
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG. 2014
DRAWING NUMBER: D-1380	
DRAWING: 3	OF: 13

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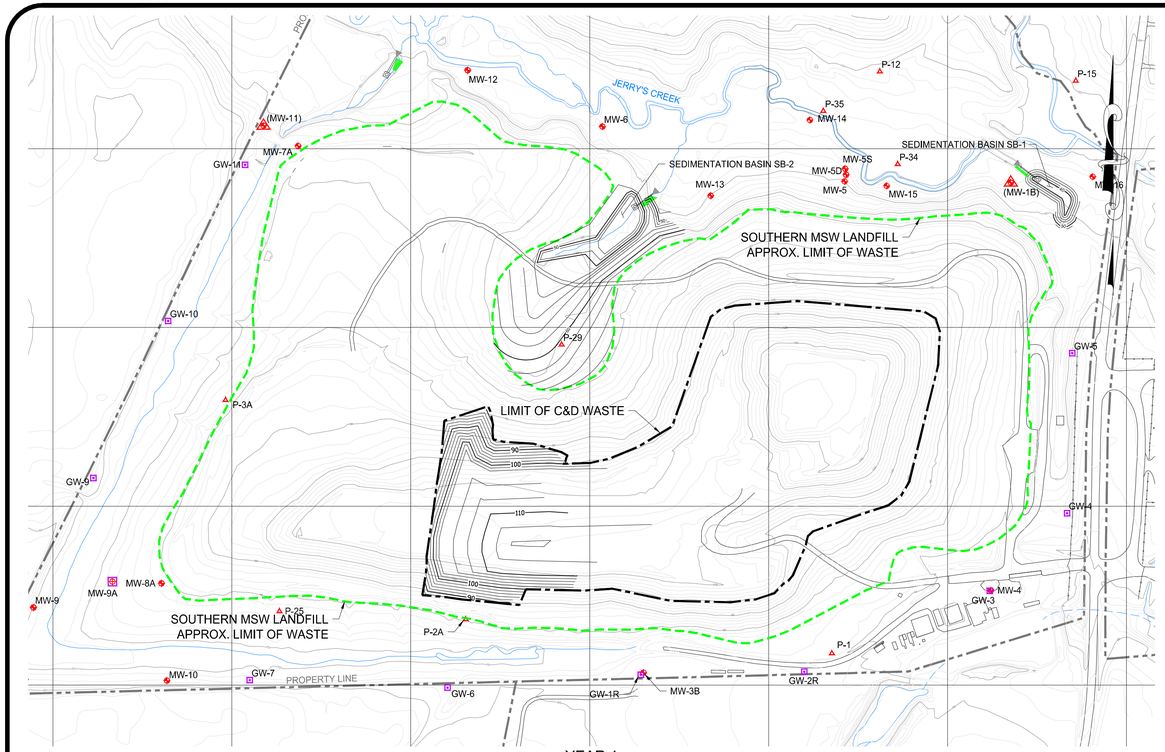
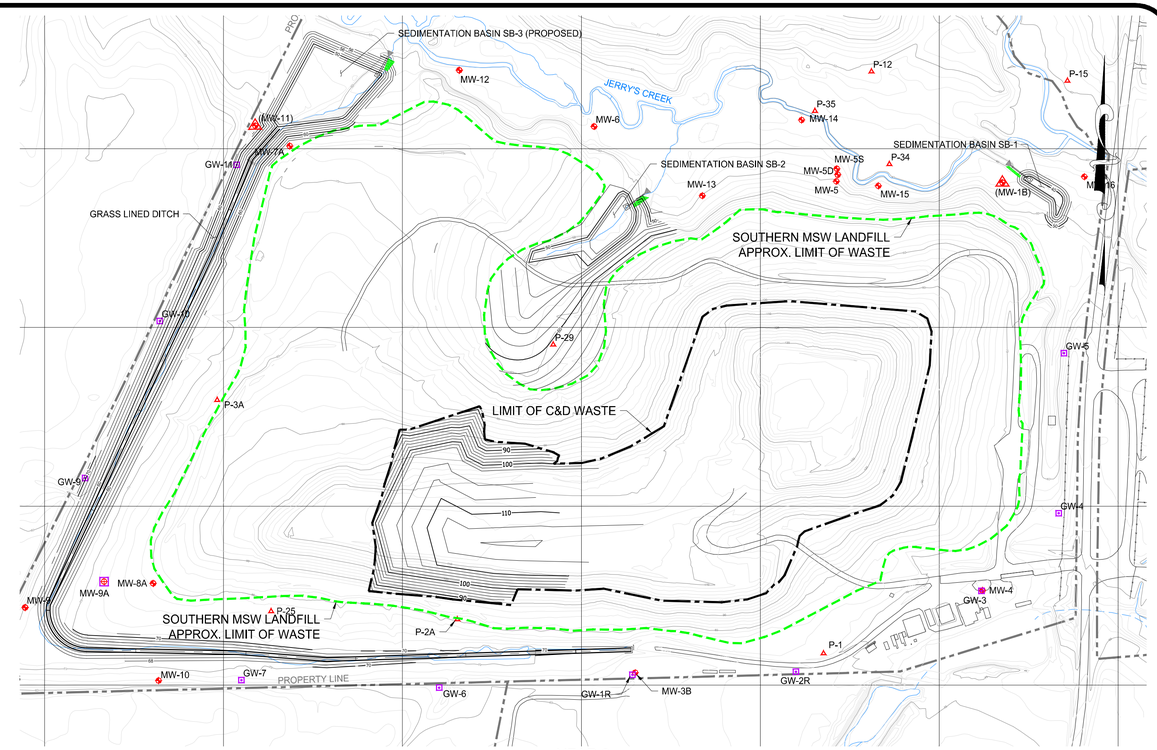


YEAR 1



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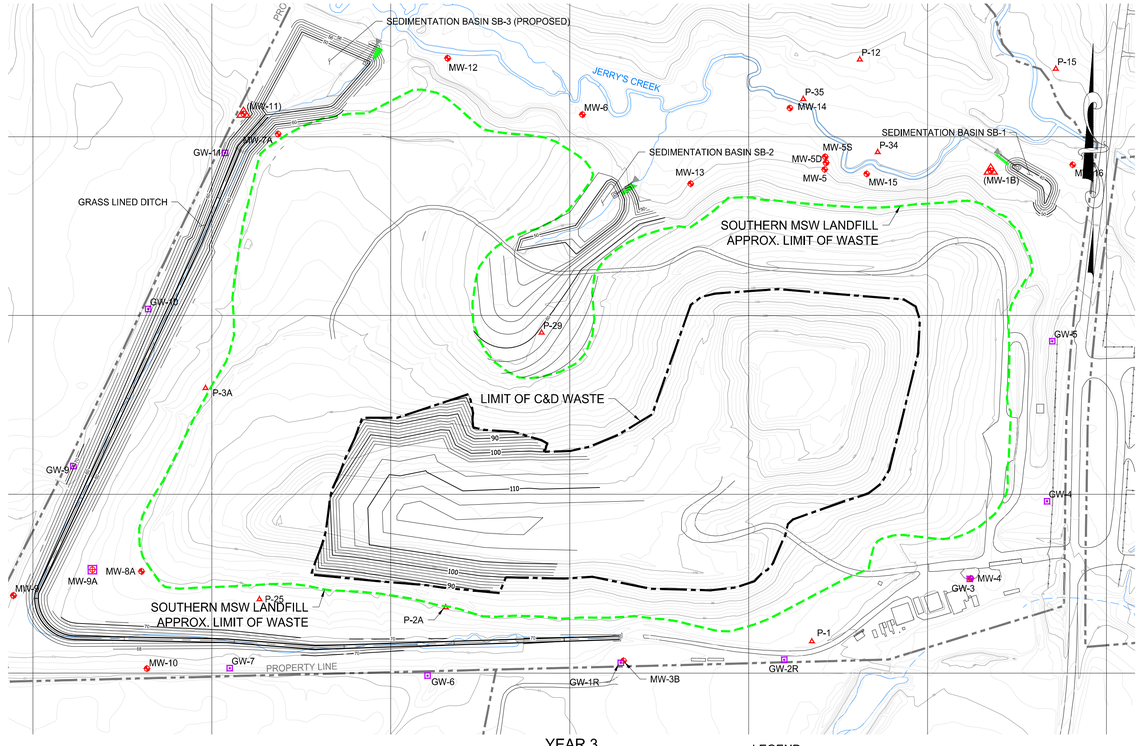
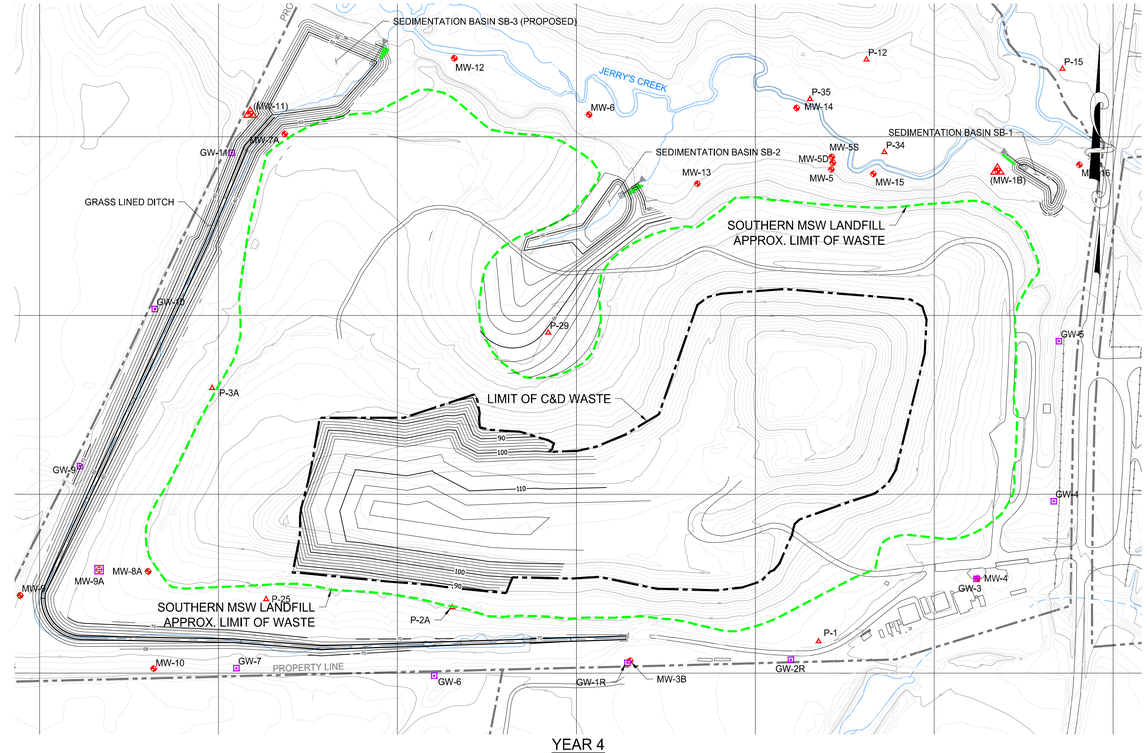


YEAR 3



YEAR 4

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
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4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- METHANE GAS MONITOR WELL
- PIEZOMETER
- GROUNDWATER MONITOR WELL
- (MW-9A) PROPOSED BACKGROUND NETWORK MONITOR WELL
- (MW-11) PROPOSED COMPLIANCE NETWORK MONITOR WELL
- LIMIT OF MSW WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- (A)—(A') CROSS SECTION LOCATION (SEE DRAWING 7 OF 13)
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

400 0 200 400

(IN FEET)

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NO.	DATE	DESCRIPTION	BY
1	6-6-2014	Indicate Phases	KSO

FILLING PLAN - YEARS 1 THROUGH 4

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: JAM
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1381-01	
DRAWING: 4	OF: 13

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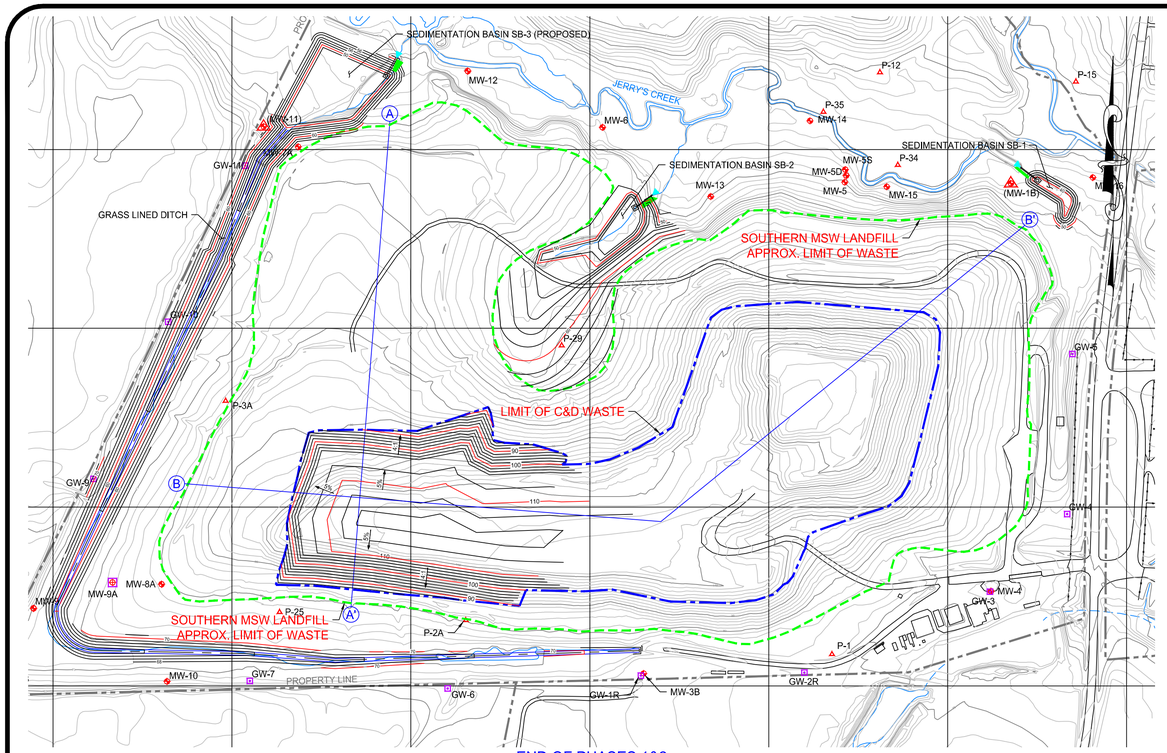
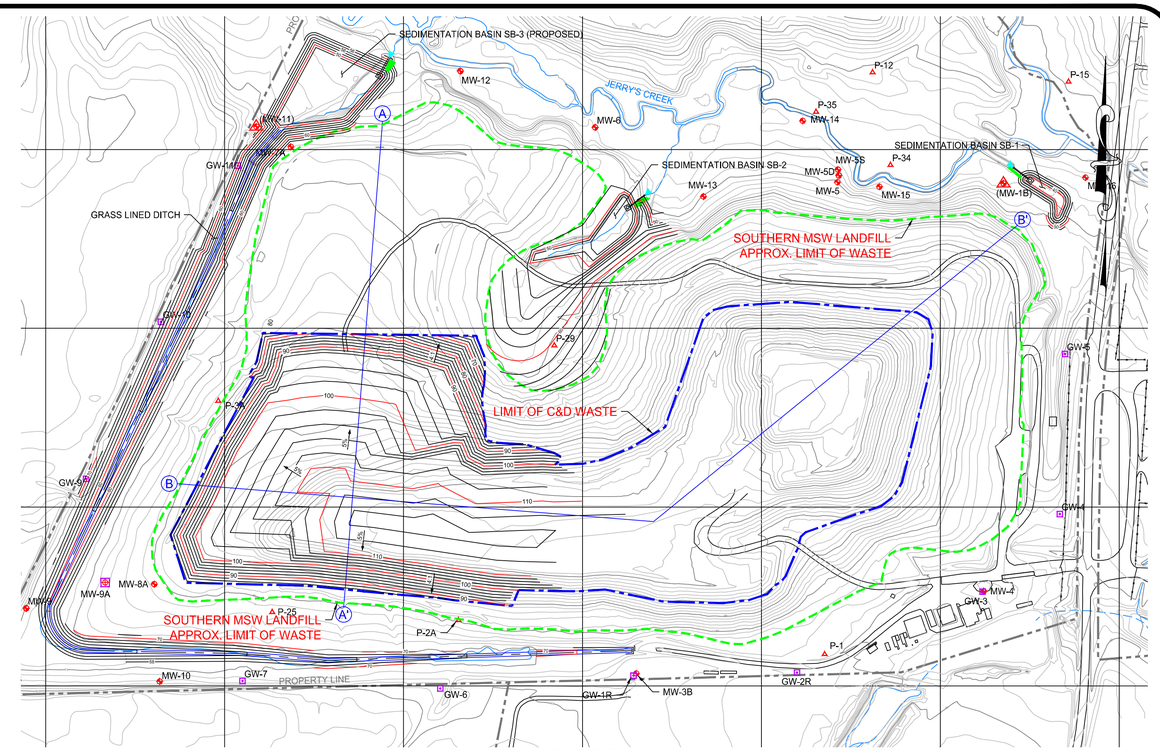
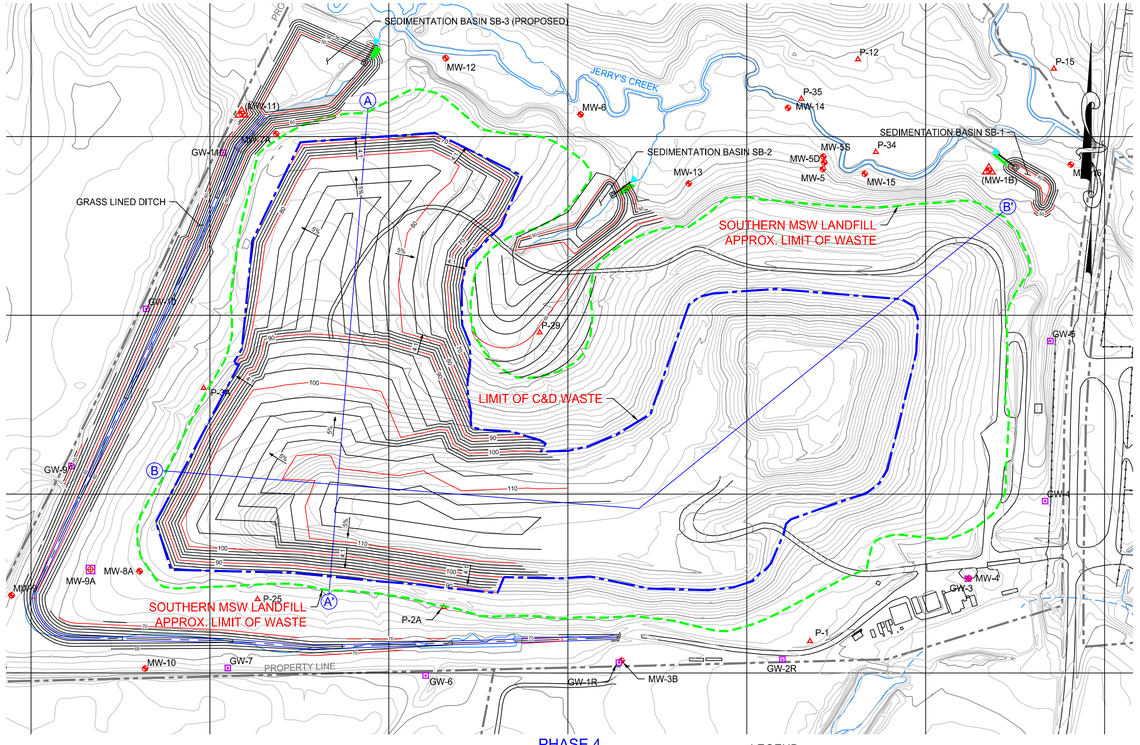


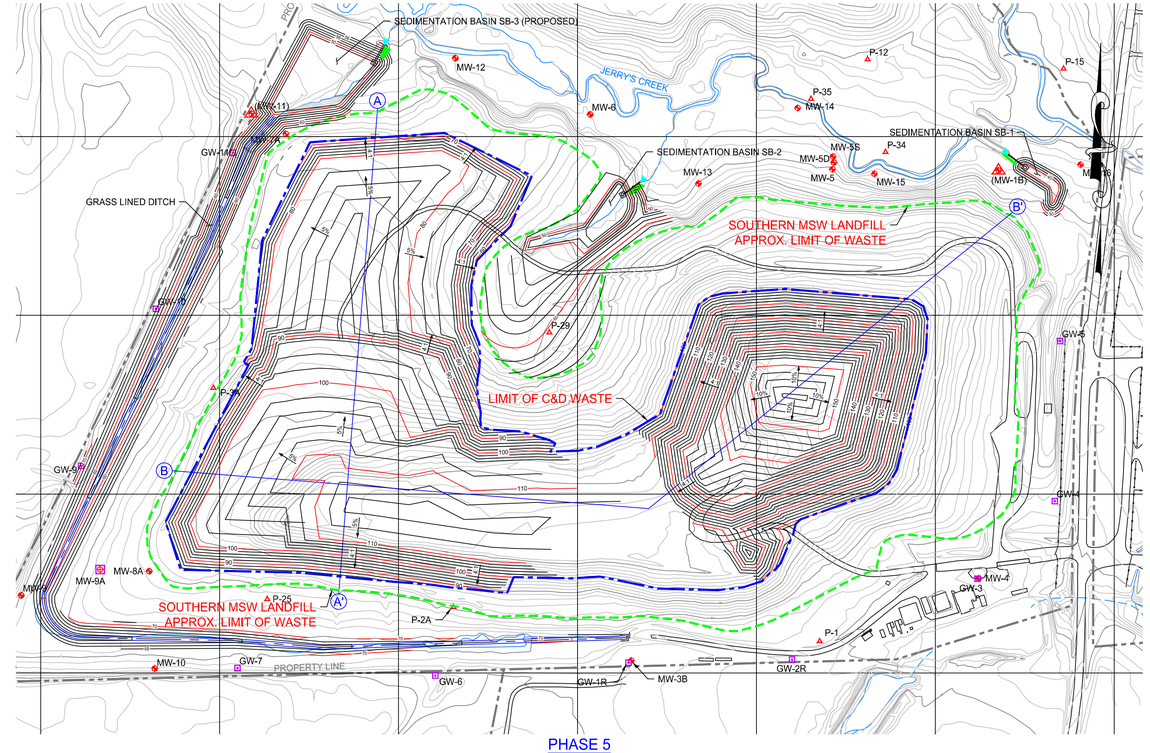
END OF PHASES 1&2



PHASE 3



PHASE 4



PHASE 5

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
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4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- METHANE GAS MONITOR WELL
- PIEZOMETER
- GROUNDWATER MONITOR WELL
- (MW-9A) PROPOSED BACKGROUND NETWORK MONITOR WELL
- (MW-11) PROPOSED COMPLIANCE NETWORK MONITOR WELL
- LIMIT OF MSW WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- (A)—(A') CROSS SECTION LOCATION (SEE DRAWING 7 OF 13)
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

400 0 200 400

(IN FEET)

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NO.	DATE	DESCRIPTION	BY
1	8-6-2014	Indicate Phases	KSO

FILLING PLAN - PHASES 1&2, 3, 4, AND 5

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: JAM
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1381-02	
DRAWING: 5	OF: 13

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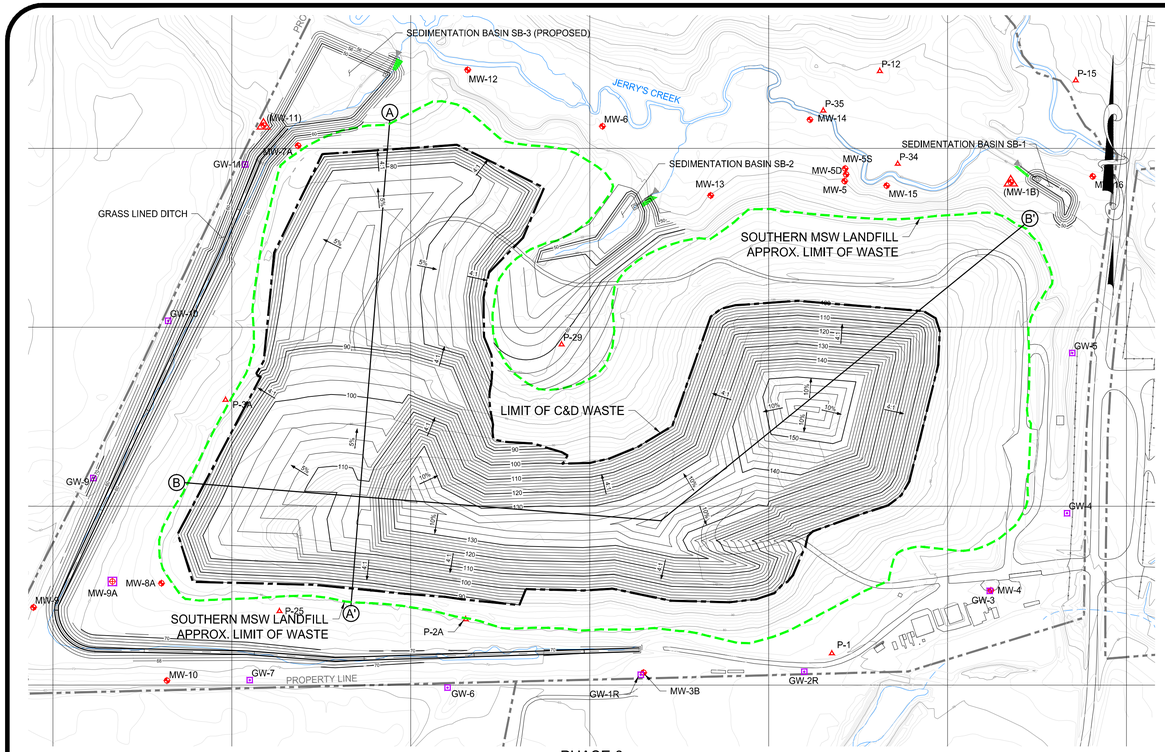
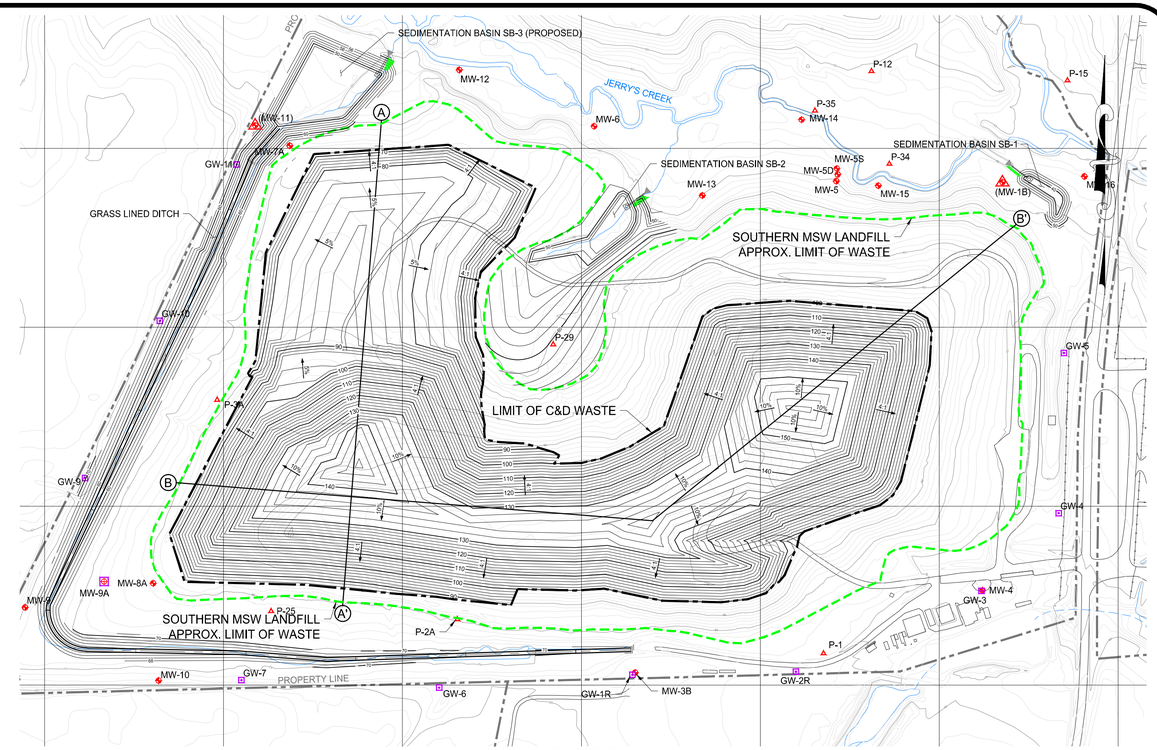
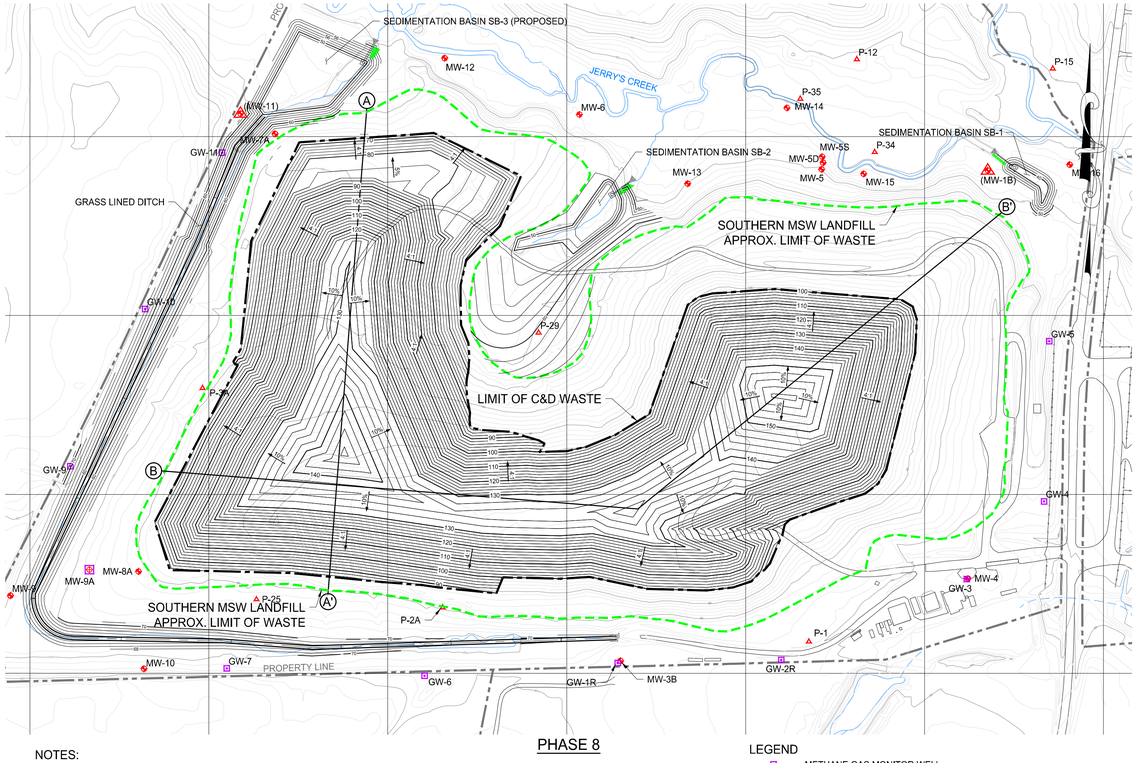


PHASE 6



PHASE 7



PHASE 8

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
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4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

LEGEND

- METHANE GAS MONITOR WELL
- PIEZOMETER
- GROUNDWATER MONITOR WELL
- (MW-9A) PROPOSED BACKGROUND NETWORK MONITOR WELL
- (MW-11) PROPOSED COMPLIANCE NETWORK MONITOR WELL
- LIMIT OF MSW WASTE
- LIMIT OF C&D WASTE PLACEMENT
- PROPERTY LINE
- (A)—(A') CROSS SECTION LOCATION (SEE DRAWING 7 OF 13)
- PROPOSED C&D ELEVATION CONTOUR - 10-FOOT INTERVAL
- PROPOSED C&D ELEVATION CONTOUR - 2-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

GRAPHIC SCALE

400 0 200 400

(IN FEET)

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NO.	DATE	DESCRIPTION	BY
1	6-6-2014	Indicate Phases	KSO

FILLING PLAN - PHASES 6, 7, AND 8

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: JAM
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1381-03	
DRAWING: 6	OF: 13

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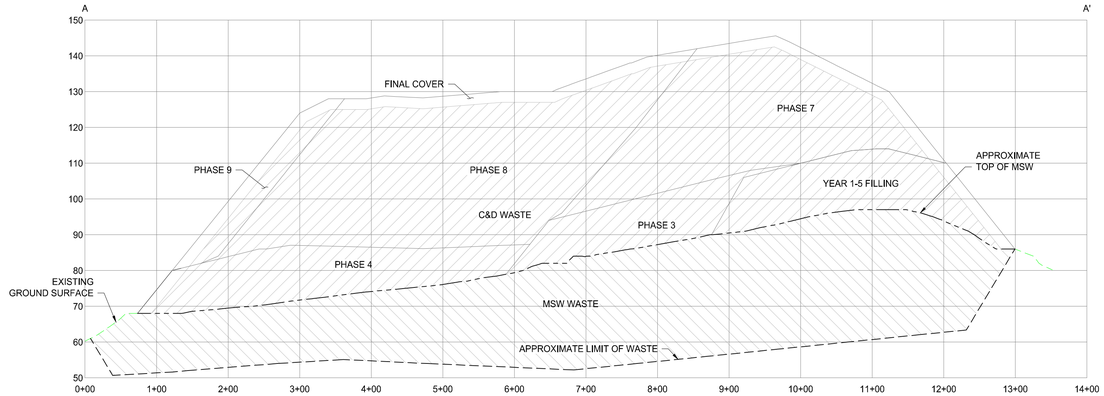
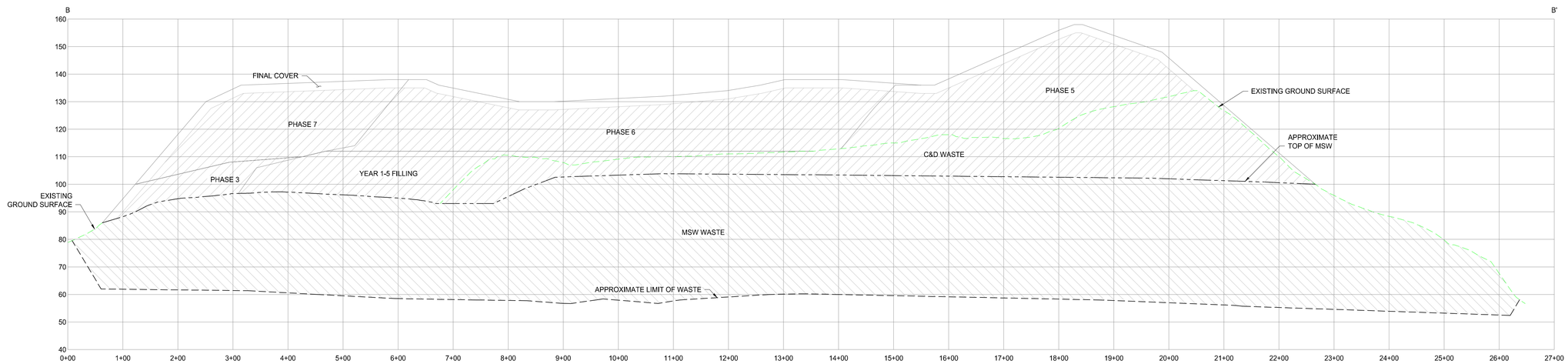


PROFILE A-A'



PROFILE B-B'

NOTES:

1. EXISTING CONTOURS FROM DRAWING 2 (D-1379)
2. PROPOSED FINAL GRADING FROM DRAWING 3 (D-1380)
3. 5 YEAR FILLING FROM DRAWINGS 5 AND 6 (D-1381-02 AND D-1381-03)

HORIZONTAL SCALE

200 0 100 200

(IN FEET)

VERTICAL SCALE

40 0 20 40

(IN FEET)

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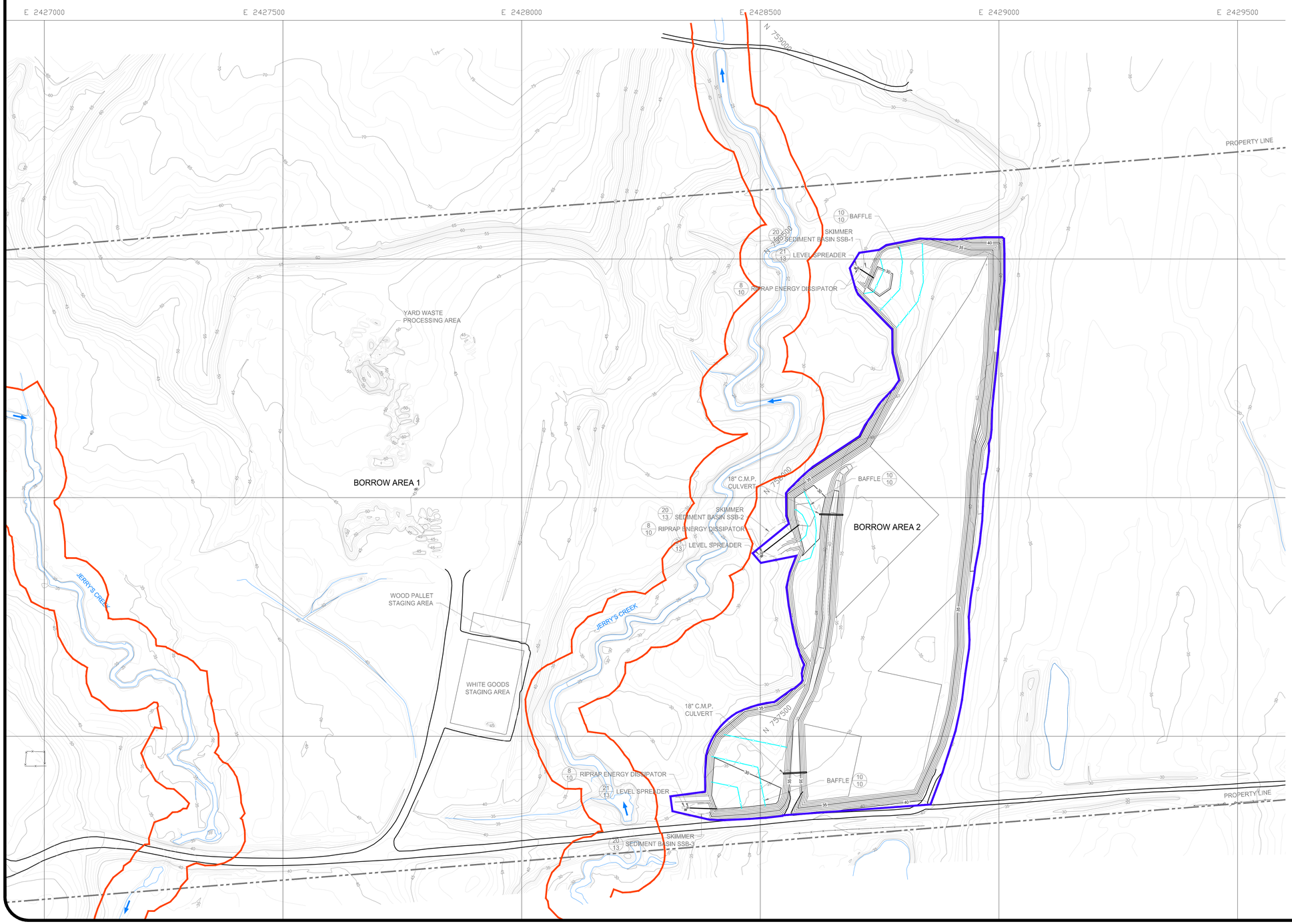
NO.	DATE	DESCRIPTION	BY
1	6/4/2014	June 2014 Permit Renewal	

LANDFILL CROSS-SECTIONS

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1382	
DRAWING: 7	OF: 13

T:\Projects\2013\EN\1054-13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Operations Plan\D1382.dwg, FIG7, 9/2/2014 10:33:19 AM, 1:1



LEGEND

- BORROW AREA
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- COIR BAFFLE
- SILT FENCE
- 50-FOOT STREAM BUFFER
- DETAIL NUMBER / FIGURE NUMBER

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
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3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

100 0 50 100 200

(IN FEET)

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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

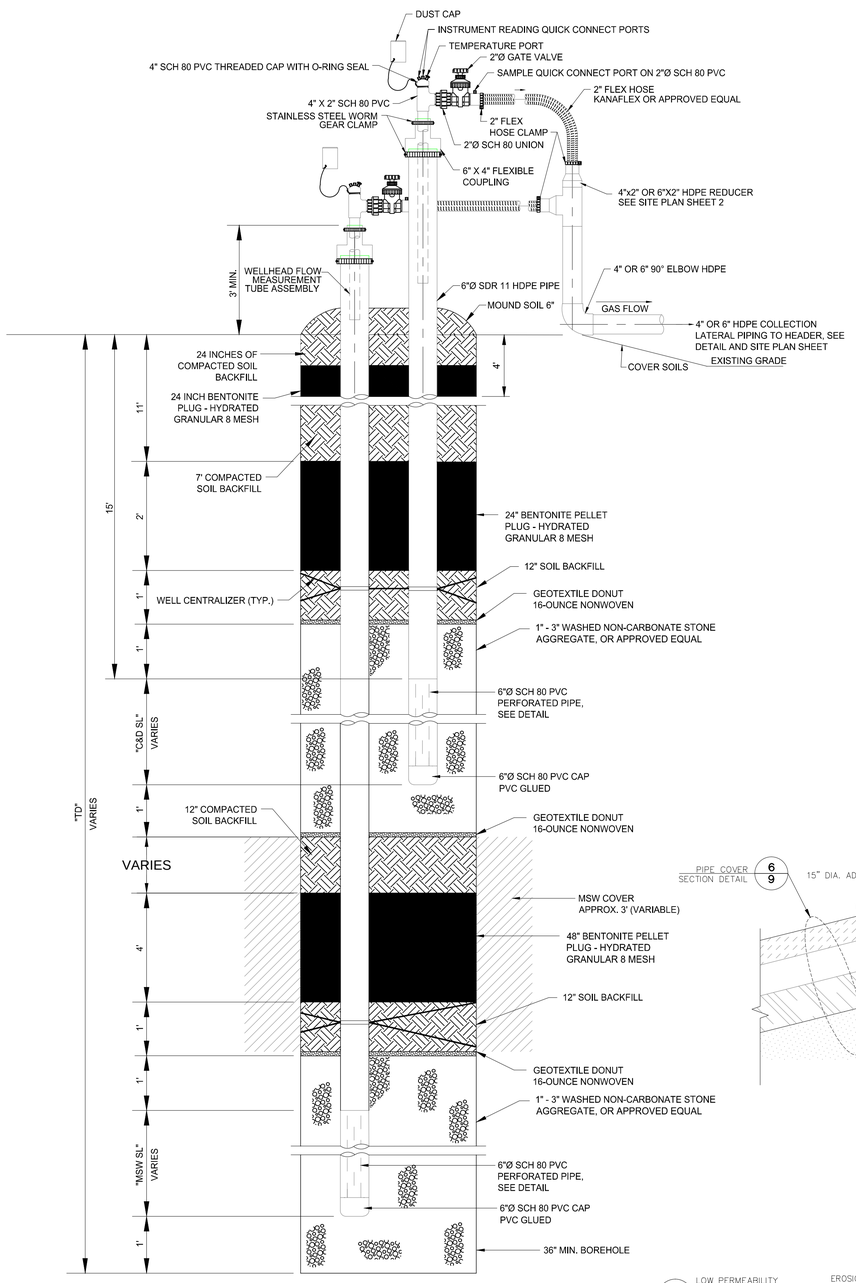
NO.	DATE	DESCRIPTION	BY
1	6-6-2014	June 2014 Permit Renewal	

BORROW AREA PLAN

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

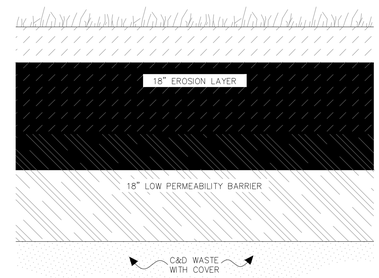
DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1383	
DRAWING: 8	OF: 13

T:\Projects\2013\ENV\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Operations Plan\D1383.dwg, FIGB, 9/3/2014 10:32:55 AM, 1:1

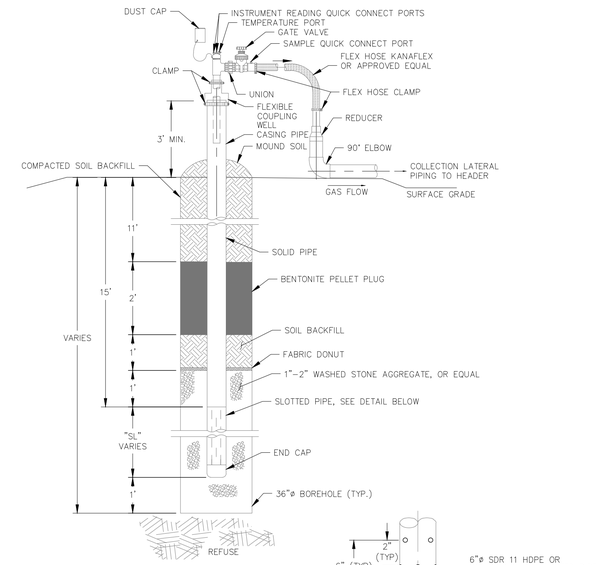


NOTES:
1. WELLHEAD ASSEMBLY SHOWN REPRESENTS 2" LANDTEC ACCU-FLO MODEL AF2V WELLHEAD ASSEMBLY, TEL. 1-800-LANDTEC, FAX 213-895-5866.
2. WELL CENTRALIZERS TO BE INSTALLED AT EVERY 25' OF BORE DEPTH TO KEEP WELL CASING CENTERED IN BORE HOLE.

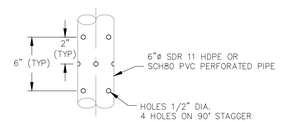
NESTED VERTICAL EXTRACTION WELL DETAIL
NOT TO SCALE



1/9 COVER SYSTEM DETAIL
SCALE: 1"=1'

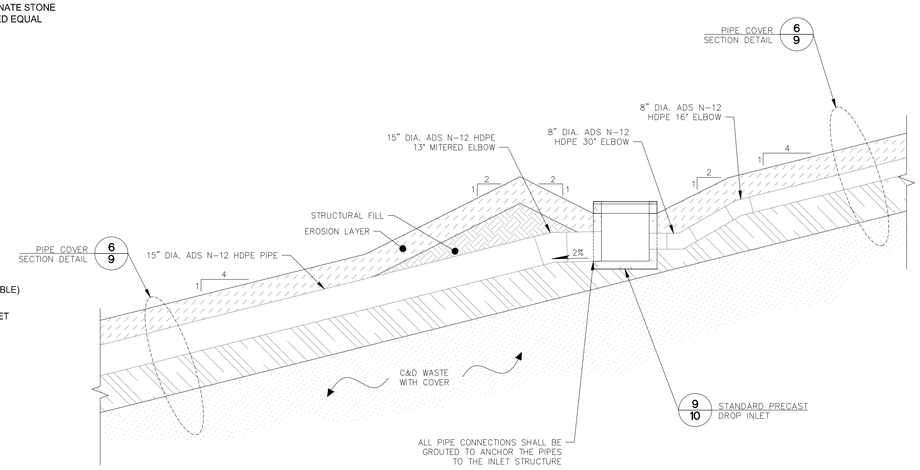


NOTES:
1. WELL TO BE INSTALLED NO DEEPER THAN 10 FEET ABOVE THE LANDFILL BASE
2. SDR 11 HDPE OR SCH80 PVC PIPE MAY BE USED.
3. SLOTTED OR PERFORATED PIPE MAY BE USED.

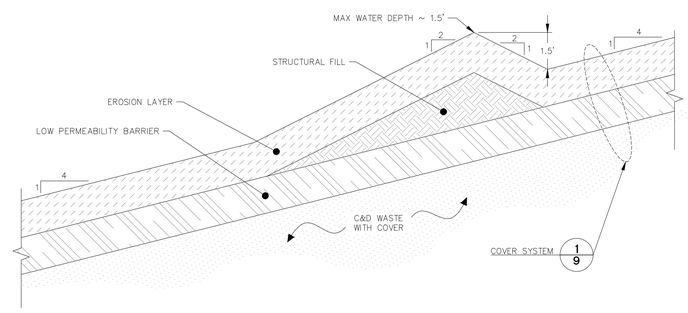


PERFORATED PIPE FOR VERTICAL WELLS DETAIL
NO SCALE

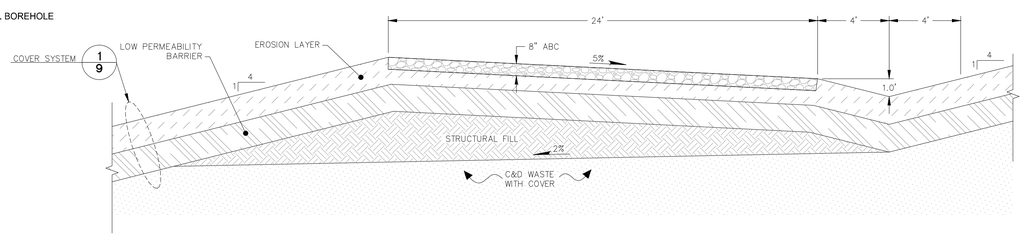
3/9 VERTICAL GAS EXTRACTION WELL DETAIL
SCALE: 1"=2'



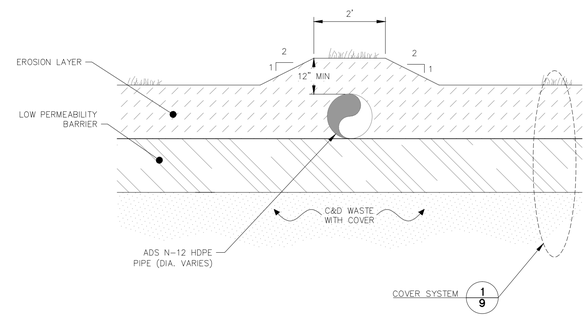
5/9 SLOPE DIVERSION BERM DROP INLET DETAIL
SCALE: 1"=3'



4/9 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



2/9 ACCESS ROAD DETAIL
SCALE: 1"=4'



6/9 PIPE COVER SECTION DETAIL
SCALE: 1"=2'

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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-4-2014	June 2014 Permit Renewal	

FINAL COVER AND GAS WELL DETAILS

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1384	
DRAWING: 9	OF: 13

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CONSTRUCTION SPECIFICATIONS

1. SITE PREPARATIONS: CLEAR, GRUB, AND STRIP TOPSOIL FROM AREAS UNDER THE EMBANKMENT TO REMOVE TREES, VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL. TO FACILITATE SEDIMENT CLEANOUT AND RESTORATION, CLEAR THE POOL AREA OF ALL BRUSH, TREES, AND OTHER OBJECTIONABLE MATERIALS. STOCKPILE ALL TOPSOIL OF SOIL CONTAINING ORGANIC MATTER FOR USE ON THE OUTER SHELL OF THE EMBANKMENT TO FACILITATE VEGETATIVE ESTABLISHMENT. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW THE BASIN AS NEEDED.

2. CUT-OFF TRENCH: EXCAVATE A CUT-OFF TRENCH ALONG THE CENTERLINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 2 FT. DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE RISER CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF EXCAVATION AND COMPACTION EQUIPMENT BUT IN NO CASE LESS THAN 2 FT. MAKE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS ARE THE SAME AS THOSE FOR THE EMBANKMENT. KEEP THE TRENCH DRY DURING BACKFILLING AND COMPACTION OPERATIONS.

3. EMBANKMENT: TAKE FILL MATERIAL FROM THE APPROVED AREAS SHOWN ON THE PLANS. IT SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY VEGETATION, ROCKS, AND OTHER OBJECTIONABLE MATERIAL. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING FILL. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT IT. COMPACTION MAY BE OBTAINED BY ROUTING THE CONSTRUCTION HAULING EQUIPMENT OVER THE FILL SO THAT THE ENTIRE SURFACE OF EACH LAYER IS TRAVERSED BY AT LEAST WHEEL OR TREAD TRACK OF THE HEAVY EQUIPMENT, OR A COMPACTOR MAY BE USED. CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING.

4. CONDUIT SPILLWAYS: SECURELY ATTACH THE RISER TO THE BARREL OR BARREL STUB TO MAKE A WATERTIGHT STRUCTURAL CONNECTION. SECURE ALL CONNECTIONS BETWEEN BARREL SECTIONS BY APPROVED WATERTIGHT ASSEMBLIES. PLACE THE BARREL AND RISER ON A FIRM, SMOOTH FOUNDATION OR IMPERVIOUS SOIL. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE OR ANTI-SEEP COLLARS. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FT. OF HAND-COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. ANCHOR THE RISER IN PLACE BY CONCRETE OR OTHER SATISFACTORY MEANS TO PREVENT FLOTATION. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.

5. EMERGENCY SPILLWAY: INSTALL THE EMERGENCY SPILLWAY IN UNDISTURBED SOIL. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE EMERGENCY SPILLWAY.

6. INLETS: DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY (REFERENCES: RUNOFF CONTROL MEASURES AND OUTLET PROTECTION).

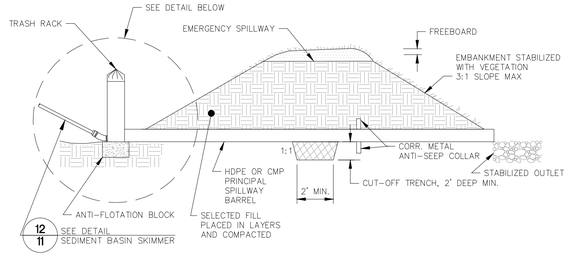
7. EROSION CONTROL: CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION (REFERENCES: SURFACE STABILIZATION).

8. SAFETY: SEDIMENT BASINS MAY ATTRACT CHILDREN AND CAN BE DANGEROUS. AVOID STEEP SIDE SLOPES, AND FENCE AND MARK BASINS WITH WARNING SIGNS IF TRESPASSING IS LIKELY. FOLLOW ALL STATE AND LOCAL REQUIREMENTS.

MAINTENANCE

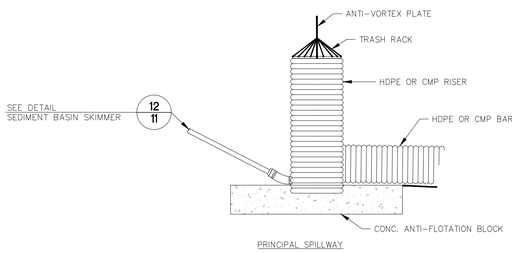
CHECK SEDIMENT BASINS AFTER PERIODS OF SIGNIFICANT RUNOFF. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE DESIGN DEPTH.

CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE RISER AND POOL AREA.

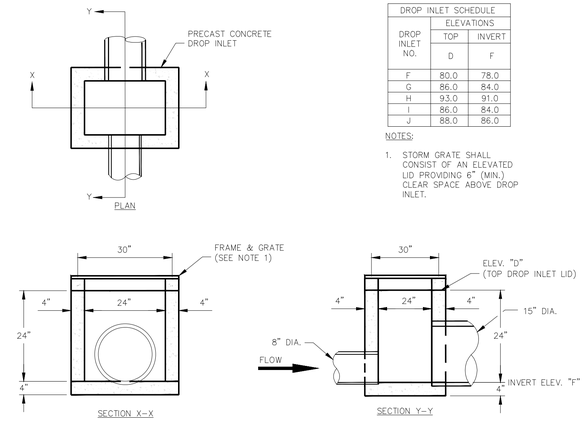


SCHEDULE FOR SEDIMENT BASINS

	SB-1	SB-2	SB-3
SKIMMER ORIFICE (in)	2	3	4
RISER DIAMETER (in)	24	36	54
BARREL DIAMETER (in)	18	24	42
BARREL INVERT @ RISER (ft.)	40	46	48.5
BARREL INVERT @ OUTLET (ft.)	39.5	45.5	48
RISER CREST ELEV. (ft.)	44	49.5	52
TOP OF DAM ELEV. (ft.)	46.0	52	56
EMERGENCY SPILLWAY ELEV. (ft.)	44.7	50.8	53.5
EMERGENCY SPILLWAY WIDTH (ft)	10	12	20
ANTI FLOTATION BLOCK (CONCRETE)	2'x5'x5'	2'x5'x5'	2'x6'x6'
ANTI SEEP COLLAR (CORR. METAL)	6"x6"	6"x6"	6"x6"



7/10 SEDIMENT BASIN DETAIL
SCALE: NTS



DROP INLET NO.	ELEVATIONS TOP D	ELEVATIONS INVERT F
F	80.0	78.0
G	86.0	84.0
H	93.0	91.0
I	86.0	84.0
J	88.0	86.0

NOTES:

1. STORM GRATE SHALL CONSIST OF AN ELEVATED LID PROVIDING 6" (MIN.) CLEAR SPACE ABOVE DROP INLET.

9/10 STANDARD PRECAST DROP INLET DETAIL
NTS

DEFINITION

A STRUCTURE DESIGNED TO CONTROL EROSION AT THE INLET OR OUTLET OF A CHANNEL OR CONDUIT.

PURPOSE

TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISSIPATING THE ENERGY.

CONSTRUCTION SPECIFICATIONS

1. ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING DISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.

2. THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.

3. FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP A MINIMUM OF 1 FT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.

4. RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.

5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.

6. RIPRAP MAY BE FIELD STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.

7. CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFALL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.

8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.

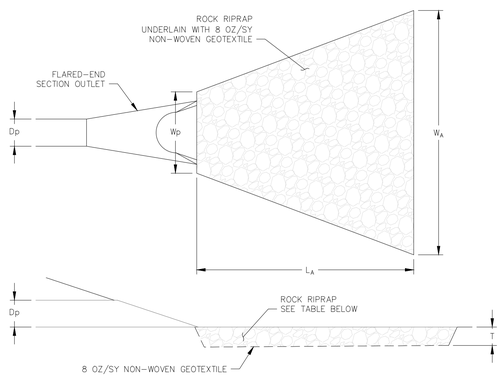
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE

INSPECT RIPRAP OUTLET STRUCTURES AFTER HEAVY RAINS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

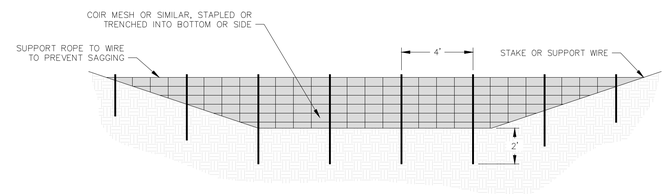
REFERENCE

N.C. EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL, 2006.



SUMMARY OF PROTECTION APRONS								
APRON LABEL	DISCHARGE PIPE LOCATION	Dp (FT)	L_A (FT)	Wp (FT)	W_A (FT)	T (IN)	D_{50} (IN)	$D_{MAX.}$ (IN)
SSB-1	OUTLET FROM SKIMMER SED BASIN	0.25	6	3.00	9.00	9.00	4.00	6.00
SSB-2	OUTLET FROM SKIMMER SED BASIN	0.33	6	3.00	9.00	9.00	4.00	6.00
SSB-3	OUTLET FROM SKIMMER SED BASIN	0.25	6	3.00	9.00	9.00	4.00	6.00

8/10 RIPRAP ENERGY DISSIPATOR DETAIL
SCALE: NTS



MAINTENANCE:

INSPECT BAFFLES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

BE SURE TO MAINTAIN ACCESS TO THE BAFFLES. SHOULD THE FABRIC OF A BAFFLE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

REMOVE SEDIMENT DEPOSITS WHEN IT REACHES HALF FULL TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE BAFFLES. TAKE CARE TO AVOID DAMAGING THE BAFFLES DURING CLEANOUT. SEDIMENT DEPTH SHOULD NEVER EXCEED HALF THE DESIGNED STORAGE DEPTH.

AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED, REMOVE ALL BAFFLE MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, BRING THE AREA TO GRADE, AND STABILIZE IT.

CONSTRUCTION SPECIFICATION:

1. GRADE THE BASIN SO THAT THE BOTTOM IS LEVEL FRONT TO BACK AND SIDE TO SIDE.

2. INSTALL POSTS OR SAW HORSES ACROSS THE WIDTH OF THE SEDIMENT TRAP (PRACTICE 6.62, SEDIMENT FENCE).

3. STEEL POSTS SHOULD BE DRIVEN TO A DEPTH OF 24 INCHES, SPACED A MAXIMUM OF 4 FEET APART, AND INSTALLED UP THE SIDES OF THE BASIN AS WELL. THE TOP OF THE FABRIC SHOULD BE 6 INCHES HIGHER THAN THE INVERT OF THE SPILLWAY. TOPS OF BAFFLES SHOULD BE 2 INCHES LOWER THAN THE TOP OF THE BERMS.

4. INSTALL AT LEAST THREE ROWS OF BAFFLES BETWEEN THE INLET AND OUTLET DISCHARGE POINT. BASINS LESS THAN 20 FEET IN LENGTH MAY USE 2 BAFFLES.

5. WHEN USING POSTS, ADD A SUPPORT WIRE OR ROPE ACROSS THE TOP OF THE MEASURE TO PREVENT SAGGING.

6. WRAP POROUS MATERIAL, LIKE JUTE BACKED BY COIR MATERIAL, OVER A SAWHORSE OR THE TOP WIRE. HAMMER REBAR INTO THE SAWHORSE LEGS FOR ANCHORING. THE FABRIC SHOULD HAVE FIVE TO TEN PERCENT OPENINGS IN THE WEAVE. ATTACH FABRIC TO A ROPE AND A SUPPORT STRUCTURE WITH ZIP TIES, WIRE, OR STAPLES.

7. THE BOTTOM AND SIDES OF THE FABRIC SHOULD BE ANCHORED IN A TRENCH OR PINNED WITH 8-INCH EROSION CONTROL MATTING STAPLES.

8. DO NOT SPLICE THE FABRIC, BUT USE A CONTINUOUS PIECE ACROSS THE BASIN.

10/10 POROUS BAFFLE DETAIL
NTS

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NO.	DATE	DESCRIPTION	BY
1	6-6-2014	June 2014 Permit Renewal	

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS I

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1385-01	
DRAWING: 10	OF: 13

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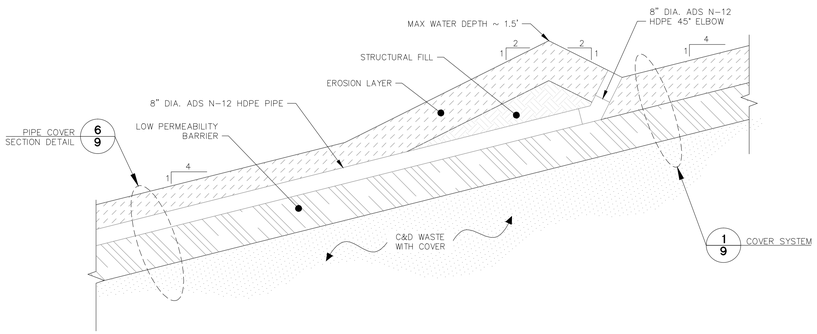
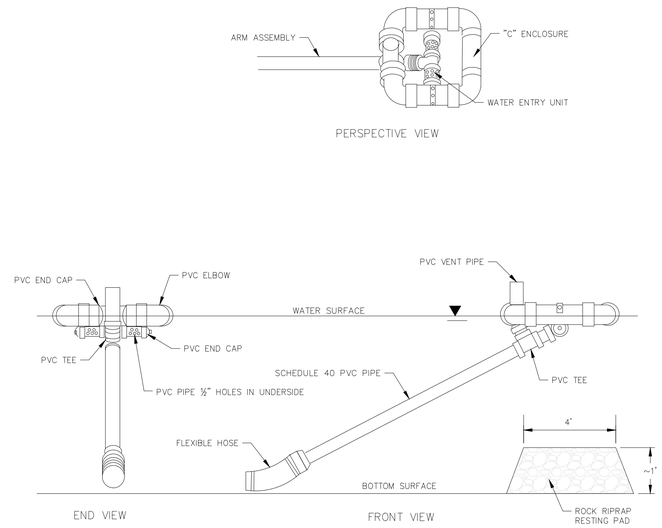


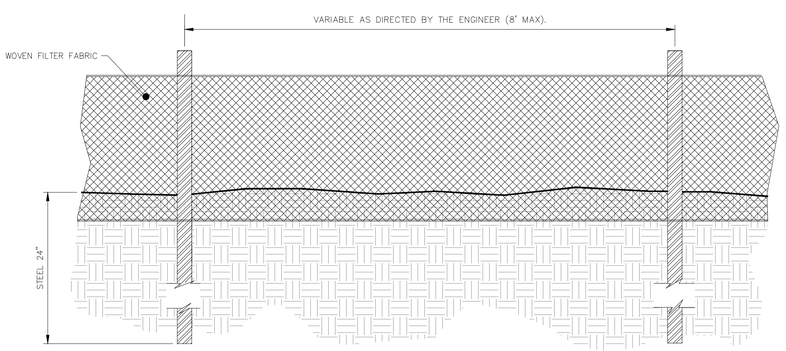
11/11 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'

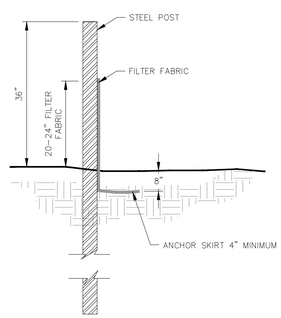


Faircloth Skimmer		
Skimmer	Size	Orifice Size
SB-1	3"	2.5"
SB-2	4"	3.9"
SB-3	8"	6.2"

Borrow Area		
Skimmer	Size	Orifice Size
SSB-1	3"	2.4"
SSB-2	4"	2.8"
SSB-3	3"	3.0"

12/11 SEDIMENT BASIN SKIMMER DETAIL
N.T.S.





GENERAL NOTES:

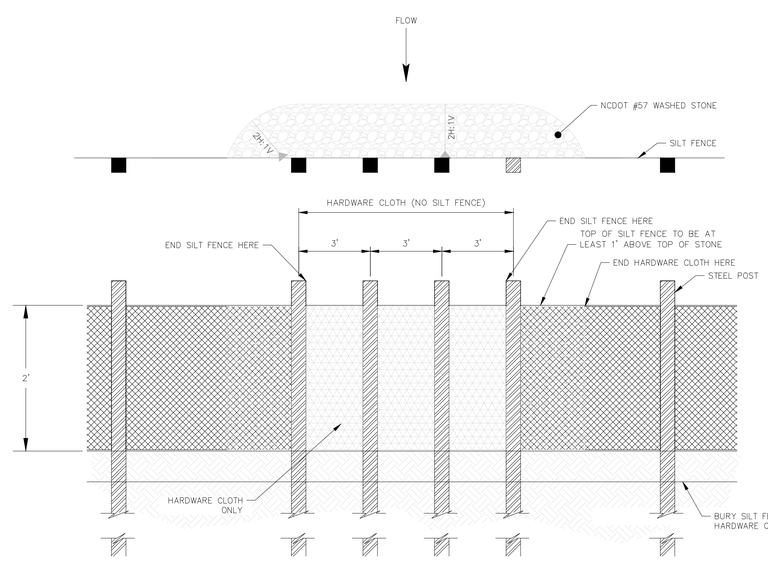
1. PREFABRICATED SILT FENCE IS NOT ACCEPTABLE ON THIS PROJECT.
2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS.
3. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
4. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS.
5. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
6. TURN SILT FENCE UP SLOPE AT ENDS.
7. SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC.
8. WHEN FABRIC IS USED WITH WIRE MESH, 8' CENTERED POSTS MAY BE USED.
9. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE

MAINTENANCE NOTES:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006

13/11 SILT FENCE DETAIL
NTS



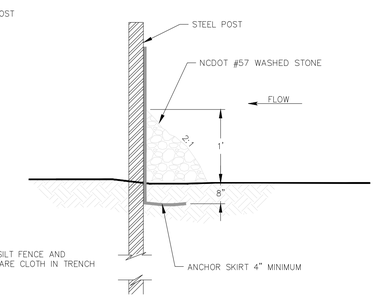
GENERAL NOTES:

1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL
2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼" MESH OPENINGS.
3. INSTALL 5' SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
4. SPACE POST A MAXIMUM OF 3'.

MAINTENANCE NOTES:

1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE OUTLET AS NEEDED TO PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: NC DOT Roadway Standard Detail 1606.01 – Special Sediment Control Fence, 2006



14/11 SILT FENCE OUTLET DETAIL
NTS

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-6-2014	June 2014 Permit Renewal	

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS II

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1385-02	
DRAWING: 11	OF: 13

T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Operations Plan\D1385.dwg, FIG11, 8/2/2014 10:30:31 AM, 1:1

DEFINITION
Controlling runoff and erosion on disturbed areas by establishing perennial vegetative : cover with seed.

PURPOSE
To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

SPECIFICATIONS

SEEDBED REQUIREMENTS
Establishment of vegetation should not be attempted on sites that are unsuitable due to excessive soil compaction, inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine–grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0 – 6.5.
- Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met – i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation – special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoil may be applied.

SEEDBED PREPARATION
Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

- Ground agricultural limestone:
  Light–textured, sandy soils: 1 to 1–1/2 tons/acre
  Heavy–textured, clayey soils: 2–3 tons/acre
- Fertilizer:
  Grasses: 800–1200 lb/acre of 10–10–10 (or the equivalent)
  Grass–legume mixtures: 800–1200 lb/acre of 5–10–10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4–6 inches of soil by disking or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding.

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

SEEDING
Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30–50%. Always take this into account in scheduling land–disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non–certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious weed seed.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume.
Apply seed uniformly with a cyclone seeder, drop–type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast–seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one–half the seed while moving back and forth across the area, making a uniform pattern; then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

HYDRO SEEDING
Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

MAINTENANCE
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding––If a stand has inadequate cover, re–evaluate choice of plant materials and quantities of lime and fertilizer. Re–establish the stand after seedbed preparation or over– seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization––On the typical disturbed site, full establishment usually requires re–fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

TEMPORARY SEEDING SPECIFICATIONS:

Seeding mixture (fall)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120

Seeding Mixture (late winter early spring)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120
Annual (Korean) Lespedeza (*Kummerowia stipulacea*)	50

Seeding mixture (summer)

Species*	Rate (lb/acre)
German Millet (*Setaria italica*)	40

Seeding dates (Piedmont)

Fall:	Aug. 15 – Dec. 30
Late winter (early spring):	Jan. 1 – May 1 Late
Summer:	May 1 – Aug. 15

Soil amendments
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10–10–10 fertilizer.

Mulch
Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring. tool.

Maintenance
Re–fertilize if growth is not fully adequate. Reseed, re–fertilize and mulch immediately following erosion or other damage.

Pursuant to G.S. 113A–57(2), the angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion–control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.
Pursuant to G.S. 113A–57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.
*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

PERMANENT SEEDING SPECIFICATIONS

Seeding mixture

Species*	Rate (lb/acre)
Centipede Grass (*Eremochloa ophiuroides*) (Grass lined Channels)	200
Centipede Grass (*Eremochloa ophiuroides*) (Other Areas)	100

Nurse plants
Between May 1 and Aug. 15, add 10 lb/acre German millet (*Setaria italica*) or 15 lb/acre Sudan grass.
Prior to May 1 or after Aug. 15, add 40 lb/acre Rye Grain (*Festuca arundinacea*).

Seeding dates

	Best	Possible
Fall:	Aug. 25 – Sept. 15	Aug. 20 – Oct. 25
Late winter:	Feb. 15 – Mar. 21	Feb. 1 –Apr. 15

Soil amendments
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10–10–10 fertilizer.

Mulch
Apply 4,000–5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

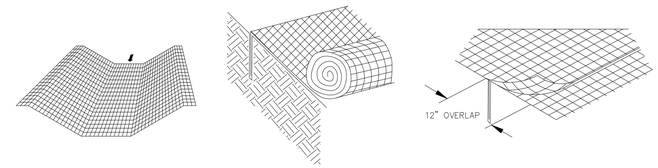
Maintenance
Re–fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

Pursuant to G.S. 113A–57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.11L NC Erosion and Sediment Control Planning and Design Manual, 2006

Contact Person Responsible for Maintenance
Mr. Danny Bagley
Telephone: (252) 827–4253
Cell: (252) 813–3947
Fax: (252) 827–6618

GENERAL SEEDING SPECIFICATIONS



IN CHANNELS, ROLL OUT STRIPS OF MATTING PARALLEL TO THE DIRECTION OF FLOW.

ANCHOR MATTING IN A 12" TRENCH

JOIN STRIPS BY ANCHORING AND OVERLAPPING

GENERAL NOTES:

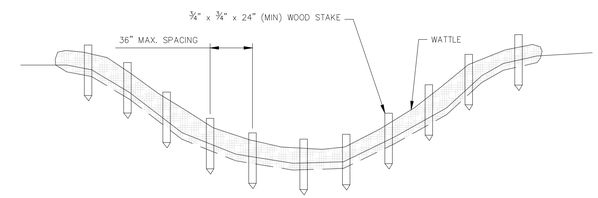
1. DITCH LINES OVER 3 PERCENT MUST BE MATTED WITH NORTH AMERICAN GREEN DS–75 MATTING OR EQUIVALENT.
2. APPLY SEED BEFORE LAYING THE NET OR MAT. IF OPEN–WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPRAYED ON AFTERWARD.
3. START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES–DO NOT STRETCH.
4. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET.

MAINTENANCE NOTES:

1. INSPECT ROLLED EROSION CONTROL PRODUCTS (RECP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAIN FALL EVENT.
2. GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE RECP.
3. ANY AREAS OF THE RECP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
4. IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.
5. MONITOR AND REPAIR THE RECP AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED.

*REF: 6.17.12 NC Erosion and Sediment Control Planning and Design Manual, 2006

15/12 TYPICAL TEMPORARY MATTING DETAIL
NTS



GENERAL NOTES:

1. SPACE WATTLES ACCORDING TO TABLE 1 ALONG ANY PORTION OF DITCHLINE WITH A SLOPE OF 5 PERCENT OR GREATER AND A SLOPE LENGTH OF 50 FEET OR GREATER.

TABLE 1: WATTLE SPACING

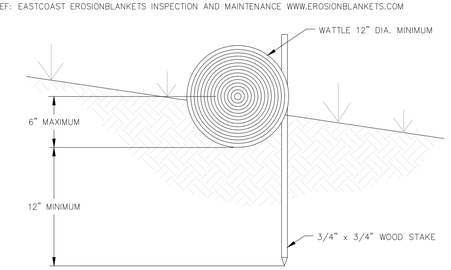
SLOPE (%)	SPACING DISTANCE (FT. O.C.) 12" DIA.	18" DIA.
5	20	30
6	17	25
7	14	21
8	13	19
9	11	17
10	10	15

2. PLACE FIRST WATTLE 1/2 SPACING DISTANCE FROM CREST OF QUALIFYING SLOPE.
3. SPACE WOODEN STAKES 3 FEET O.C. ON DOWNSTREAM SIDE THROUGH A MINIMUM OF 2 APERTURES.
4. PLACE CHECK DAMS OR WATTLES AT THE LOWER LIMITS OF EACH DAYS WORK.

MAINTENANCE NOTES:

1. IT IS IMPERATIVE THAT WATTLES BE INSPECTED AFTER INSTALLATION AND SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENTS.
2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE HEIGHT.
6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR REPLACEMENT.

*REF: EASTCOAST EROSIONBLANKETS INSPECTION AND MAINTENANCE WWW.EROSIONBLANKETS.COM



17/12 TYPICAL WATTLE DETAIL
NTS

DEFINITION

A CHANNEL WITH VEGETATIVE LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

PURPOSE

TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION, DEPOSITION, OR FLOODING.

CONSTRUCTION SPECIFICATIONS

1. REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.
2. PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE PLANS PLUS A 0.2–FT OVERCUT AROUND THE CHANNEL PERIMETER TO ALLOW FOR BULKING DURING SEEDBED PREPARATIONS AND SOD BUILDUP.
3. REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE CHANNEL FREELY.
4. THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF SPECIES. PROTECT THE CHANNEL WITH MULCH OR A TEMPORARY LINER SUFFICIENT TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE SEEDING SPECIFICATIONS).
5. APPLY LIME, FERTILIZER AND SEED BEFORE LAYING THE NET (WITHOUT MULCH) OR MAT (WITH MULCH OR SYNTHETIC). IF OPEN–WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND THE FERTILIZER AND SEED CAN BE SPRAYED ON AFTERWARD, OTHERWISE APPLY SEED AND FERTILIZER BEFORE INSTALLATION.
6. START LAYING THE NET OR MAT, AS REQUIRED, FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES – DO NOT STRETCH.
7. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 6 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END AND EVERY 3 FT AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF NETTING OR MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER OR EVERY 3 FT IF THE STRIP IS NOT WIDER THAN 8 FEET. DO NOT STRETCH THE NET/MAT WHEN APPLYING STAPLES.
8. STAPLES SHOULD BE THE "U"–SHAPED TYPE AND 4" TO 6" LONG (DEPENDING ON SOIL CONDITIONS).
9. TO JOIN ENDS OF TWO STRIPS OF NETTING, CUT A TRENCH TO ANCHOR THE END OF THE DOWN GRADIENT NET. OVERLAP THE END OF THE PREVIOUS ROLL 18 INCHES AND STAPLE EVERY 12 INCHES JUST BELOW THE ANCHOR SLOT.
10. TO JOIN ENDS OF TWO STRIPS OF MATTING, OVERLAP THE UPGRADIENT STRIP OVER THE DOWNGRADIENT ONE AT LEAST 4 INCHES. STAPLE THE OVERLAP AT THE ENDS AND EVERY 12 INCHES ALONG THE CENTER OF THE OVERLAP.

MAINTENANCE

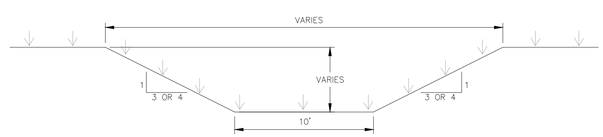
DURING THE ESTABLISHMENT PERIOD, CHECK GRASS–LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT. IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL (SEE SEEDING SPECIFICATIONS).

INSPECT ALL MULCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED, AND REINSTALL MULCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FIRMLY ESTABLISHED.

GENERAL NOTES

1. CHANNELS ARE TO BE LINED WITH NORTH AMERICAN GREEN MATTING OR APPROVED EQUIVALENT, AS REQUIRED.
2. NETTING AND MATTING PRODUCTS SHOULD BE INSTALLED ACCORDING TO MANUFACTURER'S GUIDELINES. IF THE MANUFACTURER DOES NOT PROVIDE GUIDELINES, THE ABOVE GUIDELINES FOR NETTING AND MATTING MAY BE USED.



CHANNELS ARE TO BE LINED WITH DS75.
CHANNEL SOUTH AND WEST OF LANDFILL TO BE CONSTRUCTED AT A 0.65% SLOPE.

16/12 GRASS LINED DITCH DETAIL
NTS

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-6-2014	June 2014 Permit Renewal	

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS III

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1385-03	
DRAWING: 12	OF: 13

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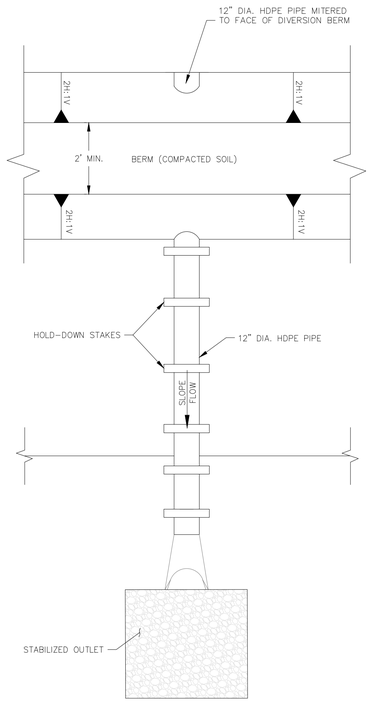
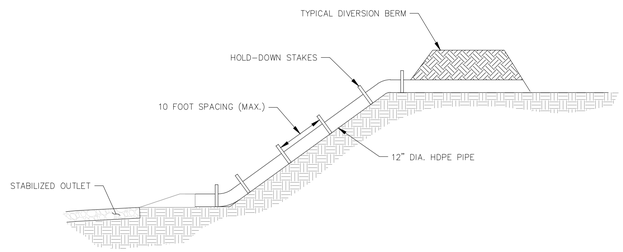




CONSTRUCTION SPECIFICATION:

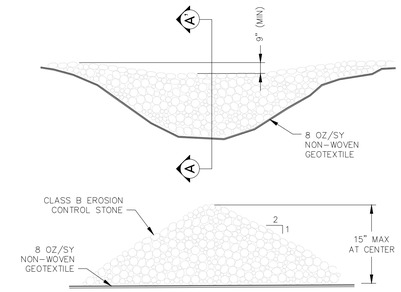
1. PLACE SLOPE DRAINS ON UNDISTURBED SOIL OR WELL COMPACTED FILL AT LOCATIONS AND ELEVATIONS SHOWN ON THE PLAN.
2. SLIGHTLY SLOPE THE SECTION OF PIPE UNDER THE DIKE TOWARD ITS OUTLET.
3. HAND TAMP THE SOIL UNDER AND AROUND THE ENTRANCE SECTION IN LIFTS NOT TO EXCEED 6 INCHES.
4. ENSURE THAT FILL OVER THE DRAIN AT THE TOP OF THE SLOPE HAS MINIMUM DEPTH OF 1.5 FEET.
5. ENSURE THAT ALL SLOPE DRAIN CONNECTIONS ARE WATERTIGHT.
6. ENSURE THAT ALL FILL MATERIAL IS WELL-COMPACTED. SECURELY FASTEN THE EXPOSED SECTION OF THE DRAIN WITH GROMMETS OR STAKES SPACED NO MORE THAN 10 FEET APART.
7. EXTEND THE DRAIN BEYOND THE TOE OF THE SLOPE, AND ADEQUATELY PROTECT THE OUTLET FROM EROSION.
8. MAKE THE SETTLED, COMPACTED DIKE RIDGE NO LESS THAN 1 FEET ABOVE THE TOP OF THE PIPE AT EVERY POINT.
9. IMMEDIATELY STABILIZE ALL DISTURBED AREAS FOLLOWING CONSTRUCTION.

MAINTENANCE NOTES:

INSPECT THE SLOPE DRAIN AND SUPPORTING DIVERSION AFTER EVERY RAINFALL, AND PROMPTLY MAKE NECESSARY REPAIRS. WHEN THE PROTECTED AREA HAS BEEN PERMANENTLY STABILIZED, TEMPORARY MEASURES MAY BE REMOVED, MATERIALS DISPOSED OF PROPERLY, AND ALL DISTURBED AREAS STABILIZED APPROPRIATELY.

*REF: 6.32.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

18/13 SLOPE DRAIN DETAIL
NTS



MAINTENANCE NOTES:

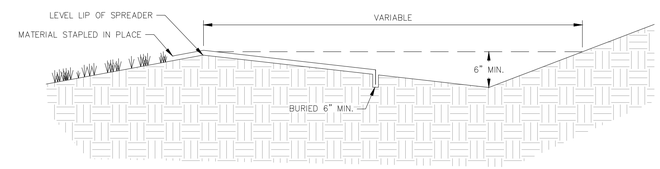
1. INSPECT CHECK DAMS AND CHANNELS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE CHANNEL WHEN NEEDED.
2. ANTICIPATE SUBMERGENCE AND DEPOSITION ABOVE THE CHECK DAM AND EROSION FROM HIGH FLOWS AROUND THE EDGES OF THE DAM. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN DAMS, ADDITIONAL MEASURES CAN BE TAKEN SUCH AS, INSTALLING A PROTECTIVE RIPRAP LINER IN THAT PORTION OF THE CHANNEL (PRACTICE 6.31, RIPRAP-LINE AND PAVED CHANNELS).
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE DAMS AS NEEDED TO PREVENT DAMAGE TO CHANNEL VEGETATION, ALLOW THE CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM, AND PREVENT LARGE FLOWS FROM CARRYING SEDIMENT OVER THE DAM. ADD STONES TO DAMS AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.

*REF: 6.83.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

GENERAL NOTES:

1. SPACE CHECK DAM IN A CHANNEL SO THAT THE CREST OF DOWNSTREAM DAM IS AT ELEVATION OF THE TOE OF UPSTREAM CHECK DAM.
2. STONE SHOULD BE PLACED OVER THE CHANNEL BANKS TO KEEP WATER FROM CUTTING AROUND THE DAM.

19/13 CHECK DAM DETAIL
NTS



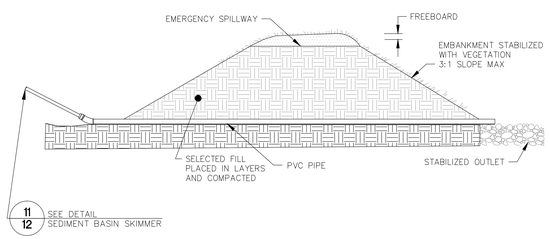
BASIN	DESIGN FLOW cfs	ENTRANCE WIDTH	DEPTH	END WIDTH	LENGTH
SSB-1	5.44	10	0.5	3	10
SSB-2	8.54	10	0.5	3	10
SSB-3	6.65	10	0.5	3	10

21/13 LEVEL SPREADER CROSS SECTION
NTS

CONSTRUCTION SPECIFICATIONS

1. CLEAR, GRUB, AND STRIP THE AREA UNDER THE EMBANKMENT OF ALL VEGETATION AND ROOT MAT. REMOVE ALL SURFACE SOIL CONTAINING HIGH AMOUNTS OF ORGANIC MATTER AND STOCKPILE OR DISPOSE OF IT PROPERLY. HAUL ALL OBJECTIONABLE MATERIAL TO THE DESIGNATED DISPOSAL AREA. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW BASIN AS NEEDED
2. ENSURE THAT FILL MATERIAL FOR THE EMBANKMENT IS FREE OF ROOTS, WOODY VEGETATION, ORGANIC MATTER, AND OTHER OBJECTIONABLE MATERIAL. PLACE THE FILL IN LIFTS NOT TO EXCEED 9 INCHES, AND MACHINE COMPACT IT. OVER FILL THE EMBANKMENT 6 INCHES TO ALLOW FOR SETTLEMENT.
3. SHAPE THE BASIN TO THE SPECIFIED DIMENSIONS. PREVENT THE SKIMMING DEVICE FROM SETTLING INTO THE MUD BY EXCAVATING A SHALLOW PIT UNDER THE SKIMMER OR PROVIDING A LOW SUPPORT UNDER THE SKIMMER OF STONE OR TIMBER.
4. PLACE THE BARREL (TYPICALLY SCHEDULE 40 PVC PIPE) ON A FIRM, SMOOTH FOUNDATION OF IMPERVIOUS SOIL OVERLAIN BY FILTER FABRIC. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM THE FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FEET OF COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.
5. ASSEMBLE THE SKIMMER FOLLOWING THE MANUFACTURER'S INSTRUCTIONS, OR AS DESIGNED.
6. LAY THE ASSEMBLED SKIMMER ON THE BOTTOM OF THE BASIN WITH THE FLEXIBLE JOINT AT THE INLET OF THE BARREL PIPE. ATTACH THE FLEXIBLE JOINT TO THE BARREL PIPE AND POSITION THE SKIMMER OVER THE EXCAVATED PIT OR SUPPORT. BE SURE TO ATTACH A ROPE TO THE SKIMMER AND ANCHOR IT TO THE SIDE OF THE BASIN. THIS WILL BE USED TO PULL THE SKIMMER TO THE SIDE FOR MAINTENANCE.
7. EARTHEN SPILLWAYS-INSTALL THE SPILLWAY IN UNDISTURBED SOIL TO THE GREATEST EXTENT POSSIBLE. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE SPILLWAY. THE SPILLWAY SHOULD BE LINED WITH LAMINATED PLASTIC OR IMPERMEABLE GEOTEXTILE FABRIC. THE FABRIC MUST BE WIDE AND LONG ENOUGH TO COVER THE BOTTOM AND SIDES AND EXTEND ONTO THE TOP OF THE DAM FOR ANCHORING IN A TRENCH. THE EDGES MAY BE SECURED WITH 8-INCH STAPLES OR PINS. THE FABRIC MUST BE LONG ENOUGH TO EXTEND DOWN THE SLOPE AND EXIT ONTO STABLE GROUND. THE WIDTH OF THE FABRIC MUST BE ONE PIECE, NOT JOINED OR SPLICED; OTHERWISE WATER CAN GET UNDER THE FABRIC. IF THE LENGTH OF THE FABRIC IS INSUFFICIENT FOR THE ENTIRE LENGTH OF THE SPILLWAY, MULTIPLE SECTIONS, SPANNING THE COMPLETE WIDTH, MAY BE USED. THE UPPER SECTION(S) SHOULD OVERLAP THE LOWER SECTION(S) SO THAT WATER CANNOT FLOW UNDER THE FABRIC. SECURE THE UPPER EDGE AND SIDES OF THE FABRIC IN A TRENCH WITH STAPLES OR PINS. (ADAPTED FROM "A MANUAL FOR DESIGNING, INSTALLING AND MAINTAINING SKIMMER SEDIMENT BASINS". FEBRUARY, 1999. J. W. FAIRCLOTH & SON.).
8. INLETS-DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE TEMPORARY SLOPE DRAINS OR DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY (REFERENCES: RUNOFF CONTROL MEASURES AND OUTLET PROTECTION).
9. EROSION CONTROL-CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION (REFERENCES: SURFACE STABILIZATION).
10. AFTER ALL THE SEDIMENT-PRODUCING AREAS HAVE BEEN PERMANENTLY STABILIZED, REMOVE THE STRUCTURE AND ALL THE UNSTABLE SEDIMENT. SMOOTH THE AREA TO BLEND WITH THE ADJOINING AREAS AND STABILIZE PROPERLY (REFERENCES: SURFACE STABILIZATION).



11/12 SEE DETAIL SEDIMENT BASIN SKIMMER

MAINTENANCE

INSPECT SKIMMER SEDIMENT BASINS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (ONE-HALF INCH OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE HEIGHT OF THE FIRST BAFFLE. PULL THE SKIMMER TO ONE SIDE SO THAT THE SEDIMENT UNDERNEATH IT CAN BE EXCAVATED. EXCAVATE THE SEDIMENT FROM THE ENTIRE BASIN, NOT JUST AROUND THE SKIMMER OR THE FIRST CELL. MAKE SURE VEGETATION GROWING IN THE BOTTOM OF THE BASIN DOES NOT HOLD DOWN THE SKIMMER.

REPAIR THE BAFFLES IF THEY ARE DAMAGED. RE-ANCHOR THE BAFFLES IF WATER IS FLOWING UNDERNEATH OR AROUND THEM.

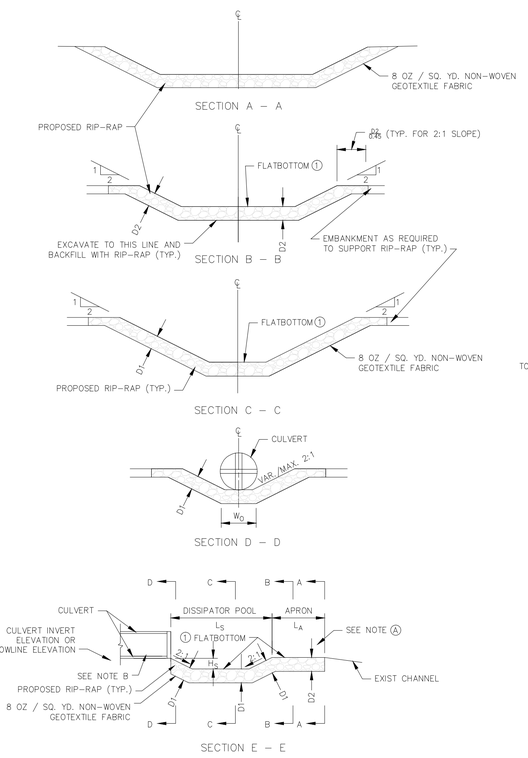
IF THE SKIMMER IS CLOGGED WITH TRASH AND THERE IS WATER IN THE BASIN, USUALLY JERKING ON THE ROPE WILL MAKE THE SKIMMER BOB UP AND DOWN AND DISLODGE THE DEBRIS AND RESTORE FLOW. IF THIS DOES NOT WORK, PULL THE SKIMMER OVER TO THE SIDE OF THE BASIN AND REMOVE THE DEBRIS. ALSO CHECK THE ORIFICE INSIDE THE SKIMMER TO SEE IF IT IS CLOGGED; IF SO REMOVE THE DEBRIS.

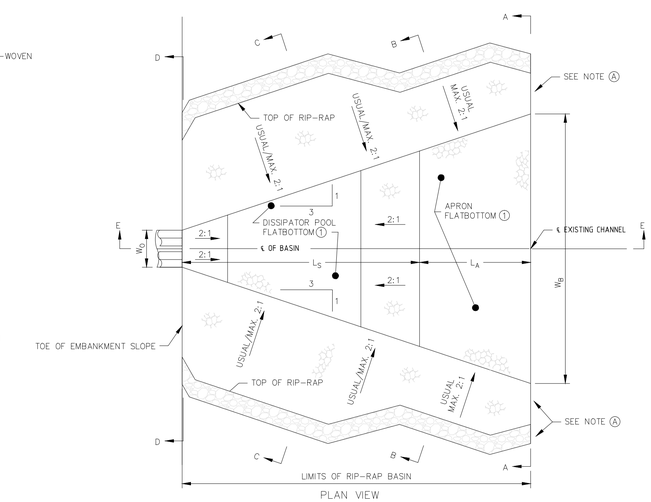
IF THE SKIMMER ARM OR BARREL PIPE IS CLOGGED, THE ORIFICE CAN BE REMOVED AND THE OBSTRUCTION CLEARED WITH A PLUMBER'S SNAKE OR BY FLUSHING WITH WATER. BE SURE AND REPLACE THE ORIFICE BEFORE REPOSITIONING THE SKIMMER.

CHECK THE FABRIC LINED SPILLWAY FOR DAMAGE AND MAKE ANY REQUIRED REPAIRS WITH FABRIC THAT SPANS THE FULL WIDTH OF THE SPILLWAY. CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE SKIMMER AND POOL AREAS.

FREEZING WEATHER CAN RESULT IN ICE FORMING IN THE BASIN. SOME SPECIAL PRECAUTIONS SHOULD BE TAKEN IN THE WINTER TO PREVENT THE SKIMMER FROM PLUGGING WITH ICE.

20/13 SKIMMER SEDIMENT BASIN DETAIL
NTS





RIP-RAP BASIN AND DIMENSIONS									
	BASIN DIMENSIONS (FT.)					RIP-RAP DEPTHS (FT.)		GEOTEXTILE FABRIC (S.V.)	RIP-RAP CLASS
	W_B	W_O	H_S	L_S	L_A	D1	D2		
SB-1	5.5	1.5	0	4.5	1.5	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B
SB-2	13.6	2.0	1.2	11.6	5.6	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B
SB-3	16.0	3.5	1.25	12.5	6.25	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B

GENERAL NOTE
Ⓐ WARP BASIN TO CONFORM TO THE NATURAL STREAM CHANNEL. TOP OF RIP-RAP IN FLOOR OF BASIN DISSIPATOR POOL OR APRON SHALL BE AT THE SAME OR LOWER ELEVATION THAN THE NATURAL CHANNEL BOTTOM SECTION A-A. MODIFY FLATBOTTOM WIDTH IF THE OPTIONAL EXTENDED TRANSITION IS REQUIRED.

SPECIAL NOTE
① DESIRABLE SLOPE IS 0.0% IN DISSIPATOR POOL FLATBOTTOM AND IN APRON FLATBOTTOM.

22/13 PLUNGE POOL DETAIL
NTS

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS IV

OPERATION PLAN
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY:
DESIGNED BY: JMB	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1385-04	
DRAWING: 13	OF: 13

T:\Projects\2013\EN\013-277A Edgecombe Permit Applications\CAD\Drawings from KSO\Operations Plan\D1385.dwg, FIG13, 9/3/2014 10:30:42 AM, 1:1

APPENDIX I-C

Waste Screening and Acceptance Program Sample Forms

EDGECOMBE COUNTY SOLID WASTE FACILITY
TARBORO, NORTH CAROLINA

PRE-ACCEPTANCE AGREEMENT

DATE _____ TIME _____ WEIGH BILL _____

CLERK OR RECEIVING AGENT _____

CUSTOMER NAME/NUMBER OR IDENTIFICATION _____

VEHICLE LICENSE _____ STATE _____

WASTE DESCRIPTION (check ALL that apply)

RESIDENTIAL _____ COMMERCIAL _____ INDUSTRIAL _____

INSTITUTIONAL _____ YARD TRIMMINGS _____ SPECIAL _____

SPECIAL DESCRIPTION _____

TOTAL WEIGHT _____

WEIGHT OF VEHICLE (TARE WEIGHT) _____

WEIGHT OF WASTE DELIVERED _____

HAULER AGREES AND WARRANTS THAT HE/SHE IS DELIVERING SOLID WASTE ONLY FOR THIS LOAD AND ANY SUBSEQUENT LOADS TO THIS FACILITY. HAULER DOES HEREBY INDEMNIFY THE FACILITY OPERATOR FOR DAMAGES CAUSED BY THE DELIVERY OF ANY HAZARDOUS/TOXIC OR OTHERWISE UNACCEPTABLE MATERIAL.

_____

DRIVERS SIGNATURE

(SOURCE: SWANA)

EDGECOMBE COUNTY SOLID WASTE FACILITY
TARBORO, NORTH CAROLINA

DETAILED SCREENING REPORT

WASTE SOURCE _____
ADDRESS _____
_____
_____
_____

PROBABLE [ ] SUSPECTED [ ] CONFIRMED [ ]

WASTE HAULER _____
ADDRESS _____
_____
_____
_____

DRIVER'S NAME _____
DETAIL _____
_____
_____

NOTIFIED:

WASTE SOURCE [ ] HAULING MANAGEMENT [ ] SITE MANAGEMENT [ ]

STATE [ ] FEDERAL [ ]

NAME _____

WITNESS (IF ANY) _____

DATE _____ TIME _____ AM PM

ACTION REQUIRED:

SOURCE: SWANA

EDGECOMBE COUNTY SOLID WASTE FACILITY TARBORO, NORTH CAROLINA WASTE SCREENING CHECK LIST	YES	NO
CONTAINERS		
FULL	____	____
PARTIALLY FULL	____	____
EMPTY	____	____
CRUSHED	____	____
PUNCTURED	____	____
POWDERS/DUSTS		
IDENTIFIED	____	____
UNKNOWN	____	____
MATERIAL SATURATED	____	____
LABEL FOR HAZARDOUS MATERIAL	____	____
ODOR/FUMES		
STRONG	____	____
FAINT	____	____
SUBSTANTIAL HEAT COMING FROM ANY MATERIAL	____	____
ITEMS FOUND		
BATTERIES	____	____
OIL	____	____
BIOMEDICAL	____	____
RADIOACTIVE	____	____
ASHES/RESIDUE	____	____
SOD/SOIL	____	____
OTHER	____	____
(CHECK ALL THAT APPLY)		

SOURCE: SWANA

NC DEPARTMENT OF HEALTH AND HUMAN SERVICES
DIVISION OF PUBLIC HEALTH
HEALTH HAZARDS CONTROL UNIT

TYPE OR USE BALLPOINT PEN
PRESS FIRMLY - ALL COPIES
MUST BE LEGIBLE

NORTH CAROLINA ASBESTOS WASTE SHIPMENT RECORD

1. Waste Generator/Owner Name and Address:	Work Site Name and Physical Address:	Waste Generator/Owner Phone Number: ( )
2. Contractor Name and Address:		Contractor Phone Number: ( )
3. Waste Disposal Site (WDS) Name, Mailing Address:	WDS Physical Site Location: NC Landfill Permit #:	WDS Phone Number: ( )

4. Name of Responsible Agency:

[ ] Forsyth Co. Environmental Affairs Dept.
[ ] Mecklenburg Co. Dept. of Environmental Protection
[ ] NC DHHS - Health Hazards Control Unit
[ ] WNC Regional Air Pollution Control Agency

Permit #:_____ NESHAP (ACTS) ID #:_____
Start Date:_____ Complete Date:_____

5. Description of materials:

6. Containers Number:_____ Vehicle: _____
Type:_____ _____

RQ, ASBESTOS, CLASS 9
NA 2212, III

7. Total Quantity (yd^3)m^3:

8. Special Handling Instructions and Additional Information:

EMERGENCY CONTACT: DIVISION OF EMERGENCY MANAGEMENT AT 1-800-858-0368

9. CONTRACTOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and government regulations.

Printed/Typed Name & Title:_____

Signature:_____ Date (MM/DD/YY):_____

10. Transporter 1 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:_____

Address:_____ Phone Number:_____

Signature:_____ Date (MM/DD/YY):_____

11. Transporter 2 (Acknowledgment of Receipt of Materials):

Printed/Typed Name & Title:_____

Address:_____ Phone Number:_____

Signature:_____ Date (MM/DD/YY):_____

12. Discrepancy Indication Space:

13. Waste Disposal Site: Owner or Operator Certification of Receipt of Asbestos Materials Covered by this Manifest, Except as Noted in Item #12.

Printed/Typed Name & Title:_____ Total Weight (Tons):_____

Signature:_____ Date (MM/DD/YY):_____

DHHS 3787 (Revised8/99)
Health Hazards Control Unit

(1 copy- Waste Generator/Owner; 1 copy- Contractor; 1 copy - Transporter; 1 copy -Disposal Site; 1 copy - Health Hazards Control Unit)

APPENDIX II-C

Water Quality Monitoring Plan

WATER QUALITY MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-13-277A

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 30, 2008, Revised August 2009, Revised January 2010,
Revised August 2014

WATER QUALITY MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA
S&ME Project No. 1054-13-277A

I hereby certify this 19th of August 2014, that this report was prepared by me or under my direct supervision.

_____
Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

Report preparation performed by:

_____
Claudia Irvin
Environmental Professional

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WATER QUALITY MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

1.0 INTRODUCTION

1.1 How to Update This Plan

Before activities are performed in accordance with this Water Quality Monitoring Plan (WQMP), please review the current State rules and North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Section (SWS) guidance for updates to rules, methods, parameter lists, sampling methods, or reporting requirements for compliance. Memorandums regarding changes that apply to compliance standards and guidance are often posted on NCDENR Division of Waste Management (DWM) internet web site at http://www.wastenotnc.org/.

1.2 Background

The Edgecombe County Landfill is a closed Municipal Solid Waste (MSW) landfill with an operating Construction and Demolition (C&D) Landfill located on top of the closed MSW Landfill. The Edgecombe County Landfill is permitted to operate by the NCDENR DWM under Permit No. 33-01. This WQMP summarizes the activities and protocol recommended to perform groundwater and surface water monitoring at the landfill in general accordance with the requirements as specified in the NCDENR Solid Waste Management Rules, Sections .0600 and .1637(a)(1) of Chapter 15A of the North Carolina Administrative Code (NCAC) Subchapter 13B. The WQMP is designed to monitor groundwater and surface water quality in order to detect a release from the landfill into the uppermost aquifer [.1623(b)(3)(C)] as well as to monitor the effectiveness of the corrective action plan (CAP) being implemented to remediate constituents released from the MSW landfill that were detected downgradient from the MSW unit. The last version of this WQMP was January 2010. The WQMP has been revised to incorporate information detailed in a September 17, 2012 letter from NCDENR-DWM, which addressed S&ME's request to modify the Sampling and Analysis Plan (SAP) by reducing the Monitored Natural Attenuation (MNA) parameters and modifying the sampling schedule. The sampling schedule modification request was approved by NCDENR. In an April 19, 2013 letter from S&ME on behalf of Edgecombe County to NCDENR-DWM regarding modifying the SAP as a result of the *Baseline Sampling and Monitored Natural Attenuation (MNA) Report* dated July 2012 and a meeting between S&ME and NCDENR where the NCDENR approved modifications to the SAP, in which geochemical parameters are to be temporarily discontinued until corrective measures detailed in the CAP are implemented. Once the corrective measures in the CAP are in place, the revised SAP for MNA and the geochemical parameters will be implemented.

The information generated from implementing this WQMP will be used to assist Edgecombe County and the NCDENR DWM in evaluating the effectiveness of corrective measures implemented at the closed landfill site. Included in this plan are sections

concerning monitoring well locations, surface water sampling locations, monitoring well construction methods, sampling procedures, analytical procedures, data evaluation, and reporting procedures.

Included in the WQMP is a hydrogeologic study of the landfill site and an evaluation of the existing water quality monitoring system that is based on the review of previous studies performed by others, available documents, and limited data collected by S&ME.

1.3 Project Information

The Edgecombe County Landfill is located along State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina (**Figure 1**). The existing landfill site is bound to the north by Jerry's Creek, to the east by SR Route 1601, and to the west and south by undeveloped agricultural land. The landfill site is shown on the Vicinity Map (**Figure 1**).

Results of the detection monitoring previously performed at the site indicated that a statistically significant increase, over background constituent concentrations, was detected for one or more constituents at the landfill in the semiannual sampling event performed in 1998. The constituent detections indicated that the groundwater water quality downgradient from the MSW unit was adversely impacted. An assessment monitoring program was implemented by Edgecombe County in 1998.

Volatile organic compounds (VOCs) and inorganic constituents have been detected above North Carolina Groundwater Protection Standards in groundwater samples collected from groundwater compliance monitoring points used to monitor the Edgecombe County Landfill. In addition, statistical evaluation of groundwater monitoring data indicates a release of VOCs and inorganic constituents from the landfill. The findings from the assessment monitoring program triggered the next regulatory directive to characterize the nature and extent of the release [.1634 (g) (1)].

In accordance with NCDENR Solid Waste Rules defined under 15A NCAC 13B, S&ME, Inc. (S&ME) has completed the following activities on behalf of Edgecombe County in response to the detections of these constituents:

- Statistical analyses of semiannual water quality results of compliance well monitoring system in accordance with the facility's *Water Quality Monitoring Plan* (WQMP);
- Alternate Source Demonstration (ASD) study in accordance with Solid Waste Rules defined under 15A NCAC 13B.1633(c)(3) and .1634(g)(2);
- Nature and Extent Study (NES) prepared in accordance with Solid Waste Rules defined under 15A NCAC 13B.1634(g)(1); and,
- Assessment of Corrective Measures (ACM) in accordance with Solid Waste Rules defined under 15A NCAC 13B.1635.

These previous assessments identified five organic compounds (vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene) and one inorganic analyte (cobalt) as constituents of concern (COCs) at the Edgecombe County Landfill.

Based on the findings of the previous assessments, and the selection of remedial action, a Corrective Action Plan (CAP) was prepared for the facility in accordance with 15A NCAC 13B.1636. The selected remedy described in the CAP addresses the protection of human health and the environment and will work to restore groundwater quality to comply with the approved groundwater protection standards. Remedial alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for corrective action. In-situ isolation was chosen because the site conceptual model indicates that water management is the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's WQMP to evaluate the effectiveness of the remedial measures and to monitor the anticipated degradation of constituent concentrations.

2.0 MONITORING SYSTEM PLAN

2.1 Hydrogeologic Study

2.1.1 Regional Physiography

Edgecombe County lies within the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain was formed by the deposition of sediments during a series of sea level transgressions and regressions. The regional topography slopes generally to the east with major topographic features consisting of three terraces modified by surface water drainage. The terraces were formed at the margin of the sea when it stood at different levels during Pleistocene time. Each terrace is indicated by a more or less pronounced scarp that marks the location of a former shore line and is separated from the adjacent terrace by an area of gentle slopes.

Edgecombe County is drained by the Tar River and its tributaries. The river has cut 60 to 70 feet into the land surface. The highest topographic elevations are about 140 feet-National Geodetic Vertical Datum (NGVD) along the western edge of the county. The lowest elevation of the County is along the Tar River (about 10 feet-NGVD) where the river crosses the county line along the southeast portion of the county.

2.1.2 Regional Geology

In general, geologic units in the Coastal Plain Region consist of deep, unconsolidated clastic sediments. The geology of Tarboro, North Carolina contains local remnants of Tertiary fossiliferous clay within the Yorktown Formation. The age of the basement units is described as pre-Cretaceous. Other formations in this region from youngest to oldest (top to bottom) include:

- The Surficial Deposits (Quaternary)
- The Yorktown Formation (Tertiary)
- The Upper Cape Fear Formation (Cretaceous)

2.1.3 Site Geology

In the site vicinity, the Quaternary-aged surficial sediments are comprised of the Penholoway, Wicomico, and Sunderland Formations. These formations are generally less than 50 feet thick, with an average of 20 to 30 feet and consist of yellow silty sand and sandy clays. These surficial sediments are cross bedded in areas. The Yorktown Formation lies beneath these surficial sediments. The Yorktown consists of 30 to 60 feet of blue gray silty clay with sandy clay, shell beds and fine sands. The Yorktown is extensive throughout the county forming an almost continuous layer. Beneath the Yorktown are Cretaceous-aged sediments of reddish brown to brown clay, sand and sandy clay with some gravel resting on the irregular bedrock surface. These sediments range in thickness from 30 in the west to 400 feet or more in thickness in the eastern area of the county.

The Cretaceous-aged sediments are underlain by crystalline igneous and metamorphic rocks, with an irregular surface that dips gently to the east. The depth to the bedrock is approximately 300 feet below NGVD (approximately 240 to 400 feet below ground surface (bgs)). There are no known faults within 2,000 feet of the site. The closest expected fault is the Roanoke Island-Goldsboro Fault cited in the literature is located outside Edgecombe County, 15 miles south of the site.

2.1.3.1 Site Topography

Topography of the facility and land surrounding the site (outside the limits of the landfill area) is generally level to gently rolling with a slope down to the east. Manmade topographic conditions at the facility include the landfill structure, roadways, borrow areas, and surface drainage features located along the south, east and west boundaries of the landfill. The eastern portion of the landfill has side slopes that range from approximately 4 horizontal to 1 vertical (4H:1V) to 6H:1V and top slopes ranging from 2 to 6 percent. The western portion of the landfill has slopes that range from approximately 8H:1V on the side slopes to about 5 percent on top.

The existing ground surface elevations at the site range from approximately 136 feet-NGVD at the top of the C&D landfill, to about 107 feet-NGVD on the top of the MSW landfill. South of the landfill, elevations range from approximately 80 feet-NGVD near the southwest corner to approximately 70 feet-NGVD near the southeast corner. Along Jerry's Creek near the northwest corner of the site, the elevation is approximately 48 feet-NGVD and near the northeast corner of the site the elevation is approximately 37 feet-NGVD.

2.1.3.2 Site Soil Classification

According to the Soil Survey of Edgecombe County, North Carolina, prepared by the United States Department of Agriculture and the Soil Conservation Service (1979), the soils in the vicinity of the site are classified as the Norfolk-Aycock-Wagram association. This association is comprised of nearly level to strongly sloping, well-drained soils. The surface layer is loamy sand to fine sandy loam with clay loam to sandy clay loam subsoil. The Norfolk-Aycock-Wagram association is usually found on uplands. The soils in this association are found in broad, slightly convex areas that are rounded along the drainage

features. They are dissected by many drainage ways that have short side slopes and narrow to wide flood plains.

Soils in the vicinity of Jerry's Creek and Wright's Creek streams are classified as the Bibb-Johnston association. These soils are usually found on flood plains in narrow to moderately broad areas along major streams. The Bibb-Johnston association is comprised of nearly level, poorly-drained and very poorly-drained soils that have loamy and sandy underlying material. The surface layer is mucky loam to fine sandy loam. The underlying material is loamy sand to sandy loam.

The subsurface exploration identified a marine clay (Yorktown Formation), underlying the near surface soils at the landfill site at depths ranging from 3 to 20 ft bgs. The full thickness of the Yorktown clay does not appear to have been fully penetrated at any of the boring locations used to evaluate the subsurface conditions at the landfill site. Based on the borings drilled to assess the lithologic sequence, the Yorktown Formation appears to be greater than 25 feet thick.

2.1.4 Regional Hydrogeology

The Coastal Plain Physiographic Region of North Carolina is located between the uplands of the Piedmont and the Atlantic Ocean. Investigations of the Coastal Plain Region have identified as many as 10 aquifers separated by 9 confining units. However, these aquifers can basically be divided into three major deep aquifer systems in North Carolina: the Quaternary Aquifer System, the Tertiary Aquifer System, and the Cretaceous Aquifer System. Each of these three major aquifer systems are separated from each other by units of lower permeability composed of clays and silts. The Quaternary Aquifer is composed of surficial deposits of sandy silt and clay. The Tertiary Aquifer is composed of glauconitic sands, clayey sands, and limestone. The Cretaceous Aquifer is composed of sand, silty and clayey sand, and clay separated by confining units of clay and silt.

The uppermost aquifer at the site is unconfined and is found in the silty sands of the Quaternary Sunderland formation. This aquifer is recharged by inflow from upgradient areas and by infiltration of precipitation. The Tertiary Yorktown clay layer, encountered at depths less than 10 feet bgs to 35 feet bgs, appears to act as a confining layer with an approximate thickness of greater than 25 feet below the landfill.

2.1.4.1 Site Hydrogeology

According to the facility's WQMP, dated September 1994, the revised Sampling and Analysis Plan (SAP) in November 1998, and groundwater and surface water compliance monitoring reports, depths to static water levels have been historically measured on a semiannual basis in several monitor wells and piezometers located at the landfill. **Figure 2** shows the locations of monitoring wells and piezometers currently located at the Edgecombe County Landfill. Most wells and piezometers at the site are screened in the surficial water bearing zone underlying the site. A summary of the construction details for the monitor wells and piezometers installed at the landfill is included in **Table 1**. Static water levels representative of the phreatic groundwater surface (water table) are measured from the top of the casing (TOC) of each monitoring well or piezometer with

an electronic water level meter. These measurement data were used to calculate the corresponding groundwater elevation within each monitor well and piezometer based on surveyed elevations of TOCs. Historical groundwater elevation data measured in the vicinity of the facility is included in Table 3 of the NES.

Historical groundwater potentiometric maps are presented in the facility's semiannual monitoring reports. Based upon the water table elevations and the resulting potentiometric gradients, the groundwater flow direction within the surficial water bearing zone underlying the facility is projected generally to the north-northeast toward Jerry's Creek.

The well network used to prepare the potentiometric maps of the area north of the landfill included compliance wells and piezometers installed to evaluate groundwater flow at the closed MSW landfill facility and included staff gauges in Jerry's Creek and Wright's Creek, piezometers installed along the southern boundary of the old northern landfill just north of Jerry's Creek, and piezometers along Wright's Creek along the northern boundary of the old northern landfill. Water levels in these piezometers demonstrated that shallow groundwater in the vicinity of the old northern landfill has radial flow to the south toward Jerry's Creek, to the northeast toward Wright's Creek, and east toward the confluence of Wright's Creek and Jerry's Creek from below the old landfill. The potentiometric maps presented in the NES indicate that Jerry's Creek and Wrights Creek are both discharge features to the groundwater, while the farm ponds south of the landfill appear to be recharge features to the surficial aquifer at the existing pool elevation.

2.1.4.2 Surface Water – Pre Landfill

Surface water from storm events at the landfill site either infiltrated into the surficial soils or flowed as sheet flow to the drainage features (paleo-channels) that originated near the southwest corner and south central area of the site. The drainage features flowed to the west and north and converged to form an intermittent tributary to Jerry's Creek. The remaining portions of the site drained directly into Jerry's Creek or to a drainage feature in the southeast area of the site that also converges with Jerry's Creek.

2.1.4.3 Surface Water – Operating Landfill

The operating landfill was developed over paleo-channels that were present in the southwest and central portions of the site. Flow that entered the former drainage features was re-directed by a drainage ditch constructed at the south and west boundary of the facility. The drainage ditch was designed to transport surface water and groundwater around the perimeter of the waste boundary.

Surface water from the active portion of the waste disposal unit now drains into a sediment basin located at the north central area of the landfill site. Water flows from the sediment basin through a discharge pipe into a drainage ditch that converges with Jerry's Creek. The sediment basin was constructed in the north portion of the drainage feature (paleo-channel) mentioned above. Jerry's Creek converges with the Tar River approximately 2,300 feet to the east of the site.

The surface water flow in the southeast portion of the site passes through either of two control structures: a small detention basin located northwest of the landfill or a farm pond located southeast of the landfill. The farm pond is partially on the landfill facility property and partially on the adjoining property to the south. The water from the farm pond passes through a culvert, east under SR1601 (Colonial Road), and converges with Jerry's Creek.

The local surface water features in the immediate vicinity of the landfill facility include: Jerry's Creek; Wright's Creek; the drainage features in the active landfill area; and the farm pond located in the southeast corner of the site. The undisturbed natural topography in the area surrounding the waste management unit has gradual to moderate slopes that grade downward toward these local surface water features. The surface of the landfill generally mimics the gradients of the natural slopes and also discharges to these surface water features. Jerry's Creek is the primary receptor of surface water runoff from the landfill. Infiltration and percolation into the upper soil horizon is expected to be moderate due to the sandy loam content within this stratum. The uppermost aquifer underlying the landfill is expected to discharge to the local surface water features.

2.1.4.4 Hydraulic Conductivity and Groundwater Flow Velocity

Rising and falling head slug tests were previously performed in monitor wells installed at the site to estimate the hydraulic conductivity of the sediments in the surficial water bearing zone at those locations. The test data (provided in previous reports) from the monitoring wells were analyzed by the Bouwer and Rice Method. The estimated permeability or hydraulic conductivity values at the site range from 6.58×10^{-6} cm/sec (centimeters per second) to 9.81×10^{-4} cm/sec. Hydraulic conductivity estimated from Falling/Rising Head Test analyses are summarized in **Table 2**. Slug tests from monitor wells and piezometers on or adjacent to the landfill facility were described in the NES.

Using the groundwater elevation data, historical hydraulic conductivity values, effective porosity, and event specific horizontal groundwater flow gradient estimated at each monitor well or piezometer were input to calculate the estimated groundwater flow velocity at each monitor well/piezometer.

The calculations are described in the following sections.

Darcy's Law states that: $q = kiA$

where; q = Rate of flow, [cm3/sec]
k = Hydraulic Conductivity, [cm/sec]
i = Hydraulic gradient = dh/dl
A = Cross sectional area, perpendicular to direction of flow [cm2]

Therefore, flow is equal to the velocity of the fluid multiplied by the cross-sectional area where flow is occurring. This yields Darcy's velocity (Vd = ki).

The seepage velocity (Vs) of a fluid flowing through a porous media is derived from Darcy's velocity. Darcy's Law describes the flow of a fluid on a macroscopic generalized

basis, assuming that the flow occurs across the entire cross-sectional area. Flow through a soil actually occurs through the void spaces between soil grains, and occurs only through that portion of the cross-section not occupied by soil particles. To determine the actual speed a fluid flows through a porous media, such as soil, a more accurate representation of the area of flow must be realized. Porosity is defined as the volume of voids per volume of total space;

$$n = Vv / Vt$$

Effective porosity (n_e) is that percent of a total volume of a given mass of soil or rock that consist of interconnecting voids. Therefore, the seepage velocity of a fluid moving through soil may be expressed as;

$$Vs = Vd / n = ki/n_e$$

Using the average hydraulic gradient of 0.02 ft/ft, average hydraulic conductivity values from the falling/rising head tests (Table 2), and effective porosity values from analytical testing or published values (Table 2) yield seepage velocity values at the well head locations ranging from 0.45 ft/yr to over 77 ft/yr at the site. The flow velocities are summarized in **Table 3**.

The flow velocities calculated for this "typical" scenario have similar velocities to those described in the NES. Groundwater flow velocity estimates in the surficial aquifer at the site in January 2005 (normal conditions) ranged from 1.73 to 45.62 feet per year (ft/yr). The groundwater flow velocity estimated in the surficial aquifer at the site in August 2007 (drought conditions) ranged from 0.21 ft/yr to 69.14 ft/yr. The average groundwater flow velocity for the site was estimated to be 24.12 ft/yr in January 2005 and 22.84 ft/yr in August 2007. The methods used for the hydraulic conductivity and groundwater flow velocity calculations were included in Appendix III of the NES.

2.2 Groundwater Monitoring System

Notification for changes or modifications to the monitoring network including installation and abandonment will be performed in general accordance with rule .0544 2(A). Revisions to the groundwater monitoring network described in this plan will be installed or modified under the supervision of a geologist or engineer licensed to practice in the State of North Carolina. Boreholes will be drilled and the wells constructed by a well driller certified by the North Carolina Well Contractors Certification Commission (ref. 15A NCAC 27) and shall be constructed in accordance with North Carolina Well Construction Standards (ref. 15A NCAC 2C). All monitor wells installed at the facility shall be located under the direction of a Professional Surveyor licensed in North Carolina relative to the State Plane coordinate system referenced to the North American Datum (NAD) 83 and the National Geodetic Vertical Datum (NGVD 29).

2.2.1 Monitor Well Network

Monitor well and piezometer locations at the facility are currently used to monitor groundwater levels, groundwater quality at background and compliance locations as well

as to assess the effectiveness of groundwater corrective measures currently being implemented. The WQMP was prepared based on the findings reported in the NES. Figures 11 and 12 from the NES depict the organic and inorganic constituent concentrations in the groundwater, respectively. The Total VOC Isoconcentration Map (NES Figure 14) was also used to design the well network presented in this WQMP. Monitor well and piezometer locations are shown on **Figure 2**. The summary of the construction details for the monitor wells and piezometers is presented in **Table 1**. A copy of the available boring logs and well construction details for the monitoring network is included in **Appendix I**.

Existing monitor well and piezometer locations in the monitor well network were suitable for detection monitoring and assessment. However, based on the refined location of the waste boundary from the NES relative to the wells used for the existing well network, the compliance well MW-7A and background well MW-9 locations will require relocation to meet the NCDENR relative point of compliance requirement of not less than 50 feet and not more than 250 feet from the waste boundary.

2.2.1.1 Monitoring Groundwater Elevation

Groundwater elevations will be monitored semiannually or more frequently from the upgradient wells (MW-3B, MW-4, and MW-9) for the groundwater corrective measures or background detection and/or assessment monitoring programs. Downgradient monitor wells (MW-5, MW-6, MW-7A, MW-12, MW-13, MW-14, MW-15, and MW-16) will be monitored for the groundwater corrective measures or compliance detection and/or assessment monitoring programs. Groundwater levels will also be measured from thirteen piezometers: P-1, P-2A, P-3A, P-12, P-15, P-17, P-18, P-19, P-25, P-26, P-29, P-34, and P-35. The piezometers are not expected to be sampled for laboratory analysis, with the exception of P-34, which may be sampled to review groundwater corrective measures. Monitor wells MW-5D, MW-5S, MW-8A, and MW-10 are also used to measure groundwater levels. After the construction and grading activities for corrective measures are performed, MW-7A and MW-9 will be used for water level measurements.

2.2.1.2 Background Monitor Wells

The monitor well network sampled semiannually for the detection and assessment monitoring programs include two upgradient (background) monitor wells: MW-4, and MW-9. These monitor wells were installed by S&ME or others between 1994 and 2004. Monitor well MW-3B will be used to monitor the groundwater corrective measures and groundwater levels for detection and/or assessment monitoring programs.

Monitor well MW-3B and MW-4 are located approximately 125 feet upgradient of the waste boundary. Monitor well MW-9 is located approximately 375 feet upgradient of the waste boundary and is west of a constructed drainage feature. Monitor well MW-9 will be used as a background monitor well in the monitoring network until the construction and grading activities required to implement the groundwater corrective measures described in the CAP are performed. Once the construction and grading activities are completed, MW-9A will be installed within the relative point of compliance for the landfill which is considered to be between 50 and 250 feet of the waste boundary. The

replacement location for MW-9 will be positioned approximately 75 feet north and approximately 240 feet east of the existing location of MW-9. The proposed well designation will be MW-9A and will be approximately 130 feet from the waste boundary.

2.2.1.3 Compliance Monitor Wells

The monitor well network that will be sampled semiannually for the detection and/or assessment monitoring programs includes four downgradient (compliance) monitor wells: MW-5, MW-6, MW-12, and MW-16 (interim compliance). These monitor wells were installed between 1994 and 2008. The downgradient monitoring well locations were designed to enable early detection of groundwater contamination that may originate from the landfill and travel in the uppermost aquifer. Downgradient monitor wells MW-7A, MW-13, MW-14, and MW-15 will be used to monitor groundwater corrective measures and groundwater levels for the detection and/or assessment monitoring programs.

Monitor well MW-1A was a former compliance well located near the northeast corner of the landfill. The well was damaged and was abandoned. After the construction and final grading activities are performed to implement the corrective measures at the facility, monitor well MW-1B will be installed to replace monitor well MW-1A. Monitor well MW-16 is used as an interim compliance well until the replacement well MW-1B is installed, after which it will be used to monitor groundwater corrective measures.

The downgradient wells, MW-5, and MW-6, appear to be within the relative point of compliance at approximately 100 feet from the waste boundary. Monitor well MW-7A appears to be located approximately 20 feet downgradient of the waste boundary delineated by the activities discussed in the NES. Monitor well MW-7A will be used for groundwater corrective measures monitoring once the corrective measures are implemented and construction activity is completed. Post-construction for the corrective measures, MW-11 will be installed west of the trench drain that will induce hydraulic control on surface and groundwater migrating toward the landfill as part of the proposed groundwater corrective measures. Monitor well MW-11 will be positioned approximately 150 feet north and approximately 150 feet east of the existing location of MW-7A. The well location will be designed to monitor the groundwater level for drawdown near the proposed trench drain once it is installed and it will be used to monitor water quality for the groundwater corrective measures west-northwest of the landfill. The proposed well construction detail for the new monitor wells (MW-1B, MW-9A, and MW-11) are summarized in **Table 4**. The monitor well/piezometer network including the parameters monitored and the status (ie. background, compliance, corrective measures) for the points in the network is presented in **Table 5**.

Additional monitoring locations have been installed to measure the effectiveness of the corrective measures that are being implemented to mitigate the constituents released from the site. S&ME installed new monitor wells and converted existing piezometer locations based on the location of the constituent concentrations delineated in the NES (S&ME, June 2008). The piezometers were converted into monitoring wells by installing protective casings set in concrete pads in the same manner as the monitoring wells.

The newly installed compliance monitor well MW-12 is positioned near the northwest corner of the facility approximately 150 feet north and 375 feet west of MW-6. This well was constructed by converting piezometer P-28A into a permanent monitor well. The location will replace compliance well MW-7A and will also monitor groundwater corrective measures including constituents of concern, monitored natural attenuation (MNA) parameters, and groundwater levels.

The newly constructed monitor well monitor well MW-13 will monitor groundwater corrective measures central to the north boundary of the landfill, approximately 350 feet west of MW-5 and approximately 175 feet south of Jerry's Creek. Monitor well MW-13 is approximately 120 feet north of the waste boundary and will monitor water quality, MNA parameters, and groundwater levels.

Monitor well 14 is located central to the north boundary of the landfill site approximately 20 feet south of Jerry's Creek, approximately 170 feet north and 90 feet west of MW-5, and approximately 265 feet north of the waste boundary. The well location is expected to monitor groundwater corrective measures and water quality for constituents previously detected in MW-5, MNA parameters and groundwater levels.

Monitor well MW-15 is located central to the north boundary of the landfill site approximately 30 feet south of Jerry's Creek, approximately 10 feet north and 135 feet east of MW-5, and approximately 130 feet north of the waste boundary. The well location is expected to monitor groundwater corrective measures and groundwater levels.

Monitor well MW-16 is positioned near the northeast corner of the landfill facility approximately 35 feet north and 250 feet east of MW-1A. The well will be used as a temporary compliance well until monitor well MW-1A is replaced after final grading is performed for the corrective measures. MW-16 will monitor groundwater corrective measures MNA parameters, and groundwater levels south of Jerry's Creek. This proposed well location is approximately 250 feet northeast of the waste boundary.

The monitor well network including the installation date and the company who installed the well is summarized below:

Water Quality Monitoring Network Groundwater Sampling Locations

Well ID	Date Installed	Total Depth (ft-bgs)	Screen Interval (ft-bgs)	Well Status/Purpose	Installed By
MW-1A	9/15/94	17.5	2.5-17.5	Abandoned/Compliance	Law Engineering
MW-1B	Proposed	17.5	2.5-17.5	Replace MW-1A for Compliance	Proposed
MW-3B	2/5/04	20.5	5.5-20.5	Groundwater Corrective Measures / Water levles	S&ME, Inc.
MW-4	9/9/94	18	3-18	Background	Law Engineering
MW-5	9/16/94	22	7-22	Compliance	Law Engineering
MW-6	9/16/94	17.5	2.5-17.5	Compliance	Law Engineering

Well ID	Date Installed	Total Depth (ft-bgs)	Screen Interval (ft-bgs)	Well Status/Purpose	Installed By
MW-7A	11/13/99	25	15-25	Groundwater Corrective Measures / Water Levels	Geotek
MW-11	Proposed	25	10-25	Groundwater Corrective Measures / Water Levels	Proposed
MW-9	2/26/02	15	5-15	Temporary Background / Water Levels	S&ME, Inc.
MW-9A	Proposed	15	5-15	Replace MW-9 for Background / Water Levels	Proposed
MW-12	7/22/08	10	5-10	Compliance	S&ME, Inc.
MW-13	10/14/08	20	10-20	Corrective Measures / Water Levels	S&ME, Inc.
MW-14	10/14/08	12	7-12	Corrective Measures / Water Levels	S&ME, Inc.
MW-15	10/14/08	11.6	6.6-11.6	Corrective Measures / Water levels	S&ME, Inc.
MW-16	10/15/08	17	7-17	Corrective Measures / Interim Compliance	S&ME, Inc.

Monitor wells were installed in general accordance with 15A NCAC 2C Well Construction Standards. Monitor wells construction details are included in **Table 1**.

2.2.2 Well Installation Procedures – New Monitor Wells

Future monitor wells designed to monitor the surficial aquifer, will be constructed into Type II wells in general accordance with the North Carolina Well Construction Standards (15A NCAC 2C .0108) and the requirements of the North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities. A North Carolina licensed well driller will be responsible for drilling boreholes and constructing monitor wells. A typical monitoring well construction detail is presented on **Figure 3**. The final screened intervals will be selected based on site conditions encountered during the drilling. Monitor wells that penetrate a confining layer or that pass through a contaminated aquifer zone to monitor depths below the first occurrence of groundwater will be installed as Type III double-cased monitor wells.

2.2.2.1 Monitor Well Installation Equipment

Equipment used for drilling and completing monitor wells will be cleaned before drilling and monitoring well installation. At a minimum, the cleaning will consist of high pressure hot-water cleaning of the down-hole drilling equipment prior to performing each boring. Boreholes for the wells will be drilled using rotary drilling methods or other typical drilling methods as site conditions dictate.

Lithologic samples will be collected during advancement of new borings for visual classification of the stratigraphy and recorded onto boring log forms. Soil samples will be collected using split-barrel sampling equipment with samples taken at 2.5-foot intervals first 10 feet and 5-foot intervals below 10 feet, or at continuous intervals with direct push hydraulic sampling procedures.

Monitor wells will be constructed through hollow stem augers or drill casing, if required. Monitor well riser and well screen will be flush joint threaded Schedule 40 PVC two inch inside diameter NSF Grade (meeting ASTM D-178S and F480 requirements). The well screen will be .01-inch machine slotted screen. Only casing with water-tight joints will be used. Well construction materials will be thoroughly cleaned prior to installation or will be installed directly from factory sealed packaging.

Following the completion of each borehole, the qualified geologist or engineer will select the screened interval for the monitoring well based on site-specific factors and the following general criteria:

1. The uppermost surficial aquifer monitor well slotted well screen interval is to be 10 or 15 feet and located so that the seasonal high water level is just below the top of the screened interval. The proposed depths of the screen intervals for the replacement wells are provided in **Table 4**. For areas with high groundwater levels (i.e., less than 3 feet below land surface), the top of screen will be placed at a depth of not less than 2 feet below land surface to allow adequate seal and to allow sufficient grout to secure the protective casing.
2. The base of the screen will not be placed more than 2 feet into the marine clay, as identified during the soil test borings.
3. The annular space between the borehole wall and the well casing will be backfilled with clean, well rounded, washed, high grade silica sand properly sized to the formation material. The sand pack will be placed to approximately two feet above the slotted screen using a tremie pipe. A minimum of one foot of sand pack above the screen may be used where the top of the screen depth is shallow to allow for an adequate seal. The hollow-stem augers, if used, or temporary casing will be incrementally withdrawn while the filter pack is placed. For depths greater than 30 feet (not anticipated), the filter pack will be placed into the annular space using a tremie pipe. The filter pack level will be frequently sounded and kept at the base of the augers or temporary casing until the desired depth of filter pack is obtained.
4. A minimum one-foot thick bentonite seal will be placed above the filter pack and hydrated with clean water. The bentonite seal will be placed with a tremie pipe unless the conditions prevent such use. The bentonite pellets will be carefully tamped into a wet cohesive clay mass before placement of the grout. Care will be taken so that the augers or temporary casing is withdrawn above the top of the pellets to prohibit the bentonite pellet seal from sticking to the auger or casing.
5. The remainder of the annular space will be filled with a cement/bentonite grout from the top of the bentonite seal to near (approximately three feet below) the ground surface. The grout will be slowly pumped through the tremie pipe at a constant rate to prevent dilution. The cement grout is to be mixed with six gallons of water for each 94 pound bag of Type I Portland cement. No aggregate materials or other debris are top be mixed into the slurry. The augers or temporary casing should be removed as the grout is placed in the borehole. Subsequent to set up, additional grout may be required for "topping off" the grout seal to the surface.

After grouting, no work is permitted on the well for a minimum of 24 hours while the grout is setting.

6. A 4-inch square (or approved equivalent) steel protective casing with a lockable cover will be placed over the well's riser pipe. The protective casing will extend from about 1.5 to 2.0 feet below ground surface to slightly above the well casing top (approximately 30 inches above ground). The protective casing will be placed over the well casing following the initial grouting. The protective casing will be sealed and immobilized in concrete placed around the outside of the protective casing.
7. The protective casing will be primed, painted, and provided with a permanently affixed name plate with the following information, as required in the well standards:

    - Well identification number
    - Drilling contractor name and registration number.
    - Total depth of well.
    - Depth of screen interval.
    - Depth to groundwater following well completion.
    - A warning that the well is for monitoring only and that the groundwater may contain hazardous materials.
8. A concrete slab or pad sloping gently away from the well casing in all directions will be constructed. The slab will serve as anchorage and is intended to prevent surface water from migrating into the well and along the wall of the casing. The concrete pad dimensions will be approximately 2 feet wide by 2 feet long and will be approximately 4 inches thick. A typical detail for the monitoring well is shown on the attached **Figure 3**.
9. The location, installation methods, and construction details of the wells may be modified depending on field conditions (i.e. shallow groundwater, confining clay layer, etc.). Any modifications, other than for high groundwater conditions, will be discussed with NCDENR DWM Solid Waste Section prior to the construction of the monitor well requiring modifications.

The following information will be recorded during the construction of wells and maintained by the owner:

- Name of the driller, driller registration number, and identification of drill rig;
- Date of Construction;
- Drilling Method;
- Borehole diameter and well casing diameter;
- Well depth (+/- 0.i foot);
- Drilling Logs including Lithology;
- Outer Casing materials;
- Casing and screen materials and design;
- Filter pack material and size, volume and placement method;
- Sealant materials volume and placement method;
- Surface seal design and construction;

- Well development procedures;
- Type of protective well casing; and,
- Well location(=/-0.5 feet), ground surface and top of casing elevation (TOC) +/-0.01 feet)

2.2.2.2 Well Development

Following well installation, new monitor wells will be developed using a bailer, pump, surge block or combination of these instruments to remove clay, silt, sand and other fine materials that may have been introduced into the formation or sand pack during drilling and well installation. Proper well development using pumping/bailing and/or surging cycles will be performed to develop the wells and to establish equilibrium of the well with the aquifer. Well development will be performed no sooner than 24 hours after well construction is complete and will continue until the suspended solids are removed from the well and turbidity is reduced to acceptable levels, if possible.

It is important to note that in some instances the selected location for newly installed groundwater monitor wells may be situated in a naturally turbid zone within the uppermost pervasive aquifer. If this case is encountered during future well installations, and efforts to reduce the turbidity within the well fail, and it is deemed that the turbidity may affect the groundwater quality results, from that location, a new well location will be selected and a new monitor well will be installed.

2.2.2.3 Survey Well Locations and Top of Casing Elevations

Prior to the initial well sampling, the highest point on the top of casing for each well will be located under the direction of a Professional Surveyor licensed in North Carolina relative to the State Plane coordinate system. The casing location and elevation will be referenced to the North American Datum (NAD) 83 and the NGVD 29 in order to calculate the elevation of the groundwater surface.

2.2.2.4 Aquifer Tests

Aquifer tests using rising or falling head displacement measurement tests (slug tests) will be performed on new monitor wells to estimate the hydraulic conductivity of the aquifer. The hydraulic conductivity from slug tests will be used to estimate the groundwater flow rate in the vicinity of the well based on hydraulic gradients at the site. The hydraulic conductivity can also be used to predict the yield of the well during sampling.

2.2.2.5 Well Yield

The primary objectives during the collection of groundwater samples for analysis are to obtain a representative groundwater sample and to prevent the sample from being altered or contaminated during withdrawal from the well, shipping, or during sample preparation. Special procedures are often necessary for sampling monitoring wells based on their yield. For the purpose of this plan, a high-yield well will be defined as a well that cannot be drawn down more than 20 percent of the water column by bailing or pumping by hand. A moderate-yield well can be drawn down more than 20 percent; however, it cannot be evacuated to dryness. A low-yield well can be evacuated to dryness and requires a minimum of a few hours to a day to fully recover.

2.2.3 Well Network Maintenance

Maintenance to the monitor wellhead and area within a 10-foot radius to the wellhead is necessary to ensure access to the wells for sampling and to maintain the integrity of the wells. The monitoring wells will be accessible by at least a four-wheel drive vehicle. Brush and weeds will be cleared from around the wells (minimum of 10-foot radius). For additional well protection, barricades (protective bollards) are recommended to be constructed around the wells (see **Figure 4**, Typical Protection for Monitoring Wells, an alternative design may be used). The barricades and well protective casings will be painted with high visibility color paint or an approved equivalent. Surface water run-on controls will be provided, where necessary, to minimize erosion near or below the concrete pads. The concrete pads will be monitored for integrity semiannually and repairs performed as needed. At each monitoring well, he following items will be checked regularly to ensure that the well network is properly maintained:

- Surface water is diverted from the wellhead;
- The concrete pad is intact and free of cracks;
- Surface water has not undercut the concrete pad;
- Settlement has not caused any gaps below the pad;
- The outer protective casing is secured with a lock in good condition;
- Well identification tag is legible and in good condition;
- Grout between the inner and outer well casing is filled to cover the outer casing;
- The inner well casing is firmly grouted in place;
- The inner and outer well casing remain upright and unobstructed; and,
- Monitor wells are visible and adequately protected from moving equipment and obstruction due to brush and weeds.

Additional inspection items, which should be performed at the time of sample collection, are described in **Section 3.4.2**.

2.2.4 Well and Piezometer Abandonment

Well abandonment for any well at the site will be conducted in accordance with 15A NCAC 2C, Part .0113 (a) (2) of the Well Construction Standards. Abandonment will be accomplished by disinfecting the well 24 hours prior to injecting cement grout slurry from the bottom of the well to the top by means of a tremie pipe. The wellhead will be removed and the well casing will be cut off below the ground surface. Well casings installed in the boring and left in-place with the top cut level to the existing grade will have a flush mount cover installed over the abandoned well. Abandonment records will be prepared and submitted to NCDENR and a copy will be placed in the operating records.

2.3 Surface Water Monitoring System

Surface water monitoring stations include one upgradient station, “Upstream”, and one downgradient station, “Downstream”, located on Jerry's Creek as shown on **Figure 2**. Surface water flow at the landfill site is generally toward the northeast into Jerry's Creek

with local flow towards adjacent drainage features. Jerry's Creek flows throughout the year and is therefore a discharge boundary for the site.

2.3.1 Surface Water Monitoring Locations

The Upstream and Downstream surface water sample locations are identified in the field by staff gauge locations set to monitor surface water elevation in Jerry's Creek. The upgradient station is located northwest of the landfill facility in Jerry's Creek, and the downgradient station northeast of the landfill is west and upstream to the convergence of Jerry's Creek and Wright's Creek. The surface water sample locations were positioned to consider turbulent flow, stream sediment load, or other debris that may elevate the sample turbidity and affect analytical results.

2.3.2 Pre-Post CAP Surface Water Monitoring Locations

Immediately before the hydraulic barrier is constructed to implement the corrective measures described in the CAP, the surface water will be monitored from the effluent discharged from the pond southeast of the landfill. The proposed sample location will monitor effluent groundwater and surface water from the farm pond that will be receive surface water and groundwater diverted from entering the landfill by the hydraulic barrier and discharged south of the landfill. After the construction of the hydraulic barrier and the grading activities are performed to implement the corrective measures, a second sample of the effluent discharged from the pond will be collected to review impacts from construction on surface water quality.

2.3.3 Leachate/Condensate Monitoring Locations

Neither leachate nor condensate locations are currently sampled at the Edgecombe County closed MSW landfill. If the need would arise to conduct leachate/condensate sampling at the facility, refer to **Section 3.5**.

2.3.4 Stormwater Sampling (Permit Requirements)

Surface water samples will be collected in general accordance with a Strom Water Pollution Prevention Plan (SWPP), a NPDES General Permit No. NCG120000, or Site Specific NPDES Permit, if applicable. The surface water samples will be analyzed in accordance with the SWPP or the NPDES permit, as applicable.

2.4 Sampling Equipment

Development, purging and sampling equipment are selected so that all materials are compatible with the sample parameters and comply with state and federal regulatory requirements for sampling.

2.4.1 Purging and Sampling Equipment

- Disposable bailer constructed of Teflon® or PVC, and nylon or PVC disposable cord.
- Re-usable stainless steel or Teflon® bailer with stainless steel or Teflon® coated cord.
- Peristaltic Pump with new silicon tubing and either dedicated Teflon®-lined sample tubing or disposable PVC sample tubing.

- Re-Usable submersible pump with stainless steel, Teflon® or PVC parts and/or tubing.
- Dedicated bladder pump with dedicated sample tubing and airline.
- Re-usable flow through cell with multi parameter meter.
- Re-usable electronic water level indicator.
- Stop watch or time piece to record sample time and/or purge intervals.
- Re-Usable dip cup or bailer constructed of Teflon® or PVC for surface water sampling.
- Re-usable bottle clamp on extension rod for direct filling sample bottles for surface water sampling.

2.4.2 Field Parameter Measurement Equipment

The field equipment will be properly calibrated prior to field use, with the calibration checked in the field at each sample location. Field adjustment to the equipment will be made as necessary and recorded in the field log. The principal field parameter monitor will be a multi-parameter meter with a flow-through cell which measures pH, conductivity, temperature, dissolved oxygen, ORP, and turbidity. The water level indicator will be electronic with an audible and/or visible alarm when the probe contacts the groundwater. Calibration logs for the field equipment will be maintained by the sampling staff and provided to the Division of Solid Waste Management DWM on request. Appropriate calibration checks in the field will be recorded on the field logs and submitted with the data analysis.

2.4.3 Equipment Decontamination

Dedicated pumps used to collect samples from each location will be decontaminated prior to installation. Once installed, they will not require additional decontamination. Decontaminating dedicated or single use disposable sample tubing will not be required for wells sampled with a peristaltic pump or where a bladder pump installed. However, for reusable field measurement equipment, meters, gauges or non-disposable dip cups or bailers that enter more than one monitor well or contact sample media, the equipment decontamination procedure will be performed in the field between uses at each well using the following steps:

- Phosphate-free soap wash
- Deionized water or distilled water rinse
- Isopropyl alcohol rinse
- Deionized water or distilled water rinse
- Air dry
- For storage, wrap equipment in aluminum foil (shiny side out)

The water level indicator will be decontaminated in the field between uses at each well. Decontamination for the water level indicator will consist of the following steps:

- Phosphate-free soap wash.
- Deionized water or distilled water rinse.
- Air dry.

2.4.4 Sample Containers

A set of sample bottles that have been pre-cleaned in the laboratory and are pre-labeled will be removed from the cooler and the surface water sample poured into a fresh container. Preservatives will be added as necessary to the sample bottles at the laboratory or immediately prior to samples being placed in them. The sample bottles will then be securely placed into a pre-cleaned cooler and a chain-of-custody form completed and placed with the samples.

3.0 SAMPLING AND ANALYSIS PLAN

The following SAP is prepared based on the S&ME plan dated May 10, 1994 and the SAP revision by S&ME dated November 1998. The sampling techniques in the revised SAP include low-flow purging and sampling methods. If low flow sampling is not possible due to pump equipment failure, low well yield or water level depths greater than the peristaltic pump can pump (~30 feet bgs), then alternative sampling techniques may be used. Alternative sampling techniques may include hand bailing, use of a non-dedicated sampling pump, or use of dedicated pump, as necessary, to obtain groundwater samples from monitor wells that are currently installed at the Edgecombe County Landfill. This SAP outlines the procedures and protocols that will be used to collect groundwater samples.

3.1 Health and Safety

A site specific Health and Safety Plan (HASP) should be developed that is appropriate for the sampling activities and the expected chemical constituents. This section of the WQMP is not a HASP, but is intended to provide minimum guidelines to protect the sample collector from potential exposure to sample constituents and minimize accidental contamination of samples by the collector. Sampling personnel should implement all local, state, and federal requirements relating to health and safety and should follow all local, state and federal requirements pertaining to the storage and disposal of any hazardous or investigation derived wastes.

Protective gloves should be worn when conducting all sampling activities.

- Do not let gloves come into contact with the sample or with the interior or lip of the sample container. Use clean, new, non-powdered and disposable gloves. Various types of gloves may be used as long as the glove materials do not contaminate the sample or if internal safety protocols require greater protection.
- Note that certain materials that may potentially be present in sample media can pass through certain glove types and be absorbed in the skin. Sampling personnel should choose gloves compatible to the contaminants at the site that allow adequate manual dexterity and the proper permeability for the circumstances under which they will be used. Powdered gloves are not recommended unless it can be demonstrated that the powder does not interfere with the sample analysis.

- Change gloves after preliminary activities, after collecting all the samples at a single sampling point, if torn or used to handle extremely dirty or highly contaminated surfaces. Properly dispose of all used gloves as investigation derived wastes.

Properly manage all investigative derived waste (IDW).

- To prevent carry over of contamination into previously uncontaminated areas, IDW should be properly managed. This includes all water, soil, drilling mud, decontamination wastes, discarded personal protective equipment (PPE), etc. from site investigations, exploratory borings, piezometer and monitoring well installation, refurbishment, abandonment, and other investigative activities. Manage all IDW that is determined to be RCRA-regulated hazardous waste according to the local, state and federal requirements.
- Properly dispose of IDW that is not a RCRA-regulated hazardous waste but is contaminated above the Department's Soil Cleanup Target Levels or the state standards and/or minimum criteria for ground water quality. If the drill cuttings/mud or purged well water is contaminated with hazardous waste, the DWM, Hazardous Waste Section (919-508-8400) should be consulted for disposal options. Containers holding IDW should be maintained in good condition. Containers should be periodically inspected for damage and to ensure that all required labeling (DOT, RCRA, etc.) is clearly visible.

3.2 Sample Locations

The monitor wells that will be sampled semiannually are or will be installed typically in the water table upper-most aquifer. One monitor well on-site (MW-5D) is constructed as a Type III double-cased monitor well with the well screen submerged below the water table. The locations of existing and proposed monitor wells and piezometers which make up the water quality monitoring network are depicted on **Figure 2** and are described in **Sections 2.2 and 2.3**.

3.2.1 Pre Corrective Measures Construction

Currently the groundwater monitoring system consists of: nine (9) downgradient groundwater monitor wells; three (3) upgradient groundwater monitor wells; thirteen (13) piezometers; and, four (4) monitor wells for measuring groundwater levels. Two surface water sample locations (upstream and downstream) marked by staff gauges installed in the channel of Jerry's Creek are also monitored.

3.2.2 Post Corrective Measures Construction

After construction of the groundwater corrective measures devices is complete, the groundwater monitoring system will consists of: nine (9) downgradient groundwater monitor wells. Four of the nine monitor wells (MW-1B, MW-5, MW-6, and MW-12) will be used for detection and/or assessment monitoring program compliance wells. Five downgradient monitor wells (MW-11, MW-13, MW-14, MW-15, and MW-16) will be used to monitor groundwater corrective measures and groundwater levels. The

groundwater monitoring system will include three (3) upgradient groundwater monitor wells; two (MW-4 and MW-9A) for detection and/or assessment monitoring program background wells, and one (MW-3B) to monitor groundwater corrective measures and groundwater levels. Thirteen (13) piezometers (**Table 1**) and six (6) monitor wells (MW-5S, MW-5D, MW-7A, MW-8A, MW-9, and MW-10) will be used for measuring groundwater levels. Two surface water sample locations (upstream and downstream) marked by staff gauges installed in the channel of Jerry's Creek will also be monitored for detection and/or assessment monitoring program compliance points.

3.3 Sample Frequency

Two independent sampling events are required annually by the NCDENR DWM. The schedule for sampling the background, compliance and surface water sample locations identified for WQMP will be on a semiannual basis for 30 years post-closure of the MSW landfill. For each year, one sampling event will be in the summer (June/July) and the second in the winter (December/January), approximately six months apart. The detection and/or assessment monitoring schedule and parameters that will be analyzed are summarized in **Table 5**. The parameter list of Appendix I Detection Monitoring Constituents is presented in **Table 6.** Assessment monitoring will be performed based on constituent concentrations detected during Detection Monitoring. Parameters analyzed during Assessment Monitoring are listed in **Table 7.**

Monitored Natural Attenuation (MNA) parameters listed in **Table 8** will be analyzed to review natural attenuation on a semiannual basis for four consecutive monitoring events in order to establish comprehensive baseline conditions. At the conclusion of the baseline sampling period, the water quality data will be reviewed to determine which monitor wells need to continue being monitored for MNA parameters and if modifications to the MNA parameter list and sampling frequency are necessary. Baseline sampling for MNA was conducted in January and July 2010 and January and July 2011, however since the corrective measures identified in the CAP have not been implemented, new baseline sampling events will need to occur post corrective measures.

3.4 Monitor Well Sampling Procedures

Development, purging and sampling equipment for monitor wells are selected so that all materials are compatible with the sample parameters and comply with state and federal regulatory requirements for sampling. In the event that non-dedicated equipment is used (i.e., reusable water level meters or development pumps), equipment will be cleaned between wells in accordance with the cleaning procedures for field equipment (ref. **Section 2.4.3** Equipment Decontamination) or standard EPA approved methods.

Sampling activities for monitor wells will consist of the following steps:

- Equipment decontamination (water level meter)
- Initial well inspection
- Groundwater level measurements
- Well purging
- Field measurements

- Sample withdrawal and filling containers

These activities are listed in the order in which they will be conducted. The first action for well sampling will be to measure the groundwater levels (**Section 3.4.4**) and evacuate the wells, as described in **Section 3.4.5**. Water levels will be measured and wells evacuated prior to collecting the water quality samples. Due to the number of wells to be sampled, it may require two days to sample all the wells. In this event, only the wells that will be sampled that day will be evacuated. Groundwater levels for the network monitor wells and piezometers will be obtained within a 48-hour period.

After the wells have been evacuated groundwater samples will be collected as described in **Section 3.4.6**. Sample collection will start with the first well that was evacuated and will continue in the order of evacuation. The evacuation and sampling order will be conducted from the least contaminated well to the most contaminated well based on historical laboratory results.

3.4.1 Equipment Decontamination

The water level meter and sampling equipment used to perform procedures required for sampling will be decontaminated in general accordance with the methods outlined in **Section 2.4.3** of this plan.

3.4.2 Initial Inspection

The sampling area around the wellhead should be prepared and an initial inspection of the well should be conducted prior to sampling. Activities should be performed to prevent cross contamination or environmental contamination. Fuel-powered equipment and other support equipment which might impact sample quality should be placed away from sampling activities (e.g., purging, sampling, decontamination) in the downwind direction.

1. Remove the well cover and remove all standing water around the top of the well casing (manhole) before opening the well.
2. Inspect the exterior protective casing of the monitoring well for damage. Document the results of the inspection if there is a problem.
3. Place a protective covering around the well head. Replace the covering if it becomes soiled or ripped during sampling.
4. Inspect the well lock and determine whether the cap fits tightly. Replace the cap if necessary.

Observations, including site conditions, personnel, equipment, etc. should be recorded in the field logbook, or sample data collection form, and repairs should be made as necessary to maintain integrity of the well and the dedicated sampling equipment.

3.4.3 Groundwater Level Measurements

Groundwater levels for the network monitor wells and piezometers will be obtained within a 48-hour period. Water levels will be measured with an electronic water level indicator that consists of a spool of dual conductor wire, a probe attached to the end, and an audible and/or visual alarm. When the probe comes in contact with water, the circuit

is closed and a meter buzzer and/or light attached to the spool signals the contact. Before the water level measurement is made, the measuring device will be decontaminated and site personnel will don proper personal protective equipment (PPE) before initiating site monitoring activities in accordance with the site Health and Safety Plan.

Monitor wells and piezometers will be gauged in order from least to most contaminated (based on total VOC concentrations) from the most recent analytical data from the well. The collection order will minimize potential impacts to sample locations from cross contamination or carry-over. The depth to groundwater will be measured in all monitoring wells during each semiannual groundwater monitoring event. The water level will be measured by slowly lowering the instrument probe into the well until the water level indictor contacts the water activating an alarm. The depth to the water from the highest point on the well casing will be measured and recorded to the nearest 0.01 foot. After the measurement is made, the water level probe and lead will be cleaned with a detergent and potable water solution, and rinsed with clean deionized or HPLC-grade water.

Total well depth measurements (bottom of well) have been taken at each of the existing monitor wells. Total well measurements should not be taken during sampling events at monitor wells equipped with dedicated bladder pumps, or other low flow sampling equipment. Attempts to collect total depth measurements at wells with dedicated sampling equipment may damage the sampling equipment, wedge the measurement tools, or unnecessarily agitate water inside the well.

If a well is to be sampled, which is not equipped with dedicated sampling equipment, total depth measurements should be taken using decontaminated sampling equipment to calculate the volume of water in the well as described in **Section 3.4.4.2**.

3.4.4 Well Evacuation (Purging) and Sampling

First attempts to collect the water quality samples from monitor wells will be made using low flow purging and sampling equipment and techniques. The low flow sampling technique is most representative of the water in the formation adjacent to the well screen when the pump discharge does not draw down the water level in the well. Monitor wells will be purged in order from least to most contaminated (based on total VOC concentrations) from the most recent analytical data from the well. The sample collection order will minimize potential impacts to sample locations from cross contamination or carry-over. During purging activities the multi meter, flow through cell and measuring devices will be decontaminated between locations and site personnel will don proper PPE and change gloves before initiating site monitoring activities in accordance with the Health and Safety Plan. Investigation derived waste such as nitrile gloves and used sample tubing will be disposed of in accordance with solid waste rules. Liquid wastes will be stored on-site and properly disposed after the analytical data is used to characterize the waste for disposal.

3.4.4.1 Low Flow Purging with Peristaltic Pump or Dedicated Bladder Pump

Equipment Set Up - Monitor wells at the Edgecombe County landfill will be equipped with dedicated down-hole sample tubing. The flexible Teflon®-lined tubing section will be inserted into each well so that the end of the tubing is located approximately mid-point of the saturated section of the well screen. The tubing will be Teflon®-lined polyethylene or Teflon®-lined PVC material with an approximate outside diameter of 0.375 inches. The tubing will be dedicated to the well and remain in the well between sampling events. This tubing has been approved by the DWM for sites using dedicated sampling pumps.

The flexible Teflon®-lined tubing will be attached to a short length of new flexible peristaltic pump tubing made of silicon, or other non-reactive tubing designed for use with peristaltic pumps and compatible with the constituents that may be present in groundwater. A new section of flexible tubing will be used one time at each well. Flexible tubing will not be reused between wells or subsequent sample events. A variable-speed peristaltic pump will be used that is capable of generating flow rates less than 100 milliliters per minute.

Purge Method - The following low flow purging technique will be employed. The stagnant water in the tubing from the previous sampling event will be removed by operating the pump to remove a minimum of one discharge tubing volume. This is estimated to be approximately 200 ml. It is recommended that the initial purge water be discharged to a container to bypass the flow cell and multi meter to avoid fowling with sediment. Once the initial sediment load in the purge water is cleared, then attach flow to the cell for monitoring. The pump will be operated at a low flow rate during purging. This rate will be less than the well recovery rate and in no case will exceed 500 ml/min. Also, the purge rate will be low enough that recharge water does not become excessively agitated or that colloids are drawn into the well bore. The recovery rate of the well will be evaluated during pumping with the use of a decontaminated water level probe.

Water levels should be measured in the well during well purging to determine drawdown of water within the well. The pumping rate should be adjusted in the well to reduce or negate drawdown in the well. If water levels are drawn down, the stagnant water portion of the water column can become mixed. If this occurs, a modified low flow method should be employed.

Water should be purged from the screened interval of the well at a flow rate ≤0.10 liter/minute. If large volumes of groundwater are needed for analyses, sampling time can be increased while pumping at low flow rates, or if well yield is adequate, the flow rate may be increased to ≤1.0 liter/min.

Representative Sample Volumes - When purging a well that has the pump intake within a fully submerged well screen, and drawdown of water within the well does not cause mixing of the stagnant water column of the well, the following volumes will removed:

- A minimum of one (1) volume of the pump, associated tubing and flow cell (if used) prior to collecting measurements of the field parameters.

- Field parameter measurements should be taken no sooner than two (2) to three (3) minutes apart.
- At least three (3) volumes of the pump, associated tubing and flow cell (if used) should be purged prior to collecting a sample.

Modified Low Flow Sample Volumes - If water levels are drawn down, and it is suspected that the stagnant water portion of the well has become mixed with representative samples from the natural formation, the following well volumes will be removed:

- A minimum of one (1) equivalent well volume is removed prior to measuring the indicator parameters.
- Field parameter measurements should be taken no sooner than two (2) to three (3) minutes apart.

Indicator parameters are recorded until stabilization is achieved (**Section 3.4.5**) and samples are collected (**Section 3.4.6**).

3.4.4.2 Purging with a Bailer

Hand bailing will be performed if low flow techniques are unsuccessful. The following technique will be employed if the samples are collected from a groundwater monitor well which is not equipped with a dedicated bladder pump, if the pump malfunctions, or if no operable peristaltic pump is available. First remove any dedicated sample tubing or equipment from the well and allow the well time for the water level to equilibrate. Using a decontaminated water level meter and either decontaminated or new stainless steel, Teflon®, PVC, or polyethylene bailer (re-usable or disposable), the following procedures will be performed.

Water level measurements will be performed to determine the static groundwater elevations and to calculate the volume of standing water in the well. All depth and water-level measurements will be referenced to the top of the well casing (inner PVC casing) and recorded to the nearest one-hundredth of a foot. Total well depth (if unknown) and water level measurements will be made with an electronic measuring device graduated in feet to the nearest ±0.01 feet. The depth and water level are used to determine that the well has not filled with silt and to calculate the volume of standing well water. The volume of well water (in gallons) is calculated using the following equation:

$$\mathbf{V = h \times \pi r^2 \times (7.48052\ gal/ft^3)}$$

where V = volume of standing water (gallons)
h = height of standing water (feet) = casing depth - water level
r = radius of well casing (feet)

The well depth, water level measurement, and calculated well volume will be recorded in a dedicated field book or sample collection form. After the water level measurements are made, a minimum of three (3) well casing volumes of groundwater will be purged from the wells. If the well is purged dry before the three casing volumes are removed, the well

will be allowed to recover to within 90 percent of its original level within 24 hours before sampling without additional bailing.

3.4.5 Field Parameter Measurements

During groundwater purging activities, the well effluent will be sampled and field parameters including temperature, specific conductance, dissolved oxygen (DO), turbidity, or pH of the groundwater will be measured and recorded after each a volume of groundwater is purged based on the purge method described in **Section 3.4.4.2**.

A multi-parameter water quality monitoring instrument will be used to measure field indicator parameters for establishing representative groundwater. These instruments should be calibrated with reference standards prior to and after each sampling day or in accordance with the manufacturer's specifications. Calibration results will be recorded in the field book or sample data collection form.

Field measurements of chemical parameters will be taken to indicate when purging is complete and sampling may begin. The measurements may be made periodically in accordance with the purge volumes indicated in **Section 3.4.4.2**, or preferably on a continuous basis using a multi-parameter probe installed in a flow cell connected to the outlet of the well pump. If a flow through cell is not used, purge water may be poured into a separate container and used to measure field parameters while sampling. This container shall not be used to fill or store record sample containers or duplicate sample containers. After the static water in the sampling equipment or well is removed by pumping/bailing, then pumping/bailing and monitoring continues until the chemical parameters have stabilized.

The following criteria define stabilization:

Temperature: ± 0.2° C
pH: ± 0.2 Standard pH Units
Conductivity: ± 5% of prior reading
Dissolved Oxygen: ± 10% of prior reading or ± 0.2 mg/L, whichever is greater
Turbidity: ± 10% prior reading or ± 10 NTUs, whichever is greater

3.4.6 Sample Collection

Samples should be collected immediately after purging is complete. The time period between completing the purge and sampling should not exceed six hours. If sample collection does not occur within one hour of purging completion, re-measure the five field parameters: temperature, pH, specific conductance, dissolved oxygen and turbidity, just prior to collecting the sample. If the measured values are not within 10 percent of the previous measurements, re-purge the well. The exception is wells which have been purged dry.

Sampling personnel will wear clean, disposable, non-powdered nitrile gloves during sample collection for each well. Unless field conditions justify other sampling regimens, samples will be collected in the following order:

1. Volatile Organics and Volatile Inorganics
2. Extractable Organics [semi-volatile organics (SVOCs), organochlorine pesticides and PCBs], Petroleum Hydrocarbons, Aggregate Organics and Oil and Grease
3. Total Metals
4. Inorganic Non-metallic, Physical and Aggregate Properties
5. Biological and Microbiological Parameters

If groundwater samples for metal analysis have a turbidity ≤ 10 NTU, the sample is collected and preserved. If turbidity is > 10 NTU, an additional sample may be collected for dissolved metals to be run separately by the laboratory if a metal is detected above groundwater protection standards. Samples collected for dissolved phase metals analysis will be field filtered. The results of the dissolved phase analysis may indicate the occurrence of the suspect metal is a result of high turbidity within the unfiltered sample.

Samples collected for volatile organics analysis will be poured slowly into glass 40-ml VOC containers fitted with Teflon® caps. The containers will be filled to the top to eliminate headspace or air bubbles. Samples collected for metals analysis will be collected in polyethylene containers. The containers are most often plastic bottles containing a small volume of nitric acid preservative. Samples collected for SVOC analysis will be collected following collection of the inorganic compounds. Generally the SVOCs are collected in unpreserved one liter amber bottles. These bottles should be rinsed prior to filling.

3.4.6.1 Sample Collection with a Peristaltic or Bladder Pump

For wells sampled using a peristaltic pump or dedicated bladder pump, the pump and sample tubing will be compatible to chemical constituents likely present at the site. During sample collection with the peristaltic or dedicated bladder pump, the sample containers will be filled directly from the discharge tubing into the sample container without the tubing contacting the well's outer casing, multi-meter flow-through cell, container used to monitor purge parameters (when a flow-through cell is not used) sample bottle, or the ground. The sample will be handled in a way to minimize aeration. The discharge will be regulated so that the sample will be delivered at a slow rate of approximately 100 to 300 ml/min directly into the sampling container with minimal turbulence, aeration, or volatilization. The pump will be operated at a low flow rate until each container has been filled. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers. Following sampling, filled sample containers will be labeled and placed in an insulated cooler with ice.

3.4.6.2 Sampling with a Bailer

During sample collection with a bailer, the bailer will be slowly lowered into the water column until full, then slowly retrieved. The sample containers will be filled by slowly pouring the groundwater from the bailer directly into the sample container without the bailer contacting the well's outer casing, sample bottle, or the ground. The sample will be handled in a way to minimize aeration. For the volatile organic containers, no air bubbles or "head-space" will be allowed in the containers. No more than two sample containers

per bail should be filled. Following sampling, filled sample containers will be labeled and placed in an insulated cooler with wet ice. The bailers will be properly disposed of following sampling. Field cleaning and re-use of bailers is not recommended. A new disposable bailer is required for each monitoring well.

3.5 Sampling Surface Water/Leachate/Condensate

The following sampling procedures are referenced from "EPA Standard Operating Procedures" and *"North Carolina Water Quality Monitoring Guidance Document for Solid Waste Facilities*", (NCDENR, 1987) and *Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling* (NCDENR, April 2008). As previously described, surface water samples are currently collected from Jerry's Creek at the Edgecombe County Landfill. The following surface water sampling guidelines should apply.

The actual sampling point in the stream or creek will be in an area of minimal turbulence and aeration. The sampling point will not be located at a constriction (where creek narrows), immediately upstream or downstream of a confluence with a tributary, nor immediately upstream or downstream of any significant structure in the creek that may result in turbulence. To the extent possible, a single grab sample will be taken at mid-depth, at the center of the channel, in an area that exhibits the greatest degree of cross-sectional homogeneity.

Surface water samples will be collected in decontaminated open top Teflon®, or stainless steel containers, or collected directly into laboratory supplied sample bottles. Sampling activities for surface water, condensate, or leachate (if necessary) will consist of the following steps:

- Equipment Decontamination (where applicable)
- Staff gauge reading
- Sample collection
- Field measurements
- Filling sample containers

If a staff gauge is installed at the sample location, the surface water level to the nearest 0.01 foot will be recorded in the field book or field sampling forms. To the extent possible, leachate/condensate should be sampled simultaneously during the regular semiannual sampling event. A single grab sample shall be taken at mid-depth, at the center of the water column, in an area that exhibits the greatest degree of cross-sectional homogeneity. Direct dipping of the sample container into the surface water body, stream, sump, basin, or structure is the most desirable method of collection, but a laboratory cleaned container, decontaminated Teflon® bailer or dipper may be used. The sample container should be rinsed with the water to be sampled prior to filling the container, unless preservatives have been added. The sample container, bailer or dipper shall be lowered to the desired depth in the surface water body, stream, sump, basin, or structure and the sampling device or container removed. Care should be taken to not allow sediment or other debris to enter the sample container. If the liquid level is not deep

enough to submerse the sample container in the water, a temporary depression in the basin, sump, or outfall bottom, may be created and used to collect the sample. After the sample has been collected, the sample container should be lifted from the water, or if the sample container is not used to collect the sample, the sample will be poured directly into the sample container minimizing aeration and turbulent flow during the fluid transfer. The containers for volatile organic samples shall be filled to the top without bubbles or headspace. The containers should be placed in protective cooler with wet ice for shipping.

3.6 Field Reporting Requirements

The sample collector will record all pertinent information regarding the purging and sampling of monitoring wells or surface water samples in a field book or sample collection data form. The field data will be recorded and retained in the operating record files. The data will also be submitted to the appropriate State agencies. The information will include at a minimum the following:

1. Well identification number;
2. Well depth; casing inside diameter, casing volume;
3. Static water level depth and measurement technique measured from top of casing to the water surface;
4. Presence of immiscible layers and detection method;
5. Well yield – high or low;
6. Purge volume or pumping rate and the time that purging was initiated and completed;
7. Sample identification numbers;
8. Well evacuation procedure/equipment;
9. Sample withdrawal p4ocedure/equipment;
10. Sampling date and time collected;
11. Sample volume, container type, and preservatives added to the sample;
12. Identification of replicates or blind duplicates;
13. Preservative(s) used;
14. Parameters requested for analysis, reason for sampling;
15. Field analysis data and methods (ie. pH, temperature, specific conductance (conductivity), DO, and nephelometric turbidity;
16. Sample distribution and transporter;
17. Field sample observations, i.e., color, odor;
18. Name of Collector;
19. Weather conditions at the time of sampling (wind, air temperature);
20. Site name and location;

3.7 Sample Storage and Transport

3.7.1 Sample Containers and Preservative

All sample containers supplied for the collection of groundwater samples by the laboratory are new, pre-cleaned as approved by EPA procedures appropriate for the parameters of interest. Sample containers are kept closed until used. The laboratory

performing the analyses will supply all necessary coolers, pre-cleaned containers marked with accurate tare weights on pre-weighed sample containers, trip blanks, chemical preservatives, labels, custody seals, and chain-of-custody and shipping forms. Adequate instructions to the laboratory will be given in advance of each monitoring event. Details concerning any changes to the monitoring plan and/or procedures will be given to the laboratory in writing prior to the field sampling personnel arriving on the site. A specific contact person will be established at both the facility and contract laboratory for communication between the two parties. Sample containers need to be constructed of a material compatible and non-reactive with the material it is to contain. A complete set of new or pre-cleaned and pre-labeled sample bottles supplied by the contract laboratory for the well to be sampled will be removed from the cooler. A groundwater sample from a decontaminated bailer or new or disposable, stainless steel, PVC, or Teflon® bailer or tubing from a dedicated well pump will be poured into a fresh container. Preservatives will be added as necessary (in accordance with EPA Methods SW- 846) to the sample bottles either by the laboratory or in the field immediately prior to sampling. One trip blank prepared by the laboratory will be analyzed for each sampling event.

In special circumstances when the facility must obtain its own containers, these containers shall be purchased from local container distributors with the exception of the septum vials and PTFE (e.g. Teflon®) lined caps required for organic analyses which are available from laboratory supply companies. Metal lids shall not be utilized for any sample containers.

3.7.2 Sample Labeling

Sample containers are labeled and organized prior to field activities as part of the pre-sampling staging process. As samples are collected, the sampling personnel will write the following information directly on the label:

1. sample identification,
2. sampling date and time, and
3. initials of sample collector.
4. analysis requested
5. preservative(s), if any
6. project/site name, and
7. any other pertinent information for sample identification.

This information is also recorded in the field book or sample data form and on the chain of custody (COC) record.

3.7.3 Chain-of-Custody and Sample Transportation Requirements

Chain-of-custody procedures will be used to establish documentation tracing sample possession from the time of sample collection until completion of analysis. The chain of custody will be used by the field personnel responsible for ensuring integrity of the samples from the time of collection to shipment to the laboratory. The laboratory will not proceed with sample analysis without a correctly prepared chain-of-custody form. The

laboratory will be responsible for maintaining custody of the samples from the time of receipt to their disposal.

3.7.3.1 Chain of Custody Form

The chain-of-custody form will include the following:

- Sample identification number
- Signature of collector (sampling personnel)
- Date and time of sample collection
- Identification of well
- Sample type (e.g., groundwater, immiscible layer)
- Number of containers
- Preservative used
- Parameters requested for analysis
- Preservative used
- Unique identification for each sample
- Signature of each person that has maintained possession of the samples
- Inclusive date and time of possession
- Air Bill Number, if the samples are shipped by common carrier

3.7.3.2 Sample Custody, Shipment and Laboratory Receipt

For the purpose of these procedures, a sample is considered in custody if it is:

- In actual possession of the responsible person;
- In view, after being in physical possession;
- Locked so that no one can tamper with it, after having been in physical custody; or in a secured area, restricted to authorized personnel.

All samples are maintained in the custody of the sampling crew during the sampling event. At the end of each sampling day and prior to the transfer of the samples off-site, chain-of-custody entries are completed on the COC for all samples. Upon transfer of custody, the chain-of-custody form is signed by a sampling crew member, including the date and time. All chain-of-custody forms received by the laboratory(s) are signed and dated by the respective Supervising Scientist(s) or their designee, or the laboratory sample custodian (at vendor labs) immediately following receipt by the laboratory. The analysts at the laboratory(s) maintain a sample-tracking record that will follow each sample through all stages of laboratory processing. The sample tracking records show the date of sample extraction or preparation, and analysis. These records are used to determine compliance with holding time limits during lab audits and data validation.

3.7.4 Laboratory Analytical Parameters

Laboratory analysis parameters listed in **Table 5** represent compound detections that will be monitored on a semiannual schedule. The parameters that will be tested at each location will include the Appendix I list of volatile organic and inorganic constituents in 40 CFR Part 258. This list will be verified and updated if new constituents are detected. The groundwater quality monitoring data will be compared to the North Carolina

Groundwater Standards, 15A NCAC 2L 0202, or NCDENR DWM Groundwater Protection Standards, where applicable. Sample analyses will be performed by a NCDENR "certified" laboratory. All data will be subjected to quality assurance and quality control protocols per NCDENR. Only analytical methods that are acceptable to NCDENR DWM will be used by the laboratory. Analysis must achieve Solid Waste Section levels (SWSLs) and Method detection Levels (MDLs) per the memo dated February 2007 distributed by the Solid Waste Section.

If one or more constituent concentration from Detection Monitoring is reported with a statistically significant increase in concentration over background of the list of Appendix I constituents, or if the detection is a violation of the North Carolina Ground Water Quality Standards, the owner or operator shall within 14 days of this finding report to the Division and place a notice in the operating record indicating which constituents have shown statistically significant changes from background levels. The owner/operator may demonstrate that the source was other than a MSWLF unit caused the contamination or that the detection resulted from sampling error, analysis, statistical evaluation or natural variation in groundwater quality per .1633(c)(3). Assessment Monitoring is required within 90 days of triggering an assessment monitoring program and annually thereafter when the contamination is found to result from the MSWLF unit. The Assessment Monitoring Program includes monitoring for constituents listed in Appendix II of 40 CFR Part 258.

3.8 Quality Control

3.8.1 Contamination Prevention

Personnel should take special effort to prevent cross contamination or environmental contamination when collecting samples.

- If possible, collect samples from the least contaminated sampling location (or background sampling location, if applicable) to the most contaminated sampling location.
- Collect the ambient or background samples first, and store them in separate ice chests or separate shipping containers within the same ice chest.
- Collect samples in flowing water at designated locations from upstream to downstream.

Do not store or ship highly contaminated samples or samples suspect of containing high concentrations of contaminants in the same ice chest or shipping containers with other environmental samples.

- Isolate sample containers by sealing them in separate, untreated plastic bags immediately after collecting, preserving, labeling, etc.
- Use a clean, untreated plastic bag to line the ice chest or shipping container.

The sampling equipment should be thoroughly decontaminated and transported in a manner that does not allow it to become contaminated. Arrangements should be made

ahead of time to decontaminate any sampling or measuring equipment that will be reused when taking samples from more than one well. Field decontamination of sampling equipment will be necessary before sampling each well to minimize the risk of cross contamination. Decontamination procedures should be included in reports as necessary. Certified pre-cleaned sampling equipment and containers may be used. When collecting aqueous samples, rinse the sample collection equipment or sample container with a portion of the sampled water before taking the actual sample. Sample containers do not need to be rinsed in the case of containers with pre-measured preservatives.

Place all fuel-powered equipment away from, and downwind of, any site activities (e.g., purging, sampling, decontamination).

- If field conditions preclude such placement, place the fuel source(s) as far away as possible from the sampling activities and describe the conditions in the field notes.
- Handle fuel (i.e., filling vehicles and equipment) prior to the sampling day. If such activities must be performed during sampling, the personnel must wear disposable gloves.
- Dispense all fuels downwind. Dispose of gloves well away from the sampling activities.

3.8.2 Quality Control Samples

Trip Blank - A trip blank will be prepared for each sample event to evaluate possible sample contamination that may occur during transport to and from the site. Trip blanks will be prepared by the laboratory and will accompany the sample containers from the laboratory to the field. The trip blank will be labeled and remain unopened throughout the duration of the field activities and subsequent shipment of the filled containers back to the laboratory. Trip blanks will be analyzed for the Appendix I or the expanded Appendix II volatile compound list using EPA Method 8260, depending on the sample analysis requirements.

Equipment Blank - To evaluate the effectiveness of the decontamination process and/or influence from new equipment and PPE used during sampling on the samples. The equipment rinse blank will be prepared during each sampling event by pumping laboratory-supplied deionized water through a new piece of silicone pump tubing, across the probe of the water level meter, across sample gloves into a second empty laboratory-supplied sample container. In the case where a bailer or dedicated pump is used to collect the samples, the equipment rinse blank will be prepared by pouring laboratory-supplied deionized water directly into the sampling equipment and then transferring the water directly into the laboratory-supplied containers. One equipment blank will be collected for each sampling event. The equipment blank will be analyzed for the each Appendix I and/or Appendix II parameter of the record samples.

Field Duplicate - One duplicate sample will be analyzed for each parameter as the record samples for each sampling event. At least one duplicate sample will be collected during each sampling event. The sampling personnel will select a sampling location at random

in the field and the location will be identified in the logbook. When the selected location is sampled, an additional set of sample containers will be prepared and labeled with the sample location listed as "duplicate". The sampling date will be recorded on the container and chain-of-custody form, but not the time of sample collection. The time of duplicate sample collection will be noted in the field book. Sample containers for the record and duplicate sample will be filled at the same time, alternately, to maximize the reproducibility of analyses between the record and duplicate sample containers.

The filled sample bottles will be securely placed into a pre-cleaned cooler with ice and a completed chain-of-custody form prior to shipping to a laboratory for analysis. The insulated cooler or shipping container will be secured with tape if shipped to the laboratory by means other than hand delivery. Upon completion of sampling, the well will be capped and secured.

3.8.3 Sample Storage and Transport

Sample labels will be attached to each sample bottle. The sample labels will be used to identify the sample location, date and time of collection, sample collector, parameters to be analyzed, and type of preservation. A security seal will be placed on the insulated cooler or the taped shipping container to insure the samples are not disturbed during transportation when shipped by means other than hand delivery.

3.8.4 Chain-of-Custody and Analysis Request Forms

A chain-of-custody record will be kept for each sample, and will be filled out at the time of sample collection. Information contained on a chain-of-custody record generally matches the requirements of EPA's RCRA Technical Enforcement Guidance Document (TEGD). A sample analysis request sheet will also be filled out at the time of sample collection. Information for the sample request sheet can be incorporated in the chain-of-custody record.

3.8.5 Laboratory Activities

A laboratory logbook(s) will be maintained by the laboratory for tracking the storage, processing and analysis of each sample. The laboratory logbook will contain information on sample storage location; preparation techniques, such as digestion or extraction methods; instrumentation used for sample analysis; results of routine QC samples for each batch of samples analyzed; and dates, times, and personnel performing each processing and analysis step.

In addition to a laboratory log book and chain-of-custody, laboratory measures used to ensure the acceptability of analytical results include the use of calibration blanks, calibration verification standards, sample spikes, surrogate spikes, and laboratory replicates. Results of analyses on these quality control measures will be reported with the results of the record sample analyses. The quality control samples (calibration blanks and control standards, sample spikes, surrogate spikes, and laboratory replicates) will be analyzed at a minimum frequency of one per 20 samples, or one per analytical batch, whichever frequency is greater.

4.0 DATA EVALUATION AND REPORTING

As referenced in the North Carolina Solid Waste Management Rules (15A NCAC 13B, Section .0600), solid waste management facilities are required to provide such groundwater monitoring capability as the NCDENR determines to be necessary to detect the effects of the facility on the groundwater in the area. Upon completion of field sampling activities and receipt of laboratory analysis, data should be compiled and reviewed for quality and accuracy with the objective of identifying if a release has occurred from the landfill into the uppermost aquifer.

4.1 Validation of Field Data Package

The field data package includes all of the field records and measurements developed by the sampling team personnel. The field data package validation procedure consists of:

- A review of field data contained on the Groundwater Monitoring Data Sheets for completeness.
- Verification that equipment blanks, field blanks, and trip blanks were properly prepared, identified, and analyzed.
- A check of the Field Sampling Calibration Form for equipment calibration and instrument condition.
- A review of the chain-of-custody Record for proper completion, signatures of field personnel and the laboratory sample custodian, and dates, and for verification that the correct analyses were specified.

4.2 Detection Monitoring

Detection monitoring and the associated sampling and analysis are performed to provide an accurate representation of groundwater quality in the upgradient (background) and downgradient (compliance) locations. Detection Monitoring includes analysis of background and compliance monitor locations for Appendix I list of volatile organic and inorganic constituents in 40 CFR Part 258. A complete list of all Appendix I Constituents is included in **Table 6**. Constituent concentrations detected in the compliance monitoring data under the Detection Monitoring Program will be compared to NCAC 2L Groundwater Standards (2L Standards) to see if any concentrations are above 2L Standards, and will be analyzed statistically to determine if a release has occurred based on background and compliance point results.

4.3 Statistical Analysis

The statistical methods used to analyze the data will be those outlined in EPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance (July 1992) which has been adopted by the North Carolina Department of Environment and Natural Resources Solid Waste Management Guidelines 15A NCAC 13B.1632. The statistical method chosen to evaluate ground-water monitoring data will comply with the standards outlined in 15A NCAC 13B Part .1632. The statistical analysis is performed to determine if a statistically significant increase over background values has occurred in any of the downgradient compliance monitoring points.

If a new monitor well is added to the water quality monitoring network, a statistical analysis will be applied after the completion of four baseline sampling events for the newly established groundwater quality monitoring network. If through the statistical analysis it is determined there is a statistically significant increase over background values at any water quality monitor well, a report detailing the findings will be submitted to the NCDENR - Solid Waste Section within 14 days of completing the statistical analysis.

Prior to determining the appropriate statistical method to use for Detection Monitoring data, the distribution of the compliance data set will be evaluated. The appropriate statistical method will be chosen based on the distribution of the compliance data set. All analytical reports will be completed with referenced analytical methodologies, QA/QC documentation, field logs, analysis request forms, chain-of-custody forms, and parameter concentrations.

The groundwater analytical results will be evaluated to determine if statistically significant evidence of contamination exists between the "background" (upgradient) well samples and the "compliance" (downgradient) well samples. Statistics will be applied on well locations that have four or more data points to analyze. One or more of the following statistical tests will be used:

- Shapiro-Wilk Normality Tests
- Shapiro-Francia Normality Tests
- Parametric analysis of variance using comparison of mean values.
- Parametric analysis of variance using comparison of median values.
- Parametric or Non-parametric Tolerance Intervals.
- Parametric or Non-parametric Prediction Intervals.
- Control chart approach.
- An alternative chosen by the operator and acceptable to the Division.

A determination will be made whether or not there is a statistically significant increase over background values for each analytical parameter. Within 14 days of completing the statistical analysis for the analytical data, the operator will submit a report to the Division. The report will include field observations relating to condition of monitoring wells, field data, statistical analysis, sampling methodologies, chain-of-custody records, QC/QA data, information on groundwater flow direction, groundwater flow rate calculations, effective porosity of formation materials (at screened interval), constituents that exceed the statistically computed Upper Limits for each well and any other pertinent information related to the sampling event.

If there is a statistically significant increase over the background levels or an exceedance of state 2L Standards for any constituent on the specific parameter suite being analyzed, the well(s) will be re-sampled within the compliance period (prior to the next routine monitoring event) to verify the water quality data. If the additional data support the conclusion of a statistical increase in compliance well(s) is verified the following will be performed:

- Report to the Division and place a notice in the operating record within 14 days of finding indicating the constituents exceeding background levels; and, either

- Demonstrate that either a source other than the landfill unit caused contamination or that an error in sampling, analysis or evaluation occurred; or

- Establish an Assessment Monitoring Program meeting the requirements of Rule 15A NCAC, 13B Part .1634 of within 90 days that includes sampling of all detection monitoring wells for Appendix II (EPA, Subtitle D Regulations) constituents.

4.4 Assessment Monitoring

If a statistically significant increase in constituent concentrations in the compliance well(s) confirm a release from the MSWLF unit, then within 90 days following the confirmation of a statistically significant increase an Assessment Monitoring Program will be implemented. The assessment monitoring will be designed to meet the requirements of 15A NCAC - 13B Part .1633. The program will be designed to assess the rate and extent of migration of leachate in the groundwater. Within 90 days after the Assessment Monitoring Program is triggered, additional groundwater samples will be collected from the compliance (downgradient) wells and analyzed for constituents in Appendix II of 40 CFR Part 258. A complete list of all Appendix II Constituents is included in **Table 7**. Following analysis of these samples, both background and compliance wells will be re-sampled and analyzed for any Appendix II constituents detected in the down-gradient wells. Four independent samples will be collected from each monitoring well and analyzed to establish a baseline for the new constituents.

The background concentration, as defined by the up-gradient wells, will be established for each of the Appendix II constituents detected from the samples. Background to compliance well concentrations will be statistically tested using the methods outlined in **Section 4.2** of this document. Groundwater protection standards will also be developed for each Appendix II constituent detected in the down-gradient wells. These standards will be based on background levels in the upgradient wells as well as the established 15A NCAC 2L groundwater quality standards (2L standard) established by the State of North Carolina. If the constituent does not have a 2L standard, or the background concentration exceeds the 2L standard, the protection standard will be based on either the background concentration or North Carolina's published Groundwater Protection Standard for the particular constituent.

If the concentrations of all Appendix II constituents are shown to be at or below background values using the approved statistical procedures for two consecutive sampling events, the owner or operator shall report this information to the DWM, and the DWM may give approval to the owner or operator to return to the Detection Monitoring Program. If the concentrations of the Appendix II constituents for the compliance wells are statistically higher than the background wells but are below the 2L standards or Groundwater Protection Standards (GPS), then assessment monitoring will

continue. Sample frequency for the assessment monitoring will be semi-annual for the active life of the facility, or until the Detection Monitoring Program is reinstated, or corrective measures are required. If as a result of the assessment monitoring, it is determined that there is a statistically significant increase in concentration for compliance wells for constituents under Appendix II on a point comparison basis compared directly to the 2L Standard or GPS, NCDENR will be notified within 14 days of this finding. At this point, requirements under §.1635 will be implemented. Once the appropriate corrective measures are approved, a Corrective Action Monitoring program will be implemented per 15A NCAC 13B.1635. A complete list of all Appendix II Constituents is included in **Table 7**.

4.5 Corrective Action Monitoring

The NCAC 2L Groundwater Quality Standards (2L Standard) or the Solid Waste Section, Groundwater Protection Standard (GWPST) have been exceeded for several target constituents in groundwater near the north-northeastern property boundary at the facility. The nearest receptor north-northwest of the facility is Jerry's Creek.

A Nature and Extent Study (NES) and an Assessment of Corrective Measures (ACM) were performed to characterize the nature and extent of the release and identify several potential solutions or corrective measures which could be implemented to address the migration of groundwater contaminants beyond the compliance boundary.

Following meetings for public questions and input, in-situ isolation combined with monitored natural attenuation (MNA) were selected to remediate the constituents of concern (CoCs). In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the COCs at the landfill. The in-situ isolation and MNA remedies selected at the Edgecombe County Landfill will involve the following:

(1) In-situ Isolation: Upgradient groundwater barrier/containment wall
(2) In-situ Isolation: Maintain consistent contour with pre-1998 waste area elevations
(3) In-situ Isolation: Increase slopes over the closed MSW unit
(4) In-situ Isolation: Stormwater improvement on the western portion of landfill
(5) Monitored Natural Attenuation (MNA)

Baseline sampling for MNA was conducted in January and July 2010 and January and July 2011, however since the corrective measures identified in the CAP have not been implemented, new baseline sampling events will need to occur post corrective measures. An April 19, 2013 S&ME, on behalf of Edgecombe County, generated a letter to NCDENR-DWM documenting the outcome of a meeting between S&ME and NCDENR. The letter documents the discussions concerning modifying the SAP as a result of the *Baseline Sampling and Monitored Natural Attenuation (MNA) Report* dated July 2012 and the meeting between S&ME and NCDENR where the NCDENR approved modifications to the SAP, in which geochemical parameters are to be temporarily discontinued until corrective measures detailed in the CAP are implemented. Once the

corrective measures in the CAP are in place, the revised SAP for MNA and the geochemical parameters will be implemented.

Analysis of MNA parameters and groundwater level monitoring have been incorporated into the facility's updated WQMP to evaluate the effectiveness of the remedial measures. The monitor well/piezometer locations and parameters used to evaluate MNA are summarized in **Table 8**. The monitor well network that will be used to evaluate groundwater levels at the site are depicted on **Figure 2** and include a network of background and compliance wells, monitor wells, piezometers that are listed on **Table 1** and surface water locations also listed on **Table 8**.

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

4.6 Report Contents and Submission

A report shall be submitted to the NCDENR which will include, at a minimum, a summary table of the field and laboratory data and a cover letter describing sampling methodology and data trends will be submitted to the NCDENR-DWM within 90 days of sampling. The DWM will be notified in the event that vendor lab analyses have not been completed within this time frame. At a minimum the report shall include the following information: field observations relating to the condition of the monitoring wells, field data, laboratory data, statistical analysis, sampling methodologies, quality assurance and quality control data, information on ground-water flow direction, calculations of ground-water flow rate, for each well any constituents that exceed ground-water standards or show a statistically significant increase over background levels, and any other pertinent information related to the sampling event.

The report should also include a site topographic map depicting the configuration of the landfill pursuant to the permit description. This map should clearly show the permitted location of the landfill with respect to the entire property.

All Groundwater Monitoring Data Sheets, Field Calibration Forms, Chain-of-Custody Record, Laboratory(s) Quality Assurance data, and Data Validation Checklists, not included in the report, should be kept on file and made available to NCDENR upon request.

4.7 Qualifications of Report

Groundwater monitoring reports will be prepared for the use of Edgecombe County for specific application to this project. The reports will be prepared in accordance with generally accepted engineering and hydrogeologic practices for projects of this type by

North Carolina licensed professional engineers or geologists. The findings and recommendations contained in these reports will be based on applicable standards of our profession (ie. Groundwater Standards, Surface Water Standards, Groundwater Protection Standards) at the time these reports will be prepared. From the DWM memorandum dated February 23, 2007, and pursuant to the October 27, 2006, DWM memorandum, submit a Solid Waste Section Environmental Monitoring Reporting Form in addition to the environmental monitoring data report. This form should be sealed by a geologist or engineer licensed in North Carolina if hydrogeologic or geologic calculations, maps, or interpretations are included with the report.

5.0 REFERENCES

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TABLES

Table 1
Existing Well/Piezometer Construction Details
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Well ID	Reason for Well	Northing	Easting	TOC ELEV (FT-MSL)	TOG ELEV (FT-MSL)	Protective Casing Diameter	Protective Casing Type	Protective Casing Interval	Riser/Screen Diameter	Riser Type	Riser Interval	Grout Type (Portland)	Grout Interval	Seal Type	Seal Interval	Filter Pack Type	Filter Pack Interval	Screen Interval
MW-3B	Corrective Measures Analysis/Water Levels	757,035.00	2,424,650.53	81.18	79.01	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.5 ft.	Type II Cement	0.0 - 3.5 ft.	Hydrated Bentonite	3.5 - 4.5 ft.	#2 Sand	4.5 - 21.5 ft.	5.5 - 20.5 ft.
MW-4	Background Analyses/Water Levels	757,264.82	2,425,621.06	68.95	66.77	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 18.0 ft.	3.0 - 18.0 ft.
MW-5	Compliance Analyses/Water Levels	758,410.72	2,425,211.43	53.75	51.89	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 7.0 ft.	Type II Cement	0.0 - 4.7 ft.	Hydrated Bentonite	4.7 - 6.3 ft.	#2 Sand	6.3 - 23.0 ft.	7.0 - 22.0 ft.
MW-5D	Water Levels	758,426.83	2,425,215.75	52.08	50.45	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 30.0 ft.	Type II Cement	0.0 - 6.0 ft.	Hydrated Bentonite	6.0 - 8.0 ft.	#2 Sand	8.0 - 40.0 ft.	30.0 - 40.0 ft.
MW-5S	Water Levels	758,446.42	2,425,216.28	50.54	47.04	4.0 in.	Stick-Up	~3.5	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 3.0 ft.	Hydrated Bentonite	3.0 - 4.0 ft.	#2 Sand	4.0 - 10.0 ft.	5.0 - 10.0 ft.
MW-6	Compliance Analyses/Water Levels	758,561.81	2,424,535.52	46.29	44.04	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 2.5 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 18.0 ft.	2.5 - 17.5 ft.
MW-7A	Corrective Measures Analyses/Water Levels	758,507.52	2,423,684.90	68.43	66.49	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 15.0 ft.	Type II Cement	0.0 - 11.0 ft.	Hydrated Bentonite	11.0 - 13.0 ft.	#2 Sand	13.0 - 25.0 ft.	15.0 - 25.0 ft.
MW-8A	Water Levels	757,284.68	2,423,303.30	82.34	79.96	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 10.0 ft.	Type II Cement	0.0 - 6.0 ft.	Hydrated Bentonite	6.0 - 8.0 ft.	#2 Sand	8.0 - 20.0 ft.	10.0 - 20.0 ft.
MW-9	Background Analyses/Water Levels	757,217.12	2,422,945.48	72.41	70.56	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 3.0 ft.	#2 Sand	3.0 - 15.0 ft.	5.0 - 15.0 ft.
MW-10	Water Levels	757,012.80	2,423,318.48	75.78	74.21	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 2.0 ft.	Type II Cement	0.0 - 0.5 ft.	Hydrated Bentonite	0.5 - 1.5 ft.	#2 Sand	1.5 - 12.0 ft.	2.0 - 12.0 ft.
MW-12	Compliance Analyses/Water Levels	758,719.269	2,424,158.858	51.24	48.56	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 0.5 ft.	Hydrated Bentonite	0.5 - 3.0 ft.	#2 Sand	3.0 - 10.5 ft.	5.0 - 10.0 ft.
MW-13	Corrective Measures Analyses/Water Levels	758,368.437	2,424,838.011	54.99	51.99	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 10.0 ft.	Type II Cement	0.0 - 6.0 ft.	Hydrated Bentonite	6.0 - 7.7 ft.	#2 Sand	7.7 - 20.0 ft.	10.0 - 20.0 ft.
MW-14	Corrective Measures Analyses/Water Levels	758,580.141	2,425,115.431	43.88	41.25	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 7.0 ft.	Type II Cement	0.0 - 3.7 ft.	Hydrated Bentonite	3.7 - 5.0 ft.	#2 Sand	5.0 - 12.5 ft.	7.0 - 12.0 ft.
MW-15	Corrective Measures Analyses/Water Levels	758,398.745	2,425,329.020	44.87	42.20	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 6.6 ft.	Type II Cement	0.0 - 3.5 ft.	Hydrated Bentonite	3.5 - 5.0 ft.	#2 Sand	5.0 - 12.0 ft.	6.6 - 11.6 ft.
MW-16	Corrective Measures Analyses/Water Levels	758,421.541	2,425,905.658	46.58	43.73	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 7.0 ft.	Type II Cement	0.0 - 5.0 ft.	Hydrated Bentonite	5.0 - 6.0 ft.	#2 Sand	6.0 - 17.3 ft.	7.0 - 17.0 ft.
GW-1R	Methane Gas Monitoring	757,029.14	2,424,642.63	81.08	79.25	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-2R	Methane Gas Monitoring	757,037.57	2,425,099.41	75.72	73.84	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-3	Methane Gas Monitoring	757,263.55	2,425,617.95	69.00	66.78	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 2.0 ft.	Type II Cement	0.0 - 0.5 ft.	Hydrated Bentonite	0	#2 Sand	0.5 - 3.0 ft.	2.0 - 3.0 ft.
GW-4	Methane Gas Monitoring	757,480.62	2,425,833.83	69.93	67.88	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 0.5 ft.	Hydrated Bentonite	0	#2 Sand	0.5 - 10.0 ft.	5.0 - 10.0 ft.
GW-5	Methane Gas Monitoring	757,932.48	2,425,852.83	65.23	63.16	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 0.5 ft.	Hydrated Bentonite	0	#2 Sand	0.5 - 10.0 ft.	5.0 - 10.0 ft.
GW-6	Methane Gas Monitoring	756,992.92	2,424,102.59	79.02	77.38	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-7	Methane Gas Monitoring	757,013.93	2,423,549.98	75.02	73.41	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-8	Methane Gas Monitoring	757,000.52	2,422,862.84	79.92	78.08	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-9	Methane Gas Monitoring	757,579.04	2,423,113.15	72.69	NS	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-10	Methane Gas Monitoring	758,018.15	2,423,322.02	69.17	67.16	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
GW-11	Methane Gas Monitoring	758,455.00	2,423,536.98	64.19	62.51	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 3.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.0 ft.	#2 Sand	2.0 - 8.0 ft.	3.0 - 8.0 ft.
P-1	Water Levels	757,088.75	2,425,176.72	74.48	72.52	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 10.0 ft.	Type II Cement	0-0.5	Hydrated Bentonite	0	#2 Sand	0.5 - 20.0 ft.	10.0 - 20.0 ft.
P-2A	Water Levels	757,183.97	2,424,154.11	83.61	81.44	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 15.0 ft.	Type II Cement	0.0 - 11.0 ft.	Hydrated Bentonite	11.0 - 13.0 ft.	#2 Sand	13.0 - 30.0 ft.	15.0 - 25.0 ft.
P-3A	Water Levels	757,797.19	2,423,482.12	79.77	77.60	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 15.0 ft.	Type II Cement	0.0 - 11.0 ft.	Hydrated Bentonite	11.0 - 13.0 ft.	#2 Sand	13.0 - 25.0 ft.	15.0 - 25.0 ft.
P-12	Water Levels	758,715.746	2,425,310.624	54.15	49.40	4.0 in.	Stick-Up	~2 to +2 BGS	1.0 in.	Sch 40 PVC	0.0 - 4.17 ft	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 3.17 ft.	#2 Sand	3.17 - 9.17 ft.	4.17 - 9.17 ft.
P-15	Water Levels	758,689.738	2,425,858.299	45.16	41.80	4.0 in.	Stick-Up	~2 to +2 BGS	1.0 in.	Sch 40 PVC	0.0 - 2.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 1.0 ft.	#2 Sand	1.0 - 7.0 ft.	2.0 - 7.0 ft.
P-17	Water Levels	758,437.412	2,426,190.771	42.45	40.00	4.0 in.	Stick-Up	~2 to +2 BGS	1.0 in.	Sch 40 PVC	0.0 - 2.7 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 1.70 ft.	#2 Sand	1.7 - 7.7 ft.	2.7 - 7.7 ft.
P-18	Water Levels	758,158.567	2,426,102.144	54.44	51.00	4.0 in.	Stick-Up	~2 to +2 BGS	1.0 in.	Sch 40 PVC	0.0 - 10.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 9.0 ft.	#2 Sand	9.0 - 15.0 ft.	10.0 - 15.0 ft.
P-19	Water Levels	757,756.845	2,426,403.572	58.88	59.00	8.0 in	Flush	~0 to .75 BGS	1.0 in.	Sch 40 PVC	0.0 - 7.67 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 5.67 ft.	#2 Sand	5.67 - 17.67 ft.	7.67 - 17.67 ft.
P-25	Water Levels	757,206.647	2,423,633.029	80.57	77.60	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 3.0 ft.	#2 Sand	3.0 - 10.0 ft.	5.0 - 10.0 ft.
P-26	Water Levels	757,554.222	2,423,325.095	80.33	77.20	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 10.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 7.0 ft.	#2 Sand	7.0 - 15.0 ft.	10.0 - 15.0 ft.
P-29	Water Levels	757,952.042	2,424,421.307	65.29	62.10	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 2.5 ft.	#2 Sand	2.5 - 10.0 ft.	5.0 - 10.0 ft.
P-34	Corrective Measures Analyses/Water Levels	758,455.766	2,425,359.738	44.34	41.30	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 3.0 ft.	#2 Sand	3.0 - 10.0 ft.	5.0 - 10.0 ft.
P-35	Water Levels	758,605.177	2,425,152.817	44.50	41.40	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Hydrated Bentonite	1.0 - 3.0 ft.	#2 Sand	3.0 - 10.0 ft.	5.0 - 10.0 ft.

Notes:
TOC = Top of Casing
TOG = Top of Ground
FT-MSL = Feet Above Mean Sea Level
BGS = Below Ground Surface
N/A = Not Applicable
NS = Not Surveyed
Monitor wells MW-1A through MW-10 and Gas wells GW-1 through GW-11 surveyed by Spruill & Associates on May 26, 2002.
Spruill & Associates surveyed piezometers P-1 through P-3A on May 26, 2002, P-4 through P-20 in December 2004, and P-21 through P-38 in September 2007.
Well locations shown on Figure 2.

TABLE 2
Falling/Rising Head Test Hydraulic Conductivity
Water Quality Monitoring Plan
Edgecombe County Landfill - Permit # 33-01
Tarboro, Edgecombe, North Carolina
S&ME Project No. 1054-13-277A

Well ID	Soil Description Intersected by Well Screen	Effective Porosity (percent)	Slug Test Hydraulic Conductivity						
			ft/yr	ft/day	ft/min	ft/sec	m/min	m/sec	cm/sec
MW-1 Slug Test (1994 Data)	Clayey Sandy Silt	15	2.42E+02	6.62E-01	4.60E-04	7.66E-06	1.40E-04	2.34E-06	2.34E-04
MW-2 Slug Test (1994 Data)	Sandy Clay	20	1.27E+01	3.48E-02	2.42E-05	4.03E-07	7.37E-06	1.23E-07	1.23E-05
MW-3 Slug Test (1994 Data)	Clayey Sandy Silt	15	5.80E+02	1.59E+00	1.10E-03	1.84E-05	3.37E-04	5.61E-06	5.61E-04
MW-4 KAve	Clayey Sandy Silt	15	2.36E+02	6.47E-01	4.49E-04	7.49E-06	1.37E-04	2.28E-06	2.28E-04
MW-5D Kave	Sandy Clay	20	5.92E+01	1.62E-01	1.13E-04	1.88E-06	3.43E-05	5.72E-07	5.72E-05
MW-7 KAve	Silty Sandy Clay	10	5.42E+01	1.48E-01	1.03E-04	1.72E-06	3.14E-05	5.24E-07	5.24E-05
MW-9 KAve	Sandy Clay	30	6.81E+00	1.87E-02	1.30E-05	2.16E-07	3.95E-06	6.58E-08	6.58E-06
MW-10 KAve	Sandy Clay	30	1.98E+02	5.44E-01	3.77E-04	6.29E-06	1.15E-04	1.92E-06	1.92E-04
P-32 KAve	Sandy Clay	30	1.02E+03	2.78E+00	1.93E-03	3.22E-05	5.89E-04	9.81E-06	9.81E-04
P-36 KAve	Sandy Clay	30	2.29E+02	6.28E-01	4.36E-04	7.27E-06	1.33E-04	2.22E-06	2.22E-04
P-37 KAve	Silty Sandy Clay	35	1.11E+02	3.05E-01	2.12E-04	3.54E-06	6.46E-05	1.08E-06	1.08E-04

Notes:

KAve = Average value of hydraulic conductivity from two or more slug tests on the same well.

Historical hydraulic conductivity and porosity values for monitor wells MW-1, MW-2, and MW-3 are from October 1994 "Initial Baseline Sampling of Groundwater, Edgecombe County Landfill" prepared by Law Engineering Company.

Hydraulic conductivity values for monitor wells MW-4, MW-5D, MW-9, MW-10, P-32, P-36, and P-37 reported in the NES Report (S&ME, June 25, 2008) determined by S&ME, Inc. from rising or falling head test (slug test) data analyzed by Bouwer and Rice Updated Method (1989) using the Aqtesolv software developed by Hydrosolve, Inc.

Porosity values for soil types described from borings for MW-9, MW-10, P-32, P-36 and P-37 from Fetter, C. W., Applied Hydrogeology, 1988.

Table 3
Estimated Groundwater Flow Velocity
Water Quality Monitoring Plan
Edgecombe County Landfill - Permit # 33-01
S&ME Project No. 1054-13-277A

ESTIMATED GROUNDWATER FLOW RATES AT WELL LOCATIONS				
Well Location	**Groundwater Gradient**	**Hydraulic Conductivity Values (cm/sec)**	**Effective Porosity (%)**	**Estimated Velocity (ft/yr)**
MW-1 (1994 Data)	0.0200	2.34E-04	15	32.08
MW-2 (1994 Data)	0.0200	1.23E-05	20	1.26
MW-3 (1994 Data)	0.0200	5.61E-04	15	77.05
MW-4	0.0200	2.28E-04	15	31.35
MW-5D	0.0200	5.72E-05	20	5.89
MW-7	0.0200	5.24E-05	10	10.79
MW-9	0.0200	6.58E-06	30	0.45
MW-10	0.0200	1.92E-04	30	13.17
P-32	0.0200	9.81E-04	30	67.39
P-36	0.0200	2.22E-04	30	15.22
P-37	0.0200	1.08E-04	35	6.34

Notes:
cm/sec = centimeters per second
ft/yr = feet per year
Historical hydraulic conductivity and porosity values for monitor wells MW-1, MW-2, and MW-3 are from October 1994 "Initial Baseline Sampling of Groundwater, Edgecombe County Landfill" prepared by Law Engineering Company.
Hydraulic conductivity values for monitor wells MW-4, MW-5D, MW-9, MW-10, P-32, P-36, and P-37 reported in the NES Report (S&ME, June 25, 2008) determined by S&ME, Inc. from rising or falling head test (slug test) data analyzed by Bouwer and Rice Updated Method (1989) using the Aqtesolv software developed by Hydrosolve, Inc.
Porosity values for soil types described from borings for MW-9, MW-10, P-32, P-36 and P-37 from Fetter, C. W., Applied Hydrogeology, 1988.

Table 4
Proposed Well Construction Details
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Well ID	Reason for Well	Northing	Easting	Protective Casing Diameter	Protective Casing Type	Protective Casing Interval	Riser/Screen Diameter	Riser Type	Riser Interval	Grout Type (Portland)	Grout Interval	Seal Type	Seal Interval	Filter Pack Type	Filter Pack Interval	Screen Interval
MW-1B	Compliance Well (Replace MW-1A)	2425676.62	758405.22	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0-2.5 ft	Type II Cement	0.0-1.0 ft.	Bentonite	1.0-2.0 ft.	#2 Sand	2.0-18.0 ft.	2.5-17.5 ft.
MW-9A	New Background Well (Replace MW-9)	2423166.2	757289.68	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 5.0 ft.	Type II Cement	0.0 - 1.0 ft.	Bentonite	1.0 - 3.0 ft.	#2 Sand	3.0 - 15.0 ft.	5.0 - 15.0 ft.
MW-11	New Corrective Measures Monitor Well (Replace MW-7A)	2423588.49	758564.19	4.0 in.	Stick-Up	~2 to +2 BGS	2.0 in.	Sch 40 PVC	0.0 - 15.0 ft.	Type II Cement	0.0 - 11.0 ft.	Bentonite	11.0 -13.0 ft.	#2 Sand	13.0 - 25.0 ft.	15.0 - 25.0 ft.

Notes:
BGS = Below Ground Surface
Well locations shown on Figure 2.

Table 5
Laboratory Parameters and Schedule
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A

Well ID	Semiannual			Well/Sample Location Status
	Appendix I VOCs and Inorganics	MNA Parameters	Water Levels	
MW-1B	x	x	x	Compliance Network
MW-3B	x	x	x	Corrective Measures
MW-4	x	x	x	Background Network
MW-5	x	x	x	Compliance Network
MW-6	x	x	x	Compliance Network
MW-7A (MW-11)	x	x	x	Temporary Compliance Network Corrective Measures
MW-9 (MW-9A)	x	x	x	Background Network Well to be Replaced
MW-12	x	x	x	Compliance Network
MW-13	x	x	x	Temporary Compliance Network Corrective Measures
MW-14	x	x	x	Temporary Compliance Network Corrective Measures
MW-15	x	x	x	Temporary Compliance Network Corrective Measures
MW-16	x	x	x	Temporary Compliance Network Corrective Measures
Upstream - SW-1	x		x	Staff Guage in Jerry's Creek Compliance Network
Downstream - SW-2	x		x	Staff Guage in Jerry's Creek Compliance Network
P-1			x	Water Levels, Network
P-2A			x	Water Levels, Network
P-3A			x	Water Levels, Network
P-12			x	Water Levels, Network
P-15			x	Water Levels, Network
P-17			x	Water Levels, Network
P-18			x	Water Levels, Network
P-19			x	Water Levels, Network
P-25			x	Water Levels, Network
P-26			x	Water Levels, Network
P-29			x	Water Levels, Network
P-34			x	Water Levels, Network
P-35			x	Water Levels, Network

Notes:
Semiannual = Sample frequency will be summer (June/July) and Winter (december/January) approximately six months apart.
VOCs = Volatile Organic Compounds
LEL = Lower Explosive Limit
Well locations shown on **Figure 2**.

Table 6
Constituents for Detection Monitoring (40 CFR 258, Appendix I)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Appendix I Constituent - Common name	CAS Number
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Beryllium	7440-41-7
Cadmium	7440-43-9
Chromium	7440-47-3
Cobalt	7440-48-4
Copper	7440-50-8
Lead	7440-92-1
Nickel	7440-02-0
Selenium	7440-49-2
Silver	7440-22-4
Thallium	7440-28-0
Vanadium	7440-62-2
Zinc	7440-66-6
Acetone	67-64-1
Acrylonitrile	107-13-1
Benzene	71-43-2
Bromochloromethane	74-97-5
Bromodichloromethane	75-27-4
Bromoform; Tribromomethane	75-25-2
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chloroethane; Ethyl chloride	75-00-3
Chloroform; Trichloromethane	67-66-3
Dibromochloromethane; Chlorodibromomethane	124-48-1
1,2-Dibromo-3-chlorpropane; DBCP	96-12-8
1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4
o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1
p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7
trans-1,4-Dichloro-2-butene	110-57-6
1,1-Dichloroethane; Ethylidene chloride	75-34-3
1,2-Dichloroethane; Ethlyene dichloride	107-06-2
1,1-Dichloroethylene; 1-1-Dichloroethene; Vinylidene chloride	75-35-4
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2
trans-1,2-Dichloroethylene; trans-1,2-Dichloroethene	156-60-5
1,2-Dichlorpropane; Propylene dichloride	78-87-5
cis-1,3-Dichlorpropene	10061-01-5
trans-1,3-Dichlorpropene	10061-02-6
Ethylbenzene	100-41-4
2-hexanone; Methyl butyl ketone	591-78-6
Methyl bromide; Bromomethane	74-83-9
Methyl chloride; Chloromethane	74-87-3
Methylene bromide Dibromomethane	74-95-3
Methylene chloride; Dichloromethane	75-09-2
Methyl ethyl ketone; MEK; 2-Butanone	78-93-3
Methyl iodide; Iodomethane	74-88-4
4-Methyl-2-pentanone; Methyl isobutyl isobutyl ketone	108-10-1
Styrene	100-42-5
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene; Tetracholorethene; Perchloroethylene	127-18-4
Toluene	108-88-3
1,1,1-Trochlorethane; Methylchloroform	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene; Trichlorethene	79-01-6
Trichlorofluoromethane; CFC-11	75-69-4
1,2,3-Trichloropropane	96-18-4
Vinyl acetate	108-05-4
Vinyl chloride	75-01-4
Xylenes	1330-20-7

Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Appendix II Constituents - Common Name	CAS Number
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Acetone	67-64-1
Acetonitrile; Methyl cyanide	75-05-8
Acetophenone	98-86-2
2-Acetylaminofluorene; 2-AAF	53-96-3
Acrolein	107-02-8
Acrylonitrile	107-13-1
Aldrin	309-00-2
Allyl chloride	107-05-1
4-Aminobiphenyl	92-67-1
Anthracene	120-12-7
Antimony	7440-36-0
Arsenic	7440-38-2
Barium	7440-39-3
Benzene	71-43-2
Benzo[a]anthracene; Benzanthracene	56-55-3
Benzo[b]fluoranthene	205-99-2
Benzo[k]fluoranthene	207-08-9
Benzo[ghi]perylene	191-24-2
Benzo[a]pyrene	50-32-8
Benyl alcohol	100-51-5
Beryllium	7440-41-7
alpha-BHC	319-84-6
beta-BHC	319-85-7
delta-BHC	319-86-8
gamma-BHC; Lindane	58-89-9
Bis(2-chloroethoxy)methane	111-91-1
Bis(2-chloroethyl)ether; Dichloroethyl ether	111-44-4
Bis-(2-chlor-1-methyl) ether; 2, 2-Dichloro-	108-60-1

Notes:

1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)

2. Polychlorinated biphenyls (CAS RN 1336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1), and Aroclor-1260 (CAS RN 11096-82-5)

3. Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), ie, chlorinated camphene

4. Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m- xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7)

Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

diisopropyl ether; DCIP	See note 6
Bis(2-ethylhexyl) phthalate	117-81-7
Bromochloromethane; Chlorobromomethane	74-97-5
Bromodichloromethane; Dibromochloromethane	75-27-4
Bromoform; Tribromomethane	75-25-2
4-Bromophenyl phenyl ether	101-55-3
Butyl benzyl phthalate; Benzyl butyl phthalate	85-68-7
Cadmium	7440-43-9
Carbon disulfide	75-15-0
Carbon tetrachloride	56-23-5
Chlordane	See NOTE 1
p-Chloroaniline	106-47-8
Chlorobenzene	108-90-7
Chlorobenzilate	510-15-6
p-Chloro-m-cresol; 4-Chloro-3-methylphenol	59-50-7
Chloroethane; Ethyl chloride	75-00-3
Chloroform; Trichloromethane	67-66-3
2-Chloronaphthalene	91-58-7
2-Chlorophenol	95-57-8
4-Chlorophenyl phenyl ether	7005-72-3
Chloroprene	126-99-8
Chromium	7440-47-3
Chrysene	218-01-9
Cobalt	218-01-9
Copper	7440-50-8
m-Cresol; 3-methylphenol	108-39-4
o-Cresol; 2-methlphenol	95-48-7
p-Cresol; 4-methylphenol	106-44-5
Cyanide	57-12-5
2,4-D; 2,4-Dichlorophenoxyacetic acid	94-75-7
4,4-DDD	72-54-8
4,4-DDE	72-55-9
4,4-DDT	50-29-3
Diallate	2303-16-4
aDibenz[a,h]anthracene	53-70-3
Dibenzofuran	132-64-9
Dibromochloromethane; Chlorodibromomethane	124-48-1
1,2-Dibromo-30chloropropane; DBCP	96-12-8
1,2-Dibromoethane; Ethylene dibromide; EDB	106-93-4
Di-n-butyl phthalate	84-74-2
o-Dichlorobenzene; 1,2-Dichlorobenzene	95-50-1
m-Dichlorobenzene; 1,3-Dichlorobenzene	541-73-1

Notes:

1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)

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3. Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), ie, chlorinated camphene

4. Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m- xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7)

Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

p-Dichlorobenzene; 1,4-Dichlorobenzene	106-46-7
3,3-Dichlorobenzidine	91-94-1
trans-1,4-Dichloro-2-butene	110-57-6
Dichlorodifluoromethane; CFC 12;	75-71-8
1,1-Dichloroethane chloride	75-34-3
1,2-Dichloroethane; Ethylene dichloride	107-06-2
1,1-Dichloroethylene; 1,1-Dichloroethane;	75-35-4
Vinylidene chloride	75-35-4
cis-1,2-Dichloroethylene; cis-1,2-Dichloroethene	156-59-2
trans-1,2-Dichloroethylene trans-1,2-Dichloroethene	156-60-5
2,4-Dichlorophenol	120-83-2
2,6-Dichlorophenol	87-65-0
1,2-Dichloropropane; Propylene dichloride	78-87-5
1,3-Dichloropropane; Trimethylene dichloride	142-28-9
2,2-Dichloropropane; Isopropylidene chloride	594-20-7
1,1-Dichloropropene	563-58-6
cis-1,3-Dichloropropene	10061-01-5
trans-1,3-Dichloropropene	10061-02-6
Dieldrin	60-57-1
Diethyl phthalate	84-66-2
0,0-Diethyl 0-2-pyrazinyl phosphorothioate; thionazin	297-97-2
Dimethoate	60-51-5
p-(Dimethylamino)azobenzene	60-11-7
7,12-Dimethylbenxz[a]anthracene	57-97-6
3,3-Dimethylbenzidine	119-93-7
2,4-Dimethlphenol; m-Xylenol	105-67-9
Dimethyl phthalate	131-11-3
m-Dinitrobenzene	99-65-0
4,6-Dinitro-o-cresol 4,6-Dinitro-2-methylphenol	534-52-1
2,4-Dinitrophenol	51-28-5
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Dinoseb; DNBP; 2-sec-Butyl-4,6-dinitrophenol	88-85-7
Di-n-octyl phthalate	117-84-0
Diphenylamine	122-39-4
Disulfoton	298-04-4
Endosulfan I	959-98-8
Endosulfan II	33213-65-9
Endodulfan sulfate	1031-07-8
Endrin	72-20-8
Endrin aldehyde	7421-93-4
Ethylbenzene	100-41-4

Notes:

1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)

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Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Ethyl methacrylate	97-63-2
Ethyl methanesulfonate	62-50-0
Famphur	52-85-7
Fluoranthene	206-44-0
Fluorene	86-73-7
Heptachlor	76-44-8
Heptachlor epoxide	1024-57-3
Hexachlorobenzene	118-74-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Hexachloropropene	188-71-7
2-Hexanone; Methyl butyl ketone	591-78-6
Indenol(1,2,3-cd)pyrene	193-39-5
Isopbutyl alcohol	78-83-1
Isodrin	465-73-6
Isophorone	78-59-1
Isosafrole	120-58-1
Kepone	143-50-0
Lead	7440-92-1
Mercury	7434-97-6
Methacrylonitrile	126-98-7
Methapyrilene	91-80-5
Methoxychlor	72-43-5
Methyl bromide; Bromomethane	74-83-9
Methyl chloride; Chloromethane	74-87-3
3-Methylcholanthrene	56-49-5
Methyl ethyl ketone; MEK; 2-Butanone	78-93-3
Methyl iodide; lodomethane	74-88-4
Methyl methacrylate	80-62-6
Methyl methanesulfonate	66-27-3
2-Methylnaphthalene	91-57-6
Methyl parathion; Parathion methyl	298-00-0
4-Methyl-2-pentanone; Methyl isobutyl ketone	108-10-1
Methylene bromide; Dibromomethane	74-95-3
Methylene chloride; Dichloromethane	75-09-2
Naphthalene	91-20-3
1,4-Naphthoquinone	130-15-4
1-Naphthylamine	134-32-7
2-Naphthylamine	91-59-8

Notes:

1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)

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3. Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), ie, chlorinated camphene

4. Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m- xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7)

Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Nickel	7440-02-0
o-Nitroaniline; 2-Nitroaniline	88-74-4
m-Nitroaniline; 3-Nitroanile	99-09-2
p-Nitroaniline; 4-Nitroaniline	100-01-6
Nitrobenzene	98-95-3
o-Nitrophenol; 2-Nitrophenol	88-75-5
p-Nitrophenol; 4-Nitrophenol	100-02-7
N-Nitrosodi-n-butylamine	924-16-3
N-Nitrosodiethylamine	55-18-5
N-Nitrosodimethylamine	62-75-9
N-Nitrosodiphenylamine, N-Nitroso-N-Di-n- propylnitro	86-30-6
N-Nitrosodipropylamine; dipropylamine;	621-64-7
N-Nitrosomethylethalamine	10595-95-6
N-Nitrosopiperidine	100-75-4
N-Nitrosopyrrolidine	930-55-2
5-Nitro-o-toluidine	99-55-8
Parathion	56-38-2
Pentachlorobenzene	608-93-5
Pentachloronitrobenzene	82-68-8
Pentachlorophenol	87-86-5
Phenacetin	62-44-2
Phenanthrene	85-01-8
Phenol	108-95-2
p-Phenylenediamine	106-50-3
Phorate	298-02-2
Polychlorinated biphenyls (PCBs); Aroclors	See NOTE 2
Pronamide	23950-58-5
Propionitrile; Ethyl cyanide	107-12-0
Pyrene	129-00-0
Safrole	94-59-7
Selenium	7440-49-2
Silver	7440-22-4
Silvex; 2,4,5-TP	93-72-1
Styrene	100-42-5
Sulfide	18496-25-8
2,4,5-T; 2,4,5-Trichlorophenoxyacetic acid	93-76-5
1,2,4,5-Tetrachlorobenzene	95-94-3
1,1,1,2-Tetrachloroethane	630-20-6
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene; Tetrachloroethene; Perchloroethyle	127-18-4
2,3,4,6-Tetrachlorophenol	58-90-2

Notes:

1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)

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Table 7
Constituents for Assessment Monitoring (40 CFR 258, Appendix II)
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Thallium	7440-28-0
Tin	7440-31-5
Toluene	108-88-3
o-Toluidine	95-53-4
Toxaphene	See NOTE 3
1,2,4-Trichlorobenzene	120-82-1
1,1,1-Trichloroethane; Methylchloroform	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene; Trichloroethene	79-01-6
Trichlorrofluoromethane; CFC-11	75-69-4
2,4,5-Trichlorophenol	95-95-4
2,4,6-Trichlorophenol	88-06-2
1,2,3-Trichloropropane	96-18-4
0,0,0-Triethyl phosphorothioate	126-68-1
sym-Trinitrobenzene	99-35-4
Vanadium	7440-62-2
Vinyl acetate	108-05-4
Vinyl chloride; Chloroethene	75-01-4
Xylene (total)	See NOTE 4
Zinc	7440-66-6

Notes:
1. Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6)
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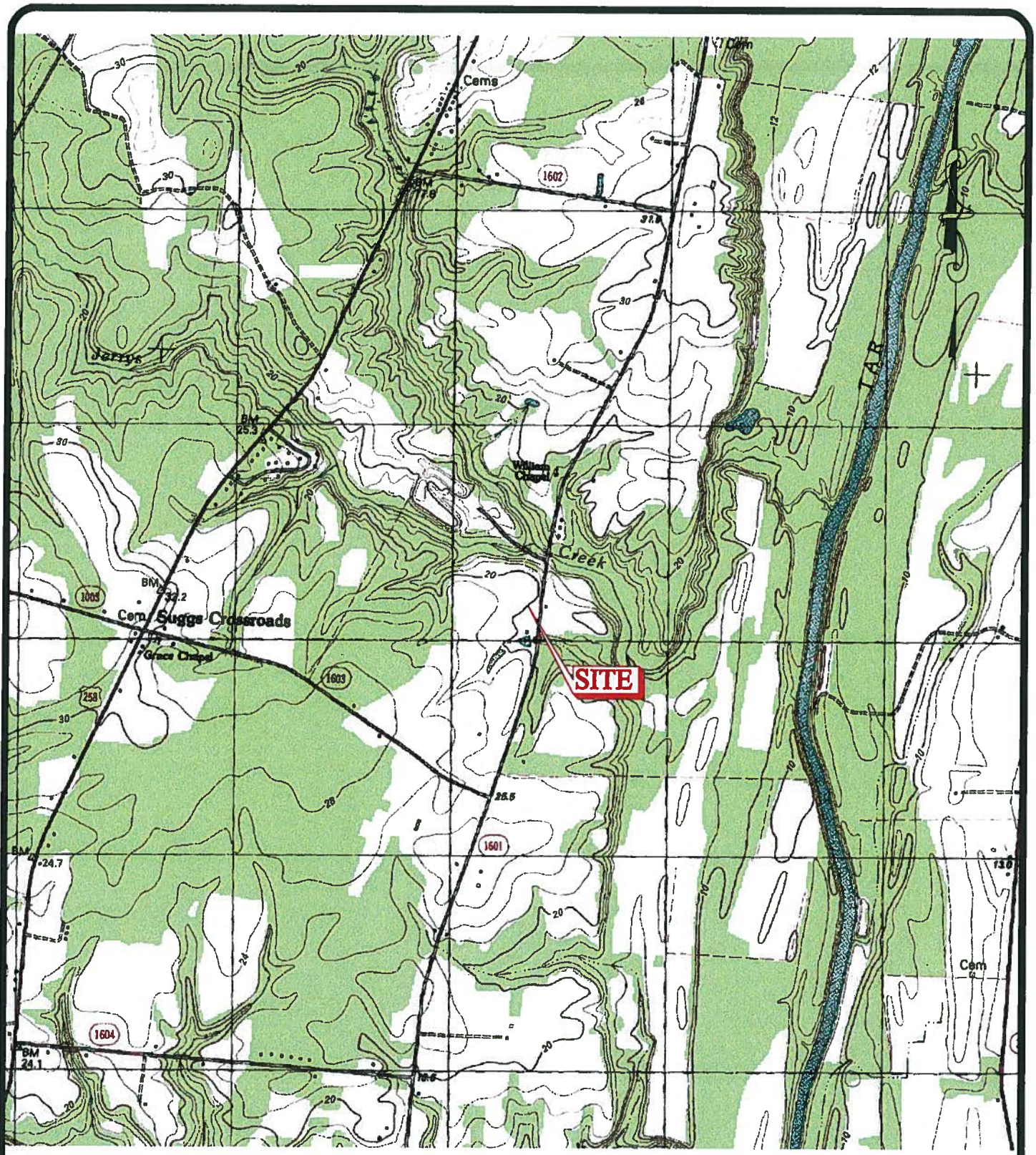
Table 8
Corrective Measures Monitoring - MNA Parameter Summary
Edgecombe County Landfill
Water Quality Monitoring Plan
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-13-277A
Permit # 33-01

Well ID	USE	40 CFR Part 258 Appendix I COCs	MONITORED NATURAL ATTENUATION PARAMETERS																			
			pH	Temp.	Specific Conductance	Oxygen Reduction Potential ORP	Dissolved Oxygen	Chloride	Sulfate	Alkalinity	BOD	COD	TOC (Total Organic Carbon)	Iron	Nitrate	Sulfide	CO_2	Ethane	Ethene	Methane	Volatile Fatty Acids	Hydrogen
		UNITS	Std	°C	mS/cm	mV	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	nM
MW-1B (MW-16)	Compliance/ Corrective Measures	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
MW-3B	Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-4	Background/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5	Compliance/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-6	Compliance/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-7A (MW-11)	Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-9 (MW-9A)	Background/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-12	Compliance/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-13	Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-14	Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-15	Correctrive Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
MW-16	Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Upstream - SW-1	Compliance/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
Downstream - SW-2	Compliance/ Corrective Measures	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS
P-34	Corrective Measures	X	X	X	X	X	X	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

NOTES:
Compliance/Corrective Measures = Sample location for compliance and corrective measures. Once corrective measures are complete, the location will be used as a compliance sample point in the Detection Montitoring Program.
Corrective Measures = Sample location for use to monitor corrective measures. Once the corrective measures are complete, no samples for analysis from this well will be required.
Background = Sample location for background levels. Once corrective measures are complete, the location will be used as a background sample point in the Detection Montitoring Program.
X = Samples collected and analyzed for four consecutive sampling events, then the well locations and parameter list will be performed only as required based on select locations therafter.
NS = Not Sampled for this parameter.
mg/L = Milligrams per Liter
Std = Standard Units
°C = Degrees Celsius
mS/cm = Microsiemens per Centimeter
mV = Millivolt
nM = Nanomolar

FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

A-1109

SCALE: 1" = 2,000'	S&ME WWW.SMEINC.COM	VICINITY MAP WATER QUALITY MONITORING PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	FIGURE NO.
DATE: JUNE 2008			1
DRAWN BY:			
PROJECT NO: 1054-07-241			

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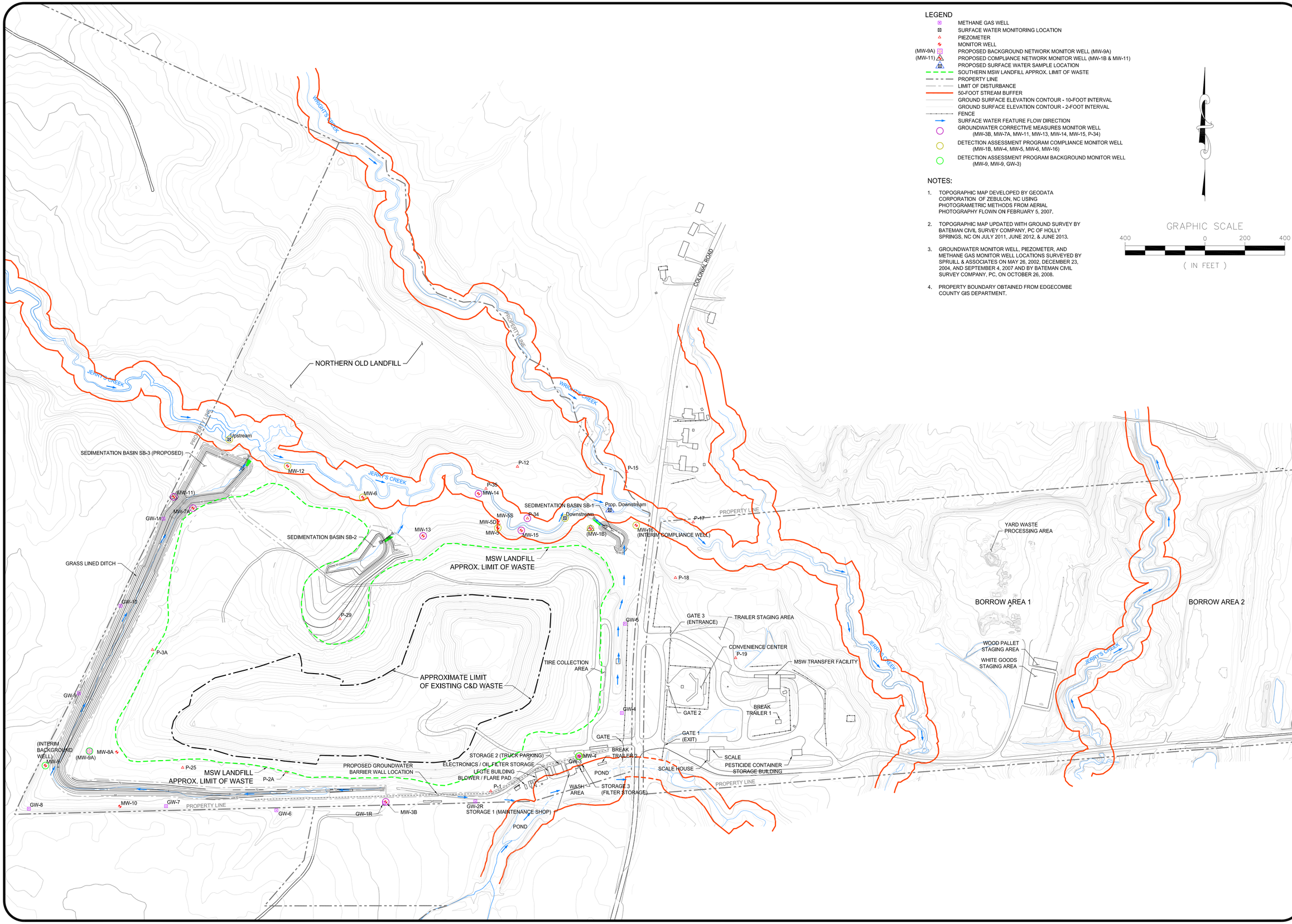


LEGEND

- METHANE GAS WELL
- SURFACE WATER MONITORING LOCATION
- PIEZOMETER
- MONITOR WELL
- (MW-9A) PROPOSED BACKGROUND NETWORK MONITOR WELL (MW-9A)
- (MW-11) PROPOSED COMPLIANCE NETWORK MONITOR WELL (MW-1B & MW-11)
- PROPOSED SURFACE WATER SAMPLE LOCATION
- SOUTHERN MSW LANDFILL APPROX. LIMIT OF WASTE
- PROPERTY LINE
- LIMIT OF DISTURBANCE
- 50-FOOT STREAM BUFFER
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- SURFACE WATER FEATURE FLOW DIRECTION
- GROUNDWATER CORRECTIVE MEASURES MONITOR WELL (MW-3B, MW-7A, MW-11, MW-13, MW-14, MW-15, P-34)
- DETECTION ASSESSMENT PROGRAM COMPLIANCE MONITOR WELL (MW-1B, MW-4, MW-5, MW-6, MW-16)
- DETECTION ASSESSMENT PROGRAM BACKGROUND MONITOR WELL (MW-9, MW-9, GW-3)

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
3. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

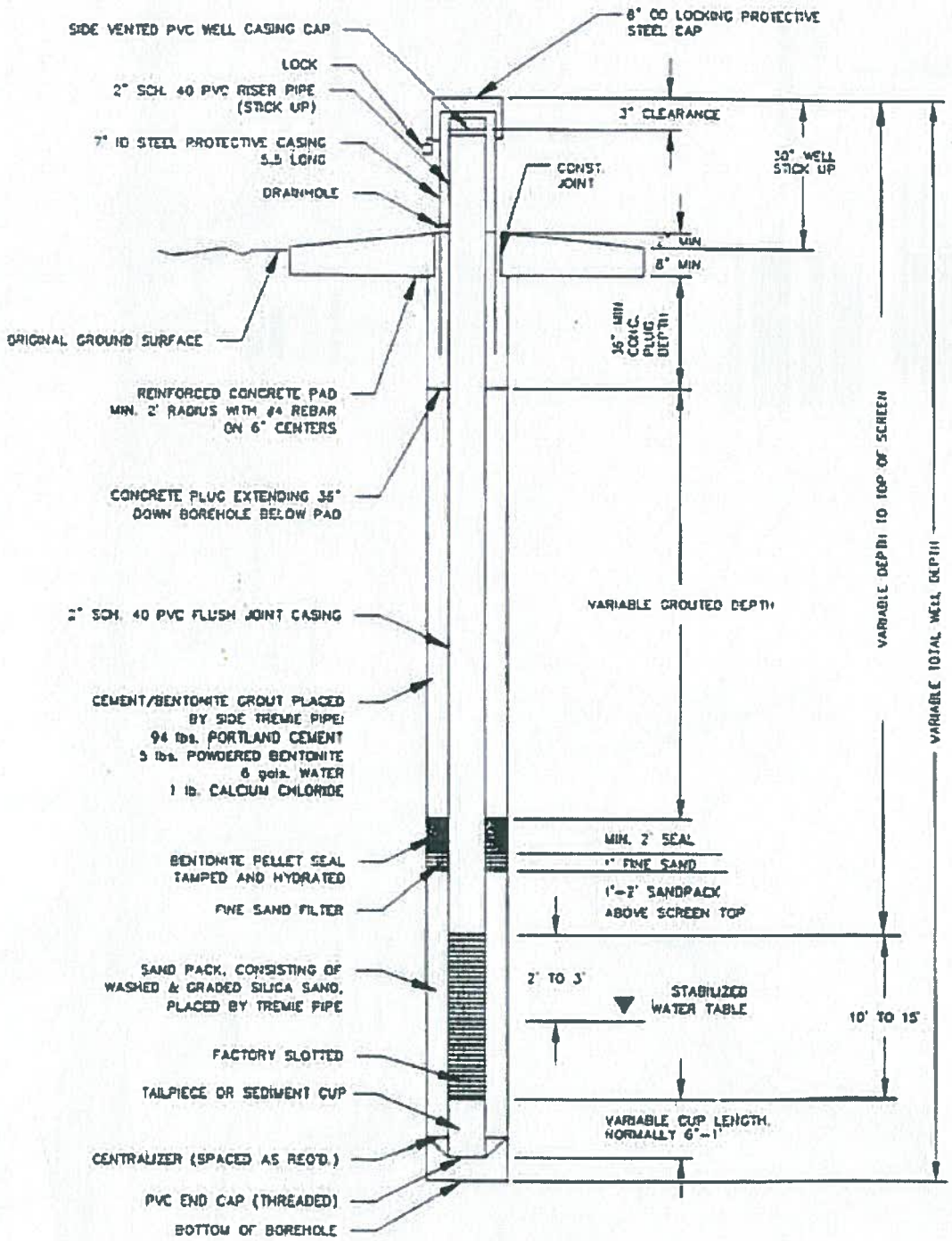
S&ME
WWW.SMEINC.COM

NO.	DATE	DESCRIPTION	BY

SITE MAP

WATER QUALITY MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

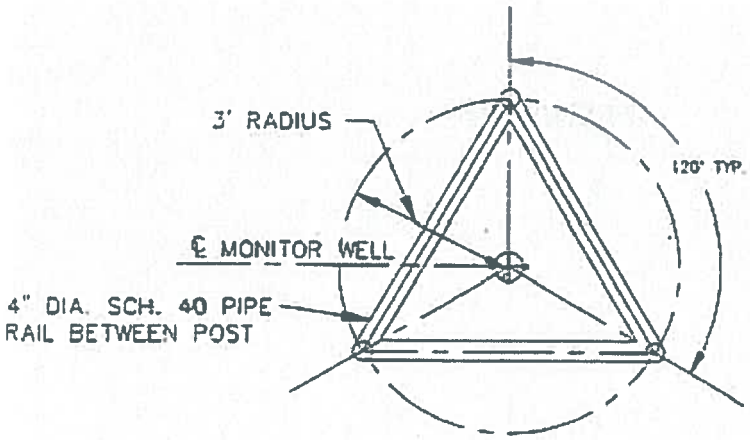
DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1400	
FIGURE: 2	OF:



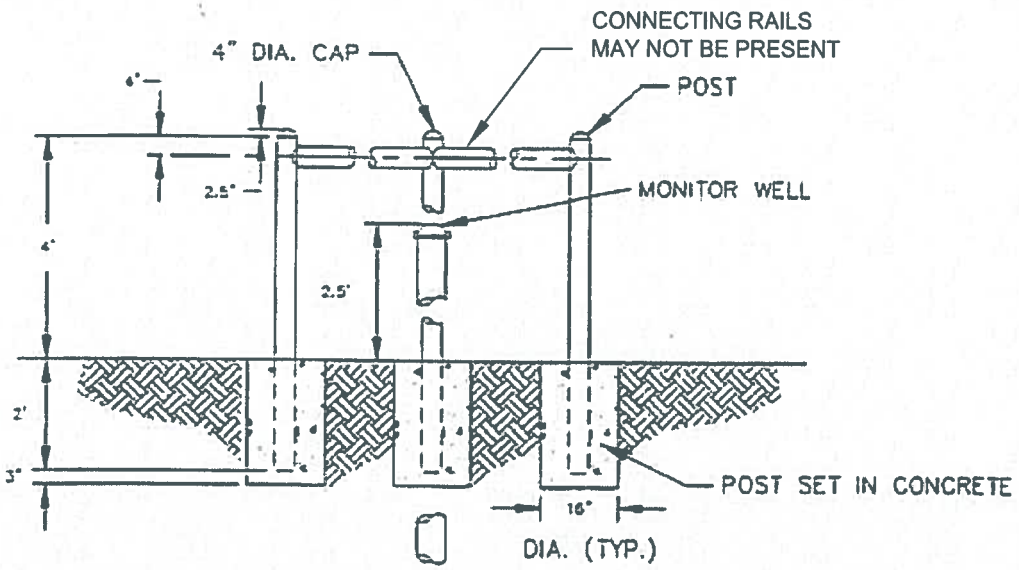
A-1107

SCALE: NTS	S&ME WWW.SMEINC.COM	TYPICAL UPPER AQUIFER GROUNDWATER MONITORING WELL DETAIL EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA
DATE: JUNE 2008		FIGURE NO. 3
DRAWN BY: BTR		
PROJECT NO: 1054-07-241		

S:\PROJECTS\2007\07-241 Edgecombe-Assmt of Corrective Measures\CVS\A1107.dwg, A1107, 7/2/2008 8:10:16 AM, 1:1



PLAN VIEW



A-1108

SCALE: NTS	S&ME WWW.SMEINC.COM	TYPICAL PROTECTION FOR MONITORING WELLS EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	FIGURE NO. 4
DATE: JUNE 2008			
DRAWN BY: BTR			
PROJECT NO: 1054-07-241			

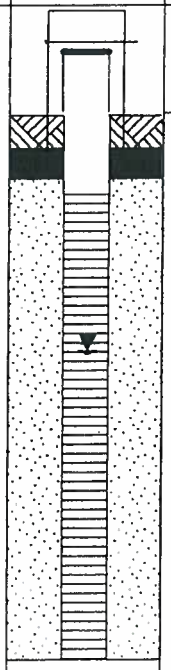
S:\PROJECTS\2007\07-241 Edgecombe-Asmt of Corrective Measures\CAD\A1108.dwg, A1108, 7/2/2008 8:40:58 AM, 1:1

APPENDIX I – Boring Logs and Well Construction Details

COMPLETION REPORT OF WELL NO. MW-1A

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	7.54
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	46.04
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	18
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/15/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							46.04		
Soil characteristics were not logged.		0.0		1	CG				
				2	BS				
				2.5	FP		41.04		
		5.0							
							36.04		
		10.0							
							31.04		
		15.0							
				17.5	BSC				
Boring terminated at 18.0 ft.									



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 2.5 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 1.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 1.0 - 2.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 2.0 - 18.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 2.5 - 17.5 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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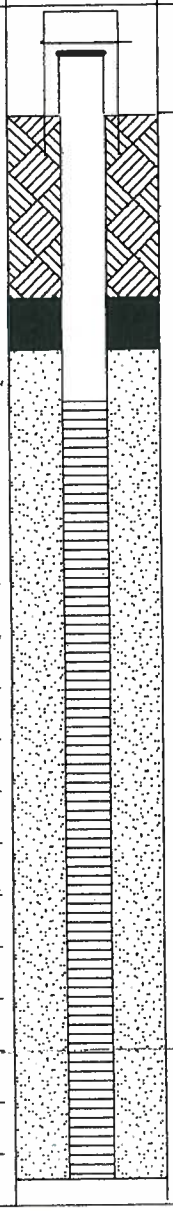
COMPLETION REPORT
OF WELL NO. MW-1A

COMPLETION REPORT OF WELL NO. MW-3-B

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	S&ME	BORING DEPTH (FT.):	20.5
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Wells
DATE DRILLED:	2/5/2004		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface		0.0							
Light yellow brown very fine silty SAND				3.5					
				4.5					
		5.0							
Red sandy SILT									
Yellow brown clayey SILT									
Brown clayey SILT		10.0							
Red brown silty CLAY									
		15.0							
Yellow brown clayey SAND									
Gray brown/ blue gray silty CLAY				61					
		20.0		20.5					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: Schedule 40 PVC
Interval: 0-10.5

GROUT
Type: Portlan Cement
Interval: 0-3.5

SEAL
Type: Bentonite
Interval: 3.5-4.5

FILTERPACK
Type: Filter Sand
Interval: 4.5-21.5

SCREEN
Diameter: 2"
Type: Schedule 40 PVC
Interval: 5.5-20.5

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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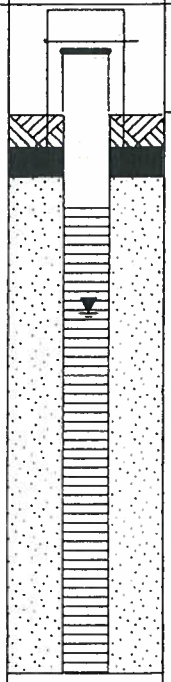
COMPLETION REPORT
OF WELL NO. MW-3-B

COMPLETION REPORT OF WELL NO. MW-4

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	6.4
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	68.95
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	18
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/9/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							68.95		
Soil characteristics were not logged.		0.0		1	CG				
				2	BS				
				3	FP		63.95		
		5.0							
							58.95		
		10.0							
							53.95		
		15.0							
				18	BSC				
Boring terminated at 18.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 3.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 18.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 3.0 - 18.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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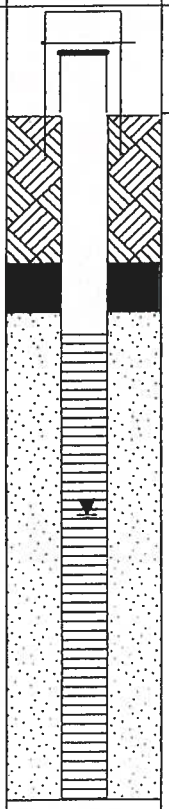
COMPLETION REPORT
OF WELL NO. MW-4

COMPLETION REPORT OF WELL NO. MW-5

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	12.85
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	53.75
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	23
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/16/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							53.75		
Soil characteristics were not logged.		0.0							
							48.75		
				4.7	CG				
		5.0							
				6.3	BS				
				7	FP				
							43.75		
		10.0							
							38.75		
		15.0							
							33.75		
		20.0							
				22	BSC				
Boring terminated at 23.0 ft.									



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 7.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 4.7 ft.

SEAL
Type: Bentonite Pellets
Interval: 4.7 - 6.3 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 6.3 - 23.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 7.0 - 22.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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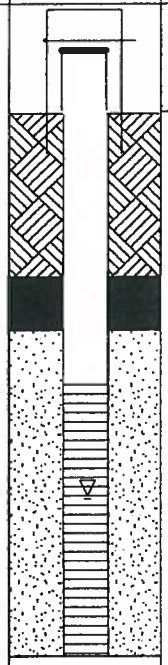
COMPLETION REPORT
OF WELL NO. MW-5

COMPLETION REPORT OF WELL NO. MW-5S

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	7.04
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	50.54
DRILLING CONTRACTOR:	Geotek	BORING DEPTH (FT.):	10
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Tomzack
DATE DRILLED:	11/12/1999		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Mottled sandy CLAY, trace Organics.		0.0							
				3	CG				
				4	BS			0.02	-19.34
		5.0						0.09	-7.56
Mottled clayey medium SAND.									
								0.29	-1.51
Mottled sandy CLAY.									
Mottled clayey medium SAND.								0.18	-10.14
Mottled gray clayey medium SAND, wet.				10	FP				
Boring terminated at 10.0 ft bgs		10.0			BSC				



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: **4.0 in.**
- Type: **Stick-Up**
- Interval: **~2 to +2 BGS**

OUTER CASING
- Diameter: **N/A**
- Type: **N/A**
- Length:

RISER CASING
- Diameter: **2.0 in.**
- Type: **Schedule 40 PVC**
- Interval: **0.0 - 5.0 ft.**

GROUT
- Type: **Type II Portland Cement**
- Interval: **0.0 - 3.0 ft.**

SEAL
- Type: **Bentonite Pellets**
- Interval: **3.0 - 4.0 ft.**

FILTERPACK
- Type: **Filter Sand #2**
- Interval: **4.0 - 10.0 ft.**

SCREEN
- Diameter: **2.0 in.**
- Type: **Schedule 40 PVC**
- Interval: **5.0 - 10.0 ft.**

LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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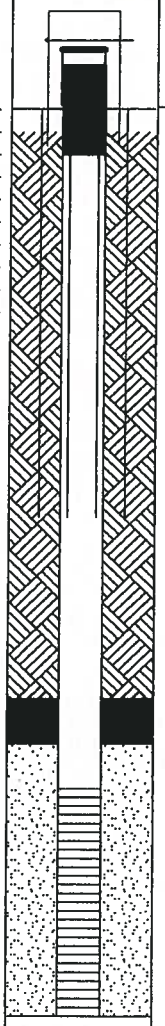
COMPLETION REPORT
OF WELL NO. MW-5S

COMPLETION REPORT OF WELL NO. MW-5D

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	52.08
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	40
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	D. Tomzack
DRILLING CONTRACTOR:	Geotek		
DRILLING METHOD:	4¼" H.S.A.		
DATE DRILLED:	11/12/1999		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							52.08		
Mottled sandy CLAY, trace Organics.		0.0		2	TOC		47.08		
Mottled clayey medium SAND.		5.0							
Mottled sandy CLAY.							42.08		
Mottled clayey medium SAND, moist									
Mottled gray clayey medium SAND, wet.		10.0							
Blue gray clayey SAND w/shells, wet.							37.08		
		15.0		18	TPC		32.08		
Blue gray sandy CLAY, stiff, moist.		20.0							
Gray mottled clayey SILT, stiff.							27.08		
		25.0		26	CG				
				28	BS		22.08		
Gray mottled silty CLAY, moist.									
Gray silty clayey SAND, very stiff to stiff.		30.0					17.08		
Gray to blue gray silty medium SAND, moist.		35.0					12.08		
Blue gray silty CLAY, very stiff.				40	FP BSC				
Boring terminated at 40' bgs.		40.0							



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter:
- Type:
- Interval:

OUTER CASING
- Diameter: 6" diameter
- Type: 0'-18'
- Length: 18

RISER CASING
- Diameter: 2"
- Type: PVC
- Interval: 0-30

GROUT
- Type: Cement
- Interval: 0-26

SEAL
- Type: Bentonite
- Interval: 26-28

FILTERPACK
- Type: Sand
- Interval: 28-40

SCREEN
- Diameter: 2"
- Type: PVC
- Interval: 30-40

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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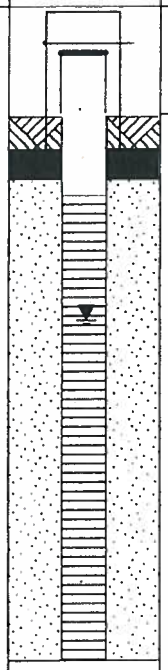
COMPLETION REPORT
OF WELL NO. MW-5D

COMPLETION REPORT OF WELL NO. MW-6

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	6.54
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	46.29
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	18
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/16/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							46.29		
Soil characteristics were not logged.		0.0		1	CG				
				2	BS				
				2.5	FP		41.29		
		5.0							
							36.29		
		10.0							
							31.29		
		15.0							
				17.5	BSC				
Boring terminated at 18.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 2.5 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 18.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 2.5 - 17.5 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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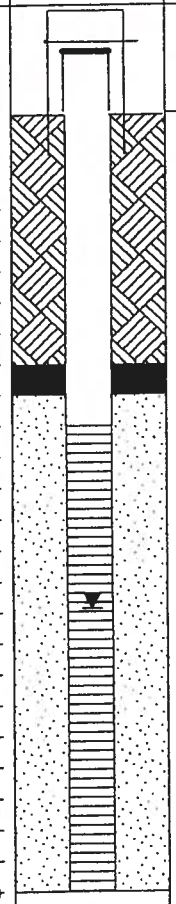
COMPLETION REPORT
OF WELL NO. MW-6

COMPLETION REPORT OF WELL NO. MW-7

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	15.88
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	25
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/15/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface		0.0							
Soil characteristics were not logged.		5.0							
				8	CG				
				9	BS				
		10.0		10	FP				
		15.0							
		20.0							
		25.0		25	BSC				
Boring terminated at 25.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 10.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 8.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 8.0 - 9.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 9.0 - 25.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 10.0 - 25.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. MW-7

COMPLETION REPORT OF WELL NO. MW-7A

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	68.43
DRILLING CONTRACTOR:	Geotek	BORING DEPTH (FT.):	25
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Tomzack
DATE DRILLED:	11/13/1999		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							68.43		
Brown and gray brown silty clayey fine to medium SAND.		0.0				13	63.43		
Red brown and brown silty sandy CLAY.		5.0				14			
Mottled silty CLAY, stiff.						18	58.43		
		10.0		11	CG	11			
				13	BS		53.43		
Mottled silty CLAY, soft.									
Black and gray sandy silty CLAY w/trace of shells, wet.		15.0		15	FP	11			
							48.43		
		20.0							
							43.43		
Black and gray sandy CLAY w/many shells, wet.				25	BSC				
Boring terminated at 25.0 ft.		25.0							

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 15.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 11.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 11.0 - 13.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 13.0 - 25.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 15.0 - 25.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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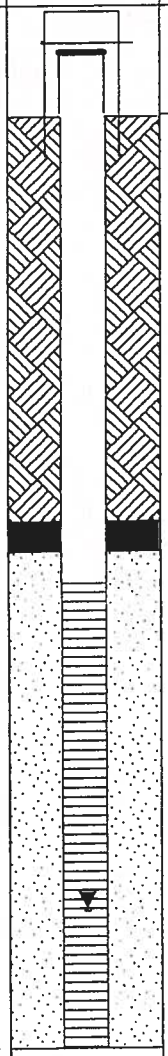
COMPLETION REPORT
OF WELL NO. MW-7A

COMPLETION REPORT OF WELL NO. MW-8

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	25.45
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	30
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/17/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Soil characteristics were not logged.		0.0							
		5.0							
		10.0							
				13	CG				
				14	BS				
				15	FP				
		15.0							
		20.0							
		25.0							
				30	BSC				
		30.0							
Boring terminated at 30.0 ft.									



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 15.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 13.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 13.0 - 14.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 14.0 - 30.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 15.0 - 30.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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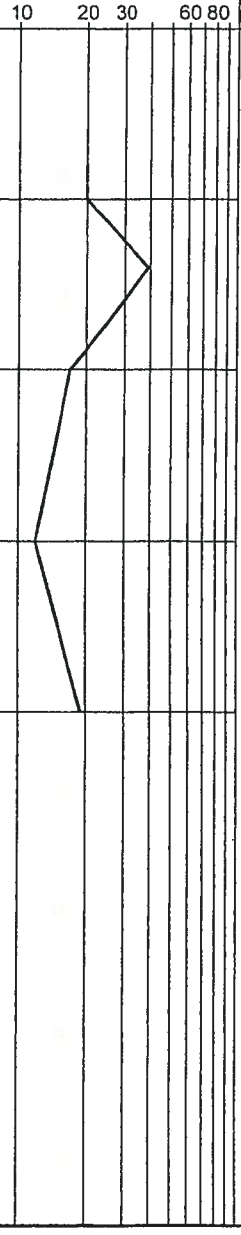
COMPLETION REPORT
OF WELL NO. MW-8

PROJECT: Edgecombe County Landfill Tarboro, NC 1040-01-545	BORING LOG MW-8A

DATE DRILLED: **11/11/99**	ELEVATION: **82.3**	NOTES:
RILLING METHOD: **4¼" H.S.A.**	BORING DEPTH: **20.0**	
LOGGED BY: **D. Tomzack**	WATER LEVEL:	
DRILLER:	DRILL RIG: **CME-55**	

DEPTH (feet)	GRAPHIC LOG	SOIL DESCRIPTION	OVA (ppm)	WATER LEVEL	ELEVATION (feet)	SAMPLE NO/TYPE
		Orange brown silty clayey SAND, moist.				
			0.75			REC %
5		Mottled silty clayey SAND, moist.	1.0		77.3	
						REC %
		Mottled gray silty clayey medium SAND, wet.	1.26			
						REC %
10			1.19		72.3	REC %
		Black and gray clayey medium SAND, moist.				
15			0.86		67.3	REC %
		Black and gray silty CLAY, stiff.				
20		Boring terminated at 20.0 ft.	0.77		62.3	REC %

STANDARD PENETRATION TEST DATA (blows/ft)



N VALUE

BORING LOG GINTLOGS.GPJ S&ME.GDT 12/8/03

1. BORING AND SAMPLING IS IN ACCORDANCE WITH ASTM D-1586.
2. PENETRATION (N-VALUE) IS THE NUMBER OF BLOWS OF 140 LB. HAMMER FALLING 30 IN. REQUIRED TO DRIVE 1.4 IN. I.D. SAMPLER 1 FT.

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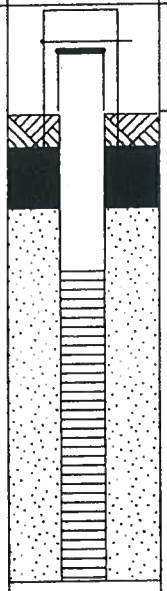
COMPLETION REPORT OF WELL NO. MW-9

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	72.41
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	15
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/26/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							72.41		
Dark gray CLAY, moist, no odor		0.0		1	CG				
				3	BS		67.41		
		5.0		5	FP				0
Light gray CLAY, moist, no odor							62.41		
		10.0					57.41		
		15.0		15	BSC				0
Boring terminated at 15.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 5.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 1.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 1.0 - 3.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 3.0 - 15.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 5.0 - 15.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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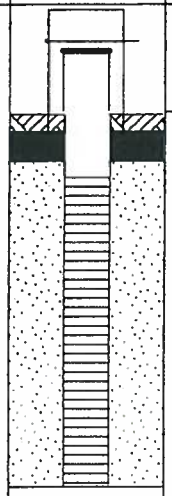
COMPLETION REPORT
OF WELL NO. MW-9

COMPLETION REPORT OF WELL NO. MW-10

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	75.78
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	12
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/26/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							75.78		
Orange fine to medium SAND w/clay, dry, no odor		0.0		0.5 1.5 2	CG BS FP				
Brown orange CLAY w/fine sand, moist, no odor		5.0					70.78		0
Gray CLAY w/fine sand, moist, no odor		10.0					65.78		6
Boring terminated at 12.0 ft.				12	BSC				11



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 2.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 0.5 ft.

SEAL
Type: Bentonite Pellets
Interval: 0.5 - 1.5 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 1.5 - 12.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 2.0 - 12.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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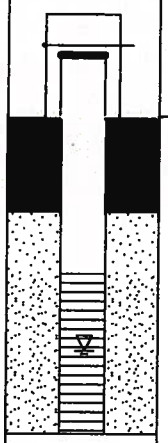
COMPLETION REPORT
OF WELL NO. MW-10

COMPLETION REPORT OF SOIL BORING NO. MW-12

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	51.24
PROJECT NO:	1054-07-239A	BORING DEPTH (FT.):	10.5
PROJECT LOCATION:	Tarboro, North Carolina	LOGGED BY:	DW/BB
DRILLING CONTRACTOR:	S&ME, Inc.		
DRILLING METHOD:	HANDAUGER		
DATE DRILLED:	7/22/2008		



STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							51.24		
Dark brown silty SAND with roots		0.0							
Light brown to tan silty very fine SAND, dry				3	BS		46.24		
Light brown sandy CLAY, damp									
Light gray with red and yellow mottling sandy CLAY, moist		5.0							
Brown gray silty fine to medium SAND, wet							41.24		
Light gray brown sandy silty CLAY, wet									
Blue gray sandy silty CLAY, wet (Yorktown)		10.0		10.19	FP TSC				
Boring terminated @ 10.5' bgs									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: **2"**
Type: **PVC**
Interval: **0-5**

GROUT
Type: **Cement**
Interval: **0-3**

SEAL
Type: **Bentonite**
Interval: **0.5-3**

FILTERPACK
Type: **Sand**
Interval: **3-10.5**

SCREEN
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **5 - 10**

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES: Ground surface elevation 48.56, converted P-28A

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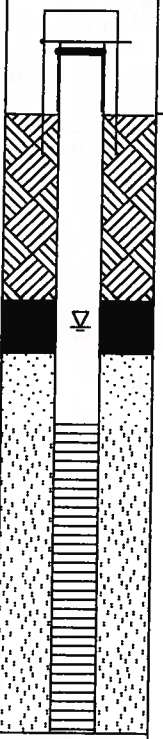
COMPLETION REPORT OF WELL NO. MW-12

COMPLETION REPORT OF SOIL BORING NO. MW-13

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	54.99
PROJECT NO:	1054-07-239A	BORING DEPTH (FT.):	20
PROJECT LOCATION:	Tarboro, North Carolina	LOGGED BY:	DBW
DRILLING CONTRACTOR:	S&ME, Inc.		
DRILLING METHOD:	4¼" H.S.A.		
DATE DRILLED:	10/14/2008		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							54.99		
TOPSOIL		0.0							
Light brown w/ red silty SAND, roots				0	GS				
Mottled brown gray sandy silty CLAY, moist						3	49.99		
Light gray sandy silty CLAY, moist		5.0		6	CG				
				7.7	BS		44.99		
Dark brown w/ black to red brown sandy SILT, no recovery		10.0				2			
Blue gray silty medium SAND w/shell fragments, wet						3	39.99		
Blue gray clayey SAND, damp, hard drill @15' bgs		15.0					34.99		
Light blue gray clayey silty SAND, moist				20	FP	17			
Light gray silty fine SAND, very dense		20.0			BSC				
Boring terminated at 20' bgs									



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: Sch 40 PVC
Interval: 0 -10

GROUT
Type: Cement
Interval: 0 - 6

SEAL
Type: Bentonite
Interval: 6 - 7.7

FILTERPACK
Type: #2 sand
Interval: 7.7 - 20

SCREEN
Diameter: 2"
Type: Sch 40 PVC
Interval: 10 - 20

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES: Ground surface elevation 51.99

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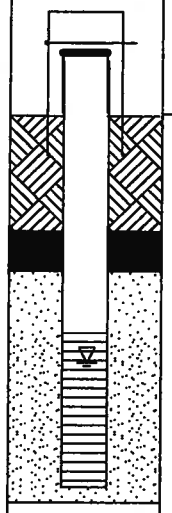
COMPLETION REPORT OF WELL NO. MW-13

COMPLETION REPORT OF SOIL BORING NO. MW-14

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	43.88
PROJECT NO:	1054-07-239A	BORING DEPTH (FT.):	12.5
PROJECT LOCATION:	Tarboro, North Carolina	LOGGED BY:	DBW
DRILLING CONTRACTOR:	S&ME, Inc.		
DRILLING METHOD:	4¼" H.S.A.		
DATE DRILLED:	10/14/2008		

STRATA

DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							43.88		
Light brown silty SAND		0.0		0	GS				
Very dark brown clayey sandy SILT, moist @ 4.5' bgs		5.0		3.7 5	CG BS	2	38.88		
Black silty SAND, wet									
Blue gray clayey SAND, damp @ 9' bgs							33.88		
Light gray silty very fine SAND, very dense		10.0				23			
Boring terminated at 12.5' bgs, water on top of light gray very fine SAND				12 12.5	BSC FP	46			

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: Sch 40 PVC
Interval: 0 - 7

GROUT
Type: Cement
Interval: 0 - 3.7

SEAL
Type: Bentonite
Interval: 3.7 - 5

FILTERPACK
Type: #2 sand
Interval: 5 - 12.5

SCREEN
Diameter: 2"
Type: Sch 40 PVC
Interval: 7 - 12

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES: Ground surface elevation 41.25, replaces P-36

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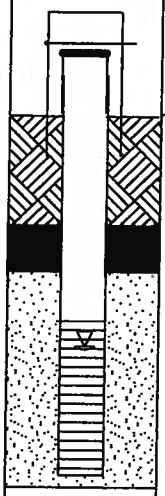
COMPLETION REPORT
OF WELL NO. MW-14

COMPLETION REPORT OF SOIL BORING NO. MW-15

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	44.87
PROJECT NO:	1054-07-239A	BORING DEPTH (FT.):	12
PROJECT LOCATION:	Tarboro, North Carolina	LOGGED BY:	DBW
DRILLING CONTRACTOR:	S&ME, Inc.		
DRILLING METHOD:	4¼" H.S.A.		
DATE DRILLED:	10/14/2008		



STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							44.87		
Light brown silty SAND, w/ root fragments, damp		0.0		0	GS				
Brown orange clayey silty SAND, damp				3.5	CG	8	39.87		
Dark brown to gray silty SAND, damp		5.0		5	BS				
Dark gray to black clayey SAND, moist						4	34.87		
Dark blue gray sandy silty CLAY w/ shell fragments - Yorktown		10.0		11.6	BSC				
Boring terminated @12' bgs				12	FP				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **0 - 6.6**

GROUT
Type: **Cement**
Interval: **0 - 3.5**

SEAL
Type: **Bentonite**
Interval: **3.5 - 5**

FILTERPACK
Type: **#2 sand**
Interval: **5 - 12**

SCREEN
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **6.6 - 11.6**

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES: Ground surface elevation 42.20, Jerry's Creek ~30' North, dry@ TOB, ~25' from P-33R, replaces P-33R

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COMPLETION REPORT OF WELL NO. MW-15

COMPLETION REPORT OF SOIL BORING NO. MW-16

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	46.58
PROJECT NO:	1054-07-239A	BORING DEPTH (FT.):	17
PROJECT LOCATION:	Tarboro, North Carolina	LOGGED BY:	DBW
DRILLING CONTRACTOR:	S&ME, Inc.		
DRILLING METHOD:	4¼" H.S.A.		
DATE DRILLED:	10/15/2008		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							46.58		
TOPSOIL, brown gray silty SAND		0.0		0	GS				
Red brown silty very fine to fine SAND						3	41.58		
Red brown silty CLAY		5.0		5 6	CG BS				
Dark gray sandy silty CLAY, very soft, wet						1	36.58		
		10.0							
Brown with blue gray silty fine to medium SAND, wet						5	31.58		
Dark blue gray silty CLAY to very fine SAND		15.0		17	BSC				
Boring terminated @ 17.3' bgs				17.3	FP				

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter:
- Type:
- Interval:

OUTER CASING
- Diameter:
- Type:
- Length:

RISER CASING
- Diameter: **2"**
- Type: **Sch 40 PVC**
- Interval: **0 - 7**

GROUT
- Type: **Cement**
- Interval: **0 - 5**

SEAL
- Type: **Bentonite**
- Interval: **5 - 6**

FILTERPACK
- Type: **#2 sand**
- Interval: **6 - 17.3**

SCREEN
- Diameter: **2"**
- Type: **Sch 40 PVC**
- Interval: **7 - 17**

LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES: Ground surface elevation 43.73, replaces MW-1A

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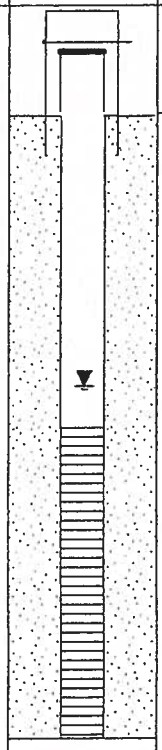
COMPLETION REPORT OF WELL NO. MW-16

COMPLETION REPORT OF WELL NO. P -1

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	8.67
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	74.48
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	20
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/20/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							74.48		
Soil characteristics were not logged.		0.0							
		5.0					69.48		
		10.0		10	FP		64.48		
		15.0					59.48		
		20.0		20	BSC		54.48		
Boring terminated at 20.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 10.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: N/A

SEAL
- Type: Bentonite Pellets
- Interval: N/A

FILTERPACK
- Type: Filter Sand #2
- Interval: 0.0 - 20.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 10.0 - 20.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. PZ-1

COMPLETION REPORT OF WELL NO. P-2A

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	83.61
DRILLING CONTRACTOR:	Geotek	BORING DEPTH (FT.):	30
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Tomzack
DATE DRILLED:	11/9/1999		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							83.61		
Mottled sandy SILT, stiff.		0.0							
						42	78.61	3597	-7.78
Gray, tan, and white silty SAND.									
		5.0				25		1276	-8.83
						33		1050	-8.82
Mottled silty SAND, moist.							73.61		
						46		1000	-9.13
Mottled silty SAND, trace Clay, wet.		10.0		11	CG				
				13	BS		68.61		
				15	FP	5		3486	-9.98
		15.0							
						5	63.61	352	-9.75
Dark gray silty sandy CLAY, moist.		20.0							
							58.61		
Dark gray silty CLAY, stiff.				25	BSC	15		515	-10.41
		25.0							
							53.61		
						25		2042	-9.83
Boring terminated at 30.0 ft.		30.0							

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 15.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 11.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 11.0 - 13.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 13.0 - 30.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 15.0 - 25.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. P-2A

COMPLETION REPORT OF WELL NO. P-3A

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	79.77
DRILLING CONTRACTOR:	Geotek	BORING DEPTH (FT.):	25
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Tomzack
DATE DRILLED:	11/13/1999		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							79.77		
Mottled clay silty fine SAND.		0.0							
Gray mottled silty fine SAND.						22	74.77	1162	2.01
Gray silty fine to medium SAND.						13		1437	2.07
Brown silty sandy CLAY w/debris.		5.0							
Brown CLAY w/wood and debris, wet.						47	69.77	735	1.96
		10.0				50		126	1.21
				11	CG				
				13	BS		64.77		
		15.0		15	FP	10			
							59.77		
		20.0							
							54.77		
Black and gray silty SAND w/trace of debris.		25.0		25	BSC	15		41.62	1.98
Boring terminated at 25.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 15.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 11.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 11.0 - 13.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 13.0 - 25.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 15.0 - 25.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT OF WELL NO. P-3A

COMPLETION REPORT OF WELL NO. P-12

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	9.2
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW/LE
DRILLING CONTRACTOR:	SEI		
DRILLING METHOD:	GEOPROBE		
DATE DRILLED:	7/7/2004		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
TOPSOIL		0.0							
Light red brown silty SAND with some clay									3.5
Light brown to light gray silty SAND									
Light gray fine SAND				3.17					3.3
Red brown fine to medium silty SAND		5.0							
Blue gray silty medium SAND with some moist silt									3.0
Medium gray SAND with little silt				9.17					

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 1"
Type: PVC
Interval: 0-4.17'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-3.17'

FILTERPACK
Type: Sand
Interval: 3.17-9.17'

SCREEN
Diameter: 1"
Type: PVC
Interval: 4.17-9.17'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

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COMPLETION REPORT
OF WELL NO. P-12

COMPLETION REPORT OF WELL NO. P-15

PROJECT:	**Edgecombe County Landfill**	WATER LEVEL TOB (FT.):	**2**
PROJECT NO:	**1040-01-545B**	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	**Tarboro, NC**	TOP OF CASING ELEVATION (FT.):	**45.16**
DRILLING CONTRACTOR:	**SEI**	BORING DEPTH (FT.):	**7**
DRILLING METHOD:	**GEOPROBE**	LOGGED BY:	**DW/LE**
DATE DRILLED:	**7/8/2004**		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							45.16		
TOPSOIL		0.0		0					
Gray brown sandy SILT				1					
Light red brown silty fine SAND									
Light gray silty fine to medium SAND									2.3
Light gray silty coarse SAND									
Light gray with red fine to medium SAND							40.16		
		5.0							
Boring terminated at 7 feet bgs				7					

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: **1"**
Type: **PVC**
Interval: **0-2'**

GROUT
Type:
Interval:

SEAL
Type: **Bentonite**
Interval: **0-1'**

FILTERPACK
Type: **Sand**
Interval: **1-7'**

SCREEN
Diameter: **1"**
Type: **PVC**
Interval: **2'-7'**

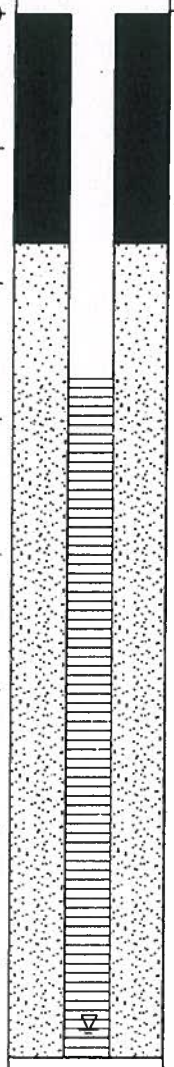
LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

COMPLETION REPORT OF WELL NO. P-17

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	7.7
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW/LE
DRILLING CONTRACTOR:	SEI		
DRILLING METHOD:	GEOPROBE		
DATE DRILLED:	7/9/2004		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
TOPSOIL		0.0							
Medium brown silty SAND				1.7					4.1
		5.0							5.3
Dark brown silty clayey SAND				7.7					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 1"
Type: PVC
Interval: 0-2.7'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-1.7'

FILTERPACK
Type: Sand
Interval: 1.7-7.7'

SCREEN
Diameter: 1"
Type: PVC
Interval: 2.7-7.7'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. P-17

COMPLETION REPORT OF WELL NO. P-18

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	15
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW/LE
DRILLING CONTRACTOR:	SEI		
DRILLING METHOD:	GEOPROBE		
DATE DRILLED:	7/9/2004		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Light brown tan sandy SILT with some clay		0.0							
Light brown with gray sandy silty CLAY		5.0							
Light brown tan sandy SILT									1.2
Light gray brown silty CLAY									2.8
Light gray brown silty sandy CLAY									
Dark red brown silty fine to medium SAND				9					3.2
		10.0							3.4
Light brown red clayey fine to medium SAND									2.5
Brown with dark red silty fine to medium SAND		15.0		15					

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter:
- Type:
- Interval:

OUTER CASING
- Diameter:
- Type:
- Length:

RISER CASING
- Diameter: 1"
- Type: PVC
- Interval: 0-10'

GROUT
- Type:
- Interval:

SEAL
- Type: Bentonite
- Interval: 0-9'

FILTERPACK
- Type: Sand
- Interval: 9-15'

SCREEN
- Diameter: 1"
- Type: PVC
- Interval: 10-15'

LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. P-18

COMPLETION REPORT OF WELL NO. P-19

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	17.7
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW/LE
DRILLING CONTRACTOR:	SEI		
DRILLING METHOD:	GEOPROBE		
DATE DRILLED:	7/7/2004		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Light brown silty fine SAND		0.0							
Red brown silty CLAY with little sand									
Dark brown/tan silty fine SAND									
Red brown sandy CLAY									
Light red brown silty CLAY (motled with gray)		5.0		5.67					8
									6.4
Light gray with iron stain clayey SILT									5
Red brown silty CLAY									
Light gray brown clayey SAND		10.0							4.7
Light gray brown silty CLAY									4.1
Light gray clayey SILT									
Light gray brown silty CLAY									
Light gray with brown clayey silty SAND									4.4
Red brown silty fine to medium SAND (to dark red brown)		15.0							4.1
Dark blue gray silty sandy CLAY with shell fragments, YORKTOWN				17.67					3.8

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter:
- Type:
- Interval:

OUTER CASING
- Diameter:
- Type:
- Length:

RISER CASING
- Diameter: 1"
- Type: PVC
- Interval: 0-7.67'

GROUT
- Type:
- Interval:

SEAL
- Type: Bentonite
- Interval: 0-5.67'

FILTERPACK
- Type: Sand
- Interval: 5.67-17.67'

SCREEN
- Diameter: 1"
- Type: PVC
- Interval: 7.67-17.67'

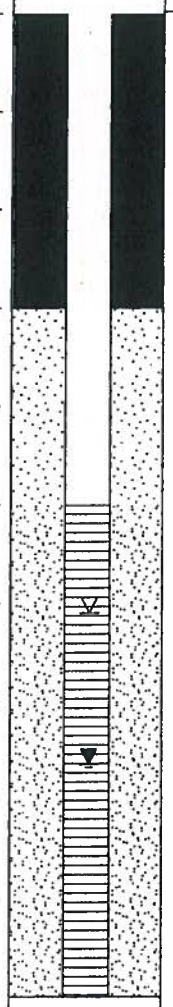
LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

NOTES:

COMPLETION REPORT OF WELL NO. P-25

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	6.1
PROJECT NO:	1040-01-545B	WATER LEVEL 24 HRS (FT.):	7.64
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	SEI	BORING DEPTH (FT.):	10
DRILLING METHOD:	GEOPROBE	LOGGED BY:	ML
DATE DRILLED:	8/1/2007		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
White SAND		0.0							
Orange Sandy CLAY								13.43	121
Brown Gray CLAY				3				44.41	134
White Orange Gray CLAY		5.0							
Boring terminated at 10 feet bgs		10.0		10					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: PVC
Interval: 0-5'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-3'

FILTERPACK
Type: Sand
Interval: 3-10'

SCREEN
Diameter: 2"
Type: PVC
Interval: 5'-10'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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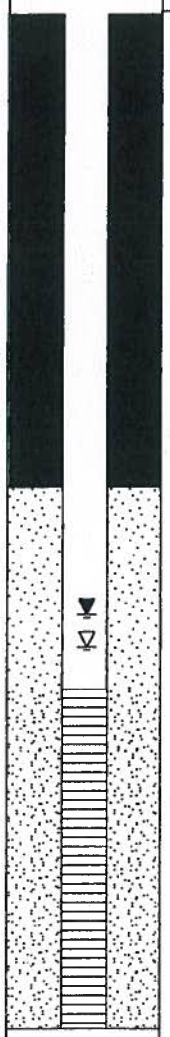
COMPLETION REPORT
OF WELL NO. P-25

COMPLETION REPORT OF WELL NO. P-26

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	9.37
PROJECT NO:	1040-01-545B	WATER LEVEL 24 HRS (FT.):	8.89
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	SEI	BORING DEPTH (FT.):	15
DRILLING METHOD:	GEOPROBE	LOGGED BY:	ML
DATE DRILLED:	8/1/2007		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
White Orange SAND		0.0							
Orange Brown Clayey SAND								1.45	120
Gray Orange Sandy CLAY								43.27	128
Gray Orange Sandy CLAY		5.0						51.15	42.97
				7				40.42	163
								11.68	103
Gray Orange Sandy CLAY - Saturated @ 11.5'		10.0							
Boring terminated at 15 feet bgs		15.0		15					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: PVC
Interval: 0-10'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-7'

FILTERPACK
Type: Sand
Interval: 7-15'

SCREEN
Diameter: 2"
Type: PVC
Interval: 10'-15'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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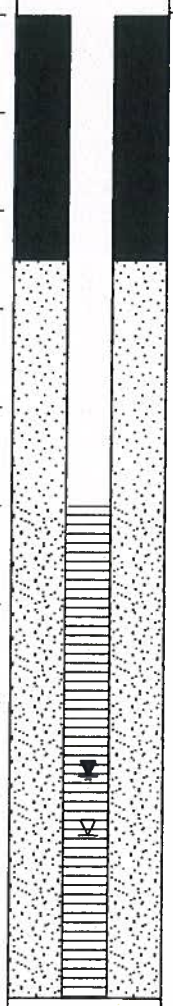
COMPLETION REPORT
OF WELL NO. P-26

COMPLETION REPORT OF WELL NO. P-29

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	8.35
PROJECT NO:	1040-01-545B	WATER LEVEL 24 HRS (FT.):	7.75
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	SEI	BORING DEPTH (FT.):	10
DRILLING METHOD:	GEOPROBE	LOGGED BY:	ML
DATE DRILLED:	8/1/2007		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Brown Black Silty SAND		0.0						3.67	14.04
Orange Gray CLAY				2.5				4.18	3.57
Orange Gray Sandy CLAY									
Orange Gray Sandy CLAY - Saturated @ 6.0'		5.0							
Gray White Sandy CLAY									
Boring terminated at 10 feet bgs		10.0		10					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: PVC
Interval: 0-5'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-2.5'

FILTERPACK
Type: Sand
Interval: 2.5-10'

SCREEN
Diameter: 2"
Type: PVC
Interval: 5'-10'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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COMPLETION REPORT
OF WELL NO. P-29

COMPLETION REPORT OF WELL NO. P-34

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	7.67
PROJECT NO:	1040-01-545B	WATER LEVEL 24 HRS (FT.):	7.81
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	SEI	BORING DEPTH (FT.):	10
DRILLING METHOD:	GEOPROBE	LOGGED BY:	ML
DATE DRILLED:	8/2/2007		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Orange Yellow Clayey SILT		0.0						1.79	56.34
Orange Gray SILT				3				2.28	164
Gray Black Silty CLAY - Saturated @ 5.0'		5.0							
Gray Sandy CLAY									
Boring terminated at 10 feet bgs		10.0		10					

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: PVC
Interval: 0-5'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-3'

FILTERPACK
Type: Sand
Interval: 3-10'

SCREEN
Diameter: 2"
Type: PVC
Interval: 5'-10'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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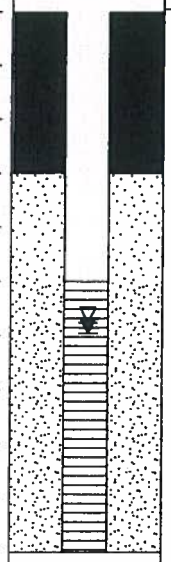
COMPLETION REPORT
OF WELL NO. P-34

COMPLETION REPORT OF WELL NO. P-35

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	5.76
PROJECT NO:	1040-01-545B	WATER LEVEL 24 HRS (FT.):	5.96
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	
DRILLING CONTRACTOR:	SEI	BORING DEPTH (FT.):	10
DRILLING METHOD:	GEOPROBE	LOGGED BY:	ML
DATE DRILLED:	8/2/2007		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND		ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface									
Brown Black Clayey SILT		0.0						2.31	66.74
Brown Black Clayey SILT				3				2.11	38.34
Brown Black Silty CLAY									
Brown Black Silty CLAY - Saturated @ 5.0'		5.0							
Gray Sandy CLAY									
Boring terminated at 10 feet bgs		10.0		10					



WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter:
Type:
Interval:

OUTER CASING
Diameter:
Type:
Length:

RISER CASING
Diameter: 2"
Type: PVC
Interval: 0-5'

GROUT
Type:
Interval:

SEAL
Type: Bentonite
Interval: 0-3'

FILTERPACK
Type: Sand
Interval: 3-10'

SCREEN
Diameter: 2"
Type: PVC
Interval: 5'-10'

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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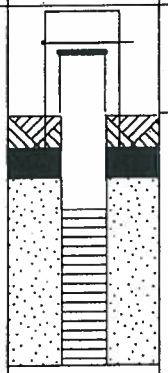
COMPLETION REPORT
OF WELL NO. P-35

COMPLETION REPORT OF WELL NO. GW-1R

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	81.08
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/5/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							81.08		
Brown medium SAND, dry, no odor detected.		0.0		1 2	CG BS			0	
Light brown medium SAND, dry, no odor detected.		5.0		3	FP		76.08	5	
Brown-orange fine to medium SAND w/clay, dry, no odor detected.				8	BSC			5	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 3.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 1.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 1.0 - 2.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 2.0 - 8.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 3.0 - 8.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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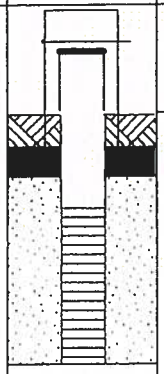
COMPLETION REPORT
OF WELL NO. GW-1R

COMPLETION REPORT OF WELL NO. GW-2R

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	73.84
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/5/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
							73.84		
Ground Surface		0.0							
Light brown fine to medium SAND, dry.				1	CG			0	
				2	BS				
Dark brown fine to medium SAND w/clay, dry.				3	FP		68.84		
								10	
Red-orange CLAY, dry, no odor detected.		5.0							
								30	
Brown fine to medium SAND w/clay, dry, no odor detected.				8	BSC			27	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 3.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 8.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 3.0 - 8.0 ft.

LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

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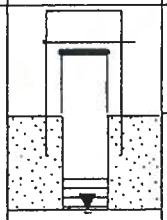
COMPLETION REPORT
OF WELL NO. GW-2R

COMPLETION REPORT OF WELL NO. GW-3

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	3
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	69.00
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	3
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/20/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface		0.0					69.00		
Soil characteristics were not logged.		-		2	FP				
		-		3	BSC				
Boring terminated at 3.0 ft.		-							

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 2.0 ft.

GROUT
Type: Type II Portland Cement
Interval: N/A

SEAL
Type: Bentonite Pellets
Interval: N/A

FILTERPACK
Type: Filter Sand #2
Interval: 0.0 - 3.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 2.0 - 3.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

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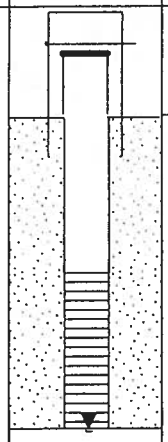
COMPLETION REPORT
OF WELL NO. GW-3

COMPLETION REPORT OF WELL NO. GW-4

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	10
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	69.93
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	10
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/20/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							69.93		
Soil characteristics were not logged.		0.0							
		5.0		5	FP		64.93		
		10.0		10	BSC		59.93		
Boring terminated at 10.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 5.0 ft.

GROUT
Type: Type II Portland Cement
Interval: N/A

SEAL
Type: Bentonite Pellets
Interval: N/A

FILTERPACK
Type: Filter Sand #2
Interval: 0.0 - 10.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 5.0 - 10.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

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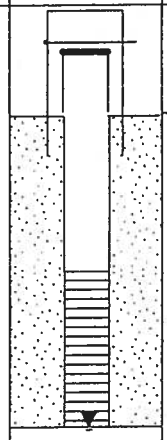
COMPLETION REPORT
OF WELL NO. GW-4

COMPLETION REPORT OF WELL NO. GW-5

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	10
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	65.23
DRILLING CONTRACTOR:	Law Engineering	BORING DEPTH (FT.):	10
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	D. Brown
DATE DRILLED:	9/20/1994		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							65.23		
Soil characteristics were not logged.		0.0							
		5.0		5	FP		60.23		
		10.0		10	BSC		55.23		
Boring terminated at 10.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 5.0 ft.

GROUT
Type: Type II Portland Cement
Interval: N/A

SEAL
Type: Bentonite Pellets
Interval: N/A

FILTERPACK
Type: Filter Sand #2
Interval: 0.0 - 10.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 5.0 - 10.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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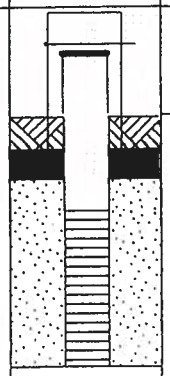
COMPLETION REPORT
OF WELL NO. GW-5

COMPLETION REPORT OF WELL NO. GW-6

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	79.02
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/5/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							79.02		
Brown medium SAND, dry, no odor detected.		0.0		1 2 3	CG BS FP		74.02	0	
Gray CLAY w/sand, moist, no odor detected.		5.0							
Boring terminated at 8.0 ft.				8	BSC			45	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 3.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 1.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 1.0 - 2.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 2.0 - 8.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 3.0 - 8.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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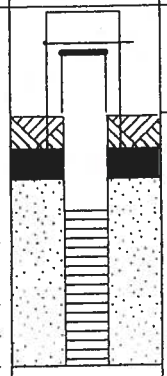
COMPLETION REPORT
OF WELL NO. GW-6

COMPLETION REPORT OF WELL NO. GW-7

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	75.02
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/5/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
							75.02		
Ground Surface		0.0							
Light brown CLAY w/fine to medium sand, moist, no odor detected.				1	CG			4	
				2	BS				
Orange-brown CLAY, moist, no odor detected.				3	FP		70.02		
		5.0						0	
Gray-brown CLAY, moist, no odor detected.									
				8	BSC			0	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 3.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 8.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 3.0 - 8.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

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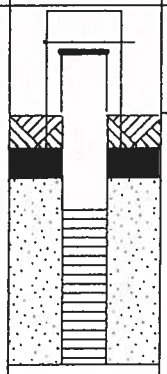
COMPLETION REPORT
OF WELL NO. GW-7

COMPLETION REPORT OF WELL NO. GW-8

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	79.92
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/6/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							79.92		
Gray CLAY, dry, no odor detected.		0.0		1	CG				
				2	BS			0	
Brown CLAY, moist, no odor detected.				3	FP		74.92		
		5.0						0	
Dark gray CLAY, moist, no odor detected.									
				8	BSC			0	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 3.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 8.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 3.0 - 8.0 ft.

LEGEND
- ∇ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

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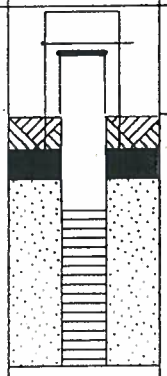
COMPLETION REPORT
OF WELL NO. GW-8

COMPLETION REPORT OF WELL NO. GW-9

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	72.69
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/6/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							72.69		
Brown-orange fine to medium SAND w/some clay, dry, no odor detected.		0.0		1 2 3	CG BS FP		67.69	0	
Gray-brown medium SAND, moist, no odor detected.		5.0							
				8	BSC			50	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
- Diameter: 4.0 in.
- Type: Stick-Up
- Interval: ~2 to +2 BGS

OUTER CASING
- Diameter: N/A
- Type: N/A
- Length: N/A

RISER CASING
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 0.0 - 3.0 ft.

GROUT
- Type: Type II Portland Cement
- Interval: 0.0 - 1.0 ft.

SEAL
- Type: Bentonite Pellets
- Interval: 1.0 - 2.0 ft.

FILTERPACK
- Type: Filter Sand #2
- Interval: 2.0 - 8.0 ft.

SCREEN
- Diameter: 2.0 in.
- Type: Schedule 40 PVC
- Interval: 3.0 - 8.0 ft.

LEGEND
- ▽ = Water Level At Termination of Boring (TOB)
- ▼ = Water Level After 24 Hours
- BS = Bentonite Seal
- FP = Filter Pack
- CG = Cement Grout
- BSC = Bottom of Screen
- REC = Core Recovery
- RQD = Rock Quality Designation

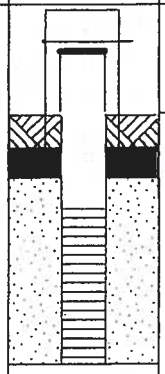
NOTES:

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES
3118 Spring Forest Road
Raleigh, NC 27616

COMPLETION REPORT
OF WELL NO. GW-9

COMPLETION REPORT OF WELL NO. GW-10

PROJECT:	Edgecombe County Landfill	WATER LEVEL TOB (FT.):	
PROJECT NO:	1040-01-545	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	Tarboro, NC	TOP OF CASING ELEVATION (FT.):	69.17
DRILLING CONTRACTOR:	S&ME, Inc.	BORING DEPTH (FT.):	8
DRILLING METHOD:	4¼" H.S.A.	LOGGED BY:	E. Lane
DATE DRILLED:	2/6/2002		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							69.17		
Red-orange CLAY w/fine to medium sand, dry, no odor detected.		0.0		1 2 3	CG BS FP		64.17		
Light gray CLAY, moist, no odor detected.		5.0						0	
Boring terminated at 8.0 ft.				8	BSC			0	

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: 4.0 in.
Type: Stick-Up
Interval: ~2 to +2 BGS

OUTER CASING
Diameter: N/A
Type: N/A
Length: N/A

RISER CASING
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 0.0 - 3.0 ft.

GROUT
Type: Type II Portland Cement
Interval: 0.0 - 1.0 ft.

SEAL
Type: Bentonite Pellets
Interval: 1.0 - 2.0 ft.

FILTERPACK
Type: Filter Sand #2
Interval: 2.0 - 8.0 ft.

SCREEN
Diameter: 2.0 in.
Type: Schedule 40 PVC
Interval: 3.0 - 8.0 ft.

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

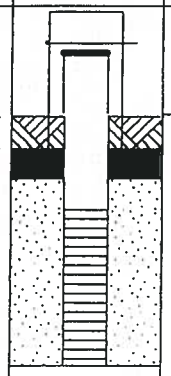
NOTES:

S&ME
ENGINEERING • TESTING
ENVIRONMENTAL SERVICES
3118 Spring Forest Road
Raleigh, NC 27616

COMPLETION REPORT
OF WELL NO. GW-10

COMPLETION REPORT OF WELL NO. GW-11

PROJECT:	**Edgecombe County Landfill**	WATER LEVEL TOB (FT.):	
PROJECT NO:	**1040-01-545**	WATER LEVEL 24 HRS (FT.):	
PROJECT LOCATION:	**Tarboro, NC**	TOP OF CASING ELEVATION (FT.):	**64.19**
DRILLING CONTRACTOR:	**S&ME, Inc.**	BORING DEPTH (FT.):	**8**
DRILLING METHOD:	**4¼" H.S.A.**	LOGGED BY:	**E. Lane**
DATE DRILLED:	**2/6/2002**		

STRATA DESCRIPTION	SYMBOL	DEPTH (feet)	WELL DETAILS	DEPTH (feet)	LEGEND	SPT (N-value)	ELEVATION (feet)	FID (ppm)	PID (ppm)
Ground Surface							64.19		
Red-orange fine to medium SAND w/clay, no odor detected.		0.0		1 2	CG BS			0	
Light brown clayey fine to medium SAND, dry, no odor detected.		5.0		3	FP		59.19	0	
Gray CLAY, moist, no odor detected.				8	BSC			0	
Boring terminated at 8.0 ft.									

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING
Diameter: **4.0 in.**
Type: **Stick-Up**
Interval: **~2 to +2 BGS**

OUTER CASING
Diameter: **N/A**
Type: **N/A**
Length: **N/A**

RISER CASING
Diameter: **2.0 in.**
Type: **Schedule 40 PVC**
Interval: **0.0 - 3.0 ft.**

GROUT
Type: **Type II Portland Cement**
Interval: **0.0 - 1.0 ft.**

SEAL
Type: **Bentonite Pellets**
Interval: **1.0 - 2.0 ft.**

FILTERPACK
Type: **Filter Sand #2**
Interval: **2.0 - 8.0 ft.**

SCREEN
Diameter: **2.0 in.**
Type: **Schedule 40 PVC**
Interval: **3.0 - 8.0 ft.**

LEGEND
▽ = Water Level At Termination of Boring (TOB)
▼ = Water Level After 24 Hours
BS = Bentonite Seal
FP = Filter Pack
CG = Cement Grout
BSC = Bottom of Screen
REC = Core Recovery
RQD = Rock Quality Designation

NOTES:

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ENVIRONMENTAL SERVICES
3118 Spring Forest Road
Raleigh, NC 27616

COMPLETION REPORT
OF WELL NO. GW-11

APPENDIX III-C

Gas Monitoring Plan

GAS MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-07-242

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 30, 2008

NORTH CAROLINA PROFESSIONAL SEAL 024294 ENGINEER JOHN A. MOODY

6-30-08

John A. Moody, P.E.
Project Manager
NC Licensed Engineer No. 024294

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS 6/30/08

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

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1. BACKGROUND INFORMATION 1
1.1 Introduction 1
1.2 Project Information 1
2. METHANE MONITORING PROGRAM 1
2.1 General Requirements 1
2.2 Methane Monitoring Well Construction 2
2.3 Methane Monitoring Procedures and Frequency 2
2.4 Reporting Requirements 3

FIGURES

Figure 1 Vicinity Map
Figure 2 Site Map
Figure 3 Methane Monitoring Well Detail
Figure 4 Flowchart – Methane Monitoring Requirements

GAS MONITORING PLAN
EDGECOMBE COUNTY LANDFILL
(PERMIT# 33-01)
TARBORO, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Gas Monitoring Plan is presented to provide the necessary requirements as specified in the Solid Waste Management Rules, Sections .0544(d) and .1626 (4). These rules present the criteria for explosive gas control as it relates to operational requirements for C&D and MSW landfill facilities. The purpose of the Gas Monitoring Plan is to provide details of the gas monitoring procedures and policies of the Edgecombe County Landfill in a single document for use at the facility. The methane gas monitoring program shall be implemented to detect possible migration of methane gas off-site from the existing landfill and future landfill development. Included in this program is the methane monitoring system, monitoring well location and construction, methane monitoring procedures, sampling frequency, and reporting requirements.

1.2 Project Information

Edgecombe County (County) currently operates a solid waste facility on a tract of land located off of State Road 1601 (Colonial Road), in Edgecombe County, south of Tarboro, North Carolina (Figure 1). At their solid waste facility, the County operates a municipal solid waste (MSW) transfer station and a construction & demolition (C&D) debris landfill unit over an existing closed MSW landfill unit, in accordance with North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM) Solid Waste Facility Permit No.33-01.

2. METHANE MONITORING PROGRAM

2.1 General Requirements

Owners and operators of all C&DLF units must ensure the following:

- The concentration of methane gas or other explosive gases generated by the facility does not exceed 25 percent of the lower explosive limit (LEL) in on-site facility structures (excluding gas control or recovery system components);
- The concentration of methane gas or other explosive gases does not exceed the LEL for methane or other explosive gases at the facility property boundary; and
- The facility does not release methane gas or other explosive gases in any concentration that can be detected in off-site structures.

The methane gas monitoring wells at the Edgecombe County Landfill are positioned to detect methane gas that may migrate into the structures located at the landfill or beyond the landfill property boundary. The wells are located between the waste boundary and the property boundary and between the waste boundary and facility structures that are

occupied or used regularly by County personnel. The landfill perimeter gas monitoring wells are spaced from 50 to 100 feet outside the waste boundary and at intervals of no more than 500 feet apart. The gas monitoring wells for the facility structures are placed adjacent to the structure between the structure and the waste.

Methane gas monitoring wells are not required north of the landfill between the waste disposal unit and Jerry's Creek. Any methane gas that flows toward Jerry's Creek is anticipated to dissipate to the atmosphere prior to reaching the property boundary. Methane monitoring gas wells are required along the eastern, western and southern property boundaries.

Eleven methane gas monitoring wells (GW-1R, GW-2R, GW-3, GW-4, GW-5, GW-6, GW-7, GW-8, GW-9, GW-10, and GW-11) and five building structures (Storage 1, Storage 2, Transfer Station, Scale House, Break Trailer 1 and Break Trailer 2) currently comprise the regular methane gas monitoring system for the landfill. Methane monitoring locations are illustrated on Figure 2.

2.2 Methane Gas Monitoring Well Construction

The methane gas monitoring wells were constructed by advancing an auger to a depth of the maximum refuse depth or to the depth of groundwater, which ever is less. A one-inch to two-inch diameter schedule 40 PVC perforated pipe was inserted into the boring hole and the annular space backfilled with pea gravel. The top of the borehole was sealed with a concrete bentonite mixture and the well protected with a steel lockable cover. The PVC pipe was installed with a non-venting PVC pipe cap. A typical detail of a methane gas monitoring well is presented on Figure 3.

2.3 Methane Monitoring Procedures and Frequency

Methane gas present in the gas monitoring wells shall be monitored by trained personnel using a LandTec portable gas analyzer equipped with an 18-inch insertion tube (or similar equivalent) using the following procedures:

1. Calibrate the explosimeter (if required) in accordance with the manufacturer's recommendations.

2. Unlock and remove the cap from the monitor well and allow pressure within the well to equilibrate. Measure the static groundwater level (when present) in the well.

3. Insert tube approximately 18 inches into the well casing, or to just above the static groundwater level if it is determined to be less than 18 inches from the top of the well casing.

4. Monitor percent methane (%CH_4) in each well until the reading on the meter stabilizes.

5. Recorded percent methane and the corresponding LEL. (LEL for methane is 5% CH_4).

Methane gas present in the facility structures will be measures by recording detected concentrations until readings stabilize, generally after approximately three to five minutes in each structure. As required by the Solid Waste Management Rules, the methane monitoring is to be conducted on a quarterly basis.

In addition, an annual visual inspection of the final cover will be conducted to detect gas break-outs (such as crack or hole in the cover soils) and areas where discolored ground or distressed vegetation indicate leakage of gas through the final cover. Any apparent gas outbreaks should be monitored with a combustible gas indicator to determine if gas is emanating from the crack or hole. The area around the gas outbreak should be "probed" by performing bar punches or hand auger boreholes at depths of 12 to 18 inches. Each borehole should be monitored with an explosimeter to record the concentration of methane gas. The data will help determine the extent of elevated landfill gas concentrations at or near the ground surface.

2.4 Reporting Requirements

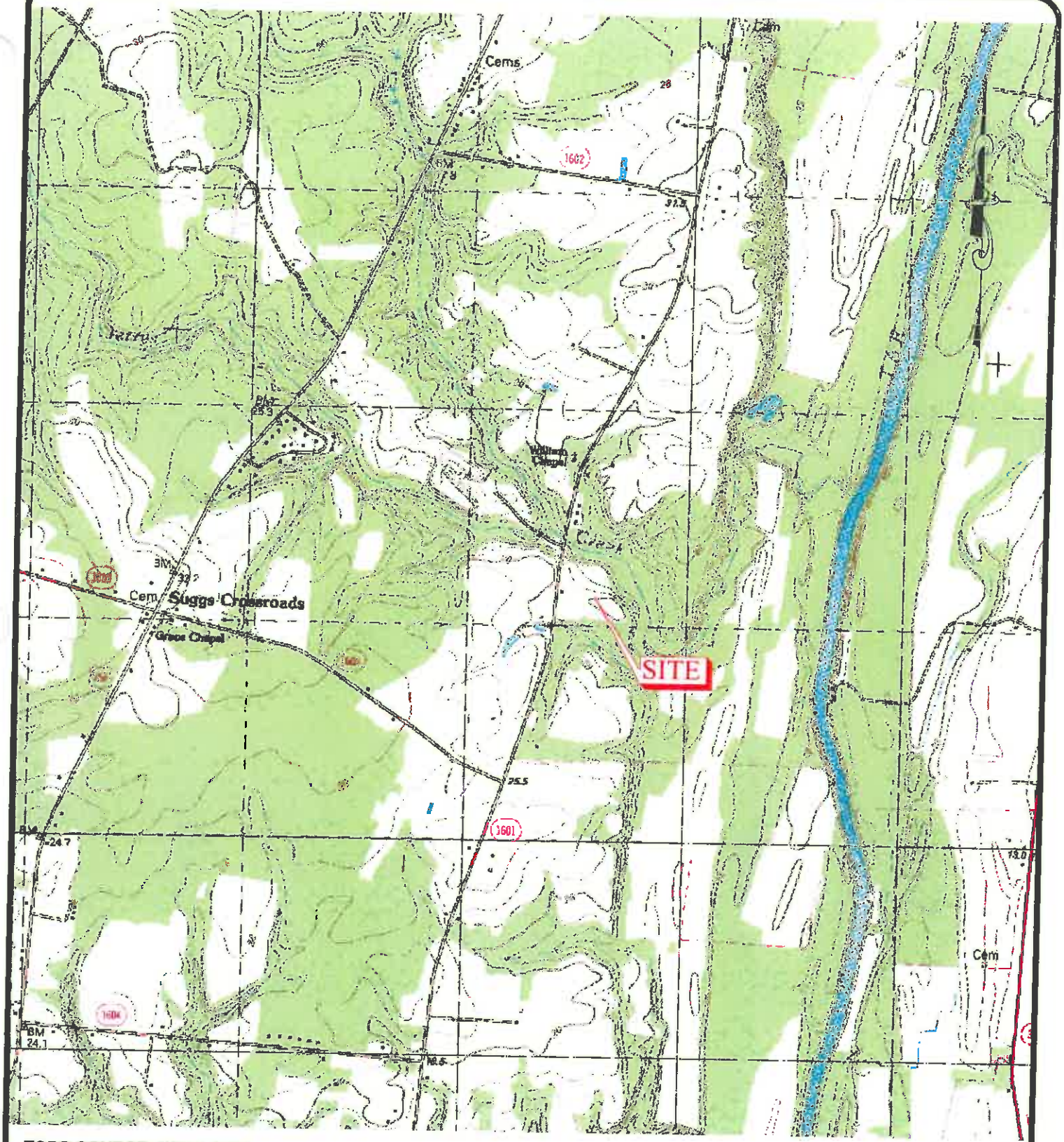
The measurements collected from the methane gas monitoring wells shall be recorded for each monitoring well and within each facility structure for each sampling event and placed in the operating record. The state regulations require that explosive gases be controlled such that concentrations of gases will be less than 25 percent of the LEL in site structures and in the subgrade at the property boundary.

If methane gas levels exceeding the maximum LEL are detected, the County shall perform the following:

- Immediately take all steps necessary to ensure protection of human health and notify the Division;
- Within seven days of detection, place in the operating record the methane or explosive gas levels detected and a description of the steps taken to protect human health; and
- Within 60 days of detection, implement a remediation plan for the methane or explosive gas releases, place a copy of the plan in the operating record, and notify the Division that the plan has been implemented. The plan must describe the nature and extent of the problem and the proposed remedy.

Figure 4 presents a flow chart summarizing methane monitoring requirements, and the necessary steps the owner/operator must take if methane gas concentrations exceed the action levels in monitor wells or facility strutures. An extension to the schedules noted above may be granted by the Division if a need for an extension is demonstrated by the County.

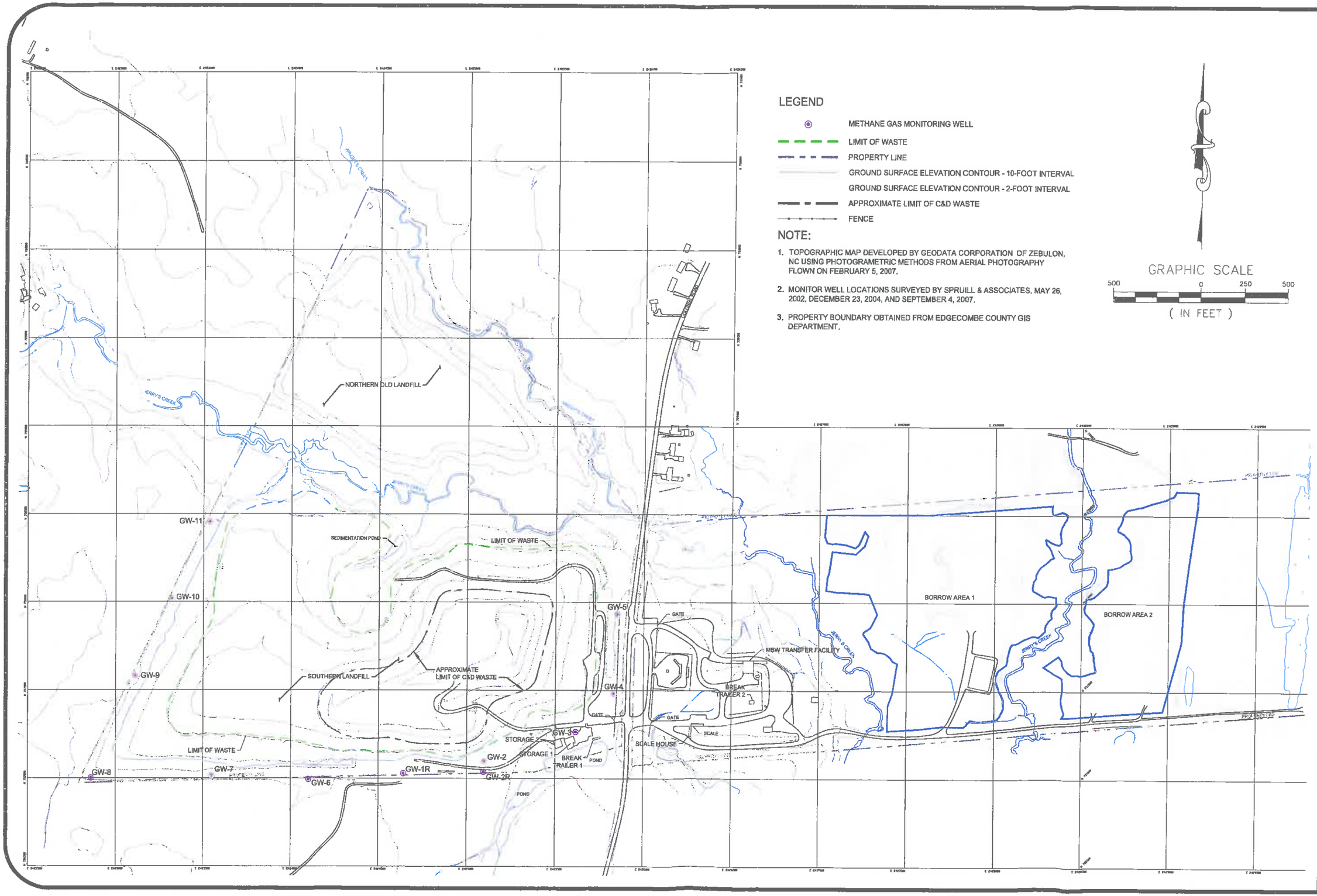
FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

A-1112

SCALE: 1" = 2000'	S&ME WWW.SMEINC.COM	VICINITY MAP	FIGURE NO.
DATE: JUNE 2008		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	1
DRAWN BY:			
PROJECT NO: 1054-07-242			



LEGEND

- METHANE GAS MONITORING WELL
- LIMIT OF WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- APPROXIMATE LIMIT OF C&D WASTE
- FENCE

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

500 0 250 500

(IN FEET)

SCALE: 1" = 500'	DATE: JUNE 2008
PROJECT NUMBER: 1054-07-242	DRAWN BY: BTR
DRAWING NUMBER: B-1089	CHECKED BY:

S&ME

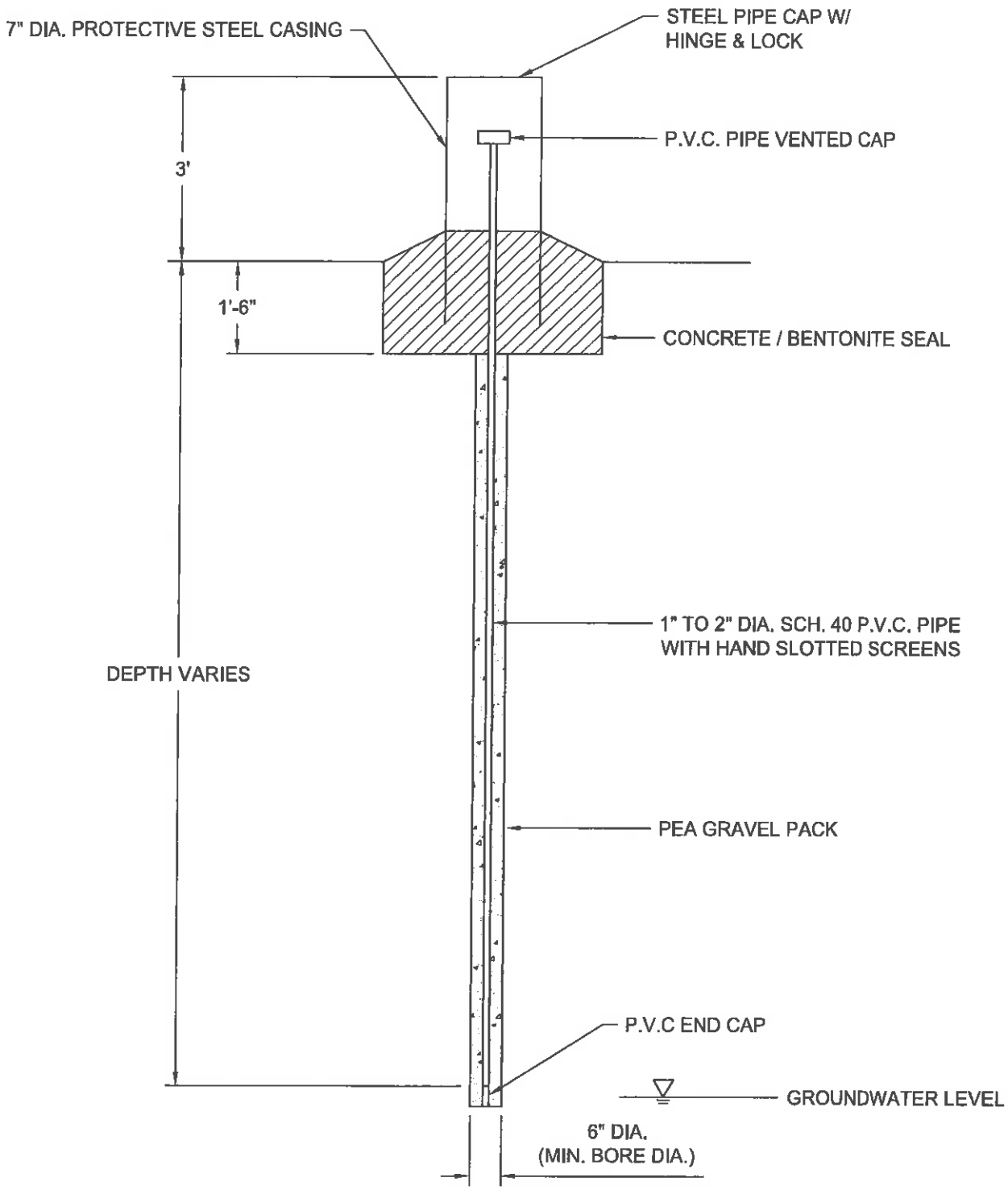
WWW.SMEINC.COM

SITE MAP

GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

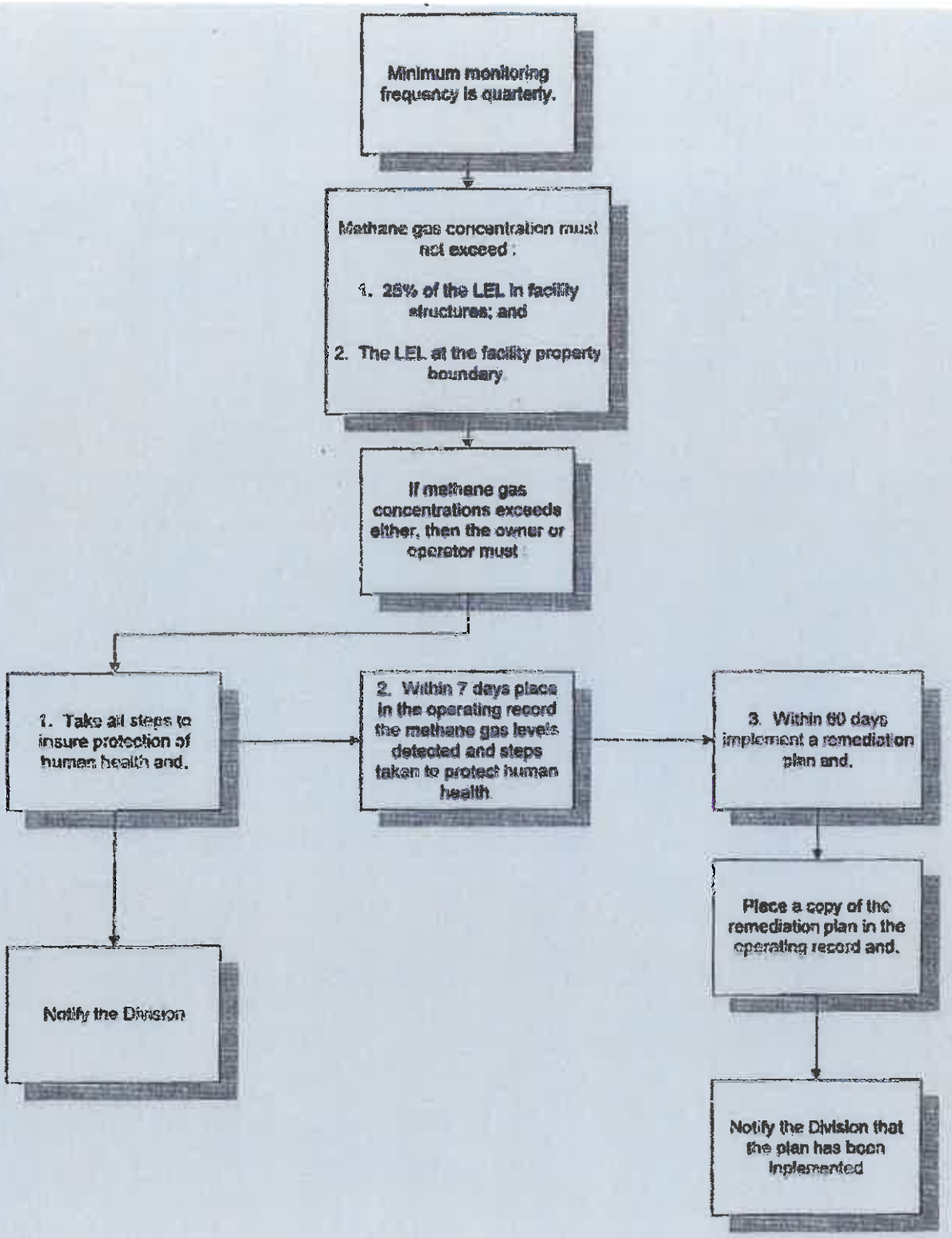
FIGURE NO.

2



A-1115

SCALE: N.T.S.	S&ME WWW.SMEINC.COM	METHANE MONITORING WELL DETAIL	FIGURE NO.
DATE: JULY 2008		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TARBORO, NORTH CAROLINA	3
DRAWN BY:			
PROJECT NO: 1054-07-242			



SCALE: NTS	S&ME Engineering/Testing Environmental Services	METHANE MONITORING REQUIREMENTS
CHECKED BY: JAM		GAS MONITORING PLAN EDGECOMBE COUNTY LANDFILL TABRORO, NORTH CAROLINA S&ME PROJECT NO. 1054-07-242
DRAWN BY: SPW		Figure No. 4
DATE: 6/30/2008		

APPENDIX IV-C

Manufactured Home Deconstruction Plan

MANUFACTURED HOME DISPOSAL PLAN

Acceptance

Any manufactured home arriving at the landfill will be charged at the same tipping fee as for construction and demolition (C&D) debris. For manufactured homes that will not fit across landfill scales, the County has established a single item flat fee based on size. The manufactured home will be staged in an area adjacent to the working face of the C&D landfill, and the acceptance date to the landfill shall be painted on the side, end, or frame of the mobile home for identification. No more than four (4) manufactured homes will be staged in the area adjacent to the working face at any time. A manufactured home that is not immediately placed into the C&D landfill will be staged a maximum duration of not more than forty-five (45) days from acceptance into the landfill.

Disposal Preparation

Once the manufactured home is in the staging area, properly trained personnel will remove the following items for recycling or proper disposal without disturbing asbestos containing materials:

1. Mercury-containing thermostats, fluorescent light bulbs, and, light ballasts, that are intact and do not have signs of leaks, if possible;
2. Freon-containing refrigerators and AC units;
3. White goods; and
4. Recyclable items readily accessible.

Manufactured home disposal preparation activities will only take place in the disposal preparation area adjacent to the C&D landfill working face. No open flames or cutting torches are permitted within 100 feet of the C&D landfill or during deconstruction activities.

At the end of each working day, items removed from the manufactured home shall be removed from the staging/disposal preparation area near the C&D working face to their designated staging areas or disposal locations. Mercury-containing thermostats, light ballasts, and CFL bulbs shall be placed in plastic bags and temporarily stored in a designated container at the Convenience Center until they are taken for proper disposal. White goods shall be taken to the white goods staging area for temporary storage until they are taken to be recycled. Items containing Freon shall be taken to the white goods staging area to have the Freon properly removed by properly trained personnel prior to recycling. Other recyclable items shall be taken to the convenience center and placed in the proper container located there.

Disposal

A backhoe or trash compactor, which is normally located at the C&D landfill, shall be used to pull the manufactured home to the edge of the landfill's working face. The manufactured home will then be flipped on its side. Once the axle and frame are separated from the body of the manufactured home, the operator shall use the trash compactor to dispose of the manufactured home as close to the bottom of the working face as practically feasible. Once the unit is completely demolished, it will be covered immediately with soil in a manner that will not cause airborne conditions as described by the Operation and Waste Acceptance Plan.

The axle(s) and frame shall be taken to the white goods staging area for temporary storage until they are taken to be recycled. Any tires on the axle(s) shall then be removed and taken to the tire storage area for temporary storage until they are taken to be recycled.

APPENDIX V-C

Edgecombe County Fire Marshall Memo

Memorandum

To: Danny Bagley, Director of Solid Waste

From: Butch Beach, Edgecombe County, Fire Marshal

Date: 6/23/2009

Re: Dispatch of Fire Departments

In case of a fire at the County Landfill or Convenient site on Colonial Road, three Fire Departments will be dispatched, South Edgecombe being the Primary Department, and Princeville and Conetoe Vol. Fire Department being the Secondary Departments. Also 911 have been notified to dispatch a Fire Marshal to that location to assist the responding departments. Thank you for your cooperation in this matter. If you have any questions please fill free to give me a call at 252-641-7843.

APPENDIX VI-C

Landfill Gas Collection and Control System Construction Completion Document/ Wastewater Discharge Permit for Landfill Gas Condensate/ Air Permit No. 10196R01

CONSTRUCTION COMPLETION REPORT and AS-BUILTS for LANDFILL GAS COLLECTION AND CONTROL SYSTEM

S&ME Project No. 1054-12-331

EDGECOMBE COUNTY
SOLID WASTE DEPARTMENT

Edgecombe County
201 St. Andrews Street
Tarboro, North Carolina 27886

Prepared on behalf of Edgecombe County by:

August 2014

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6. UPDATED LANDFILL PLANS 5
7. APPROVAL LETTERS AND PERMITS 5
8. CONSTRUCTION QUALITY ASSURANCE 6

APPENDIX A - March 30, 2011 NCDENR DWM Authorization for Constructing a Landfill Gas Collection and Control System

APPENDIX B - Asbestos Workplan Approval Letter

APPENDIX C - Backfill Stone Gradation Chart

APPENDIX D - Vent Well Abandonment Certification

APPENDIX E - Well Construction Records/Well Inventory

APPENDIX F - Wastewater Discharge Permit and Laboratory Analysis for Condensate issued by Town of Tarboro

APPENDIX G - As-Built Drawings

1. Landfill Site Plan with “V” and “GV” Well Designations
2. Landfill Site Plan with “EW” Well Designations
3. Site Map – Gas Header and Blower Flare Station
4. Landfill Gas Extraction Well Details
5. LFGCCS Details
6. Front Elevation View of Skid

7. Side Elevation View of Skid
8. Plan View of Skid
9. Condensate Sump Details
10. Condensate Storage Tank Details I
11. Condensate Storage Tank Details II
12. LFG Connection Between BFS and Gas Treatment
13. Mechanical Details

APPENDIX H - Technical Specifications

APPENDIX I - NCDENR Air Quality Permit

APPENDIX J - Photographic Log

APPENDIX K - Building/Structure and Electrical Permit

APPENDIX L - Zoning Consistency Determination

APPENDIX M - Project Completion Certifications

1. GENERAL

Conditional approval for the *Authorization for Constructing a Landfill Gas Collection and Control System* was granted by NCDENR DWM in a March 30, 2011 letter (Doc ID 13394) in response to the *Request for Approval to Construct a Landfill Gas Collection and Control System* from S&ME on behalf of Edgecombe County dated March 23, 2011. In the *Authorization* a deferral to the DWM comment numbers 3, 8, 10 and 16 from the October 17, 2009 letter addressing the C&D Landfill Permit Renewal Application was granted. It was stated that the DWM comments would need to be addressed in the Construction Completion Report for the proposed Landfill Gas Collection and Control System. Per comment #8.i the *Construction Completion Report* should include, but not limited to, a brief description of the construction activities, as-built drawings, a set of color photos of major phases of construction, gas vent data (survey data, well construction record [GW-1b form] and/or abandonment record [GW-30 form], approval letters/permits from other state and local government, and QA/QC testing results. This document presents the information for the *Construction Completion Report*, as well as addresses the responses to the four deferred DWM comments and the *Authorization for Constructing a Landfill Gas Collection and Control System* permit conditions. A copy of the March 30, 2011 *Authorization for Constructing a Landfill Gas Collection and Control System* is included in **Appendix A**.

2. ASBESTOS WORKPLAN

Because Edgecombe County Landfill has accepted (closed MSW) unit) and is accepting (the C&D unit on top of the closed MSW unit) asbestos containing material or wastes for disposal, prior to the installing extraction wells, Edgecombe County submitted *An Asbestos Work Plan for the Installation of a Landfill Gas Collection and Control System for the Edgecombe County Landfill* to the Health Hazards Control Unit of the Division of Public Health, Department of Health and Human Services (NCDHHS), Division of Public Health, Epidemiology Section for review and approval on September 7, 2011. A letter dated September 12, 2011 from the NCDHHS approved the Work Plan. A copy of the approval letter is included in **Appendix B**.

3. DESCRIPTION OF CONSTRUCTION ACTIVITIES

Edgecombe County operates a construction and demolition (C&D) landfill atop a closed municipal solid waste (MSW) landfill just south of Tarboro, North Carolina. The landfill accepted MSW from 1980 until 1997 and has been accepting C&D waste since January 1998. A landfill gas collection and control system (LFGCCS) was constructed in 2012 at the Edgecombe County landfill and consists of a series of biogas wells, LFG piping and valves, condensate sumps, and a blower/flare system (BFS), which directs the collected biogas to a blower flare system. The system is connected to a Containerized Landfill Gas to Energy (LFGTE) Facility for electricity generation.

LFG Extraction Wells and Collection System

In the Spring of 2012, Edgecombe County converted 24 passive Landfill Gas (LFG) vent wells to active LFG extraction wells and installed 24 new landfill gas extraction wells. A total of 48 active LFG extraction wells are currently installed at the Southern Landfill.

Nine of the LFG extraction wells are installed in the C&D landfill waste while the remaining 39 LFG extraction wells are installed in MSW. The LFGCCS began operation on September 7, 2012.

Due to potentially encountering leachate (considering future vertical expansions over the existing phases of C&D unit on top of closed MSW unit), the stone used to backfill the gas wells was of a non-carbonate rock origin. The stone was obtained from Wake Stone Corporation. Wake Stone Corporation was contacted to confirm that the stone was non-carbonate and to obtain the graduation chart for the #57 stone. Chris Castiger, the head of the Wake Stone Corporation Quality Control Department, stated that the stone was granite and there was no calcium carbonate in the stone. This graduation chart is **Appendix C.**

There are 48 total active extraction wells. Fourteen of the existing passive gas vents wells were temporarily capped and 20 of the vents were abandoned in March 2012. A certification of abandonment detailing the abandonment activities, signed by a Professional Geologist, is contained in **Appendix D** along with the construction details for the abandoned vent wells. The well construction records are included in **Appendix E**. **Table E-1** summarized the landfill gas extraction well locations, elevations and identification designations.

The LFG collection system is constructed with three dual-contained sumps, which collect condensate that may accumulate in the LFG collection piping. Condensate from the LFGCCS is collected in on-site condensate sumps CS-2 and CS-3 located in the landfill area and CS-1 near the condensate tanks, which eventually pump the condensate into two 2,500 gallon polyethylene storage tanks. The two condensate storage tanks are located in a concrete secondary containment area. The collected condensate is stored in the tanks until it hauled by tanker and disposed into the Town of Tarboro's sewer collection system under a Wastewater Discharge Permit issued on November, 13, 2013 by the Town of Tarboro (**Appendix F**).

As-built drawings for the LFG collection system are located in **Appendix G**. The technical specifications for the LFG collection system are included in **Appendix H.**

In the end of each operating day, the MSW wastes generated from the well installation activities were disposed to nearby MSW Transfer Station (Permit No. 33-02T), and the C&D wastes were disposed at the working faces of the C&D unit.

LFG Blower-Flare System Skid

The LFGCCS features a 4-inch diameter candlestick flare system, manufactured by Product Recovery Management (PRM). The flare is supplied with up to 300 standard cubic feet per minute (scfm) of LFG by two centrifugal, regenerative vacuum blowers, manufactured by Gardner-Denver, Incorporated® (GDI). Each blower is equipped with a 25 hp electric motor and can achieve a maximum flow rate of 300 scfm. The vacuum blower speeds are controlled by variable frequency drive (VFD).

The flare is 20 feet tall and the top three feet are equipped with a wind shroud to protect the propane pilot ignition assembly. A propane gas train provides gas for start-up procedures, when necessary.

A stainless-steel moisture separator (MS-80) removes moisture and any debris from the LFG stream before the LFG enters the vaccum blowers. LFG discharged from the blowers passes through a second stainless steel moisture separator (MS-60) before being sent to either the 2G-Cenergy® landfill gas combustion engines or to the flare. Moisture removed by the MS-80 and MS-60 are collected in moisture knock-out pots and subsequently gravity drain to a condensate storage sump.

The BFS is fully automated and is capable of shut-down and start-up. The blower-flare system operation is monitored at a programmable logic controller (PLC) panel adjacent to the flare. The PLC, equipped with a datalogger, and monitors critical operating parameters such as gas flow, gas temperature, gas pressure and flare temperature.

LFG Control and Monitoring Devices

The concentration of methane in the LFG is continuously monitored by a Landtec® FAU-TDL model gas analyzer (Serial Number: 1045). The gas analyzer is mounted on blower-flare skid on the main LFG header upstream of the flare. The continuous gas analyzer measures methane concentration on a wet basis.

The volumetric flow rate of LFG is measured continuously by a Veris Verabar V100 (serial number: V19929-01.1) in-line flow meter mounted upstream of the flare on the main LFG header. The flow meter uses averaging pitot flow technology.

Containerized Landfill Gas-To-Energy Facility

Edgecombe County purchased a modular containerized landfill gas-to-energy (LFGTE) System, manufactured by 2G-Cenergy, consisting of two (2) container-mounted, LFG-fueled, internal combustion engine modules (gen-sets) capable of producing 370 kW each. In June 2013, Edgecombe County began construction of a containerized landfill gas-to-energy facility to support the gen-sets.

New concrete foundations were constructed for the two containerized LFGTE systems and two concrete pads for the associated landfill gas treatment equipment (chiller/re-heaters and carbon vessels). The containerized LFGTE modules were connected to the LFG pipeline from the blower-flare station (BFS) to fuel the gen-sets. A new condensate sump and condensate force main were connected to the to the main BFS condensate sump to handle additional condensate produced by the gas treatment equipment. Electrical service to the gen-sets is provided by the on-site 1000 kVA transformer. Electrical components installed at the site for the containerized LFGTE facility also include, but are not limited to, a main distribution panel (MDP) inside the adjacent support building electrical control room; a disconnect switch with lockout assembly between the MDP and the 1,000 kVA electric transformer; and an electric grounding grid.

The containerized LFGTE facility is located in the southwest portion of the landfill facility within a secured, fenced compound. The facility layout is shown on **Drawing 3** and the locations of the additional LFG and condensate handling equipment installed for the containerized LFGTE facility (sump and pipes) are shown on **Drawings 12 and 13**.

Security

To establish restricted/limited access and security to the blower/flare station, data recording panel, and apparatus a security fence was constructed around the blower flare station and the containerized gen-sets for the landfill gas to energy system at the Edgecombe County Landfill.

4. AS-BUILT DRAWINGS

The scaled as-built drawings of the landfill gas collection and control system are provided in **Appendix G**. Bateman Civil Survey Co. (BCSC), a North Carolina registered Land Surveyor, surveyed the LFGCCS including the wells, piping, and blower flare station, and condensate tank area. **Drawing Sur 1 of 1**, prepared by BCSC is included in **Appendix G.**

Figure 1 is the gas vent system with the original "V" and "GV" designations. The "GV" designated wells were the recently installed active gas vent wells. The "V" designated wells were the existing passive vent wells. To avoid confusion in the future, all active vent wells were redesignated as "EW" for extraction well (**Figure 2**). All remaining wells, whether abandoned, capped or inactive, maintained the "V" designation for vent well. Construction details for the vertical extraction wells, the nested vertical extraction wells, and the wellhead and well bore details are shown in **Figure 4**. Details of the pipe cover, isolation valves, header/lateral trenches and above grade header/lateral pipes are shown in **Figure 5**.

The main gas header to the Blower Flare System as well as the Blower Flare Pad are shown in **Figure 3**. Blower Flare Station details and elevation and plan views are depicted in **Figures 6, 7, 8 and 9**. The condensate sump details are shown in **Figure 10** and the condensate sump tanks are detailed in **Figures 11 and 12**.

A photographic log of the LFGCCS is included in **Appendix K**.

5. LANDFILL GAS VENTS/GAS EXTARCTION WELLS

The active, abandoned and capped passive and active vent wells were surveyed by BCSC after the new extraction wells were installed in March 2012. **Drawing Sur 1 of 1**, prepared by BCSC is included in **Appendix G.** The survey information was incorporated into **Figures 1 and 2** located in **Appendix G**.

Well construction records for the 24 new gas extraction wells are provided in **Appendix E.** As noted in Section 5 above, the wells were originally designated as "V" and "GV" wells and then the active wells were designated as "EW" for active extraction wells. Table E-1 showing the former and present designations is also included in **Appendix E**.

6. UPDATED LANDFILL PLANS

The Edgecombe County Landfill Facility Plan, Operations and Waste Acceptance Plan, and Closure and Post-Closure Plan for the C&D landfill on top of the closed MSWLF (Permit No. 33-01) have been revised to include the operation of the LFGCCS into the day to day landfilling activities. The updated Plans address the following issues: site security and measures/actions against vandalism of the installed LFGCCS; the Contingency and Emergency Response Plan to manage fire-fighting, prevention and notification, power outage/inclement weather, odor and noise nuisances for LFGCCS; descriptions of how the operation and presence of the LFGCCS will be coordinated with the operation of the C&D unit (such as protection of the gas wells, above-ground piping, sumps from potential damage due to landfill operations); and, personnel training and safety working around the LFGCCS. Condensate management, an Operation and Maintenance Plan, and an update to the methane gas monitoring plan are also included in the Plan updates.

In the Closure Plan, a description of steps necessary to decommission the components of the LFGCCS (wells, piping, holding tanks, flare, blower, instrument panels, etc.) and restoration of the final cover system damaged by removing collection system at the end of their useful life has been addressed.

In the Closure and Post-Closure Plan, the revised closure and/or post-closure care cost estimates and an updated financial assurance mechanism that includes the costs for decommission of the components of the LFGCCS and for restoration of the final cover system at the end of their useful life, as well as the steps to decommission the landfill gas extraction vents and convert the active gas extraction wells to passive vents and remove the piping, valves, sumps, condensate tank, and flare.

7. APPROVAL LETTERS AND PERMITS

Numerous approvals and permits were required to construct and operate the LFGCCS. These approvals and permits are discussed below.

Authorization for Construction of a Landfill Gas Collection and Control System
Edgecombe County Solid Waste Management Department obtained an Authorization for Constructing a Landfill Gas Collection and Control System in March 2011 from the North Carolina Department of Environment and Natural Resources (NCDENR). This authorization is discussed in further detail in Section 1 above. A copy of the Approval is included in **Appendix A**.

Asbestos Workplan
Approval of the Asbestos Workplan for the Installation of a Landfill Gas Collection and Control System, dated September 6, 2011, was obtained from the North Carolina Department of Health and Human Services, Division of Public Health, Epidemiology Section on September 12, 2011 (**Appendix B**). This Asbestos Workplan is discussed in more detail in Section 2 above.

Building and Structure Permit

A Building and Structure Permit, as well as an Electrical Permit, were obtained through Edgecombe County for the Blower Flare System construction and installation. A copy of the permit is included in **Appendix L**.

Air Permit

A permit application to construct the 300 scfm open flare was applied for in July 2011. The NCDENR Division of Air Quality issued Air Permit No. 10196R00 for the construction and operation of air emission sources or air cleaning devices and appurtenances on October 28, 2011. The emission source ID for the open flare is ES-01. A permit modification was applied for in December 2012 and Air Permit No. 10196R01 was issued on January 16, 2013 for two additional emission sources, the landfill gas-fired engine generator sets (ES-02 and ES-03). Copies of Air Permit Nos. 10196R00 and 10196R01 are included in **Appendix I**. A summary of the air permit conditions of Permit No. 10196R01 is also included in **Appendix I**.

Wastewater Discharge Permit

Condensate from the LFGCCS is collected in on-site condensate sump CS-1, which pumps the condensate into two 2,500 gallon polyethylene storage tanks. The details of the condensate storage tank area are shown in **Appendix G, Figures 10** and **11**. The collected condensate is stored in the tanks until approximately 80% capacity, at which time it is transported by truck and discharged into the Town of Tarboro's sewer collection system in accordance with the Wastewater Discharge Permit dated November 13, 2013 issued by the Town of Tarboro (**Appendix F**). The laboratory analyses results for the condensate, prior to approval of discharge by the Town of Tarboro, are also included in **Appendix F**.

Local Zoning Approval

A Zoning Consistency Determination was obtained from the Edgecombe County Planning Department in July 2011 for installation of the Landfill Gas Flare System. It was noted that the proposed operation is consistent with applicable zoning ordinances. A copy of the Zoning Consistency Determination is included in **Appendix M**.

8. CONSTRUCTION QUALITY ASSURANCE

The Gas Collection and Control System (GCCS) Completion Certification form (FORM 5) obtained from the contractor who performed the installation of the extraction wells and the conversion of the existing passive vent wells to active vents wells, as well as the header and lateral lines, is included in **Appendix N**. The Certification states that all critical tests for all major components have been performed. FORM 3, the Final Completion Certification Form, which was obtained from the Contractor is also included in **Appendix N**. These forms certify that the LFGCCS was built according to the technical specifications developed for the system. A copy of the Specifications is included in **Appendix H**.

APPENDIX A

March 30, 2011 NCDENR DWM Authorization for Constructing a Landfill Gas Collection and Control System

NCDENR

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

Solid Waste Section

March 30, 2011

Mr. Mike Cummings, Manager
Edgecombe County Solid Waste Management Department
P.O. Box 10
Tarboro, North Carolina 27886

Subject: Authorization for Constructing a Landfill Gas Collection and Control System (LFGCCs)
Edgecombe County Landfill
Edgecombe County, North Carolina
Permit No. 33-01, Document ID No. (Doc ID) 13394

Dear Mr. Cummings:

On March 25, 2011, the Division of Waste Management (DWM), Solid Waste Section received the following document submitted on your behalf by S&ME, Inc (S&ME):

- "*Request for Approval to Construct a Landfill Gas Collection and Control System (LFGCCS)*" dated March 23, 2011 (Doc ID 13393).

According to the above-referenced document, Edgecombe County designed the LFGCCS under the assumptions that the landfill gas (LFG) will be captured and combusted with a flare system; and the planned system will be developed by three phases – Phase I through Phase III at the closed MSW unit overlain by an active C&D unit. In summary, the entire system will comprise 36 gas-extraction wells, header/lateral piping, sumps, valves, a 5000-gallon condensate tank, and a blower/flare station. The phased development of the proposed LFGCCS summarized below:

Phase	Wells Identification	Number of Wells
I	Convert the existing gas vents into gas extraction wells (V21 through V23, V47, V48, V49, V51 through V60)	16
II	Install new gas extraction wells (GV-1 through GV-8)	8
III	Convert the existing gas vents into gas extraction wells (V2, V4, V6, V7, V9, V10, V15, V16, V18, V19, V20, & V31)	12

The existing gas vents (approximately 32 of 60 vents) that will not be connected to the LFGCCS will be properly capped. The blower/flare station and the 5000-gallon condensate tank will be installed at the

Phase I. The lateral/header piping that is able to convey the flow rate up to 400 standard cubic feet per minute (scfm) will connect well headers to the blower/flare station.

Pursuant to the Solid Waste Management Rule (Rule) .0547(4), Edgecombe County has previously requested to voluntarily conduct a landfill gas management program at the Edgecombe County Landfill through "the Permit Application for Continued Operations of a C&D on Top of a Closed MSW Landfill (Doc ID 9206)." On March 31, 2010, the Solid Waste Section approved the preliminary design of the LFGCCS (The approval letter has the internal tracking number – Doc ID 9854.) and also requested County to submit a final design of LFGCCS which should incorporate the responses to the October 17, 2009 DWM comments (Doc ID 8765), specifically COMMENT Nos. 3, 8, 10, and 16 related to recording, operating, inspecting, and maintaining the LFGCCS. After reviewing the March 23, 2011 submittal (Doc ID 13393), the Solid Waste Section concluded that County hasn't completely addressed the requested responses to the above-mentioned comment in this submittal.

However, considering that the proposed LFGCCS is a time-constraint project which must be completed in mid-2012 according to the requirements stated in the Energy Efficient and Conservation Block Grant Program funded by the American Recover Act, the Solid Waste Section will assist County in moving forward of this project. Therefore, the Solid Waste Section grants Edgecombe County:

- A conditional approval to install the proposed LFGCCS at the Edgecombe County Landfill Facility in accordance with the above-referenced document dated March 23, 2011 (Doc ID 13393).

- A deferral to respond the COMMENT Nos. 3, 8, 10, and 16 stated in October 17, 2009 DWM comments (Doc ID 8765) to the time when the Record Construction Completion Report is due. The proper responses to the above-referenced comments will be a portion of pre-operating conditions of the authorization for operating the completed LFGCCS and discussed in the later sections of this letter.

Permit to Construction Conditions

Please note that this authorization for installing LFGCCs does not remove any responsibilities that Edgecombe County may have to comply with any permit condition, or any local, state or federal regulation. Furthermore, to initiate construction activities pertaining to the proposed LFGCCS at the landfill, Edgecombe County agrees to accept and implement following requirements in addition to the approved application (Doc ID 13393), which the Solid Waste Section believes can resolve potential questions raised in the project bidding processes:

1. Due to potentially encountering leachate (considering future vertical expansions over the existing phases of C&D unit on top of the closed MSW unit), the gravel or granular material used to backfill the gas wells must be either non-carbonated rock origin or be tested (by ASTM D4373 method) for the calcium carbonate content which is less than 15%. The test results from a quarry must be placed in to the Record Construction Completion Report.

2. Because the Edgecombe County Landfill has accepted (closed MSW unit) and is accepting (the C&D unit on top of the closed MSW unit) asbestos containing material or wastes for disposal, prior to installing extraction wells, the County must submit a work plan to the Health Hazards Control Unit of the Division of Public Health, Department of Health & Human Services for a review and approval. For preparing the work plan, please contact Mr. Jeff Dellinger, at phone 919-707-5950, or jeff.dellinger@ncmail.net for the details and requirements. A copy of

correspondence/approval document issued by the Health Hazards Control Unit of the Division of Public Health needs to be appended to the Record Construction Completion Report.

3. Pursuant to Rule .1626(9)(a)(2), the piping carrying condensate/leachate from well heads to the 5000-gallon condensate tank via sumps must be dual-contained piping which will be tested for leakage and air-tightness. The condensate tank may need a secondary containment system which shall be designed and constructed according to any applicable local, state or federal regulation. A copy of piping test results and as-built drawing of the secondary containment system needs to append to the Record Construction Completion Report.

4. In the end of each operating day, the MSW wastes generated from well installation activities must be disposed to nearby MSW Transfer Station (Permit No. 33-02T), and the C&D wastes must be disposed at the working faces at C&D unit.

5. To establish restricted/limited access and security to the blower/flare station, data recoding panel, and apparatus, additional permanent fencing must be provided to enclose the facility.

Interim Permit to Operation Conditions

The issuance of this authorization letter is also granting Edgecombe County an interim status for trial runs and testing the LFGCCS after the system is completed installed and constructed. The interim operating status will allow County to conduct the following tasks, but not limited to:

6. Operating and adjusting the control system in the manner that meets the requirements and conditions stated in the Air Quality Permit issued by the North Carolina Division of Air Quality.

7. Adjusting the well field and collection system to optimize the gas flow.

8. Collecting and analyzing the condensate samples from the system to meet the requirements established by an aqueous waste disposal and treatment facility.

9. Conducting other tasks required by the Energy Efficient and Conservation Block Grant Program.

Pre-Operating Conditions

Within ninety (90) days of ending the construction of LFGCCS project, Edgecombe County needs to submit updated as-built drawings and requested documentations described below. The Solid Waste Section may approve Edgecombe County to operate the constructed LFGCCS. This final Authorization for Operation of LFGCCS will be issued pending receipt and approval of the following:

10. Statutorily required permit fee in the amount of $1,500.

11. The Record Construction Completion Report for the LFGCCS project as described in the approved documents (Doc ID 9206 & 13393), Permit to Construct Conditions No. 1, 2, & 3 in this letter, and the following paragraphs. Edgecombe County must provide the scaled as-built drawings (such as layouts and typical details of the wells, piping (header & lateral pipes), valves, sumps/traps, fencing, flare/blowers/monitoring/data collection station, and apparatus), well completion logs, and the survey coordinates and elevations of the final locations of gas wells, valves, piping alignments and slopes, condensate traps/sumps, which must be provided by the licensed surveyor registered in the State of North Carolina.

12. The copy of all air quality permits associated with LFGCCS projects approved by the North Carolina Division of Air Quality.

13. Proper responses to COMMENT Nos. 3, 8, 10, and 16 stated in October 17, 2009 DWM comments (Doc ID 8765). County needs to modify the Operations Plan, Closure Plan, and Post-Closure Plan for the C&DLF on top of the closed MSWLF (Permit No. 33-01) by incorporate the operation of the LFGCCS into the day-to-day landfilling activities. The plans should address the following issues, but not limited to:

Operations Plan

- Site security and measures/actions against vandalism of the installed LFGCCS.
- The Contingency and Emergency Response Plan to manage fire fighting, prevention, and notification, power outrage/inclement weather, odor and noise nuisances for LFGCCS.
- Descriptions of how the operation and presence of the LFGCCS will be coordinated with the operation of the C&D unit (such as protection the gas wells, above-ground piping, sumps from potential damage due to landfill operation).
- Updated the existing methane gas monitoring plan.
- Personnel training and safety working around the LFGCCS.
- Condensate management – leachate/condensate removal and disposal (providing a copy of the agreement between the disposal & treatment facility and County), routine inspection of the leachate level in the traps and sumps and spillage prevention and response protocols.
- Operation and Maintenance Plan, such as frequency, checklist, report/recordation of the routine inspection, repair, and maintenance of the LFGCCS.

Closure Plan

- Descriptions of steps necessary to decommission the components of the LFGCCS (wells, piping, holding tanks, flare, blower, instrument panels, etc.), and restoration of the final cover system damaged by removing collection system at the end of their useful life.

Closure & Post-Closure Plan

- The revised closure and/or post-closure care cost estimates and updated financial assurance mechanism by including the costs for decommission the components of the LFGCCS and for restoration of the final cover system at the end of their useful life.

After the Solid Waste Section grants Edgecombe County the approval for constructing and operating the LFGCCS at the Edgecombe County Landfill Facility (Permit No. 33-01) for the current phased development, in the future County can directly go for constructing and operating the remaining phase (s) of the approved LFGCCS according to the permit conditions, approved plans, and construction specifications without additional pre-permitting approval. The county should notify the Solid Waste Section of future phase construction of the LFGCCS in the intent to construct letter prior to commencing the construction activities. The updated as-built drawings and the Record Construction Completion Report of the constructed LFGCCS can be appended to the Permit Amendment Application. The Solid Waste Section will be glad to assist the County in the successful completion of

this project, if you have any questions regarding the matters described above please contact me at 919-508-8507.

Sincerely,

Ming-Tai Chao, P.E.
Environmental Engineer II
Solid Waste Section

cc: Samuel P. Watts, P.G., S&ME
Donna Wilson, DWM
Dennis Shackelford, DWM
Ed Mussler, Permitting Branch Supervisor
Ben Barnes, DWM
Central Files

APPENDIX B

Asbestos Workplan Approval Letter

North Carolina Department of Health and Human Services
Division of Public Health • Epidemiology Section
Occupational and Environmental Epidemiology Branch
1912 Mail Service Center • Raleigh, North Carolina 27699-1912
Tel 919-707-5950 • Fax 919-870-4808

Beverly Eaves Perdue, Governor
Lanier M. Cansler, Secretary

Jeffrey P. Engel, M.D.
State Health Director

September 12, 2011

Ms. Josephine Martin
S&ME, Inc.
3201 Spring Forest Road
Raleigh, NC 27616

Subject: Landfill Gas Collection at Edgecombe County Landfill
Edgecombe County

Dear Ms. Martin:

We have completed our review of your plan for the landfill gas collection at the subject facility and have no further comments. Please adhere to the plan as submitted to our office on September 7, 2011, and submit to me the other project contacts when available. Should there be modifications to the project that will impact asbestos, please inform us of the changes in writing, before implementing such changes.

If you have any questions feel free to contact me at (919) 707-5972.

Sincerely,

Jeffery W. Dellinger
Industrial Hygiene Consultant
Health Hazards Control Unit

/jwd

cc: David Lipton, Interim Manager, HHCU
Ed Mussler, NC DSWM

APPENDIX C

Backfill Stone Gradation Chart

Wake Stone Corporation Nash Quarry # 57 – Production Gradatio

Week of January 2, 2012	1 1/2"	1"	3/4"	1/2"	3/8"	#4	#8	#200	Comm
Percent Passing	100	99	87	42	17	5	2.4	0.6	
NCDOT Maximum Specification Limit	------	100	------	60	------	10	5	0.6	
NCDOT Minimum Specification Limit	100	95	------	25	------	0	0	------	
Number of Tests	4							2	
Standard Deviation	0.00	0.53	3.15	4.26	2.29	0.67	0.35	0.13	

Wake Stone Corp

Gastiger

919 - 266 - 1100 - Chris - head of QC dept.

919- 792- 7054 - mobile

No calcium carbonate

— Granite !

APPENDIX D

Vent Well Abandonment Certification

August 18, 2014

Edgecombe County Solid Waste Department
P.O. Box 10 – County Administration Building
201 Saint Andrews Street
Tarboro, North Carolina 27886

Attention: Mr. Mike Cummings

Reference: **LFG Vent Abandonment - Geologist Certification**
Edgecombe County Construction & Demolition Landfill (Permit #33-01)
2872 Colonial Road
Tarboro, North Carolina
S&ME Project No. 1054-07-240F

Dear Mr. Cummings:

S&ME, Inc. (S&ME) is pleased to submit this letter report for the abandonment of the landfill gas (LFG) vents well at the Edgecombe County Construction & Demolition (C&D) Landfill. This report, and the services described herein, were prepared in general accordance with the scope of work described in S&ME Proposal No. P058-10V, dated July 6, 2010 and Change Order for Additional Landfill Gas Engineering Services (CO-1), dated July 14, 2011.

PROJECT BACKGROUND

Edgecombe County currently operates a C&D landfill facility and MSW transfer facility located off of State Road 1601 (Colonial Road), south of Tarboro, North Carolina. S&ME, Inc. (S&ME) is engaged as Edgecombe County's engineering consulting firm for the design and construction of a Landfill Gas Collection and Control System (LFGCCS) at the County's landfill located in Tarboro, North Carolina. On December 2, 2011, pursuant to General Statues of North Carolina, Section 143-129, as amended, the Edgecombe Purchasing Department solicited sealed bids (Bid No. 322-1201) for the construction of a LFGCCS consisting of drilling vertical landfill gas extraction wells; converting existing passive landfill gas wells to active extraction wells; capping or abandoning existing passive gas vents; installing HDPE piping, valves and sumps; and installing a 300 scfm blower/flare station. The Invitation to Bid included technical specifications, prepared by S&ME, for the LFGCCS system components. Advance One Development, LLC, from Charlotte, NC, was awarded the construction of the LFGCCS and S&ME performed part-time construction quality assurance (CQA) services.

DESCRIPTION OF SERVCIES

A total of 48 active LFG extraction wells are currently used to extract LFG from the Edgecombe County Landfill (**Figure 1**). Nine of the LFG extraction wells are installed in the C&D debris portion of the landfill waste while the remaining 39 LFG extraction wells are installed in the municipal solid waste (MSW) portion of the landfill waste. Between March 7, 2012 and September 7, 2012 Advance One Development, LLC completed construction of the LFG collection system at the Edgecombe County C&D Landfill. The LFGCCS was officially commissioned and began operation on September 7, 2012.

The LFG collection system was constructed by a combination of drilling new vertical extraction wells into the waste mass and utilizing existing passive extraction vents already installed at the landfill. LFG from the extraction wells is collected in 4-inch and 6-inch high-density polyethylene (HDPE) lateral pipes. The attached table (**Table 1**) provides a summary of the LFG extraction wells original identification (existing vents with "V" and new drilled vents with "GV" designation), their current identification ("EW" designation), location (northing and easting), elevation, total depth, and if the vents were capped, abandoned, or converted into LFG extraction wells.

- Each LFG extraction well was equipped with a LANDTEC ACCU-FLO™ Wellhead designed to control LFG flow and provide a means for measuring flow.
- Capped vents were fitted with a PVC end-cap, screwed and caulked in place with silicone caulk and constructed to stick up approximately three feet above ground surface.
- Abandoned vents were filled with a concrete-bentonite grout slurry. The grout was pumped into the bottom of the vent (tremmied) completely filling it from the bottom of the screen to the top, level with the ground surface. Prior to abandonment, the vents were excavated approximately two feet below the ground surface and the HDPE or PVC pipe was cut off.Prior to abandonment, the vents were measured to determine their total depth and the depth of standing water (if any). The "candy cane" top of the vent was removed from the vent to allow for access and the vent was cut off approximately two feet below the ground surface.

Geologist Certification

The abandoned passive LFG vents are proposed be located beneath sub-grade of the future expansion (phases) of the Edgecombe County C&D landfill or in close proximity to the future placement of waste. Mr. Sam Watts, North Carolina Licensed Professional Geologist No. 1806, observed the abandonment of the vents for the purpose of the integrity of the site conditions beneath the proposed landfill expansion. I hereby certify the borehole was properly abandoned in accordance with 15A NCAC 2C .0113(b) and in a manner that is appropriate for mitigating migration of fluids through the abandoned vent into the upper-most water aquifer.

CLOSING

S&ME appreciates this opportunity to be of service to you and Edgecombe County. I trust this information is responsive to your needs at this time. If you have questions about the information presented in this report, please contact me at (919) 872-2660.

Sincerely,
S&ME, Inc.

Samuel P. Watts, P.G.
Senior Project Manager

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS
8/8/14

Attachments: Table 1 – Landfill Gas Vent Summary
Figure 1 – Active Landfill Gas Collection and Control System

T:\Projects\2007\ENV\07-240F Edgecombe On-Call Srvcs 10-11\!Environ\Landfill Gas\Correspondence\ Edgecombe Cty - Geologist Certification Ltr.doc

INVENTORY OF ACTIVE EXTRACTION AND PASSIVE VENT WELLS
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-12-331

Original "V" and "GV" Designation	Final "EW" Designation	Well Details	Northing	Easting	Ground Surface Estimated Elevation (Ft -AMSL)	Total Depth (ft. bgs.)
GV-1	EW-39		757520.7	2525253	108.75	45
GV-2	EW-29 (C&M)	nested	757634.9	2425107	124.70	60
GV-3	EW-38 (C&M)	nested	757706	2425290	129.35	65
GV-4	EW-37 (C&M)	nested	757905.8	2425320	132.37	74
GV-5	EW-35		758032.1	2425169	108.89	52
GV-6	EW-34 (C&M)	nested	757962	2424979	126.48	65
GV-7	EW-36 (C&M)	nested	757833.2	2425135	128.67	65
GV-8	EW-31 (C&M)	nested	757760.5	2424953	115.87	45
GV-9	EW-28 (C&M)	nested	757564.2	2424922	116.55	50
GV-10	EW-27		757389.7	2425055	99.16	43
GV-11	EW-26		757406.5	2424730	112	50
GV-12	EW-23 (C&M)	nested	757389.6	2424493	114.5	45
GV-13	EW-21 (C&M)	nested	757409	2424245	114.75	53
GV-14	EW-13		757417.6	2423544	96.2	36
GV-15	EW-4		758104.2	2423932	75	23
V-1	V-1	capped	758234.875	2424984.843	81.02	10.81
V-2	EW-33		758103.396	2424929.525	93.31	17.42
V-3	V-3	capped	758173.859	2424865.797	81.83	10.97
V-4	V-4	abandoned	758107.137	2424768.177	82.00	4.2
V-5	EW-32		758032.488	2424703.279	80.61	11.9
V-6	EW-30		757941.024	2424680.129	80.39	12.5
V-7	EW-24		757768.14	2424638.767	85.13	13.4
V-8	EW-25		757666.209	2424611.896	97.54	11.4
V-9	EW-22		757602.285	2424430.24	103.86	8.5
V-10	V-10	abandoned	757740.965	2424473.668	80.92	5.5
V-11	V-11	abandoned	758098.661	2424552.239	64.03	8
V-12	V-12	abandoned	758467.688	2424429.939	61.28	9.6
V-13	V-13	capped	758402.429	2424248.547	66.37	6.7
V-14	V-14	capped	758493.705	2424191.549	67.96	10
V-15	EW-2		758272.89	2424141.719	65.83	9.8
V-16	EW-3		758137.867	2424096.532	67.09	9.5
V-17	V-17	capped	758039.361	2424108.301	66.44	7.7
V-18	EW-6		757851.24	2424045.133	79.98	11.7
V-19	EW-17		757747.308	2424154.323	81.38	11.7
V-20	EW-20		757707.422	2424314.274	81.99	13.2
V-21	EW-5		757929.862	2423918.644	80.46	13
V-22	EW-8		757995.498	2423767.298	80.26	10.7
V-23	EW-9		757914.062	2423625.145	78.96	11.1
V-24	V-24	abandoned	758110.784	2423551.852	68.05	11.7
V-25	V-25	abandoned	758256.577	2423593.412	67.64	10.7
V-26	V-26	abandoned	758393.939	2423640.316	69.86	7.7
V-27	V-27	abandoned	758511.8	2423729.772	66.26	9.6
V-28	V-28	abandoned	758519.315	2423878.78	66.67	9.55
V-29	V-29	abandoned	758502.034	2424032.163	67.64	9.6
V-30	V-30	capped	758326.336	2423955.671	69.59	9.2
V-31	EW-1		758265.454	2423864.116	73.23	11.7
V-32	V-32	capped	758151.169	2423835.84	75.59	8.8
V-33	V-33	capped	757819.051	2423518.875	78.91	8.8
V-34	V-34	capped	757668.432	2423443.021	82.50	11.7
V-35	V-35	capped	757527.58	2423385.209	82.01	11.55
V-36	V-36	capped	757374.128	2423324.799	82.04	11.55
V-37	V-37	capped	757262.058	2423428.025	82.11	10.95
V-38	V-38	abandoned	757260.636	2423597.922	83.35	12.7
V-39	V-39	abandoned	757252.66	2423801.966	83.84	12.15
V-40	V-40	abandoned	757248.012	2423939.494	84.32	12
V-41	V-41	abandoned	757210.007	2424098.42	84.21	12.15
V-42	V-42	abandoned	757176.11	2424245.654	84.35	13.3
V-43	V-43	abandoned	757164.42	2424404.15	81.70	10.95
V-44	V-44	abandoned	757166.144	2424558.164	82.06	9.55
V-45	V-45	abandoned	757188.85	2424715.932	87.06	9.55
V-46	V-46	abandoned	757508.403	2424717.506	114.00	13.7
V-47	V-47	abandoned	757417.878	2424651.056	112.68	35.5
V-48	V-48	capped	757414.863	2424456.59	112.00	14.75
V-49	V-49	capped	757406.538	2424292.608	110.35	40
V-50	V-50	capped	757571.651	2424267.093	102.40	29.7
V-51	EW-19		757574.386	2424150.023	91.73	19
V-52	EW-18		757648.351	2423954.63	90.85	17.5
V-53	EW-7		757733.496	2423863.973	89.53	16.25
V-54	EW-10		757633.451	2423969.471	91.13	18.5
V-55	EW-11		757775.377	2423739.823	88.72	20.3
V-56	EW-12		757701.938	2423610.765	91.43	14.4
V-57	EW-14		757507.695	2423695.408	98.00	19.4
V-58	EW-15		757483.204	2423843.67	98.00	16.25
V-59	EW-16		757453.128	2424003.618	96.00	18.7
V-60	V-60	capped	757428.281	2424167.075	102.00	24

NOTES:
ft. bgs. = feet below ground surface
Ft. AMSL = feet above mean sea level
NM = Not Measured
Northing & Easting measured by S&ME w/GPS on May 30, 2007.
Ground surface elevation interpreted from topographic survey by Geodata Corporation of Zebulon, NC using photorapetric methods from aerial photography flown on February 5, 2007.

LEGEND

- MONITOR WELL
- PIEZOMETER
- GAS PROBE
- GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- 8" HDPE HEADER
- 6" HDPE LATERAL
- 4" HDPE LATERAL
- APPROXIMATE LIMIT OF MSW WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

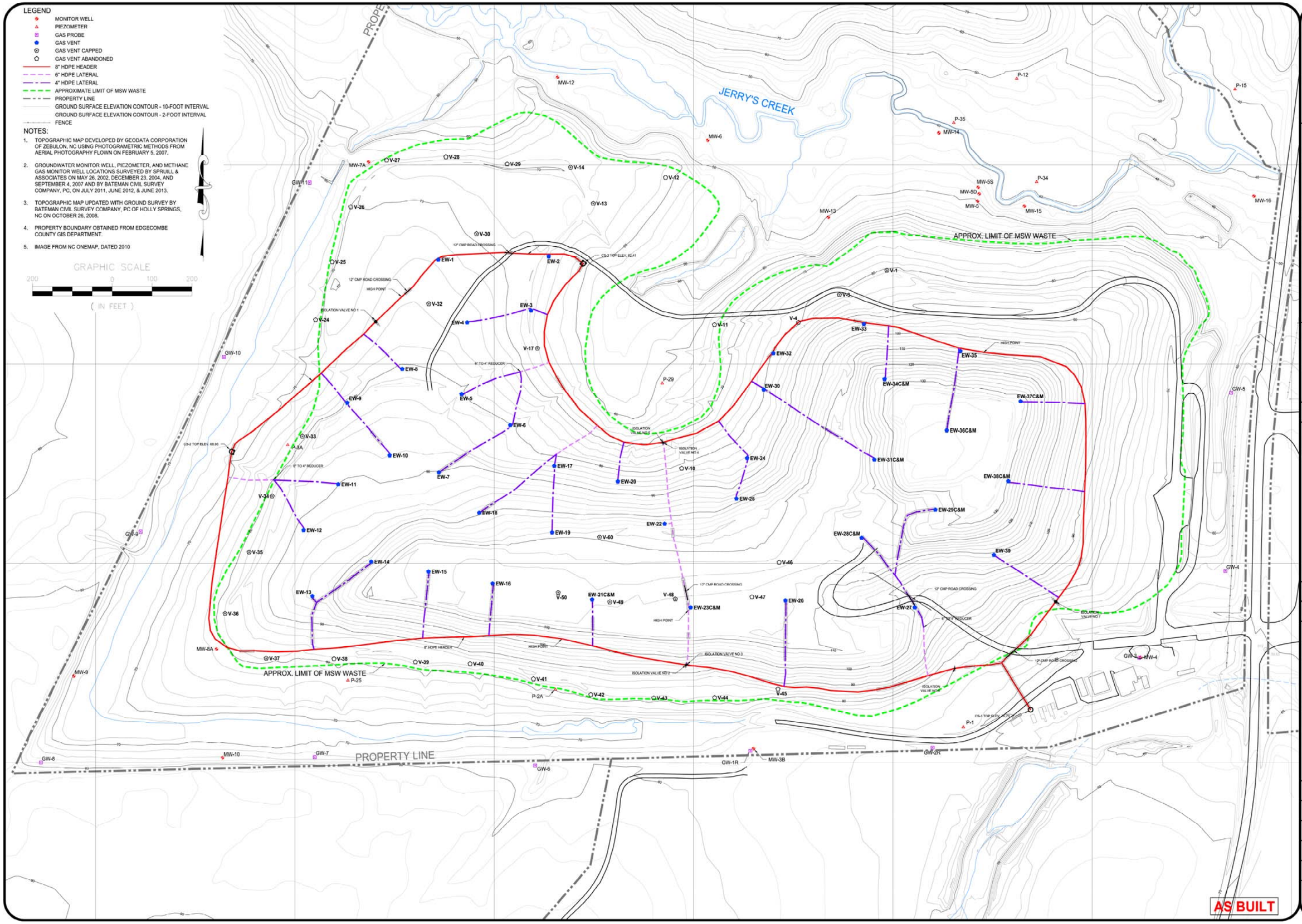
NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON JULY 2011, JUNE 2012, & JUNE 2013.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. IMAGE FROM NC ONEMAP, DATED 2010

GRAPHIC SCALE

200 0 100 200

(IN FEET)



AS BUILT

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY

ACTIVE LANDFILL GAS COLLECTION AND CONTROL SYSTEM

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1394	
DRAWING: 1	OF: 1

APPENDIX E

Well Construction Records/Well Inventory

Table E-1
INVENTORY OF ACTIVE EXTRACTION AND PASSIVE VENT WELLS
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-12-331

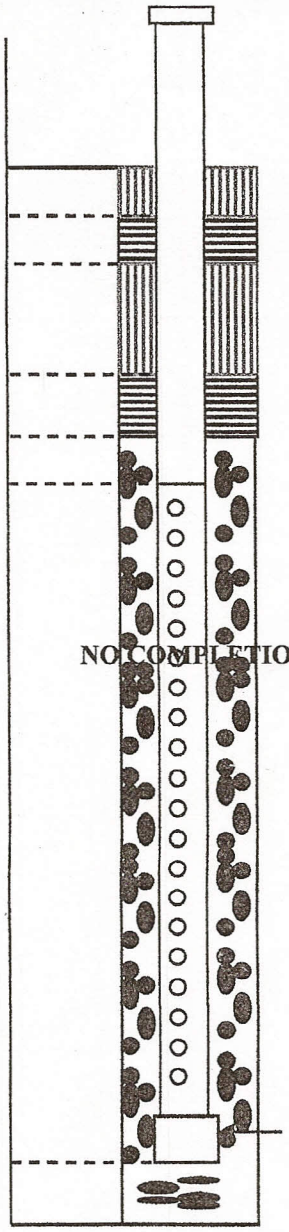
Original "V" and "GV" Designation	Final "EW" Designation	Well Details	Northing	Easting	Ground Surface Estimated Elevation (Ft -AMSL)	Total Depth (ft. bgs.)
GV-1	EW-39		757520.7	2525253	108.75	45
GV-2	EW-29 (C&M)	nested	757634.9	2425107	124.70	60
GV-3	EW-38 (C&M)	nested	757706	2425290	129.35	65
GV-4	EW-37 (C&M)	nested	757905.8	2425320	132.37	74
GV-5	EW-35		758032.1	2425169	108.89	52
GV-6	EW-34 (C&M)	nested	757962	2424979	126.48	65
GV-7	EW-36 (C&M)	nested	757833.2	2425135	128.67	65
GV-8	EW-31 (C&M)	nested	757760.5	2424953	115.87	45
GV-9	EW-28 (C&M)	nested	757564.2	2424922	116.55	50
GV-10	EW-27		757389.7	2425055	99.16	43
GV-11	EW-26		757406.5	2424730	112	50
GV-12	EW-23 (C&M)	nested	757389.6	2424493	114.5	45
GV-13	EW-21 (C&M)	nested	757409	2424245	114.75	53
GV-14	EW-13		757417.6	2423544	96.2	36
GV-15	EW-4		758104.2	2423932	75	23
V-1	V-1	capped	758234.875	2424984.843	81.02	10.81
V-2	EW-33		758103.396	2424929.525	93.31	17.42
V-3	V-3	capped	758173.859	2424865.797	81.83	10.97
V-4	V-4	abandoned	758107.137	2424768.177	82.00	4.2
V-5	EW-32		758032.488	2424703.279	80.61	11.9
V-6	EW-30		757941.024	2424680.129	80.39	12.5
V-7	EW-24		757768.14	2424638.767	85.13	13.4
V-8	EW-25		757666.209	2424611.896	97.54	11.4
V-9	EW-22		757602.285	2424430.24	103.86	8.5
V-10	V-10	abandoned	757740.965	2424473.668	80.92	5.5
V-11	V-11	abandoned	758098.661	2424552.239	64.03	8
V-12	V-12	abandoned	758467.688	2424429.939	61.28	9.6
V-13	V-13	capped	758402.429	2424248.547	66.37	6.7
V-14	V-14	capped	758493.705	2424191.549	67.96	10
V-15	EW-2		758272.89	2424141.719	65.83	9.8
V-16	EW-3		758137.867	2424096.532	67.09	9.5
V-17	V-17	capped	758039.361	2424108.301	66.44	7.7
V-18	EW-6		757851.24	2424045.133	79.98	11.7
V-19	EW-17		757747.308	2424154.323	81.38	11.7
V-20	EW-20		757707.422	2424314.274	81.99	13.2
V-21	EW-5		757929.862	2423918.644	80.46	13
V-22	EW-8		757995.498	2423767.298	80.26	10.7
V-23	EW-9		757914.062	2423625.145	78.96	11.1
V-24	V-24	abandoned	758110.784	2423551.852	68.05	11.7
V-25	V-25	abandoned	758256.577	2423593.412	67.64	10.7
V-26	V-26	abandoned	758393.939	2423640.316	69.86	7.7
V-27	V-27	abandoned	758511.8	2423729.772	66.26	9.6
V-28	V-28	abandoned	758519.315	2423878.78	66.67	9.55
V-29	V-29	abandoned	758502.034	2424032.163	67.64	9.6
V-30	V-30	capped	758326.336	2423955.671	69.59	9.2
V-31	EW-1		758265.454	2423864.116	73.23	11.7
V-32	V-32	capped	758151.169	2423835.84	75.59	8.8
V-33	V-33	capped	757819.051	2423518.875	78.91	8.8
V-34	V-34	capped	757668.432	2423443.021	82.50	11.7
V-35	V-35	capped	757527.58	2423385.209	82.01	11.55
V-36	V-36	capped	757374.128	2423324.799	82.04	11.55
V-37	V-37	capped	757262.058	2423428.025	82.11	10.95
V-38	V-38	abandoned	757260.636	2423597.922	83.35	12.7
V-39	V-39	abandoned	757252.66	2423801.966	83.84	12.15
V-40	V-40	abandoned	757248.012	2423939.494	84.32	12
V-41	V-41	abandoned	757210.007	2424098.42	84.21	12.15
V-42	V-42	abandoned	757176.11	2424245.654	84.35	13.3
V-43	V-43	abandoned	757164.42	2424404.15	81.70	10.95
V-44	V-44	abandoned	757166.144	2424558.164	82.06	9.55
V-45	V-45	abandoned	757188.85	2424715.932	87.06	9.55
V-46	V-46	abandoned	757508.403	2424717.506	114.00	13.7
V-47	V-47	abandoned	757417.878	2424651.056	112.68	35.5
V-48	V-48	capped	757414.863	2424456.59	112.00	14.75
V-49	V-49	capped	757406.538	2424292.608	110.35	40
V-50	V-50	capped	757571.651	2424267.093	102.40	29.7
V-51	EW-19		757574.386	2424150.023	91.73	19
V-52	EW-18		757648.351	2423954.63	90.85	17.5
V-53	EW-7		757733.496	2423863.973	89.53	16.25
V-54	EW-10		757633.451	2423969.471	91.13	18.5
V-55	EW-11		757775.377	2423739.823	88.72	20.3
V-56	EW-12		757701.938	2423610.765	91.43	14.4
V-57	EW-14		757507.695	2423695.408	98.00	19.4
V-58	EW-15		757483.204	2423843.67	98.00	16.25
V-59	EW-16		757453.128	2424003.618	96.00	18.7
V-60	V-60	capped	757428.281	2424167.075	102.00	24

NOTES:
ft. bgs. = feet below ground surface
Ft. AMSL = feet above mean sea level
NM = Not Measured
"V" Wells: Northing and Easting measured by S&ME with GPS on May 30, 2007. Ground surface elevation interpreted from topographic survey by Geodata Corporation of Zebulon, NC using photopetric methods from aerial photography flown February 5, 20117.
"GV" Wells: Surveyed by Bateman Civil Survey Co. on April 2, 2012.

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-01
Date: 03 / 08 · 2012

DRILLING & COMPLETION LOG



DRILL	45'	WEATHER	
COMP.		START	3:40
ABAN.		STOP	4:45
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 61°	None	Dry
2-20	C&D / Dirt plug 70°	Slight	
21-30	HHT 74°	Moderate	
31-40	72°		
41-50	64°		
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 45'

COMMENTS

Moved over to well # GV-01 Drilling from 0' to 45' Set pipe.

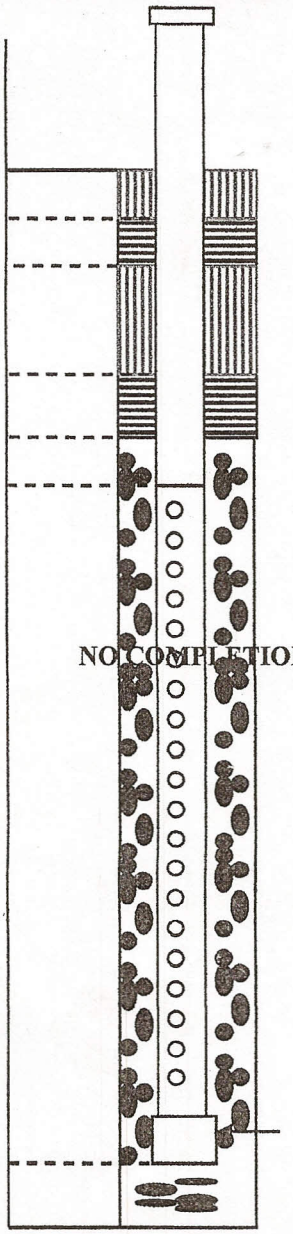
CLIENT REPRESENTATIVE DATE
NAME & TITLE

N. N. 03·08·2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-10
Date: 03-10-2012

DRILLING & COMPLETION LOG



DRILL	43	WEATHER	
COMP.		START	10:07
ABAN.		STOP	
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	none	Dry
2-20	HHT	Slight	
21-30		moderat	
31-40			
41-50			
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TO 43'

COMMENTS

Moved over to well # GV-10 Drilling from 0' to 43

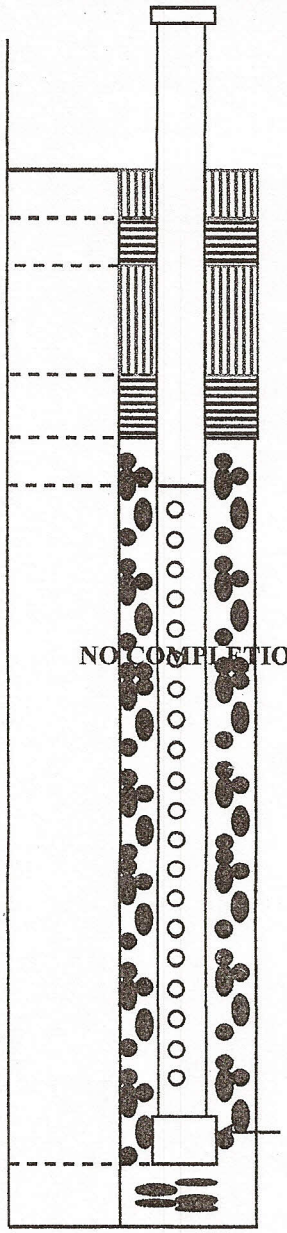
CLIENT REPRESENTATIVE DATE
NAME & TITLE

03-10-2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-11
Date: 03-09-2012

DRILLING & COMPLETION LOG



DRILL	50'	WEATHER	
COMP.		START	2:11
ABAN.		STOP	3:30
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 61°	none	Dry
2-20	C&D plug 15' 70°	Slight	
21-30	WHT 71°		
31-40	76°		
41-50	72°		
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 50'

COMMENTS

Moved over to well # GV-11. Drilling from 0' to 50' Set pipe.

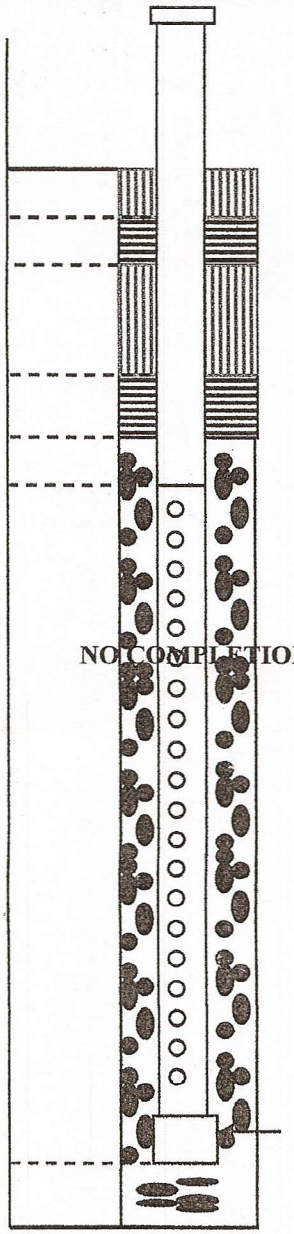
CLIENT REPRESENTATIVE DATE
NAME & TITLE

03-09-2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-12
Date: 03-10-2012

DRILLING & COMPLETION LOG



DRILL	45'	WEATHER	
COMP.		START	8:22
ABAN.		STOP	9:30
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °		DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	63°	none	Dry
2-20	C&D	70°	Slight	
21-30		64°	Moderate	
31-40	HHT	59°		
41-50		56°		Moist
51-60				
61-70				
71-80				
81-90				
91-100				
101-110				
111-120				
121-130				
131-140				

TD. 45'

COMMENTS

Moved over to well # GV-12 Drilling from 0' to 45'. Set pipe

CLIENT REPRESENTATIVE DATE
NAME & TITLE

03-10-2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

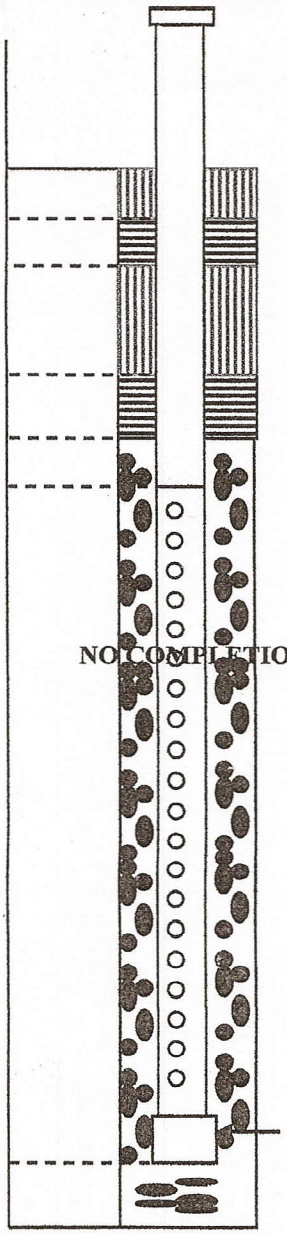
QUALITY DRILLING SERVICE

Project Name: Turboro, NC.

Well Number: GV-13

Date: 03-09-2012

DRILLING & COMPLETION LOG



DRILL	53'	WEATHER	
COMP.		START	3:50
ABAN.		STOP	5:06
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	none	Dry
2-20	C&D	Slight	
21-30	Play	Moderate	
31-40	WHT		
41-50			
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

COMMENTS

Drilling on well # GV-13. Drilling from 0' to 53' Set pipe.

CLIENT REPRESENTATIVE DATE

NAME & TITLE

N. N. 03-09-2012

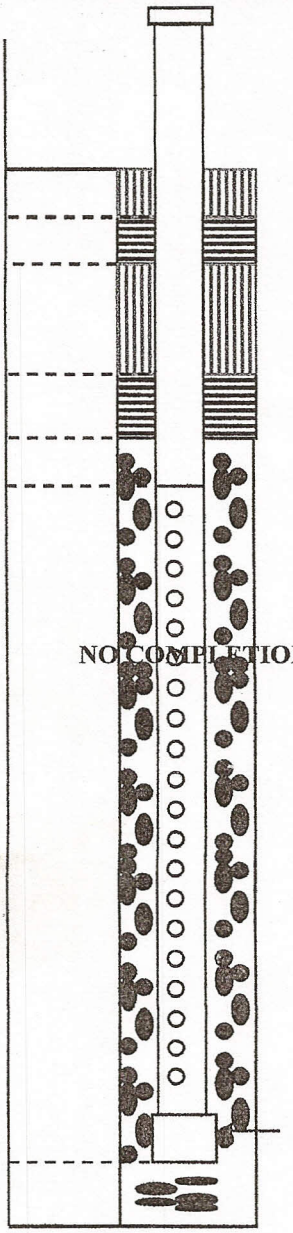
QUALITY DRILLING SERVICE DATE

SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-14
Date: 03-10-2012

DRILLING & COMPLETION LOG



DRILL	36'	WEATHER	
COMP.		START	6:54
ABAN.		STOP	8:00
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	None	Dry
2-20	HHT	Slight	↓
21-30	↓	Moderat	↓
31-40	↓	↓	wet
41-50			
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 36'

COMMENTS

Arrive on site safety meeting. Drilling on well # GV-14
Drilling from 0' to 36'. Set pipe

S.S. 03-10-2012

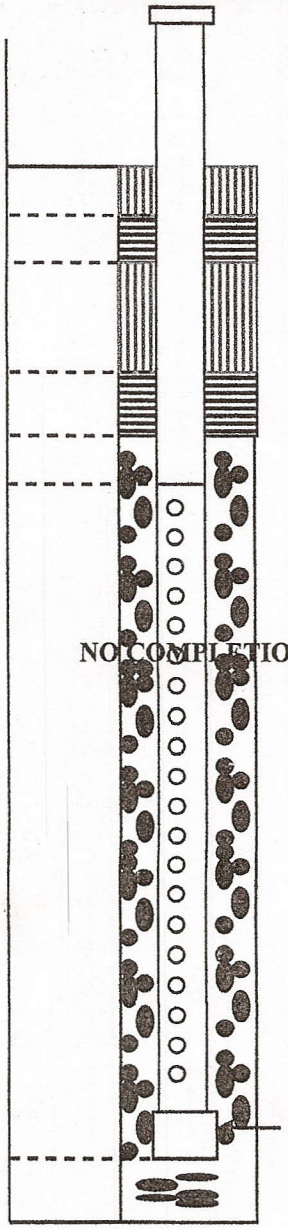
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-15
Date: 03-09-2012

DRILLING & COMPLETION LOG



DRILL	23'	WEATHER	
COMP.		START	5:50
ABAN.		STOP	6:28
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	None	Dry
2-20	HHT 65°	Slight	wet
21-30	↓ 70°	Mostly	wet
31-40			
41-50			
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

COMMENTS

Moved to well # GV-15 Drilling from 0' to 23' Set pipe.

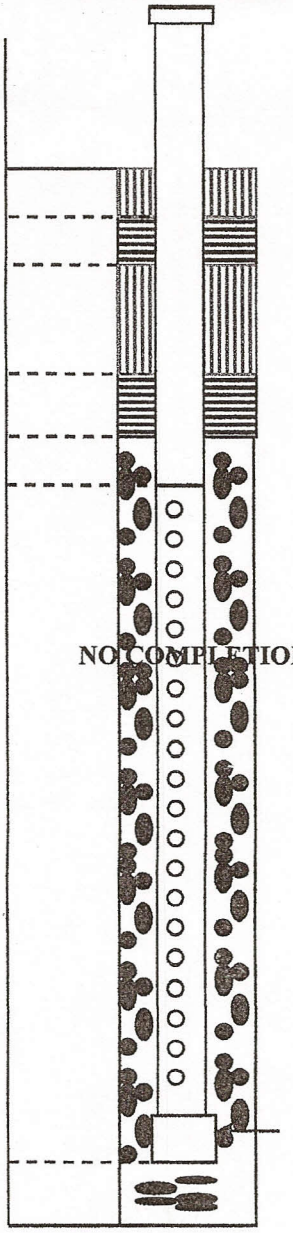
CLIENT REPRESENTATIVE DATE
NAME & TITLE

03-09-2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro
Well Number: GV-02
Date: 03 /08-2012

DRILLING & COMPLETION LOG



DRILL	60'	WEATHER	
COMP.		START	5:15
ABAN.		STOP	7:15
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 68°	none	Dry
2-20	CAD 73°	Slight	
21-30	71°	moderat	
31-40	clayplay 65°		
41-50	HHT 61°		Damp
51-60	60°		
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 60'

COMMENTS

Moved over to well # GV-02 Drilling from 0' to 60' Set pipe

S. S. 03-08-2012

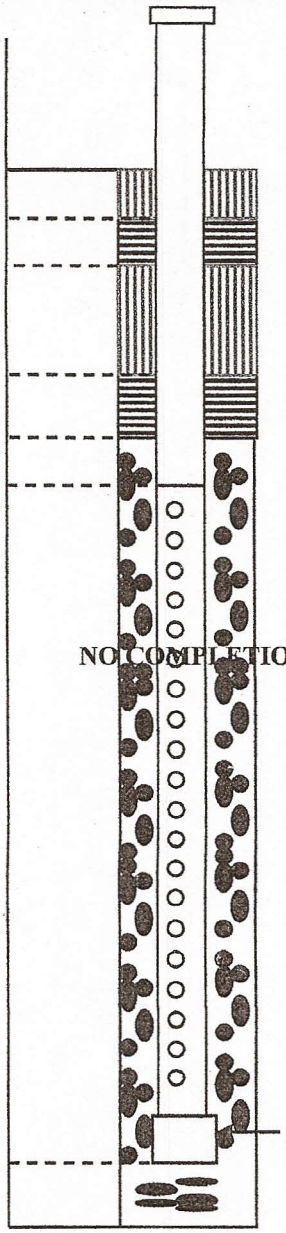
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Turbono
Well Number: GV-03
Date: 03/08.2012

DRILLING & COMPLETION LOG



DRILL	65'	WEATHER	
COMP.		START	1:10
ABAN.		STOP	3:16
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	None	Dry
2-20	C&D 63°	Slight	
21-30	76°	Moderat	
31-40	65°		
41-50	45' Dirt 64°		
51-60	HHT 74°		
61-70	71°		
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 65'

COMMENTS

Moved over to well# GV-03 Drilling from 0' to 65' Set pipe.

03.08.2012

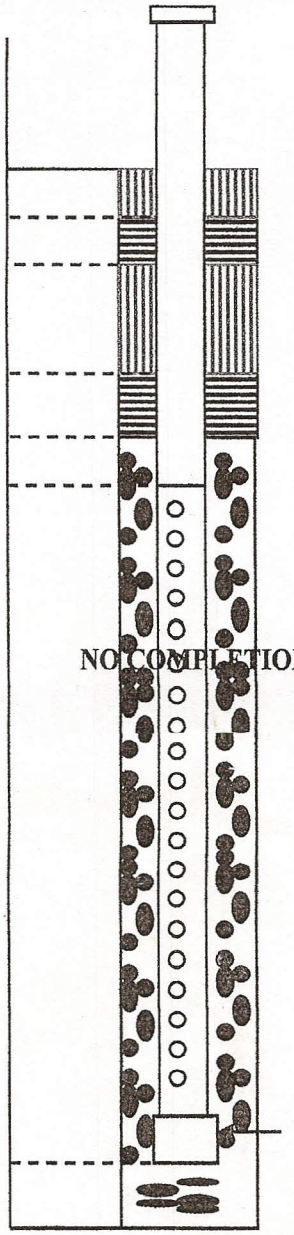
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro
Well Number: GV-4
Date: 03 / 07 · 2012

DRILLING & COMPLETION LOG



DRILL	74'	WEATHER	
COMP.	—	START	12:10
ABAN.	—	STOP	3:44
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 69°	None	Dry
2-20	~~HHT~~ C&D	Slight	Dry
21-30	C&D 67°	" "	" "
31-40	C&D 61°	Moderat	wet
41-50	C&D 71°	" "	" "
51-60	HHT/C&D 84°	" "	" "
61-70	HHT 79°	mostly	
71-80	HHT/clay 90°	↓	↓
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 74'

COMMENTS

Arrive on site. Safety Meeting. Change Cable.
Start Drilling on well# GV-4. Drilling from 0' to 74' set pipe.

03-07-2012

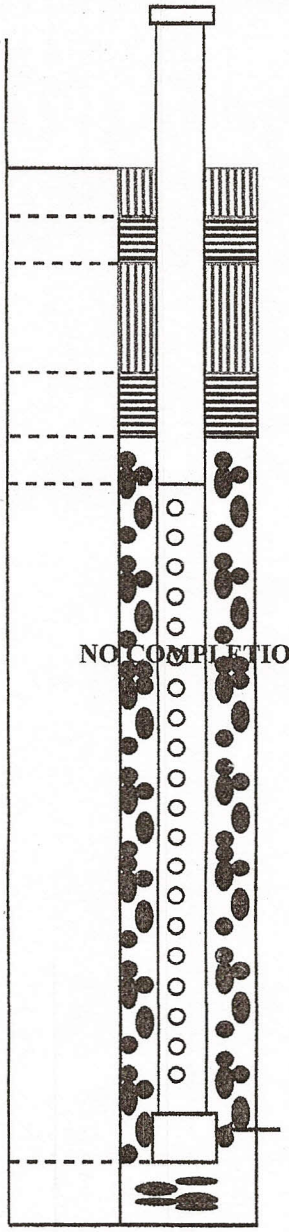
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-05
Date: 03 /08-2012

DRILLING & COMPLETION LOG



DRILL	52	WEATHER	
COMP.	\	START	7:48
ABAN.		STOP	9:43
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	None	Damp
2-20	C&D 90°	mostly	wet
21-30	↓	↓	↓
31-40	84°		
41-50	101°		
51-60	C&D / HHT	↓	↓
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 52'

COMMENTS

Arrive on site Safety Meeting. Start Drilling on well # GV-05
Drilling from 0' to 52' Set pipe.

S.P. 03-08-2012

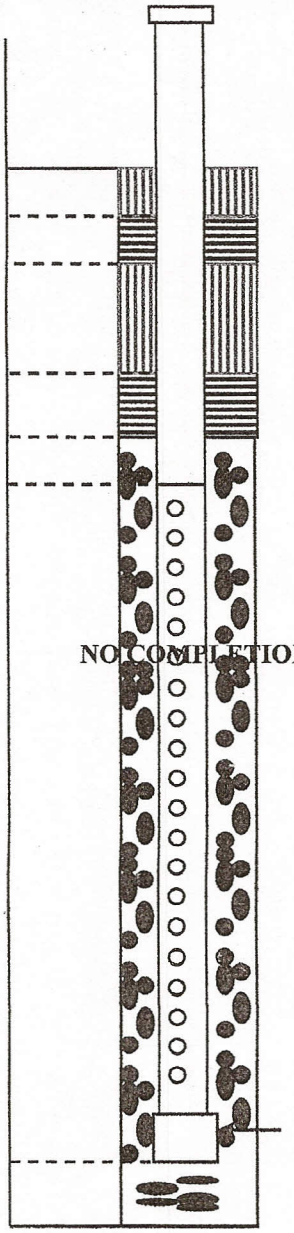
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-06
Date: 03/08/2012

DRILLING & COMPLETION LOG



DRILL	66	WEATHER	
COMP.		START	10:15
ABAN.		STOP	11:50
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover	None	Dry
2-20	Clay 63°	Slight	
21-30	72°	Moderat	
31-40	85°		
41-50	79°		
51-60	HHT 72°		
61-70	65°		
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 66'

COMMENTS

Moved over to well # GV-06 Drilling from 0' to 66' Set pipe

03·08·2012

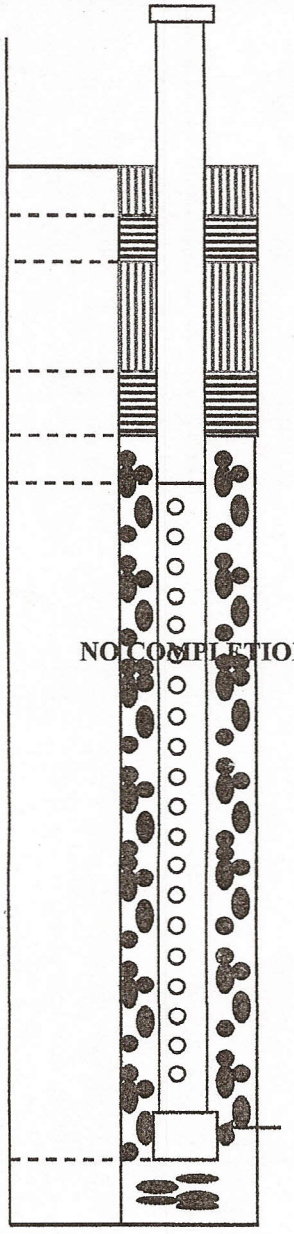
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-07
Date: 03 /09 · 2012

DRILLING & COMPLETION LOG



DRILL	65'	WEATHER	
COMP.		START	7:10
ABAN.		STOP	9:30
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 64°	None	Dry
2-20	C & D 66°	Moderate	wet
21-30	70°	Mostly	
31-40	69°		
41-50	42' clay plug 67°		
51-60	HHT 68°		
61-70	71°		
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 65'

COMMENTS

Arrive on Site. Safety Meeting. Start Drilling on well # GV-07
Drilling from 0' to 65'. Set pipe.
Moved over to well # GV-08

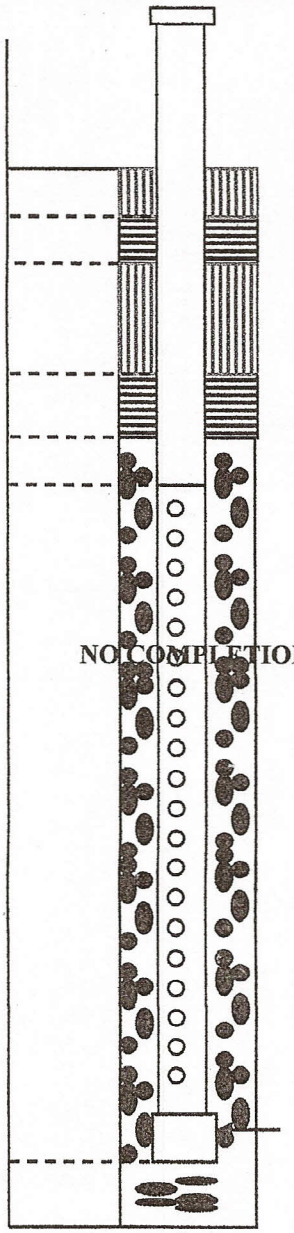
CLIENT REPRESENTATIVE DATE
NAME & TITLE

03 · 09 · 2012
QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-08
Date: 03 / 09 · 2012

DRILLING & COMPLETION LOG



DRILL	45'	WEATHER	
COMP.		START	10:00
ABAN.		STOP	12:13
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 65°	None	Dry
2-20	C&D 69°	mostly	wet
21-30	WHT/clay 71°	↓	↓
31-40	↓ 71°	↓	↓
41-50	72°	↓	↓
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

COMMENTS

Drilling on well# GV-08. Drilling from 0' to 45' Set pipe.

03-09-2012

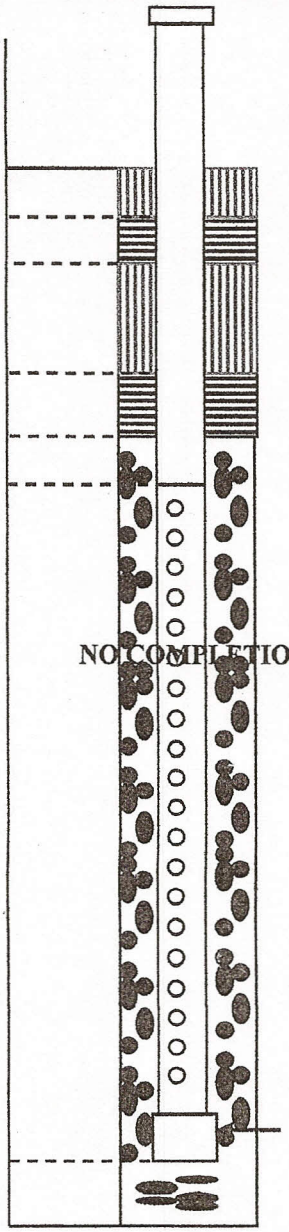
CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

QUALITY DRILLING SERVICE

Project Name: Tarboro, N.C.
Well Number: GV-09
Date: 03-09-2012

DRILLING & COMPLETION LOG



DRILL	50'	WEATHER	
COMP.		START	12:41
ABAN.		STOP	2:00
SOLID		PIPE DIA. & TYPE	
PERF.			

DEPTH	COMPOSITION & TEMPERATURE °	DEGREE OF DECOMPOSITION	AMOUNT OF MOISTURE
0-2	Cover 65°	None	Dry
2-20	C&D 74°	Slight	
21-30	70°	Moderate	
31-40	/ HHT Plugs 65°		
41-50	HHT 62°		
51-60			
61-70			
71-80			
81-90			
91-100			
101-110			
111-120			
121-130			
131-140			

TD 50'

COMMENTS

Moved over to well # GV-09 Drilling from 0' to 50' Set pipe.

S.S. 03-09-2012

CLIENT REPRESENTATIVE DATE
NAME & TITLE

QUALITY DRILLING SERVICE DATE
SITE SUPERVISOR

APPENDIX F

Wastewater Discharge Permit and Laboratory Analysis for Condensate issued by Town of Tarboro

Town of Tarboro

P.O. Box 220 – 500 Main Street
Tarboro, NC 27886-0220
Telephone (252) 641-4200
Fax (252) 641-4286
www.tarboro-nc.com

November 13, 2013

Lorenzo Carmon
Edgecombe County Manager
Post Office Box 10
Tarboro, NC 27886

Re: Wastewater Discharge Permit
Edgecombe County Landfill Gas Collection System

Dear Lorenzo:

Enclosed you will find one (1) original of the Local Permit authorizing discharge of wastewater into the Town of Tarboro's sewer collection system in accordance with standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission. The permit allows for the discharge of 5,000 gallons per month of landfill gas leachate.

If you have any questions regarding the effluent limitations, monitoring requirements, or other conditions set forth in Parts I, II, or III of this permit, please contact me at (252) 641-4229.

Sincerely,

Troy R. Lewis
Director of Public Works

Enclosure

Cc: Mike Allen, Wastewater Treatment Plant Supervisor
Whit Rawls, P.E., S&ME, Inc.

Town of Tarboro

P.O. Box 220 – 500 Main Street
Tarboro, NC 27886-0220
Telephone (252) 641-4200
Fax (252) 641-4286
www.tarboro-nc.com

LOCAL PERMIT

To Discharge Wastewater Under The
Industrial Pretreatment Program

In compliance with the provisions of the Town of Tarboro Sewer Use Ordinance, North Carolina General Statute 143-215.1, and other lawful standards and regulations promulgated and adopted by the North Carolina Environmental Management Commission, and the Town of Tarboro. The following, hereafter referred to by name as the permitee:

Edgecombe County
Edgecombe County Landfill Gas Collection System

Is hereby authorized to discharge wastewater from a facility located at:

1601 Colonial Road
Tarboro, NC 27886

into the Town of Tarboro wastewater disposal system (NPDES Permit No. NC0020605) in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III of this permit.

This permit shall become effective **November 12, 2013**

This permit and the authorization to discharge shall expire at midnight on **November 12, 2018**.

Signed this 12th day of **November 2013**.

Troy R. Lewis, Director of Public Works

Part I. Effluent Limitations and Monitoring Requirements

A. Authorization Statement

1) The Permittee is hereby authorized to discharge wastewater in accordance with the effluent limitations, monitoring requirements, and other conditions set forth in this Industrial User Pretreatment Permit (IUP) into the sewer collection system and wastewater treatment facility of the TOWN OF TARBORO.

2) The Permittee is hereby authorized to continue operation of and discharge wastewater from the treatment or pretreatment facilities. These facilities must correspond to the treatment units listed on both the application and inspection forms.

3) The Permittee is hereby authorized to, if required by the TOWN OF TARBORO and after receiving Authorization to Construct (A to C) from the TOWN OF TARBORO, construct and operate additional pretreatment units as needed to meet final effluent limitations.

B. Description of Discharge

Pump and Haul Tanker: Waste is described as land fill leachate from methane capture and energy production operations at the Edgecombe County Landfill.

C. Effluent Limits and Monitoring Requirements

Effective immediately and lasting until the expiration of this permit, the permittee is authorized to discharge from pump and haul tankers. Parameters not limited in this permit shall be discharged in accordance with the TOWN OF TARBORO Sewer Use Ordinance. This discharge shall be limited and monitored as specified in Exhibit I.

D. Monitoring and Reporting

1. Representative Sampling

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and approval by, the permit issuing authority.

2. Reporting

a. Monitoring results obtained by the permittee shall be summarized and reported on the Indirect Discharge Monitoring Report Form (IDMR), postmarked no later than the twentieth day of the month following the month in which the samples were taken. If no discharge occurs during the reporting period, "no discharge" shall be reported. Copies of these and all other reports required herein shall be submitted to:

TOWN OF TARBORO
P.O. Box 220
TARBORO, North Carolina 27886-0220

b. If the sampling performed by the permittee indicates a violation, then the permittee shall notify the TOWN within 24 hours of becoming aware of the violation. The permittee shall repeat the sampling and analysis and submit the results of the repeat analysis to the TOWN within 30 days after becoming aware of the violation.

3. Definitions

In addition to the definitions in the TOWN OF TARBORO of Sewer Use Ordinance the following definitions apply:

a. A "composite" sample, for monitoring requirements, is defined as the collection of a minimum of one grab sample per hour for each hour of discharge during the entire discharge period on the sampling day.

b. A "daily" monitoring frequency shall mean each working day.

c. A "grab" sample, for monitoring requirements, is defined as a single "dip and take" sample collected at a representative point in the discharge stream.

d. An "instantaneous" measurement, for monitoring requirements, is defined as a single reading, observation, or measurement.

e. "TTO", or Total Toxic Organics, is the sum of the concentrations of the toxic organic compounds listed in 40 CFR 433.11(e) found in the permittee's discharge at a concentration greater than 0.01 mg/L.

4. Test Procedures

Test procedures for the analysis of pollutants shall conform to 40 CFR, Part 136 and amendments thereto unless otherwise specified in this permit. Testing shall be performed by a State Certified laboratory.

5. Additional Monitoring by Permittee

If the permittee monitors any pollutant at the location(s) designated herein more frequently than required by this permit, using approved analytical methods as specified above, the results of such monitoring shall be submitted to the WWTP Supervisor. The Supervisor may require more frequent monitoring or the monitoring of other pollutants not required in this permit by written notification.

EXHIBIT I
Effluent Limitations and Monitoring Requirements
Pump and Haul Tankers

			Monitoring Frequency	
Limited Parameter	Daily Maximum	Sample Type	Local Government	Permittee
Flow, gpd	Monitor	Tanker Count	-	Per Tank Load
COD	600	Grab	As Required	Per Tank Load
BOD_5, mg/l	300	Grab	As Required	Per Tank Load
TSS, mg/l	300	Grab	As Required	Per Tank Load
Total Nitrogen, mg/L	40	Grab	As Required	Per Tank Load
TKN, mg/L	30	Grab	As Required	Per Tank Load
Ammonia, mg/L	20	Grab	As Required	Per Tank Load
Phosphorous, mg/L	8	Grab	As Required	Per Tank Load
Arsenic, mg/L	.003	Grab	As Required	Per Tank Load
Cadmium, mg/L	.003	Grab	As Required	Per Tank Load
Chromium, mg/L	.05	Grab	As Required	Per Tank Load
Copper, mg/L	.061	Grab	As Required	Per Tank Load
Lead, mg/L	.049	Grab	As Required	Per Tank Load
Nickel, mg/L	.021	Grab	As Required	Per Tank Load
Mercury, mg/L	.0003	Grab	As Required	Per Tank Load
Selenium, mg/L	.005	Grab	As Required	Per Tank Load
Zinc, mg/L	.175	Grab	As Required	Per Tank Load
Cyanide, mg/L	.041	Grab	As Required	Per Tank Load
pH	6-9 range	Grab	As Required	Per Tank Load

* After the period of one (1) year, should all tests show that parameters remain under limits as specified in the Town's Sewer Use Ordinance, the Town Public Director of Public Works may reduce sampling frequency at their discretion.
* Depending on parameter and concentration precedence that is set, the Town Director of Public Works may apply and/or adjust permit limits as deemed necessary.

Additional Limitations:

The Permittee shall notify the Town prior to the discharge of each tank load of wastewater. The Town will specify the discharge point and will authorize the discharge event.

Part II. General Conditions

A. Duty to Comply

The permittee shall comply with all conditions of this permit and with all conditions otherwise regulated in the Town's Sewer User Ordinance. Any permit noncompliance constitutes a violation of the Sewer Use and Pretreatment Ordinance and is grounds for possible enforcement action.

B. Duty to Mitigate - Prevention of Adverse Impact

The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit which has a reasonable likelihood of adversely affecting human health, the POTW, the waters receiving the POTW's discharge, or the environment.

C. Facilities Operation

The permittee shall at all times maintain in good working order and operate as efficiently as possible, all control facilities or systems installed or used by the permittee to achieve compliance with the terms and conditions of this permit. Bypass of treatment facilities is prohibited except when approved in advance by the TOWN OF TARBORO WWTP Supervisor. Bypass approval shall be given only when such bypass is in compliance with 40 CFR 403.17.

D. Removed Substances

Solids, sludge, filter backwash, or other pollutants removed in the course of treatment or control of wastewater shall be disposed of in a manner such as to prevent any pollutants from such materials from entering the POTW. The permittee is responsible for assuring its compliance with any requirements regarding the generation, treatment, storage, and/or disposal of "Hazardous waste" as defined under the Federal Resource Conservation and Recovery Act.

E. Upset Conditions

An "upset" means an exceptional incident in which there is an unintentional and temporary noncompliance with the effluent limitations of this permit because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed or inadequate treatment facilities, lack of preventive maintenance, or careless or improper operations.

An upset may constitute an affirmative defense for action brought for the noncompliance. The permittee has the burden of proof to provide evidence and demonstrate that none of the factors specifically listed above were responsible for the noncompliance.

F. Right of Entry

The permittee shall allow the staff of the State of North Carolina Department of Environment, Health and Natural Resources, Division of Water Quality, the Regional Administrator of the Environmental Protection Agency, the WWTP Supervisor or their authorized representatives, upon the presentation of credentials:

1. To enter upon the permittee's premises where a real or potential discharge is located or in which records are required to be kept under the terms and conditions of this permit; and;
2. At reasonable times to have access to and copy records required to be kept under the terms and conditions or this permit; to inspect any monitoring equipment or monitoring method required in this permit; and to sample any discharge of pollutants.

G. Availability of Reports

The permittee shall retain records of all monitoring information, including all calibration and maintenance records as well as copies of reports and information used to complete the application for this permit for at least three years. All records that pertain to matters that are subject to any type of enforcement action shall be retained and preserved by the permittee until all enforcement activities have concluded and all periods of limitation with respect to any and all appeals have expired.

Except for data determined to be confidential under the Sewer Use Ordinance, all reports prepared in accordance with terms of this permit shall be available for public inspection at the TOWN OF TARBORO Public Works Building. As required by the Sewer Use Ordinance, effluent data shall not be considered confidential.

H. Duty to Provide Information

The permittee shall furnish to the Supervisor, within a reasonable time, any information which the Supervisor or the Division of Environmental Management may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish, upon request, copies of records required to be kept by this permit.

I. Signatory Requirements

All reports or information submitted pursuant to the requirements of this permit must be signed and certified by a ranking official or duly authorized agent of the permittee.

J. Toxic Pollutants

If a toxic effluent standard or prohibition (including any schedule of compliance specified in such effluent standard or prohibition) is established under Section 307(a) of the Federal Clean Water Act for a toxic pollutant which is present in the discharge and such standard or prohibition is more stringent than any limitation for such pollutant in this permit, this permit may be revised or modified in accordance with the toxic effluent standard or prohibition and the permittee so notified.

K. Civil and Criminal Liability

Nothing in this permit shall be construed to relieve the permittee from civil or criminal penalties for noncompliance.

L. Federal and/or State Laws

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable Federal and/or State law or regulations.

M. Penalties

The TOWN OF TARBORO Sewer Use Ordinance provides that any person who violates a permit condition is subject to a civil penalty per day of such violation.

The TOWN OF TARBORO Sewer Use Ordinance also provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction, be punished by a fine.

N. Need to Halt or Reduce not a Defense

It shall not be a defense for a permittee in an enforcement action that the permitted activity would have been halted or reduced to maintain compliance with the conditions of the permit.

O. Transferability

This permit shall not be reassigned or transferred or sold to a new owner, new user, different premises, or a new or changed operation without approval of the Division.

P. Property Rights

This permit does not convey any property rights in either real or personal property, or any exclusive privileges, not does it authorize any injury to private property or any invasion of personal rights, or any infringement of Federal, State, or Local Government laws or regulations.

Q. Severability

The provisions of this permit are severable and, if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

R. Permit Modifications, Revocation, Termination

This permit may be modified, revoked and reissued or terminated with cause in accordance with the requirements of the Sewer Use Ordinance and North Carolina General Statutes or implementing regulations.

S. Reapplication for Permit Renewal

The permittee is responsible for filing an application for reissuance of this permit within 180 days of its expiration date.

T. Dilution Prohibition

The permittee shall not increase the use of potable or process water or in any other way attempt to dilute the discharge as a partial or complete substitute for adequate treatment to achieve compliance with the limitations contained in this permit.

U. Notification of Production Changes

The permittee shall give notice to the TOWN 90 days prior to any facility expansion, production increase, or process modification which has the potential to result in new or substantially increased discharges or a change in the nature of the discharge.

V. Construction

No construction of pretreatment facilities or additions thereto shall be begun until Final Plans and Specifications have been submitted to the TOWN OF TARBORO and written approval and an Authorization To Construct have been issued.

W. Sludge Management Plan

Ninety days prior to the initial disposal of sludge generated by any pretreatment facility the permittee shall submit a sludge management plan.

X. Categorical Standard Reopener

This permit shall be modified, or alternatively, revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved under Sections 302(b)(2)(C) and (D), 304(b)(2), and 307(a)(2) of the Clean Water Act, if the effluent standard or limitation so issued or approved.

1. Contains different conditions or is otherwise more stringent than any effluent limitation in this permit; or
2. Controls any pollutant not limited in this permit.

The permit as modified or reissued under this paragraph shall also contain any other requirements of the Act then applicable.

Y. Accidental Discharges and Slug Loads

The permittee shall provide protection from accidental discharges of prohibited materials or other substances regulated by this permit.

The permittee shall notify the TOWN immediately of all discharges that could cause problems to the POTW including any slug loadings as defined by 40 CFR 403.5(b). If the permittee experiences such a discharge they shall inform the Water and Sewer Supervisor immediately upon the first awareness of the commencement of the discharge. A written follow up report thereof shall be filed by the permittee within five (5) days.

Z. General Prohibitive Standards

The permittee shall comply with the general prohibitive discharge standards in 40 CFR 403.5 (a) and (b) of the Federal pretreatment.

Part III. Other Requirements

A. Reopener

This permit shall be modified or, alternatively, revoked and reissued to comply with any applicable effluent standards or limitation issued or approved by the TOWN, as the Control Authority, for the control of any pollutant not now controlled by this permit or the TOWN Ordinance.

B. Additional Sampling Requirements

Prior to the beginning of discharge, the permittee shall submit to the TOWN OF TARBORO the analytical results of one grab sample using the analytical methods as described in 40 CFR Part 136, Appendix A, Method 601 and 602 for all parameters covered by that method. The sample shall be collected at the influent to the pretreatment facility and shall be representative of the discharge from all contributing remediation wells. Should that analysis detect any pollutants other than those currently limited by this permit, this permit may be modified or alternatively revoked and reissued to include limitations for those parameters.

C. Discharge Limit

The permitted discharge limit until modified shall be 5,000 gallons per month. If operations increase and additional discharge is necessary, then the permittee shall apply to the Director of Public Works to amend this permit subject to all provisions and conditions of the same.

D. Additional Treatment of Leachate

In that representative samples have indicated low pH values for effluent, it is necessary to raise the pH to a level between 6 and 9 to ensure no adverse impact on WWTP operations. Therefore it shall be a requirement of this permit that the permittee provide treatment to effluent to raise the pH to acceptable levels prior to pumping and hauling.

E. Responsible Fees and Charges

Issuance of this permit does not relieve the permittee of all responsibility for paying all charges and fees related to water service, wastewater treatment, and wastewater pretreatment program administration such as have been, or as may in the future be, adopted by the TOWN OF TARBORO. These charges include, but are not limited to, sewer user charges, sewer surcharges, pretreatment permit fees, pretreatment administrative fees, pretreatment monitoring and testing fees, and any other fees associated with the Industrial Pretreatment Program deemed necessary by the TOWN OF TARBORO.

October 3, 2013

Mr. Troy Lewis
Director of Public Works
Town of Tarboro
P.O Box 220
Tarboro, North Carolina 27886

Reference: Submittal of Full TCLP Analysis and Priority Pollutant Scan Analysis of Edgecombe County LFGCCS Condensate
Tarboro, North Carolina
S&ME Project No. 1054-07-240F

Dear Mr. Lewis:

On behalf of Edgecombe County (the County), S&ME is pleased to present the results of laboratory analyses of landfill gas (LFG) condensate samples that were collected from the County's landfill gas collection and control system (LFGCCS) during multiple sampling events conducted in 2012 and 2013. The attached laboratory results are being submitted to you for your review in order for you to determine if the Town of Tarboro's wastewater treatment plant (WWTP) will accept periodic discharges of LFG condensate from the County's LFGCCS.

PROJECT BACKGROUND

The County has operated a LFGCCS at the County's landfill, in Tarboro, since September 2012. LFG produced by the landfill is extracted by vacuum force and directed to a candlestick flare for combustion. The LFG contains moisture that condenses as the LFG travels through the LFGCCS pipes towards the flare. The condensate is collected in two 5,000 gallon storage tanks.

A landfill gas to energy (LFGTE) facility is scheduled to be commissioned at the County's landfill beginning on October 28, 2013. The LFGTE facility will include a LFG condensate removal system that will produce additional LFG condensate.

LABORATORY ANALYSES

On April 24, 2013, on behalf of the County, S&ME submitted to you, laboratory results of LFG condensate samples collected from the County's LFGCCS that were analyzed by the following analytical methods:

- Toxicity Characteristic Leaching Potential (TCLP) volatile organic compounds (VOCs) by U.S. EPA Method 8260B (sample collected December 13, 2012); and
- Flash Point Analysis by U.S. EPA Method 1010 (sample collected February 22, 2013).

Following the submittal of the TCLP VOC and flash point analysis results, you forwarded a letter from Dr. Shankar Mistry, of The Wooten Company (Wooten) to Ms. Claudia Irvin, of S&ME, dated June 6, 2013, requesting that the County provide additional analytical data for the LFG condensate. Dr. Mistry requested the following additional analytical results of the LFG condensate be provided: complete TCLP analysis, Ignitability, Reactivity, Corrosivity, BOD, COD, pH and hydrogen sulfide. An email dated July 10, 2013 from Dr. Mistry to you requested that a priority pollutant scan analysis also be submitted for review.

On June 19, 2013, S&ME collected a condensate sample and submitted the sample to ESC Lab Sciences, a North Carolina certified laboratory, for the laboratory analyses specified above, except for the priority pollutant scan. The results of the analysis have been tabulated and compared to the regulatory limits in the attached **Table 1**. On July 17, 2013, S&ME collected an additional condensate sample and submitted it to ESC Lab Sciences for the priority pollutant scan analysis. The results of this analysis have also been tabulated in the attached **Table 1**. The results indicate that the condensate is in compliance with the regulatory limits to be considered not hazardous. Please note, all LFG condensate samples, for which laboratory analytical results are attached to this letter, were collected from the same sampling location (CS-1).

CONCLUSION

Based on previous conversations with you, S&ME understands that after the attached analytical data is reviewed and if the WWTP determines that the LFG condensate is non-hazardous, the WWTP will conduct a trial discharge of the LFG condensate in order to determine if the LFG condensate discharges will be accepted by the WWTP.

Edgecombe County is prepared to provide LFG condensate for a trial discharge to the WWTP as soon as possible, following your review of the attached laboratory data.
Please contact us at (919) 872-2660 if you have any questions about the information presented.

Sincerely,
S&ME, Inc.

Whit Rawls, P.E.
Project Engineer

Samuel P. Watts, P.G.
Senior Project Manager

CC: Dr. Shankar Mistry, P.E. – The Wooten Company

Attachments: Table 1: Summary of Condensate Analytical Results
Laboratory Report – TCLP VOCs – December 2012
Laboratory Report – Flashpoint Analysis – February 2013
Laboratory Report – Full TCLP Analysis – June 2013
Laboratory Report – Priority Pollutant Scan - July 2013

TABLE 1
SUMMARY OF CONDENSATE ANALYTICAL RESULTS
JUNE 19 and JULY 17, 2013
EDGECOMBE COUNTY LANDFILL
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
TARBORO, NORTH CAROLINA
S&ME PROJECT NO. 1054-07-240F

Parameter	Analytical Method	Result	Regulatory Limit
BOD	5210 B-201	**2,200,000 µg/l**	N/A
COD	410.4	**3,300,000 µg/l**	N/A
pH	9040C	**4.2 su**	N/A
Specific Conductance	9050A	**590 µmhos/cm**	N/A
Hydrogen Sulfide	4500S2-H	**63 µg/l**	N/A
Sulfide, Dissolved	4500S2 D-2	**63 µg/l**	N/A
Corrosivity	9040C	Non-Corrosive	N/A
Flashpoint	D93/101	Did Not Flash at 170° F	N/A
Reactive CN	9012B	< 0.125 mg/l	N/A
Reactive Sulf.	9034/90	< 25 mg/l	N/A
TCLP Extraction Metals	1311		
Mercury	7470	< 0.0010 mg/l	0.2 mg/l
Arsenic	6010B	<0.25 mg/l	5 mg/l
Barium	6010B	<0.75 mg/l	100 mg/l
Cadmium	6010B	<0.25 mg/l	1.0 mg/l
Chromium	6010B	<0.25 mg/l	5.0 mg/l
Lead	6010B	<0.25 mg/l	5.0 mg/l
Selenium	6010B	<0.25 mg/l	1.0 mg/l
Silver	6010B	<0.25 mg/l	5.0 mg/l
TCLP ZHE Extraction Volatiles	1311		
Benzene	8260B	<0.050 mg/l	0.5 mg/l
Carbon Tetrachloride	8260B	<0.050 mg/l	0.5 mg/l
Chorobenzene	8260B	<0.050 mg/l	100.0 mg/l
Chloroform	8260B	<0.25 mg/l	6.0 mg/l
1,2-Dichloroethane	8260B	<0.050 mg/l	0.5 mg/l
1,1-Dichloroethene	8260B	<0.050 mg/l	0.7 mg/l
2-Butanone (MEK)	8260B	<0.50 mg/l	200.0 mg/l
Tetrachloroethene	8260B	<0.050 mg/l	0.7 mg/l
Trichloroethene	8260B	<0.050 mg/l	0.5 mg/l
Vinyl Chloride	8260B	<0.050 mg/l	0.2 mg/l
TCLP Pesticides			
Chlordane	8081A	<0.0050 mg/l	0.03 mg/l
Endrin	8081A	<0.0050 mg/l	0.2 mg/l
Heptachlor	8081A	<0.0050 mg/l	0.008 mg/l
Lindane	8081A	<0.0050 mg/l	0.4 mg/l
Methoxyclor	8081A	<0.0050 mg/l	10.0 mg/l
Toxaphene	8081A	<0.010 mg/l	0.5 mg/l
TCLP Herbicides			
2,4,5-TP (Silvex)	8151A	<0.0020 mg/l	1.0 mg/l
2,4-D	8151A	<0.0020 mg/l	10.0 mg/l
TCLP Semi-Volatiles			
1,4-Dichlorobenzene	8270D	<0.10 mg/l	7.5 mg/l
2,4-Dinitrotoluene	8270D	<0.10 mg/l	0.13 mg/l
Hexachlorobenzene	8270D	<0.10 mg/l	0.13 mg/l
Hexachloro-1,3-butadiene	8270D	<0.10 mg/l	0.5 mg/l
Hexachloroethane	8270D	<0.10 mg/l	3.0 mg/l
Nitrobenzene	8270D	<0.10 mg/l	2.0 mg/l
Pyridine	8270D	<0.10 mg/l	5.0 mg/l
3&4-Methyl Phenol	8270D	**1.1 mg/l**	400 mg/l
2-Methylphenol	8270D	<0.10 mg/l	200 mg/l
Pentachlorophenol	8270D	<0.10 mg/l	100 mg/l
2,4,5-Trichlorophenol	8270D	<0.10 mg/l	400 mg/l
2,4,6-Trichlorophenol	8270D	<0.10 mg/l	2.0 mg/l
Priority Pollutant Scan			
Volatile Organics	8260B	All BDL	Various
Base Neutrals,Acid Extractables	8270C	All BDL	Various
Pesticides/PCBs	8081A/8082	All BDL	Various
Arsenic	6020	**14 µg/l**	5,000 µg/l
Mercury	7470A	<0.2 µg/l	200 µg/l
Chromium	6010B	< 10 µg/l	5,000 µg/l
Lead	6010B	< 5 µg/l	5,000 µg/l
Selenium	6010B	< 20 µg/l	100 µg/l
Silver	6010B	< 10 µg/l	5,000 µg/l

Notes:
1. µg/l = micrograms per liter
2. mg/l = milligrams per liter
3. su = standard units
4. µmhos/cm = microsiemens per centimeter
5. Concentrations exceeding the laboratory's detection limits are shown in BOLD fields.
6. BDL = Below Detection Limit
7. Regulatory Limits taken from the NCDENR Hazardous Waste Compliance Manual for Generators of Hazardous Waste.

Environmental Conservation Laboratories, Inc.
102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515
www.encolabs.com

Wednesday, January 2, 2013

S&ME, Inc. (SM001)

Attn: Whit Rawls

3201 Spring Forest Road

Raleigh, NC 27616

RE: Laboratory Results for
Project Number: 1054-12-331, Project Name/Desc: Edgecombe County Landfill
ENCO Workorder(s): C215127

Dear Whit Rawls,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Friday, December 14, 2012.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chuck Smith

Chuck Smith
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 8.

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: CS-1	Lab ID: C215127-01	Sampled: 12/13/12 12:00	Received: 12/14/12 12:40

Parameter	Hold Date/Time(s)		Prep Date/Time(s)		Analysis Date/Time(s)
EPA 8260B	12/27/12	01/11/13	12/28/12	15:59	12/28/2012 20:25

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NORTH CAROLINA SWS SAMPLE DETECTION SUMMARY

Client ID: CS-1 Lab ID: C215127-01

Analyte	Results	Flag	DF	MDL	MRL	NC SWSL	Units	Method	Notes
2-Butanone	8.03	J	1	0.120	0.500	100	mg/L	EPA 8260B	
Chlorobenzene	0.0140	J	1	0.0140	0.100	3	mg/L	EPA 8260B	

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ANALYTICAL RESULTS

Description: CS-1
Matrix: Waste Water
Project: Edgecombe County Landfill

Lab Sample ID: C215127-01
Sampled: 12/13/12 12:00
Sampled By: Whit Rawls

Received: 12/14/12 12:40
Work Order: C215127

TCLP Volatile Organics by GCMS

^ - ENCO Jacksonville certified analyte [NC 442]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
1,1-Dichloroethene [75-35-4] ^	0.0210	U	mg/L	1	0.0210	0.100	5	EPA 8260B	12/28/12 20:25	JDB	
1,2-Dichloroethane [107-06-2] ^	0.0160	U	mg/L	1	0.0160	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
2-Butanone [78-93-3] ^	**8.03**	J	mg/L	1	0.120	0.500	100	EPA 8260B	12/28/12 20:25	JDB	
Benzene [71-43-2] ^	0.0150	U	mg/L	1	0.0150	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Carbon Tetrachloride [56-23-5] ^	0.0120	U	mg/L	1	0.0120	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Chlorobenzene [108-90-7] ^	**0.0140**	J	mg/L	1	0.0140	0.100	3	EPA 8260B	12/28/12 20:25	JDB	
Chloroform [67-66-3] ^	0.0150	U	mg/L	1	0.0150	0.100	5	EPA 8260B	12/28/12 20:25	JDB	
Tetrachloroethene [127-18-4] ^	0.0250	U	mg/L	1	0.0250	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Trichloroethene [79-01-6] ^	0.0170	U	mg/L	1	0.0170	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Vinyl chloride [75-01-4] ^	0.0180	U	mg/L	1	0.0180	0.100	1	EPA 8260B	12/28/12 20:25	JDB	

Surrogates	*Results*	*DF*	*Spike Lvl*	*% Rec*	*% Rec Limits*	*Batch*	*Method*	*Analyzed*	*By*	Notes
4-Bromofluorobenzene	*5.85*	*1*	*5.00*	*117 %*	*62-132*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	
Dibromofluoromethane	*5.36*	*1*	*5.00*	*107 %*	*73-134*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	
Toluene-d8	*5.90*	*1*	*5.00*	*118 %*	*66-138*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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QUALITY CONTROL

TCLP Volatile Organics by GCMS - Quality Control

Batch 2L28016 - EPA 5030B_MS

Blank (2L28016-BLK1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 16:22

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0002	U	0.0010	mg/L							
1,2-Dichloroethane	0.0002	U	0.0010	mg/L							
2-Butanone	0.0012	U	0.0050	mg/L							
Benzene	0.0002	U	0.0010	mg/L							
Carbon Tetrachloride	0.0001	U	0.0010	mg/L							
Chlorobenzene	0.0001	U	0.0010	mg/L							
Chloroform	0.0002	U	0.0010	mg/L							
Tetrachloroethene	0.0002	U	0.0010	mg/L							
Trichloroethene	0.0002	U	0.0010	mg/L							
Vinyl chloride	0.0002	U	0.0010	mg/L							
Surrogate: 4-Bromofluorobenzene	*0.0561*			*mg/L*	*0.0500*		*112*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0549*			*mg/L*	*0.0500*		*110*	*73-134*			
Surrogate: Toluene-d8	*0.0594*			*mg/L*	*0.0500*		*119*	*66-138*			

Blank (2L28016-BLK2) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 16:57

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0210	UD	0.100	mg/L							
1,2-Dichloroethane	0.0160	UD	0.100	mg/L							
2-Butanone	0.120	UD	0.500	mg/L							
Benzene	0.0150	UD	0.100	mg/L							
Carbon Tetrachloride	0.0120	UD	0.100	mg/L							
Chlorobenzene	0.0140	UD	0.100	mg/L							
Chloroform	0.0150	UD	0.100	mg/L							
Tetrachloroethene	0.0250	UD	0.100	mg/L							
Trichloroethene	0.0170	UD	0.100	mg/L							
Vinyl chloride	0.0180	UD	0.100	mg/L							
Surrogate: 4-Bromofluorobenzene	*0.0579*			*mg/L*	*0.0500*		*116*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0519*			*mg/L*	*0.0500*		*104*	*73-134*			
Surrogate: Toluene-d8	*0.0591*			*mg/L*	*0.0500*		*118*	*66-138*			

LCS (2L28016-BS1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 17:31

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0204		0.0010	mg/L	0.0200		102	51-145			
Benzene	0.0226		0.0010	mg/L	0.0200		113	76-120			
Chlorobenzene	0.0242		0.0010	mg/L	0.0200		121	80-124			
Trichloroethene	0.0213		0.0010	mg/L	0.0200		107	80-120			
Surrogate: 4-Bromofluorobenzene	*0.0587*			*mg/L*	*0.0500*		*117*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0524*			*mg/L*	*0.0500*		*105*	*73-134*			
Surrogate: Toluene-d8	*0.0600*			*mg/L*	*0.0500*		*120*	*66-138*			

Matrix Spike (2L28016-MS1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:06

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	2.07		0.100	mg/L	2.00	0.0210 U	103	51-145			

QUALITY CONTROL

TCLP Volatile Organics by GCMS - Quality Control

Batch 2L28016 - EPA 5030B_MS

Matrix Spike (2L28016-MS1) Continued Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:06

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Benzene	2.32		0.100	mg/L	2.00	0.0150 U	116	76-120			
Chlorobenzene	2.42		0.100	mg/L	2.00	0.0140	120	80-124			
Trichloroethene	2.08		0.100	mg/L	2.00	0.0170 U	104	80-120			
Surrogate: 4-Bromofluorobenzene	*5.87*			*mg/L*	*5.00*		*117*	*62-132*			
Surrogate: Dibromofluoromethane	*5.50*			*mg/L*	*5.00*		*110*	*73-134*			
Surrogate: Toluene-d8	*6.02*			*mg/L*	*5.00*		*120*	*66-138*			

Matrix Spike Dup (2L28016-MSD1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:41

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	2.10		0.100	mg/L	2.00	0.0210 U	105	51-145	2	16	
Benzene	2.33		0.100	mg/L	2.00	0.0150 U	117	76-120	0.4	17	
Chlorobenzene	2.49		0.100	mg/L	2.00	0.0140	124	80-124	3	19	
Trichloroethene	2.03		0.100	mg/L	2.00	0.0170 U	102	80-120	2	18	
Surrogate: 4-Bromofluorobenzene	*5.96*			*mg/L*	*5.00*		*119*	*62-132*			
Surrogate: Dibromofluoromethane	*5.70*			*mg/L*	*5.00*		*114*	*73-134*			
Surrogate: Toluene-d8	*5.94*			*mg/L*	*5.00*		*119*	*66-138*			

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

10775 Central Port Dr
Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

4810 Executive Park Court, Suite 211
Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page 1 of 1

Client Name: S&ME	Project Number: 1054-12-331
Address: 3201 Spring Forest Rd	Project Name/Desc: Edgecombe Co. LFG
City/ST/Zip: Raleigh, NC 27614	PO # / Billing Info:
Tel: 919.872.2660 / Fax: 919.876-3558	Reporting Contact: W. Rawls
Sampler(s) Name, Affiliation (Print): W. Rawls / S&ME	Billing Contact: Sam Watts
Sampler(s) Signature:	Facility # (if required):

Requested Analyses: TCLP - 8260

Requested Turnaround Times
Note: Rush requests subject to acceptance by the facility
✓ Standard
___ Expedited
Due 12/28/12

Lab Workorder: C215127

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	TCLP - 8260	Sample Comments
	CS-1	12/13/12	1200	G	WW	6	X	
						6	<-- Total # of Containers	

Preservation (See Codes) (Combine as necessary)

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
W. Rawls	12/14/12 1130	[signature]	12/14/12 1200	[signature]	12/14/12 1240

Comments:

Cooler #'s & Temps on Receipt: 0.5°C

Condition Upon Receipt: ✓ Acceptable ___ Unacceptable

Matrix: GW-Groundwater SO-Soil SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

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Environmental Conservation Laboratories, Inc.
102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515
www.encolabs.com

Friday, March 8, 2013

S&ME, Inc. (SM001)

Attn: Whit Rawls

3201 Spring Forest Road

Raleigh, NC 27616

RE: Laboratory Results for
Project Number: 1054-12-331, Project Name/Desc: Edgecombe County Landfill
ENCO Workorder(s): C301958

Dear Whit Rawls,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Monday, February 25, 2013.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chuck Smith

Chuck Smith
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 8.

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: CS-1	Lab ID: C301958-01	Sampled: 02/22/13 13:00	Received: 02/25/13 11:10
Parameter	**Hold Date/Time(s)**	**Prep Date/Time(s)**	**Analysis Date/Time(s)**
EPA 1010	03/08/13	03/06/13 12:11	3/6/2013 12:11

Client ID: CS-1	Lab ID: C301958-02	Sampled: 02/22/13 13:05	Received: 02/25/13 11:10
Parameter	**Hold Date/Time(s)**	**Prep Date/Time(s)**	**Analysis Date/Time(s)**
EPA 1010	03/08/13	03/06/13 12:11	3/6/2013 12:11

SAMPLE DETECTION SUMMARY

No positive results detected.

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ANALYTICAL RESULTS

Description: CS-1
Matrix: Solution
Project: Edgecombe County Landfill

Lab Sample ID: C301958-01
Sampled: 02/22/13 13:00
Sampled By: Whit Rawls

Received: 02/25/13 11:10
Work Order: C301958

Classical Chemistry Parameters

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
Flashpoint [ECL-0063]	> 200		°F	1				EPA 1010	03/06/13 12:11	PJG	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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Description: CS-1
Matrix: Solution
Project: Edgecombe County Landfill

Lab Sample ID: C301958-02
Sampled: 02/22/13 13:05
Sampled By: Whit Rawls

Received: 02/25/13 11:10
Work Order: C301958

Classical Chemistry Parameters

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
Flashpoint [ECL-0063]	> 200		°F	1				EPA 1010	03/06/13 12:11	PJG	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

QUALITY CONTROL

Classical Chemistry Parameters - Quality Control

Batch 3C06009 - NO PREP

LCS (3C06009-BS1) Prepared: 03/06/2013 12:11 Analyzed: 03/06/2013 12:11

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Flashpoint	81			°F	81.0		100	90-110			

Duplicate (3C06009-DUP1) Prepared: 03/06/2013 12:11 Analyzed: 03/06/2013 12:11

Source: B301022-03

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Flashpoint	> 200	U		°F		0.0				200	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.

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Jacksonville, FL 32216-6069
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CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Client Name	S&ME, Inc.
Project Number	1054-12-331
Address	3201 Spring Forest Rd.
Project Name/Desc	Edgecombe Co. Landfill
City/ST/Zip	Raleigh, NC 27616
PO # / Billing Info	(Proj No.)
Tel	919.872.2660
Fax	919.876.3958
Reporting Contact	Whit Rawls
Sampler(s) Name, Affiliation (Print)	Whit Rawls, S&ME
Billing Contact	Whit Rawls
Sampler(s) Signature	
Site Location / Time Zone	Tarboro, NC

Requested Analyses: Flash Point

Requested Turnaround Times
Note: Rush requests subject to acceptance by the facility
✓ Standard
Expedited
Due __/__/__

Lab Workorder: C301958

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Preservation (See Codes) (Combine as necessary)	Sample Comments
	CS-1	2/22/13	1300	G	O		1	
	CS-1	2/22/13	1305	G	O		1	
						2	<-- Total # of Containers	

Sample Kit Prepared By: Whit Rawls	Date/Time: 2/22/13 1730	Relinquished By	Date/Time: 2/25/13 1012
Relinquished By	Date/Time	Received By	Date/Time: 2/25/13 1016
Relinquished By	Date/Time	Received By	Date/Time: 2/25/13 1116
Cooler ID's & Temps on Receipt: 1.6°C		Condition Upon Receipt: X Acceptable	Unacceptable

Comments/Special Reporting Requirements: Other = landfill gas condensate - analysis to determine if acceptable for Tar River Regional WWTP.

Matrix: GW-Groundwater SO-Soil DW-Drinking Water SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments) Preservation: H-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

12065 Lebanon Rd.
Mt. Juliet, TN 37122
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Tax I.D. 62-0814289

Est. 1970

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

Report Summary

Saturday June 29, 2013

Report Number: L642598
Samples Received: 06/20/13
Client Project: 1054-07-240F

Description: Edgecombe County

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By: Tom Mellette , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

Date Received : June 20, 2013
Description : Edgecombe County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

ESC Sample # : L642598-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
BOD	2200000	2000	ug/l	5210 B-201	06/26/13	1
COD	3300000	50000	ug/l	410.4	06/25/13	5
pH	4.2		su	9040C	06/26/13	1
Specific Conductance	590		umhos/cm	9050A	06/27/13	1
Hydrogen Sulfide	63.	50.	ug/l	4500S2-H	06/27/13	1
Sulfide,Dissolved	63.	50.	ug/l	4500S2 D-2	06/26/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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.
Reported: 06/29/13 11:44 Printed: 06/29/13 11:44
L642598-01 (PH) - 4.2@20.5c

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REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

ESC Sample # : L642598-02

Date Received : June 20, 2013
Description : Edgecombe County

Site ID :

Sample ID : CONDENSATE

Project : 1054-07-240F

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

Parameter	Result	Det. Limit	Units	Limit	Method	Date/Time	By	Dil
Corrosivity	Non-Corrosiv				9040C	06/26/13 1041	ADF	1
Flashpoint	See Footnote		deg F		D93/101	06/26/13 1751	AS	1
Reactive CN (SW846 7.3.3.2)	BDL	0.125	mg/l		9012B	06/27/13 1039	MCG	1
Reactive Sulf.(SW846 7.3.4.1)	BDL	25.	mg/l		9034/90	06/26/13 1615	DJD	1
TCLP Extraction	-				1311	06/22/13 0701	MVE	1
Mercury	BDL	0.0010	mg/l	0.20	7470A	06/22/13 2102	CCE	1
Arsenic	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Barium	BDL	0.75	mg/l	100	6010B	06/26/13 1400	ST	5
Cadmium	BDL	0.25	mg/l	1.0	6010B	06/26/13 1400	ST	5
Chromium	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Lead	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Selenium	BDL	0.25	mg/l	1.0	6010B	06/26/13 1400	ST	5
Silver	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
TCLP ZHE Extraction	-				1311	06/24/13 0809	MVE	1
TCLP Volatiles								
Benzene	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Carbon tetrachloride	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Chlorobenzene	BDL	0.050	mg/l	100	8260B	06/24/13 1544	JRB	1
Chloroform	BDL	0.25	mg/l	6.0	8260B	06/24/13 1544	JRB	1
1,2-Dichloroethane	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
1,1-Dichloroethene	BDL	0.050	mg/l	0.70	8260B	06/24/13 1544	JRB	1
2-Butanone (MEK)	12.	0.50	mg/l	200	8260B	06/26/13 0221	DP	1
Tetrachloroethene	BDL	0.050	mg/l	0.70	8260B	06/24/13 1544	JRB	1
Trichloroethene	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Vinyl chloride	BDL	0.050	mg/l	0.20	8260B	06/24/13 1544	JRB	1
Surrogate Recovery								
Toluene-d8	101.		% Rec.	114.	8260B	06/24/13 1544	JRB	1
Dibromofluoromethane	107.		% Rec.	125.	8260B	06/24/13 1544	JRB	1
a,a,a-Trifluorotoluene	102.		% Rec.	114.	8260B	06/24/13 1544	JRB	1
4-Bromofluorobenzene	102.		% Rec.	128.	8260B	06/24/13 1544	JRB	1
TCLP Pesticides								
Chlordane	BDL	0.0050	mg/l	0.030	8081A	06/26/13 1835	CBB	1
Endrin	BDL	0.0050	mg/l	0.020	8081A	06/26/13 1835	CBB	1
Heptachlor	BDL	0.0050	mg/l	0.0080	8081A	06/26/13 1835	CBB	1
Lindane	BDL	0.0050	mg/l	0.40	8081A	06/26/13 1835	CBB	1

L642598-02 (FLASHPOINT) - Did Not Flash @ 170 F

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REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

Date Received : June 20, 2013
Description : Edgecombe County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

ESC Sample # : L642598-02

Site ID :

Project : 1054-07-240F

Parameter	Result	Det. Limit	Units	Limit	Method	Date/Time	By	Dil
Methoxychlor	BDL	0.0050	mg/l	10.	8081A	06/26/13 1835	CBB	1
Toxaphene	BDL	0.010	mg/l	0.50	8081A	06/26/13 1835	CBB	1
Surrogate Recovery								
Decachlorobiphenyl	37.8		% Rec.	123.	8081A	06/26/13 1835	CBB	1
Tetrachloro-m-xylene	76.2		% Rec.	114.	8081A	06/26/13 1835	CBB	1
TCLP Herbicides								
2,4,5-TP (Silvex)	BDL	0.0020	mg/l	1.0	8151A	06/24/13 2215	HMH	1
2,4-D	BDL	0.0020	mg/l	10.	8151A	06/24/13 2215	HMH	1
Surrogate Recovery								
2,4-Dichlorophenyl Acetic Acid	94.9		% Rec.		8151A	06/24/13 2215	HMH	1
TCLP Semi-Volatiles								
1,4-Dichlorobenzene	BDL	0.10	mg/l	7.5	8270D	06/24/13 2222	KMF	1
2,4-Dinitrotoluene	BDL	0.10	mg/l	0.13	8270D	06/24/13 2222	KMF	1
Hexachlorobenzene	BDL	0.10	mg/l	0.13	8270D	06/24/13 2222	KMF	1
Hexachloro-1,3-butadiene	BDL	0.10	mg/l	0.50	8270D	06/24/13 2222	KMF	1
Hexachloroethane	BDL	0.10	mg/l	3.0	8270D	06/24/13 2222	KMF	1
Nitrobenzene	BDL	0.10	mg/l	2.0	8270D	06/24/13 2222	KMF	1
Pyridine	BDL	0.10	mg/l	5.0	8270D	06/24/13 2222	KMF	1
3&4-Methyl Phenol	1.1	0.10	mg/l	400	8270D	06/24/13 2222	KMF	1
2-Methylphenol	BDL	0.10	mg/l	200	8270D	06/24/13 2222	KMF	1
Pentachlorophenol	BDL	0.10	mg/l	100	8270D	06/24/13 2222	KMF	1
2,4,5-Trichlorophenol	BDL	0.10	mg/l	400	8270D	06/24/13 2222	KMF	1
2,4,6-Trichlorophenol	BDL	0.10	mg/l	2.0	8270D	06/24/13 2222	KMF	1
Surrogate Recovery								
2-Fluorophenol	43.1		% Rec.	87.0	8270D	06/24/13 2222	KMF	1
Phenol-d5	46.4		% Rec.	67.0	8270D	06/24/13 2222	KMF	1
Nitrobenzene-d5	42.6		% Rec.	120.	8270D	06/24/13 2222	KMF	1
2-Fluorobiphenyl	71.1		% Rec.	122.	8270D	06/24/13 2222	KMF	1
2,4,6-Tribromophenol	72.4		% Rec.	148.	8270D	06/24/13 2222	KMF	1
p-Terphenyl-d14	85.3		% Rec.	149.	8270D	06/24/13 2222	KMF	1

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit(EQL)
Limit - Maximum Contaminant Level as established by the US EPA
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
.
Reported: 06/29/13 11:44 Printed: 06/29/13 11:45
L642598-02 (FLASHPOINT) - Did Not Flash @ 170 F

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L642598-01	WG668700	SAMP	pH	R2723023	T8
	WG667981	SAMP	BOD	R2723400	B1
L642598-02	WG668695	SAMP	Corrosivity	R2723022	T8
	WG668362	SAMP	2,4,6-Trichlorophenol	R2721001	J3
	WG668868	SAMP	Arsenic	R2723924	O
	WG668868	SAMP	Cadmium	R2723924	O
	WG668868	SAMP	Selenium	R2723924	O
	WG668868	SAMP	Silver	R2723924	O

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
B1	(ESC) - The blank depletion was greater than the recommended maximum depletion of 0.2mg/L.
J3	The associated batch QC was outside the established quality control range for precision.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.
T8	(ESC) - Additional method/sample information: Sample(s) received past/too close to holding time expiration.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
06/29/13 at 11:45:01

TSR Signing Reports: 690
R5 - Desired TAT

Sample: L642598-01 Account: SMERLNC Received: 06/20/13 14:30 Due Date: 06/27/13 00:00 RPT Date: 06/29/13 11:44

Sample: L642598-02 Account: SMERLNC Received: 06/20/13 14:30 Due Date: 06/27/13 00:00 RPT Date: 06/29/13 11:44

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S&ME Inc. - Raleigh NC
Claudia Ervin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Mercury	< .001	mg/l			WG668002	06/22/13 19:34
1,4-Dichlorobenzene	< .1	mg/l			WG668362	06/24/13 20:22
2,4,5-Trichlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
2,4,6-Trichlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
2,4-Dinitrotoluene	< .1	mg/l			WG668362	06/24/13 20:22
2-Methylphenol	< .1	mg/l			WG668362	06/24/13 20:22
3&4-Methyl Phenol	< .1	mg/l			WG668362	06/24/13 20:22
Hexachloro-1,3-butadiene	< .1	mg/l			WG668362	06/24/13 20:22
Hexachlorobenzene	< .1	mg/l			WG668362	06/24/13 20:22
Hexachloroethane	< .1	mg/l			WG668362	06/24/13 20:22
Nitrobenzene	< .1	mg/l			WG668362	06/24/13 20:22
Pentachlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
Pyridine	< .1	mg/l			WG668362	06/24/13 20:22
2,4,6-Tribromophenol		% Rec.	57.50	11.2-130	WG668362	06/24/13 20:22
2-Fluorobiphenyl		% Rec.	62.30	29.5-131	WG668362	06/24/13 20:22
2-Fluorophenol		% Rec.	33.50	10-77.9	WG668362	06/24/13 20:22
Nitrobenzene-d5		% Rec.	45.30	21.8-123	WG668362	06/24/13 20:22
Phenol-d5		% Rec.	25.90	5-70.1	WG668362	06/24/13 20:22
p-Terphenyl-d14		% Rec.	67.10	29.3-137	WG668362	06/24/13 20:22
1,1-Dichloroethene	< .05	mg/l			WG668430	06/24/13 15:05
1,2-Dichloroethane	< .05	mg/l			WG668430	06/24/13 15:05
Benzene	< .05	mg/l			WG668430	06/24/13 15:05
Carbon tetrachloride	< .05	mg/l			WG668430	06/24/13 15:05
Chlorobenzene	< .05	mg/l			WG668430	06/24/13 15:05
Chloroform	< .25	mg/l			WG668430	06/24/13 15:05
Tetrachloroethene	< .05	mg/l			WG668430	06/24/13 15:05
Trichloroethene	< .05	mg/l			WG668430	06/24/13 15:05
Vinyl chloride	< .05	mg/l			WG668430	06/24/13 15:05
4-Bromofluorobenzene		% Rec.	104.1	82-120	WG668430	06/24/13 15:05
Dibromofluoromethane		% Rec.	107.7	82-126	WG668430	06/24/13 15:05
Toluene-d8		% Rec.	100.5	92-112	WG668430	06/24/13 15:05
a,a,a-Trifluorotoluene		% Rec.	105.5	90-116	WG668430	06/24/13 15:05
COD	< 10	mg/l			WG668217	06/25/13 11:49
2,4,5-TP (Silvex)	< .002	mg/l			WG668420	06/24/13 20:38
2,4-D	< .002	mg/l			WG668420	06/24/13 20:38
2,4-Dichlorophenyl Acetic Acid		% Rec.	94.50	23.3-142	WG668420	06/24/13 20:38
BOD	0.280	mg/l			WG667981	06/26/13 09:44
Arsenic	< .05	mg/l			WG668868	06/26/13 13:16
Barium	< .15	mg/l			WG668868	06/26/13 13:16
Cadmium	< .05	mg/l			WG668868	06/26/13 13:16
Chromium	< .05	mg/l			WG668868	06/26/13 13:16
Lead	< .05	mg/l			WG668868	06/26/13 13:16
Selenium	< .05	mg/l			WG668868	06/26/13 13:16
Silver	< .05	mg/l			WG668868	06/26/13 13:16
Sulfide, Dissolved	< .05	mg/l			WG668725	06/26/13 19:00

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Quality Assurance Report
Level II

L642598

June 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Reactive CN (SW846 7.3.3.2)	< .125	mg/l			WG668752	06/27/13 10:30
Reactive Sulf.(SW846 7.3.4.1)	< 25	mg/l			WG668749	06/26/13 16:15
Specific Conductance	1.20	umhos/cm			WG669086	06/27/13 14:05
Chlordane	< .005	mg/l			WG668366	06/26/13 16:54
Endrin	< .005	mg/l			WG668366	06/26/13 16:54
Lindane	< .005	mg/l			WG668366	06/26/13 16:54
Heptachlor	< .005	mg/l			WG668366	06/26/13 16:54
Methoxychlor	< .005	mg/l			WG668366	06/26/13 16:54
Toxaphene	< .01	mg/l			WG668366	06/26/13 16:54
Decachlorobiphenyl		% Rec.	81.20	10-141	WG668366	06/26/13 16:54
Tetrachloro-m-xylene		% Rec.	101.0	10-125	WG668366	06/26/13 16:54

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0	0.000180	8.68	20	L642217-01	WG668002
COD	mg/l	3200	3300	3.08	5	L642598-01	WG668217
COD	mg/l	65.0	57.0	13.1*	5	L642900-11	WG668217
Corrosivity		0	0	0	10	L642569-01	WG668695
pH	su	7.80	7.70	0.776	1	L642362-01	WG668700
pH	su	4.20	4.20	1.20*	1	L642598-01	WG668700
BOD	mg/l	0	6.30	NA	5	L642411-01	WG667981
BOD	mg/l	6.00	9.60	46.2*	5	L642647-02	WG667981
BOD	mg/l	310.	290.	6.67*	5	L642665-01	WG667981
Arsenic	mg/l	0	0	0	20	L643025-01	WG668868
Barium	mg/l	1.20	1.15	4.26	20	L643025-01	WG668868
Cadmium	mg/l	0	0.00510	NA	20	L643025-01	WG668868
Chromium	mg/l	0	0.00700	NA	20	L643025-01	WG668868
Lead	mg/l	0.170	0.170	0	20	L643025-01	WG668868
Selenium	mg/l	0	0.00200	NA	20	L643025-01	WG668868
Silver	mg/l	0	0	0	20	L643025-01	WG668868
Sulfide,Dissolved	mg/l	0.0610	0.0630	3.23	20	L642598-01	WG668725
Flashpoint	deg F	0	0	0	20	L642569-01	WG668860
Reactive CN (SW846 7.3.3.2)	mg/l	0	0	0	20	L642569-01	WG668752
Reactive Sulf.(SW846 7.3.4.1)	mg/l	0	0	0	20	L642569-01	WG668749

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June 29, 2013

Analyte	Units	Result	Duplicate Duplicate	RPD	Limit	Ref Samp	Batch
Reactive Sulf.(SW846 7.3.4.1)	mg/l	0	0	0	20	L643154-01	WG668749
Specific Conductance	umhos/cm	2100	2000	3.44	20	L642366-02	WG669086
Specific Conductance	umhos/cm	34000	34000	1.48	20	L642800-01	WG669086

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Mercury	mg/l	.003	0.00303	101.	85-115	WG668002
1,4-Dichlorobenzene	mg/l	.01	0.00681	68.1	21-89.4	WG668362
2,4,5-Trichlorophenol	mg/l	.01	0.00731	73.1	34.9-112	WG668362
2,4,6-Trichlorophenol	mg/l	.01	0.00689	68.9	29.8-107	WG668362
2,4-Dinitrotoluene	mg/l	.01	0.00709	70.9	31.2-105	WG668362
2-Methylphenol	mg/l	.01	0.00603	60.3	26.4-86.9	WG668362
3&4-Methyl Phenol	mg/l	.01	0.00644	64.4	27.9-92	WG668362
Hexachloro-1,3-butadiene	mg/l	.01	0.00696	69.6	16.1-104	WG668362
Hexachlorobenzene	mg/l	.01	0.00864	86.4	38.5-116	WG668362
Hexachloroethane	mg/l	.01	0.00592	59.2	16.5-89.8	WG668362
Nitrobenzene	mg/l	.01	0.00736	73.6	31.4-106	WG668362
Pentachlorophenol	mg/l	.01	0.00450	45.0	10-97.4	WG668362
Pyridine	mg/l	.01	0.00431	43.1	13.5-58.9	WG668362
2,4,6-Tribromophenol				69.80	11.2-130	WG668362
2-Fluorobiphenyl				77.10	29.5-131	WG668362
2-Fluorophenol				44.70	10-77.9	WG668362
Nitrobenzene-d5				69.90	21.8-123	WG668362
Phenol-d5				31.60	5-70.1	WG668362
p-Terphenyl-d14				85.80	29.3-137	WG668362
1,1-Dichloroethene	mg/l	.025	0.0275	110.	54-134	WG668430
1,2-Dichloroethane	mg/l	.025	0.0271	108.	69-128	WG668430
Benzene	mg/l	.025	0.0278	111.	72-119	WG668430
Carbon tetrachloride	mg/l	.025	0.0281	112.	63-129	WG668430
Chlorobenzene	mg/l	.025	0.0261	105.	78-123	WG668430
Chloroform	mg/l	.025	0.0283	113.	76-122	WG668430
Tetrachloroethene	mg/l	.025	0.0267	107.	69-131	WG668430
Trichloroethene	mg/l	.025	0.0270	108.	75-121	WG668430
Vinyl chloride	mg/l	.025	0.0229	91.4	55-142	WG668430
4-Bromofluorobenzene				96.48	82-120	WG668430
Dibromofluoromethane				106.0	82-126	WG668430
Toluene-d8				101.1	92-112	WG668430
a,a,a-Trifluorotoluene				104.6	90-116	WG668430
COD	mg/l	183	184.	101.	90-110	WG668217
2,4,5-TP (Silvex)	mg/l	.005	0.00508	102.	60.8-121	WG668420
2,4-D	mg/l	.005	0.00486	97.2	52.4-110	WG668420
2,4-Dichlorophenyl Acetic Acid				113.0	23.3-142	WG668420
Corrosivity		5.79	5.80	100.	98.3-101.7	WG668695
pH	su	5.79	5.80	100.	98.3-101.7	WG668700

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Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
BOD	mg/l	198	188.	94.9	84.6-115.4	WG667981
BOD	mg/l	198	203.	103.	84.6-115.4	WG667981
BOD	mg/l	198	209.	106.	84.6-115.4	WG667981
BOD	mg/l	198	169.	85.4	84.6-115.4	WG667981
BOD	mg/l	198	199.	101.	84.6-115.4	WG667981
BOD	mg/l	198	191.	96.5	84.6-115.4	WG667981
Arsenic	mg/l	1.11	1.07	96.4	85-115	WG668868
Barium	mg/l	1.11	1.07	96.4	85-115	WG668868
Cadmium	mg/l	1.11	1.04	93.7	85-115	WG668868
Chromium	mg/l	1.11	1.08	97.3	85-115	WG668868
Lead	mg/l	1.11	1.04	93.7	85-115	WG668868
Selenium	mg/l	1.11	1.15	104.	85-115	WG668868
Silver	mg/l	1.11	1.12	101.	85-115	WG668868
Sulfide,Dissolved	mg/l	.5	0.490	98.0	85-115	WG668725
Flashpoint	deg F	82	83.0	101.	96-104	WG668860
Reactive Sulf.(SW846 7.3.4.1)	mg/l	100	100.	100.	70-130	WG668749
Specific Conductance	umhos/cm	878	880.	100.	85-115	WG669086
Endrin	mg/l	.0002	0.000196	98.2	60-123	WG668366
Lindane	mg/l	.0002	0.000189	94.4	59-116	WG668366
Heptachlor	mg/l	.0002	0.000190	95.2	10-131	WG668366
Methoxychlor	mg/l	.0002	0.000212	106.	66-122	WG668366
Decachlorobiphenyl				74.80	10-141	WG668366
Tetrachloro-m-xylene				86.30	10-125	WG668366

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,4-Dichlorobenzene	mg/l	0.00603	0.00681	60.0	21-89.4	12.2	32.6	WG668362
2,4,5-Trichlorophenol	mg/l	0.00589	0.00731	59.0	34.9-112	21.6	23.9	WG668362
2,4,6-Trichlorophenol	mg/l	0.00535	0.00669	54.0	29.8-107	25.1*	24.1	WG668362
2,4-Dinitrotoluene	mg/l	0.00701	0.00709	70.0	31.2-105	1.06	22	WG668362
2-Methylphenol	mg/l	0.00516	0.00603	52.0	26.4-86.9	15.6	26.5	WG668362
3&4-Methyl Phenol	mg/l	0.00560	0.00644	56.0	27.9-92	14.0	27	WG668362
Hexachloro-1,3-butadiene	mg/l	0.00607	0.00696	61.0	16.1-104	13.6	31.2	WG668362
Hexachlorobenzene	mg/l	0.00872	0.00864	87.0	38.5-116	0.910	20.1	WG668362
Hexachloroethane	mg/l	0.00551	0.00592	55.0	16.5-89.8	7.08	30.7	WG668362
Nitrobenzene	mg/l	0.00653	0.00736	65.0	31.4-106	11.9	25.7	WG668362
Pentachlorophenol	mg/l	0.00327	0.00450	33.0	10-97.4	31.6	35.1	WG668362
Pyridine	mg/l	0.00317	0.00431	32.0	13.5-58.9	30.6	32.5	WG668362
2,4,6-Tribromophenol				60.00	11.2-130			WG668362
2-Fluorobiphenyl				73.70	29.5-131			WG668362
2-Fluorophenol				28.10	10-77.9			WG668362
Nitrobenzene-d5				58.90	21.8-123			WG668362
Phenol-d5				25.00	5-70.1			WG668362
p-Terphenyl-d14				78.20	29.3-137			WG668362

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Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,1-Dichloroethene	mg/l	0.0269	0.0275	108.	54-134	2.19	20	WG668430
1,2-Dichloroethane	mg/l	0.0271	0.0271	108.	69-128	0.0900	20	WG668430
Benzene	mg/l	0.0275	0.0278	110.	72-119	1.09	20	WG668430
Carbon tetrachloride	mg/l	0.0276	0.0281	110.	63-129	1.95	20	WG668430
Chlorobenzene	mg/l	0.0261	0.0261	104.	78-123	0.230	20	WG668430
Chloroform	mg/l	0.0277	0.0283	111.	76-122	2.09	20	WG668430
Tetrachloroethene	mg/l	0.0261	0.0267	104.	69-131	2.28	20	WG668430
Trichloroethene	mg/l	0.0263	0.0270	105.	75-121	2.65	20	WG668430
Vinyl chloride	mg/l	0.0222	0.0229	89.0	55-142	2.83	20	WG668430
4-Bromofluorobenzene				98.55	82-120			WG668430
Dibromofluoromethane				103.2	82-126			WG668430
Toluene-d8				100.8	92-112			WG668430
a,a,a-Trifluorotoluene				102.5	90-116			WG668430
COD	mg/l	191.	184.	104.	90-110	3.73	5	WG668217
2,4,5-TP (Silvex)	mg/l	0.00533	0.00508	106.	60.8-121	4.74	20	WG668420
2,4-D	mg/l	0.00513	0.00486	103.	52.4-110	5.43	20	WG668420
2,4-Dichlorophenyl Acetic Acid				115.0	23.3-142			WG668420
Corrosivity		5.80	5.80	100.	98.3-101.7	0	10	WG668695
pH	su	5.80	5.80	100.	98.3-101.7	0	20	WG668700
Sulfide,Dissolved	mg/l	0.502	0.490	100.	85-115	2.42	20	WG668725
Flashpoint	deg F	83.0	83.0	101.	96-104	0	7	WG668860
Reactive Sulf.(SW846 7.3.4.1)	mg/l	90.0	100.	90.0	70-130	10.5	20	WG668749
Specific Conductance	umhos/	880.	880.	100.	85-115	0	20	WG669086
Endrin	mg/l	0.000198	0.000196	99.0	60-123	0.760	20	WG668366
Lindane	mg/l	0.000191	0.000189	96.0	59-116	1.31	20	WG668366
Heptachlor	mg/l	0.000193	0.000190	97.0	10-131	1.56	28	WG668366
Methoxychlor	mg/l	0.000210	0.000212	105.	66-122	0.750	20	WG668366
Decachlorobiphenyl				63.60	10-141			WG668366
Tetrachloro-m-xylene				89.30	10-125			WG668366

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Mercury	mg/l	0.00340	0.000180	.003	107.	80-120	L642217-01	WG668002
Mercury	mg/l	0.00251	0.0000427	.003	82.1	80-120	L642145-01	WG668002
1,4-Dichlorobenzene	mg/l	0.0608	0	.1	60.8	14-104	L642911-02	WG668362
2,4,5-Trichlorophenol	mg/l	0.0592	0	.1	59.2	30.6-120	L642911-02	WG668362
2,4,6-Trichlorophenol	mg/l	0.0478	0	.1	47.8	19.1-114	L642911-02	WG668362
2,4-Dinitrotoluene	mg/l	0.0741	0	.1	74.1	16.2-135	L642911-02	WG668362

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Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
2-Methylphenol	mg/l	0.00457	0	.1	4.57*	10-133	L642911-02	WG668362
3&4-Methyl Phenol	mg/l	0.00615	0	.1	6.15*	17.4-100	L642911-02	WG668362
Hexachloro-1,3-butadiene	mg/l	0.0634	0	.1	63.4	15.7-109	L642911-02	WG668362
Hexachlorobenzene	mg/l	0.0918	0	.1	91.8	31.9-135	L642911-02	WG668362
Hexachloroethane	mg/l	0.0547	0	.1	54.7	10.4-105	L642911-02	WG668362
Nitrobenzene	mg/l	0.0637	0	.1	63.7	23.1-121	L642911-02	WG668362
Pentachlorophenol	mg/l	0.0619	0	.1	61.9	10-108	L642911-02	WG668362
Pyridine	mg/l	0.0350	0	.1	35.0	10-77.8	L642911-02	WG668362
2,4,6-Tribromophenol					52.20	11.2-130		WG668362
2-Fluorobiphenyl					75.90	29.5-131		WG668362
2-Fluorophenol					10.40	10-77.9		WG668362
Nitrobenzene-d5					60.30	21.8-123		WG668362
Phenol-d5					5.610	5-70.1		WG668362
p-Terphenyl-d14					84.20	29.3-137		WG668362
1,1-Dichloroethene	mg/l	1.31	0	1.25	105.	32-152	L642213-01	WG668430
1,2-Dichloroethane	mg/l	1.34	0	1.25	107.	59-135	L642213-01	WG668430
Benzene	mg/l	1.43	0.0820	1.25	108.	51-134	L642213-01	WG668430
Carbon tetrachloride	mg/l	1.30	0	1.25	104.	49-140	L642213-01	WG668430
Chlorobenzene	mg/l	1.37	0	1.25	109.	69-126	L642213-01	WG668430
Chloroform	mg/l	1.36	0	1.25	108.	64-130	L642213-01	WG668430
Tetrachloroethene	mg/l	1.28	0	1.25	102.	56-139	L642213-01	WG668430
Trichloroethene	mg/l	1.24	0	1.25	99.1	40-155	L642213-01	WG668430
Vinyl chloride	mg/l	1.11	0	1.25	88.8	32-159	L642213-01	WG668430
4-Bromofluorobenzene					94.40	82-120		WG668430
Dibromofluoromethane					99.52	82-126		WG668430
Toluene-d8					99.95	92-112		WG668430
a,a,a-Trifluorotoluene					94.03	90-116		WG668430
1,1-Dichloroethene	mg/l	1.33	0	1.25	106.	32-152	L642598-02	WG668430
1,2-Dichloroethane	mg/l	1.35	0	1.25	108.	59-135	L642598-02	WG668430
Benzene	mg/l	1.34	0	1.25	107.	51-134	L642598-02	WG668430
Carbon tetrachloride	mg/l	1.36	0	1.25	109.	49-140	L642598-02	WG668430
Chlorobenzene	mg/l	1.27	0	1.25	102.	69-126	L642598-02	WG668430
Chloroform	mg/l	1.37	0	1.25	110.	64-130	L642598-02	WG668430
Tetrachloroethene	mg/l	1.28	0	1.25	102.	56-139	L642598-02	WG668430
Trichloroethene	mg/l	1.27	0	1.25	102.	40-155	L642598-02	WG668430
Vinyl chloride	mg/l	1.12	0	1.25	89.6	32-159	L642598-02	WG668430
4-Bromofluorobenzene					99.90	82-120		WG668430
Dibromofluoromethane					103.9	82-126		WG668430
Toluene-d8					101.0	92-112		WG668430
a,a,a-Trifluorotoluene					100.7	90-116		WG668430
COD	mg/l	413.	0	400	103.	90-110	L642658-10	WG668217
2,4,5-TP (Silvex)	mg/l	0.0487	0	.05	97.4	60.8-121	L642911-02	WG668420
2,4-D	mg/l	0.0456	0	.05	91.1	52.4-110	L642911-02	WG668420
2,4-Dichlorophenyl Acetic Acid					112.0	23.3-142		WG668420
Arsenic	mg/l	1.08	0	1.11	97.3	75-125	L643025-01	WG668868
Barium	mg/l	2.20	1.15	1.11	94.6	75-125	L643025-01	WG668868
Cadmium	mg/l	1.04	0.00510	1.11	93.2	75-125	L643025-01	WG668868
Chromium	mg/l	1.06	0.00700	1.11	94.9	75-125	L643025-01	WG668868
Lead	mg/l	1.20	0.170	1.11	92.8	75-125	L643025-01	WG668868
Selenium	mg/l	1.18	0.00200	1.11	106.	75-125	L643025-01	WG668868
Silver	mg/l	1.11	0	1.11	100.	75-125	L643025-01	WG668868

* Performance of this Analyte is outside of established criteria.
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S&ME Inc. - Raleigh NC
Claudia Ervin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Arsenic	mg/l	1.09	0	1.11	98.2	75-125	L643142-09	WG668868
Barium	mg/l	1.20	0	1.11	108.	75-125	L643142-09	WG668868
Cadmium	mg/l	1.06	0	1.11	95.5	75-125	L643142-09	WG668868
Chromium	mg/l	1.10	0	1.11	99.1	75-125	L643142-09	WG668868
Lead	mg/l	1.09	0	1.11	98.2	75-125	L643142-09	WG668868
Selenium	mg/l	1.10	0	1.11	99.1	75-125	L643142-09	WG668868
Silver	mg/l	0.518	0	1.11	46.7*	75-125	L643142-09	WG668868
Sulfide,Dissolved	mg/l	0.882	0.0630	1	81.9	80-120	L642598-01	WG668725
Endrin	mg/l	0.00185	0	.002	92.5	36-135	L642911-02	WG668366
Lindane	mg/l	0.00177	0	.002	88.7	43-105	L642911-02	WG668366
Heptachlor	mg/l	0.00158	0	.002	79.0	10-165	L642911-02	WG668366
Methoxychlor	mg/l	0.00203	0	.002	102.	10-147	L642911-02	WG668366
Decachlorobiphenyl					63.90	10-141		WG668366
Tetrachloro-m-xylene					83.90	10-125		WG668366

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0.00331	0.00340	104.	80-120	2.60	20	L642217-01	WG668002
Mercury	mg/l	0.00274	0.00251	89.9	80-120	8.91	20	L642145-01	WG668002
1,4-Dichlorobenzene	mg/l	0.0675	0.0608	67.5	14-104	10.5	36.4	L642911-02	WG668362
2,4,5-Trichlorophenol	mg/l	0.0620	0.0592	62.0	30.6-120	4.71	33.8	L642911-02	WG668362
2,4,6-Trichlorophenol	mg/l	0.0490	0.0478	49.0	19.1-114	2.47	29.9	L642911-02	WG668362
2,4-Dinitrotoluene	mg/l	0.0750	0.0741	75.0	16.2-135	1.13	20.6	L642911-02	WG668362
2-Methylphenol	mg/l	0.00457	0.00457	4.57*	10-133	0.0300	40	L642911-02	WG668362
3&4-Methyl Phenol	mg/l	0.00591	0.00615	5.92*	17.4-100	3.91	27.7	L642911-02	WG668362
Hexachloro-1,3-butadiene	mg/l	0.0695	0.0634	69.4	15.7-109	9.12	37.6	L642911-02	WG668362
Hexachlorobenzene	mg/l	0.0933	0.0918	93.2	31.9-135	1.54	20	L642911-02	WG668362
Hexachloroethane	mg/l	0.0601	0.0547	60.1	10.4-105	9.47	40	L642911-02	WG668362
Nitrobenzene	mg/l	0.0744	0.0637	74.4	23.1-121	15.6	29	L642911-02	WG668362
Pentachlorophenol	mg/l	0.0626	0.0619	62.6	10-108	1.12	40	L642911-02	WG668362
Pyridine	mg/l	0.0408	0.0350	40.8	10-77.8	15.3	38.8	L642911-02	WG668362
2,4,6-Tribromophenol				53.40	11.2-130				WG668362
2-Fluorobiphenyl				78.70	29.5-131				WG668362
2-Fluorophenol				11.30	10-77.9				WG668362
Nitrobenzene-d5				72.10	21.8-123				WG668362
Phenol-d5				5.480	5-70.1				WG668362
p-Terphenyl-d14				87.80	29.3-137				WG668362
1,1-Dichloroethene	mg/l	1.39	1.31	111.	32-152	5.86	20	L642213-01	WG668430
1,2-Dichloroethane	mg/l	1.40	1.34	112.	59-135	4.27	20	L642213-01	WG668430
Benzene	mg/l	1.49	1.43	112.	51-134	3.80	20	L642213-01	WG668430
Carbon tetrachloride	mg/l	1.36	1.30	109.	49-140	4.63	20	L642213-01	WG668430
Chlorobenzene	mg/l	1.38	1.37	110.	69-126	1.11	20	L642213-01	WG668430
Chloroform	mg/l	1.36	1.36	109.	64-130	0.690	20	L642213-01	WG668430
Tetrachloroethene	mg/l	1.33	1.28	106.	56-139	3.69	20	L642213-01	WG668430
Trichloroethene	mg/l	1.25	1.24	100.	40-155	1.10	20	L642213-01	WG668430
Vinyl chloride	mg/l	1.18	1.11	94.0	32-159	5.76	21	L642213-01	WG668430
4-Bromofluorobenzene				94.94	82-120				WG668430
Dibromofluoromethane				100.4	82-126				WG668430
Toluene-d8				101.2	92-112				WG668430
a,a,a-Trifluorotoluene				92.50	90-116				WG668430

* Performance of this Analyte is outside of established criteria.
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Quality Assurance Report
Level II

L642598

June 29, 2013

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
1,1-Dichloroethene	mg/l	1.39	1.33	112.	32-152	4.66	20	L642598-02	WG668430
1,2-Dichloroethane	mg/l	1.41	1.35	113.	59-135	4.34	20	L642598-02	WG668430
Benzene	mg/l	1.39	1.34	111.	51-134	3.83	20	L642598-02	WG668430
Carbon tetrachloride	mg/l	1.42	1.36	114.	49-140	4.54	20	L642598-02	WG668430
Chlorobenzene	mg/l	1.33	1.27	106.	69-126	4.43	20	L642598-02	WG668430
Chloroform	mg/l	1.41	1.37	113.	64-130	2.87	20	L642598-02	WG668430
Tetrachloroethene	mg/l	1.34	1.28	107.	56-139	4.59	20	L642598-02	WG668430
Trichloroethene	mg/l	1.32	1.27	106.	40-155	4.19	20	L642598-02	WG668430
Vinyl chloride	mg/l	1.16	1.12	92.7	32-159	3.43	21	L642598-02	WG668430
4-Bromofluorobenzene				102.0	82-120				WG668430
Dibromofluoromethane				104.6	82-126				WG668430
Toluene-d8				101.4	92-112				WG668430
a,a,a-Trifluorotoluene				101.3	90-116				WG668430
COD	mg/l	403.	413.	101.	90-110	2.45	5	L642658-10	WG668217
2,4,5-TP (Silvex)	mg/l	0.0582	0.0487	116.	60.8-121	17.7	20	L642911-02	WG668420
2,4-D	mg/l	0.0502	0.0456	100.	52.4-110	9.57	20	L642911-02	WG668420
2,4-Dichlorophenyl Acetic Acid				121.0	23.3-142				WG668420
Arsenic	mg/l	1.09	1.08	98.2	75-125	0.922	20	L643025-01	WG668868
Barium	mg/l	2.19	2.20	93.7	75-125	0.456	20	L643025-01	WG668868
Cadmium	mg/l	1.03	1.04	92.3	75-125	0.966	20	L643025-01	WG668868
Chromium	mg/l	1.06	1.06	94.9	75-125	0	20	L643025-01	WG668868
Lead	mg/l	1.19	1.20	91.9	75-125	0.837	20	L643025-01	WG668868
Selenium	mg/l	1.17	1.18	105.	75-125	0.851	20	L643025-01	WG668868
Silver	mg/l	1.10	1.11	99.1	75-125	0.905	20	L643025-01	WG668868
Arsenic	mg/l	1.08	1.09	97.3	75-125	0.922	20	L643142-09	WG668868
Barium	mg/l	1.18	1.20	106.	75-125	1.68	20	L643142-09	WG668868
Cadmium	mg/l	1.04	1.06	93.7	75-125	1.90	20	L643142-09	WG668868
Chromium	mg/l	1.08	1.10	97.3	75-125	1.83	20	L643142-09	WG668868
Lead	mg/l	1.08	1.09	97.3	75-125	0.922	20	L643142-09	WG668868
Selenium	mg/l	1.10	1.10	99.1	75-125	0	20	L643142-09	WG668868
Silver	mg/l	0.623	0.518	56.1*	75-125	18.4	20	L643142-09	WG668868
Sulfide,Dissolved	mg/l	0.896	0.882	83.3	80-120	1.57	20	L642598-01	WG668725
Endrin	mg/l	0.00185	0.00185	92.4	36-135	0.0900	26	L642911-02	WG668366
Lindane	mg/l	0.00176	0.00177	88.2	43-105	0.640	24	L642911-02	WG668366
Heptachlor	mg/l	0.00158	0.00158	79.1	10-165	0.160	39	L642911-02	WG668366
Methoxychlor	mg/l	0.00203	0.00203	101.	10-147	0.120	40	L642911-02	WG668366
Decachlorobiphenyl				65.70	10-141				WG668366
Tetrachloro-m-xylene				82.10	10-125				WG668366

Serial Dilution

Batch number /Run number / Sample number cross reference

WG668002: R2718305: L642598-02
WG667995: R2718966: L642598-02

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L642598

June 29, 2013

WG668322: R2719040: L642598-02
WG668362: R2721001: L642598-02
WG668430: R2721002 R2722482: L642598-02 02
WG668217: R2721301: L642598-01
WG668420: R2721681: L642598-02
WG668695: R2723022: L642598-02
WG668700: R2723023: L642598-01
WG667981: R2723400: L642598-01
WG668868: R2723924: L642598-02
WG668725: R2724163: L642598-01
WG668860: R2724280: L642598-02
WG668752: R2724589: L642598-02
WG668749: R2725021: L642598-02
WG669086: R2725082: L642598-01
WG669288: R2725400: L642598-01
WG668366: R2726321: L642598-02

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
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June 29, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

Company Name/Address

S & ME (SMERLNC)
3201 Spring Forest Road
Raleigh, North Carolina 27604

Alternate Billing

Report to: Claudia Irvin

E-mail to: Cirvin@smeinc.com

Project Description: Edgecombe County

City/State

PHONE: 919-872-2660

FAX: 919-876-3958

Client Project No. 1054-07-240F

Lab Project #

Collected by: SAM WATTS

Site/Facility ID#

P.O.#

Collected by(signature): Sam Watts

Packed on Ice N__ Y ✓

Rush? (Lab MUST be Notified)
_____Same Day.....200%
_____Next Day.....100%
_____Two Day.....50%

Date Results Needed

Email?___No___Yes
FAX?___No___Yes

Analysis/Container/Preservative

Chain of Custody
Page_1__of__1_

Prepared by:
ESC LAB SCIENCES
12065 Lebanon Road
Mt. Juliet TN 37122
Phone (615)758-5858
Phone (800) 767-5859
1039

CoCode (lab use only)
SMERLNC
Template/Prelogin

Shipped Via: Raleigh Service Center

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No of Cntrs	Full TCLP: 2 x 1L amber glass bottles-no preserv.	Ignitability, Reactivity, & Corrosivity: 1 x 1L amber glass bottle-no preserv.	BOD: 1 x 1L HDPE-no preserv.	COD: 1 x 250 HDPE-sulfuric	pH: 1 x 125 HDPE- no preserv.	Hydrogen Sulfide: 1 x 250ml amber glass septa- NaOh + ZnAc already added(pink)		Remarks/contaminant	Sample # (lab only)
CONDENSATE	Grab	WW	N/A	6/19/13	13:15	7	X	X	X	X	X	X			L642548-01/-02

*Matrix: SS-Soil/Solid GW-Groundwater WW-Wastewater DW-Drinking Water OT- Other_____

Remarks:

pH_____ Temp_____
Flow_____ Other_____

Relinquisher by:(Signature)	Date:	Time:	Received by:(Signature)	Samples returned via: FedEx__ UPS__ Other SWB	Condition (lab use only)
Sam Watts	6/19/13	15:30	[signature]		COC SI
Relinquisher by:(Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.1°C	Bottles Received: 7+1B
Relinquisher by:(Signature) [signature]	Date: 6/14/13	Time: 17:10	Received for lab by: (Signature) [signature]	Date: 06-20-13	Time: 1430

JR

OW

pH Checked: NCF:

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Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

Report Summary

Monday July 29, 2013

Report Number: L647503
Samples Received: 07/19/13
Client Project: 1054-07-240F

Description: Edgecomber Co. Landfill

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Tom Mellette , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

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Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

Date Received : July 19, 2013
Description : Edgecomber County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

ESC Sample # : L647503-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Cyanide	BDL	5.0	ug/l	9012B	07/26/13	1
Total Phenol by 4AAP	2000	80.	ug/l	9066	07/24/13	2
Antimony	19.	1.0	ug/l	6020	07/26/13	1
Arsenic	14.	1.0	ug/l	6020	07/26/13	1
Thallium	BDL	1.0	ug/l	6020	07/26/13	1
Mercury	BDL	0.20	ug/l	7470A	07/22/13	1
Beryllium	BDL	2.0	ug/l	6010B	07/23/13	1
Cadmium	BDL	5.0	ug/l	6010B	07/23/13	1
Chromium	BDL	10.	ug/l	6010B	07/23/13	1
Copper	BDL	20.	ug/l	6010B	07/23/13	1
Lead	BDL	5.0	ug/l	6010B	07/23/13	1
Nickel	BDL	20.	ug/l	6010B	07/23/13	1
Selenium	BDL	20.	ug/l	6010B	07/23/13	1
Silver	BDL	10.	ug/l	6010B	07/23/13	1
Zinc	62.	30.	ug/l	6010B	07/23/13	1
PP Volatile Organics						
Benzene	BDL	1.0	ug/l	8260B	07/20/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	07/20/13	1
Bromoform	BDL	1.0	ug/l	8260B	07/20/13	1
Bromomethane	BDL	5.0	ug/l	8260B	07/20/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	07/20/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	07/20/13	1
Chloroethane	BDL	5.0	ug/l	8260B	07/20/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	07/20/13	1
Chloroform	BDL	5.0	ug/l	8260B	07/20/13	1
Chloromethane	BDL	2.5	ug/l	8260B	07/20/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	07/20/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	07/20/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	07/20/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	07/20/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	07/20/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

ESC Sample # : L647503-01

Date Received : July 19, 2013
Description : Edgecomber County

Site ID :

Sample ID : CONDENSATE

Project # : 1054-07-240F

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
Toluene	BDL	5.0	ug/l	8260B	07/20/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	07/20/13	1
Surrogate Recovery						
Toluene-d8	95.4		% Rec.	8260B	07/20/13	1
Dibromofluoromethane	102.		% Rec.	8260B	07/20/13	1
a,a,a-Trifluorotoluene	100.		% Rec.	8260B	07/20/13	1
4-Bromofluorobenzene	99.2		% Rec.	8260B	07/20/13	1
Pesticide/PCBs						
Aldrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Alpha BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Beta BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Delta BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Gamma BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Chlordane	BDL	0.50	ug/l	8081A/8082	07/23/13	1
4,4-DDD	BDL	0.050	ug/l	8081A/8082	07/23/13	1
4,4-DDE	BDL	0.050	ug/l	8081A/8082	07/23/13	1
4,4-DDT	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Dieldrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan I	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan II	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan sulfate	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin aldehyde	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin ketone	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Heptachlor	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Heptachlor epoxide	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Hexachlorobenzene	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Methoxychlor	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Toxaphene	BDL	0.50	ug/l	8081A/8082	07/23/13	1
PCB 1016	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1221	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1232	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1242	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1248	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1254	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1260	BDL	0.50	ug/l	8081A/8082	07/24/13	1
Pest/PCBs Surrogates						
Decachlorobiphenyl	48.8		% Rec.	8081A/8082	07/23/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

ESC
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12065 Lebanon Rd.
Mt. Juliet, TN 37122
(615) 758-5858
1-800-767-5859
Fax (615) 758-5859

Tax I.D. 62-0814289

Est. 1970

REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

Date Received : July 19, 2013
Description : Edgecomber County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

ESC Sample # : L647503-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Tetrachloro-m-xylene	19.3		% Rec.	8081A/8082	07/23/13	1
PP Base/Neutral Extractables						
Acenaphthene	BDL	50.	ug/l	8270 C	07/24/13	50
Acenaphthylene	BDL	50.	ug/l	8270 C	07/24/13	50
Anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzidine	BDL	500	ug/l	8270 C	07/24/13	50
Benzo(a)anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(b)fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(k)fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(g,h,i)perylene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(a)pyrene	BDL	50.	ug/l	8270 C	07/24/13	50
Bis(2-chlorethoxy)methane	BDL	500	ug/l	8270 C	07/24/13	50
Bis(2-chloroethyl)ether	BDL	500	ug/l	8270 C	07/24/13	50
Bis(2-chloroisopropyl)ether	BDL	500	ug/l	8270 C	07/24/13	50
4-Bromophenyl-phenylether	BDL	500	ug/l	8270 C	07/24/13	50
2-Chloronaphthalene	BDL	50.	ug/l	8270 C	07/24/13	50
4-Chlorophenyl-phenylether	BDL	500	ug/l	8270 C	07/24/13	50
Chrysene	BDL	50.	ug/l	8270 C	07/24/13	50
Dibenz(a,h)anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
3,3-Dichlorobenzidine	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dinitrotoluene	BDL	500	ug/l	8270 C	07/24/13	50
2,6-Dinitrotoluene	BDL	500	ug/l	8270 C	07/24/13	50
Fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Fluorene	BDL	50.	ug/l	8270 C	07/24/13	50
Hexachlorobenzene	BDL	50.	ug/l	8270 C	07/24/13	50
Hexachloro-1,3-butadiene	BDL	500	ug/l	8270 C	07/24/13	50
Hexachlorocyclopentadiene	BDL	500	ug/l	8270 C	07/24/13	50
Hexachloroethane	BDL	500	ug/l	8270 C	07/24/13	50
Indeno(1,2,3-cd)pyrene	BDL	50.	ug/l	8270 C	07/24/13	50
Isophorone	BDL	500	ug/l	8270 C	07/24/13	50
Naphthalene	BDL	50.	ug/l	8270 C	07/24/13	50
Nitrobenzene	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodimethylamine	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodiphenylamine	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodi-n-propylamine	BDL	500	ug/l	8270 C	07/24/13	50
Phenanthrene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzylbutyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Bis(2-ethylhexyl)phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Di-n-butyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Diethyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Dimethyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Di-n-octyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Pyrene	BDL	50.	ug/l	8270 C	07/24/13	50

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

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S&ME Inc. - Raleigh NC
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Raleigh, NC 27616

July 29,2013

Date Received : July 19, 2013
Description : Edgecomber County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

ESC Sample # : L647503-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,2,4-Trichlorobenzene	BDL	500	ug/l	8270 C	07/24/13	50
PP Acid Extractables						
4-Chloro-3-methylphenol	BDL	500	ug/l	8270 C	07/24/13	50
2-Chlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dichlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dimethylphenol	BDL	500	ug/l	8270 C	07/24/13	50
4,6-Dinitro-2-methylphenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dinitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
2-Nitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
4-Nitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
Pentachlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
Phenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4,6-Trichlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
Surrogate Recovery						
2-Fluorophenol	38.1		% Rec.	8270 C	07/24/13	50
Phenol-d5	1020		% Rec.	8270 C	07/24/13	50
Nitrobenzene-d5	99.0		% Rec.	8270 C	07/24/13	50
2-Fluorobiphenyl	77.0		% Rec.	8270 C	07/24/13	50
2,4,6-Tribromophenol	29.8		% Rec.	8270 C	07/24/13	50
p-Terphenyl-d14	81.5		% Rec.	8270 C	07/24/13	50

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
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Reported: 07/29/13 10:44 Printed: 07/29/13 10:44
L647503-01 (8270PP) - Dilution due to matrix

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L647503-01	WG673055	SAMP	Acenaphthene	R2757241	O
	WG673055	SAMP	Acenaphthylene	R2757241	O
	WG673055	SAMP	Anthracene	R2757241	O
	WG673055	SAMP	Benzidine	R2757241	O
	WG673055	SAMP	Benzo(a)anthracene	R2757241	O
	WG673055	SAMP	Benzo(b)fluoranthene	R2757241	O
	WG673055	SAMP	Benzo(k)fluoranthene	R2757241	O
	WG673055	SAMP	Benzo(g,h,i)perylene	R2757241	O
	WG673055	SAMP	Benzo(a)pyrene	R2757241	O
	WG673055	SAMP	Bis(2-chlorethoxy)methane	R2757241	O
	WG673055	SAMP	Bis(2-chloroethyl)ether	R2757241	O
	WG673055	SAMP	Bis(2-chloroisopropyl)ether	R2757241	O
	WG673055	SAMP	4-Bromophenyl-phenylether	R2757241	O
	WG673055	SAMP	2-Chloronaphthalene	R2757241	O
	WG673055	SAMP	4-Chlorophenyl-phenylether	R2757241	O
	WG673055	SAMP	Chrysene	R2757241	O
	WG673055	SAMP	Dibenz(a,h)anthracene	R2757241	O
	WG673055	SAMP	3,3-Dichlorobenzidine	R2757241	O
	WG673055	SAMP	2,4-Dinitrotoluene	R2757241	O
	WG673055	SAMP	2,6-Dinitrotoluene	R2757241	O
	WG673055	SAMP	Fluoranthene	R2757241	O
	WG673055	SAMP	Fluorene	R2757241	O
	WG673055	SAMP	Hexachlorobenzene	R2757241	O
	WG673055	SAMP	Hexachloro-1,3-butadiene	R2757241	O
	WG673055	SAMP	Hexachlorocyclopentadiene	R2757241	O
	WG673055	SAMP	Hexachloroethane	R2757241	O
	WG673055	SAMP	Indeno(1,2,3-cd)pyrene	R2757241	O
	WG673055	SAMP	Isophorone	R2757241	O
	WG673055	SAMP	Naphthalene	R2757241	O
	WG673055	SAMP	Nitrobenzene	R2757241	O
	WG673055	SAMP	n-Nitrosodimethylamine	R2757241	O
	WG673055	SAMP	n-Nitrosodiphenylamine	R2757241	O
	WG673055	SAMP	n-Nitrosodi-n-propylamine	R2757241	O
	WG673055	SAMP	Phenanthrene	R2757241	O
	WG673055	SAMP	Benzylbutyl phthalate	R2757241	O
	WG673055	SAMP	Bis(2-ethylhexyl)phthalate	R2757241	O
	WG673055	SAMP	Di-n-butyl phthalate	R2757241	O
	WG673055	SAMP	Diethyl phthalate	R2757241	O
	WG673055	SAMP	Dimethyl phthalate	R2757241	O
	WG673055	SAMP	Di-n-octyl phthalate	R2757241	O
	WG673055	SAMP	Pyrene	R2757241	O
	WG673055	SAMP	1,2,4-Trichlorobenzene	R2757241	O
	WG673055	SAMP	4-Chloro-3-methylphenol	R2757241	O
	WG673055	SAMP	2-Chlorophenol	R2757241	O
	WG673055	SAMP	2,4-Dichlorophenol	R2757241	O
	WG673055	SAMP	2,4-Dimethylphenol	R2757241	O
	WG673055	SAMP	4,6-Dinitro-2-methylphenol	R2757241	O
	WG673055	SAMP	2,4-Dinitrophenol	R2757241	O
	WG673055	SAMP	2-Nitrophenol	R2757241	O
	WG673055	SAMP	4-Nitrophenol	R2757241	O
	WG673055	SAMP	Pentachlorophenol	R2757241	OJ3
	WG673055	SAMP	Phenol	R2757241	O
	WG673055	SAMP	2,4,6-Trichlorophenol	R2757241	O
	WG673055	SAMP	2-Fluorophenol	R2757241	J7
	WG673055	SAMP	Phenol-d5	R2757241	J7
	WG673055	SAMP	Nitrobenzene-d5	R2757241	J7
	WG673055	SAMP	2-Fluorobiphenyl	R2757241	J7
	WG673055	SAMP	2,4,6-Tribromophenol	R2757241	J7
	WG673055	SAMP	p-Terphenyl-d14	R2757241	J7
	WG672968	SAMP	Delta BHC	R2755006	J3
	WG672968	SAMP	4,4-DDD	R2755006	J3
	WG672968	SAMP	4,4-DDE	R2755006	J3
	WG672968	SAMP	4,4-DDT	R2755006	J3
	WG672968	SAMP	Endrin aldehyde	R2755006	J4
	WG672968	SAMP	PCB 1260	R2757062	J3

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
07/29/13 at 10:44:44

TSR Signing Reports: 690
R5 - Desired TAT

GW -Arsenic always needs ASG

Sample: L647503-01 Account: SMERLNC Received: 07/19/13 12:00 Due Date: 07/26/13 00:00 RPT Date: 07/29/13 10:44

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Tax I.D. 62-0814289

Est. 1970

S&ME Inc. - Raleigh NC
Claudia Irvin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
1,1,1-Trichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1,2-Trichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1-Dichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1-Dichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichloropropane	< .001	mg/l			WG672945	07/20/13 02:00
1,3-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
1,4-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
2-Chloroethyl vinyl ether	< .05	mg/l			WG672945	07/20/13 02:00
Benzene	< .001	mg/l			WG672945	07/20/13 02:00
Bromodichloromethane	< .001	mg/l			WG672945	07/20/13 02:00
Bromoform	< .001	mg/l			WG672945	07/20/13 02:00
Bromomethane	< .005	mg/l			WG672945	07/20/13 02:00
Carbon tetrachloride	< .001	mg/l			WG672945	07/20/13 02:00
Chlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
Chlorodibromomethane	< .001	mg/l			WG672945	07/20/13 02:00
Chloroethane	< .005	mg/l			WG672945	07/20/13 02:00
Chloroform	< .005	mg/l			WG672945	07/20/13 02:00
Chloromethane	< .0025	mg/l			WG672945	07/20/13 02:00
cis-1,3-Dichloropropene	< .001	mg/l			WG672945	07/20/13 02:00
Ethylbenzene	< .001	mg/l			WG672945	07/20/13 02:00
Methylene Chloride	< .005	mg/l			WG672945	07/20/13 02:00
Tetrachloroethene	< .001	mg/l			WG672945	07/20/13 02:00
Toluene	< .005	mg/l			WG672945	07/20/13 02:00
trans-1,2-Dichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
trans-1,3-Dichloropropene	< .001	mg/l			WG672945	07/20/13 02:00
Trichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
Vinyl chloride	< .001	mg/l			WG672945	07/20/13 02:00
4-Bromofluorobenzene		% Rec.	106.0	82-120	WG672945	07/20/13 02:00
Dibromofluoromethane		% Rec.	103.0	82-126	WG672945	07/20/13 02:00
Toluene-d8		% Rec.	99.00	92-112	WG672945	07/20/13 02:00
a,a,a-Trifluorotoluene		% Rec.	101.0	90-116	WG672945	07/20/13 02:00
Mercury	< .0002	mg/l			WG673036	07/22/13 08:56
4,4-DDD	< .00005	mg/l			WG672968	07/23/13 17:45
4,4-DDE	< .00005	mg/l			WG672968	07/23/13 17:45
4,4-DDT	< .00005	mg/l			WG672968	07/23/13 17:45
Aldrin	< .00005	mg/l			WG672968	07/23/13 17:45
Alpha BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Beta BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Chlordane	< .005	mg/l			WG672968	07/23/13 17:45
Delta BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Dieldrin	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan I	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan II	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan sulfate	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin aldehyde	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin ketone	< .00005	mg/l			WG672968	07/23/13 17:45
Gamma BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Heptachlor	< .00005	mg/l			WG672968	07/23/13 17:45
Heptachlor epoxide	< .00005	mg/l			WG672968	07/23/13 17:45
Hexachlorobenzene	< .00005	mg/l			WG672968	07/23/13 17:45
Methoxychlor	< .00005	mg/l			WG672968	07/23/13 17:45

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Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Toxaphene	< .0005	mg/l			WG672968	07/23/13 17:45
Decachlorobiphenyl		% Rec.	74.10	10-141	WG672968	07/23/13 17:45
Tetrachloro-m-xylene		% Rec.	33.60	10-125	WG672968	07/23/13 17:45
Total Phenol by 4AAP	< .04	mg/l			WG673461	07/24/13 13:40
Beryllium	< .002	mg/l			WG673077	07/23/13 22:48
Cadmium	< .005	mg/l			WG673077	07/23/13 22:48
Chromium	< .01	mg/l			WG673077	07/23/13 22:48
Copper	< .02	mg/l			WG673077	07/23/13 22:48
Lead	< .005	mg/l			WG673077	07/23/13 22:48
Nickel	< .02	mg/l			WG673077	07/23/13 22:48
Selenium	< .02	mg/l			WG673077	07/23/13 22:48
Silver	< .01	mg/l			WG673077	07/23/13 22:48
Zinc	< .03	mg/l			WG673077	07/23/13 22:48
PCB 1016	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1221	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1232	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1242	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1248	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1254	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1260	< .0005	mg/l			WG672968	07/24/13 14:58
Decachlorobiphenyl		% Rec.	86.60	10-141	WG672968	07/24/13 14:58
Tetrachloro-m-xylene		% Rec.	36.10	10-125	WG672968	07/24/13 14:58
Cyanide	< .005	mg/l			WG673413	07/26/13 11:24
Antimony	< .001	mg/l			WG673297	07/26/13 04:07
Thallium	< .001	mg/l			WG673297	07/26/13 04:07
Arsenic	< .001	mg/l			WG673297	07/25/13 23:12

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0	0.0000108	12.1	20	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	0.120	0.130	8.00	20	L647419-02	WG673461
Total Phenol by 4AAP	mg/l	0.0910	0.120	27.5*	20	L647516-02	WG673461
Beryllium	mg/l	0	0	0	20	L647525-04	WG673077
Cadmium	mg/l	0	0.0000100	NA	20	L647525-04	WG673077
Chromium	mg/l	0	0	0	20	L647525-04	WG673077
Copper	mg/l	0	0.00210	NA	20	L647525-04	WG673077
Lead	mg/l	0	0	0	20	L647525-04	WG673077
Nickel	mg/l	0.0260	0.0198	27.1*	20	L647525-04	WG673077
Selenium	mg/l	0	0.0159	NA	20	L647525-04	WG673077
Silver	mg/l	0	0.00620	NA	20	L647525-04	WG673077
Zinc	mg/l	0	0	0	20	L647525-04	WG673077
Cyanide	mg/l	0	0	0	20	L647844-01	WG673413

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July 29, 2013

Analyte	Units	Duplicate Result	Duplicate	RPD	Limit	Ref Samp	Batch
Cyanide	mg/l	0	0	0	20	L647441-07	WG673413
Antimony	mg/l	0	0	0	20	L647630-06	WG673297
Thallium	mg/l	0	0	0	20	L647630-06	WG673297
Arsenic	mg/l	0	0	0	20	L647630-06	WG673297

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
1,1,1-Trichloroethane	mg/l	.025	0.0231	92.3	71-126	WG672945
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0221	88.6	78-130	WG672945
1,1,2-Trichloroethane	mg/l	.025	0.0228	91.3	81-121	WG672945
1,1-Dichloroethane	mg/l	.025	0.0243	97.1	73-123	WG672945
1,1-Dichloroethene	mg/l	.025	0.0254	102.	54-134	WG672945
1,2-Dichlorobenzene	mg/l	.025	0.0239	95.5	82-121	WG672945
1,2-Dichloroethane	mg/l	.025	0.0245	98.2	69-128	WG672945
1,2-Dichloropropane	mg/l	.025	0.0225	90.0	77-121	WG672945
1,3-Dichlorobenzene	mg/l	.025	0.0248	99.3	77-127	WG672945
1,4-Dichlorobenzene	mg/l	.025	0.0237	94.9	79-117	WG672945
2-Chloroethyl vinyl ether	mg/l	.125	0.122	97.8	26-172	WG672945
Benzene	mg/l	.025	0.0235	93.8	72-119	WG672945
Bromodichloromethane	mg/l	.025	0.0223	89.0	75-127	WG672945
Bromoform	mg/l	.025	0.0251	100.	61-136	WG672945
Bromomethane	mg/l	.025	0.0246	98.4	42-172	WG672945
Carbon tetrachloride	mg/l	.025	0.0243	97.1	63-129	WG672945
Chlorobenzene	mg/l	.025	0.0248	99.0	78-123	WG672945
Chlorodibromomethane	mg/l	.025	0.0239	95.5	73-128	WG672945
Chloroethane	mg/l	.025	0.0249	99.5	52-164	WG672945
Chloroform	mg/l	.025	0.0240	96.2	76-122	WG672945
Chloromethane	mg/l	.025	0.0216	86.4	50-141	WG672945
cis-1,3-Dichloropropene	mg/l	.025	0.0233	93.1	74-124	WG672945
Ethylbenzene	mg/l	.025	0.0249	99.5	77-124	WG672945
Methylene Chloride	mg/l	.025	0.0230	92.0	67-122	WG672945
Tetrachloroethene	mg/l	.025	0.0257	103.	69-131	WG672945
Toluene	mg/l	.025	0.0232	92.8	75-114	WG672945
trans-1,2-Dichloroethene	mg/l	.025	0.0225	90.1	63-127	WG672945
trans-1,3-Dichloropropene	mg/l	.025	0.0232	92.7	69-124	WG672945
Trichloroethene	mg/l	.025	0.0243	97.2	69-131	WG672945
Vinyl chloride	mg/l	.025	0.0231	92.5	55-142	WG672945
4-Bromofluorobenzene				102.0	82-120	WG672945
Dibromofluoromethane				98.40	82-126	WG672945
Toluene-d8				102.0	92-112	WG672945
a,a,a-Trifluorotoluene				104.0	90-116	WG672945
Mercury	mg/l	.003	0.00299	99.8	85-115	WG673036
4,4-DDD	mg/l	.0002	0.000214	107.	60-123	WG672968
4,4-DDE	mg/l	.0002	0.000151	75.3	50-120	WG672968
4,4-DDT	mg/l	.0002	0.000178	88.8	61-121	WG672968
Aldrin	mg/l	.0002	0.0000662	33.1	10-136	WG672968
Alpha BHC	mg/l	.0002	0.000179	89.5	58-114	WG672968
Beta BHC	mg/l	.0002	0.000195	97.7	61-120	WG672968
Delta BHC	mg/l	.0002	0.000192	96.2	57-120	WG672968
Dieldrin	mg/l	.0002	0.000183	91.4	62-123	WG672968
Endosulfan I	mg/l	.0002	0.000176	88.1	63-123	WG672968
Endosulfan II	mg/l	.0002	0.000201	100.	63-124	WG672968

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Quality Assurance Report
Level II

L647503

July 29, 2013

Laboratory Control Sample

Analyte	Units	Known Val	Result	% Rec	Limit	Batch
Endosulfan sulfate	mg/l	.0002	0.000194	97.0	59-125	WG672968
Endrin	mg/l	.0002	0.000193	96.6	60-123	WG672968
Endrin aldehyde	mg/l	.0002	0.000193	96.5*	42-92	WG672968
Endrin ketone	mg/l	.0002	0.000188	94.0	60-117	WG672968
Gamma BHC	mg/l	.0002	0.000179	89.6	59-116	WG672968
Heptachlor	mg/l	.0002	0.0000882	44.1	10-131	WG672968
Heptachlor epoxide	mg/l	.0002	0.000177	88.6	61-118	WG672968
Hexachlorobenzene	mg/l	.0002	0.0000985	49.2	28-116	WG672968
Methoxychlor	mg/l	.0002	0.000209	105.	66-122	WG672968
Decachlorobiphenyl				63.40	10-141	WG672968
Tetrachloro-m-xylene				29.60	10-125	WG672968
Total Phenol by 4AAP	mg/l	.5	0.548	110.	90-110	WG673461
Beryllium	mg/l	1	0.996	99.6	85-115	WG673077
Cadmium	mg/l	1	1.02	102.	85-115	WG673077
Chromium	mg/l	1	1.03	103.	85-115	WG673077
Copper	mg/l	1	1.03	103.	85-115	WG673077
Lead	mg/l	1	1.04	104.	85-115	WG673077
Nickel	mg/l	1	0.945	94.5	85-115	WG673077
Selenium	mg/l	1	0.990	99.0	85-115	WG673077
Silver	mg/l	1	0.992	99.2	85-115	WG673077
Zinc	mg/l	1	0.991	99.1	85-115	WG673077
PCB 1016	mg/l	.0005	0.000420	84.0	32-126	WG672968
PCB 1260	mg/l	.0005	0.000446	89.3	58-128	WG672968
Decachlorobiphenyl				81.30	10-141	WG672968
Tetrachloro-m-xylene				41.60	10-125	WG672968
Cyanide	mg/l	.1	0.0939	93.9	90-110	WG673413
Antimony	mg/l	.05	0.0458	91.6	85-115	WG673297
Thallium	mg/l	.05	0.0452	90.4	85-115	WG673297
Arsenic	mg/l	.05	0.0461	92.2	85-115	WG673297

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,1,1-Trichloroethane	mg/l	0.0232	0.0231	93.0	71-126	0.490	20	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0229	0.0221	92.0	78-130	3.57	20	WG672945
1,1,2-Trichloroethane	mg/l	0.0238	0.0228	95.0	81-121	4.00	20	WG672945
1,1-Dichloroethane	mg/l	0.0242	0.0243	97.0	73-123	0.490	20	WG672945
1,1-Dichloroethene	mg/l	0.0247	0.0254	99.0	54-134	2.68	20	WG672945
1,2-Dichlorobenzene	mg/l	0.0243	0.0239	97.0	82-121	1.68	20	WG672945
1,2-Dichloroethane	mg/l	0.0247	0.0245	99.0	69-128	0.510	20	WG672945
1,2-Dichloropropane	mg/l	0.0234	0.0225	94.0	77-121	4.09	20	WG672945
1,3-Dichlorobenzene	mg/l	0.0257	0.0248	103.	77-127	3.48	20	WG672945
1,4-Dichlorobenzene	mg/l	0.0244	0.0237	98.0	79-117	2.88	20	WG672945
2-Chloroethyl vinyl ether	mg/l	0.125	0.122	100.	26-172	2.20	22	WG672945
Benzene	mg/l	0.0239	0.0235	96.0	72-119	2.03	20	WG672945
Bromodichloromethane	mg/l	0.0230	0.0223	92.0	75-127	3.11	20	WG672945
Bromoform	mg/l	0.0265	0.0251	106.	61-136	5.27	20	WG672945
Bromomethane	mg/l	0.0246	0.0246	98.0	42-172	0.160	20	WG672945
Carbon tetrachloride	mg/l	0.0242	0.0243	97.0	63-129	0.460	20	WG672945

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July 29, 2013

Laboratory Control Sample Duplicate

Analyte	Units	Result	Ref	%Rec	Limit	RPD	Limit	Batch
Chlorobenzene	mg/l	0.0259	0.0248	104.	78-123	4.50	20	WG672945
Chlorodibromomethane	mg/l	0.0246	0.0239	98.0	73-128	3.11	20	WG672945
Chloroethane	mg/l	0.0242	0.0249	97.0	52-164	2.75	20	WG672945
Chloroform	mg/l	0.0245	0.0240	98.0	76-122	1.96	20	WG672945
Chloromethane	mg/l	0.0214	0.0216	86.0	50-141	0.910	20	WG672945
cis-1,3-Dichloropropene	mg/l	0.0242	0.0233	97.0	74-124	4.03	20	WG672945
Ethylbenzene	mg/l	0.0257	0.0249	103.	77-124	3.17	20	WG672945
Methylene Chloride	mg/l	0.0227	0.0230	91.0	67-122	1.54	20	WG672945
Tetrachloroethene	mg/l	0.0266	0.0257	106.	69-131	3.44	20	WG672945
Toluene	mg/l	0.0236	0.0232	94.0	75-114	1.85	20	WG672945
trans-1,2-Dichloroethene	mg/l	0.0223	0.0225	89.0	63-127	0.880	20	WG672945
trans-1,3-Dichloropropene	mg/l	0.0232	0.0232	93.0	69-124	0.160	20	WG672945
Trichloroethene	mg/l	0.0250	0.0243	100.	69-131	2.69	20	WG672945
Vinyl chloride	mg/l	0.0229	0.0231	91.0	55-142	1.17	20	WG672945
4-Bromofluorobenzene				106.0	82-120			WG672945
Dibromofluoromethane				99.60	82-126			WG672945
Toluene-d8				102.0	92-112			WG672945
a,a,a-Trifluorotoluene				102.0	90-116			WG672945
4,4-DDD	mg/l	0.000173	0.000214	87.0	60-123	21.3*	20	WG672968
4,4-DDE	mg/l	0.000109	0.000151	55.0	50-120	31.8*	22	WG672968
4,4-DDT	mg/l	0.000138	0.000178	69.0	61-121	25.3*	20	WG672968
Aldrin	mg/l	0.0000627	0.0000662	31.0	10-136	5.53	33	WG672968
Alpha BHC	mg/l	0.000165	0.000179	83.0	58-114	7.91	21	WG672968
Beta BHC	mg/l	0.000177	0.000195	88.0	61-120	9.98	20	WG672968
Delta BHC	mg/l	0.000154	0.000192	77.0	57-120	22.1*	21	WG672968
Dieldrin	mg/l	0.000160	0.000183	80.0	62-123	13.5	20	WG672968
Endosulfan I	mg/l	0.000156	0.000176	78.0	63-123	12.0	20	WG672968
Endosulfan II	mg/l	0.000184	0.000201	92.0	63-124	8.64	20	WG672968
Endosulfan sulfate	mg/l	0.000179	0.000194	90.0	59-125	7.98	21	WG672968
Endrin	mg/l	0.000170	0.000193	85.0	60-123	12.5	20	WG672968
Endrin aldehyde	mg/l	0.000172	0.000193	86.0	42-92	11.6	21	WG672968
Endrin ketone	mg/l	0.000179	0.000188	89.0	60-117	5.19	20	WG672968
Gamma BHC	mg/l	0.000162	0.000179	81.0	59-116	9.90	20	WG672968
Heptachlor	mg/l	0.0000901	0.0000882	45.0	10-131	2.13	28	WG672968
Heptachlor epoxide	mg/l	0.000157	0.000177	78.0	61-118	11.9	20	WG672968
Hexachlorobenzene	mg/l	0.000108	0.0000985	54.0	28-116	9.30	27	WG672968
Methoxychlor	mg/l	0.000181	0.000209	91.0	66-122	14.4	20	WG672968
Decachlorobiphenyl				63.00	10-141			WG672968
Tetrachloro-m-xylene				35.10	10-125			WG672968
Total Phenol by 4AAP	mg/l	0.544	0.548	109.	90-110	0.733	20	WG673461
PCB 1016	mg/l	0.000430	0.000420	86.0	32-126	2.27	22	WG672968
PCB 1260	mg/l	0.000568	0.000446	114.	58-128	24.1*	20	WG672968
Decachlorobiphenyl				94.70	10-141			WG672968
Tetrachloro-m-xylene				42.70	10-125			WG672968
Cyanide	mg/l	0.101	0.0939	101.	90-110	7.29	20	WG673413

Matrix Spike

Analyte	Units	MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
1,1,1-Trichloroethane	mg/l	0.0205	0	.025	81.9	58-137	L647630-01	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0183	0	.025	73.2	64-149	L647630-01	WG672945

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Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
1,1,2-Trichloroethane	mg/l	0.0188	0	.025	75.1	73-128	L647630-01	WG672945
1,1-Dichloroethane	mg/l	0.0356	0.0152	.025	81.8	58-133	L647630-01	WG672945
1,1-Dichloroethene	mg/l	0.0227	0	.025	90.7	32-152	L647630-01	WG672945
1,2-Dichlorobenzene	mg/l	0.0205	0	.025	81.9	75-125	L647630-01	WG672945
1,2-Dichloroethane	mg/l	0.0209	0	.025	83.5	59-135	L647630-01	WG672945
1,2-Dichloropropane	mg/l	0.0194	0	.025	77.8	68-126	L647630-01	WG672945
1,3-Dichlorobenzene	mg/l	0.0210	0	.025	84.0	69-131	L647630-01	WG672945
1,4-Dichlorobenzene	mg/l	0.0228	0	.025	91.0	70-123	L647630-01	WG672945
2-Chloroethyl vinyl ether	mg/l	0.0822	0	.125	65.8	10-161	L647630-01	WG672945
Benzene	mg/l	0.0212	0.00135	.025	79.2	51-134	L647630-01	WG672945
Bromodichloromethane	mg/l	0.0189	0	.025	75.5	67-132	L647630-01	WG672945
Bromoform	mg/l	0.0205	0	.025	82.1	59-137	L647630-01	WG672945
Bromomethane	mg/l	0.0205	0	.025	81.8	23-177	L647630-01	WG672945
Carbon tetrachloride	mg/l	0.0212	0	.025	84.8	49-140	L647630-01	WG672945
Chlorobenzene	mg/l	0.0220	0.00153	.025	81.7	69-126	L647630-01	WG672945
Chlorodibromomethane	mg/l	0.0196	0	.025	78.2	68-130	L647630-01	WG672945
Chloroethane	mg/l	0.0231	0.00226	.025	83.3	32-177	L647630-01	WG672945
Chloroform	mg/l	0.0210	0	.025	84.1	64-130	L647630-01	WG672945
Chloromethane	mg/l	0.0180	0	.025	72.0	27-155	L647630-01	WG672945
cis-1,3-Dichloropropene	mg/l	0.0196	0	.025	78.2	63-127	L647630-01	WG672945
Ethylbenzene	mg/l	0.0206	0	.025	82.5	64-135	L647630-01	WG672945
Methylene Chloride	mg/l	0.0201	0.000356	.025	79.2	52-130	L647630-01	WG672945
Tetrachloroethene	mg/l	0.0217	0	.025	86.7	56-139	L647630-01	WG672945
Toluene	mg/l	0.0197	0.000307	.025	77.6	61-126	L647630-01	WG672945
trans-1,2-Dichloroethene	mg/l	0.0198	0	.025	79.3	45-137	L647630-01	WG672945
trans-1,3-Dichloropropene	mg/l	0.0187	0	.025	74.6	59-130	L647630-01	WG672945
Trichloroethene	mg/l	0.0210	0.000808	.025	80.9	40-155	L647630-01	WG672945
Vinyl chloride	mg/l	0.0217	0.00244	.025	77.1	32-159	L647630-01	WG672945
4-Bromofluorobenzene					101.0	82-120		WG672945
Dibromofluoromethane					101.0	82-126		WG672945
Toluene-d8					101.0	92-112		WG672945
a,a,a-Trifluorotoluene					103.0	90-116		WG672945
Mercury	mg/l	0.00296	0.0000108	.003	98.2	80-120	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	2.97	2.00	1	97.0	90-110	L647503-01	WG673461
Beryllium	mg/l	1.00	0	1	100.	75-125	L647525-04	WG673077
Cadmium	mg/l	1.01	0.0000100	1	101.	75-125	L647525-04	WG673077
Chromium	mg/l	0.976	0	1	97.6	75-125	L647525-04	WG673077
Copper	mg/l	1.02	0.00210	1	102.	75-125	L647525-04	WG673077
Lead	mg/l	0.987	0	1	98.7	75-125	L647525-04	WG673077
Nickel	mg/l	0.929	0.0198	1	90.9	75-125	L647525-04	WG673077
Selenium	mg/l	0.972	0.0159	1	95.6	75-125	L647525-04	WG673077
Silver	mg/l	0.0472	0.00620	1	4.10*	75-125	L647525-04	WG673077
Zinc	mg/l	0.992	0	1	99.2	75-125	L647525-04	WG673077
Cyanide	mg/l	0.191	0	.2	95.5	90-110	L647441-08	WG673413
Antimony	mg/l	0.0450	0	.05	90.0	75-125	L647630-06	WG673297
Thallium	mg/l	0.0460	0	.05	92.0	75-125	L647630-06	WG673297
Arsenic	mg/l	0.0470	0	.05	94.0	75-125	L647630-06	WG673297

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
1,1,1-Trichloroethane	mg/l	0.0221	0.0205	88.3	58-137	7.55	20	L647630-01	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0213	0.0183	85.1	64-149	15.0	20	L647630-01	WG672945
1,1,2-Trichloroethane	mg/l	0.0212	0.0188	84.7	73-128	12.0	20	L647630-01	WG672945
1,1-Dichloroethane	mg/l	0.0374	0.0356	89.1	58-133	4.99	20	L647630-01	WG672945
1,1-Dichloroethene	mg/l	0.0238	0.0227	95.2	32-152	4.89	20	L647630-01	WG672945
1,2-Dichlorobenzene	mg/l	0.0230	0.0205	91.9	75-125	11.5	20	L647630-01	WG672945
1,2-Dichloroethane	mg/l	0.0239	0.0209	95.4	59-135	13.3	20	L647630-01	WG672945
1,2-Dichloropropane	mg/l	0.0218	0.0194	87.0	68-126	11.2	20	L647630-01	WG672945
1,3-Dichlorobenzene	mg/l	0.0237	0.0210	94.7	69-131	11.9	20	L647630-01	WG672945
1,4-Dichlorobenzene	mg/l	0.0256	0.0228	102.	70-123	11.7	20	L647630-01	WG672945
2-Chloroethyl vinyl ether	mg/l	0.0670	0.0822	53.6	10-161	20.3	40	L647630-01	WG672945
Benzene	mg/l	0.0235	0.0212	88.8	51-134	10.7	20	L647630-01	WG672945
Bromodichloromethane	mg/l	0.0210	0.0189	84.0	67-132	10.6	20	L647630-01	WG672945
Bromoform	mg/l	0.0238	0.0205	95.2	59-137	14.7	20	L647630-01	WG672945
Bromomethane	mg/l	0.0214	0.0205	85.5	23-177	4.36	21	L647630-01	WG672945
Carbon tetrachloride	mg/l	0.0230	0.0212	91.9	49-140	7.96	20	L647630-01	WG672945
Chlorobenzene	mg/l	0.0247	0.0220	92.7	69-126	11.8	20	L647630-01	WG672945
Chlorodibromomethane	mg/l	0.0226	0.0196	90.4	68-130	14.4	20	L647630-01	WG672945
Chloroethane	mg/l	0.0243	0.0231	88.3	32-177	5.29	21	L647630-01	WG672945
Chloroform	mg/l	0.0232	0.0210	92.9	64-130	9.99	20	L647630-01	WG672945
Chloromethane	mg/l	0.0193	0.0180	77.0	27-155	6.76	20	L647630-01	WG672945
cis-1,3-Dichloropropene	mg/l	0.0225	0.0196	89.9	63-127	13.8	20	L647630-01	WG672945
Ethylbenzene	mg/l	0.0234	0.0206	93.4	64-135	12.5	20	L647630-01	WG672945
Methylene Chloride	mg/l	0.0218	0.0201	85.6	52-130	7.68	20	L647630-01	WG672945
Tetrachloroethene	mg/l	0.0244	0.0217	97.4	56-139	11.6	20	L647630-01	WG672945
Toluene	mg/l	0.0219	0.0197	86.2	61-126	10.3	20	L647630-01	WG672945
trans-1,2-Dichloroethene	mg/l	0.0208	0.0198	83.3	45-137	4.95	20	L647630-01	WG672945
trans-1,3-Dichloropropene	mg/l	0.0220	0.0187	88.0	59-130	16.5	20	L647630-01	WG672945
Trichloroethene	mg/l	0.0237	0.0210	91.4	40-155	11.8	20	L647630-01	WG672945
Vinyl chloride	mg/l	0.0228	0.0217	81.3	32-159	4.80	21	L647630-01	WG672945
4-Bromofluorobenzene				104.0	82-120				WG672945
Dibromofluoromethane				102.0	82-126				WG672945
Toluene-d8				101.0	92-112				WG672945
a,a,a-Trifluorotoluene				101.0	90-116				WG672945
Mercury	mg/l	0.00299	0.00296	99.4	80-120	1.23	20	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	3.01	2.97	101.	90-110	1.34	20	L647503-01	WG673461
Beryllium	mg/l	1.01	1.00	101.	75-125	0.995	20	L647525-04	WG673077
Cadmium	mg/l	1.02	1.01	102.	75-125	0.985	20	L647525-04	WG673077
Chromium	mg/l	0.996	0.976	99.6	75-125	2.03	20	L647525-04	WG673077
Copper	mg/l	1.04	1.02	104.	75-125	1.94	20	L647525-04	WG673077
Lead	mg/l	1.00	0.987	100.	75-125	1.31	20	L647525-04	WG673077
Nickel	mg/l	0.948	0.929	92.8	75-125	2.02	20	L647525-04	WG673077
Selenium	mg/l	1.00	0.972	98.4	75-125	2.84	20	L647525-04	WG673077
Silver	mg/l	0.0382	0.0472	3.20*	75-125	21.1*	20	L647525-04	WG673077
Zinc	mg/l	1.01	0.992	101.	75-125	1.80	20	L647525-04	WG673077
Cyanide	mg/l	0.181	0.191	90.5	90-110	5.38	20	L647441-08	WG673413
Antimony	mg/l	0.0459	0.0450	91.8	75-125	1.98	20	L647630-06	WG673297
Thallium	mg/l	0.0461	0.0460	92.2	75-125	0.217	20	L647630-06	WG673297
Arsenic	mg/l	0.0473	0.0420	94.6	75-125	11.9	20	L647630-06	WG673297

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Claudia Irvin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

Serial Dilution

Batch number /Run number / Sample number cross reference

WG672945: R2752301: L647503-01
WG673036: R2752622: L647503-01
WG672968: R2755006 R2757062: L647503-01 01
WG673461: R2756320: L647503-01
WG673077: R2756863: L647503-01
WG673055: R2757241: L647503-01
WG673413: R2758003: L647503-01
WG673297: R2759471: L647503-01

* ' Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
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July 29, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

October 3, 2013

Mr. Troy Lewis
Director of Public Works
Town of Tarboro
P.O Box 220
Tarboro, North Carolina 27886

Reference: Submittal of Full TCLP Analysis and Priority Pollutant Scan Analysis of Edgecombe County LFGCCS Condensate
Tarboro, North Carolina
S&ME Project No. 1054-07-240F

Dear Mr. Lewis:

On behalf of Edgecombe County (the County), S&ME is pleased to present the results of laboratory analyses of landfill gas (LFG) condensate samples that were collected from the County's landfill gas collection and control system (LFGCCS) during multiple sampling events conducted in 2012 and 2013. The attached laboratory results are being submitted to you for your review in order for you to determine if the Town of Tarboro's wastewater treatment plant (WWTP) will accept periodic discharges of LFG condensate from the County's LFGCCS.

PROJECT BACKGROUND

The County has operated a LFGCCS at the County's landfill, in Tarboro, since September 2012. LFG produced by the landfill is extracted by vacuum force and directed to a candlestick flare for combustion. The LFG contains moisture that condenses as the LFG travels through the LFGCCS pipes towards the flare. The condensate is collected in two 5,000 gallon storage tanks.

A landfill gas to energy (LFGTE) facility is scheduled to be commissioned at the County's landfill beginning on October 28, 2013. The LFGTE facility will include a LFG condensate removal system that will produce additional LFG condensate.

LABORATORY ANALYSES

On April 24, 2013, on behalf of the County, S&ME submitted to you, laboratory results of LFG condensate samples collected from the County's LFGCCS that were analyzed by the following analytical methods:

- Toxicity Characteristic Leaching Potential (TCLP) volatile organic compounds (VOCs) by U.S. EPA Method 8260B (sample collected December 13, 2012); and
- Flash Point Analysis by U.S. EPA Method 1010 (sample collected February 22, 2013).

Following the submittal of the TCLP VOC and flash point analysis results, you forwarded a letter from Dr. Shankar Mistry, of The Wooten Company (Wooten) to Ms. Claudia Irvin, of S&ME, dated June 6, 2013, requesting that the County provide additional analytical data for the LFG condensate. Dr. Mistry requested the following additional analytical results of the LFG condensate be provided: complete TCLP analysis, Ignitability, Reactivity, Corrosivity, BOD, COD, pH and hydrogen sulfide. An email dated July 10, 2013 from Dr. Mistry to you requested that a priority pollutant scan analysis also be submitted for review.

On June 19, 2013, S&ME collected a condensate sample and submitted the sample to ESC Lab Sciences, a North Carolina certified laboratory, for the laboratory analyses specified above, except for the priority pollutant scan. The results of the analysis have been tabulated and compared to the regulatory limits in the attached **Table 1**. On July 17, 2013, S&ME collected an additional condensate sample and submitted it to ESC Lab Sciences for the priority pollutant scan analysis. The results of this analysis have also been tabulated in the attached **Table 1**. The results indicate that the condensate is in compliance with the regulatory limits to be considered not hazardous. Please note, all LFG condensate samples, for which laboratory analytical results are attached to this letter, were collected from the same sampling location (CS-1).

CONCLUSION

Based on previous conversations with you, S&ME understands that after the attached analytical data is reviewed and if the WWTP determines that the LFG condensate is non-hazardous, the WWTP will conduct a trial discharge of the LFG condensate in order to determine if the LFG condensate discharges will be accepted by the WWTP.

Edgecombe County is prepared to provide LFG condensate for a trial discharge to the WWTP as soon as possible, following your review of the attached laboratory data.
Please contact us at (919) 872-2660 if you have any questions about the information presented.

Sincerely,
S&ME, Inc.

Whit Rawls, P.E.
Project Engineer

Samuel P. Watts, P.G.
Senior Project Manager

CC: Dr. Shankar Mistry, P.E. – The Wooten Company

Attachments: Table 1: Summary of Condensate Analytical Results
Laboratory Report – TCLP VOCs – December 2012
Laboratory Report – Flashpoint Analysis – February 2013
Laboratory Report – Full TCLP Analysis – June 2013
Laboratory Report – Priority Pollutant Scan - July 2013

TABLE 1
SUMMARY OF CONDENSATE ANALYTICAL RESULTS
JUNE 19 and JULY 17, 2013
EDGECOMBE COUNTY LANDFILL
LANDFILL GAS COLLECTION AND CONTROL SYSTEM
TARBORO, NORTH CAROLINA
S&ME PROJECT NO. 1054-07-240F

Parameter	Analytical Method	Result	Regulatory Limit
BOD	5210 B-201	2,200,000 µg/l	N/A
COD	410.4	3,300,000 µg/l	N/A
pH	9040C	4.2 su	N/A
Specific Conductance	9050A	590 µmhos/cm	N/A
Hydrogen Sulfide	4500S2-H	63 µg/l	N/A
Sulfide, Dissolved	4500S2 D-2	63 µg/l	N/A
Corrosivity	9040C	Non-Corrosive	N/A
Flashpoint	D93/101	Did Not Flash at 170° F	N/A
Reactive CN	9012B	< 0.125 mg/l	N/A
Reactive Sulf.	9034/90	< 25 mg/l	N/A
TCLP Extraction Metals	1311		
Mercury	7470	< 0.0010 mg/l	0.2 mg/l
Arsenic	6010B	<0.25 mg/l	5 mg/l
Barium	6010B	<0.75 mg/l	100 mg/l
Cadmium	6010B	<0.25 mg/l	1.0 mg/l
Chromium	6010B	<0.25 mg/l	5.0 mg/l
Lead	6010B	<0.25 mg/l	5.0 mg/l
Selenium	6010B	<0.25 mg/l	1.0 mg/l
Silver	6010B	<0.25 mg/l	5.0 mg/l
TCLP ZHE Extraction Volatiles	1311		
Benzene	8260B	<0.050 mg/l	0.5 mg/l
Carbon Tetrachloride	8260B	<0.050 mg/l	0.5 mg/l
Chorobenzene	8260B	<0.050 mg/l	100.0 mg/l
Chloroform	8260B	<0.25 mg/l	6.0 mg/l
1,2-Dichloroethane	8260B	<0.050 mg/l	0.5 mg/l
1,1-Dichloroethene	8260B	<0.050 mg/l	0.7 mg/l
2-Butanone (MEK)	8260B	<0.50 mg/l	200.0 mg/l
Tetrachloroethene	8260B	<0.050 mg/l	0.7 mg/l
Trichloroethene	8260B	<0.050 mg/l	0.5 mg/l
Vinyl Chloride	8260B	<0.050 mg/l	0.2 mg/l
TCLP Pesticides			
Chlordane	8081A	<0.0050 mg/l	0.03 mg/l
Endrin	8081A	<0.0050 mg/l	0.2 mg/l
Heptachlor	8081A	<0.0050 mg/l	0.008 mg/l
Lindane	8081A	<0.0050 mg/l	0.4 mg/l
Methoxyclor	8081A	<0.0050 mg/l	10.0 mg/l
Toxaphene	8081A	<0.010 mg/l	0.5 mg/l
TCLP Herbicides			
2,4,5-TP (Silvex)	8151A	<0.0020 mg/l	1.0 mg/l
2,4-D	8151A	<0.0020 mg/l	10.0 mg/l
TCLP Semi-Volatiles			
1,4-Dichlorobenzene	8270D	<0.10 mg/l	7.5 mg/l
2,4-Dinitrotoluene	8270D	<0.10 mg/l	0.13 mg/l
Hexachlorobenzene	8270D	<0.10 mg/l	0.13 mg/l
Hexachloro-1,3-butadiene	8270D	<0.10 mg/l	0.5 mg/l
Hexachloroethane	8270D	<0.10 mg/l	3.0 mg/l
Nitrobenzene	8270D	<0.10 mg/l	2.0 mg/l
Pyridine	8270D	<0.10 mg/l	5.0 mg/l
3&4-Methyl Phenol	8270D	1.1 mg/l	400 mg/l
2-Methylphenol	8270D	<0.10 mg/l	200 mg/l
Pentachlorophenol	8270D	<0.10 mg/l	100 mg/l
2,4,5-Trichlorophenol	8270D	<0.10 mg/l	400 mg/l
2,4,6-Trichlorophenol	8270D	<0.10 mg/l	2.0 mg/l
Priority Pollutant Scan			
Volatile Organics	8260B	All BDL	Various
Base Neutrals,Acid Extractables	8270C	All BDL	Various
Pesticides/PCBs	8081A/8082	All BDL	Various
Arsenic	6020	14 µg/l	5,000 µg/l
Mercury	7470A	<0.2 µg/l	200 µg/l
Chromium	6010B	< 10 µg/l	5,000 µg/l
Lead	6010B	< 5 µg/l	5,000 µg/l
Selenium	6010B	< 20 µg/l	100 µg/l
Silver	6010B	< 10 µg/l	5,000 µg/l

Notes:
1. µg/l = micrograms per liter
2. mg/l = milligrams per liter
3. su = standard units
4. µmhos/cm = microsiemens per centimeter
5. Concentrations exceeding the laboratory's detection limits are shown in BOLD fields.
6. BDL = Below Detection Limit
7. Regulatory Limits taken from the NCDENR Hazardous Waste Compliance Manual for Generators of Hazardous Waste.

Environmental Conservation Laboratories, Inc.
102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515
www.encolabs.com

Wednesday, January 2, 2013

S&ME, Inc. (SM001)

Attn: Whit Rawls

3201 Spring Forest Road

Raleigh, NC 27616

RE: Laboratory Results for
Project Number: 1054-12-331, Project Name/Desc: Edgecombe County Landfill
ENCO Workorder(s): C215127

Dear Whit Rawls,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Friday, December 14, 2012.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chuck Smith

Chuck Smith
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 8.

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: CS-1	Lab ID: C215127-01	Sampled: 12/13/12 12:00	Received: 12/14/12 12:40

Parameter	Hold Date/Time(s)		Prep Date/Time(s)		Analysis Date/Time(s)
EPA 8260B	12/27/12	01/11/13	12/28/12	15:59	12/28/2012 20:25

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NORTH CAROLINA SWS SAMPLE DETECTION SUMMARY

Client ID: CS-1 Lab ID: C215127-01

Analyte	Results	Flag	DF	MDL	MRL	NC SWSL	Units	Method	Notes
2-Butanone	8.03	J	1	0.120	0.500	100	mg/L	EPA 8260B	
Chlorobenzene	0.0140	J	1	0.0140	0.100	3	mg/L	EPA 8260B	

www.encolabs.com

ANALYTICAL RESULTS

Description: CS-1
Matrix: Waste Water
Project: Edgecombe County Landfill

Lab Sample ID: C215127-01
Sampled: 12/13/12 12:00
Sampled By: Whit Rawls

Received: 12/14/12 12:40
Work Order: C215127

TCLP Volatile Organics by GCMS

^ - ENCO Jacksonville certified analyte [NC 442]

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
1,1-Dichloroethene [75-35-4] ^	0.0210	U	mg/L	1	0.0210	0.100	5	EPA 8260B	12/28/12 20:25	JDB	
1,2-Dichloroethane [107-06-2] ^	0.0160	U	mg/L	1	0.0160	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
2-Butanone [78-93-3] ^	**8.03**	J	mg/L	1	0.120	0.500	100	EPA 8260B	12/28/12 20:25	JDB	
Benzene [71-43-2] ^	0.0150	U	mg/L	1	0.0150	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Carbon Tetrachloride [56-23-5] ^	0.0120	U	mg/L	1	0.0120	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Chlorobenzene [108-90-7] ^	**0.0140**	J	mg/L	1	0.0140	0.100	3	EPA 8260B	12/28/12 20:25	JDB	
Chloroform [67-66-3] ^	0.0150	U	mg/L	1	0.0150	0.100	5	EPA 8260B	12/28/12 20:25	JDB	
Tetrachloroethene [127-18-4] ^	0.0250	U	mg/L	1	0.0250	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Trichloroethene [79-01-6] ^	0.0170	U	mg/L	1	0.0170	0.100	1	EPA 8260B	12/28/12 20:25	JDB	
Vinyl chloride [75-01-4] ^	0.0180	U	mg/L	1	0.0180	0.100	1	EPA 8260B	12/28/12 20:25	JDB	

Surrogates	*Results*	*DF*	*Spike Lvl*	*% Rec*	*% Rec Limits*	*Batch*	*Method*	*Analyzed*	*By*	Notes
4-Bromofluorobenzene	*5.85*	*1*	*5.00*	*117 %*	*62-132*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	
Dibromofluoromethane	*5.36*	*1*	*5.00*	*107 %*	*73-134*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	
Toluene-d8	*5.90*	*1*	*5.00*	*118 %*	*66-138*	*2L28016*	*EPA 8260B*	*12/28/12 20:25*	*JDB*	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

QUALITY CONTROL

TCLP Volatile Organics by GCMS - Quality Control

Batch 2L28016 - EPA 5030B_MS

Blank (2L28016-BLK1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 16:22

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0002	U	0.0010	mg/L							
1,2-Dichloroethane	0.0002	U	0.0010	mg/L							
2-Butanone	0.0012	U	0.0050	mg/L							
Benzene	0.0002	U	0.0010	mg/L							
Carbon Tetrachloride	0.0001	U	0.0010	mg/L							
Chlorobenzene	0.0001	U	0.0010	mg/L							
Chloroform	0.0002	U	0.0010	mg/L							
Tetrachloroethene	0.0002	U	0.0010	mg/L							
Trichloroethene	0.0002	U	0.0010	mg/L							
Vinyl chloride	0.0002	U	0.0010	mg/L							
Surrogate: 4-Bromofluorobenzene	*0.0561*			*mg/L*	*0.0500*		*112*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0549*			*mg/L*	*0.0500*		*110*	*73-134*			
Surrogate: Toluene-d8	*0.0594*			*mg/L*	*0.0500*		*119*	*66-138*			

Blank (2L28016-BLK2) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 16:57

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0210	UD	0.100	mg/L							
1,2-Dichloroethane	0.0160	UD	0.100	mg/L							
2-Butanone	0.120	UD	0.500	mg/L							
Benzene	0.0150	UD	0.100	mg/L							
Carbon Tetrachloride	0.0120	UD	0.100	mg/L							
Chlorobenzene	0.0140	UD	0.100	mg/L							
Chloroform	0.0150	UD	0.100	mg/L							
Tetrachloroethene	0.0250	UD	0.100	mg/L							
Trichloroethene	0.0170	UD	0.100	mg/L							
Vinyl chloride	0.0180	UD	0.100	mg/L							
Surrogate: 4-Bromofluorobenzene	*0.0579*			*mg/L*	*0.0500*		*116*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0519*			*mg/L*	*0.0500*		*104*	*73-134*			
Surrogate: Toluene-d8	*0.0591*			*mg/L*	*0.0500*		*118*	*66-138*			

LCS (2L28016-BS1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 17:31

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	0.0204		0.0010	mg/L	0.0200		102	51-145			
Benzene	0.0226		0.0010	mg/L	0.0200		113	76-120			
Chlorobenzene	0.0242		0.0010	mg/L	0.0200		121	80-124			
Trichloroethene	0.0213		0.0010	mg/L	0.0200		107	80-120			
Surrogate: 4-Bromofluorobenzene	*0.0587*			*mg/L*	*0.0500*		*117*	*62-132*			
Surrogate: Dibromofluoromethane	*0.0524*			*mg/L*	*0.0500*		*105*	*73-134*			
Surrogate: Toluene-d8	*0.0600*			*mg/L*	*0.0500*		*120*	*66-138*			

Matrix Spike (2L28016-MS1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:06

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	2.07		0.100	mg/L	2.00	0.0210 U	103	51-145			

QUALITY CONTROL

TCLP Volatile Organics by GCMS - Quality Control

Batch 2L28016 - EPA 5030B_MS

Matrix Spike (2L28016-MS1) Continued Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:06

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Benzene	2.32		0.100	mg/L	2.00	0.0150 U	116	76-120			
Chlorobenzene	2.42		0.100	mg/L	2.00	0.0140	120	80-124			
Trichloroethene	2.08		0.100	mg/L	2.00	0.0170 U	104	80-120			
Surrogate: 4-Bromofluorobenzene	*5.87*			*mg/L*	*5.00*		*117*	*62-132*			
Surrogate: Dibromofluoromethane	*5.50*			*mg/L*	*5.00*		*110*	*73-134*			
Surrogate: Toluene-d8	*6.02*			*mg/L*	*5.00*		*120*	*66-138*			

Matrix Spike Dup (2L28016-MSD1) Prepared: 12/28/2012 15:59 Analyzed: 12/28/2012 18:41

Source: C215127-01

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
1,1-Dichloroethene	2.10		0.100	mg/L	2.00	0.0210 U	105	51-145	2	16	
Benzene	2.33		0.100	mg/L	2.00	0.0150 U	117	76-120	0.4	17	
Chlorobenzene	2.49		0.100	mg/L	2.00	0.0140	124	80-124	3	19	
Trichloroethene	2.03		0.100	mg/L	2.00	0.0170 U	102	80-120	2	18	
Surrogate: 4-Bromofluorobenzene	*5.96*			*mg/L*	*5.00*		*119*	*62-132*			
Surrogate: Dibromofluoromethane	*5.70*			*mg/L*	*5.00*		*114*	*73-134*			
Surrogate: Toluene-d8	*5.94*			*mg/L*	*5.00*		*119*	*66-138*			

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.

ENVIRONMENTAL CONSERVATION LABORATORIES CHAIN-OF-CUSTODY RECORD

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Orlando, FL 32824
(407) 826-5314 Fax (407) 850-6945

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Jacksonville, FL 32216-6069
(904) 296-3007 Fax (904) 296-6210

102-A Woodwinds Industrial Ct.
Cary, NC 27511
(919) 467-3090 Fax (919) 467-3515

Page 1 of 1

Client Name: S&ME	Project Number: 1054-12-331
Address: 3201 Spring Forest Rd	Project Name/Desc: Edgecombe Co. LFG
City/ST/Zip: Raleigh, NC 27616	PO # / Billing Info:
Tel: 919.872.2660 Fax: 919.876.3558	Reporting Contact: W. Rawls
Sampler(s) Name, Affiliation (Print): W. Rawls / S&ME	Billing Contact: Sam Watts
Sampler(s) Signature:	Facility # (if required):

Requested Analyses: TCLP - 8260

Requested Turnaround Times
Note : Rush requests subject to acceptance by the facility
✓ Standard
___ Expedited
Due 12/28/12

Lab Workorder: C215127

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	TCLP - 8260	Sample Comments
	CS-1	12/13/12	1200	G	W.W.	6	X	
						6		

Preservation (See Codes) (Combine as necessary)

<-- Total # of Containers

Sample Kit Prepared By	Date/Time	Relinquished By	Date/Time	Received By	Date/Time
W. Rawls	12/14/12 1130	[signature]	12/14/12 1200	[signature]	12/14/12 1240
		Relinquished By	Date/Time	Received By	Date/Time
		Relinquished By	Date/Time	Received By	Date/Time

Comments:

Cooler #'s & Temps on Receipt: 0.5°C

Condition Upon Receipt: ✓ Acceptable ___ Unacceptable

Matrix : GW-Groundwater SO-Soil SE-Sediment SW Surface Water WW Wastewater A-Air O-Other (detail in comments)

Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note : All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist

Environmental Conservation Laboratories, Inc.
102-A Woodwinds Industrial Court
Cary NC, 27511
Phone: 919.467.3090 FAX: 919.467.3515
www.encolabs.com

Friday, March 8, 2013

S&ME, Inc. (SM001)

Attn: Whit Rawls

3201 Spring Forest Road

Raleigh, NC 27616

RE: Laboratory Results for
Project Number: 1054-12-331, Project Name/Desc: Edgecombe County Landfill
ENCO Workorder(s): C301958

Dear Whit Rawls,

Enclosed is a copy of your laboratory report for test samples received by our laboratory on Monday, February 25, 2013.

Unless otherwise noted in an attached project narrative, all samples were received in acceptable condition and processed in accordance with the referenced methods/procedures. Results for these procedures apply only to the samples as submitted.

The analytical results contained in this report are in compliance with NELAC standards, except as noted in the project narrative. This report shall not be reproduced except in full, without the written approval of the Laboratory.

This report contains only those analyses performed by Environmental Conservation Laboratories. Unless otherwise noted, all analyses were performed at ENCO Cary. Data from outside organizations will be reported under separate cover.

If you have any questions or require further information, please do not hesitate to contact me.

Sincerely,

Chuck Smith

Chuck Smith
Project Manager

Enclosure(s)

The total number of pages in this report, including this page is 8.

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SAMPLE SUMMARY/LABORATORY CHRONICLE

Client ID: CS-1	Lab ID: C301958-01	Sampled: 02/22/13 13:00	Received: 02/25/13 11:10
Parameter	**Hold Date/Time(s)**	**Prep Date/Time(s)**	**Analysis Date/Time(s)**
EPA 1010	03/08/13	03/06/13 12:11	3/6/2013 12:11

Client ID: CS-1	Lab ID: C301958-02	Sampled: 02/22/13 13:05	Received: 02/25/13 11:10
Parameter	**Hold Date/Time(s)**	**Prep Date/Time(s)**	**Analysis Date/Time(s)**
EPA 1010	03/08/13	03/06/13 12:11	3/6/2013 12:11

SAMPLE DETECTION SUMMARY

No positive results detected.

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ANALYTICAL RESULTS

Description: CS-1
Matrix: Solution
Project: Edgecombe County Landfill

Lab Sample ID: C301958-01
Sampled: 02/22/13 13:00
Sampled By: Whit Rawls

Received: 02/25/13 11:10
Work Order: C301958

Classical Chemistry Parameters

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
Flashpoint [ECL-0063]	> 200		°F	1				EPA 1010	03/06/13 12:11	PJG	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

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Description: CS-1
Matrix: Solution
Project: Edgecombe County Landfill

Lab Sample ID: C301958-02
Sampled: 02/22/13 13:05
Sampled By: Whit Rawls

Received: 02/25/13 11:10
Work Order: C301958

Classical Chemistry Parameters

Analyte [CAS Number]	Results	Flag	Units	DF	MDL	MRL	NC SWSL	Method	Analyzed	By	Notes
Flashpoint [ECL-0063]	> 200		°F	1				EPA 1010	03/06/13 12:11	PJG	

This report relates only to the sample as received by the laboratory, and may only be reproduced in full.

QUALITY CONTROL

Classical Chemistry Parameters - Quality Control

Batch 3C06009 - NO PREP

LCS (3C06009-BS1) Prepared: 03/06/2013 12:11 Analyzed: 03/06/2013 12:11

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Flashpoint	81			°F	81.0		100	90-110			

Duplicate (3C06009-DUP1) Prepared: 03/06/2013 12:11 Analyzed: 03/06/2013 12:11

Source: B301022-03

Analyte	Result	Flag	MRL	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Flashpoint	> 200	U		°F		0.0				200	

FLAGS/NOTES AND DEFINITIONS

B	The analyte was detected in the associated method blank.
D	The sample was analyzed at dilution.
J	The reported value is between the laboratory method detection limit (MDL) and the laboratory method reporting limit (MRL), adjusted for actual sample preparation data and moisture content, where applicable.
U	The analyte was analyzed for but not detected to the level shown, adjusted for actual sample preparation data and moisture content, where applicable.
E	The concentration indicated for this analyte is an estimated value above the calibration range of the instrument. This value is considered an estimate.
MRL	Method Reporting Limit. The MRL is roughly equivalent to the practical quantitation limit (PQL) and is based on the low point of the calibration curve, when applicable, sample preparation factor, dilution factor, and, in the case of soil samples, moisture content.

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CHAIN-OF-CUSTODY RECORD

Page 1 of 1

Client Name: S&ME, Inc.	Project Number: 1054-12-331
Address: 3201 Spring Forest Rd.	Project Name/Desc: Edgecombe Co. Landfill
City/ST/Zip: Raleigh, NC 27616	PO # / Billing Info: (Proj No.)
Tel: 919-872-2660 Fax: 919-876-3958	Reporting Contact: Whit Rawls
Sampler(s) Name, Affiliation (Print): Whit Rawls, S&ME	Billing Contact: Whit Rawls
Sampler(s) Signature:	Site Location / Time Zone: Tarboro, NC

Requested Analyses: Flash Point

Requested Turnaround Times
Note: Rush requests subject to acceptance by the facility
✓ Standard
___ Expedited
Due __/__/__

Lab Workorder: C301958

Item #	Sample ID (Field Identification)	Collection Date	Collection Time	Comp / Grab	Matrix (see codes)	Total # of Containers	Preservation (See Codes) (Combine as necessary)	Sample Comments
	CS-1	2/22/13	1300	G	O		1	
	CS-1	2/22/13	1305	G	O		1	
						2	<-- Total # of Containers	

Sample Kit Prepared By: Whit Rawls	Date/Time: 2/22/13 17:00	Relinquished By:	Date/Time: 2/25/13 1012	Received By:	Date/Time: 2/25/13 1012
Comments/Special Reporting Requirements: Other = landfill gas condensate - analysis to determine if acceptable for Tar River Regional WWTP.		Relinquished By:	Date/Time:	Received By:	Date/Time:
		Relinquished By:	Date/Time:	Received By:	Date/Time: 2/25/13 1110
		Cooler #'s & Temps on Receipt: 1.6°C		Condition Upon Receipt: X Acceptable	Unacceptable

Matrix: GW-Groundwater SO-Soil DW-Drinking Water SE-Sediment SW-Surface Water WW-Wastewater A-Air O-Other (detail in comments) Preservation: I-Ice H-HCl N-HNO3 S-H2SO4 NO-NaOH O-Other (detail in comments)

Note: All samples submitted to ENCO Labs are in accordance with the terms and conditions listed on the reverse of this form, unless prior written agreements exist.

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Tax I.D. 62-0814289

Est. 1970

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

Report Summary

Saturday June 29, 2013

Report Number: L642598
Samples Received: 06/20/13
Client Project: 1054-07-240F

Description: Edgecombe County

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Tom Mellette , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

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Est. 1970

REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

Date Received : June 20, 2013
Description : Edgecombe County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

ESC Sample # : L642598-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
BOD	2200000	2000	ug/l	5210 B-201	06/26/13	1
COD	3300000	50000	ug/l	410.4	06/25/13	5
pH	4.2		su	9040C	06/26/13	1
Specific Conductance	590		umhos/cm	9050A	06/27/13	1
Hydrogen Sulfide	63.	50.	ug/l	4500S2-H	06/27/13	1
Sulfide,Dissolved	63.	50.	ug/l	4500S2 D-2	06/26/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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.
Reported: 06/29/13 11:44 Printed: 06/29/13 11:44
L642598-01 (PH) - 4.2@20.5c

ESC
L·A·B S·C·I·E·N·C·E·S
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REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

Date Received : June 20, 2013
Description : Edgecombe County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

ESC Sample # : L642598-02

Site ID :

Project : 1054-07-240F

Parameter	Result	Det. Limit	Units	Limit	Method	Date/Time	By	Dil
Corrosivity	Non-Corrosiv				9040C	06/26/13 1041	ADF	1
Flashpoint	See Footnote		deg F		D93/101	06/26/13 1751	AS	1
Reactive CN (SW846 7.3.3.2)	BDL	0.125	mg/l		9012B	06/27/13 1039	MCG	1
Reactive Sulf.(SW846 7.3.4.1)	BDL	25.	mg/l		9034/90	06/26/13 1615	DJD	1
TCLP Extraction	-				1311	06/22/13 0701	MVE	1
Mercury	BDL	0.0010	mg/l	0.20	7470A	06/22/13 2102	CCE	1
Arsenic	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Barium	BDL	0.75	mg/l	100	6010B	06/26/13 1400	ST	5
Cadmium	BDL	0.25	mg/l	1.0	6010B	06/26/13 1400	ST	5
Chromium	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Lead	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
Selenium	BDL	0.25	mg/l	1.0	6010B	06/26/13 1400	ST	5
Silver	BDL	0.25	mg/l	5.0	6010B	06/26/13 1400	ST	5
TCLP ZHE Extraction	-				1311	06/24/13 0809	MVE	1
TCLP Volatiles								
Benzene	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Carbon tetrachloride	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Chlorobenzene	BDL	0.050	mg/l	100	8260B	06/24/13 1544	JRB	1
Chloroform	BDL	0.25	mg/l	6.0	8260B	06/24/13 1544	JRB	1
1,2-Dichloroethane	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
1,1-Dichloroethene	BDL	0.050	mg/l	0.70	8260B	06/24/13 1544	JRB	1
2-Butanone (MEK)	12.	0.50	mg/l	200	8260B	06/26/13 0221	DP	1
Tetrachloroethene	BDL	0.050	mg/l	0.70	8260B	06/24/13 1544	JRB	1
Trichloroethene	BDL	0.050	mg/l	0.50	8260B	06/24/13 1544	JRB	1
Vinyl chloride	BDL	0.050	mg/l	0.20	8260B	06/24/13 1544	JRB	1
Surrogate Recovery								
Toluene-d8	101.		% Rec.	114.	8260B	06/24/13 1544	JRB	1
Dibromofluoromethane	107.		% Rec.	125.	8260B	06/24/13 1544	JRB	1
a,a,a-Trifluorotoluene	102.		% Rec.	114.	8260B	06/24/13 1544	JRB	1
4-Bromofluorobenzene	102.		% Rec.	128.	8260B	06/24/13 1544	JRB	1
TCLP Pesticides								
Chlordane	BDL	0.0050	mg/l	0.030	8081A	06/26/13 1835	CBB	1
Endrin	BDL	0.0050	mg/l	0.020	8081A	06/26/13 1835	CBB	1
Heptachlor	BDL	0.0050	mg/l	0.0080	8081A	06/26/13 1835	CBB	1
Lindane	BDL	0.0050	mg/l	0.40	8081A	06/26/13 1835	CBB	1

L642598-02 (FLASHPOINT) - Did Not Flash @ 170 F

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REPORT OF ANALYSIS

Claudia Ervin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

June 29,2013

Date Received : June 20, 2013
Description : Edgecombe County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 06/19/13 13:15

ESC Sample # : L642598-02

Site ID :

Project : 1054-07-240F

Parameter	Result	Det. Limit	Units	Limit	Method	Date/Time	By	Dil
Methoxychlor	BDL	0.0050	mg/l	10.	8081A	06/26/13 1835	CBB	1
Toxaphene	BDL	0.010	mg/l	0.50	8081A	06/26/13 1835	CBB	1
Surrogate Recovery								
Decachlorobiphenyl	37.8		% Rec.	123.	8081A	06/26/13 1835	CBB	1
Tetrachloro-m-xylene	76.2		% Rec.	114.	8081A	06/26/13 1835	CBB	1
TCLP Herbicides								
2,4,5-TP (Silvex)	BDL	0.0020	mg/l	1.0	8151A	06/24/13 2215	HMH	1
2,4-D	BDL	0.0020	mg/l	10.	8151A	06/24/13 2215	HMH	1
Surrogate Recovery								
2,4-Dichlorophenyl Acetic Acid	94.9		% Rec.		8151A	06/24/13 2215	HMH	1
TCLP Semi-Volatiles								
1,4-Dichlorobenzene	BDL	0.10	mg/l	7.5	8270D	06/24/13 2222	KMF	1
2,4-Dinitrotoluene	BDL	0.10	mg/l	0.13	8270D	06/24/13 2222	KMF	1
Hexachlorobenzene	BDL	0.10	mg/l	0.13	8270D	06/24/13 2222	KMF	1
Hexachloro-1,3-butadiene	BDL	0.10	mg/l	0.50	8270D	06/24/13 2222	KMF	1
Hexachloroethane	BDL	0.10	mg/l	3.0	8270D	06/24/13 2222	KMF	1
Nitrobenzene	BDL	0.10	mg/l	2.0	8270D	06/24/13 2222	KMF	1
Pyridine	BDL	0.10	mg/l	5.0	8270D	06/24/13 2222	KMF	1
3&4-Methyl Phenol	1.1	0.10	mg/l	400	8270D	06/24/13 2222	KMF	1
2-Methylphenol	BDL	0.10	mg/l	200	8270D	06/24/13 2222	KMF	1
Pentachlorophenol	BDL	0.10	mg/l	100	8270D	06/24/13 2222	KMF	1
2,4,5-Trichlorophenol	BDL	0.10	mg/l	400	8270D	06/24/13 2222	KMF	1
2,4,6-Trichlorophenol	BDL	0.10	mg/l	2.0	8270D	06/24/13 2222	KMF	1
Surrogate Recovery								
2-Fluorophenol	43.1		% Rec.	87.0	8270D	06/24/13 2222	KMF	1
Phenol-d5	46.4		% Rec.	67.0	8270D	06/24/13 2222	KMF	1
Nitrobenzene-d5	42.6		% Rec.	120.	8270D	06/24/13 2222	KMF	1
2-Fluorobiphenyl	71.1		% Rec.	122.	8270D	06/24/13 2222	KMF	1
2,4,6-Tribromophenol	72.4		% Rec.	148.	8270D	06/24/13 2222	KMF	1
p-Terphenyl-d14	85.3		% Rec.	149.	8270D	06/24/13 2222	KMF	1

BDL - Below Detection Limit
Det. Limit - Estimated Quantitation Limit(EQL)
Limit - Maximum Contaminant Level as established by the US EPA
Note:
The reported analytical results relate only to the sample submitted.
This report shall not be reproduced, except in full, without the written approval from ESC.
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Reported: 06/29/13 11:44 Printed: 06/29/13 11:45
L642598-02 (FLASHPOINT) - Did Not Flash @ 170 F

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L642598-01	WG668700	SAMP	pH	R2723023	T8
	WG667981	SAMP	BOD	R2723400	B1
L642598-02	WG668695	SAMP	Corrosivity	R2723022	T8
	WG668362	SAMP	2,4,6-Trichlorophenol	R2721001	J3
	WG668868	SAMP	Arsenic	R2723924	O
	WG668868	SAMP	Cadmium	R2723924	O
	WG668868	SAMP	Selenium	R2723924	O
	WG668868	SAMP	Silver	R2723924	O

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
B1	(ESC) - The blank depletion was greater than the recommended maximum depletion of 0.2mg/L.
J3	The associated batch QC was outside the established quality control range for precision.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.
T8	(ESC) - Additional method/sample information: Sample(s) received past/too close to holding time expiration.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
06/29/13 at 11:45:01

TSR Signing Reports: 690
R5 - Desired TAT

Sample: L642598-01 Account: SMERLNC Received: 06/20/13 14:30 Due Date: 06/27/13 00:00 RPT Date: 06/29/13 11:44

Sample: L642598-02 Account: SMERLNC Received: 06/20/13 14:30 Due Date: 06/27/13 00:00 RPT Date: 06/29/13 11:44

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Claudia Ervin
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Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Mercury	< .001	mg/l			WG668002	06/22/13 19:34
1,4-Dichlorobenzene	< .1	mg/l			WG668362	06/24/13 20:22
2,4,5-Trichlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
2,4,6-Trichlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
2,4-Dinitrotoluene	< .1	mg/l			WG668362	06/24/13 20:22
2-Methylphenol	< .1	mg/l			WG668362	06/24/13 20:22
3&4-Methyl Phenol	< .1	mg/l			WG668362	06/24/13 20:22
Hexachloro-1,3-butadiene	< .1	mg/l			WG668362	06/24/13 20:22
Hexachlorobenzene	< .1	mg/l			WG668362	06/24/13 20:22
Hexachloroethane	< .1	mg/l			WG668362	06/24/13 20:22
Nitrobenzene	< .1	mg/l			WG668362	06/24/13 20:22
Pentachlorophenol	< .1	mg/l			WG668362	06/24/13 20:22
Pyridine	< .1	mg/l			WG668362	06/24/13 20:22
2,4,6-Tribromophenol		% Rec.	57.50	11.2-130	WG668362	06/24/13 20:22
2-Fluorobiphenyl		% Rec.	62.30	29.5-131	WG668362	06/24/13 20:22
2-Fluorophenol		% Rec.	33.50	10-77.9	WG668362	06/24/13 20:22
Nitrobenzene-d5		% Rec.	45.30	21.8-123	WG668362	06/24/13 20:22
Phenol-d5		% Rec.	25.90	5-70.1	WG668362	06/24/13 20:22
p-Terphenyl-d14		% Rec.	67.10	29.3-137	WG668362	06/24/13 20:22
1,1-Dichloroethene	< .05	mg/l			WG668430	06/24/13 15:05
1,2-Dichloroethane	< .05	mg/l			WG668430	06/24/13 15:05
Benzene	< .05	mg/l			WG668430	06/24/13 15:05
Carbon tetrachloride	< .05	mg/l			WG668430	06/24/13 15:05
Chlorobenzene	< .05	mg/l			WG668430	06/24/13 15:05
Chloroform	< .25	mg/l			WG668430	06/24/13 15:05
Tetrachloroethene	< .05	mg/l			WG668430	06/24/13 15:05
Trichloroethene	< .05	mg/l			WG668430	06/24/13 15:05
Vinyl chloride	< .05	mg/l			WG668430	06/24/13 15:05
4-Bromofluorobenzene		% Rec.	104.1	82-120	WG668430	06/24/13 15:05
Dibromofluoromethane		% Rec.	107.7	82-126	WG668430	06/24/13 15:05
Toluene-d8		% Rec.	100.5	92-112	WG668430	06/24/13 15:05
a,a,a-Trifluorotoluene		% Rec.	105.5	90-116	WG668430	06/24/13 15:05
COD	< 10	mg/l			WG668217	06/25/13 11:49
2,4,5-TP (Silvex)	< .002	mg/l			WG668420	06/24/13 20:38
2,4-D	< .002	mg/l			WG668420	06/24/13 20:38
2,4-Dichlorophenyl Acetic Acid		% Rec.	94.50	23.3-142	WG668420	06/24/13 20:38
BOD	0.280	mg/l			WG667981	06/26/13 09:44
Arsenic	< .05	mg/l			WG668868	06/26/13 13:16
Barium	< .15	mg/l			WG668868	06/26/13 13:16
Cadmium	< .05	mg/l			WG668868	06/26/13 13:16
Chromium	< .05	mg/l			WG668868	06/26/13 13:16
Lead	< .05	mg/l			WG668868	06/26/13 13:16
Selenium	< .05	mg/l			WG668868	06/26/13 13:16
Silver	< .05	mg/l			WG668868	06/26/13 13:16
Sulfide,Dissolved	< .05	mg/l			WG668725	06/26/13 19:00

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Quality Assurance Report
Level II

L642598

June 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Reactive CN (SW846 7.3.3.2)	< .125	mg/l			WG668752	06/27/13 10:30
Reactive Sulf.(SW846 7.3.4.1)	< 25	mg/l			WG668749	06/26/13 16:15
Specific Conductance	1.20	umhos/cm			WG669086	06/27/13 14:05
Chlordane	< .005	mg/l			WG668366	06/26/13 16:54
Endrin	< .005	mg/l			WG668366	06/26/13 16:54
Lindane	< .005	mg/l			WG668366	06/26/13 16:54
Heptachlor	< .005	mg/l			WG668366	06/26/13 16:54
Methoxychlor	< .005	mg/l			WG668366	06/26/13 16:54
Toxaphene	< .01	mg/l			WG668366	06/26/13 16:54
Decachlorobiphenyl		% Rec.	81.20	10-141	WG668366	06/26/13 16:54
Tetrachloro-m-xylene		% Rec.	101.0	10-125	WG668366	06/26/13 16:54

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0	0.000180	8.68	20	L642217-01	WG668002
COD	mg/l	3200	3300	3.08	5	L642598-01	WG668217
COD	mg/l	65.0	57.0	13.1*	5	L642900-11	WG668217
Corrosivity		0	0	0	10	L642569-01	WG668695
pH	su	7.80	7.70	0.776	1	L642362-01	WG668700
pH	su	4.20	4.20	1.20*	1	L642598-01	WG668700
BOD	mg/l	0	6.30	NA	5	L642411-01	WG667981
BOD	mg/l	6.00	9.60	46.2*	5	L642647-02	WG667981
BOD	mg/l	310.	290.	6.67*	5	L642665-01	WG667981
Arsenic	mg/l	0	0	0	20	L643025-01	WG668868
Barium	mg/l	1.20	1.15	4.26	20	L643025-01	WG668868
Cadmium	mg/l	0	0.00510	NA	20	L643025-01	WG668868
Chromium	mg/l	0	0.00700	NA	20	L643025-01	WG668868
Lead	mg/l	0.170	0.170	0	20	L643025-01	WG668868
Selenium	mg/l	0	0.00200	NA	20	L643025-01	WG668868
Silver	mg/l	0	0	0	20	L643025-01	WG668868
Sulfide,Dissolved	mg/l	0.0610	0.0630	3.23	20	L642598-01	WG668725
Flashpoint	deg F	0	0	0	20	L642569-01	WG668860
Reactive CN (SW846 7.3.3.2)	mg/l	0	0	0	20	L642569-01	WG668752
Reactive Sulf.(SW846 7.3.4.1)	mg/l	0	0	0	20	L642569-01	WG668749

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Level II

L642598

June 29, 2013

Analyte	Units	Duplicate Result	Duplicate	RPD	Limit	Ref Samp	Batch
Reactive Sulf.(SW846 7.3.4.1)	mg/l	0	0	0	20	L643154-01	WG668749
Specific Conductance	umhos/cm	2100	2000	3.44	20	L642366-02	WG669086
Specific Conductance	umhos/cm	34000	34000	1.48	20	L642800-01	WG669086

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Mercury	mg/l	.003	0.00303	101.	85-115	WG668002
1,4-Dichlorobenzene	mg/l	.01	0.00681	68.1	21-89.4	WG668362
2,4,5-Trichlorophenol	mg/l	.01	0.00731	73.1	34.9-112	WG668362
2,4,6-Trichlorophenol	mg/l	.01	0.00689	68.9	29.8-107	WG668362
2,4-Dinitrotoluene	mg/l	.01	0.00709	70.9	31.2-105	WG668362
2-Methylphenol	mg/l	.01	0.00603	60.3	26.4-86.9	WG668362
3&4-Methyl Phenol	mg/l	.01	0.00644	64.4	27.9-92	WG668362
Hexachloro-1,3-butadiene	mg/l	.01	0.00696	69.6	16.1-104	WG668362
Hexachlorobenzene	mg/l	.01	0.00864	86.4	38.5-116	WG668362
Hexachloroethane	mg/l	.01	0.00592	59.2	16.5-89.8	WG668362
Nitrobenzene	mg/l	.01	0.00736	73.6	31.4-106	WG668362
Pentachlorophenol	mg/l	.01	0.00450	45.0	10-97.4	WG668362
Pyridine	mg/l	.01	0.00431	43.1	13.5-58.9	WG668362
2,4,6-Tribromophenol				69.80	11.2-130	WG668362
2-Fluorobiphenyl				77.10	29.5-131	WG668362
2-Fluorophenol				44.70	10-77.9	WG668362
Nitrobenzene-d5				69.90	21.8-123	WG668362
Phenol-d5				31.60	5-70.1	WG668362
p-Terphenyl-d14				85.80	29.3-137	WG668362
1,1-Dichloroethene	mg/l	.025	0.0275	110.	54-134	WG668430
1,2-Dichloroethane	mg/l	.025	0.0271	108.	69-128	WG668430
Benzene	mg/l	.025	0.0278	111.	72-119	WG668430
Carbon tetrachloride	mg/l	.025	0.0281	112.	63-129	WG668430
Chlorobenzene	mg/l	.025	0.0261	105.	78-123	WG668430
Chloroform	mg/l	.025	0.0283	113.	76-122	WG668430
Tetrachloroethene	mg/l	.025	0.0267	107.	69-131	WG668430
Trichloroethene	mg/l	.025	0.0270	108.	75-121	WG668430
Vinyl chloride	mg/l	.025	0.0229	91.4	55-142	WG668430
4-Bromofluorobenzene				96.48	82-120	WG668430
Dibromofluoromethane				106.0	82-126	WG668430
Toluene-d8				101.1	92-112	WG668430
a,a,a-Trifluorotoluene				104.6	90-116	WG668430
COD	mg/l	183	184.	101.	90-110	WG668217
2,4,5-TP (Silvex)	mg/l	.005	0.00508	102.	60.8-121	WG668420
2,4-D	mg/l	.005	0.00486	97.2	52.4-110	WG668420
2,4-Dichlorophenyl Acetic Acid				113.0	23.3-142	WG668420
Corrosivity		5.79	5.80	100.	98.3-101.7	WG668695
pH	su	5.79	5.80	100.	98.3-101.7	WG668700

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Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
BOD	mg/l	198	188.	94.9	84.6-115.4	WG667981
BOD	mg/l	198	203.	103.	84.6-115.4	WG667981
BOD	mg/l	198	209.	106.	84.6-115.4	WG667981
BOD	mg/l	198	169.	85.4	84.6-115.4	WG667981
BOD	mg/l	198	199.	101.	84.6-115.4	WG667981
BOD	mg/l	198	191.	96.5	84.6-115.4	WG667981
Arsenic	mg/l	1.11	1.07	96.4	85-115	WG668868
Barium	mg/l	1.11	1.07	96.4	85-115	WG668868
Cadmium	mg/l	1.11	1.04	93.7	85-115	WG668868
Chromium	mg/l	1.11	1.08	97.3	85-115	WG668868
Lead	mg/l	1.11	1.04	93.7	85-115	WG668868
Selenium	mg/l	1.11	1.15	104.	85-115	WG668868
Silver	mg/l	1.11	1.12	101.	85-115	WG668868
Sulfide,Dissolved	mg/l	5	0.490	98.0	85-115	WG668725
Flashpoint	deg F	82	83.0	101.	96-104	WG668860
Reactive Sulf.(SW846 7.3.4.1)	mg/l	100	100.	100.	70-130	WG668749
Specific Conductance	umhos/cm	878	880.	100.	85-115	WG669086
Endrin	mg/l	.0002	0.000196	98.2	60-123	WG668366
Lindane	mg/l	.0002	0.000189	94.4	59-116	WG668366
Heptachlor	mg/l	.0002	0.000190	95.2	10-131	WG668366
Methoxychlor	mg/l	.0002	0.000212	106.	66-122	WG668366
Decachlorobiphenyl				74.80	10-141	WG668366
Tetrachloro-m-xylene				86.30	10-125	WG668366

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,4-Dichlorobenzene	mg/l	0.00603	0.00681	60.0	21-89.4	12.2	32.6	WG668362
2,4,5-Trichlorophenol	mg/l	0.00589	0.00731	59.0	34.9-112	21.6	23.9	WG668362
2,4,6-Trichlorophenol	mg/l	0.00535	0.00689	54.0	29.8-107	25.1*	24.1	WG668362
2,4-Dinitrotoluene	mg/l	0.00701	0.00709	70.0	31.2-105	1.06	22	WG668362
2-Methylphenol	mg/l	0.00516	0.00603	52.0	26.4-86.9	15.6	26.5	WG668362
3&4-Methyl Phenol	mg/l	0.00560	0.00644	56.0	27.9-92	14.0	27	WG668362
Hexachloro-1,3-butadiene	mg/l	0.00607	0.00696	61.0	16.1-104	13.6	31.2	WG668362
Hexachlorobenzene	mg/l	0.00872	0.00864	87.0	38.5-116	0.910	20.1	WG668362
Hexachloroethane	mg/l	0.00551	0.00592	55.0	16.5-89.8	7.08	30.7	WG668362
Nitrobenzene	mg/l	0.00653	0.00736	65.0	31.4-106	11.9	25.7	WG668362
Pentachlorophenol	mg/l	0.00327	0.00450	33.0	10-97.4	31.6	35.1	WG668362
Pyridine	mg/l	0.00317	0.00431	32.0	13.5-58.9	30.6	32.5	WG668362
2,4,6-Tribromophenol				60.00	11.2-130			WG668362
2-Fluorobiphenyl				73.70	29.5-131			WG668362
2-Fluorophenol				28.10	10-77.9			WG668362
Nitrobenzene-d5				58.90	21.8-123			WG668362
Phenol-d5				25.00	5-70.1			WG668362
p-Terphenyl-d14				78.20	29.3-137			WG668362

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Est. 1970

S&ME Inc. - Raleigh NC
Claudia Ervin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Laboratory Control Sample Result	Ref	%Rec	Limit	Duplicate RPD	Limit	Batch
1,1-Dichloroethene	mg/l	0.0269	0.0275	108.	54-134	2.19	20	WG668430
1,2-Dichloroethane	mg/l	0.0271	0.0271	108.	69-128	0.0900	20	WG668430
Benzene	mg/l	0.0275	0.0278	110.	72-119	1.09	20	WG668430
Carbon tetrachloride	mg/l	0.0276	0.0281	110.	63-129	1.95	20	WG668430
Chlorobenzene	mg/l	0.0261	0.0261	104.	78-123	0.230	20	WG668430
Chloroform	mg/l	0.0277	0.0283	111.	76-122	2.09	20	WG668430
Tetrachloroethene	mg/l	0.0261	0.0267	104.	69-131	2.28	20	WG668430
Trichloroethene	mg/l	0.0263	0.0270	105.	75-121	2.65	20	WG668430
Vinyl chloride	mg/l	0.0222	0.0229	89.0	55-142	2.83	20	WG668430
4-Bromofluorobenzene				98.55	82-120			WG668430
Dibromofluoromethane				103.2	82-126			WG668430
Toluene-d8				100.8	92-112			WG668430
a,a,a-Trifluorotoluene				102.5	90-116			WG668430
COD	mg/l	191.	184.	104.	90-110	3.73	5	WG668217
2,4,5-TP (Silvex)	mg/l	0.00533	0.00508	106.	60.8-121	4.74	20	WG668420
2,4-D	mg/l	0.00513	0.00486	103.	52.4-110	5.43	20	WG668420
2,4-Dichlorophenyl Acetic Acid				115.0	23.3-142			WG668420
Corrosivity		5.80	5.80	100.	98.3-101.7	0	10	WG668695
pH	su	5.80	5.80	100.	98.3-101.7	0	20	WG668700
Sulfide,Dissolved	mg/l	0.502	0.490	100.	85-115	2.42	20	WG668725
Flashpoint	deg F	83.0	83.0	101.	96-104	0	7	WG668860
Reactive Sulf.(SW846 7.3.4.1)	mg/l	90.0	100.	90.0	70-130	10.5	20	WG668749
Specific Conductance	umhos/	880.	880.	100.	85-115	0	20	WG669086
Endrin	mg/l	0.000198	0.000196	99.0	60-123	0.760	20	WG668366
Lindane	mg/l	0.000191	0.000189	96.0	59-116	1.31	20	WG668366
Heptachlor	mg/l	0.000193	0.000190	97.0	10-131	1.56	28	WG668366
Methoxychlor	mg/l	0.000210	0.000212	105.	66-122	0.750	20	WG668366
Decachlorobiphenyl				63.60	10-141			WG668366
Tetrachloro-m-xylene				89.30	10-125			WG668366

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Mercury	mg/l	0.00340	0.000180	.003	107.	80-120	L642217-01	WG668002
Mercury	mg/l	0.00251	0.0000427	.003	82.1	80-120	L642145-01	WG668002
1,4-Dichlorobenzene	mg/l	0.0608	0	.1	60.8	14-104	L642911-02	WG668362
2,4,5-Trichlorophenol	mg/l	0.0592	0	.1	59.2	30.6-120	L642911-02	WG668362
2,4,6-Trichlorophenol	mg/l	0.0478	0	.1	47.8	19.1-114	L642911-02	WG668362
2,4-Dinitrotoluene	mg/l	0.0741	0	.1	74.1	16.2-135	L642911-02	WG668362

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Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
2-Methylphenol	mg/l	0.00457	0	.1	4.57*	10-133	L642911-02	WG668362
3&4-Methyl Phenol	mg/l	0.00615	0	.1	6.15*	17.4-100	L642911-02	WG668362
Hexachloro-1,3-butadiene	mg/l	0.0634	0	.1	63.4	15.7-109	L642911-02	WG668362
Hexachlorobenzene	mg/l	0.0918	0	.1	91.8	31.9-135	L642911-02	WG668362
Hexachloroethane	mg/l	0.0547	0	.1	54.7	10.4-105	L642911-02	WG668362
Nitrobenzene	mg/l	0.0637	0	.1	63.7	23.1-121	L642911-02	WG668362
Pentachlorophenol	mg/l	0.0619	0	.1	61.9	10-108	L642911-02	WG668362
Pyridine	mg/l	0.0350	0	.1	35.0	10-77.8	L642911-02	WG668362
2,4,6-Tribromophenol					52.20	11.2-130		WG668362
2-Fluorobiphenyl					75.90	29.5-131		WG668362
2-Fluorophenol					10.40	10-77.9		WG668362
Nitrobenzene-d5					60.30	21.8-123		WG668362
Phenol-d5					5.610	5-70.1		WG668362
p-Terphenyl-d14					84.20	29.3-137		WG668362
1,1-Dichloroethene	mg/l	1.31	0	1.25	105.	32-152	L642213-01	WG668430
1,2-Dichloroethane	mg/l	1.34	0	1.25	107.	59-135	L642213-01	WG668430
Benzene	mg/l	1.43	0.0820	1.25	108.	51-134	L642213-01	WG668430
Carbon tetrachloride	mg/l	1.30	0	1.25	104.	49-140	L642213-01	WG668430
Chlorobenzene	mg/l	1.37	0	1.25	109.	69-126	L642213-01	WG668430
Chloroform	mg/l	1.36	0	1.25	108.	64-130	L642213-01	WG668430
Tetrachloroethene	mg/l	1.28	0	1.25	102.	56-139	L642213-01	WG668430
Trichloroethene	mg/l	1.24	0	1.25	99.1	40-155	L642213-01	WG668430
Vinyl chloride	mg/l	1.11	0	1.25	88.8	32-159	L642213-01	WG668430
4-Bromofluorobenzene					94.40	82-120		WG668430
Dibromofluoromethane					99.52	82-126		WG668430
Toluene-d8					99.95	92-112		WG668430
a,a,a-Trifluorotoluene					94.03	90-116		WG668430
1,1-Dichloroethene	mg/l	1.33	0	1.25	106.	32-152	L642598-02	WG668430
1,2-Dichloroethane	mg/l	1.35	0	1.25	108.	59-135	L642598-02	WG668430
Benzene	mg/l	1.34	0	1.25	107.	51-134	L642598-02	WG668430
Carbon tetrachloride	mg/l	1.36	0	1.25	109.	49-140	L642598-02	WG668430
Chlorobenzene	mg/l	1.27	0	1.25	102.	69-126	L642598-02	WG668430
Chloroform	mg/l	1.37	0	1.25	110.	64-130	L642598-02	WG668430
Tetrachloroethene	mg/l	1.28	0	1.25	102.	56-139	L642598-02	WG668430
Trichloroethene	mg/l	1.27	0	1.25	102.	40-155	L642598-02	WG668430
Vinyl chloride	mg/l	1.12	0	1.25	89.6	32-159	L642598-02	WG668430
4-Bromofluorobenzene					99.90	82-120		WG668430
Dibromofluoromethane					103.9	82-126		WG668430
Toluene-d8					101.0	92-112		WG668430
a,a,a-Trifluorotoluene					100.7	90-116		WG668430
COD	mg/l	413.	0	400	103.	90-110	L642658-10	WG668217
2,4,5-TP (Silvex)	mg/l	0.0487	0	.05	97.4	60.8-121	L642911-02	WG668420
2,4-D	mg/l	0.0456	0	.05	91.1	52.4-110	L642911-02	WG668420
2,4-Dichlorophenyl Acetic Acid					112.0	23.3-142		WG668420
Arsenic	mg/l	1.08	0	1.11	97.3	75-125	L643025-01	WG668868
Barium	mg/l	2.20	1.15	1.11	94.6	75-125	L643025-01	WG668868
Cadmium	mg/l	1.04	0.00510	1.11	93.2	75-125	L643025-01	WG668868
Chromium	mg/l	1.06	0.00700	1.11	94.9	75-125	L643025-01	WG668868
Lead	mg/l	1.20	0.170	1.11	92.8	75-125	L643025-01	WG668868
Selenium	mg/l	1.18	0.00200	1.11	106.	75-125	L643025-01	WG668868
Silver	mg/l	1.11	0	1.11	100.	75-125	L643025-01	WG668868

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Quality Assurance Report
Level II

L642598

June 29, 2013

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
Arsenic	mg/l	1.09	0	1.11	98.2	75-125	L643142-09	WG668868
Barium	mg/l	1.20	0	1.11	108.	75-125	L643142-09	WG668868
Cadmium	mg/l	1.06	0	1.11	95.5	75-125	L643142-09	WG668868
Chromium	mg/l	1.10	0	1.11	99.1	75-125	L643142-09	WG668868
Lead	mg/l	1.09	0	1.11	98.2	75-125	L643142-09	WG668868
Selenium	mg/l	1.10	0	1.11	99.1	75-125	L643142-09	WG668868
Silver	mg/l	0.518	0	1.11	46.7*	75-125	L643142-09	WG668868
Sulfide, Dissolved	mg/l	0.882	0.0630	1	81.9	80-120	L642598-01	WG668725
Endrin	mg/l	0.00185	0	.002	92.5	36-135	L642911-02	WG668366
Lindane	mg/l	0.00177	0	.002	88.7	43-105	L642911-02	WG668366
Heptachlor	mg/l	0.00158	0	.002	79.0	10-165	L642911-02	WG668366
Methoxychlor	mg/l	0.00203	0	.002	102.	10-147	L642911-02	WG668366
Decachlorobiphenyl					63.90	10-141		WG668366
Tetrachloro-m-xylene					83.90	10-125		WG668366

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0.00331	0.00340	104.	80-120	2.60	20	L642217-01	WG668002
Mercury	mg/l	0.00274	0.00251	89.9	80-120	8.91	20	L642145-01	WG668002
1,4-Dichlorobenzene	mg/l	0.0675	0.0608	67.5	14-104	10.5	36.4	L642911-02	WG668362
2,4,5-Trichlorophenol	mg/l	0.0620	0.0592	62.0	30.6-120	4.71	33.8	L642911-02	WG668362
2,4,6-Trichlorophenol	mg/l	0.0490	0.0478	49.0	19.1-114	2.47	29.9	L642911-02	WG668362
2,4-Dinitrotoluene	mg/l	0.0750	0.0741	75.0	16.2-135	1.13	20.6	L642911-02	WG668362
2-Methylphenol	mg/l	0.00457	0.00457	4.57*	10-133	0.0300	40	L642911-02	WG668362
3&4-Methyl Phenol	mg/l	0.00591	0.00615	5.92*	17.4-100	3.91	27.7	L642911-02	WG668362
Hexachloro-1,3-butadiene	mg/l	0.0695	0.0634	69.4	15.7-109	9.12	37.6	L642911-02	WG668362
Hexachlorobenzene	mg/l	0.0933	0.0918	93.2	31.9-135	1.54	20	L642911-02	WG668362
Hexachloroethane	mg/l	0.0601	0.0547	60.1	10.4-105	9.47	40	L642911-02	WG668362
Nitrobenzene	mg/l	0.0744	0.0637	74.4	23.1-121	15.6	29	L642911-02	WG668362
Pentachlorophenol	mg/l	0.0626	0.0619	62.6	10-108	1.12	40	L642911-02	WG668362
Pyridine	mg/l	0.0408	0.0350	40.8	10-77.8	15.3	38.8	L642911-02	WG668362
2,4,6-Tribromophenol				53.40	11.2-130				WG668362
2-Fluorobiphenyl				78.70	29.5-131				WG668362
2-Fluorophenol				11.30	10-77.9				WG668362
Nitrobenzene-d5				72.10	21.8-123				WG668362
Phenol-d5				5.480	5-70.1				WG668362
p-Terphenyl-d14				87.80	29.3-137				WG668362
1,1-Dichloroethene	mg/l	1.39	1.31	111.	32-152	5.86	20	L642213-01	WG668430
1,2-Dichloroethane	mg/l	1.40	1.34	112.	59-135	4.27	20	L642213-01	WG668430
Benzene	mg/l	1.49	1.43	112.	51-134	3.80	20	L642213-01	WG668430
Carbon tetrachloride	mg/l	1.36	1.30	109.	49-140	4.63	20	L642213-01	WG668430
Chlorobenzene	mg/l	1.38	1.37	110.	69-126	1.11	20	L642213-01	WG668430
Chloroform	mg/l	1.36	1.36	109.	64-130	0.690	20	L642213-01	WG668430
Tetrachloroethene	mg/l	1.33	1.28	106.	56-139	3.69	20	L642213-01	WG668430
Trichloroethene	mg/l	1.25	1.24	100.	40-155	1.10	20	L642213-01	WG668430
Vinyl chloride	mg/l	1.18	1.11	94.0	32-159	5.76	21	L642213-01	WG668430
4-Bromofluorobenzene				94.94	82-120				WG668430
Dibromofluoromethane				100.4	82-126				WG668430
Toluene-d8				101.2	92-112				WG668430
a,a,a-Trifluorotoluene				92.50	90-116				WG668430

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Quality Assurance Report
Level II

L642598

June 29, 2013

Matrix Spike Duplicate

Analyte	Units	MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
1,1-Dichloroethene	mg/l	1.39	1.33	112.	32-152	4.66	20	L642598-02	WG668430
1,2-Dichloroethane	mg/l	1.41	1.35	113.	59-135	4.34	20	L642598-02	WG668430
Benzene	mg/l	1.39	1.34	111.	51-134	3.83	20	L642598-02	WG668430
Carbon tetrachloride	mg/l	1.42	1.36	114.	49-140	4.54	20	L642598-02	WG668430
Chlorobenzene	mg/l	1.33	1.27	106.	69-126	4.43	20	L642598-02	WG668430
Chloroform	mg/l	1.41	1.37	113.	64-130	2.87	20	L642598-02	WG668430
Tetrachloroethene	mg/l	1.34	1.28	107.	56-139	4.59	20	L642598-02	WG668430
Trichloroethene	mg/l	1.32	1.27	106.	40-155	4.19	20	L642598-02	WG668430
Vinyl chloride	mg/l	1.16	1.12	92.7	32-159	3.43	21	L642598-02	WG668430
4-Bromofluorobenzene				102.0	82-120				WG668430
Dibromofluoromethane				104.6	82-126				WG668430
Toluene-d8				101.4	92-112				WG668430
a,a,a-Trifluorotoluene				101.3	90-116				WG668430
COD	mg/l	403.	413.	101.	90-110	2.45	5	L642658-10	WG668217
2,4,5-TP (Silvex)	mg/l	0.0582	0.0487	116.	60.8-121	17.7	20	L642911-02	WG668420
2,4-D	mg/l	0.0502	0.0456	100.	52.4-110	9.57	20	L642911-02	WG668420
2,4-Dichlorophenyl Acetic Acid				121.0	23.3-142				WG668420
Arsenic	mg/l	1.09	1.08	98.2	75-125	0.922	20	L643025-01	WG668868
Barium	mg/l	2.19	2.20	93.7	75-125	0.456	20	L643025-01	WG668868
Cadmium	mg/l	1.03	1.04	92.3	75-125	0.966	20	L643025-01	WG668868
Chromium	mg/l	1.06	1.06	94.9	75-125	0	20	L643025-01	WG668868
Lead	mg/l	1.19	1.20	91.9	75-125	0.837	20	L643025-01	WG668868
Selenium	mg/l	1.17	1.18	105.	75-125	0.851	20	L643025-01	WG668868
Silver	mg/l	1.10	1.11	99.1	75-125	0.905	20	L643025-01	WG668868
Arsenic	mg/l	1.08	1.09	97.3	75-125	0.922	20	L643142-09	WG668868
Barium	mg/l	1.18	1.20	106.	75-125	1.68	20	L643142-09	WG668868
Cadmium	mg/l	1.04	1.06	93.7	75-125	1.90	20	L643142-09	WG668868
Chromium	mg/l	1.08	1.10	97.3	75-125	1.83	20	L643142-09	WG668868
Lead	mg/l	1.08	1.09	97.3	75-125	0.922	20	L643142-09	WG668868
Selenium	mg/l	1.10	1.10	99.1	75-125	0	20	L643142-09	WG668868
Silver	mg/l	0.623	0.518	56.1*	75-125	18.4	20	L643142-09	WG668868
Sulfide,Dissolved	mg/l	0.896	0.882	83.3	80-120	1.57	20	L642598-01	WG668725
Endrin	mg/l	0.00185	0.00185	92.4	36-135	0.0900	26	L642911-02	WG668366
Lindane	mg/l	0.00176	0.00177	88.2	43-105	0.640	24	L642911-02	WG668366
Heptachlor	mg/l	0.00158	0.00158	79.1	10-165	0.160	39	L642911-02	WG668366
Methoxychlor	mg/l	0.00203	0.00203	101.	10-147	0.120	40	L642911-02	WG668366
Decachlorobiphenyl				65.70	10-141				WG668366
Tetrachloro-m-xylene				82.10	10-125				WG668366

Serial Dilution

Batch number /Run number / Sample number cross reference

WG668002: R2718305: L642598-02
WG667995: R2718966: L642598-02

* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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S&ME Inc. - Raleigh NC
Claudia Ervin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

WG668322: R2719040: L642598-02
WG668362: R2721001: L642598-02
WG668430: R2721002 R2722482: L642598-02 02
WG668217: R2721301: L642598-01
WG668420: R2721681: L642598-02
WG668695: R2723022: L642598-02
WG668700: R2723023: L642598-01
WG667981: R2723400: L642598-01
WG668868: R2723924: L642598-02
WG668725: R2724163: L642598-01
WG668860: R2724280: L642598-02
WG668752: R2724589: L642598-02
WG668749: R2725021: L642598-02
WG669086: R2725082: L642598-01
WG669288: R2725400: L642598-01
WG668366: R2726321: L642598-02

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L642598

June 29, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

Company Name/Address

S & ME (SMERLNC)
3201 Spring Forest Road
Raleigh, North Carolina 27604

Alternate Billing

Report to: Claudia Irvin

E-mail to: cirvin@smeinc.com

Project Description: Edgecombe County

City/State

PHONE: 919-572-2660
FAX: 919-876-3958

Client Project No. 1054-07-240F

Lab Project #

Collected by: SAM WATTS

Site/Facility ID#

P.O.#

Collected by(signature): [signature]

Packed on Ice N__ Y ✓

Rush? (Lab MUST be Notified)
_____Same Day.....200%
_____Next Day.....100%
_____Two Day.....50%

Date Results Needed

Email?___No___Yes
FAX?___No___Yes

Analysis/Container/Preservative

Chain of Custody
Page_1__of__1_

Prepared by:
ESC LABS SCIENCES
YOUR LAB OF CHOICE
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Mt. Juliet TN 37122
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Phone (800) 767-5859
1039

CoCode (lab use only)
SMERLNC
Template/Prelogin

Shipped Via: Raleigh Service Center

Sample ID	Comp/Grab	Matrix*	Depth	Date	Time	No of Cntrs	Full TCLP: 2 x 1L amber glass bottles-no preserv.	Ignitability, Reactivity, & Corrosivity: 1 x 1L amber glass bottle-no preserv.	BOD: 1 x 1L HDPE-no preserv.	COD: 1 x 250 HDPE-sulfuric	pH: 1 x 125 HDPE- no preserv.	Hydrogen Sulfide: 1 x 250ml amber glass septa- NaOh + ZnAc already added(pink)		Remarks/contaminant	Sample # (lab only)
CONDENSATE	Grab	WW	N/A	6/19/13	13:15	7	X	X	X	X	X	X			L642598-01/-02

Matrix: SS-Soil/Solid GW-Groundwater WW-Wastewater DW-Drinking Water OT- Other_____

Remarks:

pH:_____ Temp_____
Flow_____ Other_____

Relinquisher by:(Signature)	Date:	Time:	Received by:(Signature)	Samples returned via: FedEx__ UPS__ Other SWA	Condition (lab use only)
[signature]	6/19/13	15:30	[signature]		Cols I JR
Relinquisher by:(Signature)	Date:	Time:	Received by: (Signature)	Temp: 2.1°C	Bottles Received: 7+1B
[signature]	6/19/13	17:10	Received for lab by: (Signature) [signature]	Date: 06-20-13	Time: 1430
					pH Checked: NCF:

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Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

Report Summary

Monday July 29, 2013

Report Number: L647503

Samples Received: 07/19/13

Client Project: 1054-07-240F

Description: Edgecomber Co. Landfill

The analytical results in this report are based upon information supplied by you, the client, and are for your exclusive use. If you have any questions regarding this data package, please do not hesitate to call.

Entire Report Reviewed By:

Tom Mellette , ESC Representative

Laboratory Certification Numbers

A2LA - 1461-01, AIHA - 100789, AL - 40660, CA - 01157CA, CT - PH-0197, FL - E87487, GA - 923, IN - C-TN-01, KY - 90010, KYUST - 0016, NC - ENV375/DW21704/BIO041, ND - R-140. NJ - TN002, NJ NELAP - TN002, SC - 84004, TN - 2006, VA - 460132, WV - 233, AZ - 0612, MN - 047-999-395, NY - 11742, WI - 998093910, NV - TN000032011-1, TX - T104704245-11-3, OK - 9915, PA - 68-02979, IA Lab #364

Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.
Note: The use of the preparatory EPA Method 3511 is not approved or endorsed by the CA ELAP.

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Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

Date Received : July 19, 2013
Description : Edgecomber County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

ESC Sample # : L647503-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Cyanide	BDL	5.0	ug/l	9012B	07/26/13	1
Total Phenol by 4AAP	2000	80.	ug/l	9066	07/24/13	2
Antimony	19.	1.0	ug/l	6020	07/26/13	1
Arsenic	14.	1.0	ug/l	6020	07/26/13	1
Thallium	BDL	1.0	ug/l	6020	07/26/13	1
Mercury	BDL	0.20	ug/l	7470A	07/22/13	1
Beryllium	BDL	2.0	ug/l	6010B	07/23/13	1
Cadmium	BDL	5.0	ug/l	6010B	07/23/13	1
Chromium	BDL	10.	ug/l	6010B	07/23/13	1
Copper	BDL	20.	ug/l	6010B	07/23/13	1
Lead	BDL	5.0	ug/l	6010B	07/23/13	1
Nickel	BDL	20.	ug/l	6010B	07/23/13	1
Selenium	BDL	20.	ug/l	6010B	07/23/13	1
Silver	BDL	10.	ug/l	6010B	07/23/13	1
Zinc	62.	30.	ug/l	6010B	07/23/13	1
PP Volatile Organics						
Benzene	BDL	1.0	ug/l	8260B	07/20/13	1
Bromodichloromethane	BDL	1.0	ug/l	8260B	07/20/13	1
Bromoform	BDL	1.0	ug/l	8260B	07/20/13	1
Bromomethane	BDL	5.0	ug/l	8260B	07/20/13	1
Carbon tetrachloride	BDL	1.0	ug/l	8260B	07/20/13	1
Chlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
Chlorodibromomethane	BDL	1.0	ug/l	8260B	07/20/13	1
Chloroethane	BDL	5.0	ug/l	8260B	07/20/13	1
2-Chloroethyl vinyl ether	BDL	50.	ug/l	8260B	07/20/13	1
Chloroform	BDL	5.0	ug/l	8260B	07/20/13	1
Chloromethane	BDL	2.5	ug/l	8260B	07/20/13	1
1,2-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,3-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,4-Dichlorobenzene	BDL	1.0	ug/l	8260B	07/20/13	1
1,1-Dichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,2-Dichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,1-Dichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
trans-1,2-Dichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
1,2-Dichloropropane	BDL	1.0	ug/l	8260B	07/20/13	1
cis-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	07/20/13	1
trans-1,3-Dichloropropene	BDL	1.0	ug/l	8260B	07/20/13	1
Ethylbenzene	BDL	1.0	ug/l	8260B	07/20/13	1
Methylene Chloride	BDL	5.0	ug/l	8260B	07/20/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

ESC Sample # : L647503-01

Date Received : July 19, 2013
Description : Edgecomber County

Site ID :

Sample ID : CONDENSATE

Project # : 1054-07-240F

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,1,2,2-Tetrachloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
Tetrachloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
Toluene	BDL	5.0	ug/l	8260B	07/20/13	1
1,1,1-Trichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
1,1,2-Trichloroethane	BDL	1.0	ug/l	8260B	07/20/13	1
Trichloroethene	BDL	1.0	ug/l	8260B	07/20/13	1
Vinyl chloride	BDL	1.0	ug/l	8260B	07/20/13	1
Surrogate Recovery						
Toluene-d8	95.4		% Rec.	8260B	07/20/13	1
Dibromofluoromethane	102.		% Rec.	8260B	07/20/13	1
a,a,a-Trifluorotoluene	100.		% Rec.	8260B	07/20/13	1
4-Bromofluorobenzene	99.2		% Rec.	8260B	07/20/13	1
Pesticide/PCBs						
Aldrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Alpha BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Beta BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Delta BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Gamma BHC	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Chlordane	BDL	0.50	ug/l	8081A/8082	07/23/13	1
4,4-DDD	BDL	0.050	ug/l	8081A/8082	07/23/13	1
4,4-DDE	BDL	0.050	ug/l	8081A/8082	07/23/13	1
4,4-DDT	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Dieldrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan I	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan II	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endosulfan sulfate	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin aldehyde	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Endrin ketone	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Heptachlor	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Heptachlor epoxide	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Hexachlorobenzene	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Methoxychlor	BDL	0.050	ug/l	8081A/8082	07/23/13	1
Toxaphene	BDL	0.50	ug/l	8081A/8082	07/23/13	1
PCB 1016	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1221	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1232	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1242	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1248	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1254	BDL	0.50	ug/l	8081A/8082	07/24/13	1
PCB 1260	BDL	0.50	ug/l	8081A/8082	07/24/13	1
Pest/PCBs Surrogates						
Decachlorobiphenyl	48.8		% Rec.	8081A/8082	07/23/13	1

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

Date Received : July 19, 2013
Description : Edgecomber County

Sample ID : CONDENSATE

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

ESC Sample # : L647503-01

Site ID :

Project # : 1054-07-240F

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
Tetrachloro-m-xylene	19.3		% Rec.	8081A/8082	07/23/13	1
PP Base/Neutral Extractables						
Acenaphthene	BDL	50.	ug/l	8270 C	07/24/13	50
Acenaphthylene	BDL	50.	ug/l	8270 C	07/24/13	50
Anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzidine	BDL	500	ug/l	8270 C	07/24/13	50
Benzo(a)anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(b)fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(k)fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(g,h,i)perylene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzo(a)pyrene	BDL	50.	ug/l	8270 C	07/24/13	50
Bis(2-chlorethoxy)methane	BDL	500	ug/l	8270 C	07/24/13	50
Bis(2-chloroethyl)ether	BDL	500	ug/l	8270 C	07/24/13	50
Bis(2-chloroisopropyl)ether	BDL	500	ug/l	8270 C	07/24/13	50
4-Bromophenyl-phenylether	BDL	500	ug/l	8270 C	07/24/13	50
2-Chloronaphthalene	BDL	50.	ug/l	8270 C	07/24/13	50
4-Chlorophenyl-phenylether	BDL	500	ug/l	8270 C	07/24/13	50
Chrysene	BDL	50.	ug/l	8270 C	07/24/13	50
Dibenz(a,h)anthracene	BDL	50.	ug/l	8270 C	07/24/13	50
3,3-Dichlorobenzidine	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dinitrotoluene	BDL	500	ug/l	8270 C	07/24/13	50
2,6-Dinitrotoluene	BDL	500	ug/l	8270 C	07/24/13	50
Fluoranthene	BDL	50.	ug/l	8270 C	07/24/13	50
Fluorene	BDL	50.	ug/l	8270 C	07/24/13	50
Hexachlorobenzene	BDL	50.	ug/l	8270 C	07/24/13	50
Hexachloro-1,3-butadiene	BDL	500	ug/l	8270 C	07/24/13	50
Hexachlorocyclopentadiene	BDL	500	ug/l	8270 C	07/24/13	50
Hexachloroethane	BDL	500	ug/l	8270 C	07/24/13	50
Indeno(1,2,3-cd)pyrene	BDL	50.	ug/l	8270 C	07/24/13	50
Isophorone	BDL	500	ug/l	8270 C	07/24/13	50
Naphthalene	BDL	50.	ug/l	8270 C	07/24/13	50
Nitrobenzene	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodimethylamine	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodiphenylamine	BDL	500	ug/l	8270 C	07/24/13	50
n-Nitrosodi-n-propylamine	BDL	500	ug/l	8270 C	07/24/13	50
Phenanthrene	BDL	50.	ug/l	8270 C	07/24/13	50
Benzylbutyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Bis(2-ethylhexyl)phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Di-n-butyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Diethyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Dimethyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Di-n-octyl phthalate	BDL	150	ug/l	8270 C	07/24/13	50
Pyrene	BDL	50.	ug/l	8270 C	07/24/13	50

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
L647503-01 (8270PP) - Dilution due to matrix

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REPORT OF ANALYSIS

Claudia Irvin
S&ME Inc. - Raleigh NC
3201 Spring Forest Road
Raleigh, NC 27616

July 29,2013

ESC Sample # : L647503-01

Date Received : July 19, 2013
Description : Edgecomber County

Site ID :

Sample ID : CONDENSATE

Project # : 1054-07-240F

Collected By : Sam Watts
Collection Date : 07/17/13 11:35

Parameter	Result	Det. Limit	Units	Method	Date	Dil.
1,2,4-Trichlorobenzene	BDL	500	ug/l	8270 C	07/24/13	50
PP Acid Extractables						
4-Chloro-3-methylphenol	BDL	500	ug/l	8270 C	07/24/13	50
2-Chlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dichlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dimethylphenol	BDL	500	ug/l	8270 C	07/24/13	50
4,6-Dinitro-2-methylphenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4-Dinitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
2-Nitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
4-Nitrophenol	BDL	500	ug/l	8270 C	07/24/13	50
Pentachlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
Phenol	BDL	500	ug/l	8270 C	07/24/13	50
2,4,6-Trichlorophenol	BDL	500	ug/l	8270 C	07/24/13	50
Surrogate Recovery						
2-Fluorophenol	38.1		% Rec.	8270 C	07/24/13	50
Phenol-d5	1020		% Rec.	8270 C	07/24/13	50
Nitrobenzene-d5	99.0		% Rec.	8270 C	07/24/13	50
2-Fluorobiphenyl	77.0		% Rec.	8270 C	07/24/13	50
2,4,6-Tribromophenol	29.8		% Rec.	8270 C	07/24/13	50
p-Terphenyl-d14	81.5		% Rec.	8270 C	07/24/13	50

BDL - Below Detection Limit
Det. Limit - Practical Quantitation Limit(PQL)
Note:
The reported analytical results relate only to the sample submitted.
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Reported: 07/29/13 10:44 Printed: 07/29/13 10:44
L647503-01 (8270PP) - Dilution due to matrix

Attachment A
List of Analytes with QC Qualifiers

Sample Number	Work Group	Sample Type	Analyte	Run ID	Qualifier
L647503-01	WG673055	SAMP	Acenaphthene	R2757241	O
	WG673055	SAMP	Acenaphthylene	R2757241	O
	WG673055	SAMP	Anthracene	R2757241	O
	WG673055	SAMP	Benzidine	R2757241	O
	WG673055	SAMP	Benzo(a)anthracene	R2757241	O
	WG673055	SAMP	Benzo(b)fluoranthene	R2757241	O
	WG673055	SAMP	Benzo(k)fluoranthene	R2757241	O
	WG673055	SAMP	Benzo(g,h,i)perylene	R2757241	O
	WG673055	SAMP	Benzo(a)pyrene	R2757241	O
	WG673055	SAMP	Bis(2-chlorethoxy)methane	R2757241	O
	WG673055	SAMP	Bis(2-chloroethyl)ether	R2757241	O
	WG673055	SAMP	Bis(2-chloroisopropyl)ether	R2757241	O
	WG673055	SAMP	4-Bromophenyl-phenylether	R2757241	O
	WG673055	SAMP	2-Chloronaphthalene	R2757241	O
	WG673055	SAMP	4-Chlorophenyl-phenylether	R2757241	O
	WG673055	SAMP	Chrysene	R2757241	O
	WG673055	SAMP	Dibenz(a,h)anthracene	R2757241	O
	WG673055	SAMP	3,3-Dichlorobenzidine	R2757241	O
	WG673055	SAMP	2,4-Dinitrotoluene	R2757241	O
	WG673055	SAMP	2,6-Dinitrotoluene	R2757241	O
	WG673055	SAMP	Fluoranthene	R2757241	O
	WG673055	SAMP	Fluorene	R2757241	O
	WG673055	SAMP	Hexachlorobenzene	R2757241	O
	WG673055	SAMP	Hexachloro-1,3-butadiene	R2757241	O
	WG673055	SAMP	Hexachlorocyclopentadiene	R2757241	O
	WG673055	SAMP	Hexachloroethane	R2757241	O
	WG673055	SAMP	Indeno(1,2,3-cd)pyrene	R2757241	O
	WG673055	SAMP	Isophorone	R2757241	O
	WG673055	SAMP	Naphthalene	R2757241	O
	WG673055	SAMP	Nitrobenzene	R2757241	O
	WG673055	SAMP	n-Nitrosodimethylamine	R2757241	O
	WG673055	SAMP	n-Nitrosodiphenylamine	R2757241	O
	WG673055	SAMP	n-Nitrosodi-n-propylamine	R2757241	O
	WG673055	SAMP	Phenanthrene	R2757241	O
	WG673055	SAMP	Benzylbutyl phthalate	R2757241	O
	WG673055	SAMP	Bis(2-ethylhexyl)phthalate	R2757241	O
	WG673055	SAMP	Di-n-butyl phthalate	R2757241	O
	WG673055	SAMP	Diethyl phthalate	R2757241	O
	WG673055	SAMP	Dimethyl phthalate	R2757241	O
	WG673055	SAMP	Di-n-octyl phthalate	R2757241	O
	WG673055	SAMP	Pyrene	R2757241	O
	WG673055	SAMP	1,2,4-Trichlorobenzene	R2757241	O
	WG673055	SAMP	4-Chloro-3-methylphenol	R2757241	O
	WG673055	SAMP	2-Chlorophenol	R2757241	O
	WG673055	SAMP	2,4-Dichlorophenol	R2757241	O
	WG673055	SAMP	2,4-Dimethylphenol	R2757241	O
	WG673055	SAMP	4,6-Dinitro-2-methylphenol	R2757241	O
	WG673055	SAMP	2,4-Dinitrophenol	R2757241	O
	WG673055	SAMP	2-Nitrophenol	R2757241	O
	WG673055	SAMP	4-Nitrophenol	R2757241	O
	WG673055	SAMP	Pentachlorophenol	R2757241	OJ3
	WG673055	SAMP	Phenol	R2757241	O
	WG673055	SAMP	2,4,6-Trichlorophenol	R2757241	O
	WG673055	SAMP	2-Fluorophenol	R2757241	J7
	WG673055	SAMP	Phenol-d5	R2757241	J7
	WG673055	SAMP	Nitrobenzene-d5	R2757241	J7
	WG673055	SAMP	2-Fluorobiphenyl	R2757241	J7
	WG673055	SAMP	2,4,6-Tribromophenol	R2757241	J7
	WG673055	SAMP	p-Terphenyl-d14	R2757241	J7
	WG672968	SAMP	Delta BHC	R2755006	J3
	WG672968	SAMP	4,4-DDD	R2755006	J3
	WG672968	SAMP	4,4-DDE	R2755006	J3
	WG672968	SAMP	4,4-DDT	R2755006	J3
	WG672968	SAMP	Endrin aldehyde	R2755006	J4
	WG672968	SAMP	PCB 1260	R2757062	J3

Attachment B
Explanation of QC Qualifier Codes

Qualifier	Meaning
J3	The associated batch QC was outside the established quality control range for precision.
J4	The associated batch QC was outside the established quality control range for accuracy.
J7	Surrogate recovery cannot be used for control limit evaluation due to dilution.
O	(ESC) Sample diluted due to matrix interferences that impaired the ability to make an accurate analytical determination. The detection limit is elevated in order to reflect the necessary dilution.

Qualifier Report Information

ESC utilizes sample and result qualifiers as set forth by the EPA Contract Laboratory Program and as required by most certifying bodies including NELAC. In addition to the EPA qualifiers adopted by ESC, we have implemented ESC qualifiers to provide more information pertaining to our analytical results. Each qualifier is designated in the qualifier explanation as either EPA or ESC. Data qualifiers are intended to provide the ESC client with more detailed information concerning the potential bias of reported data. Because of the wide range of constituents and variety of matrices incorporated by most EPA methods,it is common for some compounds to fall outside of established ranges. These exceptions are evaluated and all reported data is valid and useable "unless qualified as 'R' (Rejected)."

Definitions

Accuracy - The relationship of the observed value of a known sample to the true value of a known sample. Represented by percent recovery and relevant to samples such as: control samples, matrix spike recoveries, surrogate recoveries, etc.

Precision - The agreement between a set of samples or between duplicate samples. Relates to how close together the results are and is represented by Relative Percent Differrence.

Surrogate - Organic compounds that are similar in chemical composition, extraction, and chromotography to analytes of interest. The surrogates are used to determine the probable response of the group of analytes that are chemically related to the surrogate compound. Surrogates are added to the sample and carried through all stages of preparation and analyses.

TIC - Tentatively Identified Compound: Compounds detected in samples that are not target compounds, internal standards, system monitoring compounds, or surrogates.

Summary of Remarks For Samples Printed
07/29/13 at 10:44:44

TSR Signing Reports: 690
R5 - Desired TAT

GW -Arsenic always needs ASG

Sample: L647503-01 Account: SMERLNC Received: 07/19/13 12:00 Due Date: 07/26/13 00:00 RPT Date: 07/29/13 10:44

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Level II

L647503

July 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
1,1,1-Trichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1,2,2-Tetrachloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1,2-Trichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1-Dichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,1-Dichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichloroethane	< .001	mg/l			WG672945	07/20/13 02:00
1,2-Dichloropropane	< .001	mg/l			WG672945	07/20/13 02:00
1,3-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
1,4-Dichlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
2-Chloroethyl vinyl ether	< .05	mg/l			WG672945	07/20/13 02:00
Benzene	< .001	mg/l			WG672945	07/20/13 02:00
Bromodichloromethane	< .001	mg/l			WG672945	07/20/13 02:00
Bromoform	< .001	mg/l			WG672945	07/20/13 02:00
Bromomethane	< .005	mg/l			WG672945	07/20/13 02:00
Carbon tetrachloride	< .001	mg/l			WG672945	07/20/13 02:00
Chlorobenzene	< .001	mg/l			WG672945	07/20/13 02:00
Chlorodibromomethane	< .001	mg/l			WG672945	07/20/13 02:00
Chloroethane	< .005	mg/l			WG672945	07/20/13 02:00
Chloroform	< .005	mg/l			WG672945	07/20/13 02:00
Chloromethane	< .0025	mg/l			WG672945	07/20/13 02:00
cis-1,3-Dichloropropene	< .001	mg/l			WG672945	07/20/13 02:00
Ethylbenzene	< .001	mg/l			WG672945	07/20/13 02:00
Methylene Chloride	< .005	mg/l			WG672945	07/20/13 02:00
Tetrachloroethene	< .001	mg/l			WG672945	07/20/13 02:00
Toluene	< .005	mg/l			WG672945	07/20/13 02:00
trans-1,2-Dichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
trans-1,3-Dichloropropene	< .001	mg/l			WG672945	07/20/13 02:00
Trichloroethene	< .001	mg/l			WG672945	07/20/13 02:00
Vinyl chloride	< .001	mg/l			WG672945	07/20/13 02:00
4-Bromofluorobenzene		% Rec.	106.0	82-120	WG672945	07/20/13 02:00
Dibromofluoromethane		% Rec.	103.0	82-126	WG672945	07/20/13 02:00
Toluene-d8		% Rec.	99.00	92-112	WG672945	07/20/13 02:00
a,a,a-Trifluorotoluene		% Rec.	101.0	90-116	WG672945	07/20/13 02:00
Mercury	< .0002	mg/l			WG673036	07/22/13 08:56
4,4-DDD	< .00005	mg/l			WG672968	07/23/13 17:45
4,4-DDE	< .00005	mg/l			WG672968	07/23/13 17:45
4,4-DDT	< .00005	mg/l			WG672968	07/23/13 17:45
Aldrin	< .00005	mg/l			WG672968	07/23/13 17:45
Alpha BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Beta BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Chlordane	< .005	mg/l			WG672968	07/23/13 17:45
Delta BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Dieldrin	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan I	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan II	< .00005	mg/l			WG672968	07/23/13 17:45
Endosulfan sulfate	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin aldehyde	< .00005	mg/l			WG672968	07/23/13 17:45
Endrin ketone	< .00005	mg/l			WG672968	07/23/13 17:45
Gamma BHC	< .00005	mg/l			WG672968	07/23/13 17:45
Heptachlor	< .00005	mg/l			WG672968	07/23/13 17:45
Heptachlor epoxide	< .00005	mg/l			WG672968	07/23/13 17:45
Hexachlorobenzene	< .00005	mg/l			WG672968	07/23/13 17:45
Methoxychlor	< .00005	mg/l			WG672968	07/23/13 17:45

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Level II

L647503

July 29, 2013

Laboratory Blank

Analyte	Result	Units	% Rec	Limit	Batch	Date Analyzed
Toxaphene	< .0005	mg/l			WG672968	07/23/13 17:45
Decachlorobiphenyl		% Rec.	74.10	10-141	WG672968	07/23/13 17:45
Tetrachloro-m-xylene		% Rec.	33.60	10-125	WG672968	07/23/13 17:45
Total Phenol by 4AAP	< .04	mg/l			WG673461	07/24/13 13:40
Beryllium	< .002	mg/l			WG673077	07/23/13 22:48
Cadmium	< .005	mg/l			WG673077	07/23/13 22:48
Chromium	< .01	mg/l			WG673077	07/23/13 22:48
Copper	< .02	mg/l			WG673077	07/23/13 22:48
Lead	< .005	mg/l			WG673077	07/23/13 22:48
Nickel	< .02	mg/l			WG673077	07/23/13 22:48
Selenium	< .02	mg/l			WG673077	07/23/13 22:48
Silver	< .01	mg/l			WG673077	07/23/13 22:48
Zinc	< .03	mg/l			WG673077	07/23/13 22:48
PCB 1016	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1221	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1232	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1242	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1248	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1254	< .0005	mg/l			WG672968	07/24/13 14:58
PCB 1260	< .0005	mg/l			WG672968	07/24/13 14:58
Decachlorobiphenyl		% Rec.	86.60	10-141	WG672968	07/24/13 14:58
Tetrachloro-m-xylene		% Rec.	36.10	10-125	WG672968	07/24/13 14:58
Cyanide	< .005	mg/l			WG673413	07/26/13 11:24
Antimony	< .001	mg/l			WG673297	07/26/13 04:07
Thallium	< .001	mg/l			WG673297	07/26/13 04:07
Arsenic	< .001	mg/l			WG673297	07/25/13 23:12

Duplicate

Analyte	Units	Result	Duplicate	RPD	Limit	Ref Samp	Batch
Mercury	mg/l	0	0.0000108	12.1	20	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	0.120	0.130	8.00	20	L647419-02	WG673461
Total Phenol by 4AAP	mg/l	0.0910	0.120	27.5*	20	L647516-02	WG673461
Beryllium	mg/l	0	0	0	20	L647525-04	WG673077
Cadmium	mg/l	0	0.0000100	NA	20	L647525-04	WG673077
Chromium	mg/l	0	0	0	20	L647525-04	WG673077
Copper	mg/l	0	0.00210	NA	20	L647525-04	WG673077
Lead	mg/l	0	0	0	20	L647525-04	WG673077
Nickel	mg/l	0.0260	0.0198	27.1*	20	L647525-04	WG673077
Selenium	mg/l	0	0.0159	NA	20	L647525-04	WG673077
Silver	mg/l	0	0.00620	NA	20	L647525-04	WG673077
Zinc	mg/l	0	0	0	20	L647525-04	WG673077
Cyanide	mg/l	0	0	0	20	L647844-01	WG673413

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July 29, 2013

Analyte	Units	Result	Duplicate Duplicate	RPD	Limit	Ref Samp	Batch
Cyanide	mg/l	0	0	0	20	L647441-07	WG673413
Antimony	mg/l	0	0	0	20	L647630-06	WG673297
Thallium	mg/l	0	0	0	20	L647630-06	WG673297
Arsenic	mg/l	0	0	0	20	L647630-06	WG673297

Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
1,1,1-Trichloroethane	mg/l	.025	0.0231	92.3	71-126	WG672945
1,1,2,2-Tetrachloroethane	mg/l	.025	0.0221	88.6	78-130	WG672945
1,1,2-Trichloroethane	mg/l	.025	0.0228	91.3	81-121	WG672945
1,1-Dichloroethane	mg/l	.025	0.0243	97.1	73-123	WG672945
1,1-Dichloroethene	mg/l	.025	0.0254	102.	54-134	WG672945
1,2-Dichlorobenzene	mg/l	.025	0.0239	95.5	82-121	WG672945
1,2-Dichloroethane	mg/l	.025	0.0245	98.2	69-128	WG672945
1,2-Dichloropropane	mg/l	.025	0.0225	90.0	77-121	WG672945
1,3-Dichlorobenzene	mg/l	.025	0.0248	99.3	77-127	WG672945
1,4-Dichlorobenzene	mg/l	.025	0.0237	94.9	79-117	WG672945
2-Chloroethyl vinyl ether	mg/l	.125	0.122	97.8	26-172	WG672945
Benzene	mg/l	.025	0.0235	93.6	72-119	WG672945
Bromodichloromethane	mg/l	.025	0.0223	89.0	75-127	WG672945
Bromoform	mg/l	.025	0.0251	100.	61-136	WG672945
Bromomethane	mg/l	.025	0.0246	98.4	42-172	WG672945
Carbon tetrachloride	mg/l	.025	0.0243	97.1	63-129	WG672945
Chlorobenzene	mg/l	.025	0.0248	99.0	78-123	WG672945
Chlorodibromomethane	mg/l	.025	0.0239	95.5	73-128	WG672945
Chloroethane	mg/l	.025	0.0249	99.5	52-164	WG672945
Chloroform	mg/l	.025	0.0240	96.2	76-122	WG672945
Chloromethane	mg/l	.025	0.0216	86.4	50-141	WG672945
cis-1,3-Dichloropropene	mg/l	.025	0.0233	93.1	74-124	WG672945
Ethylbenzene	mg/l	.025	0.0249	99.5	77-124	WG672945
Methylene Chloride	mg/l	.025	0.0230	92.0	67-122	WG672945
Tetrachloroethene	mg/l	.025	0.0257	103.	69-131	WG672945
Toluene	mg/l	.025	0.0232	92.8	75-114	WG672945
trans-1,2-Dichloroethene	mg/l	.025	0.0225	90.1	63-127	WG672945
trans-1,3-Dichloropropene	mg/l	.025	0.0232	92.7	69-124	WG672945
Trichloroethene	mg/l	.025	0.0243	97.2	69-131	WG672945
Vinyl chloride	mg/l	.025	0.0231	92.5	55-142	WG672945
4-Bromofluorobenzene				102.0	82-120	WG672945
Dibromofluoromethane				96.40	82-126	WG672945
Toluene-d8				102.0	92-112	WG672945
a,a,a-Trifluorotoluene				104.0	90-116	WG672945
Mercury	mg/l	.003	0.00299	99.8	85-115	WG673036
4,4-DDD	mg/l	.0002	0.000214	107.	60-123	WG672968
4,4-DDE	mg/l	.0002	0.000151	75.3	50-120	WG672968
4,4-DDT	mg/l	.0002	0.000178	88.8	61-121	WG672968
Aldrin	mg/l	.0002	0.0000662	33.1	10-136	WG672968
Alpha BHC	mg/l	.0002	0.000179	89.5	58-114	WG672968
Beta BHC	mg/l	.0002	0.000195	97.7	61-120	WG672968
Delta BHC	mg/l	.0002	0.000192	96.2	57-120	WG672968
Dieldrin	mg/l	.0002	0.000183	91.4	62-123	WG672968
Endosulfan I	mg/l	.0002	0.000176	88.1	63-123	WG672968
Endosulfan II	mg/l	.0002	0.000201	100.	63-124	WG672968

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Analyte	Units	Laboratory Control Sample Known Val	Result	% Rec	Limit	Batch
Endosulfan sulfate	mg/l	.0002	0.000194	97.0	59-125	WG672968
Endrin	mg/l	.0002	0.000193	96.6	60-123	WG672968
Endrin aldehyde	mg/l	.0002	0.000193	96.5*	42-92	WG672968
Endrin ketone	mg/l	.0002	0.000188	94.0	60-117	WG672968
Gamma BHC	mg/l	.0002	0.000179	89.6	59-116	WG672968
Heptachlor	mg/l	.0002	0.0000882	44.1	10-131	WG672968
Heptachlor epoxide	mg/l	.0002	0.000177	88.6	61-118	WG672968
Hexachlorobenzene	mg/l	.0002	0.0000985	49.2	28-116	WG672968
Methoxychlor	mg/l	.0002	0.000209	105.	66-122	WG672968
Decachlorobiphenyl				63.40	10-141	WG672968
Tetrachloro-m-xylene				29.60	10-125	WG672968
Total Phenol by 4AAP	mg/l	.5	0.548	110.	90-110	WG673461
Beryllium	mg/l	1	0.996	99.6	85-115	WG673077
Cadmium	mg/l	1	1.02	102.	85-115	WG673077
Chromium	mg/l	1	1.03	103.	85-115	WG673077
Copper	mg/l	1	1.03	103.	85-115	WG673077
Lead	mg/l	1	1.04	104.	85-115	WG673077
Nickel	mg/l	1	0.945	94.5	85-115	WG673077
Selenium	mg/l	1	0.990	99.0	85-115	WG673077
Silver	mg/l	1	0.992	99.2	85-115	WG673077
Zinc	mg/l	1	0.991	99.1	85-115	WG673077
PCB 1016	mg/l	.0005	0.000420	84.0	32-126	WG672968
PCB 1260	mg/l	.0005	0.000446	89.3	58-128	WG672968
Decachlorobiphenyl				81.30	10-141	WG672968
Tetrachloro-m-xylene				41.60	10-125	WG672968
Cyanide	mg/l	.1	0.0939	93.9	90-110	WG673413
Antimony	mg/l	.05	0.0458	91.6	85-115	WG673297
Thallium	mg/l	.05	0.0452	90.4	85-115	WG673297
Arsenic	mg/l	.05	0.0461	92.2	85-115	WG673297

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
1,1,1-Trichloroethane	mg/l	0.0232	0.0231	93.0	71-126	0.490	20	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0229	0.0221	92.0	78-130	3.57	20	WG672945
1,1,2-Trichloroethane	mg/l	0.0238	0.0228	95.0	81-121	4.00	20	WG672945
1,1-Dichloroethane	mg/l	0.0242	0.0243	97.0	73-123	0.490	20	WG672945
1,1-Dichloroethene	mg/l	0.0247	0.0254	99.0	54-134	2.68	20	WG672945
1,2-Dichlorobenzene	mg/l	0.0243	0.0239	97.0	82-121	1.68	20	WG672945
1,2-Dichloroethane	mg/l	0.0247	0.0245	99.0	69-128	0.510	20	WG672945
1,2-Dichloropropane	mg/l	0.0234	0.0225	94.0	77-121	4.09	20	WG672945
1,3-Dichlorobenzene	mg/l	0.0257	0.0248	103.	77-127	3.48	20	WG672945
1,4-Dichlorobenzene	mg/l	0.0244	0.0237	98.0	79-117	2.88	20	WG672945
2-Chloroethyl vinyl ether	mg/l	0.125	0.122	100.	26-172	2.20	22	WG672945
Benzene	mg/l	0.0239	0.0235	96.0	72-119	2.03	20	WG672945
Bromodichloromethane	mg/l	0.0230	0.0223	92.0	75-127	3.11	20	WG672945
Bromoform	mg/l	0.0265	0.0251	106.	61-136	5.27	20	WG672945
Bromomethane	mg/l	0.0246	0.0246	98.0	42-172	0.160	20	WG672945
Carbon tetrachloride	mg/l	0.0242	0.0243	97.0	63-129	0.460	20	WG672945

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Claudia Irvin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

Analyte	Units	Laboratory Control Sample Duplicate Result	Ref	%Rec	Limit	RPD	Limit	Batch
Chlorobenzene	mg/l	0.0259	0.0248	104.	78-123	4.50	20	WG672945
Chlorodibromomethane	mg/l	0.0246	0.0239	98.0	73-128	3.11	20	WG672945
Chloroethane	mg/l	0.0242	0.0249	97.0	52-164	2.75	20	WG672945
Chloroform	mg/l	0.0245	0.0240	98.0	76-122	1.96	20	WG672945
Chloromethane	mg/l	0.0214	0.0216	86.0	50-141	0.910	20	WG672945
cis-1,3-Dichloropropene	mg/l	0.0242	0.0233	97.0	74-124	4.03	20	WG672945
Ethylbenzene	mg/l	0.0257	0.0249	103.	77-124	3.17	20	WG672945
Methylene Chloride	mg/l	0.0227	0.0230	91.0	67-122	1.54	20	WG672945
Tetrachloroethene	mg/l	0.0266	0.0257	106.	69-131	3.44	20	WG672945
Toluene	mg/l	0.0236	0.0232	94.0	75-114	1.85	20	WG672945
trans-1,2-Dichloroethene	mg/l	0.0223	0.0225	89.0	63-127	0.880	20	WG672945
trans-1,3-Dichloropropene	mg/l	0.0232	0.0232	93.0	69-124	0.160	20	WG672945
Trichloroethene	mg/l	0.0250	0.0243	100.	69-131	2.69	20	WG672945
Vinyl chloride	mg/l	0.0229	0.0231	91.0	55-142	1.17	20	WG672945
4-Bromofluorobenzene				106.0	82-120			WG672945
Dibromofluoromethane				99.60	82-126			WG672945
Toluene-d8				102.0	92-112			WG672945
a,a,a-Trifluorotoluene				102.0	90-116			WG672945
4,4-DDD	mg/l	0.000173	0.000214	87.0	60-123	21.3*	20	WG672968
4,4-DDE	mg/l	0.000109	0.000151	55.0	50-120	31.8*	22	WG672968
4,4-DDT	mg/l	0.000138	0.000178	69.0	61-121	25.3*	20	WG672968
Aldrin	mg/l	0.0000627	0.0000662	31.0	10-136	5.53	33	WG672968
Alpha BHC	mg/l	0.000165	0.000179	83.0	58-114	7.91	21	WG672968
Beta BHC	mg/l	0.000177	0.000195	88.0	61-120	9.98	20	WG672968
Delta BHC	mg/l	0.000154	0.000192	77.0	57-120	22.1*	21	WG672968
Dieldrin	mg/l	0.000160	0.000183	80.0	62-123	13.5	20	WG672968
Endosulfan I	mg/l	0.000156	0.000176	78.0	63-123	12.0	20	WG672968
Endosulfan II	mg/l	0.000184	0.000201	92.0	63-124	8.64	20	WG672968
Endosulfan sulfate	mg/l	0.000179	0.000194	90.0	59-125	7.98	21	WG672968
Endrin	mg/l	0.000170	0.000193	85.0	60-123	12.5	20	WG672968
Endrin aldehyde	mg/l	0.000172	0.000193	86.0	42-92	11.6	21	WG672968
Endrin ketone	mg/l	0.000179	0.000188	89.0	60-117	5.19	20	WG672968
Gamma BHC	mg/l	0.000162	0.000179	81.0	59-116	9.90	20	WG672968
Heptachlor	mg/l	0.0000901	0.0000882	45.0	10-131	2.13	28	WG672968
Heptachlor epoxide	mg/l	0.000157	0.000177	78.0	61-118	11.9	20	WG672968
Hexachlorobenzene	mg/l	0.000108	0.0000985	54.0	28-116	9.30	27	WG672968
Methoxychlor	mg/l	0.000181	0.000209	91.0	66-122	14.4	20	WG672968
Decachlorobiphenyl				63.00	10-141			WG672968
Tetrachloro-m-xylene				35.10	10-125			WG672968
Total Phenol by 4AAP	mg/l	0.544	0.546	109.	90-110	0.733	20	WG673461
PCB 1016	mg/l	0.000430	0.000420	86.0	32-126	2.27	22	WG672968
PCB 1260	mg/l	0.000568	0.000446	114.	58-128	24.1*	20	WG672968
Decachlorobiphenyl				94.70	10-141			WG672968
Tetrachloro-m-xylene				42.70	10-125			WG672968
Cyanide	mg/l	0.101	0.0939	101.	90-110	7.29	20	WG673413

Analyte	Units	Matrix Spike MS Res	Ref Res	TV	% Rec	Limit	Ref Samp	Batch
1,1,1-Trichloroethane	mg/l	0.0205	0	.025	81.9	58-137	L647630-01	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0183	0	.025	73.2	64-149	L647630-01	WG672945

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Analyte	Units	MS Res	Matrix Spike Ref Res	TV	% Rec	Limit	Ref Samp	Batch
1,1,2-Trichloroethane	mg/l	0.0188	0	.025	75.1	73-128	L647630-01	WG672945
1,1-Dichloroethane	mg/l	0.0356	0.0152	.025	81.8	58-133	L647630-01	WG672945
1,1-Dichloroethene	mg/l	0.0227	0	.025	90.7	32-152	L647630-01	WG672945
1,2-Dichlorobenzene	mg/l	0.0205	0	.025	81.9	75-125	L647630-01	WG672945
1,2-Dichloroethane	mg/l	0.0209	0	.025	83.5	59-135	L647630-01	WG672945
1,2-Dichloropropane	mg/l	0.0194	0	.025	77.8	68-126	L647630-01	WG672945
1,3-Dichlorobenzene	mg/l	0.0210	0	.025	84.0	69-131	L647630-01	WG672945
1,4-Dichlorobenzene	mg/l	0.0228	0	.025	91.0	70-123	L647630-01	WG672945
2-Chloroethyl vinyl ether	mg/l	0.0822	0	.125	65.8	10-161	L647630-01	WG672945
Benzene	mg/l	0.0212	0.00135	.025	79.2	51-134	L647630-01	WG672945
Bromodichloromethane	mg/l	0.0189	0	.025	75.5	67-132	L647630-01	WG672945
Bromoform	mg/l	0.0205	0	.025	82.1	59-137	L647630-01	WG672945
Bromomethane	mg/l	0.0205	0	.025	81.8	23-177	L647630-01	WG672945
Carbon tetrachloride	mg/l	0.0212	0	.025	84.8	49-140	L647630-01	WG672945
Chlorobenzene	mg/l	0.0220	0.00153	.025	81.7	69-126	L647630-01	WG672945
Chlorodibromomethane	mg/l	0.0196	0	.025	78.2	68-130	L647630-01	WG672945
Chloroethane	mg/l	0.0231	0.00226	.025	83.3	32-177	L647630-01	WG672945
Chloroform	mg/l	0.0210	0	.025	84.1	64-130	L647630-01	WG672945
Chloromethane	mg/l	0.0180	0	.025	72.0	27-155	L647630-01	WG672945
cis-1,3-Dichloropropene	mg/l	0.0196	0	.025	78.2	63-127	L647630-01	WG672945
Ethylbenzene	mg/l	0.0206	0	.025	82.5	64-135	L647630-01	WG672945
Methylene Chloride	mg/l	0.0201	0.000356	.025	79.2	52-130	L647630-01	WG672945
Tetrachloroethene	mg/l	0.0217	0	.025	86.7	56-139	L647630-01	WG672945
Toluene	mg/l	0.0197	0.000307	.025	77.6	61-126	L647630-01	WG672945
trans-1,2-Dichloroethene	mg/l	0.0198	0	.025	79.3	45-137	L647630-01	WG672945
trans-1,3-Dichloropropene	mg/l	0.0187	0	.025	74.6	59-130	L647630-01	WG672945
Trichloroethene	mg/l	0.0210	0.000808	.025	80.9	40-155	L647630-01	WG672945
Vinyl chloride	mg/l	0.0217	0.00244	.025	77.1	32-159	L647630-01	WG672945
4-Bromofluorobenzene					101.0	82-120		WG672945
Dibromofluoromethane					101.0	82-126		WG672945
Toluene-d8					101.0	92-112		WG672945
a,a,a-Trifluorotoluene					103.0	90-116		WG672945
Mercury	mg/l	0.00296	0.0000108	.003	98.2	80-120	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	2.97	2.00	1	97.0	90-110	L647503-01	WG673461
Beryllium	mg/l	1.00	0	1	100.	75-125	L647525-04	WG673077
Cadmium	mg/l	1.01	0.0000100	1	101.	75-125	L647525-04	WG673077
Chromium	mg/l	0.976	0	1	97.6	75-125	L647525-04	WG673077
Copper	mg/l	1.02	0.00210	1	102.	75-125	L647525-04	WG673077
Lead	mg/l	0.987	0	1	98.7	75-125	L647525-04	WG673077
Nickel	mg/l	0.929	0.0198	1	90.9	75-125	L647525-04	WG673077
Selenium	mg/l	0.972	0.0159	1	95.6	75-125	L647525-04	WG673077
Silver	mg/l	0.0472	0.00620	1	4.10*	75-125	L647525-04	WG673077
Zinc	mg/l	0.992	0	1	99.2	75-125	L647525-04	WG673077
Cyanide	mg/l	0.191	0	.2	95.5	90-110	L647441-08	WG673413
Antimony	mg/l	0.0450	0	.05	90.0	75-125	L647630-06	WG673297
Thallium	mg/l	0.0460	0	.05	92.0	75-125	L647630-06	WG673297
Arsenic	mg/l	0.0470	0	.05	94.0	75-125	L647630-06	WG673297

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Quality Assurance Report
Level II

L647503

July 29, 2013

Analyte	Units	Matrix Spike Duplicate MSD	Ref	%Rec	Limit	RPD	Limit	Ref Samp	Batch
1,1,1-Trichloroethane	mg/l	0.0221	0.0205	88.3	58-137	7.55	20	L647630-01	WG672945
1,1,2,2-Tetrachloroethane	mg/l	0.0213	0.0183	85.1	64-149	15.0	20	L647630-01	WG672945
1,1,2-Trichloroethane	mg/l	0.0212	0.0188	84.7	73-128	12.0	20	L647630-01	WG672945
1,1-Dichloroethane	mg/l	0.0374	0.0356	89.1	58-133	4.99	20	L647630-01	WG672945
1,1-Dichloroethene	mg/l	0.0238	0.0227	95.2	32-152	4.89	20	L647630-01	WG672945
1,2-Dichlorobenzene	mg/l	0.0230	0.0205	91.9	75-125	11.5	20	L647630-01	WG672945
1,2-Dichloroethane	mg/l	0.0239	0.0209	95.4	59-135	13.3	20	L647630-01	WG672945
1,2-Dichloropropane	mg/l	0.0218	0.0194	87.0	68-126	11.2	20	L647630-01	WG672945
1,3-Dichlorobenzene	mg/l	0.0237	0.0210	94.7	69-131	11.9	20	L647630-01	WG672945
1,4-Dichlorobenzene	mg/l	0.0256	0.0228	102.	70-123	11.7	20	L647630-01	WG672945
2-Chloroethyl vinyl ether	mg/l	0.0670	0.0822	53.6	10-161	20.3	40	L647630-01	WG672945
Benzene	mg/l	0.0235	0.0212	88.8	51-134	10.7	20	L647630-01	WG672945
Bromodichloromethane	mg/l	0.0210	0.0189	84.0	67-132	10.6	20	L647630-01	WG672945
Bromoform	mg/l	0.0238	0.0205	95.2	59-137	14.7	20	L647630-01	WG672945
Bromomethane	mg/l	0.0214	0.0205	85.5	23-177	4.36	21	L647630-01	WG672945
Carbon tetrachloride	mg/l	0.0230	0.0212	91.9	49-140	7.96	20	L647630-01	WG672945
Chlorobenzene	mg/l	0.0247	0.0220	92.7	69-126	11.8	20	L647630-01	WG672945
Chlorodibromomethane	mg/l	0.0226	0.0196	90.4	68-130	14.4	20	L647630-01	WG672945
Chloroethane	mg/l	0.0243	0.0231	88.3	32-177	5.29	21	L647630-01	WG672945
Chloroform	mg/l	0.0232	0.0210	92.9	64-130	9.99	20	L647630-01	WG672945
Chloromethane	mg/l	0.0193	0.0180	77.0	27-155	6.76	20	L647630-01	WG672945
cis-1,3-Dichloropropene	mg/l	0.0225	0.0196	89.9	63-127	13.8	20	L647630-01	WG672945
Ethylbenzene	mg/l	0.0234	0.0206	93.4	64-135	12.5	20	L647630-01	WG672945
Methylene Chloride	mg/l	0.0218	0.0201	85.6	52-130	7.68	20	L647630-01	WG672945
Tetrachloroethene	mg/l	0.0244	0.0217	97.4	56-139	11.6	20	L647630-01	WG672945
Toluene	mg/l	0.0219	0.0197	86.2	61-126	10.3	20	L647630-01	WG672945
trans-1,2-Dichloroethene	mg/l	0.0208	0.0198	83.3	45-137	4.95	20	L647630-01	WG672945
trans-1,3-Dichloropropene	mg/l	0.0220	0.0187	88.0	59-130	16.5	20	L647630-01	WG672945
Trichloroethene	mg/l	0.0237	0.0210	91.4	40-155	11.8	20	L647630-01	WG672945
Vinyl chloride	mg/l	0.0228	0.0217	81.3	32-159	4.80	21	L647630-01	WG672945
4-Bromofluorobenzene				104.0	82-120				WG672945
Dibromofluoromethane				102.0	82-126				WG672945
Toluene-d8				101.0	92-112				WG672945
a,a,a-Trifluorotoluene				101.0	90-116				WG672945
Mercury	mg/l	0.00299	0.00296	99.4	80-120	1.23	20	L647459-18	WG673036
Total Phenol by 4AAP	mg/l	3.01	2.97	101.	90-110	1.34	20	L647503-01	WG673461
Beryllium	mg/l	1.01	1.00	101.	75-125	0.995	20	L647525-04	WG673077
Cadmium	mg/l	1.02	1.01	102.	75-125	0.985	20	L647525-04	WG673077
Chromium	mg/l	0.996	0.976	99.6	75-125	2.03	20	L647525-04	WG673077
Copper	mg/l	1.04	1.02	104.	75-125	1.94	20	L647525-04	WG673077
Lead	mg/l	1.00	0.987	100.	75-125	1.31	20	L647525-04	WG673077
Nickel	mg/l	0.948	0.929	92.8	75-125	2.02	20	L647525-04	WG673077
Selenium	mg/l	1.00	0.972	98.4	75-125	2.84	20	L647525-04	WG673077
Silver	mg/l	0.0382	0.0472	3.20*	75-125	21.1*	20	L647525-04	WG673077
Zinc	mg/l	1.01	0.992	101.	75-125	1.80	20	L647525-04	WG673077
Cyanide	mg/l	0.181	0.191	90.5	90-110	5.38	20	L647441-08	WG673413
Antimony	mg/l	0.0459	0.0450	91.8	75-125	1.98	20	L647630-06	WG673297
Thallium	mg/l	0.0461	0.0460	92.2	75-125	0.217	20	L647630-06	WG673297
Arsenic	mg/l	0.0473	0.0420	94.6	75-125	11.9	20	L647630-06	WG673297

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Quality Assurance Report
Level II

L647503

July 29, 2013

Serial Dilution

Batch number /Run number / Sample number cross reference

WG672945: R2752301: L647503-01
WG673036: R2752622: L647503-01
WG672968: R2755006 R2757062: L647503-01 01
WG673461: R2756320: L647503-01
WG673077: R2756863: L647503-01
WG673055: R2757241: L647503-01
WG673413: R2758003: L647503-01
WG673297: R2759471: L647503-01

* * Calculations are performed prior to rounding of reported values.
* Performance of this Analyte is outside of established criteria.
For additional information, please see Attachment A 'List of Analytes with QC Qualifiers.'

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Est. 1970

S&ME Inc. - Raleigh NC
Claudia Irvin
3201 Spring Forest Road

Raleigh, NC 27616

Quality Assurance Report
Level II

L647503

July 29, 2013

The data package includes a summary of the analytic results of the quality control samples required by the SW-846 or CWA methods. The quality control samples include a method blank, a laboratory control sample, and the matrix spike/matrix spike duplicate analysis. If a target parameter is outside the method limits, every sample that is effected is flagged with the appropriate qualifier in Appendix B of the analytic report.

Method Blank - an aliquot of reagent water carried through the entire analytic process. The method blank results indicate if any possible contamination exposure during the sample handling, digestion or extraction process, and analysis. Concentrations of target analytes above the reporting limit in the method blank are qualified with the "B" qualifier.

Laboratory Control Sample - is a sample of known concentration that is carried through the digestion/extraction and analysis process. The percent recovery, expressed as a percentage of the theoretical concentration, has statistical control limits indicating that the analytic process is "in control". If a target analyte is outside the control limits for the laboratory control sample or any other control sample, the parameter is flagged with a "J4" qualifier for all effected samples.

Matrix Spike and Matrix Spike Duplicate - is two aliquots of an environmental sample that is spiked with known concentrations of target analytes. The percent recovery of the target analytes also has statistical control limits. If any recoveries that are outside the method control limits, the sample that was selected for matrix spike/matrix spike duplicate analysis is flagged with either a "J5" or a "J6". The relative percent difference (%RPD) between the matrix spike and the matrix spike duplicate recoveries is all calculated. If the RPD is above the method limit, the effected samples are flagged with a "J3" qualifier.

APPENDIX G

As-Built Drawings

SUR 1 of 1	Gas Collection and Control System As-Built Survey (Partial), prepared by Bateman Civil Survey Co.
1.	Landfill Site Plan with “V” and “GV” Well Designations
2.	Landfill Site Plan with “EW” Well Designations
3.	Site Map – Gas Header and Blower Flare Station
4.	Landfill Gas Extraction Well Details
5.	LFGCCS Details
6.	Front Elevation View of Skid
7.	Side Elevation View of Skid
8.	Plan View of Skid
9.	Condensate Sump Details
10.	Condensate Storage Tank Details I
11.	Condensate Storage Tank Details II
12.	LFG Connection Between BFS and Gas Treatment
13.	Mechanical Details

NOTES
1. THE HORIZONTAL DATUM IS NORTH CAROLINA 3200, NAD 1983. VERTICAL DATUM IS NAVD 88.
2. FIELD WORK FOR SURVEY COMPLETED DURING THE MONTHS OF MARCH - APRIL 2012.
3. WETLANDS ARE NOT ADDRESSED BY THIS SURVEY.
4. ONLY COPIES OF THIS SURVEY WITH THE LAND SURVEYOR'S ORIGINAL SIGNATURE & AN ORIGINAL EMBOSSED, INK OR SCANNED SEAL ARE THE PRODUCT OF THE LAND SURVEYOR.
5. THIS SURVEY WAS PREPARED FOR THE PARTIES AND PURPOSE INDICATED HEREON. ANY EXTENSION OF THE USE BEYOND THE PURPOSE AGREED TO BETWEEN THE CLIENT AND SURVEYOR EXCEEDS THE SCOPE OF THE ENGAGEMENT.
6. THIS PARCEL MAY BE SUBJECT TO EASEMENTS OR RIGHTS OF OTHERS THAT HAVE NOT BEEN DISCLOSED ON THIS MAP.
7. HORIZONTAL AND VERTICAL CONTROL PROVIDED BY S&ME.
8. ALL SPOT ELEVATIONS REPRESENT TOP OF PIPE.

LEGEND

- EXTRACTION WELL
- ISOLATION VALVE
- CONDENSATE SUMP
- CAPPED VENT
- BURIED HDPE GAS PIPE (TOTAL: 2,216')
- BOLLARD

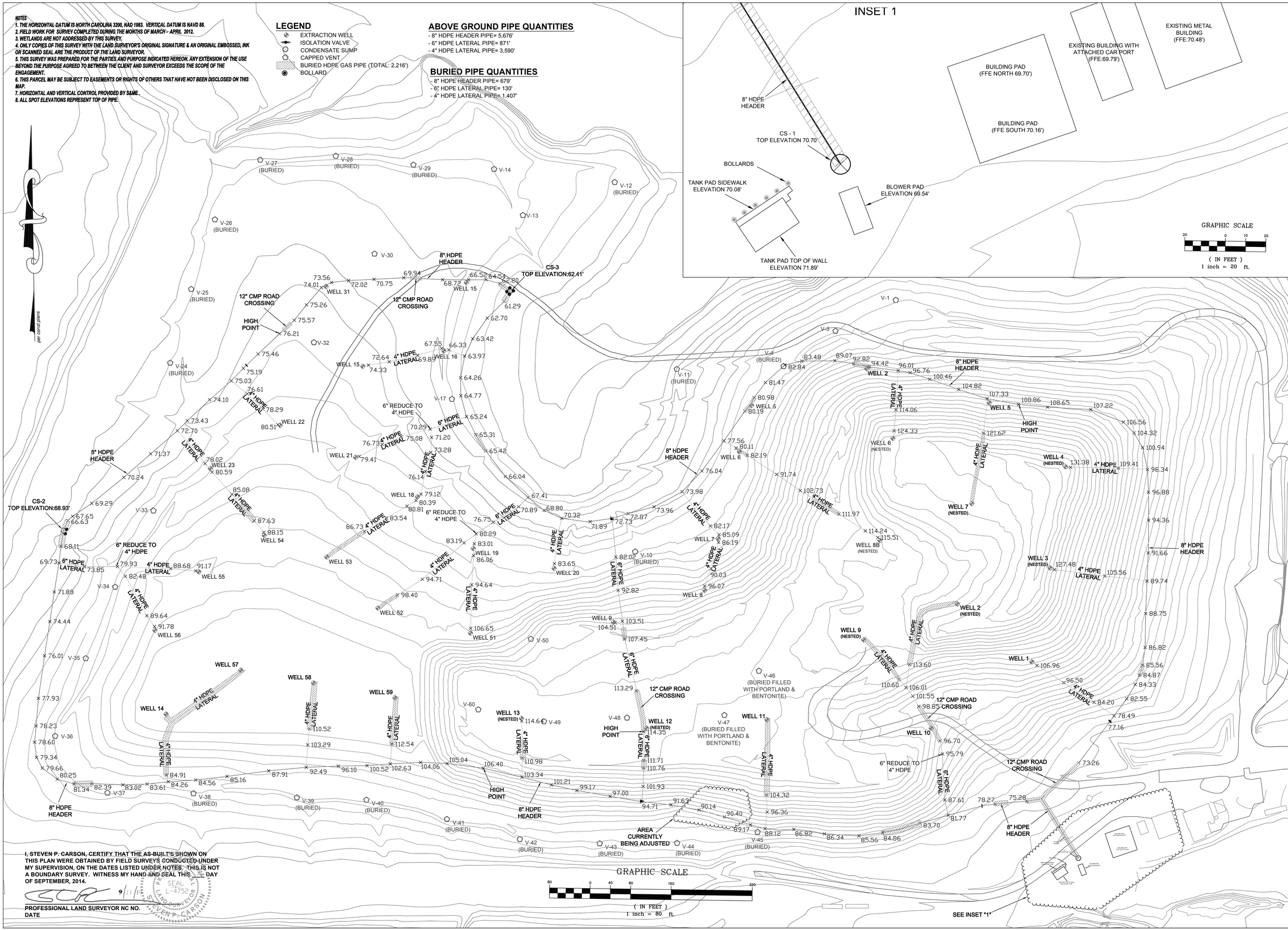
ABOVE GROUND PIPE QUANTITIES

- 8" HDPE HEADER PIPE= 5,676'
- 6" HDPE LATERAL PIPE= 871'
- 4" HDPE LATERAL PIPE= 3,590'

BURIED PIPE QUANTITIES

- 8" HDPE HEADER PIPE= 679'
- 6" HDPE LATERAL PIPE= 130'
- 4" HDPE LATERAL PIPE= 1,407'

per const plans



I, STEVEN P. CARSON, CERTIFY THAT THE AS-BUILT'S SHOWN ON THIS PLAN WERE OBTAINED BY FIELD SURVEYS CONDUCTED UNDER MY SUPERVISION, ON THE DATES LISTED UNDER NOTES. THIS IS NOT A BOUNDARY SURVEY. WITNESS MY HAND AND SEAL THIS 9TH DAY OF SEPTEMBER, 2014.

9/11/14

PROFESSIONAL LAND SURVEYOR NC NO.
DATE

SEAL L-4752 LAND SURVEYOR STEVEN P. CARSON

Bateman Civil Survey Company, PC
Engineers • Surveyors • Planners
200 North Main Street, Holly Springs, NC 27540
Phone:(919) 577-1080 Fax:(919) 577-1081
Info@BatemanCivilSurvey.com

Gas Collection and Control System
As-built Survey (Partial)
Edgecombe County Landfill
Tarboro, North Carolina

Revisions

Designed By:	N / A
Drawn By:	JRD
Checked By:	SPC
Scale:	VARIES
Date:	04/02/12
Drawing Number:	120140

SUR 1 OF 1

LEGEND

- MONITOR WELL
- PIEZOMETER
- GAS PROBE
- GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- 8" HDPE HEADER
- 6" HDPE LATERAL
- 4" HDPE LATERAL
- APPROXIMATE LIMIT OF MSW WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

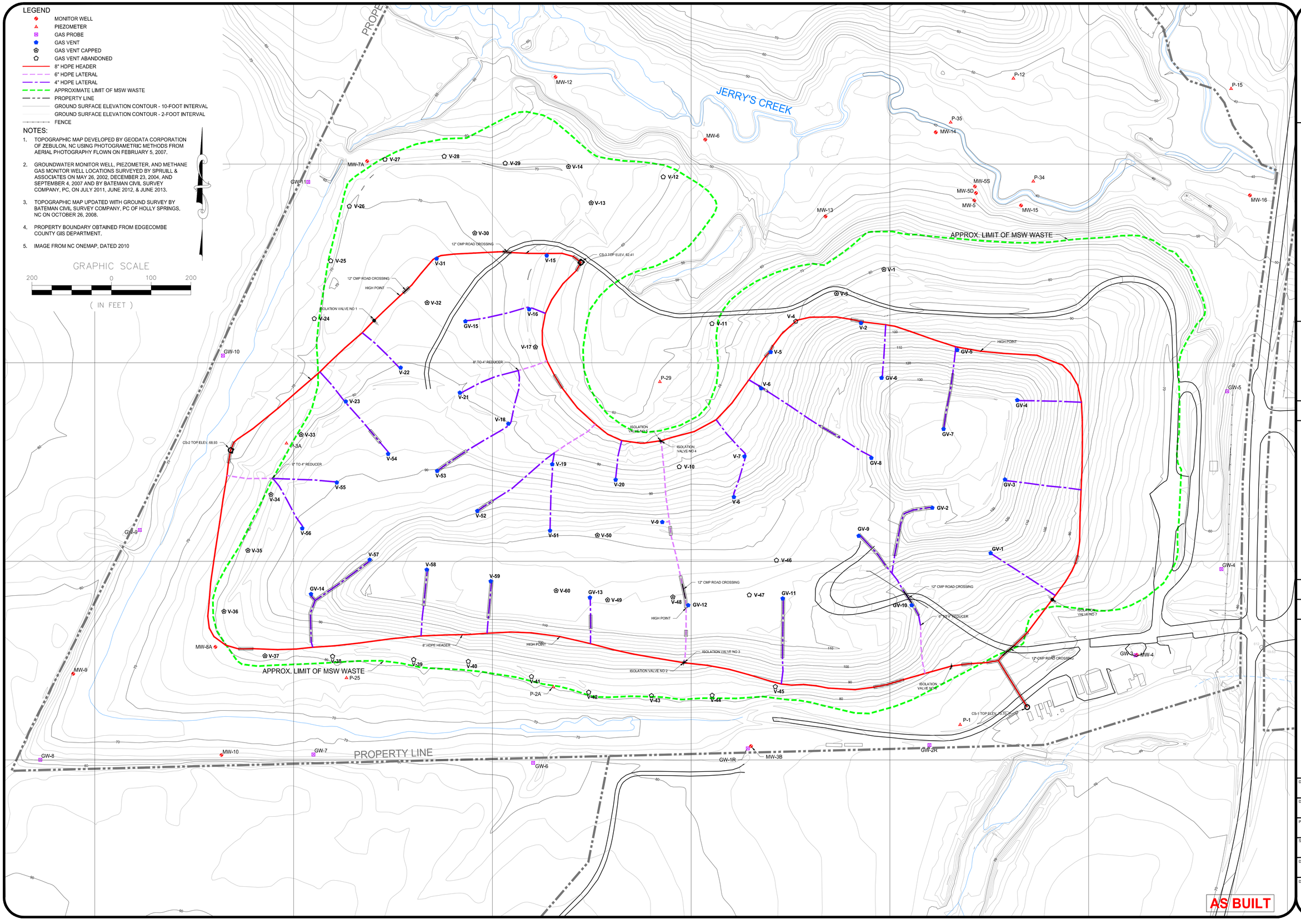
NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON JULY 2011, JUNE 2012, & JUNE 2013.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. IMAGE FROM NC ONEMAP, DATED 2010

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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NO.	DATE	DESCRIPTION	BY

LANDFILL SITE PLAN WITH "V" & "GW" WELL DESIGNATIONS

LFGCCS CONSTRUCTION COMPLETION REPORT
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1393	
DRAWING: 1	OF: 13

Y:\Projects\301290\V12-331 Edgecombe - LFGCCS\CAD\01393.dwg, FIG1, 9/12/2014 3:02:38 PM, 1:1

LEGEND

- MONITOR WELL
- PIEZOMETER
- GAS PROBE
- GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- 8" HDPE HEADER
- 6" HDPE LATERAL
- 4" HDPE LATERAL
- APPROXIMATE LIMIT OF MSW WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

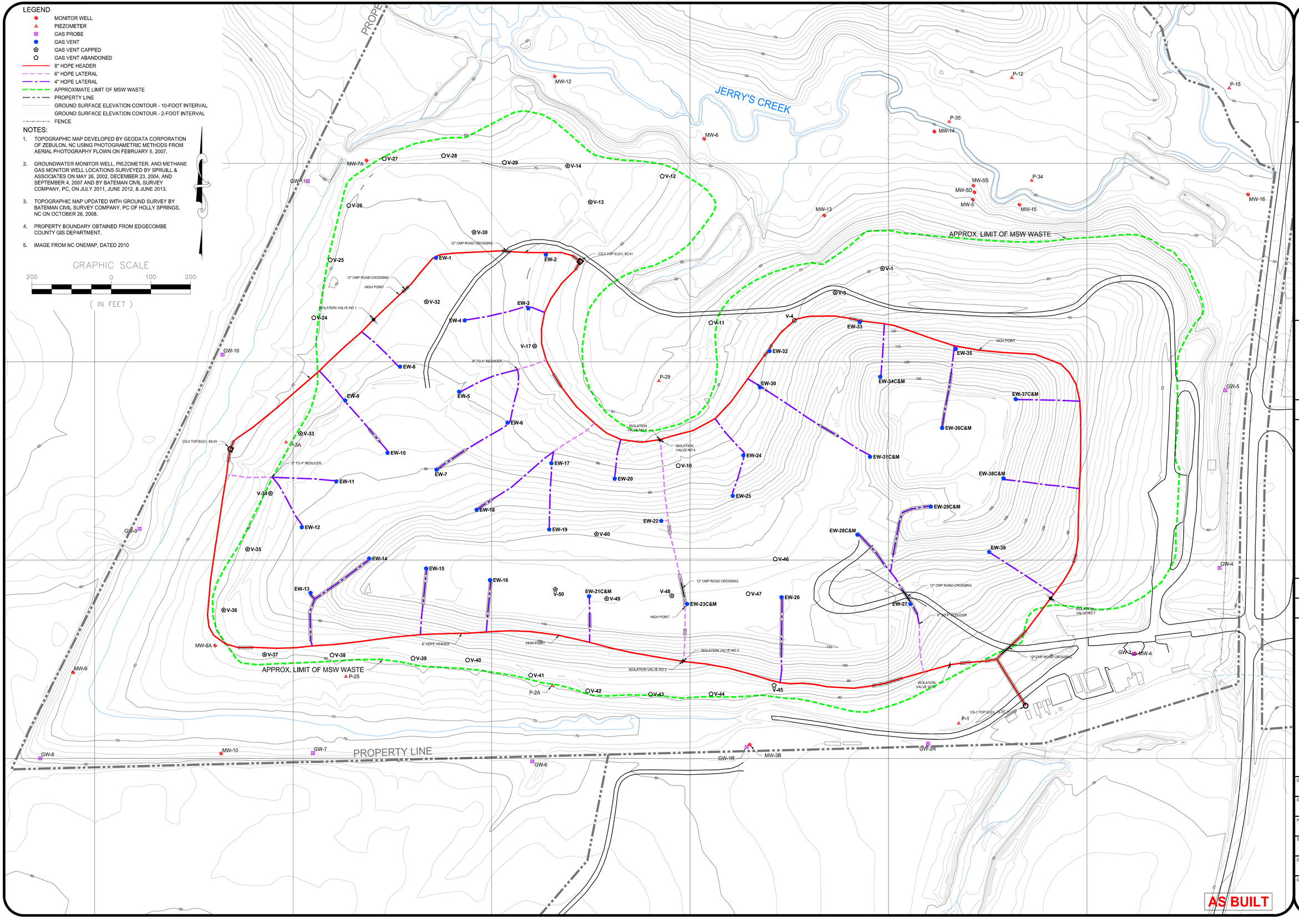
NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON JULY 2011, JUNE 2012, & JUNE 2013.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. IMAGE FROM NC ONEMAP, DATED 2010

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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LANDFILL SITE PLAN WITH "EW" WELL DESIGNATIONS

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DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1394	
DRAWING: 2	OF: 13

T:\Projects\2012\EW\12-331 Edgecombe - LFGCCS O&M\CAD\01394.dwg, FIG2, 8/12/2014 3:02:19 PM, 1:1

18" CMP (3" PVC PIPE RUNS THOUGH)
INV. ELV:62.79'

18" CPP
INV. ELV:64.43'

18" CMP (3" PVC PIPE RUNS THOUGH)
INV. ELV:63.33'

18" CPP (BURIED)
INV. ELV:64.93'

EXIST. UNDERGROUND TELEPHONE

EXIST. AIR LINE

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. BUILDING

EXIST. UNDERGROUND ELECT.

EXIST. LANDFILL GAS HEADER
(BELOW GROUND)

LFGTE BUILDING

CONDENSATE SUMP CS-1

LIQUID CONDENSATE LINES

AIR LINE

LIQUID TRANSFER PUMP

EXIST. ELECTRIC
TRANSFORMER PAD

EXIST. BLOWER
FLARE PAD

EXIST.
CONDENSATE PAD

H-FRAME SUPPORT

EXIST. SILT FENCE

EXIST. TREE PROTECTION

EXIST. FRENCH DRAIN

EXIST. POND

70

LEGEND

	EXIST. FRENCH DRAIN
	LIQUID CONDENSATE LINE
AIR	EXIST. AIR LINE
LFG	EXIST. LANDFILL GAS HEADER
XSF	EXIST. SILT FENCE
SD	EXIST. STORM DRAIN
XTP	EXIST. TREE PROTECTION
UT	EXIST. UNDERGROUND TELEPHONE
UE	EXIST. UNDERGROUND ELECTRIC
W	EXIST. WATER

GRAPHIC SCALE

40 0 20 40

(IN FEET)

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GAS HEADER & BLOWER FLARE SYSTEM

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TARBORO, NORTH CAROLINA

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DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: 1" = 20'	DATE: AUG 2014
DRAWING NUMBER: D-1395	
DRAWING: 3	OF: 13

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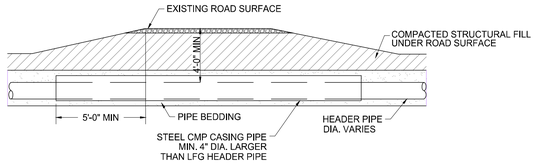
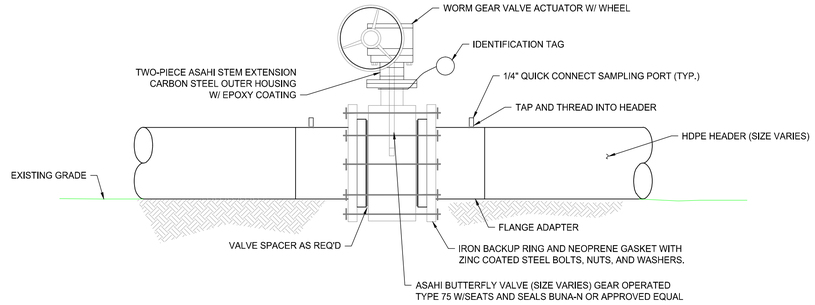


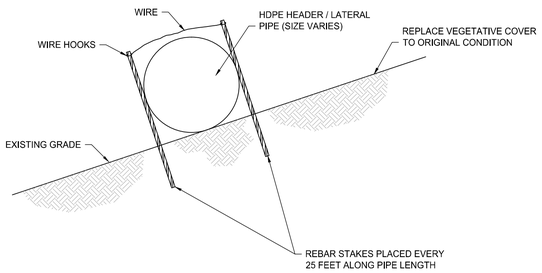
ROAD CROSSING DETAIL

NOT TO SCALE



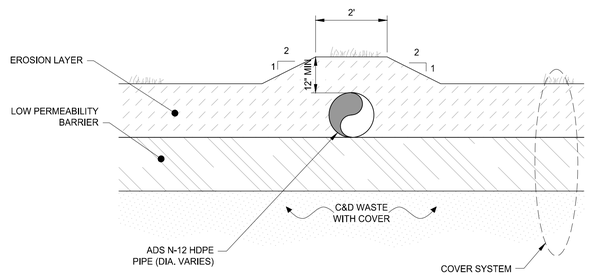
LFG COLLECTION SYSTEM ISOLATION VALVE DETAIL

NOT TO SCALE



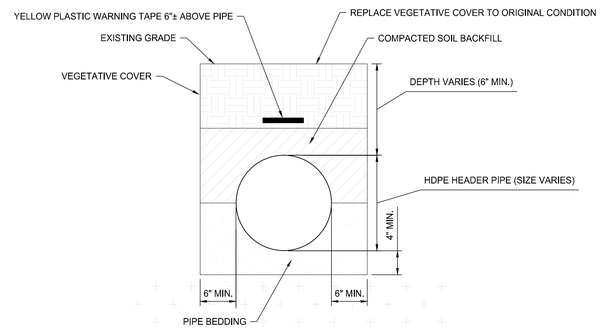
ABOVE GRADE HEADER/LATERAL

NOT TO SCALE



PIPE COVER SECTION DETAIL

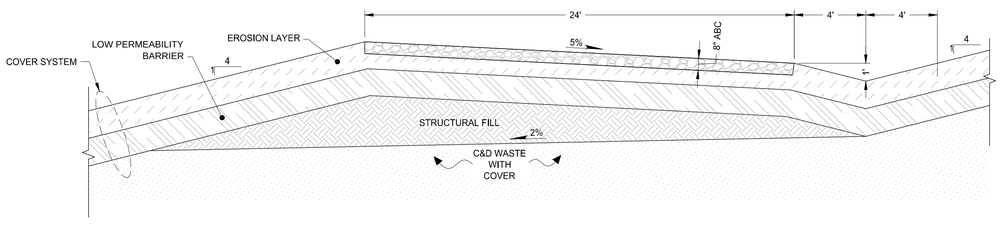
NOT TO SCALE



HEADER/LATERAL TRENCH DETAIL

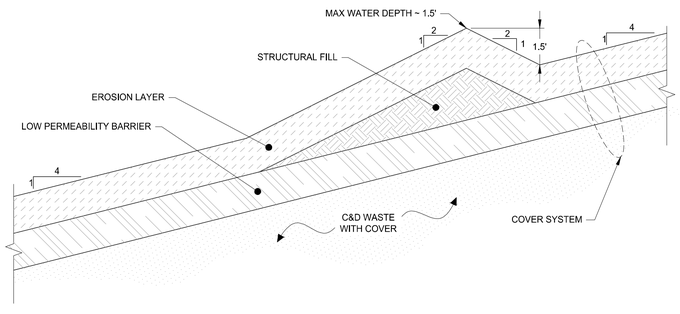
NOT TO SCALE

NOTE: PIPE BEDDING MATERIAL MAY BE SAND, CLEAN EXCAVATED SOILS, OR OTHER MATERIAL AS APPROVED BY ENGINEER.



ACCESS ROAD DETAIL

NOT TO SCALE



SLOPE DIVERSION BERM DETAIL

NOT TO SCALE

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LFGCCS DETAILS

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EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

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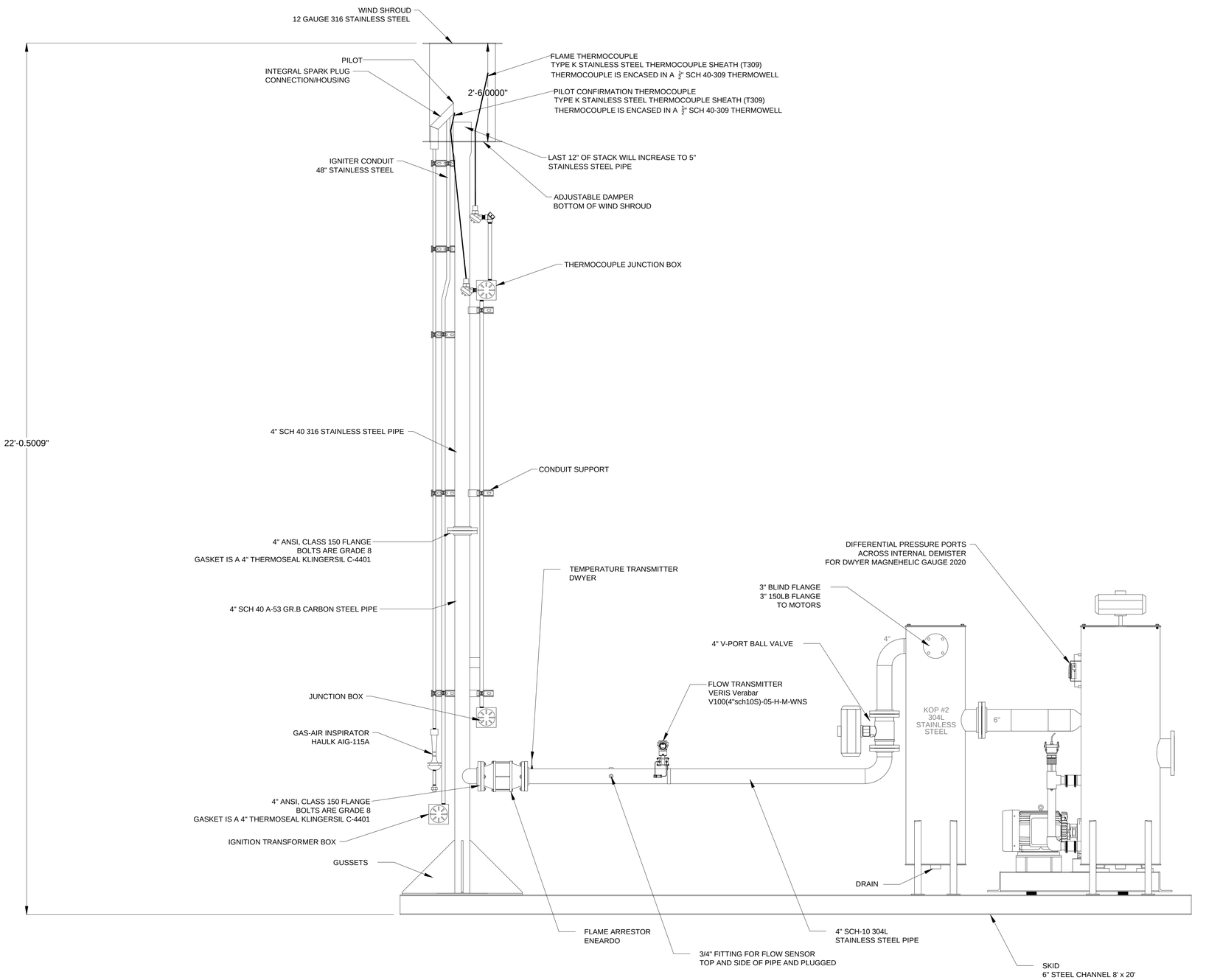
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1396-02	
DRAWING: 5	OF: 13

T:\Projects\2012\ENV\12-331 Edgecombe - LFGCCS O&M\CAD\D1396.dwg, FIG5, 8/12/2014 1:01:37 PM, 1:1

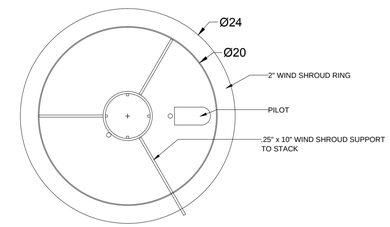
GENERAL NOTES

THE LOWER SECTION OF THE FLARE WILL BE MADE UP OF 4" SCH 40 A-53 GR.B CARBON STEEL PIPE.
THE TOP SECTION OF THE FLARE WITH BE FLANGED TO THE LOWER SECTION AND IT IS MADE OF 4" SCH 40 316 STAINLESS STEEL.
THE BASE WILL BE 30" X 30" SQUARE .5" THICK A-36 PLATE. THE PLATE WILL BE WELDED TO THE BOTTOM OF THE 4" FLARE AND SUPPORTED WITH FOUR (4) 16" TALL x 16" LONG x .5" THICK EQUALLY SPACED GUSSETS.
THE FLARE BASE WILL BE DIRECTLY WELDED TO THE EQUIPMENT SKID
CONCRETE PAD AND ANCHORING BY OTHERS.



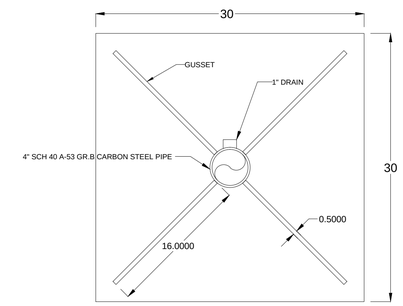
ELEVATION VIEW OF FLARE SKID

SCALE: 3/4"=1'



PLAN VIEW OF WIND SHROUD

SCALE: 1-1/2"=1'



PLAN VIEW OF BASE DETAIL

SCALE: 1-1/2"=1'

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NO.	DATE	DESCRIPTION	BY

FRONT ELEVATION VIEW OF SKID

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TARBORO, NORTH CAROLINA

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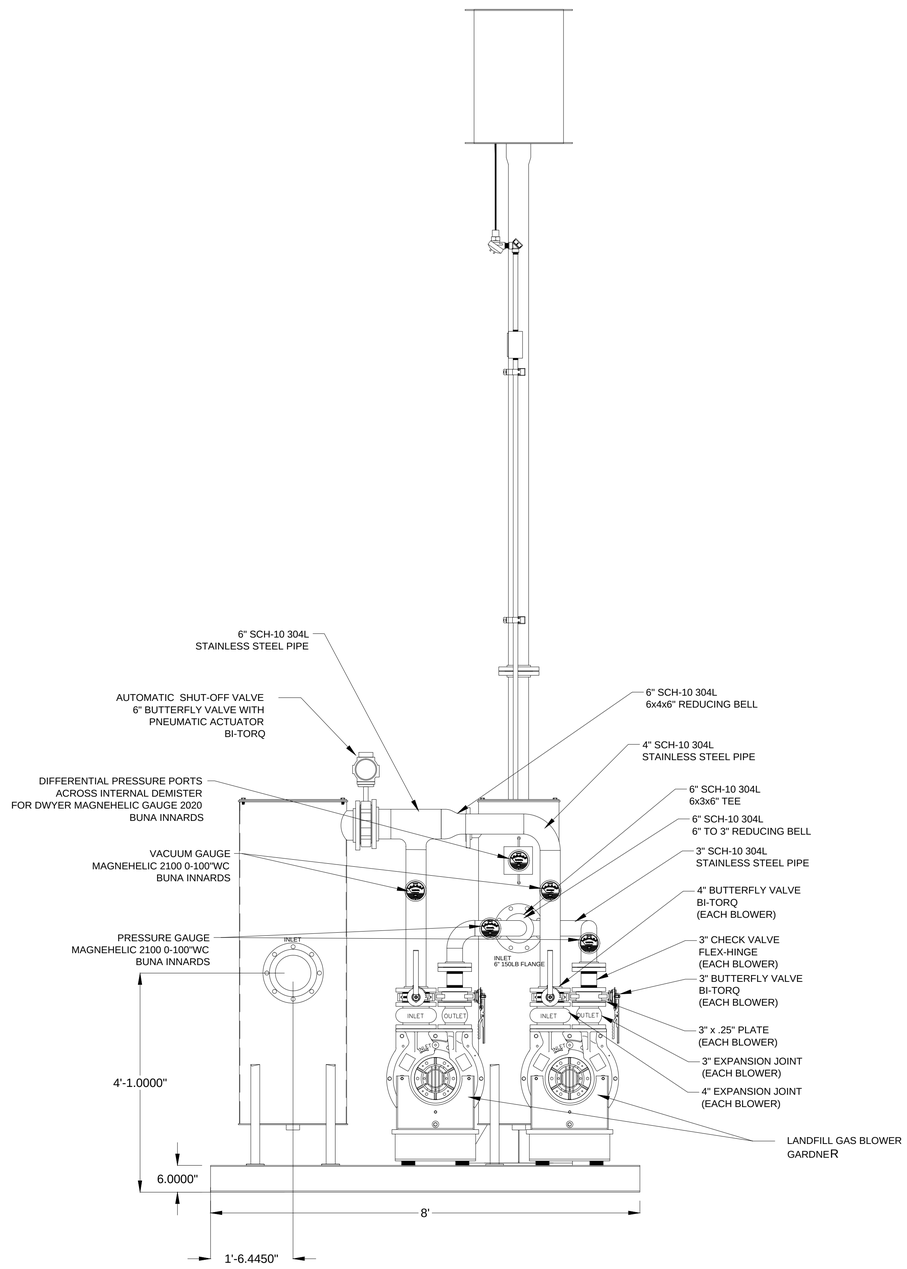
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1398-01	
DRAWING: 6	OF: 13

T:\Projects\2012\EN\12-331 Edgecombe - LFGCCS O&M\CAD\01398.dwg, FIG6, 9/12/2014 3:01:18 PM, 1:1



ELEVATION VIEW OF FLARE SKID

SCALE: 3/4"=1'

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NO.	DATE	DESCRIPTION	BY

SIDE ELEVATION VIEW OF SKID

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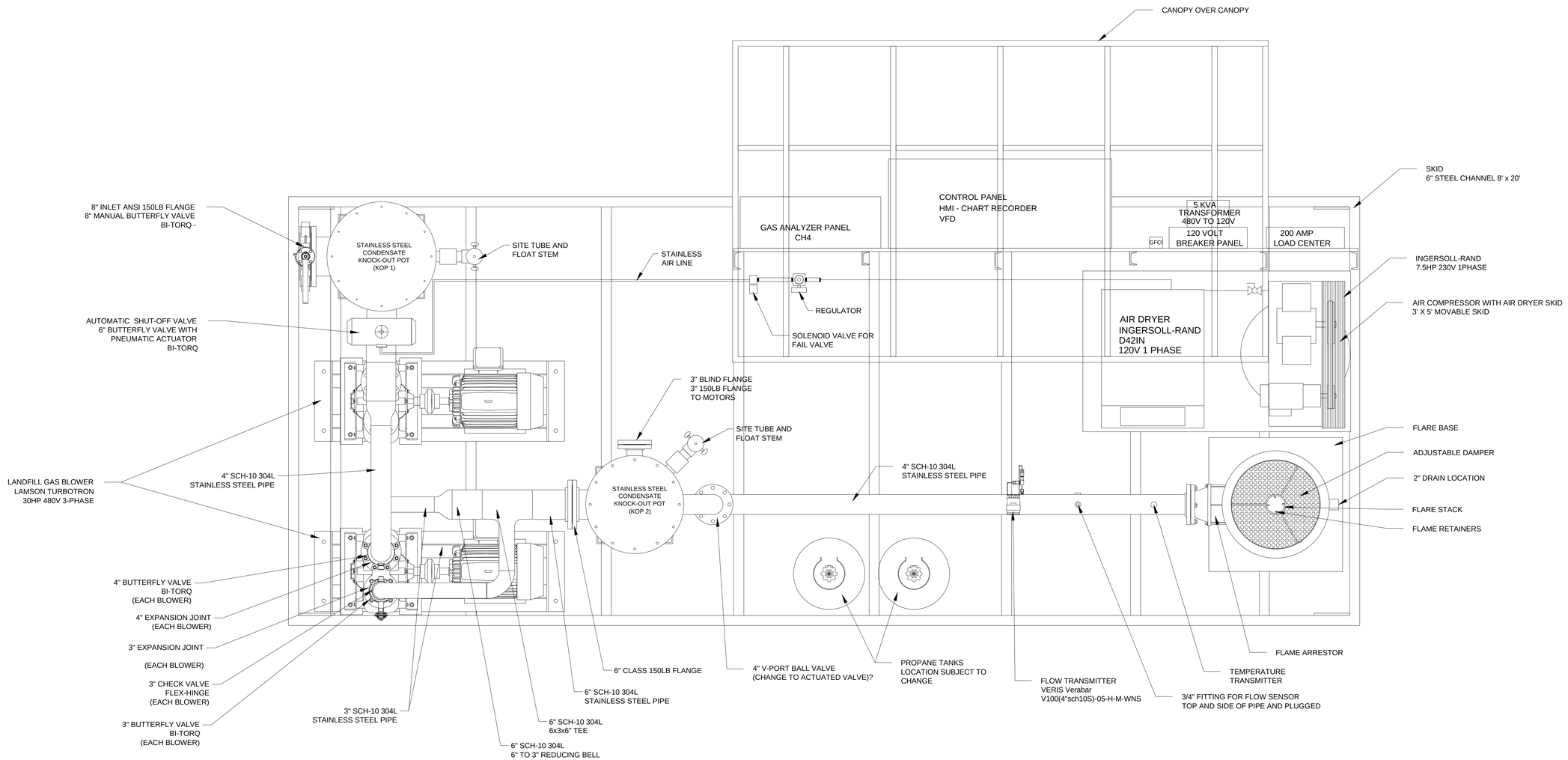
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1398-02	
DRAWING: 7	OF: 13

T:\Projects\2012\EN\12-331 Edgecombe - LFGCCS O&M\CAD\01398.dwg, FIG7, 8/12/2014 3:01:07 PM, 1:1



PLAN VIEW OF FLARE SKID

NOT TO SCALE

AS BUILT

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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY

PLAN VIEW OF SKID

LFGCCS CONSTRUCTION COMPLETION REPORT
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1398-03	
DRAWING: 8	OF: 13

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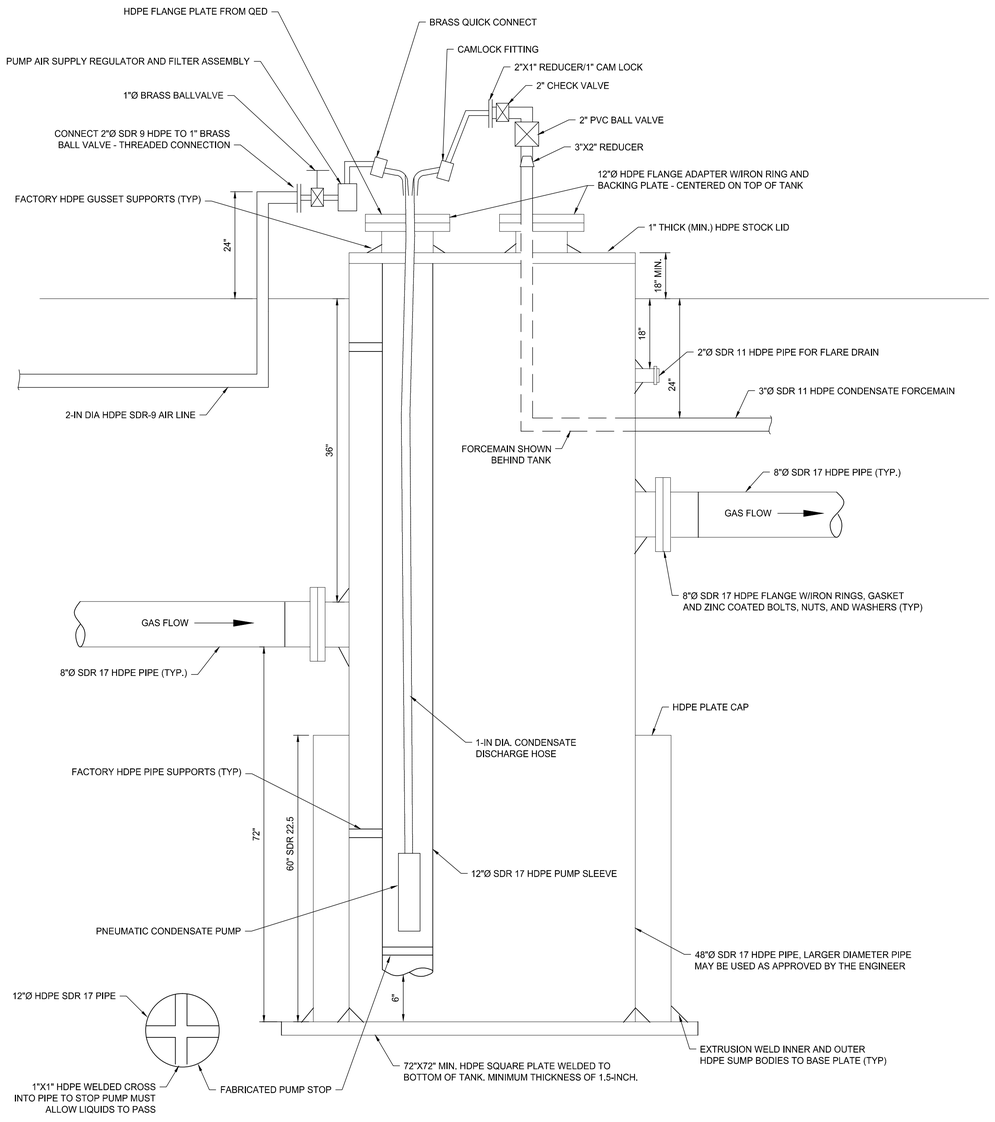
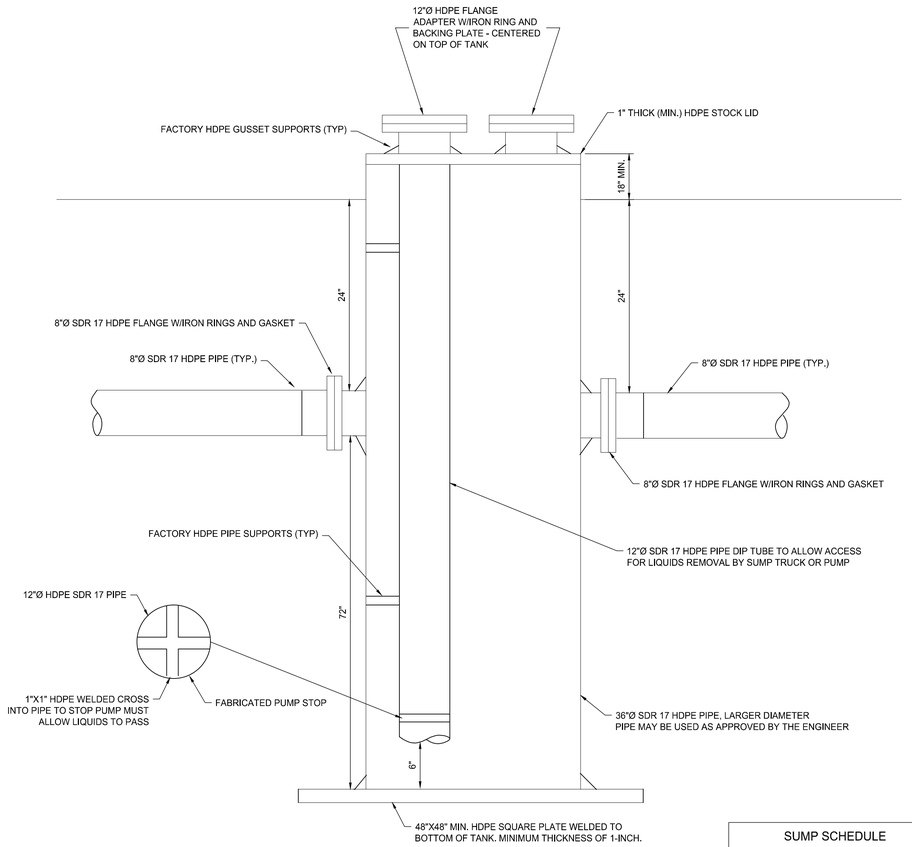


CONDENSATE SUMP DETAIL CS-1

NOT TO SCALE



CONDENSATE SUMP DETAIL CS-2 AND CS-3

NOT TO SCALE

SUMP SCHEDULE		
SUMP	SIZE	BASE PLATE
CS-1	48"Ø	60"X60"
CS-2	36"Ø	48"X48"
CS-3	36"Ø	48"X48"

AS BUILT

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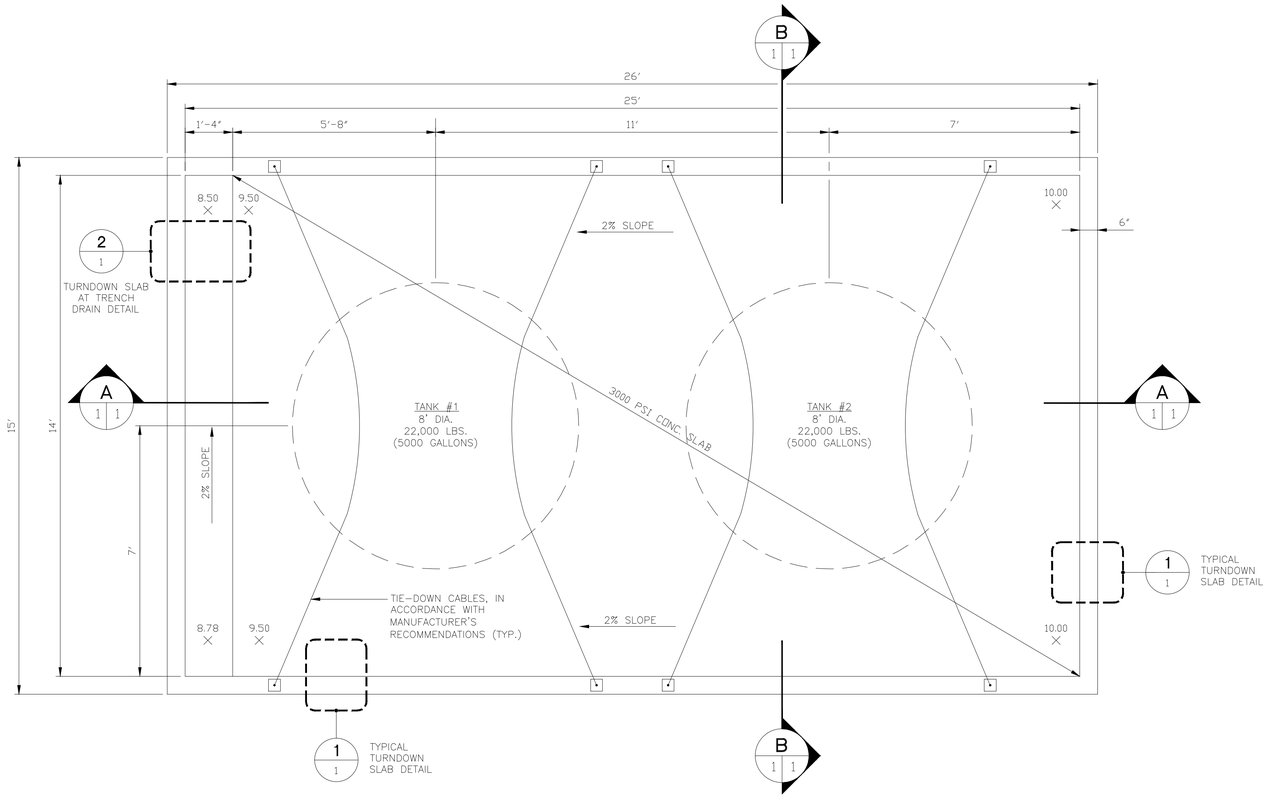
NO.	DATE	DESCRIPTION	BY

CONDENSATE SUMP DETAILS

LFGCCS CONSTRUCTION COMPLETION REPORT
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

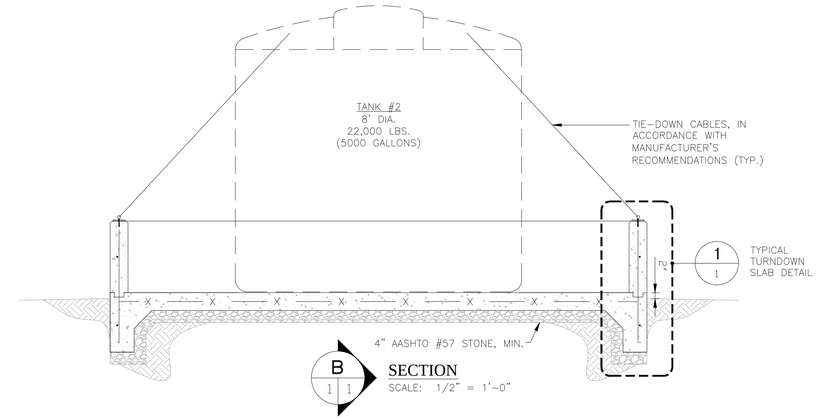
DRAWN BY:
CHECKED BY:
DESIGNED BY:
APPROVED BY:
PROJECT NUMBER: 1054-12-331
SCALE: NTS
DATE: AUG 2014
DRAWING NUMBER: D-1399-01
DRAWING: 9
OF: 13

T:\Projects\2012\EN\12-331 Edgecombe - LFGCCS O&M\CAD\01399.dwg, FIG9, 8/12/2014 1:00:47 PM, 1:1



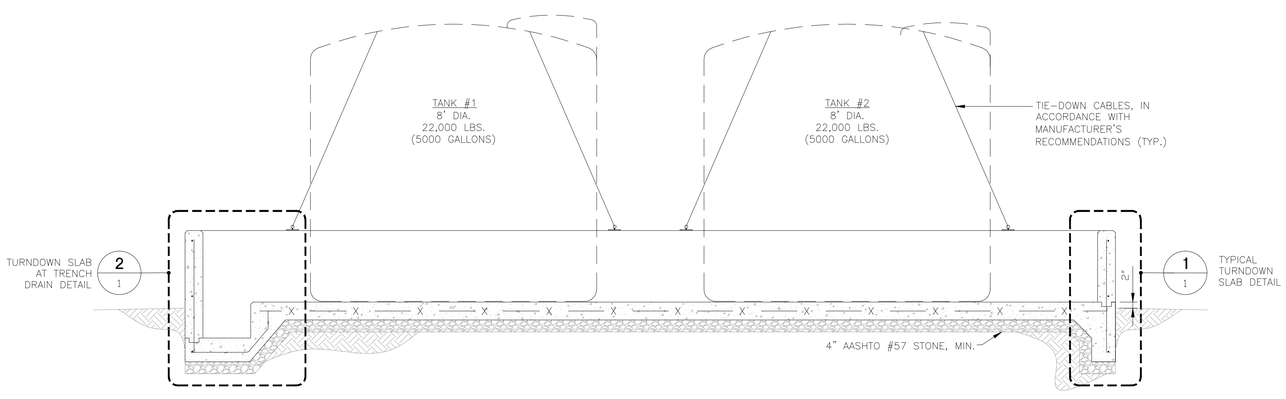
CONDENSATE STORAGE FACILITY FOUNDATION PLAN

SCALE: 1/2" = 1'-0"



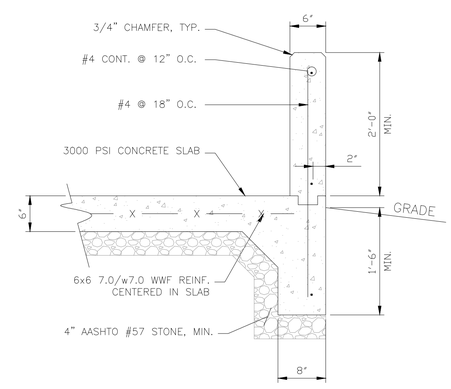
SECTION

SCALE: 1/2" = 1'-0"



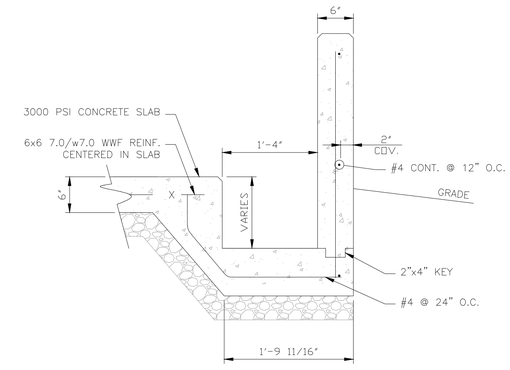
SECTION

SCALE: 1/2" = 1'-0"



DETAIL: TYPICAL TURNDOWN SLAB

SCALE: 1"= 1'-0"



DETAIL: TURNDOWN SLAB AT TRENCH DRAIN

SCALE: 1"= 1'-0"

GENERAL STRUCTURAL NOTES:

1. MINIMUM COVER ON REINFORCEMENT IN CONCRETE IS 3", UNLESS OTHERWISE NOTED.
2. ALL REBAR SHALL OVERLAP A MINIMUM OF 48 BAR DIAMETERS.
3. SUBGRADE SOLIDS SHALL HAVE A MINIMUM ALLOWABLE BEARING PRESSURE OF 3000 PSF, AS VERIFIED BY A QUALIFIED GEOTECHNICAL ENGINEER.
4. SLAB SHALL DRAIN TO TRENCH DRAIN AT 2% SLOPE. SEE PLAN FOR SPOT ELEVATIONS.
5. SPOT ELEVATIONS ARE BASED ON LIMITED TOPOGRAPHIC INFORMATION, CONTRACTOR SHALL VERIFY GRADES AND ELEVATIONS PRIOR TO CONSTRUCTION

AS BUILT

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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

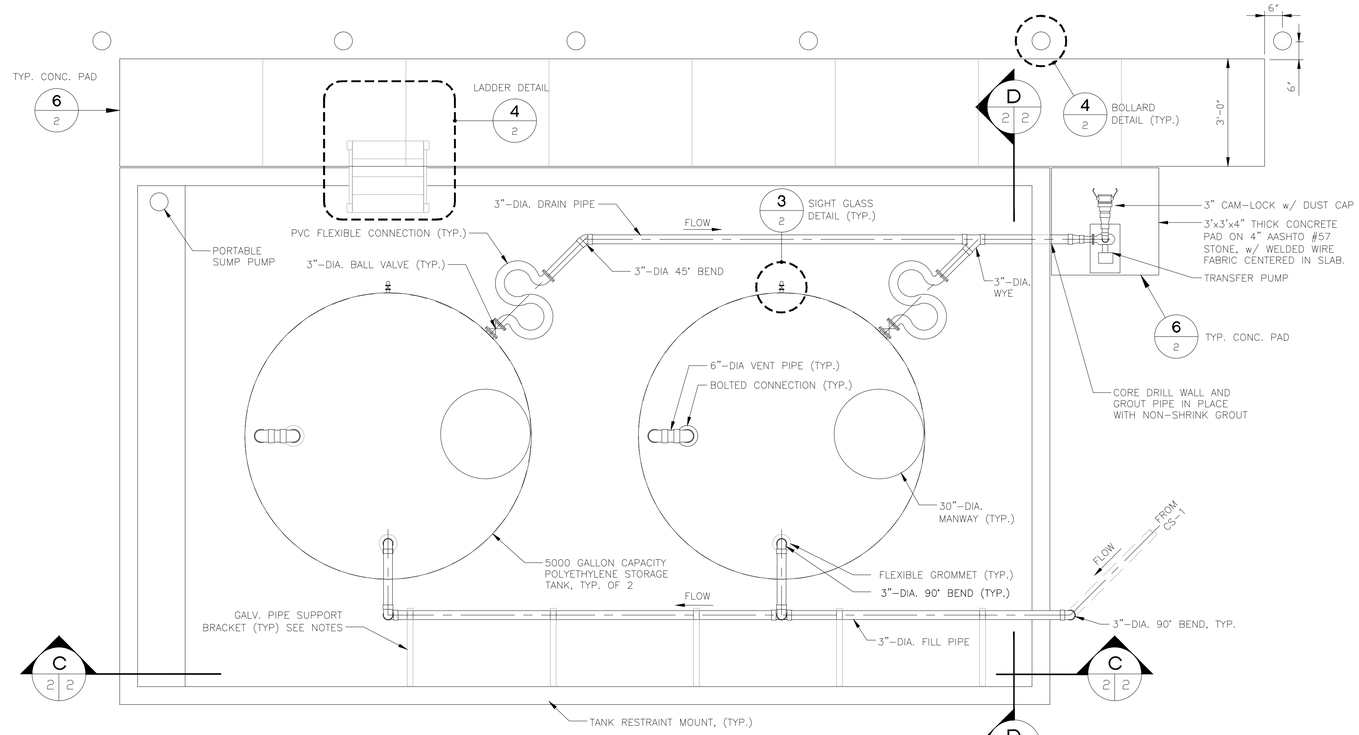
NO.	DATE	DESCRIPTION	BY

CONDENSATE STORAGE TANK DETAILS 1

LFGCCS CONSTRUCTION COMPLETION REPORT
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1399-02	
DRAWING: 10	OF: 13

T:\Projects\2012\ENV\12-331 Edgecombe - LFGCCS C&M\CAD\D1399.dwg FIG10, 9/12/2014 3:00:38 PM, 1:1

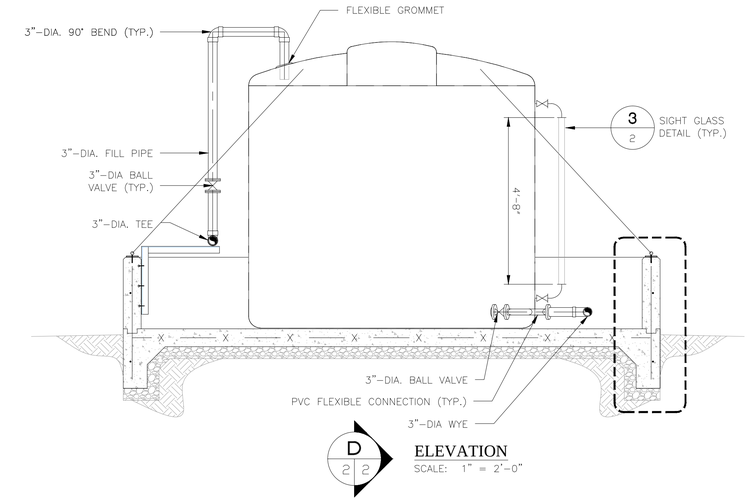


CONDENSATE STORAGE FACILITY MECHANICAL PLAN

SCALE: 1" = 2'-0"

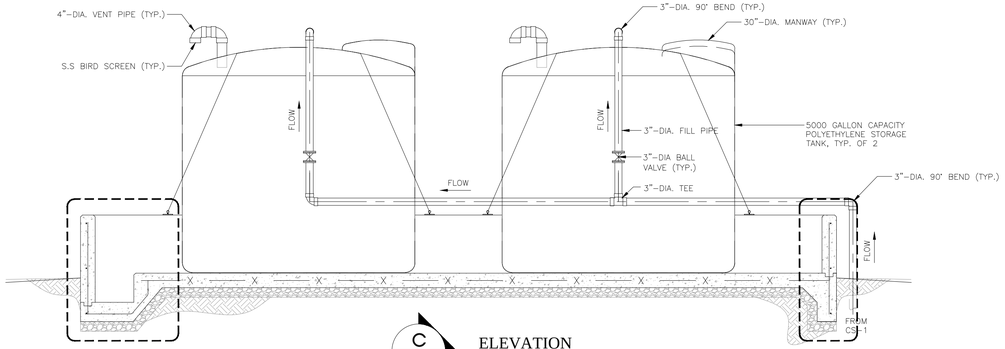
NOTES:

1. CONCRETE PAD SHALL BE SLOPED AWAY FROM STRUCTURES AT 2% MIN.
2. EXPOSED OUTSIDE CORNERS SHALL BE CHAMFERED.
3. EDGES ADJACENT TO STRUCTURES SHALL HAVE A 1/2" EXPANSION GAP, FILLED WITH BACKER ROD AND POLYURETHANE SEALANT.
4. CONTROL JOINTS SHALL BE PROVIDED @ 4' MAX. HORIZ. INTERVALS



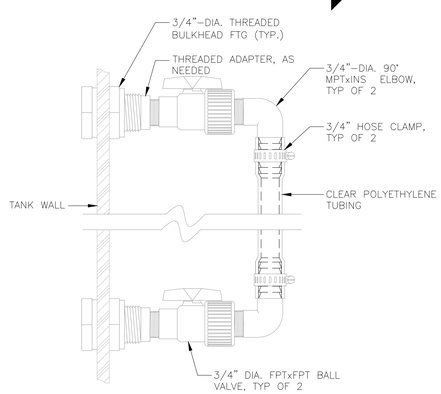
ELEVATION

SCALE: 1" = 2'-0"



ELEVATION

SCALE: 1" = 2'-0"

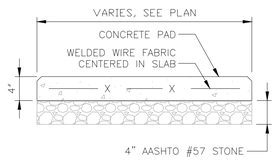


3/2 DETAIL: SIGHT GLASS

SCALE: NONE

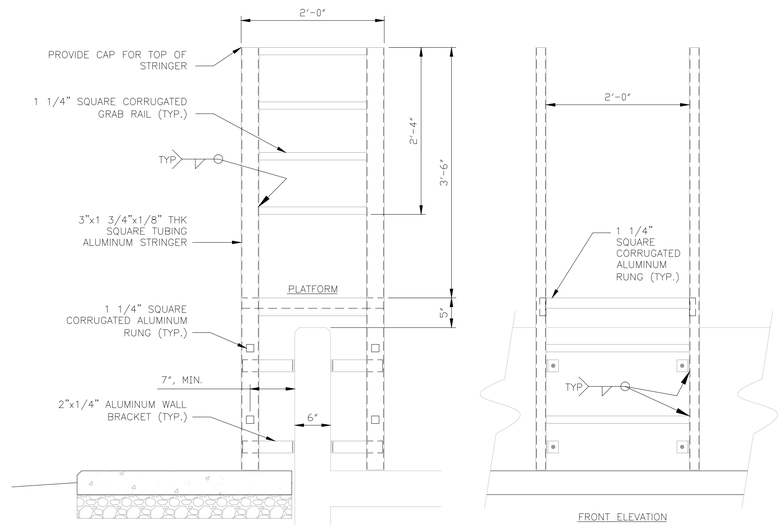
GENERAL MECHANICAL NOTES:

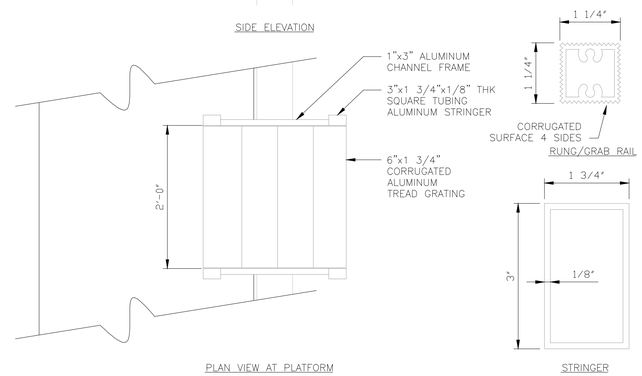
1. LOCATIONS OF PIPING ARE BASED ON THE BEST INFORMATION AVAILABLE, AND ARE APPROXIMATE. THE CONTRACTOR SHALL VERIFY ALL PIPING LOCATIONS TO HIS SATISFACTION PRIOR TO INSTALLATION.
2. ALL PIPING SHALL BE SCHEDULE 80 PVC, UNLESS NOTED OTHERWISE.
3. ALL PIPING SHALL BE FULLY SUPPORTED. NO PIPING SHALL REST DIRECTLY AGAINST CONCRETE OR OTHER DELETERIOUS MATERIALS. FILL PIPE SHALL BE SUPPORTED WITH GALV. BRACKETS MOUNTED TO CONTAINMENT WALL, DRAIN PIPE SHALL BE SUPPORTED WITH GALV. STANDS. ALL SUPPORTS SHALL BE SECURELY ANCHORED
4. ALL ABOVE-GROUND PIPING SHALL BE INSULATED AND HEAT TRACED. INSULATION NOT SHOWN FOR CLARITY.
5. TANK TIE-DOWNS ARE NOT SHOWN FOR CLARITY. CONTRACTOR SHALL ADJUST EQUIPMENT AND PIPING SO THEY DO NOT INTERFERE WITH RESTRAINTS.



6/2 DETAIL: TYP. CONC. PAD

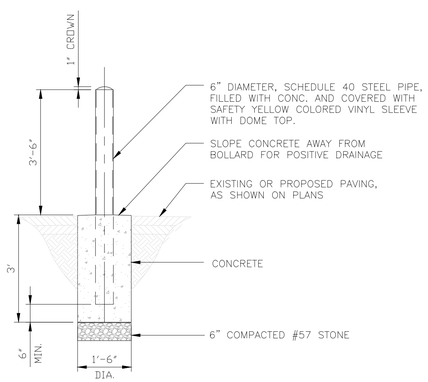
SCALE: NONE





4/2 DETAIL: LADDER

SCALE: NONE



5/2 DETAIL: TYPICAL BOLLARD

SCALE: 1"= 2'-0"

AS BUILT

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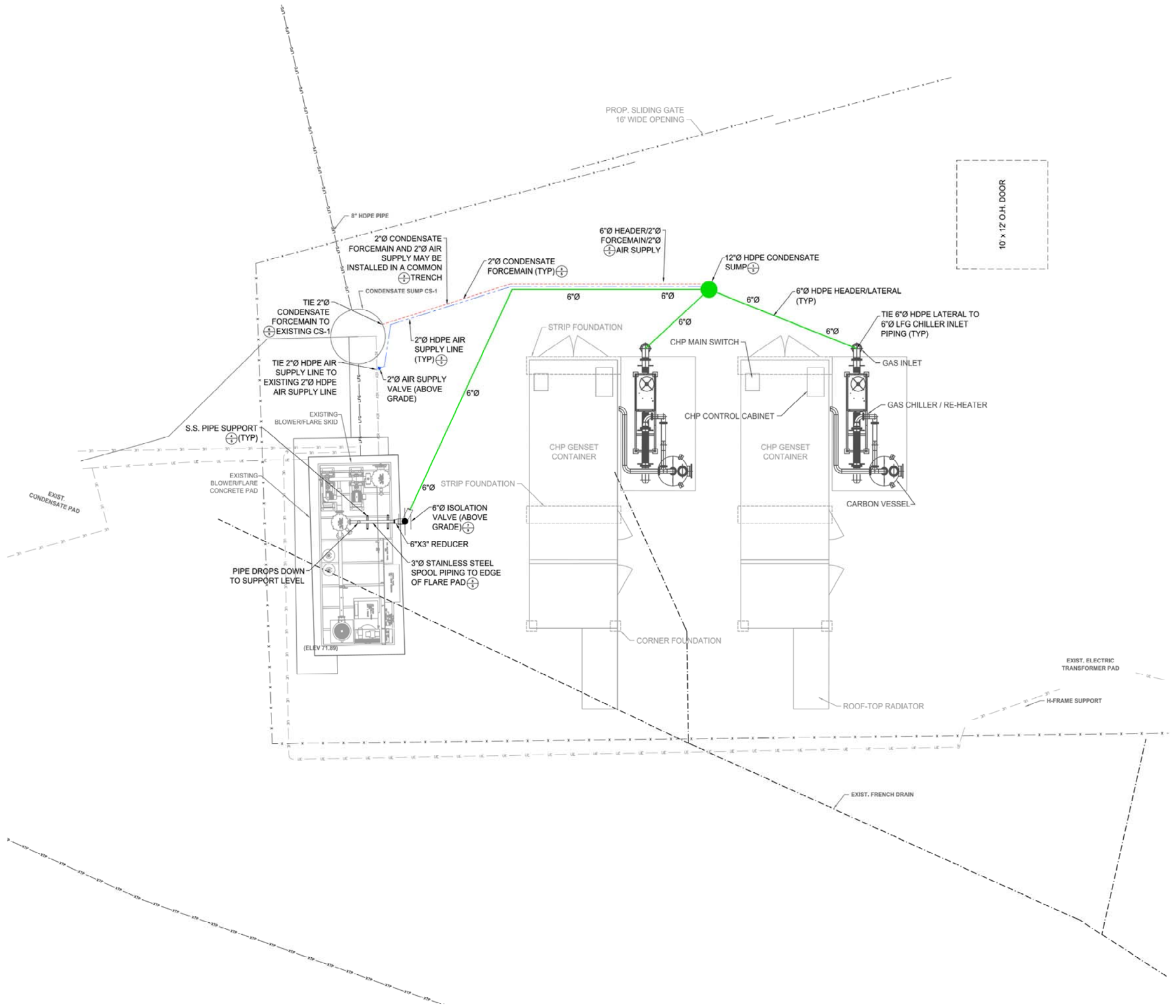
NO.	DATE	DESCRIPTION	BY

CONDENSATE STORAGE TANK DETAILS 2

LFGCCS CONSTRUCTION COMPLETION REPORT
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY:	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-12-331	
SCALE: NTS	DATE: AUG 2014
DRAWING NUMBER: D-1399-03	
DRAWING: 11	OF: 13

T:\Projects\2012\EN\12-331 Edgecombe - LFGCCS C&M\CAD\D1399.dwg, FIG11, 9/12/2014 1:00:28 PM, 1:1



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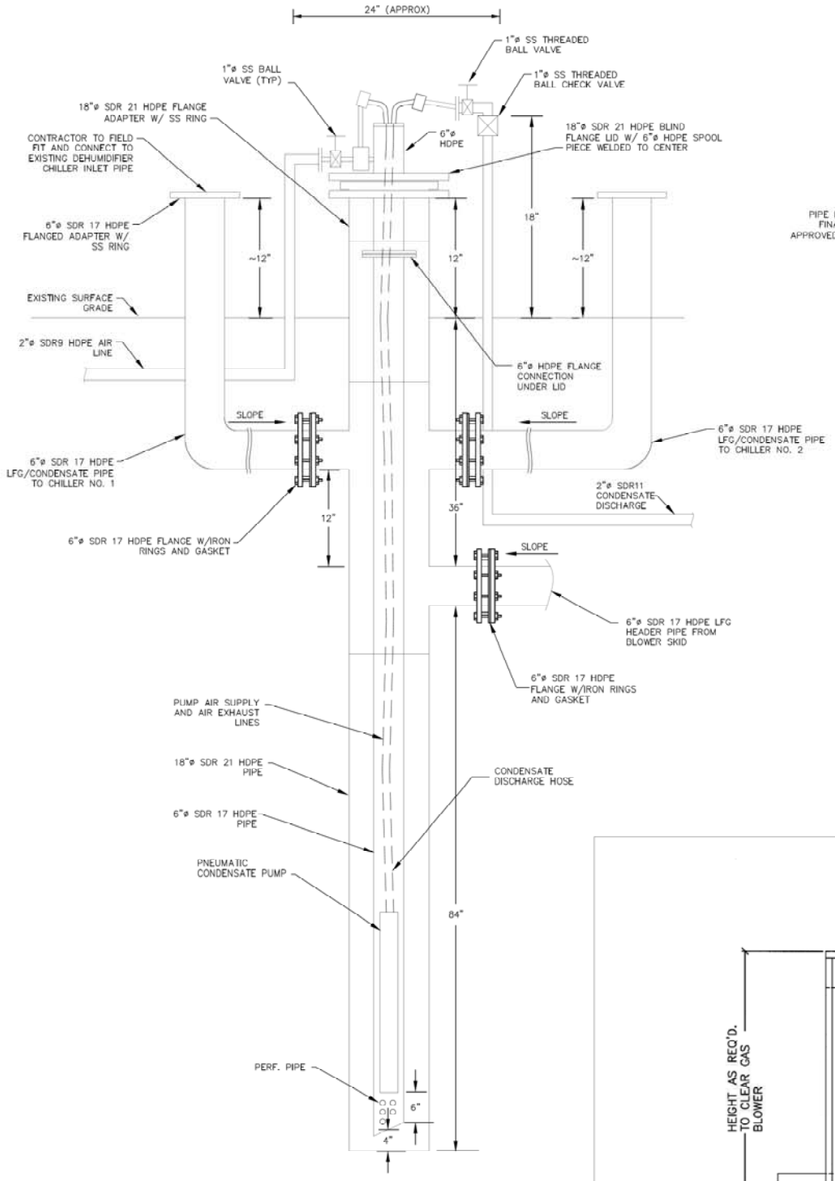
NO.	DATE	DESCRIPTION	BY

LFG CONNECTION BETWEEN BFS & GAS TREATMENT

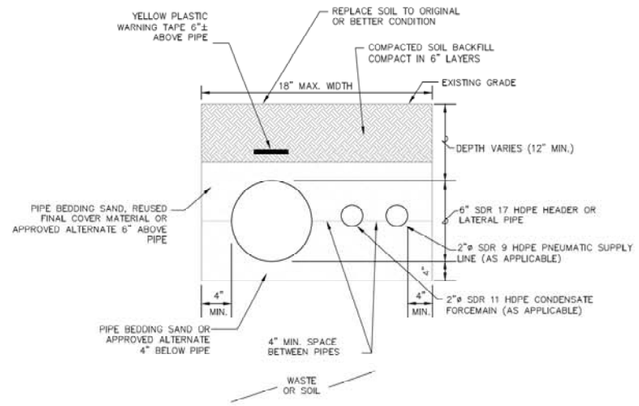
CONTAINERIZED LFGTE FACILITY
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ANC	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-240F	
SCALE: 1" = 5'	DATE: MARCH 2013
DRAWING NUMBER: D-1309	
DRAWING: 12	OF: 13

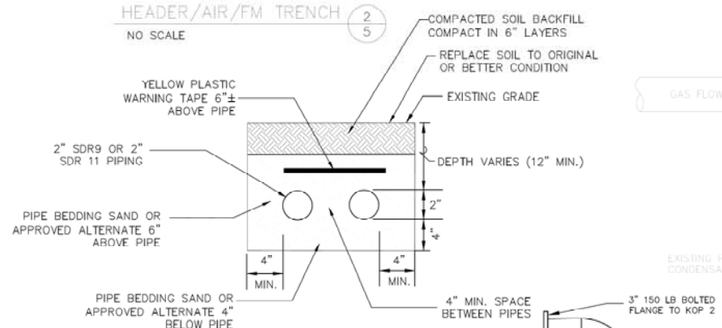


DEHUMIDIFIER SUMP (1/5)
NO SCALE

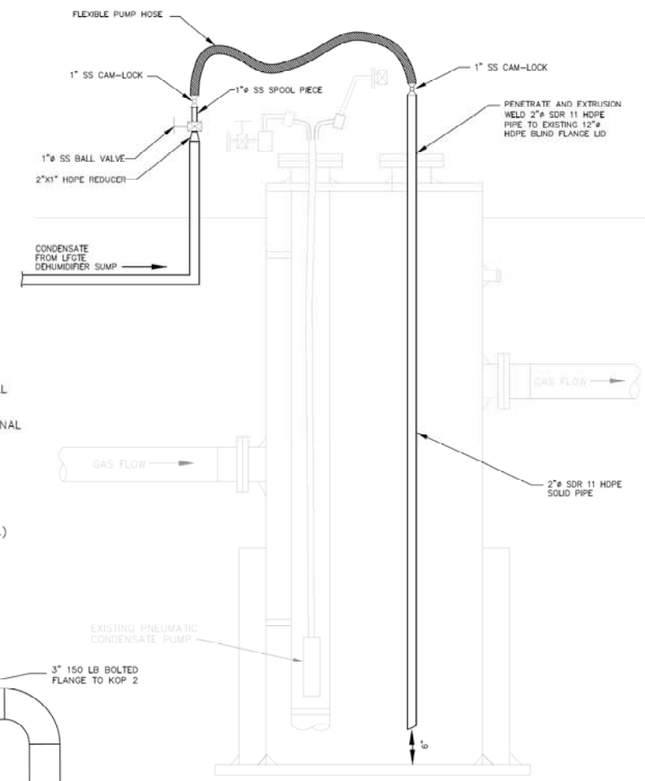
NOTE: AT A MAXIMUM LIQUID DISCHARGE RATE OF 60 GAL/DAY FOR EACH CHILLER, SUMP WILL HAVE A LIQUID STORAGE CAPACITY FOR APPROXIMATELY 6 DAYS.



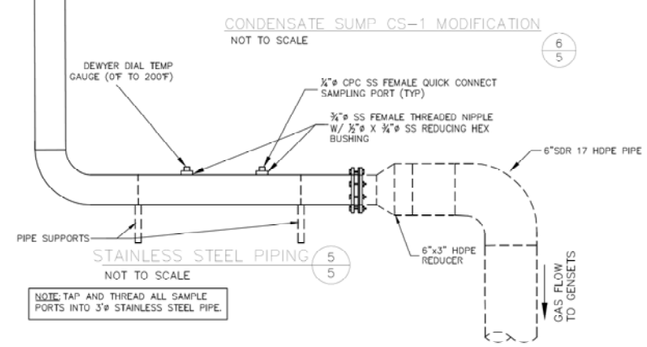
HEADER/AIR/FM TRENCH (2/5)
NO SCALE



AIR/FORCEMAIN TRENCH (3/5)
NO SCALE

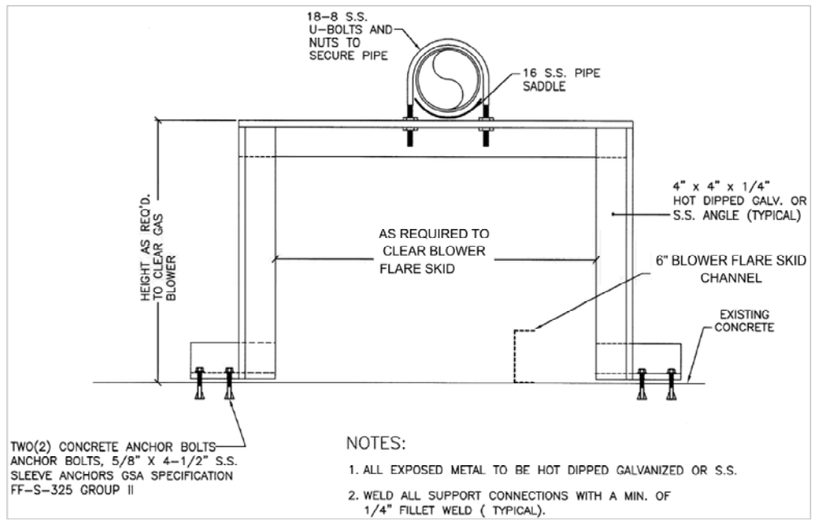


CONDENSATE SUMP CS-1 MODIFICATION (6/5)
NOT TO SCALE



STAINLESS STEEL PIPING (5/5)
NOT TO SCALE

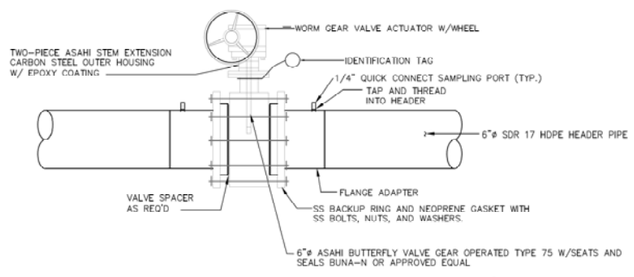
NOTE: TAP AND THREAD ALL SAMPLE PORTS INTO 3"ø STAINLESS STEEL PIPE.



NOTES:

1. ALL EXPOSED METAL TO BE HOT DIPPED GALVANIZED OR S.S.
2. WELD ALL SUPPORT CONNECTIONS WITH A MIN. OF 1/4" FILLET WELD (TYPICAL).

3" S.S. PIPE SUPPORT (4/5)
NO SCALE



LFG COLLECTION SYSTEM ISOLATION VALVE DETAIL (7/5)
NOT TO SCALE

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NO.	DATE	DESCRIPTION	BY

MECHANICAL DETAILS

CONTAINERIZED LFGTE FACILITY
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: CEC
DESIGNED BY: ANC	APPROVED BY: SPW
PROJECT NUMBER: 1054-07-240F	
SCALE:	DATE: NOV. 2012
DRAWING NUMBER: D-1310	
DRAWING: 13	OF: 13

APPENDIX H

Technical Specifications

TECHNICAL SPECIFICATIONS TABLE OF CONTENTS

DIVISION 01000

01000	Summary of Work
01025	Measurement & Payment
01050	Field Engineering
01052	Surveying for LFG System
01200	Meetings
01300	Submittals
01400	Quality Requirements
01500	Construction Facilities
01600	Material and Equipment
01630	Product Options and Substitutions
01650	Start-Up
01700	Close-out
01800	Health and Safety

DIVISION 02000

02060	Aggregate
02200	Earthwork
02320	Structural Fill
02321	Backfill
02670	LFG Wells and Wellheads
02985	Seeding

DIVISION 03000

03100	Concrete Forms and Accessories
03300	Cast In-Place Concrete
03480	Pre-Cast Concrete Structures

DIVISION 10000

10340	Fixed Aluminum Ladders

DIVISION 11000

11170	Skid-Mounted Landfill Gas Blower/Flare System
11200	Condensate Sumps
11300	Liquid Transfer Pumps

DIVISION 13000

13200	Polyethylene Storage Tanks

DIVISION 15000

15050	Pipe and Pipe Fittings
15052	Landfill Gas System Valves
15880	Compressed Air System

SECTION 01000

SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. A summary of the Work to be performed under this Contract is presented herein. The following summary is not intended to specifically mention each component of the Work covered by the Contract Documents.

1.2 RELATED SECTIONS

A. All Sections.

1.3 SCOPE OF WORK

A. The location of the project site is the Edgecombe County Landfill located at 2872 Colonial Road in Tarboro, North Carolina, in Edgecombe County.

B. The work of this Contract consists of furnishing and installing, complete, including labor, equipment, parts, materials, and other work incidental for approximately eight (8) new vertical extraction gas wells, conversion of 28 existing gas vents to active gas wells, capping 32 existing gas vents, three (3) condensate sumps, approximately 5,000 linear feet of above grade gas piping, three (3) isolation valve assemblies, a 300 scfm blower/flare station, and related valves and appurtenances.

C. CONTRACTOR to complete the Work, in place, tested, and ready for continuous service. CONTRACTOR to perform or provide repairs, replacements, and restoration required as a result of damages resulting from construction operations.

D. CONTRACTOR to furnish all materials, equipment, and incidentals which are reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.

1.4 CONTRACTOR'S WORK SCOPE

A. CONTRACTOR shall furnish all labor, materials, tools, equipment, supervision, transportation, and installation services required for the following tasks as summarized below, and outlined in the Drawings and Specifications:

1. Pre-construction survey of all new vertical well locations, condensate sumps, header/lateral alignment at a 100 linear foot interval, blind flanges, and isolation valves. CONTRACTOR to stake in the field and provide

survey data to ENGINEER for approval prior to beginning construction. ENGINEER and OWNER to visually approve staking.

2. Drill, install, and backfill vertical extraction wells. Temporarily cap all new wells to prevent the free-venting of LFG.

3. Convert 28 existing passive gas vents to active gas wells.

4. Cap 32 existing passive gas vents, not being used in the active landfill gas collection system.

5. Install on-grade landfill gas header and lateral piping. Belowgrade piping may be required in some areas due to road crossings, crossing stormwater features, or to otherwise provide positive condensate drainage in the gas piping to a condensate sump.

6. Install condensate sumps.

7. Install vertical gas extraction wellheads on 8 new gas wells and 28 converted gas vents.

8. Make connections from LFG laterals to vertical extraction wells.

9. Install blower/flare station.

10. Startup and test blower/flare station and LFG collection and condensate systems. OWNER to provide LFG collection system balancing.

11. Re-grade and re-vegetate all disturbed areas to OWNER satisfaction.

12. Make all repairs, improvements, and/or modifications to Work to satisfy ENGINEER substantial completion punchlist.

13. Clean site to OWNER satisfaction and demobilize.

14. Provide all necessary warrantees, as-built surveys, Record Drawings, and construction documentation to ENGINEER.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. The items listed below beginning with paragraph 3.1, refer to and are the same pay items listed on the Bid Form. They constitute all of the lump sum and unit price pay items for the completion of the work. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, plant, or services, CONTRACTOR'S field office, job signs, sanitary requirements, testing and safety devices, submittals, record drawings, water supplies, power, maintaining traffic, removal of contractor-generated waste, watchmen, security, bonds, insurance, warrantees, and all other items specified in the General Requirements. Compensation for all such labor, materials, and services shall be included in the bid prices stipulated for the lump sum and contingency pay items.

B. Each pay item bid price will be deemed to include an amount considered by the CONTRACTOR to be adequate compensation to cover the CONTRACTOR'S overhead and profit for each of the separately identified pay items.

C. CONTRACTOR mobilization and demobilization shall be paid for separately with a lump sum pay item.

D. CONTRACTOR shall locate existing utilities prior to excavation. Utility location shall not be paid for separately and shall be included in the bid prices stipulated for the lump sum and unit pay items.

E. All CONTRACTOR Health and Safety provisions to perform the work will not be paid for separately and shall be included in the bid prices stipulated for the lump sum and unit pay items.

F. Monthly Payment Applications for lump sum, or unit price pay items in progress shall be based on the percent complete at the end of each month as determined by the ENGINEER and the OWNER. During the last week of each month, the CONTRACTOR is responsible for providing the ENGINEER and OWNER with records of construction that has occurred during the month. The ENGINEER and OWNER will consider the information provided by the CONTRACTOR and other information as necessary before making a determination on the percent complete on each pay item for the month. The CONTRACTOR’s monthly payment application should reflect the percent complete for each pay item as determined by the ENGINEER and OWNER.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.3 SUMMARY

A. This Section specifies administrative and procedural requirements for lump sum and unit bid prices.

1. A lump sum price is an amount proposed by Bidders and stated on the Bid Form as a price where measurement will not be made for payment for materials, services and/or work identified in the plans and specifications for a particular pay item. The CONTRACTOR will not be entitled to any adjustment in a lump sum bid price as a result of any change caused by a variation in quantities as a result of more accurate measurements. The CONTRACTOR agrees to accept the aforesaid lump sum bid price as complete and total compensation for all work to be performed under a lump sum pay item.

2. A unit price is an amount bid and stated on the Bid Form as a price per unit of measurement based on the measured quantities for materials and/or services.

3. Additional work may be required during the progress of the project primarily due to changing landfill conditions. The unit price proposed by the bidders and stated on the Bid Form as a price per unit of measurement of work completed that may be added to the project by FIELD ORDER. A Field Order will be issued to the CONTRACTOR by the ENGINEER for additional work deemed necessary by the OWNER. It will be the responsibility of the CONTRACTOR to request additional time to be added to the Contract Time Period for any work added to the project by Field Order.

4. Lump sum prices include all necessary material, labor, equipment, overhead, profit and applicable taxes.

5. Refer to individual Specification Sections for construction activities requiring the establishment of bid prices.

6. The OWNER reserves the right to reject the CONTRACTOR's measurement of work-in-place that involves use of established unit cost bid prices, and to have this work measured by an independent surveyor at the OWNER'S expense.

1.4 VALUES OF UNIT PRICES

A. The number of units and quantities contained in the Bid Schedule are approximate only, and final payment will be made for the actual number of units and quantities incorporated in the Work or made necessary to complete the project.

B. In the event that Work and materials or equipment are required to be furnished to a greater or lesser extent than is indicated by the Contract Documents, such work and materials or equipment shall be furnished in greater or lesser quantities.

1.5 CHANGES AND EXTRA WORK

A. Changes and extra work will be measured and paid for in accordance with the requirements of this Section. It will be the responsibility of the CONTRACTOR to request additional time to be added to the Contract Time Period for any work added to the project by changes.

1.6 REJECTED MATERIALS

A. Quantities of material wasted or disposed in a manner not called for in the Specifications; rejected loads of material, including material rejected after it has been placed by reasons of the failure of CONTRACTOR to conform to the provisions of the Specifications; material not unloaded from the transporting vehicle; material placed outside the limits indicated by the Drawings or established by OWNER; or material remaining on hand after completion of the Work, will not be paid for, and such quantities will not be included in the final total quantities. No compensation will be made for loading, hauling, and disposing of rejected material.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 MEASUREMENT AND PAYMENT

A. PAY ITEMS

1. MOBILIZATION/DEMOBILIZATION/BONDS/INSURANCE

Measurement: Measurement of the various items of work for Mobilization and Demobilization, Bonds, and Insurance will not be made for payment and all items shall be included in the Contract Lump Sum Price.

Payment: Payment for Mobilization and Demobilization shall be made at the Contract Lump Sum Price which price and payment shall be full compensation for the preparatory work and operations in mobilizing for the commencement of the work including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, and for any other pre-construction expense necessary for the start of the work, regardless of how many times such moves are made. The item shall also include all costs to clean the site and demobilize. Mobilization and Demobilization shall also include bonds; insurance; indemnification; permits; utility services; sanitary facilities; CONTRACTOR's temporary field offices; security; construction photographs; licensures; and taxes;. The CONTRACTOR will be paid one half of the lump sum price at the initiation of mobilization and the remainder of the lump sum price at the completion of demobilization and site cleanup to the satisfaction of the

OWNER and ENGINEER. The amount of the Mobilization and Demobilization cannot exceed eight (8) percent of the total Project Bid.

2. HEALTH AND SAFETY

Measurement: Measurement for the CONTRACTOR'S Health and Safety will not be made for payment and all items shall be included in the contract lump sum price.

Payment: Payment will be made to CONTRACTOR in a lump sum basis for all required health and safety requirements for the projects, including, but not limited to, well drilling safety, applicable OSHA requirements, asbestos requirements, landfill gas requirements, electrical safety requirements, and site specific requirements.

3. SURVEYING

Measurement: Measurement of the various items of work for the surveying will not be made for payment and all items shall be included in the Contract Lump Sum Price.

Payment: Payment will be made to CONTRACTOR on a lump sum basis for all costs to perform pre-construction survey and stake-outs, surveys to complete quantities, intermediate surveys, surveys for grade, surveys to document as-built conditions, and the preparation of Record Drawings. One-half of the lump sum survey payment will be made upon completion and ENGINEER acceptance of the pre-construction survey and stake-out. The remaining one-half of the lump sum payment will be made upon the completion and ENGINEER acceptance of the as-built survey and Record Drawings.

4. LANDFILL GAS EXTRACTION WELLS

Measurement: Measured by installed vertical linear foot (VLF) from the existing grade (at the time of installation) to the bottom of the boring as accepted by the ENGINEER.

Payment: Payment for 36-inch vertical extraction wells includes all costs to drill, install well materials, and dispose of all drill cuttings (including solid waste) as shown in the Drawings. CONTRACTOR shall dispose all drill cuttings to the active working face of the landfill. Payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals necessary for accessing well locations, drilling and boring, installation of 6" diameter SCH 80 PVC casing, pipe fittings, backfill materials, bentonite plugs, geotextile separator, temporary caps, all quality control testing, health and safety, and all other associated construction, complete and in-place in accordance with the Drawings and Specifications. The CONTRACTOR will be paid for abandoned wells at one-half the price per vertical foot for vertical gas extraction wells as listed in the Bid.

5. NESTED LANDFILL GAS EXTRACTION WELLS

Measurement: Measured by installed vertical linear foot (VLF) from the existing grade (at the time of installation) to the bottom of the boring as accepted by the ENGINEER.

Payment: Payment for 36-inch vertical extraction wells includes all costs to drill, install well materials, and dispose of all drill cuttings (including solid waste) as shown in the Drawings. CONTRACTOR shall dispose all drill cuttings to the active working face of the landfill. Payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals necessary for accessing well locations, drilling and boring, installation of 6" diameter SCH 80 PVC casing, pipe fittings, backfill materials, bentonite plugs, geotextile separator, temporary caps, all quality control testing, health and safety, and all other associated construction, complete and in-place in accordance with the Drawings and Specifications. The CONTRACTOR will be paid for abandoned wells at one-half the price per vertical foot for vertical gas extraction wells as listed in the Bid.

6. 2-INCH DIA. EXTRACTION WELL WELLHEADS

Measurement: Measured by each (EA) complete wellhead assembly installed, tested, and accepted by the ENGINEER.

Payment: Payment includes all costs to furnish and install wellheads as described in Section 02670 and as shown on the Drawings. Payment includes all labor, materials, tools, equipment, and incidentals for installing the wellhead, local backfill and grading to drain; connection of wellhead to header/lateral piping; flexible PVC pipe; gate valves; monitoring ports; pipe fittings to connect to lateral/header; gas lateral and well vent above grade risers; quality control testing; warrantees; and other associated construction.

7, 8, & 9. ON-GRADE LANDFILL GAS HDPE PIPING (8, 6, and 4-inch pipe)

Measurement: Measured by the linear foot (LF) installed on-grade and based on a survey of the completed installation and accepted by the ENGINEER.

Payment: Payment includes all costs, equipment, tools, and labor to furnish and install HDPE piping, fittings, location and avoidance of utilities, on grade pipe stabilization, re-bar staking, soil berm installation, intermediate grading and surface preparation, and quality control testing as shown on the Drawings and described in the Specifications.

10, 11 & 12, BELOW GRADE LANDFILL GAS HDPE PIPING (8, 6, and 4-inch pipe)

Measurement: Measured by the linear foot (LF) installed below grade based on a survey of the completed installation and accepted by the ENGINEER.

Payment: Payment includes all costs, equipment, tools, and labor to furnish and install HDPE piping, intermediate grading, fittings, location and avoidance of utilities, trench excavation, trench stabilization, removal of waste materials to active working face, below grade pipe installation, bedding materials, backfill soil, and quality control testing as shown on the Drawings and described in the Specifications. Payment also includes the cost for HDPE gas pipe within road-crossings. The additional costs of encasement pipe, repair of roadways, and drainage features are in the Road Crossing Unit Cost item.

13. CONVERSION OF PASSIVE GAS VENTS TO ACTIVE GAS WELLS

Measurement: Measurement by each (EA) complete conversion completed satisfactory by CONTRACTOR and accepted by ENGINEER.

Payment: Payment includes all costs to convert the existing gas vents to active gas wells, except the wellhead costs. These costs include installation of a wellbore seal, installation of the bentonite plugs, surface grading and compaction, extension or reduction solid HDPE piping (as needed), and all labor, equipment, tools, warranties, and all performed quality testing.

14. 8-INCH HDPE FLANGES

Measurement: Measurement for the various items of work for the 6-inch HDPE flanges will be made on each (EA) complete flange assembly satisfactorily installed by the CONTRACTOR and accepted by the ENGINEER.

Payment: Payment for 8-inch HDPE flanges shall be made on each flange installed, of which price and payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals for installing the HDPE SDR 17 flange adapter; HDPE SDR 11 flange plate; iron back-up ring; zinc-coated bolts, nuts, and washers; neoprene gasket; pipe fusion; plastic sheeting and taping; all quality control testing; and all other associated construction, complete and in-place in accordance with the plans and specifications.

15. 8-INCH BUTTERFLY ISOLATION VALVES

Measurement: Measured by each (EA) isolation valve assembly installed, tested, and accepted by the ENGINEER.

Payment: Payment includes all costs to furnish and install 8-inch butterfly valve and related equipment as shown on the Drawings. Payment includes all labor, materials, equipment, and tools; fittings; bolts, nuts, and washers; backfill (if required) valve extension housings; valve operating wheels and handles; valve operating stems; monitoring ports and associated pipe; and all quality control testing.

16. CAPPING PASSIVE GAS VENTS

Measurement: Measurement by each (EA) passive gal vent capped and sealed satisfactory by CONTRACTOR and approved by ENGINEER.
Payment: Payment includes all costs to cap and seal existing passive gas vents that are not going to be connected to the active gas collection system. These costs to include PVC cap, stainless steel screws, silicone caulk, replacement of HDPE slotted riser pipe with solid riser pipe (as applicable), and all labor, equipment, tools, warranties, and all performance and quality testing.

17. CONDENSATE SUMPS

Measurement: Measured by each (EA) condensate sump installed, tested, and accepted by the ENGINEER.

Payment: Payment includes all costs to furnish and install HDPE condensate sump, backfill, gravel, connections, and related equipment as shown on the Drawings. Payment includes all labor, materials, equipment, and tools, warrantees, and all performance and quality control testing.

18. 300 SCFM BLOWER AND OPEN FLARE SYSTEM

Measurement: Measurement for the various items of work for the procurement, delivery, and successful testing of a 300 scfm blower and open flare system satisfactorily provided by the CONTRACTOR and accepted by the ENGINEER.

Payment: Payment for the connection shall be made on a lump sum basis, of which payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals necessary for procurement, insurance, fabrication, delivery, testing, demonstration, and all other steps needed to provide a fully-operational 400 scfm blower and open flare system in accordance with the plans and specifications. Payment of a maximum of 10 percent of the contract lump sum price may be requested upon ENGINEER's approval of Shop Drawings. Payment of an additional 40 percent of the contract lump sum price may be requested upon delivery of the blower/flare station to the site. Payment of the remaining 50 percent contract lump sum price will be made upon final acceptance of blower/flare station by ENGINEER, including successful completion of all testing.

19. BLOWER/FLARE INSTALLATION

Measurement: Measurement for the various items of work for the installation of the 300 scfm blower/flare system satisfactorily installed by the CONTRACTOR and accepted by the ENGINEER.

Payment: Payment for the connection shall be made on a lump sum basis, of which payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals necessary for all site grading and earthwork to level the blower/flare site, installation of gravel flare base, installation of storm water controls, chain-link fencing, LFG inlet piping and condensate drain connections, extension and installation of all electrical and telephone connections, locating existing utilities; all quality control testing; and all other associated construction, complete and in-place in accordance with the plans and specifications.

20. ROAD CROSSINGS (12-INCH CMP)

Measurement: Measured by the linear foot (LF) installed based on a survey of the completed installation and accepted by the ENGINEER.

Payment: Payment for the road-crossings is based on the corrugated metal pipe (CMP), bedding, additional required pipe slope, replacement of roadway surface, coordination with OWNER, and quality control testing. The HDPE gas pipe, condensate forcemain, and pneumatic supply lines within the road-crossings will be paid under the separate linear foot prices for these items.

21. SOIL EROSION AND SEDIMENT CONTROL

Measurement: Measurement will not be made for payment and all items shall be included in the contract lump sum.

Payment: Payment will be made through CONTRACTOR on a lump sum basis for all required soil erosion and sediment control requirements for the project including, but not limited to, installation of erosion and sediment controls as required by field conditions in compliance with the solid waste permit and applicable NC regulations, [Section 02200, 3.6].

22. COVER RESTORATION

Measurement: Measurement for the various items of work for the cover restoration will be for the complete re-vegetation of disturbed and damaged areas of the landfill cover by the CONTRACTOR during his normal work and accepted by the ENGINEER.

Payment: Payment for the re-vegetation shall be on a lump sum basis and payment shall be full compensation for furnishing all labor, materials, equipment, and incidentals necessary for final grading to pre-construction (or better) conditions, seeding, mulching, fertilizing, protecting, and otherwise ensuring that successful vegetation is established to the acceptance of the OWNER and ENGINEER.

END OF SECTION

SECTION 01050

FIELD ENGINEERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements for survey work to be performed by CONTRACTOR to layout Work under this Contract.

B. Before commencing any surveys, CONTRACTOR will give ENGINEER two (2) working days advance notice so that ENGINEER may witness such work.

1.2 RELATED SECTIONS

A. Section 01025 - Measurement and Payment.
Section 01052 – Surveying for LFG System

1.3 DESCRIPTION

A. Reference points: Reference points to be provided by ENGINEER will include referenced monuments and elevation benchmarks in the vicinity of the Project. If displaced by CONTRACTOR, replacement of these reference points will be at the expense of CONTRACTOR.

B. CONTRACTOR will furnish all necessary detail surveys including all lines, grades, and elevation appropriate to control construction.

1.4 SURVEYS FOR MEASUREMENT FOR PAYMENT

A. When the Specifications or ENGINEER require Bid Schedule items of work to be measured by surveying methods, CONTRACTOR will perform the surveys. All such surveys, including control surveys for establishing the measurement reference lines, will be performed by a duly qualified and licensed surveyor in the presence of CONTRACTOR who will provide notice so ENGINEER may witness the surveying operation. ENGINEER may independently check calculations of final quantities for payment purposes. A duplicate of the note reductions and calculations will be given to ENGINEER. All calculated quantities shall be certified by surveyor as to accuracy.

1.5 SURVEYING ACCURACY AND TOLERANCES IN SETTING OF SURVEY STAKES

A. Perform control traverse field surveys and computations to an accuracy of at least 1:10,000.

B. The tolerances applicable in setting survey stakes are as set forth below. Such tolerances cannot supersede stricter tolerances required by the Drawings or Specifications, and cannot otherwise relieve the CONTRACTOR of responsibility for measurements in compliance therewith.

Type of Mark	Horizontal Position	Elevation
Permanent reference points	1 in 10,000	±.01 ft.
General excavation and earthwork	1 in 2,000	±.10 ft.

A. Tolerances for designed thickness shown on Drawings and for elevations shown on the Drawings are ±0.10 foot unless otherwise specified.

B. Surveyor must be licensed in the State of North Carolina, unless otherwise noted in the Specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01052

SURVEYING FOR LFG SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

Section includes requirements for surveying, field engineering, and record documents.

1.2 CONTRACTOR'S SURVEYOR

CONTRACTOR is required to use a qualified and North Carolina licensed surveyor to provide field engineering and surveying services as required for layout and as-built surveys as indicated on the Drawings and specified herein. The CONTRACTOR may use qualified in-house staff to perform intermediate surveying work during the construction. The CONTRACTOR's surveyor shall perform the following as necessary to install the LFG system:

- Locate existing features;
- Generate cut sheets;
- Provide construction stake out;
- Update Record Drawings;
- Create final Record Drawings;
- Provide surveys for measurement and payment for the work, and provide survey base maps for record Drawings.

1.3 OWNER'S SURVEYOR

The OWNER's surveyor may verify the work as the OWNER deems necessary.

1.4 DEFINITIONS

A. Existing Features: existing features may include but are not limited to the following:

- Stormwater System
- Sediment Basins
- Grass lined, rip rap lined, and gabion lined channels
- Buried piping
- Leachate System
- Manholes
- Groundwater Monitoring wells
- Leachate Systems

B. Independent Surveyor: employed by an organization which is independent from the CONTRACTOR.

1.5 SUBMITTALS

Submit the following items to the ENGINEER for review:

A. Pre-Construction Survey: To account for site conditions that may differ significantly from those shown on the drawings, the CONTRACTOR shall submit to the ENGINEER for review a complete pre-construction survey of (at a minimum) all new vertical wells, all header/lateral pipe at 100 linear foot intervals, isolation valves, condensate sumps, and blower/flare station location. The pre-construction survey must include the northing, easting, and vertical elevation of all points and must be delivered to the ENGINEER in a digital file in AutoCAD. The CONTRACTOR to stake these locations in the field for visual approval by the ENGINEER and OWNER prior to beginning work.

B. Project As-Built Drawings (record documents): Upon Substantial Completion of the Work, deliver As-Built 24” x 36” drawings to ENGINEER. Final payment will not be made until satisfactory record documents are received by the ENGINEER. Accompany record documents with transmittal letter containing:

- Date;
- Project title and number;
- CONTRACTOR'S name and address;
- Title and number of each record document;
- Certification that each document as submitted is complete and accurate;
- Signature of CONTRACTOR, or his authorized representative; and,
- Certification from North Carolina licensed surveyor.

At a minimum, the as-built drawings should consist of the following level of detail:

- Northing and Easting (State Plane Coordinate System) coordinates or reference to permanent surface improvements for every installed extraction well, condensate sump, lateral/header pipe interconnection, blower/flare station, leachate, and condensate system, blind flanges, road crossings, and LFG header/lateral high points.

- Top of pipe elevations at all LFG lateral and header pipes at intervals not to exceed 50 linear feet between horizontal measurements, as well as at every lateral/header/collector pipe interconnection.

- Give particular attention to concealed elements that would be difficult to measure and record at a later date.

- A digital file of the Record Drawings must be provided to the ENGINEER in AutoCAD format.

1.6 MONTHLY INSPECTIONS

To verify the CONTRACTOR's monthly progress payment requests, the ENGINEER may request the following items for monthly inspection:

A. Record Documents maintained by CONTRACTOR
B. Surveyor's Measurements, Notes and Cut Sheets

1.7 SITE CONDITIONS

A. Existing Grades: The Drawings depict year 2011surface elevations. Filling activities, maintenance activities, new construction, regrading, and routine settlement may have occurred since the original survey. The CONTRACTOR is responsible for locating, and notifying the OWNER of such changes if they materially affect the proposed LFG system installation.

B. Existing Features: CONTRACTOR is required to field verify the location of existing features that materially affect installation of the proposed LFG system. The OWNER's record drawings are available to the CONTRACTOR to field verify existing features. The existence and location of existing features shown on the drawings are not guaranteed. Before beginning sitework, the CONTRACTOR shall investigate and verify the existence and location of underground utilities and existing features. The OWNER and the ENGINEER take no responsibility for the accuracy of these record drawings implied or otherwise.

C. Field Verification: Prior to construction, the CONTRACTOR shall verify the location of existing features at points of connection or tie-in to the Work.

D. Field Conditions and Measurements: The CONTRACTOR shall base all measurements, both horizontal and vertical, from established benchmarks. The CONTRACTOR shall be responsible for field verification of all dimensions and conditions at the job site.

E. Discrepancies: Should the CONTRACTOR discover any discrepancy between actual conditions and those indicated which prevent following good practice or the intent of the Drawings and Specifications, he shall notify the ENGINEER, request clarification and instructions, and shall not proceed with his work until he has received the same from the ENGINEER.

F. No Additional Payment: No claims shall be made for extra payment or extensions of Contract completion time if the CONTRACTOR fails to notify the ENGINEER of any discrepancy before proceeding with the aspect of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 QUALIFICATIONS OF SURVEYOR

The CONTRACTOR shall utilize a qualified surveyor. As noted in Part 1.2 above, the CONTRACTOR's surveyor must be licensed in the State of North Carolina for all work except intermediate grade and construction assistance surveying.

3.2 FIELD SURVEY WORK

A. Control Points: The ENGINEER will identify existing control points as indicated in the Supplementary Conditions portion of these specifications. The CONTRACTOR shall promptly replace lost or destroyed project control points. Replacements shall be based on the original survey control points. The CONTRACTOR shall relate all work to the facility elevation datum and coordinate system. The CONTRACTOR is responsible for all construction layout and staking. As needed, CONTRACTOR shall establish additional benchmarks and control points to complete his surveying. Any additional benchmarks shall be noted on the Record Drawings.

B. Site Improvements: The CONTRACTOR shall work from lines and levels established by benchmarks and markers to set lines and levels as needed to properly locate each element of the Project. The CONTRACTOR shall locate and lay out LFG collection system, including stakes for wells, condensate management system, and LFG header pipes and appurtenances by instrumentation and similar appropriate means. The CONTRACTOR shall calculate and measure required dimensions within indicated or recognized tolerances. The CONTRACTOR shall not scale Drawings to determine dimensions.

C. Relocation of Existing Utilities: The CONTRACTOR shall furnish information necessary to adjust, move or relocate existing features, structures, utility poles, lines, services or other appurtenances located in, or affected by construction of the LFG system. The CONTRACTOR shall coordinate with local authorities having jurisdiction.

D. Surveyor's Log: The CONTRACTOR shall keep neat legible notes of all measurements and calculations made by him while surveying and laying out the work. The CONTRACTOR shall maintain a surveyor's log of control and other survey work. The CONTRACTOR shall make this log available for reference by the ENGINEER.

3.3 TOLERANCES

A. Inside the Limits of Existing Refuse: Within the limit of existing refuse, elevations and contour lines shown on the drawings are approximate. However, minimum and maximum slope requirements shown on the drawings and specified herein must be observed at all times unless otherwise approved by the ENGINEER. Slopes shall be constructed as indicated. Minimum slope for LFG headers on the landfill surface shall be 3.0 percent unless otherwise indicated on the drawings or approved by the ENGINEER.

B. Outside the Limits of Existing Refuse: Outside the limits of existing refuse, grades and pipe slopes shall be constructed as indicated on the drawings or as otherwise approved by the ENGINEER.

3.4 RECORD DOCUMENTS

A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the ENGINEER's reference during normal working hours. Store record documents and samples in CONTRACTOR'S field office apart from documents used for construction. Provide files, racks, and secure storage for record documents and samples.

B. Recording

1. Label and file record documents and samples in accordance with Specification Section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

2. Preparation of project record documents shall be by personnel qualified to prepare the required drawings.

3. Record and update daily record information from field notes, on set of blue line prints, and copy of Project Manual.

4. Record information concurrently (daily) with construction progress. Do not conceal work until required information is recorded.

5. Record deviations from required lines and levels, and advise the ENGINEER when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

C. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual

installation where the installation varies substantially from the work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

Mark record sets with red erasable pencil. Mark new information that is important to the OWNER, but was not shown on Contract Drawings or Shop Drawings. Note related Change Order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Legibly mark each item to record actual construction, including:

1. Measured horizontal and vertical locations of underground appurtenances in accordance with Section 1.5 C above.

2. Measured locations of LFG collection system, existing liner systems, internal utilities, and appurtenances concealed in construction, referenced to visible and accessible features of construction.

3. Field changes (dimensions and detail)

4. Changes made by Modifications.

5. Details not on original Contract Drawings.

6. References to related Shop Drawings and Modifications.

7. Depths of various elements of the Work in relation to datum.

D. Record Specifications: Maintain one complete copy of the Project Manual, including addenda, and one copy of other written construction documents such as Change Orders and modifications issued in printed form during construction. Mark these documents to show substantial variations in actual work performed in comparison with the text of the Specifications and modifications. Give particular attention to substitutions, selection of options and similar information on elements that are concealed or cannot otherwise be readily discerned later by direct observation. Note related record drawing information and product data. Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Change Order or Field Order.

3. Other matters not originally specified.

E. Record Product Data: Maintain one copy of each Product Data submittal. Mark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instructions and recommendations. Give particular attention to concealed products and portions of the work which cannot be otherwise be readily discerned later by direct observation. Note related Change Orders and mark-up of record drawings and Specifications.

Upon completion of mark-up, submit complete set of record Product Data to the ENGINEER for the OWNER'S records.

F. Record Sample Submitted: Immediately prior to the date or dates of Substantial Completion, the CONTRACTOR will meet at the site with the ENGINEER and the OWNER'S personnel to determine which of the submitted samples that have been maintained during progress of the work are to be transmitted to the OWNER for record purposes. Comply with delivery to the OWNER'S sample storage area.

G. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the ENGINEER for the OWNER'S records. Miscellaneous record submittals include but are not limited to:

1. Field test records
2. Inspection certificates
3. Manufacturer's certificates

H. CONTRACTOR is required to present all Record Drawings, Record Specifications, retained submittals, survey data, and other required information to ENGINEER on-site for inspection prior to CONTRACTOR submittal of any monthly pay requests.

3.6 INSPECTION

Verify locations of survey control points and existing features prior to starting work. Promptly notify ENGINEER of any discrepancies.

3.7 SURVEY FOR MEASUREMENT AND PAYMENT

Measurement for payment calculations shall be performed by the CONTRACTOR'S licensed surveyor at the CONTRACTOR’s expense and verified by the ENGINEER.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Representatives of CONTRACTOR, subcontractors, and suppliers attending meetings must be authorized to act on behalf of organizations they represent.

1.2 PRE-CONSTRUCTION MEETING

A. Meeting will be held at a location selected by OWNER.

B. Attendance:

1. CONTRACTOR's Project Manager.

2. CONTRACTOR's On-Site Field Superintendent.

3. Any Subcontractors or Supplier's representatives whom CONTRACTOR may desire to invite or OWNER may request.

4. ENGINEER's Representatives.

5. OWNER's Representatives.

C. A suggested format would include, but not be limited to, the following subjects:

1. Presentation of Contract Documents, including Drawings and Specifications, proposed construction progress schedule, and submittals as required by the Contract Documents.

2. Required bonds and insurance certifications prior to Notice to Proceed.

3. Contract Times and Liquidated Damages.

4. Procedures for handling submittals, including pre-construction survey.

5. Direction of correspondence, and coordinating responsibility between CONTRACTOR, ENGINEER, and OWNER.

6. Request or scheduling of routine progress meetings.

7. Laboratory testing of construction materials, including any off-site soil.

8. Applications for payment, and progress payment procedures.

9. Change Order procedures.

10. OWNER's site regulations.

11. CONTRACTOR questions.

12. Site tour and job walk.

D. The meeting will be documented by the ENGINEER. Copies of the minutes and relevant documents will be provided to all parties.

1.3 ROUTINE PROGRESS MEETINGS

A. The ENGINEER will schedule and administer progress meetings at a minimum of once per month, or as requested by ENGINEER or OWNER.

B. Attendance:

1. OWNER’S Representative.

2. ENGINEER.

3. ENGINEER’s CQA personnel (as applicable).

4. CONTRACTOR's superintendent.

5. Subcontractors as appropriate to agenda.

6. Suppliers as appropriate to agenda.

C. Meeting requirements:

1. ENGINEER will administer the following general requirements for progress meetings:

a. Prepare agenda for meetings.

b. Make physical arrangements for meetings.

c. Preside at meetings.

d. Record significant proceedings and decisions of meeting.

e. Reproduce and distribute copies of meeting record to participants in meeting and to parties affected by decisions made at meeting.

D. Suggested Agenda:

1. Review and approval of record of previous meeting.

2. Review of Work progress since previous meeting.

3. Field observations, problems, and conflicts.

4. Problems which impede Work Schedule.

5. Review of off-site delivery schedules.

6. Corrective measures and procedures to regain projected schedule if a review of the schedule deems it necessary.

7. Revisions to Construction Progress Schedule.

8. Coordination of schedules between contractors.

9. Review submittal schedules; expedite as required.

10. Maintenance of quality and safety standards.

11. Pending changes and substitutions.

12. Review proposed changes for effect on construction schedule and completion date, and on other contracts of projects.

13. Review of Drawings and Specifications.

14. Review of bid item quantities relative to original estimates.

15. Review and update of as-built Drawings.

16. Other business.

1.4 DAILY PROGRESS MEETINGS

A. At the ENGINEER's option, an informal progress meeting will be held daily before or shortly after the start of work. At a minimum, this meeting will be

attended by the ENGINEER (or ENGINEER's CQA personnel) and CONTRACTOR's Superintendent or designee. The purpose of this meeting is to:

1. Review scheduled work activities.

2. Discuss problems and resolutions.

3. Review survey or test data.

4. Discuss the CONTRACTOR's personnel and equipment assignments for the day.

5. Review the previous day's activities and accomplishments.

B. This meeting will be documented by the ENGINEER (or ENGINEER's CQA personnel).

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed Products list.

D. Shop Drawings.

E. Product Data.

F. Samples.

G. Manufacturer's installation instructions.

H. Manufacturers' certificates.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal with a transmittal form. Within fifteen (15) calendar days after the CONTRACTOR has received the OWNER's Notice To Proceed, the CONTRACTOR shall provide to the ENGINEER a minimum of four (4) copies of each submittal.

B. Sequentially number the transmittal form. For revised submittals add an alphabetic suffix to the original number.

C. Identify Project, CONTRACTOR, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.

D. Apply CONTRACTOR's stamp, signed or initialed certifying review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite review by the ENGINEER and delivery in the time frame specified. Coordinate submission of related items.

F. ENGINEER shall have seven (7) calendar days review time for each submittal excluding delivery time to and from the CONTRACTOR.

G. CONTRACTOR to identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

H. Provide space for CONTRACTOR, ENGINEER and/or OWNER's Representative review stamps.

I. If revisions and re-submittals are required, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with provisions.

K. Submittals not requested may not be recognized or processed.

1.3 APPLICATIONS FOR PAYMENT

A. CONTRACTOR to submit to the ENGINEER, no more frequently than monthly, Applications for Payment in accordance with the requirements listed in the General Conditions.

B. CONTRACTOR to use the standard forms shown in Appendix A and an Microsoft EXCEL spreadsheet to tabulate the quantities and unit prices for each item installed. The EXCEL spreadsheet to be provided to the ENGINEER updated with each Application for Payment.

C. CONTRACTOR to provide a schedule of values for all materials and equipment as requested by the ENGINEER to process the Applications.

D. CONTRACTOR to provide any survey measurements, photographs, drawings, record documents, etc. as requested by the ENGINEER to process the Application for Payment.

E. Once ENGINEER determines that CONTRACTOR's Application for Payment is properly completed and correct, ENGINEER will transmit the certificate for payment to the OWNER for payment.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in duplicate within five (5) business days after date of Notice to Proceed.

B. Revise and resubmit to ENGINEER as requested but no less than every 14 days. The revised schedule must show the original target schedule. Submit revised schedules during weekly progress meetings.

C. Submit a computer-generated schedule with separate line for each item of Work or operation identifying first work day of each week.

E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the critical path, start, and finish, float dates, and duration.

F. Indicate estimated percentage of completion for each item of Work at each submission.

G. Indicate submittal dates and review periods required for shop Drawings, product data, samples, and product delivery dates, including those furnished by OWNER.

1.5 PROPOSED PRODUCTS LIST

A. Within fifteen (15) calendar days after date of OWNER-CONTRACTOR Agreement, submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.6 SHOP DRAWINGS

A. Provide a minimum of two (2) copies.

B. Shop Drawings: Submit for review. After review, produce copies and distribute in accordance with the SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

1.7 PRODUCT DATA

A. Provide a minimum of two (2) copies.

B. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

C. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.

1.8 MANUFACTURER INSTALLATION INSTRUCTIONS

A. When specified in individual specification sections, submit three copies of printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to the ENGINEER.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.9 MANUFACTURER CERTIFICATES

A. When specified in individual specification sections, submit manufacturer's certificates in specified quantities.

B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting data, affidavits, certifications, and quality control testing.

C. Certificates must be specific to the material or product delivered to the site.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Tolerances.
2. Surveying.
3. References.
4. Mock-Up Requirements.
5. Testing and observation requirements.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' and/or supplier's instructions, including each step in sequence.

C. When manufacturers' and/or supplier's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Construction Drawings or as instructed by manufacturer.

G. Materials stored off the site shall be stored in a bonded warehouse and shall be clearly marked as being for this project.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 SURVEYING

A. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

B. The Contractor will be responsible for all surveying necessary for construction including Record Drawings. A 50' X 50' grid pattern or as otherwise approved by the CQA Consultant, of ground surface elevations in the construction area shall be surveyed and reference points installed by the Contractor prior to excavation and prior to placement of the soil materials. The Record finished grades and Record Drawings shall be determined and provided by he Contractor's licensed surveyor.

C. Record Drawings for liner system construction shall include at a minimum:
   1. Subgrade;
   2. Low permeability soil liner;
   3. Erosion and vegetative cover;
   4. Perimeter berms, roads, and stormwater management features; and
   5. Landfill gas wells.

D. The thickness of the soil layers (low permeability soil liner, erosion and vegetative layer) shall be determined by non-destructive survey methods by comparison of topographic survey and spot elevations of the top of subject layer to the bottom of the subject layer. All anchor trenches, berms, toes, crests and breaks-in-slope shall be surveyed, field referenced and located on Record Drawings.

1.5 REFERENCES

A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable code.

B. Obtain copies of standards where required by product specifications sections.

C. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Contractual relationships, duties, and responsibilities of parties in Contract, nor those of Engineer or CQA Consultant shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in respective product specification sections.

1.7 TESTING AND OBSERVATION REQUIREMENTS

A. Testing and observation services for the purpose of conducting tests shall be performed by the CQA Consultant as required by the project Construction Quality Assurance (CQA) Plan. All costs of testing shall be paid by the Owner except for those called out in the CQA documents to be the contractor's responsibility.

B. Testing, observations and source quality control may occur on or off project site. Perform off-site testing as required by CQA Consultant or Owner.

C. CQA Reports will be submitted by the CQA Consultant to the State Regulatory Solid Waste Section/Department indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. Contractor shall cooperate with CQA Consultant; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. The Contractor shall give ample advance notice to the CQA Consultant prior to expected time for operations requiring testing services and/or before covering up items that require inspection.
   2. The Contractor shall make arrangements with CQA Consultant and pay for additional samples and tests required for Contractor's use.

E. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

F. Re-testing or observation required because of non-conformance to specified requirements shall be performed by same CQA Consultant. Payment for re-testing will be charged to Contractor by deducting testing charges from Contract Sum/Price.

G. CQA Consultant Responsibilities:
   1. Provide qualified personnel at site. Cooperate with Owner, Engineer, and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials with requirements of Contract Documents.
   4. Promptly notify Owner and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests required by Engineer.

6. Attend preconstruction meetings and progress meetings.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Contractor shall verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Contractor shall examine and verify specific conditions described in individual specification sections.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction facilities required for the construction of the permanent facilities specified under the Scope of Work of this Contract.

B. Construction facilities include furnishing of all equipment, materials, tools, accessories, incidentals, labor, and performing all work for the installation of equipment and for construction of facilities, including their maintenance, operation, and removal, if required, at the completion of the Work under the Contract.

1.2 DEFINITION

A. Construction facilities include, but are not be limited to, the following temporary offices, utilities, equipment, materials, facilities, areas, and services:

1. CONTRACTOR's Field Office (Optional)
2. Parking Areas
3. Temporary Roads
4. Storage of Materials and Equipment
5. Construction Equipment
6. Temporary Sanitary Facilities
7. Temporary Electric Power
8. Temporary Water
9. First Aid Facilities
10. Security

1.3 GENERAL REQUIREMENTS

A. CONTRACTOR is responsible for furnishing, installing, constructing, operating, maintaining, removing and disposing of the construction related facilities, as specified in this Specification, and as required by OWNER for the completion of the Work under the Contract.

B. Locate and maintain construction facilities in a clean, safe and sanitary condition at all times until completion of the Contract.

C. The requirements specified herein are in addition to any requirements specified elsewhere in the Contract Documents. Construction facilities must meet the requirements for all-weather service.

D. Minimize land disturbances related to the construction facilities to the greatest extent possible and restore land to the extent reasonable and practical, to its original contours by grading to provide positive drainage and by seeding the area to match with existing vegetation, or as specified elsewhere. All debris or other disturbances resulting from the CONTRACTOR's actions shall be removed by the CONTRACTOR to the satisfaction of the OWNER.

1.4 FIELD OFFICE

A. At his option, CONTRACTOR to provide and pay for his own field office to be located as directed by the OWNER. CONTRACTOR to have a job box or other secure storage location on-site for the storage of Project Records.

1.5 PARKING AREAS

A. OWNER will provide parking area for maintenance and delivery vehicles, the OWNER's, ENGINEER's, and CONTRACTOR's representatives, and other authorized visitors.

1.6 TEMPORARY ROADS

A. Temporary roads are existing roads that are improved, or new roads constructed by CONTRACTOR for convenience of CONTRACTOR in the performance of the Work under the Contract. Coordinate construction with OWNER.

B. Keep erosion to a minimum and maintain suitable grade and radii of curves to facilitate ease of movement of vehicles and equipment.

C. Clean equipment so that mud or dirt is not carried onto public roads. Clean any mud or dirt transported by equipment onto paved roads both on site and off site. CONTRACTOR to minimize dust emissions from the hauling of soil and waste materials. As needed, CONTRACTOR to water roads and provide dust reduction and all OWNER site speed limits must be maintained.

1.7 STORAGE OF MATERIALS AND EQUIPMENT

A. Make arrangements for storage areas for materials and equipment. Locations and configurations of such facilities are subject to the acceptance of OWNER.

B. Confine all operations, including storage of materials, to approved area. CONTRACTOR is liable for any and all damage caused during such use of property of the OWNER or others. Store materials in accordance with manufacturer's instructions when applicable. CONTRACTOR to ensure that all equipment and materials used in the work are stored in a dry and protected condition.

C. Store construction materials and equipment within boundaries of designated areas. Storage of gasoline or similar fuels must conform to state and local regulations and be limited to the areas approved for this purpose by the OWNER.

1.8 CONSTRUCTION EQUIPMENT

A. Erect, equip, and maintain all construction equipment in accordance with all applicable statutes, laws, ordinances, rules, and regulations of OWNER or other authority having jurisdiction.

B. Provide and maintain scaffolding, staging, runways, hoists, barricades, and similar equipment required for performance of the Contract. Provide hoists or similar equipment with operators and signals, as required.

C. Provide, maintain, and remove upon completion of the Work, all temporary rigging, scaffolding, hoisting equipment, debris boxes, barricades around openings and excavations, fences, ladders, and all other temporary work, as required for all work hereunder unless otherwise directed by OWNER.

D. Construction equipment and temporary work must conform to all the requirements of state, county, local authorities, OSHA, and underwriters which pertain to operation, safety, and fire hazard. Furnish and install all items necessary for conformity with such requirements, whether or not called for under separate sections of these Specifications.

1.9 TEMPORARY SANITARY FACILITIES

A. Provide temporary sanitary facilities for use by all CONTRACTOR employees and persons engaged in the Work, including subcontractors, their employees and authorized visitors.

B. Sanitary facilities include enclosed chemical toilets and washing facilities. These facilities must meet the requirements of local public health standards. Open pit or trench latrines are not permitted.

C. Locate sanitary facilities as approved by OWNER, and maintain in a sanitary condition during the entire course of the Work.

1.10 TEMPORARY ELECTRIC POWER

A. Provide and maintain during the course and progress of the Work all electrical power and wiring requirements to facilitate the Work of all trades and services associated with the Work. Make arrangements with the applicable serving utility company or provide generators and pay all charges for providing and maintaining electrical service including usage costs at the site unless otherwise approved by the OWNER. Furnish all temporary wiring, feeders, and connections.

B. Routing of temporary conductors, including welding leads, must not create a safety hazard nor interfere with operation and maintenance of existing facilities.

C. Install all temporary wiring in accordance with the applicable requirements of the local electrical code.

1.11 TEMPORARY WATER

A. CONTRACTOR to make all arrangements for water needs from OWNER.

1.12 FIRST AID FACILITIES

A. Provide first aid equipment and supplies to serve all CONTRACTOR personnel at the site.

1.13 SECURITY

A. Make all necessary provisions and be responsible for the security of the Work and the site until final inspection and acceptance of the Work unless otherwise approved by the OWNER. In no case shall the OWNER be responsible for the security of the CONTRACTOR's supplies, property, or equipment.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

1.2 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.3 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, and/or damage.

D. Any damaged materials, whether as originally shipped or as a result of handling, shall be replaced at no additional cost to the OWNER and with no extension of contract time.

1.4 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.

B. For exterior storage of fabricated products, place aboveground on sloped supports, if in accord with manufacturer's handling instructions.

C. Provide off-site storage and protection when site does not permit on-site storage or protection.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

E. Store loose granular materials on solid flat surfaces in a well-drained area.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

H. Any products that become damaged during storage shall be replaced at no additional cost to the OWNER and with no extension of contract time.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01630

PRODUCT OPTIONS AND SUBSTITUTIONS

PART 1 GENERAL

1.1 SUMMARY

A. This Section describes CONTRACTOR procedures for securing approval of proposed product options and substitutions.

1.2 PRODUCT OPTIONS

A. The Contract is based on standards of quality established in the Contract Documents.

1. In agreeing to the terms and conditions of the Contract, the CONTRACTOR has accepted a responsibility to verify that the specified products will be available and to place orders for all required materials in such a timely manner as is needed to meet his agreed construction schedule.

2. The OWNER and ENGINEER do not agree to the substitution of materials or methods called for in the Contract Documents, except as they may specifically otherwise state in writing.

B. Materials and/or methods specified by name:

1. Where materials and/or methods are specified by naming one single manufacturer and/or model number, without stating that equal products will be considered, only the material and/or method named is approved for incorporation into the Work.

2. Should the CONTRACTOR demonstrate to the approval of the ENGINEER that a specified material or method was ordered in a timely manner and will not be available in time for incorporation into this Work, the CONTRACTOR shall submit to the ENGINEER such data on proposed substitute materials and/or methods as are needed to help the ENGINEER determine suitability of the proposed substitution.

C. Where materials and/or methods are specified by name and/or model number, followed by the words "or an equal approved in advance by the OWNER" or similar wording:

1. The material and/or method specified by name establishes the required standard of quality;
2. Materials and/or methods proposed by the CONTRACTOR to be used in lieu of materials and/or methods so specified by name must in all ways be equal or exceed the qualities of the named materials and/or methods;

D. The following products do not require further approval except for interface within the Work:

1. Products specified by reference to standard specifications such as ASTM and similar standards;

2. Products specified by manufacturer's name and catalog model number.

E. Where the phrase "or equal," or "or equal as approved by the ENGINEER," occurs in the Contract Documents, do not assume that the materials, equipment, or methods will be approved as equal unless the item has been specifically so approved in writing for this Work by the ENGINEER.

F. The decision of the OWNER, as recommended by the ENGINEER, shall be final.

1.2 DELAYS

A. Delays in construction arising by virtue of the non-availability of a specified material and/or method will not be considered by the OWNER as justifying an increase in the agreed Time of Completion.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01650

START-UP

PART 1 GENERAL

1.1 DESCRIPTION

A. A startup certification is required for the blower/flare system. Certifications include the Manufacturer's Check-Out Certification and the Demonstration Certification. The CONTRACTOR shall satisfy the requirements of these certifications as specified herein.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 PRELIMINARY MATTERS

A Startup Certification: Prior to system startup, successfully complete all testing required of the individual components. Complete and submit two (2) copies of the attached "Manufacturer's Check-Out Certification" form. The submitted copies shall have signatures of the General CONTRACTOR, the Subcontractor (if involved), and the Manufacturer's representative (if involved). All copies shall be provided with the respective Operation and Maintenance (O&M) Manual. This form and the O&M Manual shall be submitted prior to providing operational training to the OWNER and prior to conducting the final inspection.

B. Demonstrate to the ENGINEER that all temporary jumpers and/or bypasses have been removed and that all components are operating under their own controls as designated

C. Coordinate startup activities with the OWNER and with the ENGINEER prior to commencing system startup

3.2 STARTUP

A. Confirm that all equipment is properly energized and that all switches are set to their normal operating condition.

B. Initiate startup in accordance with the startup sequence. This startup sequence shall follow, exactly, the sequence in the submitted operation and maintenance manual.

C. Observe individual component operations and make adjustments as necessary to optimize the performance of the Work.

D. Coordinate with the OWNER and ENGINEER before performing any adjustments that may disturb other landfill operations.

3.3 DEMONSTRATION AND TESTING

A. After all work components have been constructed, field tested, and started-up in accordance with the individual specifications and manufacturer requirements, perform the demonstration and testing in the presence of the ENGINEER and the OWNER. The demonstration shall be held upon completion of all systems at a date to be agreed upon in writing with the OWNER.

B. The demonstration and testing shall be conducted for three consecutive days. The Work must operate successfully throughout the three-day testing period in the manner intended. If the Work does not operate successfully, the problems shall be corrected, and the three-day test shall be restarted to Day 1.

C. Acceptability of the Work's performance will be based on the work performing as specified in the Contract Documents, either under actual or simulated operating conditions as approved by the ENGINEER. The intent of the demonstration and testing is for the CONTRACTOR to demonstrate to the OWNER and the ENGINEER that the Work will function as a completed and operable system under normal as well as emergency operating conditions and is ready for acceptance.

D. In conjunction with the demonstration and testing, the CONTRACTOR shall provide a training session or sessions for a minimum of one (1) 8-hour day to adequately instruct designated OWNER personnel on system startup, operations, shutdown, and other essential features of the system equipment. The training shall detail the function of the various systems and system components and their relationships to each other. In addition, system operations under all alarm conditions shall be demonstrated; some of these alarm conditions may be simulated (e.g., via electrical jumpers) for training purposes. Prior to the substantial completion, the CONTRACTOR shall submit for approval, a detailed agenda for the training sessions and the experience of the person(s) conducting the training. Training shall be conducted on one weekday following the completion of startup testing (see Paragraph 3.3 B) at a mutually agreed upon time during normal business hours.

E. Demonstration Certification: Complete and submit two (2) copies of the attached "Demonstration Certification" form. The submitted copies shall have signatures of General CONTRACTOR, the Subcontractor (if involved), and the Manufacturer's representative (if involved). All copies shall be provided with the respective Operation and Maintenance Manual.

MANUFACTURER'S CHECK-OUT CERTIFICATION

____ OWNER: _____
____ ENGINEER: _____ Check-out
____ CONTRACTOR: _____ Memo No. _____

PROJECT DATA

NAME: _____
_____
_____

LOCATION: _____
_____
_____

OWNER: _____
_____
_____
_____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING # _____
SPECIFICATION _____
SECTION: _____

Name of equipment checked:_____
Name of manufacturer of equipment:_____

1. The equipment furnished by us has been checked on the job by us. We have reviewed (where applicable) the performance verification information submitted to us by the CONTRACTOR.
2. The equipment is properly installed, except for items noted below.*
3. The equipment is operating satisfactorily, except for items noted below.*
4. The written operating and maintenance information (where applicable) has been presented to the CONTRACTOR, and gone over with him in detail. Two (2) copies of all applicable operating and maintenance information and parts lists have been furnished to him for insertion in each of the Equipment Brochures.

Checked By:_____ _____
Name of General CONTRACTOR — Name of Manufacturer's Rep.

_____ _____
Address and Phone No. Of Rep. — Authorized Signature/Title/Date

_____ _____
Signature/Title/Person Making Check — Name of Subcontractor

_____ _____
Date Checked — Authorized Signature/Title/Date

* Manufacturer's Representative Notations - Exception noted at time of check were:

Manufacturer's Representative to note adequacy of related equipment that directly affects operation, performance or function of equipment checked. (No comment presented herein will indicate adequacy of related systems or equipment):

DEMONSTRATION CERTIFICATION

____ OWNER: _____
____ ENGINEER: _____ Check-out
____ CONTRACTOR: _____ Memo No. _____

PROJECT DATA

NAME: _____
_____
_____

LOCATION: _____
_____
_____

OWNER: _____
_____
_____
_____

CONTRACT DATA

NUMBER: _____
DATE: _____
DRAWING # _____
SPECIFICATION _____
SECTION: _____

NOTE TO CONTRACTOR:
Submit four (4) copies of all information listed below under (a) and (b) for review at least one week before scheduled demonstration of the work. After all information has been approved by the ENGINEER, give the OWNER a Demonstration of Completed Systems as specified and have the OWNER sign four (4) copies of this form. After this has been done, a written request for a final inspection of the system shall be made.

MEMORANDUM:
Approval of this certificate indicates that the OWNER has been given a Demonstration of Completed Systems on the work covered under this Specification Section. Operation of the overall system and of major equipment items were described and demonstrated. The following items were given to the OWNER:

(a) OWNER's two (2) copies of Operation and Maintenance Manual for equipment or systems specified under this section containing approved submittal sheets on all items, including the following:

(1) Maintenance information published by manufacturer on equipment items.

(2) Printed warranties by manufacturers on equipment items.

(3) Check-Out Certification on equipment signed by manufacturer's representative.

(4) Written operating instructions on any specialized items.

(5) Explanation of guarantees and warranties on the system.

(b) Record drawing showing as-built conditions.

(c) A demonstration/training session presenting system operation and maintenance procedures.

_____
(Name of CONTRACTOR)

By: _____
(Authorized Signature, Title & Date)

_____
(Name of Subcontractor)

By: _____
(Authorized Signature, Title & Date)

Received the following: Operations and Maintenance manual, as-built Drawings, demonstration and instructions on system operation

_____
(OWNER)

By: _____
(Authorized Signature, Title & Date)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope of Work: The CONTRACTOR shall provide all labor, materials, equipment and incidentals necessary to closeout the project as specified herein. Activities may include, but are not limited to final cleaning, preparation of record documents, operations and maintenance documents, delivery of spare parts, and transfer of warranties.

B. Related Work Described Elsewhere

1. All Sections.

1.2 CLOSEOUT PROCEDURES

A The CONTRACTOR shall submit written certification that Contract Documents have been reviewed, Work has been inspected by CONTRACTOR, Work has been tested in the presence of the ENGINEER, and that Work is complete in accordance with Contract Documents and ready for ENGINEER's final inspection and review.

B ENGINEER shall make a final inspection of all CONTRACTOR work to verify CONTRACTOR’s statements.

C Should the ENGINEER consider that the Work is incomplete or defective:

1. The ENGINEER will promptly notify the CONTRACTOR in writing, listing the incomplete or defective work.

2. CONTRACTOR shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the ENGINEER for review.

3. The ENGINEER will re-inspect the Work.

D. Once the ENGINEER considers the Work to be acceptable, the CONTRACTOR shall submit closeout submittals and final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

E. Should the ENGINEER perform re-inspections of the Work due to the failure of the Work to comply with the claims of status of completion made by the CONTRACTOR:

1. OWNER will compensate the ENGINEER for such additional services.

2. OWNER will deduct the amount of such compensation from the final payment to the CONTRACTOR.

1.3 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Project Record Documents.

C. Warranties and Bonds

D. Evidence of Payment and Release of Liens

1.4 FINAL ADJUSTMENT OF ACCOUNTS

A. CONTRACTOR to submit a final statement of accounting to ENGINEER for review. Statement to include all final adjustments to the Contract Sum, including all change orders, allowances, unit prices, deductions for uncorrected Work, liquidated damages, and any other adjustments.

B. ENGINEER will prepare a final Change Order, reflecting the approved adjustments to the Contract Sum.

C. CONTRACTOR will submit the final Application for Payment.

1.5 FINAL CLEANING

A. Prior to any Final Payments and payment for demobilization from the site, CONTRACTOR to execute final cleaning prior to final project assessment.

B. Clean equipment and fixtures with cleaning materials appropriate to the surface and material being cleaned. Clean filters of operating equipment, clean debris from manholes, and clean the site.

C. Remove waste and surplus materials, rubbish, and construction facilities installed by the CONTRACTOR from the site.

D. Verify that grading, seeding, and repair of the landfill cap at all disturbed areas has been accomplished to the satisfaction of OWNER and ENGINEER. Verify that erosion and sediment control structures removed or damaged during performance of the Work have been repaired or restored to the satisfaction of OWNER and ENGINEER.

1.6 OPERATION AND MAINTENANCE DATA

A Submit data bound in 8-1/2 x 11 inch text pages, three ring binders with durable plastic covers.

B Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, typed in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, Subcontractors, and major equipment suppliers.

2. Part 2: Operation and maintenance instructions, arranged and subdivided by subsystem. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:

    a. Shop drawings and product data.
    b. Certificates.
    c. Photocopies of warranties.

E Submit one draft copy of completed volumes to ENGINEER a minimum of 15 calendar days prior to Final Inspection. This copy will be reviewed and returned, with ENGINEER comments. Revise content of all document sets as required prior to final submission.

F Submit two (2) sets of revised final volumes, within 10 calendar days after final inspection.

1.7 WARRANTIES AND BONDS

A. Provide two (2) notarized copies of all warranties and bonds. At a minimum, CONTRACTOR to provide a written warranty for one (1) year from the date of final acceptance of the Work for all his Work on this project. The warranty shall be in addition to any other product or equipment specific warranties available.

B. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three ring binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.

F. Related Damages and Losses: When correcting warranted Work that has failed, CONTRACTOR to remove and replace any other Work that has been damaged as a result of such failure at no additional cost to OWNER.

G. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected, CONTRACTOR to reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

H. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with the Contract Documents. The CONTRACTOR is responsible for the cost of replacing or rebuilding the defective Work regardless of whether the OWNER has benefited from the use of the Work through a portion of its anticipated life.

I. OWNER's Recourse: Written warranties made to the OWNER are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the OWNER can enforce such other duties, obligations, rights, or remedies.

J. Manufacturer's disclaimers and limitations on product warranties do not relieve the CONTRACTOR of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the CONTRACTOR.

END OF SECTION

SECTION 01800

HEALTH AND SAFETY PLAN

PART 1 GENERAL

1.1 DESCRIPTION

A. In the event that the ENGINEER or OWNER identify an exclusion zone, the CONTRACTOR will use only site crew members in the identified area that are trained in accordance with the United States Occupational Safety and Health Administration (OSHA) regulations 29 CFR 191.120. The workers also need to have completed the minimum 40-hours Hazardous Materials training course and necessary refresher courses. This applies to both the CONTRACTOR's workers and any Subcontractor site workers.

B. All site workers that work in the identified exclusion zone must be under a Medical Monitoring Program as outlined in 29 CFR 1910.120, and be physically capable of wearing a respirator, if necessary.

C. Actions that potentially endangered workers shall be stopped immediately and brought to the OWNER's attention. Health and Safety is the responsibility of the CONTRACTOR.

1.2 SITE SPECIFIC HEALTH AND SAFETY PLAN

A. The CONTRACTOR shall prepare a written site-specific Health and Safety (Plan) for use by the CONTRACTOR and Subcontractor site workers. This plan must be prepared to meet the 29 CFR 1910.120 OSHA regulations and shall include as a minimum, the following:

1. Organizational Structure: to include general supervision, Health and Safety office, lines of authority and responsibility and communication. The Health and Safety Office shall be a worker who will be present at all times during the site construction, in addition to his/her other site duties.

2. Comprehensive Work Plan: to include the work tasks and objectives, resources needed, and training requirements for workers (health and safety, machine operations license, etc.). This shall include a section on safety procedures to be followed for excavation and well drilling in landfill waste and work in areas where exposure to landfill gas and leachate is likely.

3. Health and Safety: to include identification of possible site hazards (e.g., solid waste, landfill gas, and Leachate), training levels for each category

of site workers, personal protective equipment and medical surveillance needed, site control measures, and confined space entry procedures.

4. Emergency Response Plans: to include all emergency telephone numbers, a highlighted map showing the quickest route to the nearest emergency care facility and written directions to such facility.

5. Air Monitoring Procedures: to include frequency and type of air monitoring of exposed refuse, landfill surfaces, boreholes and excavations, and site worker areas, calibration of air monitoring equipment, and action levels of air contaminants for site worker protection. All equipment calibration and field gas measurements shall be recorded with the date and time of sample, and the sampler's name. Sampling shall be done by a CONTRACTOR's worker trained in the use of gas sampling equipment. These trained workers shall be designated in the CONTRACTOR's Plan.

6. Respiratory Protection Program: to include written documentation of the CONTRACTOR’s respiratory program.

7. Drilling and Gas Well Installation Safety Procedures: to include prevention of fall hazards and controlled access zones

8. A signature page for all site workers covered by the Plan (CONRACTOR and Subcontractor site workers.)

B. Acceptance of the CONTRACTOR's Plan by the OWNER is necessary prior to the start of site operations. The Plan should incorporate and be consistent with the OWNER's and the LANDFILL OPERATOR's health and safety policies and procedures.

C. The CONTRACTOR shall consider the various materials disposed of (municipal solid waste, construction and demolition debris) that may be encountered during excavation in preparing the Health and Safety Plan.

D. The Health and Safety Plan should reflect the information contained in "A Compilation of Landfill Gas Field Practices and Procedures, Solid Waste Association of North America (SWANA), March 1992."

1.3 SITE OPERATIONS

A. The Plan will be kept on site in an easily accessible spot during all site operating hours. All site workers will be notified of the location of the Plan.

B. A Safety Meeting will be held by CONTRACTOR and attended by all CONTRACTOR site workers prior to starting construction. At this safety meeting, the Plan will be reviewed with the site workers, and all site workers will

sign the Plan indicating that they have been apprised of the Plan's contents. New site workers must review the Plan with the CONTRACTOR's Health and Safety Officer prior to beginning work on site, and must sign that they have been apprised of the Plan's contents.

C. Site operations will take place in conditions of adequate light only.

D. Areas of open refuse (i.e., excavations, trenches and boreholes) will be monitored for combustible gases, methane, volatile organics, hydrogen sulfide and oxygen through the use of field gas meters. Respiratory protection for acid gases and organic vapors will be used by the worker while monitoring gas levels. Appropriate respiratory protection will be taken by other workers as necessary.

E. No workers will be allowed in any trench or excavation while excavation of the area is in progress. Entry into the excavation shall be made only after the CONTRACTOR's site worker has monitored the air in the excavation, and determined the appropriate level of personal protection required for entry into the excavation. Site workers in excavations must be supervised at all times.

F. Site workers will limit their dermal exposure to excavated refuse. Minimal skin protection includes puncture resistant shoes meeting ANSI standards, long pants, long-sleeved shirts, safety glasses, safety vests, hard hats, and rubber gloves to be used when handling refuse.

G. Start-up and shutdown of engines will not be done in areas of excavated refuse or where elevated landfill gas emissions have been documented.

PART 2 PRODUCTS (Not used)

PART 3 EXECUTION

A. Work performed shall be consistent with the following guidelines and references and in compliance with all applicable local, state, and federal regulations and standards including, but not limited to, those listed below. In the case that these requirements are conflicting, the one which offers the greatest protection shall be followed.

   a. CONTRACTOR's approved, site-specific Health and Safety Plan.

   b. *Asbestos Work Plan for the Installation of a Landfill Gas Collection and Control System*, prepared by S&ME, Inc, approved by the State of North Carolina, Department of Health and Human Services, Division of Public Health, Health Hazards Control Unit on September 12, 2011.

c. Occupational Safety and Health Administration (OSHA) Construction Industry Standards, 29 CFR1926, and General Industry Standards, 29 CFR 1910.

d. National Fire Protection Association (NFPA), 327

B. At a minimum, all workers employed by the contractor or any subcontractors shall wear and/or use the following:
- Standard work clothes (long pants, shirts with sleeves)
- Hard Hat
- High visibility safety shirt, vest, or jacket
- Steel toe work boots
- Leather work gloves (as work tasks dictate)
- Safety glasses with affixed side shields (as work tasks dictate)
- Hearing protection (as work tasks dictate)

Hazards associated with the work shall be evaluated by the contractor and appropriate measures taken to ensure the safety of contractor employees, County personnel, and the public.

C. Health Hazards Control Unit (HHCU) of the North Carolina Department of Health and Human Services (DHHS), Division of Public Health to have authority to enforce the National Emissions Standards for Hazardous Air Pollutants (NESHAP) Regulation in most NC counties. The ENGINEER has prepared and submitted an "Asbestos Work Plan" to inform the HHCU of how the contractor will protect the public and the environment should excavation disturb waste that contains asbestos. The "Asbestos Work Plan" was approved by the HHCU on Septeber 12, 2011. The CONTRACTOR will be required to adhere to the procedures specified in the approved "Asbestos Work Plan."

D. The HHCU requires that a trained asbestos supervisor (TAS) be present during drilling and trenching, and an accredited asbestos inspector (AAI) perform the special asbestos inspections. The ENGINEER will provide a TAS and/or AAI as required by the "Asbestos Work Plan." The CONTRACTOR shall provide at least 48-hour notice of drilling/trenching activities to the ENGINEER so they may make a TAS and/or AAI available during drilling or trenching activities that may encounter waste.

END OF SECTION

SECTION 02060

AGGREGATE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aggregate materials for fill, drainage, and grading purposes.

B. Related Sections:

1. Section 02200 – Earthwork
2. Section 02320 – Structural Fill
3. Section 02321 – Backfill

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Coarse Aggregate:

1. Basis of Measurement: A1, A2, & A3 by the **in place cubic yard** or as otherwise indicated in other Sections of these Specifications. Installation quantities shall not include quantities placed beyond the lines and grades shown on the Drawings.
2. Basis of Payment:
   a. Includes supplying aggregate materials, hauling, stockpiling, and placement.
   b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:

1. AASHTO T11 – Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
2. AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
3. AASHTO T180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:

1. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.

2. ASTM D421 – Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
3. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.
4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft^3 (600 kN-m/m^3)).
5. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
6. ASTM D1557 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18 inch Drop.
7. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
8. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
9. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
10. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
11. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

C. North Carolina Department of Transportation (NCDOT) Standard specifications for Roads and Structures.

1.4 SUBMITTALS

A. Section 01300 – Administrative Requirements: Submittal procedures.

B. Materials Source: Submit name of imported materials suppliers and description of material.

C. Manufacturer's/Supplier's Certificate: Certify materials meet or exceed specified requirements.

D. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material type from single source throughout the Work.

B. Perform Work in accordance with North Carolina Department of Transportation Standard Specifications for Roads and Structures or as otherwise specified.

PART 2 PRODUCTS

2.1. COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 - Roadways: Conforming to ABC Stone NCDOT standards. Coarse Aggregate Type A1 used for roadway subgrades shall conform to section 1010 of NCDOT Standard Specifications of Type A aggregate base course.

B. Coarse Aggregate Type A2 – Drainage Aggregate: Subangular, subrounded, rounded, or well rounded particle shaped conforming to No. 57 Stone NCDOT Standard Specifications sections 1005 and 1006. Coarse Aggregate Type A2 shall be used for pipe vent construction and erosion control device construction and shall conform to the specifications in this section.

C. Coarse Aggregate Type A3: Conforming to Class B Riprap NCDOT Standard Specifications section 1042. Coarse Aggregate Type A3 used for erosion control device construction and shall conform to the specifications in this section.

2.3 SOURCE QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation services.

B. Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136, ASTM D421, ASTM D422, ASTM D4253, ASTM D4254, AASHTO T11, and/or AASHTO T27.

C. When tests indicate materials do not meet specified requirements, change material or material source and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1. STOCKPILING

A. Stockpile materials on site at locations designated by Engineer.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

E. Stockpile materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.2. STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.3. EXAMINATION

A. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

B. Perform proofrolling of roadway or slab subgrades with a pneumatic tired vehicle with a minimum loaded weight of 20 tons under the observation of the Engineer or his representative to help identify subgrade areas that require repair. Proofrolling shall be conducted at the discretion of the Engineer or his representative. Any soft, saturated or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

3.4. PREPARATION

A. Correct irregularities in subgrade gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

C. Repair subgrade areas identified by the Engineer or his representative prior to placing aggregate or structural fill.

3.5. AGGREGATE PLACEMENT

A. Spread aggregate over prepared subgrade to a total compacted thickness as specified on Drawings.

B. Place aggregate in layer thicknesses according to NCDOT Standard Specifications section 0520 and compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.6. TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.7. FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation requirements.

B. Compact testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D698, AASHTO T180, ASTM D2167, ASTM D2922, and/or ASTM D3017.

C. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

D. Frequency of Tests: Minimum of 2,500 square feet, one correction test per compacted lift.

E. Stone Pavement Surface
   1. Compact placed aggregate materials to achieve compaction of 100 percent.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.1 DESCRIPTION

A. Scope of Work: The CONTRACTOR shall provide all labor, materials, equipment and incidentals required to perform all excavating, trenching, backfilling, compaction, and replacement of cover as specified herein, and indicated for the purpose of constructing and installing the LFG collection system and associated facilities required to complete the work.

B. The CONTRACTOR shall provide all temporary means needed to maintain excavations in a continuously dewatered condition.

C. The CONTRACTOR shall stockpile suitable existing cover material during earthwork activities and use the material as backfill. Suitable existing soils shall be removed and stockpiled separately for use as topsoil.

D. The CONTRACTOR shall perform all earthwork so as to minimize the disturbed area. The disturbed area along LFG header lines and laterals shall be limited to 20 feet on each side of the pipe (i.e., 40 feet total).

E. Work under this Section includes trenching activities both within and outside or municipal solid waste (MSW).

F. Related Work Described Elsewhere

1. Section 02670: LFG Extraction Well and Wellheads
2. Section 11170: Skid-Mounted Landfill Gas Blower/Flare System
3. Section 11200: Condensate Sumps
4. Section 15050: Pipe and Pipe Fittings

1.2 PROJECT CONDITIONS

A. Existing Features: The Drawings show surface features on the landfill and certain underground features. These features include, but are not limited to: existing landfill gas collection and control system; groundwater and gas monitoring wells; access roads; utilities; and drainage devices. This information has been obtained from a 2011 topographic survey and existing records. It is not guaranteed to be correct or complete and is shown for the convenience of the CONTRACTOR. The CONTRACTOR shall explore ahead of the required excavation to determine the exact location of all features. They shall be protected from damage by the

CONTRACTOR. If they are broken or damaged, they shall be restored to their original condition by the CONTRACTOR at no cost to the OWNER.

1.3 PROTECTION

A. The CONTRACTOR is solely responsible for protection of the work. Completed work that is damaged by weather or other means shall be repaired by the CONTRACTOR at no additional cost to the OWNER. Earthwork that has been previously accepted, may become degraded due to exposure. Work that has been placed, previously accepted and later becomes degraded or damaged, shall be repaired or reworked at no additional cost to the OWNER and in accordance with the Contract Documents.

1.4 QUALITY ASSURANCE/QUALITY CONTROL

A. Quality Control and Quality Assurance will be performed by the ENGINEER. The CONTRACTOR must allow access to all work and provide advance notice to ENGINEER to inspect and determine compliance with the plans and specifications.

1.5 EXCAVATION CLASSIFICATION

A. All excavation shall be considered unclassified. The expense of excavating, removal, hauling, dewatering and disposal or all materials including hard materials, rock materials and other materials specified herein shall be included in the contract pricing. No additional compensation will be made for excavation of waste or rock material.

PART 2 MATERIALS

2.1 SOIL MATERIALS

A. Bedding material shall be a clean, clayey sand, or silty material, free of particles exceeding 1 inch in diameter, wet clay, muck, refuse, organic matter, and other deleterious substances. Bedding material may be sand, or clean soil. Suitable bedding material, except that obtained during excavation, is available onsite. CONTRACTOR is responsible for obtaining and hauling suitable material to working areas.

B. Compacted soil backfill for trenching on and around the work area shall be with like material that is excavated from the trench as described on the Drawings, or it may be borrow soil obtained and transported by the CONTRACTOR from an off-site source.

C. Any soil backfill from an off-site source and used in the construction shall be capable of maintaining vegetation and conform to the following criteria.

1. The soil shall have 100% passing the 3-inch sieve.
2. At least 80% shall pass the #4 sieve, at least 15% shall pass the # 200 sieve.
3. The organic content shall be at least 4%.
4. Maximum Liquid Limit is 50%
5. Maximum Plasticity Index is 25%
6. pH range of 5.5 to 7
7. Free of extraneous materials harmful to plant growth

D. Soil backfill containing refuse will not be accepted.

E. The CONTRACTOR shall furnish a representative sample of proposed off-site soil weighing approximately 75 pounds to the ENGINEER for approval at least 10 calendar days prior to the date of anticipated use of such material. Upon visual inspection, the ENGINEER may request that the CONTRACTOR perform testing on the soil to meet the above criteria, at the CONTRACTOR's expense. These tests will include the following:

1. Perform particle size distribution test (ASTM D422), Atterberg limits (ASTM D4318), and Standard Proctor compaction test (5 point curve, ASTM D 698). Three Organic Content (loss on ignition, ASTM D2974) tests shall be performed as well.

2. Soil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil. Report suitability of soil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory growth layer.

F. ENGINEER reserves the right to waive any testing requirements and to visually inspect backfill soil prior to placement.

PART 3 EXECUTION

3.1 GENERAL

A. Excavations for structures and pipelines shall be open excavations, shored and braced where necessary to prevent possible injury to workmen and to new and existing structures or pipelines**.**

B. Stability of Excavations: Slope sides of excavations, when necessary, to comply with codes and ordinances of agencies having jurisdiction. Shore and brace where sloping is not possible because of space restrictions, location of the landfill or other features, or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling.

C. Stockpile excavated materials to be reused as backfill on the up-gradient side of the excavation. Segregate differing excavation materials as to type. Provide positive drainage for all existing and newly graded areas and other construction areas, including stockpile locations, during each phase of the work. Temporary controls shall be provided to prevent soil erosion and undesirable stormwater run-off.

D. Dry conditions shall be maintained by the CONTRACTOR in all excavations.

E. CONTRACTOR is responsible for the protection, storage, and quality of any stockpiled off-site soils.

3.2 PIPE TRENCHING, BACKFILLING, AND COMPACTION

A. No more than 400 feet of trench may be opened in advance of pipe laying unless approved by the ENGINEER.

B. Trench width shall be minimized but shall conform to the following:

1. Sufficient to provide room for installing, jointing, and inspecting piping, but in no case wider at top of pipe than pipe barrel outside diameter plus 2 feet, unless otherwise indicated.

2. Enlargements at pipe joints may be made if required and approved by the ENGINEER.

3. Sufficient for sheeting, bracing, sloping, and dewatering as required.

4. Sufficient to allow thorough compacting of backfill adjacent to bottom half of pipe.

5. Do not use excavating equipment which requires the trench to be excavated to excessive width.

C. Depth of trench shall be as indicated on the Drawings. The pipes will be field-located by the CONTRACTOR with approval of the ENGINEER. If approved by the ENGINEER, depths may be revised provided the minimum slope and cover

requirements are maintained. The excavation shall not be carried below the required depth to provide a stable trench bottom.

D. The trench shall be backfilled with material as stated in 2.1 above and as approved by the ENGINEER.

E. Backfilling and compacting the segregated soils (or imported off-site soils) shall be accomplished to re-achieve the performance criteria of the existing in-place soil cover system as stated below:

1. Soil Cover shall be placed and compacted in lifts. The maximum loose lift thickness shall be 6 inches. Soil backfill shall be compacted to at least 93% of its maximum dry density as determined by ASTM D 698. Any testing requirements may be waived by the ENGINEER upon visual inspection of the compaction. At a minimum, CONTRACTOR must use a mechanical compactor (i.e., jumping jack, vibrating plate, etc.) for two (2) passes for each 6-inch soil lift. CONTRACTOR shall protect the buried pipe from any damage to compaction equipment.

F. Trenches shall be constructed with uniform grades. Trench excavations shall be kept in a dry condition. The CONTRACTOR shall be responsible for maintaining the dry conditions. The CONTRACTOR shall not excavate for pipe installation during inclement weather.

G. Upon completion of pipe trench backfilling, excess excavated material shall be disposed of on-site as directed by the OWNER.

H. Backfill material which has been contaminated with clusters of rock or gravel, sand lenses, organic debris or other deleterious material shall be removed and replaced with uncontaminated soil materials.

I. No backfill material shall be placed, spread, or compacted while the subgrade or the backfill material is frozen/thawing, saturated, desiccated, during unfavorable weather conditions or periods of precipitation.

J. In Landfill areas, CONTRACTOR shall backfill trench so there is no exposed waste at the end of each workday.

K. In Landfill areas with existing final cap, CONTRACTOR shall restore the low-permeability layer and provide sufficient compaction to match the existing in-place conditions. If the ENGINEER suspects the hydraulic conductivity characteristic has been compromised, the CONTRACTOR shall test the restored low-permeability lay to demonstrate a hydraulic conductivity of less than 1×10^{-5} cm/sec.

3.3 SHEETING, SHORING AND BRACING

A. Excavations requiring sheeting, shoring, and bracing are not anticipated, but may be required for portions of this Work. The CONTRACTOR shall notify the ENGINEER if such requirement is encountered in the field. Such work shall proceed upon ENGINEER approval, per the following:

1. Excavations for structures and pipe lines shall be open excavation, sheeted, shored, and braced where necessary to prevent injury to workmen, structures, or pipelines.

2. All County, state, and federal ordinances, codes, regulations, and laws shall be observed.

3. Used materials shall be in good condition, not damaged or excessively pitted.

4. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.

5. Unless otherwise shown, specified, or ordered, all materials used for construction shall be removed when work is completed. Such removal shall be made in a manner not injurious to the structure or its appearance or to adjacent work. Disposal of waste will be in accordance with directions from the ENGINEER.

6. The clearances and types of temporary structures and sheeting, shoring, and bracing, insofar as they affect the character of the finished work, will be subject to comments of the ENGINEER; however, in any case, the CONTRACTOR shall be solely responsible for the adequacy of all sheeting, shoring, bracing, etc.

3.5 GRADING

A. General: CONTRACTOR to uniformly grade areas within limits of construction under this Section, including adjacent transition areas. Compact with uniform slopes to provide positive drainage. CONTRACTOR shall return landfill cover, side slopes, and surface water drainage features to original or better condition.

3.6 SOIL EROSION OR SEDIMENT CONTROL

A. Install erosion and sediment controls as required by field conditions and in compliance with the Solid Waste Permit and applicable North Carolina regulations.

B. Disturbed areas outside of the waste limits to be seeded and mulched in accordance with applicable North Carolina regulations. The seed mixture and applicable rates shall be approved by the ENGINEER. Lime and fertilizer shall be applied along with seed and mulch at rates as approved by the ENGINEER. Higher application rates may be necessary at the site to establish vegetation adequate to control erosion and sediment transport.

C. Disturbed areas within the waste limits will be seeded and mulched to re-establish vegetative growth.

D. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

END OF SECTION

SECTION 02320

STRUCTURAL FILL

PART 1 GENERAL

PART 2 SUMMARY

A. Section Includes:
   1. Structural fill defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier.
   2. Erosion layer defined as compacted fill placed for cover system construction.
   3. Vegetative soil layer defined as fill placed for cover system construction.

B. Related Sections:
   1. Section 02321 – Backfill.
   2. Section 03480 – Pre-Cast Concrete Structures.

2.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fill Type S1, Structural Fill and Erosion Layer:
   1. Basis of Measurement: By the cubic yard filled. The quantity of structural fill and erosion layer will be based upon the in-place volume between the prepared subgrade and the structurally filled surface as determined by surveys after completion of the placement of the structural fill. A grid pattern, as approved by the Engineer, of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall check the as-built finished grades and determine the backfilled volume based on survey data provided by the Earthwork Contractor.
   2. Basis of Payment: By the cubic yard placed times the unit price for fill placement.
      a. Includes excavating, screening to particle size requirements, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
      b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Earthwork Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

B. Fill Type S2, Vegetative Soil Layer:

1. 1. Basis of Measurement: By the cubic yard filled. The quantity of vegetative soil layer will be based upon the in-place volume between the prepared subgrade and the filled surface as determined by surveys after completion of the placement of the vegetative soil layer. A grid pattern, as approved by the Engineer, of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The Engineer shall check the as-built finished grades and determine the backfilled volume based on survey data provided by the Earthwork Contractor.

2. Basis of Payment: By the cubic yard placed times the unit price for fill placement.

a. Includes excavating, screening to particle size requirements, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.

b. Requested payment quantities will be submitted by the Contractor with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

2.3 REFERENCES

A. ASTM D422 - Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

C. ASTM D1556 – Standard Test Method for Density of Soil In Place by the Sand-Cone Method.

D. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

E. ASTM D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

F. ASTM D2487 – Standard Practices for Classification of Soil for Engineering Purposes (Unified Soil Classification System)

G. ASTM D2937 - Standard Test Method for Density of Soil in place by the Drive-Cylinder Method.

H. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

2.4 SUBMITTALS

A. Section 01300 – Administrative Requirements: Submittal procedures.

B. Samples: Submit, in air-tight containers, 50 lb sample of each type of excavated material to testing laboratory to determine suitability for use as structural fill material.

PART 3 PRODUCTS

3.1 FILL MATERIALS

A. Fill Type S1, Structural Fill and Erosion Layer:
1. Structural fill is defined as compacted fill for perimeter berms, surface water control systems, roadways, or other systems not intended to function as a migration barrier.
2. Erosion layer is defined as compacted fill placed over the low permeability soil layer for cover system construction
3. Natural soil material from designated on-site borrow areas and/or stockpiles.
4. Structural fill and erosion soil layer shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, or CL soils according to the Unified Soil Classification System (ASTM D2487).
5. Free of topsoil, organic material, roots, stumps, brush, rocks larger than 3 inches, subsoil, debris, vegetation, and other foreign matter.
6. Structural fill located within 1-foot of geosynthetics components shall have a maximum particle size of 2 inches. The material shall be screened by the Earthwork Contractor, if necessary, to remove particle sizes greater than 2 inches in diameter. No more than 5 percent of the material should be retained on the No. 4 sieve.
7. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.

B. Fill Type S2, Vegetative Soil Layer:
1. Topsoil and vegetative soil is defined as fill placed to achieve final grades on the final cover system or to otherwise support vegetation establishment in areas not within the landfill cells.
2. Excavated and reused materials from designated on-site or off-site borrow areas and/or stockpiles and/or approved soil from trenching operations.
3. Shall be classified as SM, SC, SW-SM, SW-SC, SP-SM, ML, or CL soils according to the Unified Soil Classification System (ASTM D2487).

4. Free of roots, stumps, brush, rocks larger than 3 inches, debris, and other foreign matter.
5. Topsoil material shall have nutrient content and pH capable of supporting vegetation.
6. Shall have a minimum organic content of 3 percent by weight.
7. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 2 inches in diameter with no more than 15 percent retained on the No. 4 sieve.

PART 4 EXECUTION

4.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions

B. The Engineer will assist the Earthwork Contractor in the determination of Structural Fill and non-select material during excavation operations. The Earthwork Contractor will be responsible for excavating, transporting, stockpiling, placing and compacting all materials as needed.

4.2 PREPARATION

A. Prepare and compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type S1 fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

D. Proofroll subgrade with a pneumatic tired vehicle with a minimum weight of 20 tons to identify subgade areas that require repair; fill and compact to density equal to or greater than requirements for subsequent fill material. Any soft, saturated or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

4.3 BACKFILLING

A. Backfill areas to contours and elevations as shown on Drawings with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

C. Fill Type S1: Place and compact material in loose lifts not exceeding 8 inches or 6 inches compacted thickness. Manually compacted fill near pipes and other structures will be placed in loose lifts not exceeding 4 to 6 inches in thickness.

D. Fill type S1 over geosynthetic materials will be compacted by tracking with a low ground pressure bulldozer or other approved equipment with a ground pressure of less than 5 psi.

E. Fill Type S2: Scarify subgrade, place material in one lift and track in with backhoe or other equipment approved by Engineer.

F. Fill Type S1, backfill for drop inlets, and culverts:
   1. Backfill of the drop inlets and culverts shall be placed and compacted in 6 inch thick loose lifts around the drop inlets and up to 2 feet above the culverts.
   2. Compaction shall be performed by hand tampers or small hand operated compactors.

G. Employ placement method that does not disturb or damage other work.

H. Backfill simultaneously on each side of unsupported structures until supports are in place.

I. Protect backfill from desiccation, crusting, or cracking.

J. Make gradual grade changes. Blend slope into level areas.

K. Remove surplus backfill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.

L. Leave fill material stockpile areas free of excess fill materials.

4.4 TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

4.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation services.

B. Laboratory Testing
   1. Perform laboratory material tests in accordance with ASTM D422, ASTM D698, ASTM D2216, and ASTM D4318.
   2. Test at a frequency of:

a. 10,000 cubic yards of type S1 placed;
b. When materials using for structural fill change; and/or
c. when directed by the Engineer.

3. Sample size shall be 50-lb.

C. In Place Compaction and Natural Moisture Content Tests

1. Perform in place compaction tests in accordance with ASTM D1556, ASTM D2922, or ASTM D2937.
2. Perform in place natural moisture content test in accordance with ASTM D2216.
3. Frequency of compaction/natural moisture content tests:
   a. Cover system fills, area fills outside landfill cells, surface water control systems, or other systems not intended to function as a migration barrier, in-place density and moisture: Each lift at a minimum frequency of 1 per acre per lift.
   b. Perimeter berms and roadways: Each lift at a minimum frequency of 1 per 5000 sq. ft.
4. Landfill and Embankments:
   a. Type S1 fill shall be compacted to minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
   b. Testing of the first compacted lift shall be limited to the top 6 inches of the lift thickness.
   c. Fill Type S2 should be placed in one continuous loose lift and tracked in by backhoe or other equipment approved by Engineer.
   d. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.
5. Drop Inlets, and Culverts:
   a. Compaction shall be at a minimum 95 percent of the Standard Proctor maximum dry density.
   b. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by Engineer.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

4.6 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02321

BACKFILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Sections:
   1. Site filling for constructing low permeability barrier.
   2. Consolidation and compaction as scheduled.

B. Related Sections:
   1. Section 02200 – Earthwork
   2. Section 02320 – Structural Fill
   3. Section 02670 – Vertical Wells

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fill Type S3, Low Permeability Barrier:
   1. Basis of Measurement: By the cubic yard filled.
      a. The quantity of low permeability barrier fill will be based upon the volume between the subgrade surface and top of low permeability barrier (after overbuild removal) as determined by surveys after completion of the placement of the low permeability barrier.
      b. A grid pattern as approved by the Engineer of ground surface elevations in the cell area shall be surveyed and reference points installed by the Contractor before and after placement of low permeability barrier. The grid pattern shall be conducted at the same points for each layer and shall include points at the top and bottom of slopes with a minimum of one point on the slope in between. The Engineer shall verify the as-built finished grades and volume of the low permeability barrier based on survey data provided by the Contractor.
      c. Quantities shall not include overbuild or replacement volumes of defective areas resulting from erosion or insufficient density and/or permeability test results.
   2. Basis of Payment:
      a. Includes excavation, screening to particle size requirement, hauling, scraping, stockpiling, scarifying substrate surface, placing where required, compacting, maintenance, and removing accumulated water during construction.
      b. Payment for low permeability barrier will be based on the in-place volume filled times the unit price for low permeability barrier.
      c. Requested payment quantities will be submitted by the Contractor

with final approval by the Engineer. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

d. The entire low permeability barrier must meet or exceed the specified thickness, density and permeability requirements prior to payment.

1.3 REFERENCES

A. ASTM D421 - Standard Practices for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

B. ASTM D422 - Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).

C. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor Test).

D. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.

E. ASTM D2216 - Standard Test Method for Natural Moisture Content.

F. ASTM D2487 – Standard Practices for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

G. ASTM D2937 - Standard Test Method for Density of Soil in place by the Drive-Cylinder Method Test.

H. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

I. ASTM D5084 - Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Remolded and Undisturbed Permeability).

1.4 SUBMITTALS

A. Section 01300 – Administrative Requirements: Submittal procedures.

B. Samples: Submit, in air-tight containers, 50 lb. per sample of each type of excavated material to testing laboratory to determine suitability for use as low permeability barrier fill material.

C. Upon completion of the low permeability barrier submit survey results to Engineer for review and approval documenting the thickness of the low permeability barrier.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Standard Fill Type S3, Low Permeability Barrier:

1. Excavated and reused material from designated on-site borrow area and/or stockpile and/or off-site borrow area approved by the Owner and Engineer.
2. Low permeability barrier material shall be classified as SC, CL, CH, ML, or MH soils according to the Unified Soil Classification System (ASTM D2487).
3. Free of waste, gypsum, ferrous material, topsoil, roots, stumps, brush, rocks larger than 1 inch, subsoil, debris, vegetation, calcareous concretions or nodules, and other foreign matter.
4. Fill material shall have a maximum particle size of 1 inch. The low permeability barrier material shall be raked or sieved by the Contractor, if necessary, to remove all particles greater than 1 inch in diameter. No more than 5 percent of the low permeability barrier fill material should be retained on the No. 4 sieve.
5. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil (prior to compaction) that is free of clay clods greater than 2 inches in diameter.
6. Borrow area(s) shall be final graded to slopes as shown on the Drawings.
7. Material with a minimum Liquid Limit of 30 and Plasticity Index of 10 or as subsequently specified by the Engineer based on laboratory testing (ASTM D4318).
8. Material shall have a maximum permeability of 2.7×10^{-6} cm/sec on slopes greater than 5% and 1×10^{-5} cm/sec on slopes of 5% or less (GCL included below latter).

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Coordination and project conditions

B. The Engineer will assist the Contractor in the determination of low permeability barrier material and non-select material during excavation operations. The Contractor will be responsible for excavating, screening, transporting, stockpiling, placing and compacting all materials as needed.

C. Continuous and repeated visual observation of the materials will be performed by the Contractor to ensure proper material is being used.

D. Engineer will make frequent observations of the low permeability barrier placement operations and materials, and will consult with the site personnel on suitable liner fill and locations of such. Low permeability barrier fill proposed shall be observed by the Engineer prior to actual use.

3.2 PREPARATION

A. Prepare existing subgrade.

B. Test Pad Construction:

1. A test pad 35 ft x 100 ft in area shall be constructed inside or outside the landfill footprint using the same construction methods, equipment and material to be used for the low permeability barrier.

2. The completed construction of the test pad must precede the beginning of placement of the low permeability barrier.

3. Compaction and soil moisture content shall be in accordance with Part 3.3 of this Section.

4. Low permeability barrier material shall be placed in three or more compacted lifts of six-inch thick maximum thickness for a total thickness of 18 inches.

5. A minimum of 6 undisturbed samples will be obtained in the test pad by the Engineer or his representative at a frequency of two samples per lift. The following laboratory tests will be performed on the undisturbed or remolded samples to document the soil's characteristics and to verify that the material, construction methods, and equipment can achieve required permeability per section 2.1A.8:

a. Atterberg Limits Test (ASTM D4318) at frequency of 1 tests per lift
b. Grain Size with Hydrometer (ASTM D422) at frequency of 1 test per lift.
c. Remolded Permeability (ASTM D5084) at frequency of 1 test per lift.
d. Undisturbed Permeability (ASTM D5084) at frequency of 1 test per lift.
e. Standard Proctor Test (ASTM D698) at frequency of 1 test per lift.

6. Field moisture and field density tests will also be performed by the Engineer or his representative during soil placing and compaction to document the conditions obtained by the construction method, equipment and material to correlate with the required permeability for the low permeability barrier test pad.

   a. Field Density Test (ASTM D2937) at frequency of 3 tests per lift.
   b. Natural Moisture Content Test (ASTM D2216) at frequency of 3 tests per lift.

7. The Contractor shall allow sufficient time for construction and testing of the test pad prior to placement of the low permeability barrier.

8. If the initial test pad does not meet the permeability requirements, a second test pad shall be constructed prior to placement of the low permeability barrier.

9. Based on the material classification, density, moisture, and permeability testing performed on the test pad, the Engineer will determine the specified range of acceptable densities and moisture contents required to achieve the required permeability.

10. If the low permeability barrier material differs in classification, plasticity or gradation to the material used in the test pad, the Engineer will require construction of another test pad with additional laboratory classification and permeability testing prior to the materials use to evaluate the its suitability as a low permeability barrier material.

C. Prior to low permeability barrier placement, the prepared subgrade shall be proofrolled with a pneumatic tired vehicle with a minimum weight of 20 tons at the approval of the Engineer. Proofrolling shall be conducted at the discretion of the Engineer or his representative. Any soft, saturated or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

3.3 FILLING

A. Place fill to contours and elevations as shown on Drawings with unfrozen materials.

B. The low permeability barrier shall be a minimum of 18 inches thick. Thickness of the low permeability barrier on the side slopes shall be measured perpendicular to the slope.

C. Low permeability barrier shall have a compacted lift thickness of 6 in. ± 1 in. Thinner lifts are permissible to achieve design grade.

D. Lift thickness may be sampled upon completion (but prior to subsequent lift placement) by hand augering through the lift and measuring the thickness. The resulting penetration shall be promptly backfilled by the Contractor with a hand tamped clayey soil mixture of one part bentonite and three parts low permeability barrier material.

E. Samples of the in-place low permeability barrier material shall be tested and evaluated in accordance with provisions of the Construction Quality Assurance Plan and Part 3.5 of this Section prior to final acceptance of the low permeability barrier. All compaction or permeability test locations shall be filled with a mixture of one part bentonite and three parts low permeability barrier material.

F. Equipment or truck traffic shall not be permitted on previous fill lifts during the period between scarifying and compaction of a new fill lift unless approved by the Engineer.

G. After the lift to be compacted is conditioned, representative samples will be taken by the Engineer or his representative and tested for moisture content prior to any compactive efforts. If the moisture content is within the range specified in Part 3.5 D of this Section 02321, compaction may begin. If the moisture content is outside of this range, the low permeability barrier fill shall be wetted or dried and reworked accordingly. The low permeability barrier fill should be sprinkled or sprayed with water, utilizing equipment creating a uniform application and dozed, wind-rowed, and/or disc-plowed to uniformly increase the moisture content of the low permeability barrier if the material moisture content is too low. The low permeability barrier fill shall be dozed, wind-rowed, and/or disc-plowed to help air dry the soil if the moisture content is too high.

H. Each lift shall be thoroughly compacted and satisfy the moisture and density criteria established from the test pad results. Field testing shall be completed according to Part 3.5 D of this Section before a subsequent lift is placed.

I. Compaction of lifts shall be as follows:

1. Compaction of lifts shall be performed with an appropriately heavy, properly

ballasted, deep penetrating foot compactor and shall be subject to approval of the Engineer.

2. Dozer equipment shall not be used for primary compaction efforts.

3. A minimum number of passes will be required on each lift as determined by the test pad. A pass is defined as one trip of the compacting equipment over the lift and back to the starting point by a single drum roller or one trip across the lift surface from one side to the other if the compacting equipment has front and back compacting rollers. This requirement is to allow thorough remolding of the soil by kneading action.

4. The daily work area shall extend a distance so as to maintain moist and uniform soil conditions (facilitate bonding) and continuous operations. Desiccation, crusting, or cracking of the lift surface shall be avoided as much as possible. Each lift shall be protected, at all times after placement, from desiccation and crusting.

5. If desiccation, crusting, or cracking of the lift surface occurs before placement of the next lift, this area shall be scarified to a sufficient depth to mix with moist materials, or sprinkled with water and then scarified at the direction of the Engineer.

6. The surface of the underlying lift shall be scarified prior to compaction of each subsequent lift (i.e.: Lift 2 to Lift 3, etc.) to facilitate bonding of the lifts.

7. The transition between the bottom and side slopes shall be accomplished by compacting parallel (bottom to top) to the slope.

8. Soil moisture and dry density requirements:

    a. To determine the moisture content and dry density requirements of the compacted soil are being satisfied, field and laboratory tests shall be performed at the frequencies specified in Part 3.5 C and D of this Section.
    b. Compacted moisture content shall be between 2 and 5 percent wet of optimum moisture content, as determined by density testing, or as determined by the results of the low permeability barrier test pad.
    c. The low permeability barrier shall be compacted to a minimum dry density of 95 percent (or as determined by the results of the low permeability barrier test pad) of the maximum dry density determined from the standard Proctor test (ASTM D-698). Where densities less than the specified density are measured, the low permeability barrier shall be recompacted and/or removed and reworked to meet density criteria.

J. Low permeability barrier fill shall not be placed or compacted during sustained periods with air temperatures below 32°F. Low permeability barrier fill may be placed and compacted during periods of early morning and early evening freezing temperatures with warming trends above 45°F during the day. No fill shall be placed on frozen subgrade. If the low permeability barrier or structural fill freezes or ices, the fill section shall be, allowed to thaw, rescarified and recompacted, at the discretion of the Engineer. Low permeability barrier or structural fill material shall not be placed on frozen or icy subgrade soils.

K. During construction, finished lifts or sections shall be sprinkled with water, as needed, to avoid excessive cracking or at least twice daily.

L. At the end of each construction day's activities, completed lifts or sections shall be sealed by rolling with rubber tired or smooth drum rollers and sprinkled with water, as needed, to avoid excessive cracking.

M. After completion of a segment of low permeability barrier, but before installation of the overlying materials, the surface shall be surveyed by the Contractor to ensure the specified thickness (minimum of 18 inches).

N. The surface of the low permeability barrier shall be smooth drum rolled and maintained free of rocks, organics, voids and sharp edges.

O. The as-built thickness shall be determined by survey methods (non-destructive) as described in Part 1.2 A of this Section.

P. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces.

Q. Bench the existing upstream and downstream slopes during fill placement to promote bonding of existing and new fill materials.

R. Employ placement methods that do not disturb or damage other work.

S. Make gradual grade changes. Blend slope into level areas.

T. Remove surplus fill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.

U. Leave fill material stockpile areas free of excess fill materials.

V. Repair eroded areas.

3.4 TOLERANCES

A. Section 01400 - Quality Requirements: Tolerances.

B. Top Surface: Plus 0.1 feet from required elevations shown on Drawings.

3.5 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation services.

B. Perform the following laboratory classification and/or index material tests :

1. Tests to perform:
   a. Standard Proctor Test (ASTM D698).
   b. Atterberg Limits (ASTM D4318).
   c. Grain Size with Hydrometer (ASTM D421 and ASTM D422).

2. Frequency to perform tests:
   a. Once per every 3,000 cubic yards obtained from stockpile or borrow area;
   b. When there is an apparent change in the material type; and/or
   c. As directed by Engineer or Engineer's representative.

C. Low permeability barrier material must achieve required permeability per section 0231part 2.1A.8 in accordance with laboratory testing (ASTM D5084).

1. Bulk samples will be taken by the Engineer at intervals of 1 sample per 3,000 cubic yards of material to be placed from the stockpile/borrow area(s). Samples will be transported to a soils laboratory for permeability testing.
   a. The samples will be compacted to at least 95 percent of standard Proctor at moisture contents similar to field conditions and/or as subsequently specified based on laboratory testing results (ASTM D2216)
   b. Remolded Permeability Tests (ASTM D5084) shall be run with a maximum hydraulic gradient of 15 and a maximum confining pressure of 10 psi.

2. Undisturbed Permeability Tests (ASTM D5084) will be performed as directed by Engineer or Engineer's representative. Areas that are not consistent in density, moisture content, or classification with previously approved low permeability barrier material will require additional undisturbed permeability testing of the in-place low permeability barrier material prior to final acceptance.

3. The Engineer may request an in-situ permeability test be performed on the in-place low permeability barrier material if the material being placed is not consistent with the material previously tested and approved for construction.

D. Perform in-place compaction tests in accordance with the following:

1. Density Tests (ASTM D2937) at frequency of once per every other 100 foot by 100 foot grid per lift. The low permeability barrier shall be

compacted to a minimum dry density of 95 percent (or as determined by the results of the low permeability barrier test pad) of the maximum dry density determined from the standard Proctor test (ASTM D698).

2. Natural Moisture Content Tests (ASTM D2216) at frequency of at every density location and at least once per every 800 cubic yards placed. Compacted moisture content shall be between 2 and 5 percent wet of optimum moisture content or as determined by the results of the low permeability barrier test pad.

E. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.6 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Protecting finished work.

B. The low permeability barrier shall be overbuilt a thickness of 3 inches or covered with a sacrificial 10 mil plastic sheeting where required to protect the finished surface from erosion, desiccation, or other damage.

1. If the overbuild option is selected for protecting the liner, upon removal of the overbuild, the surface of the low permeability barrier will be re-rolled with a smooth drum roller to achieve the surface condition specified in Part 3.3 L of this Section.

2. If excessive desiccation cracking becomes evident, as determined by the Engineer, the surface will require rewetting and rerolling prior to placement of overlying materials. If excessive desiccation cracking remains evident after rerolling, the surface shall be scarified on the top 3-inches and reworked as specified in Part 3.3 of this Section 02321.

C. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02670

LFG WELLS AND WELLHEADS

PART 1 GENERAL

1.1 DESCRIPTION

A. The CONTRACTOR shall provide all equipment, materials, and labor needed to install and make ready for use the landfill gas (LFG) wells and wellheads on the vertical extraction wells, and converted passive gas vents as specified herein and as indicated on the Drawings.

B. The well screens, seals, gravel, and soil backfill packs shall be set at depths shown on the Contract Drawings or as designated in the field by the ENGINEER.

C. It is expected that combustible methane gas and hydrogen sulfide gas will be venting from boreholes drilled to install the wells. The CONTRACTOR'S bid price shall include provision for all equipment and procedures necessary to safely install wells under this condition.

D. All work will be performed by qualified and licensed workmen in accordance with the best standards and practices available.

E. The CONTRACTOR shall at all times keep the landfill areas free from the accumulation of waste material or rubbish caused by his operations.

F. Related Work Described Elsewhere

1. Section 15050: Pipe and Pipe Fittings
2. Section 02200: Earthwork
3. Section 11200: Condensate Sumps

1.2 SUBMITTALS

A. Within fifteen (15) calendar days after the CONTRACTOR has received the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, four (4) copies of catalog cuts on materials furnished; shop Drawings showing dimensions, materials, and configuration of the wellhead assembly; and manufacturers' brochures containing complete information and instructions pertaining to the storage, handling, installation, and operation.

B. Within twenty-one (21) business days after drilling is complete, the CONTRACTOR shall submit to the ENGINEER two (2) sets of well logs (drilling and construction) based on information recorded in the field during construction.

PART 2 PRODUCTS

2.1 MATERIALS

A. Backfill Materials:

1. STONE: Gravel backfill shall be between 1-inch and 3-inches in diameter, and shall be composed of washed, clean, hard and durable fragments, free of silt, clay, dirt, vegetation and other objectionable matter. Gravel shall be a minimum of 90 percent non calcium carbonate material. CONTRACTOR to provide ENGINEER certification from quarry that stone meets calcium carbonate specifications via ASTM Method D4373.

2. SOIL: Soil backfill material shall be clean granular fill free of stones larger than 1-inch, construction debris, refuse, muck, soft clay, loam, sponge material, vegetation/organic matter, or angular rock. Soil shall meet the requirements in Section 02200.

3. BENTONITE: "Bentonite Plug" as shown on the Drawings, shall refer to a well seal comprised of hydrated sodium bentonite pellets or chips of a thickness indicated on the Drawings. Bentonite material shall consist of clay greater than 85% sodium montmorillonite, without additives. No Bentonite powder will be acceptable.

B. Slotted PVC and HDPE Pipe: The slotted piping shall be SCH 80 PVC or SDR 17 HDPE as shown on the Drawings and as specified in Section 15050. The slots in the extraction well piping shall be as shown on the Drawings and must be supplied by the factory.

C. Solid PVC and HDPE Pipe: The solid wall piping shall by SCH 80 PVC or SDR 17 HDPE as shown on the Drawings and as specified in Section 15050.

D. Rigid and Flexible PVC Pipe: Rigid and flexible PVC pipe shall be as specified in Section 15050.

E. Vertical Wellhead Assemblies shall be a pre-fabricated unit consisting of a gate valve, union disconnect, an impact pitot tube suitable for flow measurements, adapter bushing or Fernco reducer fitting, temperature gauge, impact and static pressure ports, and dust caps. Wellhead assembly

shall be manufactured by Landtec, Commerce, CA, 800-LANDTEC (800-526-3832), or approved equal.

The gate valve shall be constructed of Type 1, Grade 1, PVC with socket fittings and a polypropylene wedge. No metal parts shall be in contact with the LFG flowing through the valve. The valve shall meet the requirements of ASTM D 1784 for rigid PVC compounds. The "gate" shall be of a tapered cylindrical plug design made of PVC, thickly lined with styrene butadiene rubber (SBR) material, flanged, non-rising stem with position indicator.

2.2 IDENTIFICATION

A. Each well shall have its identification number neatly painted on the casing using stencil letters and numerals 2 inches high.

2.3 SPARE PARTS

A. The CONTRACTOR shall supply the OWNER with two spare wellhead assembly and 100 feet of spare 2-inch diameter flexible PVC pipe.

PART 3 EXECUTION

3.1 DRILLING

A. The CONTRACTOR shall notify the ENGINEER a minimum of three (3) calendar days prior to the start of drilling.

B. The CONTRACTOR shall provide a thoroughly experienced, licensed, and competent driller during all drilling operations. The CONTRACTOR shall obtain any local or state drilling permits or obtain any licensures required by federal, state, or local laws prior to drilling.

C. The CONTRACTOR shall employ a licensed North Carolina surveyor to survey and stake the well locations prior to drilling. Survey information must include Northing, Easting, and elevation of all well locations. Pre-construction survey information must be provided to the ENGINEER in hard copy and digital (AutoCAD) formats no later than two (2) business days prior to the expected start of drilling. Well locations will be approved and may be adjusted by the ENGINEER prior to beginning drilling.

D. The CONTRACTOR shall use dry drilling equipment. Wet rotary drilling equipment may not be used.

E. Wells are to be drilled to the depth and diameter as shown on the Contract Drawings. The boring depths shown on the Contract Drawings are

estimated and may be adjusted in the field by the ENGINEER. Under no circumstances are the drilling depths from the well schedule on the Contract Drawings to be exceeded unless approved by the ENGINEER in advance.

F. In the event that down-hole problems are encountered, (i.e., refusal to drill, leachate in large quantities, cave-ins, etc.) the CONTRACTOR will attempt to drill for an additional two (2) hours. If the drilling has not progressed a total of four (4) vertical feet within this period, the ENGINEER will then make a decision on how to proceed based on one of the following two options. The ENGINEER will have at least one (1) hour from the time of notification by the CONTRACTOR to make the appropriate decision.

1. The ENGINEER may direct the CONTRACTOR to cease drilling operations and complete the well at depth. If this option is chosen, the CONTRACTOR will complete the well as described in the Drawings and Specifications and the OWNER will pay no additional compensation to the CONTRACTOR.

2. The ENGINEER may direct the CONTRACTOR to cease drilling operations and abandon the well bore. If this option is chosen, the well bore will be abandoned as described below. Compensation for abandoned vertical wells will be at one-half the installed unit price for vertical wells.

Refusal to drill as used in the Specifications is defined as less than two (2) vertical feet per hour.

The drilling abandonment procedure is as follows: The well bore is to be backfilled with the excavated refuse or a well-graded soil to within five (5) feet of the surface. During backfilling the CONTRACTOR must use the proper procedures to prevent any bridging of materials during this task. A 4-foot thick bentonite plug will be placed in the borehole when the depth is 5 feet below the existing grade. The final one foot must be backfilled with soils containing the specifications of the existing landfill cap as shown in the Drawings and Specifications. The backfill must meet or exceed existing conditions. The CONTRACTOR may be required to excavate this area to ensure proper compaction and placement of cap. All costs associated with the replacement of the cap are the responsibility of the CONTRACTOR. The OWNER may, at its own expense, perform tests to verify the compacted density of the backfill material. The CONTRACTOR is also responsible for loading and hauling any remaining refuse to the working face of the Landfill.

G. The OWNER reserves the right to add or delete any proposed wells prior to the completion of the CONTRACTOR's drilling.

H. The bore for the well shall be straight and plumb and the well pipe shall be installed in the center of the borehole. The CONTRACTOR shall take all necessary precautions to maintain the well pipe vertically plumbed during the backfill operation of the bored hole to the satisfaction of the ENGINEER. If the pipe installed is out of plumb, as determined by the ENGINEER, the CONTRACTOR, at his own expense, shall correct the alignment.

I. ENGINEER to direct CONTRACTOR in the field on installation of gas well perforated and solid piping, nesting gas well piping in one bore hole, depth of stone backfill, location of Bentonite plugs, and depth of soil backfill based on visual observation of drill tailings.

J. The CONTRACTOR shall keep detailed well logs for all wells drilled, including the total depth of well, the static water level, the depth, thickness, and description of soil or waste strata, waste temperature, and the occurrence of any water bearing zones. The logs shall also include detailed well construction diagrams for all wells installed. These diagrams shall include dimensions that indicate total well depth, length of slotted pipe, length of solid pipe, length of stick-up to the top of the wellhead, thickness of stone, thickness of bentonite plug(s), and thickness of soil material. Two (2) copies of the well logs shall be submitted to the ENGINEER no later than twenty-one (21) days after the completion of drilling.

3.2 JOINING OF PIPES

A PVC and HDPE pipes shall be joined as specified in Section 15050. In addition, stainless steel lag screws shall be installed at each PVC coupling to secure vertical piping during placement in well boring. Four stainless steel sheet metal screws per PVC coupling or two stainless steel screws per PVC bell fitting shall be installed. The length of the lag screws shall equal the sum of the PVC pipe and PVC coupling (or bell fitting) wall thicknesses.

3.3 BACKFILLING

A Backfilling of the well shall commence immediately after well drilling is completed and the well piping has been installed. Backfill materials shall be placed carefully within the wells to the dimensions shown on the Drawings and as approved by the ENGINEER. The ENGINEER, on the basis of a visual examination, may reject gravel and soil backfill containing foreign material. Both well piping and backfill shall be

installed with a safety grate installed over the boring as approved by the ENGINEER.

B The Bentonite Plug shall be backfilled in 6-inch lifts. Prior to placing each lift, the CONTRACTOR shall soak the in-place bentonite in accordance with manufacturer recommendations.

C. Soil backfill shall be rodded in the boring to provide even distribution and compaction.

D. The ENGINEER shall inspect the extraction well borings and caissons 4 to 8 weeks after completion of the final well. Any settlement in the boring shall be repaired by the CONTRACTOR by adding compacted fill around the well casing at no additional cost to the OWNER.

3.4 TEMPORARY CAP

A. The CONTRACTOR shall temporarily cap the riser pipe of the vertical extraction wells to prevent direct venting of LFG through the riser pipe. The temporary cap shall be removed during the installation of the wellheads.

3.5 WASTE DISPOSAL

A. The CONTRACTOR shall dispose of construction waste, including well cuttings, at the active portion of the landfill as directed by the ENGINEER. The CONTRACTOR shall remove spoils promptly and shall be responsible for controlling odors from the spoils. All costs associated with the loading and transportation of wastes by the CONTRACTOR shall be included in the unit price for vertical well and caisson construction. No waste disposal fees will be charged to the CONTRACTOR for the disposal of excavated wastes in the active face. The OWNER may require the CONTRACTOR to weigh all waste loads at the facility scales for internal tracking purposes. The costs and time for such potential weighings must be included in the unit price for the vertical wells and any LFG piping. Upon approval of the OWNER, the CONTRACTOR may temporarily store waste in covered roll-off containers for a maximum of 24 hours prior to disposal at the active face.

3.6 CONVERSION OF EXISTING GAS VENTS TO ACTIVE GAS WELLS

A. Existing passive gas vents are constructed of 6-inch SDR 17 HDPE. Existing gas vents V-2, V-4, V-6, and V-7 were constructed of perforated 6-inch SDR 17 HDPE pipe to the ground surface and above grade. CONTRACTOR to excavate five (5) vertical feet below the ground surface at these vents and replace the perforated 6-inch HDPE pipe with solid 6-inch SDR 17 HDPE pipe. An HDPE electrofusion coupling or butt

fusion welding must be used. CONTRACTOR to install a 10-foot by 10-foot synthetic well bore seal around well casing, as manufactured by LandTEC, or approved equal. Wellbore seal to be installed at a depth of approximately 18 inches below surface grade.

3.7 CAPPING EXISTING GAS VENTS

A. Contractor to cap existing 6-inch SDR 17 HDPE gas vents that are not being connected to the active LFG collection system by installing a PVC SCH 40 cap on top of the well casing. The cap to be secured using four (4) stainless steel lag screws and sealed with silicone caulk.

3.8 WELLHEAD INSTALLATION

A. The wellhead assembly shall be installed on the extraction well riser pipes in accordance with the manufacturer's recommendations. Connections to underground HDPE lateral and header pipe shall be as shown on the Drawings. Pipes shall be joined as specified in Section 15050. Care shall be taken not to damage or impact the pitot tube during installation. If a pitot tube is damaged during installation, CONTRACTOR shall replace it at no cost to the OWNER.

B. The wellhead shall be connected to the lateral via flexible PVC pipe, as shown on the Drawings.

END OF SECTION

SECTION 02985

SEEDING AND MULCHING

PART 1 - GENERAL

1.1 WORK INCLUDED

The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary and finish grade, seed, and maintain all seeded areas as specified herein including all areas disturbed by the CONTRACTOR'S operations.

1.2 SUBMITTALS

A. Submit to the ENGINEER for review complete shop drawings or all materials and equipment furnished under this Section, including seed mixtures and product label information.

B. Samples of all materials shall be submitted for inspection and acceptance upon ENGINEER'S request.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.

D. Certification by Limestone and Fertilizer manufacturer that the products supplied comply with requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Fertilizer shall be complete commercial fertilizer, 10-10-10 grade. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.

B. Lime: ASTM C 602, Class T, agricultural limestone in the form of dolomitic limestone containing a minimum 80 percent calcium carbonate equivalent, with a

minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.

C. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than one percent weed content.

D. The seed shall be furnished and delivered premixed in the proportions specified in Paragraph 3.02 E. A manufacturer's certificate of compliance to the specified mixes shall be submitted by the manufacturer for each seed type. These certificates shall include the guaranteed percentages of purity, weed content and germination of the seed, and also the net weight and date of shipment. No seed may be sown until the CONTRACTOR has submitted the certificates.

E. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.

F. Mulch shall be one of the following:

1. Straw Mulch: Provide air-dry, clean, mildew-and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

2. Peat Mulch: Provide peat moss in natural, shredded, or granulated form, of fine texture, with a pH range of 4 to 6 and a water-absorbing capacity; of 1100 to 2000 percent.

3. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

G. Tackifier shall be one of the following.

1. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.

2. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.

PART 3 – EXECUTION

3.1 APPLICATION

A. Lime shall be applied at the rate of 4000 lbs per acre, or as recommended in reports from

a qualified soil testing agency in accordance with the protective cover soils analysis described in Section 02290, item 1.07D.

B. Fertilizer shall be applied at the rate of 1000 pounds per acre, or as recommended in reports from a qualified soil testing agency.

3.2 SEEDING

A. Seed all disturbed areas of construction (excluding riprap lined ditches).

B. No seeding should be undertaken in windy or unfavorable weather, when the ground is too wet to rake easily, when it is in a frozen condition, or too dry.

C. The subgrade of all areas to be seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed.

D. Fertilizer shall be uniformly spread and disked to a depth of at least 4 inches.

E. Immediately following this preparation the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray. Seed shall be applied, depending on the period of year, at the following rates:

March 1 to August 14

Seeding Mixtures Species	**Application Rate (lb/acre)**
Common Bermuda (hulled)	30
Weeping Lovegrass	10
Sericea Lespedeza (scarified)	50

August 15 to February 28

Seeding Mixtures Species	**Application Rate (lb/acre)**
Common Bermuda (unhulled)	40
Weeping Lovegrass	10
Sericea Lespedeza (scarified)	80
Reseeding Crimson Clover	20
Rye Grain	20

F. All seeded areas shall be mulched with clean small-grain straw at a rate of 1-1/2 to 2 tons per acre. Asphalt emulsion shall be applied uniformly at a rate of 300 gallons per acre to tack the mulch, unless otherwise shown on the plans. Mechanical tacking will be

considered on a case-by-case basis as approved by the ENGINEER.

G. The CONTRACTOR shall keep all seeded areas watered and in good conditions. Reseeding shall be done if and when necessary until a good, health, uniform growth is established over the entire area seeded.

H. On slopes, the CONTRACTOR shall provide against washouts by an approved method. Any washouts which occurs shall be regraded and reseeded at the CONTRACTOR'S expense until good sod is established.

I. CONTRACTOR is responsible for installing temporary seeding/mulching as required to protect the work prior to the establishment of grass from permanent seeding/mulching.

3.3 HYDROSEEDING

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.

2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3. Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb per acre.

3.4 MAINTENANCE

A. The CONTRACTOR shall maintain all seeded areas in a condition approved by the ENGINEER until final acceptance of the Contract. Maintenance shall include, but not be limited to, repair of seeded areas, irrigation, and weed control. Protection shall be provided for all seeded areas against trespassing and damage. Slopes shall be protected from damage due to erosion, settlement, and other causes and shall be repaired promptly.

B. All seeded areas shall be inspected on a regular basis and any necessary repairs or reseedings made within the planting season, if possible.

END OF SECTION

SECTION 03100

CONCRETE FORMS AND ACCESSORIES GENERAL

1.1 SUMMARY

A. Section Includes:
1. Formwork for cast-in place concrete.
2. Shoring, bracing, and anchorage.
3. Architectural form liners.
4. Form accessories.
5. Form stripping.

B. Related Sections:
1. Section 03300 - Cast-in-Place Concrete.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Refer to Section 03300.

1.3 REFERENCES

A. American Concrete Institute:
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 - Building Code Requirements for Structural Concrete.
3. ACI 347 - Guide to Formwork for Concrete.

1.4 DESIGN REQUIREMENTS

A. Design, engineer, and construct formwork, shoring and bracing to conform to design and code requirements to achieve concrete shape, line and dimension as indicated on Drawings.

1.5 SUBMITTALS

A. NA

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI 318, and ACI 347.

B. For wood products furnished for work of this Section, comply with the American Forest and Paper Association (AF & PA).

C. Perform Work in accordance with NCDOT standards.

1.7 QUALIFICATIONS

A. Design formwork under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of project.

1.8 COORDINATION

A. Section 01300 - Administrative Requirements: Project meetings.

B. Coordinate this Section with other sections of work, requiring attachment of components to formwork.

PART 2 PRODUCTS

2.1 WOOD FORM MATERIALS

A. Form Materials: At discretion of Contractor unless otherwise directed by Engineer due to special conditions or situations.

2.2 PREFABRICATED FORMS

A. Furnish materials in accordance with NCDOT standards.

2.3 ARCHITECTURAL FORM LINERS

A. Furnish materials in accordance with NCDOT standards.

2.4 FORMWORK ACCESSORIES

A. Form Ties: At discretion of Contractor unless otherwise directed by Engineer due to special conditions or situations.

B. Spreaders: Standard, non-corrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. Wire ties, wood spreaders or through bolts are not permitted.

C. Form Anchors and Hangers:
   1. Do not use anchors and hangers leaving exposed metal at concrete surface.
   2. Symmetrically arrange hangers supporting forms from structural steel members to minimize twisting or rotation of member.
   3. Penetration of structural steel members is not permitted.

D. Form Release Agent: Colorless mineral oil that will not stain concrete, or absorb moisture or impair natural bonding or color characteristics of coating intended for use on concrete.

E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Size, strength and character to maintain formwork in place while placing concrete.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Project meetings.

B. Verify lines, levels, and centers before proceeding with formwork. Verify dimensions agree with Drawings.

C. When formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Engineer.

3.2 INSTALLATION

A. Earth Forms:
   1. Earth forms are not permitted.

B. Formwork - General:
   1. Provide top form for sloped surfaces steeper than 1.5 horizontal to 1 vertical to hold shape of concrete during placement, unless it can be demonstrated that top forms can be omitted.
   2. Construct forms to correct shape and dimensions, mortar-tight, braced, and of sufficient strength to maintain shape and position under imposed loads from construction operations.
   3. Camber forms where necessary to produce level finished soffits unless otherwise shown on Drawings.
   4. Carefully verify horizontal and vertical positions of forms. Correct misaligned or misplaced forms before placing concrete.
   5. Complete wedging and bracing before placing concrete.

C. Forms for Smooth Finish Concrete:
   1. Use steel, plywood or lined board forms.
   2. Use clean and smooth plywood and form liners, uniform in size, and free from surface and edge damage capable of affecting resulting concrete finish.
   3. Install form lining with close-fitting square joints between separate sheets without springing into place.
   4. Use full size sheets of form lines and plywood wherever possible.
   5. Tape joints to prevent protrusions in concrete.
   6. Use care in forming and stripping wood forms to protect corners and edges.
   7. Level and continue horizontal joints.
   8. Keep wood forms wet until stripped.

D. Forms for Surfaces to Receive Membrane Waterproofing: Use plywood or steel forms. After erection of forms, tape form joints to prevent protrusions in concrete.

E. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

F. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

G. Obtain Engineer's approval before framing openings in structural members not indicated on Drawings.

H. Install void forms in accordance with manufacturer's recommendations.

I. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.3 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces are indicated to receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

D. Reuse and Coating of Forms: Thoroughly clean forms and reapply form coating before each reuse. For exposed work, do not reuse forms with damaged faces or edges. Apply form coating to forms in accordance with manufacturer's specifications. Do not coat forms for concrete indicated to receive "scored finish". Apply form coatings before placing reinforcing steel.

3.4 INSTALLATION - INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Install formed openings for items to be embedded in or passing through concrete work.

B. Locate and set in place items required to be cast directly into concrete.

C. Coordinate with Work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.

D. Install accessories straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install water stops continuous without displacing reinforcement.

F. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

G. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

H. Form Ties:
   1. Use sufficient strength and sufficient quantity to prevent spreading of forms.
   2. Place ties at least 1 inch away from finished surface of concrete.
   3. Leave inner rods in concrete when forms are stripped.
   4. Space form ties equidistant, symmetrical and aligned vertically and horizontally unless otherwise shown on Drawings.

I. Arrangement: Arrange formwork to allow proper erection sequence and to permit form removal without damage to concrete.

3.5 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.6 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and removal has been approved by formwork design Engineer.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Leave forms in place for minimum number of days as specified in ACI 347.

3.7 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

3.8 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Engineer after placement of reinforcing steel in forms, but prior to placing concrete.

D. Schedule concrete placement to permit formwork inspection before placing concrete.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete for the following:
   1. Drop Inlet perimeter pads and pipe connections.
   2. Miscellaneous cast-in-place concrete as needed.

B. Related Sections:
   1. Section 02320 – Backfill - Structural.
   2. Section 03100 - Concrete Forms and Accessories.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Concrete:
   1. Basis of Measurement: By the cubic yard for cast in place concrete.
   2. Basis of Payment: By the cubic yard times the unit price per cubic yard placed
      a. Includes concrete, concrete forms and accessories, placement and accessories including consolidating and leveling, troweling, and curing.

1.3 REFERENCES

A. American Concrete Institute:
   1. ACI 301 - Specifications for Structural Concrete.
   2. ACI 305R - Hot Weather Concreting.
   3. ACI 306.1 - Standard Specification for Cold Weather Concreting.
   4. ACI 308 (American Concrete Institute) - Standard Practice for Curing Concrete.
   5. ACI 318 - Building Code Requirements for Structural Concrete.

B. ASTM International:
   1. ASTM C33 - Standard Specification for Concrete Aggregates.
   2. ASTM C94 - Standard Specification for Ready-Mixed Concrete.
   3. ASTM C150 - Standard Specification for Portland Cement.
   4. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
   5. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete.
   6. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

7. ASTM C1017 - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
8. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
9. ASTM C1116 - Standard Specification for Fiber-Reinforced Concrete.

1.4 SUBMITTALS

A. Section 01300 - Administrative Requirements: Submittal procedures.

B. Product Data: Submit data on:
   1. Concrete mix design at least 14 days prior to using the mixture.

C. Design Data:
   1. Submit concrete mix design for each concrete strength. Submit separate mix designs when admixtures are required for the following:
      a. Hot and cold weather concrete work.
      b. Air entrained concrete work.
   2. Identify mix ingredients and proportions, including admixtures.

1.5 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations of embedded utilities and components concealed from view in finished construction.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.

B. Perform any waterproofing in accordance with Manufacturer’s recommendations..

C. Acquire cement and aggregate from one source for Work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306.1 when concreting during cold weather.

1.7 COORDINATION

A. Section 01300 - Administrative Requirements: Project meetings.

1.8 QUALIFICATIONS

A. Waterproofing Material Manufacturer (if applicable): Company specializing in waterproofing membrane with minimum three years documented experience.

B. Waterproofing Applicator (if applicable): Company specializing in performing the work of this section with minimum three years documented experience.

1.9 WARRANTY

A. Section 01700 - Execution Requirements: Product warranties and product bonds.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150, Type I or Type II.

B. Fine and Coarse Aggregates: ASTM C33.

C. Water: Clean and not detrimental to concrete.

2.2 ADMIXTURES (Engineer's approval required prior to using any admixtures)

A. Furnish materials in accordance with NCDOT standards.

B. Air Entrainment: ASTM C260.

C. Chemical: ASTM C494; Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.

D. Fly Ash, Calcined Pozzolan: ASTM C618; Class Type C or F, limit fly ash to maximum 25 percent of cement content by weight.

E. Plasticizing: ASTM C1017.

2.3 ACCESSORIES

A. Non-Shrink Grout: ASTM C1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 4,000 psi in 72 hours.

B. Concrete Reinforcing Fibers: ASTM C1116 Type III, synthetic fiber reinforced concrete. Fibers shall be synthetic fiber consisting of 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. A minimum of 1.5 pounds of fiber per cubic yard of concrete shall be used. Fibers shall be added at the batch plant. Toughness indices shall meet requirements for performance Level I.

2.4 CONCRETE MIX

A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C94.

B. Select proportions for normal weight concrete (if applicable) in accordance with ACI 301.

C. Select aggregate proportions for light weight concrete (if applicable) in accordance with ACI 301.

D. Provide concrete to the following criteria:

Unit	Measurement
Compressive Strength (7 day)	3,000 psi
Compressive Strength (28 day)	4,000 psi
Water/Cement Ratio (maximum)	0.45 by weight (mass)
Air Entrained	4 - 6 percent
Slump	3 inches

E. Admixtures: Include admixture types and quantities indicated in concrete mix designs approved by Engineer through submittal process.
1. Use accelerating admixtures in cold weather. Use of admixtures will not relax cold weather placement requirements.
2. Use set retarding admixtures during hot weather.
3. Add air entraining agent to normal weight concrete mix for work exposed to exterior.
4. Air Entrainment: ASTM C260.
5. Chemical: ASTM C494 Type A - Water Reducing, Type B – Retarding, Type C – Accelerating, Type D - Water Reducing and Retarding, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, Type G - Water Reducing, High Range and Retarding.
6. Fly Ash, Calcined Pozzolan: ASTM C618.
7. Plasticizing: ASTM C1017.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Project meetings.

B. Verify requirements for concrete cover over reinforcement.

C. Verify anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with placing concrete.

D. Verify substrate surfaces are smooth, free of honeycomb or pitting, and not detrimental to full contact bond of waterproofing materials.

E. Verify items penetrating surfaces to receive waterproofing are securely installed.

F. Verify substrate surface slopes to drain for horizontal waterproofing applications.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

C. Seal cracks and joints with sealant materials using depth to width ratio as recommended by sealant manufacturer.

3.3 PLACING CONCRETE

A. Place concrete in accordance with ACI 318.

B. Notify Engineer minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, and embedded parts are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Do not interrupt successive placement; do not permit cold joints to occur.

F. If inside lined area, protect liner and all geosynthetic components from damage during installation and placement of concrete. Any damage caused to the liner as a result of the Contractor’s action shall be repaired at his expense

3.4 CONCRETE FINISHING

A. Provide formed concrete surfaces to be left exposed with smooth rubbed finish.

3.5 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure all concrete in accordance with ACI 308 unless otherwise directed by Engineer.

3.6 BACKFILLING

A. Notify engineer prior to backfilling against concrete structures.

B. Concrete should have a minimum of 75 percent of design 28-day compressive strength prior to backfilling concrete structures unless approved by the Engineer

3.7 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation requirements.

B. Field inspection and testing will be performed in accordance with ACI 301 and under provisions of Section 01400.

C. Provide free access to Work and cooperate with appointed firm.

D. Submit proposed mix design of each class of concrete to inspection and testing firm and Engineer for review 14 days prior to commencement of Work.

E. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

F. Four concrete test cylinders will be taken for every 100 cu yds or fraction thereof or a minimum of one set of cylinders per each structure or type/class of concrete placed.

G. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. One slump test will be taken for each set of test cylinders taken.

I. One air content test will be made for each set of test cylinders taken.

J. Maintain records of concrete placement. Record date, location, quantity, air temperature and test samples taken.

3.8 PATCHING

A. Allow Engineer to inspect concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Engineer upon discovery.

C. Patch imperfections in accordance with ACI 301.

3.9 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Engineer.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01700 - Execution Requirements: Protecting installed construction.

END OF SECTION

SECTION 03480

PRE-CAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stormwater drop inlets.

B. Related Sections:
   1. Section 02320 – Structural Fill.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Stormwater Drop Inlets:
   1. Basis of Measurement: By each unit.
   2. Basis of Payment: By each unit times the unit price for each structure.
      a. Includes excavating, concrete sections, cover frames and covers, sealing pipe outlets to depth indicated and backfilling.

1.3 REFERENCES

A. American Concrete Institute
   1. ACI 318 - Building Code Requirements for Reinforced Concrete.

B. ASTM International
   1. ASTM C443 - Joints.
   2. ASTM C913 - Standard Specification for Pre-cast Concrete Water and Wastewater Structures.

C. NCDOT Standard Specifications for Roads and Structures (latest edition)

1.4 DESIGN REQUIREMENTS

A. Design Criteria:
   1. Honeycombed or retempered concrete is not permitted.
   2. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318, Design for H20 Loading.
   3. Design of Lifting Devices for Pre-cast Structures: In accordance with ASTM C 913.
   4. Design of Joints for Pre-cast Structures: In accordance with ASTM C443.

1.5 SUBMITTALS

A. Section 01300 - Administrative Requirements: Submittal procedures.

B. Shop Drawing: Indicate structure locations, elevations, piping, sizes and elevations of penetrations.

C. Product Data: Submit covers, component construction, features, configuration, and dimensions.

D. Manufacturer's Certificates: Submit Statement of Compliance, supporting data from Materials Suppliers attesting that pre-cast concrete structures provided meet or exceed ASTM Standards and Specification requirements.

1.6 CLOSEOUT SUBMITTALS

A. Section 01700 - Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components and connections.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with North Carolina and Local Municipality standards.

1.8 DELIVERY, STORAGE AND HANDLING

A. Section 01600 - Product Requirements: Product delivery requirements; Product storage and handling requirements.

B. Comply with Pre-cast Concrete Manufacturer's instructions for unloading, storing and moving pre-cast structures.

C. Store pre-cast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

D. Mark each pre-cast structure by indentation or waterproof paint showing date of manufacture, Manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Section 01600 - Product Requirements: Product storage and handling requirements.

B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Configuration shall be as shown on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01300 - Administrative Requirements: Verification of existing conditions before starting work.

B. Verify connections, sizes, locations and inverts are as indicated on Drawings.

C. Verify items provided by other sections of Work are properly sized and located.

D. Verify excavations for the structures are correct.

3.2 PREPARATION

A. Coordinate placement of connecting pipes required by other Sections of Work as described in these Specifications.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect pre-cast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

D. Remove and replace soft or saturated foundation soils prior to installation as recommended by the Engineer or his representative.

3.3 INSTALLATION

A. Excavation and Backfill:
   1. Excavate for pre-cast concrete structures in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
   2. When groundwater is encountered, prevent accumulation of water in excavations. Place pre-cast concrete structures in dry trench.
   3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Lift pre-cast structures at lifting points designated by Manufacturer.

C. When lowering pre-cast concrete structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

D. Set cover frames and covers level without tipping, to correct elevations.

E. Coordinate with other Sections of Work as described in these Specifications to provide correct size, shape, and location.

3.4 FIELD QUALITY CONTROL

A. Section 01400 - Quality Requirements: Testing and observation requirements and Section 01700 - Execution Requirements: Testing, adjusting, and balancing.

B. Request inspection by Engineer prior to placing structures or aggregate cover over piping.

C. Compaction Testing: In accordance with Section 02320.

D. When tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.5 PROTECTION OF FINISHED WORK

A. Section 01700 - Execution Requirements: Protecting installed construction.

END OF SECTION

SECTION 10340

FIXED ALUMINUM LADDERS

PART 1 GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall supply all materials, equipment, and labor needed to install complete and make ready for use all fixed aluminum ladders as specified herein and as indicated on the Drawings for the LFG control system.

1.2 SUBMITTALS

A. Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, four (4) copies of certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, and installation of fixed aluminum ladders.

1.3 REFERENCE

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B 209	Aluminum and Aluminum-Alloy Sheet and Plate.
ASTM B211	Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

2. AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI A14.3	Ladders, Fixed, Safety Requirements.

3. OCCUPATIONAL HEALTH AND SAFETY ADMINISTRATION (OSHA)

OSHA 3124-12R 2003 Stairways and Ladders

1.4 QUALITY ASSURANCE

A. Provide only aluminum ladders conforming to the requirements of the referenced ASTM standards, ANSI standards, and OSHA standards.

B. Manufacturer Qualifications: product shall be provided by a manufacturer that has commercially fabricated fixed aluminum access ladders for a minimum of five (5) years.

C. Utilize only trained and certified welders, equipment, and installers.

D. Follow all ASTM practices and standards in the manufacture and fabrication of aluminum ladders.

E. Follow manufacturer’s written instructions for handling, storage, and installation.

1.5 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be installed, including model number, material, and finish.

B. Shop Drawings: Manufacturer's shop drawings indicating elevations, dimensions, connections, and size and type of fasteners.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. ACL Industries, Inc. of Manchester, NH.

B. WACO Products, Inc. of Baltimore, MD.

C. Approved equal.

2.2 FIXED ALUMINUM ACCESS LADDERS

A. Heavy-duty aluminum ladder, with platform and return.

B. Materials: ASTM B221, Alloy 6063, Temper T-6, non-spark extruded aluminum and ASTM B209, Alloy 6063 Temper T-6 sheet aluminum.

C. Aluminum Finish: Mill finish.

D. Nominal Height: As indicated on the Drawings.

E. Cross Over Span: As determined by width of parapet wall and as indicated on the Drawings.

F. Side Rails: 1 3/4 inches (45 mm) wide by 3 inch (76 mm) tubes with 1/8 inch (3 mm) wall thickness. Extend rails 42 inches (1065 mm) above containment wall. Provide rails on opposite side mounted to rear of containment wall and extending 42 inches (1065 mm) above containment wall and below containment wall to the containment slab.

G. Grab Bars: Connect front and rear side rails with 4 pairs of 1 1/4 inch (32 mm) square tube grab bars with corrugated surfaces.

H. Platform: Provide cross over platform fabricated from 6 inches (152 mm) wide by 1 3/4 inches (45 mm) deep aluminum treads with mill-finished non-slip surface.

I. Rungs: 1 1/4 inches (32 mm) wide by 1 1/4 inches (32 mm) tube with serrated surfaces and capable of 1,000 pound (455 kg) load. Space 12 inches (310 mm) on center. Attach rungs in centerline of side rails by welding.

J. Rung Length: 18 inches (457 mm).

K. Accessories:

L. Wall Brackets: 2 inch (50 mm) by 1/4 inch (6 mm) minimum flat bar aluminum wall brackets.

M. Floor Brackets: Anchor side rails to floor with 2 by 1/4 inch (50 by 6 mm) minimum flat bar aluminum floor brackets. Allow 7 inches (180 mm) minimum clearance from wall to centerline of rungs.

PART 3 EXECUTION

3.1 PREPARATION

A. Do not begin installation until substrates have been properly prepared. Notify Engineer of unsatisfactory conditions before commencing work.

B. Field-verify required dimensions. Coordinate with supporting construction to ensure adequate attachment and support.

C. All surfaces in contact with concrete shall be coated with a minimum 10 mil. layer of bitumastic, such that no bare aluminum surface is in direct contact with concrete.

D. Isolate dissimilar metals to prevent electrolysis with bituminous paint or non-absorptive isolation pad to prevent contact.

3.2 INSTALLATION

A. Install ladders and accessories in accordance with manufacturer's instructions and approved submittals.

B. Securely anchor support brackets with fasteners of type and size recommended by manufacturer.

C. All fasteners and fastener systems shall be grade 304 stainless steel. Installation shall include the application of anti-seize compound to all threaded components.

D. Place brackets as indicated by the drawings.

E. Allow 7 inches (180 mm) minimum clearance from wall to center line of rungs.

F. Inspect ladder to verify proper and secure installation.

3.3 CLEANING

A. Clean ladders as recommended by manufacturer. Do not use abrasive agents, steel wool or chemicals.

END OF SECTION

SECTION 11170

SKID-MOUNTED LANDFILL GAS BLOWER/FLARE SYSTEM (BFS)

PART 1 GENERAL

1.1 DESCRIPTION

A. The work described in this section consists of furnishing all labor, materials, equipment, and incidentals necessary to furnish, install, field test, and warranty, a SKID-MOUNTED LANDFILL GAS BLOWER/FLARE SYSTEM, as shown on the Drawings and as specified herein, including all appurtenances to provide a complete system ready for operation.

B. The Skid-Mounted Landfill Gas Blower/Flare System shall include the following four sub-systems:

a. Gas Handling System.
b. Interconnecting Piping System.
c. Candlestick Flare System.
d. Control System.

C. The CONTRACTOR shall be responsible for all electrical wiring connections for operation and control of all equipment related to the Skid-Mounted Landfill Gas Blower/Flare System.

1.2 SUBMITTALS

A. All equipment and accessories shall have manufacturer's Shop Drawings approved by the ENGINEER prior to shipment and shall be tested for conformance with these Specifications prior to acceptance and final payment by the OWNER. Within twenty (20) calendar days after the CONTRACTOR has received the OWNER’s Notice To Proceed, CONTRACTOR shall submit two (2) copies of the following materials and shop drawing information:

1. Certified Shop Drawings showing all important details of construction and dimensions.

2. Descriptive literature, bulletins, and/or catalogs of the equipment.

3. A complete bill of materials for all equipment.

4. The total weight of the equipment, including the weight of the single largest item.

5. Complete performance data that will indicate full compliance with the Specifications; performance curves for flow and pressure/vacuum capacity.

6. Complete control panel diagrams and elevations showing all components, wires, connections, and numbered terminals.

7. Complete electrical interconnect diagram showing all wires and terminals between the control panel and external devices.

8. Exceptions to the applicable requirements, Drawings, Specifications, and applicable codes and standards.

9. Certification that the equipment furnished for this project does not exceed the sound pressure specified herein.

B. Two (2) copies of an operation and maintenance (O&M) manual specifically prepared for this installation shall be furnished a minimum of three (3) weeks prior to delivery of equipment. The manual shall be prepared specifically for this installation and shall include all required catalog cuts, Drawings, equipment list, descriptions, definitions, procedures, and information necessary to instruct operating and maintenance personnel unfamiliar with such equipment. The manual shall include a list of suppliers, with phone numbers and contact, for equipment parts that may need servicing or replacement. The CONTRACTOR shall modify the manual, as necessary, based on the ENGINEER's comments following start-up and shall submit two (2) copies of the finalized manual two (2) weeks after start-up. The OWNER will not issue final payment to the CONTRACTOR until final O&M Manual is submitted and approved.

C. Test Procedures: Detailed outline of functional test procedures shall include a step by step description of the proposed tests, a list of all test equipment including calibration dates, and signoff sheets.

D. Spare Parts: In addition to the spare parts recommended by this specification, a list of manufacturer's recommended spare parts shall be submitted.

1.3 QUALIFICATION

A. The Skid-Mounted Landfill Gas Blower/Flare System, including all ancillary equipment, shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the equipment to be furnished. The equipment shall be designed and fabricated in accordance with the best practices and methods. The manufacturer shall have experience in supplying equipment for landfill gas handling systems.

B. The Skid-Mounted Landfill Gas Blower/Flare System shall be manufactured by John Zink Company, Perennial Energy, Inc., LFG Specialties, Inc., CMi Energy, LLC, Parnel Biogas, Callidus Technologies Inc., or approved equal.

1.4 DESIGN CRITERIA

A. Landfill Gas Centrifugal Blower

1. Equipment specified herein is intended to be standard equipment for use in a landfill gas handling system.

2. The blower shall be direct electric motor driven, complete with blower, electric motor, shaft coupling, coupling guard, equipment base, and vibration isolation pad. The blower shall be designed for continuous operation in an outdoor environment and shall conform to the following:

Number required	2
Rated capacity, scfm	300
Minimum capacity, scfm	30
Site elevation	70 feet above MSL
Gas composition	
Methane	25 - 65 percent
Carbon Dioxide	25 - 50 percent
Oxygen	0 - 5 percent
Traces gases (e.g., VOCs, H_2S)	0 - 1 percent
Blower inlet vacuum, inches of water	60
Blower outlet pressure, PSI	3.0
Landfill gas inlet temperature	
Maximum, degrees F	120
Minimum, degrees F	60
Motor	
Totally enclosed, fan cooled	
Estimated motor horsepower	15
Noise limit	85 dbA at 3 feet
LFG moisture content	100% saturated

3. When rated volumetric capacity is reduced to 20 percent of design, blowers under the specified inlet conditions shall not surge or overload the motor.

4. Blower motors to be constructed with variable frequency drives (VFDs) mounted in separate air conditioned panels.

B. Candlestick Flare System:

1. The landfill gas flare system shall be designed to operate continuously at the following service conditions:

Landfill gas flow rate, scfm	300

Btu loading, MM Btu/hour	0.9 to 9
Inlet temperature, degrees F	80 to 130
LFG moisture content	100% saturated
Landfill gas composition range:	
Methane	25 to 65 percent
Carbon Dioxide	25 - 50 percent
Oxygen	0 - 5 percent
Traces gases (e.g., VOCs, H_2S)	0 - 1 percent
Site elevation:	70 feet above MSL

Controls and accessories to include the following:

Propane supply with a spark plug igniter for flame ignition.
Two (2) propane supply tanks
Thermocouples for flame temperature confirmation (main and pilot)
Flare control panel.
Auto re-start.
Automatic dialer system for failure to restart.
Pneumatically-operated emergency shut-off valve.
Programmable Logic Controller (PLC)
Two (2) Mass Pro-Bar Flow Meters with Totalizers
Digital Data Logger
Flame arrestor
Variable Frequency Drive (VFD) for Blowers
Continuous Methane Analyzer
Stainless Steel V-Port Ball Valve

2. The landfill gas flare shall be capable of achieving a minimum weighted average destruction efficiency of greater than 98 percent of total non-methane organic compounds and meet the requirements of 40 CFR 60.18.

1.5 APPLICABLE CODES AND STANDARDS

A. All equipment shall be manufactured in accordance with codes and guidelines as specifically detailed herein and in accordance with applicable portions of the following (latest edition):

1. Local laws and ordinances.

2. State and Federal laws.

3. National Electrical Code.

4. National Electrical Manufacturers Association (NEMA)

5. Underwriters Laboratories (UL).

6. Uniform Building Code (UBC).

7. American National Standards Institute (ANSI).

8. American Society of Mechanical Engineers (ASME).

9. American Gas Association (AGA).

10. Institute of Electrical and Electronic Engineers (IEEE).

11. Instrument Society of America (ISA).

12. Industrial Risk Insurance (IRI).

13. Factory Mutual (FM).

14. National Fire Protection Agency (NFPA).

15. Environmental Protection Agency (EPA).

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. The equipment shall be delivered on site as fully assembled as transportation will allow. Factory-assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the ENGINEER.

C. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built, and securely bolted thereto.

D. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.7 WARRANTY AND GUARANTEES

A. The CONTRACTOR shall warrant the units being supplied to the OWNER against defects in workmanship and material for a period of 12 months from the date of equipment acceptance by the OWNER. In the event that the equipment fails to perform as specified, the equipment manufacturer shall promptly repair or replace the defective equipment without any cost to the OWNER (including handling and shipment costs) and without any cost to the OWNER associated with the equipment manufacturer and/or CONTRACTOR field personnel making site visits for assessments and repairs.

PART 2 PRODUCTS

2.1 GENERAL

A. These Specifications are intended to give a general description of what is required, but do not cover all requirements of the equipment as offered. They are, however, intended to cover the furnishing, delivery, and field testing of all materials, equipment, and apparatus as required. Auxiliary equipment necessary for proper operation of the proposed Skid-Mounted Landfill Gas Blower/Flare System not mentioned in these Specifications or shown on the Drawings shall be furnished and installed.

B. Equipment shall not have been in service, except for shop tests, at any time prior to delivery, except as approved by the ENGINEER. The equipment shall be furnished factory-assembled to the extent possible and ready for installation.

C. Equipment shall be designed and proportioned to have liberal strength, stability, and stiffness and shall be especially adapted for the intended service. Ample room and facilities shall be provided for inspection, repairs, and adjustments.

D. Parts of equipment shall be amply proportioned for all stresses which may occur during operation and for any additional stresses which may occur during fabrication, transportation, handling, and erection.

E. At all levels of performance of each gas system, the sound pressure shall not exceed 85 dbA over a frequency range of 37.8 to 9,600 cycles per second. Measurement shall be made a distance of 3 feet from the outer face of the equipment. The manufacturer shall certify that the equipment furnished for this project does not exceed the specified sound pressure. This written certification shall be submitted with the Shop Drawings.

F. A brass, aluminum, or stainless steel nameplate shall be attached to each main item of equipment and or equipment enclosure in a conspicuous place. The following information shall be plainly marked on the nameplate: name and address of the manufacturer, model number, and any other information necessary for part identification.

G. If necessary, modifications shall be made in the manufacturer's standard product to make it conform to the specific requirements of the Specifications and to requirements contained in regulations issued by public agencies. Such modifications shall be noted in Shop Drawing submittals.

2.2 LANDFILL GAS HANDLING SYSTEM

A. The blower motor assemblies shall be gas inlet driven, direct drive, multistage centrifugal-type or pressure fan blowers capable of meeting the performance specifications. Impellers shall be mounted on one shaft supported on each end by bearings mounted in the outboard bearing housings. The blowers shall be built from parts cast in patterns from which previous units have been built and tested.

B. Each blower motor assembly shall be plumbed and factory mounted on a steel skid and delivered to the site as a complete unit. Neoprene base pads shall be provided. Two (2) blowers shall be installed at the site under this contract.

C. Each blower motor shall be recommended by the blower manufacturer to be compatible with electrical service of 480-volt, 3-phase, and 60-hertz. The blower motors shall be high efficiency, totally enclosed, fan cooled (TEFC) motors suitable for Class 1, Division 2, Group D, classified location, and UL-approved. Bearings shall be of the antifriction type with an AFBMA L-10 rating of no less than 25,000 hours.

D. Blower housings. The housings shall consist of cast-iron sections held securely between cast-iron inlet and outlet heads with steel tie rods. No contact shall be made between the shaft rotor and the housing, other than through the bearings. Stuffing boxes shall be used as seals to insure no leakage of gas to the atmosphere or air into the landfill gas. The inlet and outlet connections shall be standard flange patterns per ANSI and shall be an integral part of the heads.

E. Bases. Hot dip galvanized or epoxy-coated steel bedplates of suitable size for mounting blowers and drivers shall be furnished by the blower manufacturer. The blower and motor shall be carefully aligned and then bolted in place. Suitable vibration isolation pads shall be provided under the steel bedplates of the units.

F. Internal coating. The blowers shall be supplied with a factory-applied Bisonite, Kynar, phenolic coating, or approved equal, to protect all internal parts that will be in contact with extracted gas to provide resistance to corrosion.

G. Impellers. Impellers shall be one-piece cast aluminum alloy, keyed to the shaft and held by a locknut. Impellers shall be precisely machine balanced. Vibration shall not exceed 2 mils in the vertical plane measured at the blower bearing housings.

H. Casing drains. Each blower stage shall be provided with casing drains. These drains shall be connected to a common drainline and included with a shut-off valve at a location that is easily accessible to the operator.

I. Shafts. Each shaft shall be made of high grade carbon steel of sufficient diameter to operate below first critical speed.

J. Pressure and vacuum gauges. The CONTRACTOR shall provide a pressure gauge on the outlet and a vacuum gauge on the inlet side of each blower. Pressure and vacuum gauges shall be capable of measuring 0 to 100 in-w.c. Gauges shall be designed and suitable for outdoor installation with Stainless Steel wetted parts and housings.

K. Experience. Blowers shall be manufactured in the United States. Blower manufacturers shall have a minimum of 5 years experience in the design and manufacture of this type of equipment and shall have a minimum of 25 currently operating installations in the United States. Blowers shall be manufactured by the following, or approved equal:

1) Houston Service Industries, Inc.
Houston, Texas 77061
(713) 947-1623

2) Continental Blower, LLC
Liverpool, New York 13088
(315) 451-5410

3) Spencer Turbine Company (Powermizer Model)
Windsor, Connecticut 06095
(800) 232-4321

4) Gardner Denver, Inc. (Lamson)
Peachtree City, GA 30269
(770) 632-5000

L. Blower Motor Assemblies

1. Installation:

a. Electrical installation shall be in accordance with the Specifications, and the notes on the Drawings and the National Electric Code.

b. Install the blower motor assemblies in compliance with the manufacturer's recommendations, the Drawings, and as specified below.

c. The CONTRACTOR shall check and, if necessary, adjust the alignment of the motor and blower after installation at the site in accordance with the instructions of the blower manufacturer.

d. Equipment shall be field tested by the CONTRACTOR to verify proper alignment and operation, including: freedom from binding, scraping, vibration, shaft runout, or other defects.

e. Shop-painted items which have damage to the shop coatings shall be touched up to match the basic color of the equipment, as approved by the ENGINEER.

M. Moisture Separator Assembly (knock-out pot):

1. The moisture separator shall be completely fabricated from SCH 10 T-304L stainless steel or approved equal. It shall be of a vertical, cylindrical design with demister element removal from the top. Connection flanges shall meet ANSI specifications.

2. The demister shall be made from non-corrosive mesh and shall be supported on and held down by high open area, stainless steel grid, or equivalent. The first moisture separator shall be able to remove 100 percent of droplets greater than 10 micron and shall also remove particulates having a density equal to or greater than water which are greater than 10 micron in size. The second moisture separator shall be able to remove 100 percent of droplets greater than 5 micron and shall also remove particulates having a density equal to or greater than water which are greater than 5 micron in size.

3. The moisture separator shall have a flow capacity of at least 300 scfm. At the design maximum flow rates, temperatures and pressures, the moisture separator shall not have a pressure drop greater than 3 inches water column and shall be capable of withstanding no less then 3.0 pounds per square inch gauge vacuum.

4. Condensate Removal. There shall be a 2-inch FNP coupling in the bottom of the assembly with a SS “True Union” manual ball valve for condensate removal.

5. Pressure Drop Monitoring. There shall be two 1/2-inch pipe couplings in the side of the unit, one upstream and one downstream of the demister element material, for the purpose of connecting differential pressure monitoring device(s).

6. The moisture separator assembly manufacturer shall have experience in the design and manufacture of this type of equipment installed on similar landfill gas installations in the U.S.

2.3 INTERCONNECTING PIPING SYSTEM

A. Expansion Joints

1. Expansion joints between the blower inlet and outlet and connected piping shall be flanged concentric reducers sized to match the blower flanges to the connecting pipe or valves.

B. Valves

1. Butterfly valves located at the inlet and outlet of each blower shall be bubble-tight, cast iron body, wafer-type with 316 stainless steel disc and stem, Acetal stem bushing, and Teflon replaceable resilient seat. Surfaces shall be clean, dry, and free from rust and grease before coating.

2. Manual operators shall be gear or lever type. Operators shall have adjustable stop limiting devices to prevent over-travel of disc. Should an adjustment of the disc be required to maintain a bubble-tight seal, this adjustment shall be made externally without removing the operator housing cover.

3. Check valves on each blower outlet shall be fabricated from stainless steel and be flanged and designed for installation and operation on a centrifugal blower discharge application.

4. Sample Valves. Gas and pressure sampling valves shall 1/4-inch SCH 80 PVC or stainless steel ball valves. Valve seats and seals shall be EPDM. Valves shall have a 1/4-inch MPT on one end and hose barb connection on the other and. Replacement parts and valves shall be commonly available.

5. V-Port Ball Valve. The v-port ball valve shall be constructed of stainless steel and shall be flanged at both ends. The valve shall be sized to handle 0-300 scfm of gas flow and shall have a manual adjustment lever. The valve should be fully adjustable within the specified flow range and should be suitable for modification in the future to operate with an electric or pneumatic actuator, if desired by the OWNER.

C. Piping:

1. Piping on the gas handling system skid shall be SCH 10 T-304L stainless steel, or approved equal. The same specification applies to tees, elbows, wyes, flanges, and other pipe fittings. Flanges shall conform to ANSI 150-pound specifications.

2. The gaskets shall be full-face rubber or neoprene, 1/16 inch to 1/8 inch in thickness, and shall meet the requirements of ANSI Specification A21.11.

3. Where shown on the Drawings or as required, pipes and fittings shall be drilled and tapped to receive drainage or other piping or plugs. All holes shall be drilled at right angles to the axis of pipes and fittings.

4. Piping and fittings shall be supported so as to prevent any strain being transmitted between sections and connected equipment and appurtenances. Release of any joint shall result in no transverse piping movement and shall allow easy removal and replacement of any piping component. Supports in addition to those shown on the Drawings may be required.

2.4 CANDLESTICK FLARE SYSTEM

A. The landfill gas flare system shall be a unitized, modular system including all components for a complete and operational system. The flare shall comply with the Design Criteria of Part 1.4 above.

B. The landfill gas flare system shall be pre-piped and pre-wired to the extent possible, requiring minimal field assembly.

C. The landfill gas flare system shall include, but not be limited to, the following components:

1. Automatic Shut-Off Valve. The valve shall open when prompted by the flare control panel and closed by loss of electrical power, flame failure, or blower failure. It shall be a pneumatically operated butterfly valve, bubble-tight, wafer-style, equipped with a stainless steel disk and Teflon seat. The operator shall have a spring fail close device. It shall close when directed by the logic in less than 5 seconds. The compressed gas necessary to operate the valve shall be supplied by a nitrogen bottle or compressed air supply (to be provided by the OWNER), provided unless otherwise specified by ENGINEER. CONTRACTOR to make final connections to the automatic shut-off valve using suitable hose or other gas supply lines.

2. Flame Arrester

   a. Flame arrester shall have 150-pound ANSI flanged connections.
   b. The housing construction shall be aluminum. The element assembly shall be all aluminum and shall be arranged for easy removal from the housing to facilitate inspection and cleaning. The arrestor shall be designed and tested to meet the intended service at the specified minimum and maximum flow and pressure conditions.

c. Maximum head loss through the flame arrester shall not exceed 3 inches of water column at 300 scfm. The internal element shall be designed for easy removal for cleaning and inspection.

3. Flare Stack. The flare stack shall be constructed from ASTM A53 steel, and shall be of sufficient length to provide an overall flare system height of more than 20 feet. Flare construction shall consist of welds conforming to AWS D1.1 standards. The top 5 feet of the stack/burner tip shall be constructed of 316 stainless steel.

4. Burner. The burner unit shall be constructed of 316 stainless steel. It shall consist of the burner nozzle, vanes, and impingement assembly. It shall be designed such that the full range of flow rates, as specified herein, shall combust without causing either flame yellowing, flame lift-off, or flashback, and shall perform according to the destruction and reduction efficiency requirements listed earlier in this specification.

5. Windshield. The flare windshield shall be constructed of 316 stainless steel. The windshield shall extend at least 2 feet above landfill gas exit.

6. Adjustible Flare Tip Damper System. Flare shall have a manually adjustable damper system (or similar system) for regulating the flare flame height based on total gas flow to the flare tip. The flare will be used in conjunction with a future engine plant and the flare flow will fluctuate between the minimum and maximum expected flow rates. The damper system should be able to help keep the flare ignited under low flow conditions.

7. Propane Pilot System. Pilot fuel supply assembly shall include pressure regulator, pressure indicator, solenoid valve, manual shutoff valve and pilot gas pressure manometer port. CONTRACTOR shall provide two (2) 10 gallon L.P. bottles equipped with fuel gauges and regulators arranged such that one bottle can be removed from the system for re-filling without affecting system operation.

8. Electronic Spark Ignition. Electronic igniter transformer assembly shall be removable without disconnecting conduit or wiring. Spark igniter assembly shall be readily available parts. The manufacturer shall provide a list of parts not commonly available and list of suppliers.

9. Flare Mounting System. This system shall be manufactured of ASTM A36 carbon steel members, which shall be welded to the structure using AWS D1.1 methods. Sufficient steel gusset material shall be incorporated in the structure to prevent erratic vertical alignment of the flare pipe. Flare mounting shall provide anchorage to the foundation to prevent overturning

and provide resistance against seismic or wind forces. Structural design shall comply with UBC 100 MPH criteria.

10. Finish. Carbon steel base of the flare stack shall be sand-blast prepared and primed. Sand blasting shall be to SP-6 guidelines. An inorganic zinc primer, solvent or water based, with a minimum of 14 lbs metallic zinc content per gallon shall be applied. Minimum application will involve 1 coat, 4 MDFT cover. Acceptable coating suppliers include Ameron Protective Coatings (Brea, CA), DuPont Chemical Company (Wilmington, DE), Glidden Company (Cleveland, OH), and Koppers Company (Pittsburgh, PA).

11. Condensate Drains. Drain ports in the flame arrester and flare stack (2" FNPT) shall be equipped with SS ball valves.

2.5 CONTROL SYSTEM

The control panel for the Skid-Mounted Landfill Gas Blower/Flare System shall be compliant with NEMA 4 specifications at a minimum. The main control panel shall be sized to accommodate the required controls, provided with a NEMA 4 compliant window in the door through which status annunciators, recorder, controller, etc. may be viewed. The control panel shall be mounted, installed and prewired by the manufacturer. The panel shall include, but not be limited to, the following components:

1. A load center for the motors, outlets, fixtures, controls, devices, lights, etc.

2. A control center to receive all the signals from the various safeties, controls and monitoring equipment, and to automatically control all the components of the system.

3. An operator control panel to allow either manual or automatic selection for the control of the operating components of the system.

    a. Flare controls shall include trouble light contacts, automatic start/stop for pilot ignition, controllers, spark plugs, flame safeguard controller, thermocouples, timers, and other components necessary for a complete, operational automatic system. Automatic operation shall be achieved through adjustable timers, relays, and switches controlled by the PLC based on signal inputs from the thermocouples.

    b. Blower controls shall include ITE Type ETI, or equal motor circuit protectors, motor starters, voltage monitors, ammeters, run time meters, hand-off-automatic switches, and push-to-test annunciator lights. A restart time delay shall be provided to prevent blower

restart until sufficient time has elapsed for the shaft to stop spinning (approximately 8 minutes).

4. A weather/heat shield shall be provided to protect the control panel against radiated heat (solar and/or flare) and rain. The control system shall be designed and manufactured as an outdoor system.

5. Safeties. The system shall be equipped with the following safeties as a minimum:

   a. Blower-motor overcurrent shall cause system shutdown.
   b. Blower-motor undercurrent (surge) shall cause system shutdown.
   c. Flame failure shall cause system shutdown.
   d. Blower voltage or phase loss shall cause system shutdown.
   e. High liquid level in the condensate KO pot
   f. High gas pressure in the pipeline to the LFG engines

6. Control Panel Face-Mounted Devices. The system shall be equipped with the following control panel face-mounted devices as a minimum:

   a. Alarm and shutdown message annunciator lights or touchpanel display.
   b. Blower motor current meter(s).
   c. Hand/Off/Auto switches for the blower(s).
   d. Hand/Off/Auto switches for the flare.
   e. Flare Only/Flare & Engine
   f. Hand/Off/Auto switches for the shutdown valve.
   g. Run indicators for the blower(s).
   h. Total elapsed run time for each blower.
   i. Flame failure indicator for the flare.
   j. Automatic shut-off valve failure indication.
   k. Flame Temperature Indicator
   l. Emergency Shut-Off Button

A. Auxiliary Equipment

1. Local alarm light.

2. Auxiliary lighting shall be provided via photocell-activated light mounted to the flare/blower control panel rack.

3. Two outdoor receptacles (120V) with ground fault protection shall be provided at the flare/blower control panel rack.

B. Automatic Telephone Dialer:

1. General. The system shall receive input from the various monitored items in the form of a change in the status of a dry contact. Upon such change, the system shall automatically dial up to eight pre-selected phone numbers. When answered, the system shall send voice messages reporting the specific alarm condition.

2. The system shall make provisions for the following input alarms

   a. Flame failure.
   b. System shutdown
   c. Power Failure

3. Equipment Description:

   a. The automatic dialer shall be an advanced microprocessor and synthesized voice technology capable of dialing up to 8 phone numbers, 16 digits each, maximum. The OWNER will obtain the service contract with the phone company.

   b. The unit shall permit the user to program the following functions:

      (1) Each fault channel to a normally open or closed mode.
      (2) A different fault sense delay from 1 to 99 seconds.
      (3) Programmable answering delay of 1 to 20 rings.
      (4) Dialing and re-dialing up to eight separate pre-determined telephone numbers and delivering a synthesized voice message.

   c. Normal power shall be 105-135 volts AC. The unit shall contain its own gel cell rechargeable battery which shall automatically be kept charged when AC power is present. The system shall operate on battery power for 24 hours in the event of AC power failure.

   d. The unit shall be provided with a NEMA 12 enclosure, which shall be mounted inside the blower/flare main control panel.

   e. Automatic dialer shall be Microtel Model MCS200, Raco Verbatim Series VSS, Guard It or approved equal.

2.6 IGNITION PROCEDURE

A. The pilot and main flame ignition shall be controlled by thermocouples and timers to perform the following functions:

1. Spark ignition of propane gas creates pilot flame that ignites LFG main flame.

2. When pilot is successfully ignited, blower(s) and actuator valve on flare inlet are activated.

3. When main flame is successfully ignited, pilot propane gas is shut off.

4. If pilot is not ignited after three attempts within the pre-selected time interval (as set on the timer), the pilot is shut off, a trouble light is illuminated and alarm sent (via the autodialer).

5. If main flame is not ignited within the pre-selected time interval, the pilot is shut off, and the trouble light is illuminated and alarm sent.

6. If the main flame fails, the blower(s) is turned off, and the inlet valve is closed and alarm sent.

7. In the event of loss of flame, the flame and blower(s) shall automatically attempt to restart after an adjustable time delay of 5 to 15 minutes.

B. In the event of a power failure, the flare and blowers shall automatically attempt to restart when power resumes after an adjustable time delay of 5 to 15 minutes.

C. The blower/flare should be capable of operating in “Flare Only” and “Flare/Engine” modes. In the “Flare Only” mode, the blower/flare system will not be sending gas to the engines and all normal shut-downs will activated. In “Flare/Engine” mode, the flare may be used as a supplemental combustion device; however, the blowers and all system controls should be able to continue operation to provide gas to the engines in the event that the flare is not operational.

2.7 AUXILIARY EQUIPMENT

A. Gas Mass Flow Meters

1. The mass flow meters shall have a primary element consisting of a venture, V-cone, or a single insertion type element with a differential pressure transducer and remote electronics. The flowmeters will be integrated with inline LFG temperature and pressure measurements for correcting the mass flow to 60 degrees F at 14.7 psia. The method of operation shall utilize a varying delta P signal to calculate a mass flow rate corrected to standard temperature and pressure. The flowmeter shall have a digital LCD readout showing instantaneous (SCFM) flow and totalized flow and provide a 4-20ma signal to the datalogger and PLC located in the control panel. The flow meter shall be capable of reading gas flows in the range of 0 to 400 SCFM. The primary element shall be manufactured by: Fisher-Rosemount, McCrometer, Veris, Inc. or approved equal. The flow meter shall be installed per the manufacturer’s recommendation.

2. The flow meter shall be installed in a manner that allows for removal for cleaning and calibration with no obstructions in straight piping a minimum of 10 diameters upstream and 5 pipe diameters downstream.

3. One flow meter will be installed in the piping to the flare stack and a second flow meter will be installed in the piping to the engine plant.

B. LFG Continuous Methane Analyzer

1. The methane analyzer shall provide continuous measurement, display, and allow for recording of methane concentration in the landfill gas downstream of the blower(s) and prior to the tee to the engine pipeline.

2. The analyzer shall be equipped with a sampling conditioning system, stainless steel tubing, condensate drain, and ports and regulators as necessary to allow field calibration. The analyzer shall be mounted in an enclosure with viewing window, freeze protection heater, and air conditioning. The unit shall provide standard output options, such as 4-20 ma signal.

3. The analyzer shall be equipped with a pump sufficient to withdraw sample under vacuum up to 60 in-wc.

4. The analyzer shall be a Siemans Ultramat 23 NDIR Gas Analyzer, or approved equal. This instrument measures methane on a dry gas basis; therefore, a separate inline moisture probe will be required to correct methane concentrations to a wet basis or alternate procedure as approved by the ENGINEER.

C. Datalogger

1. The datalogger shall be a minimum 12-channel Yokogawa paperless chart recorder with 5.5-inch color display and 10BASE-T Ethernet adapter communications medium (or approved equal). The unit shall be provided with the necessary math function hardware/software to provide totalized LFG flow for up to two (2) inputs. Sampling frequency for all inputs shall be at least once every 1 minute.

   The initial inputs include:

   - LFG Flow to Flare
   - LFG Flow to Engine(s)
   - LFG Methane Concentration
   - LFG Percent Moisture in discharge pipe
   - Flare temperature
   - Applied Vacuum

D. Gauges. The system shall be equipped with the following gauges as a minimum:

1. Pressure, Vacuum, and Differential Gauges: Gauges shall be designed for use on a LFG application and shall have SS wetted parts and housings. Gauges shall read "INCHES OF WATER." Graduations shall be at intervals of 1 inch of water.

   a. Flame arrester pressure drop indicator. Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

   b. Moisture separator pressure drop indicator. Gauge shall be capable of measuring 0 to 15 in-w.c., differential pressure.

   c. Blower vacuum and pressure indicators. Vacuum gauges shall be capable of measuring 0 to 80 in-w.c. Pressure gauges shall be capable of measuring 0 to 100 in-w.c.

   d. System vacuum indicator. A vacuum gauge shall be mounted upstream of the knock-out pot as indicated on the Drawings. It shall be capable of measuring 0 to 80 in-w.c.

   e. System pressure indicator. A pressure gauge shall be mounted downstream of the blowers' outlet valves as indicated on the Drawings. It shall be capable of measuring 0 to 100 in-w.c.

2. Blower inlet and outlet temperature indicators.

   a. Dial-type temperature gauges shall be provided at the inlet and outlet of each blower. The gauges shall range from 0 to 200 degrees F.

2.8 SPARE PARTS

A. The Vendor shall provide the following spare parts:

1. 20 ounces of blower Grease.

2. One each vacuum, pressure and temperature gauge.

3. One blower/motor shaft coupling.

4. One pilot and one main flame thermocouples.

5. Indicator light package.

6. One set fuses/relays.

7. Two spark plug ignitors.

PART 3 EXECUTION

3.1 INSTALLATION

A. The manufacturer/supplier shall install the following items on the main skid:

1. Blower-Motor Assemblies.
2. Moisture Separator Assembly (knock-out pot).
3. Piping and fittings.
4. Valves.
5. Control Panels.

B. The flame arrester and inlet control valve shall be installed on the flare inlet pipe, supported by the candlestick flare skid and pipe support.

C. All equipment shall be installed in strict accordance with the manufacturer's recommendations and codes and standards.

D. All skid-mounted equipment shall be installed plumb and perpendicular to piping.

E. Marred or abraded surfaces of equipment shall be cleaned and refinished to match original finish.

F. The CONTRACTOR shall coordinate the electrical work with the equipment manufacturer and panel fabricator to provide a complete, integrated, and automatic system.

3.2 START-UP AND TESTING

A. Factory Test. The controls for the landfill gas blower/flare system shall be tested at the supplier's plant before shipment. Complete test reports shall be provided to the ENGINEER which show that all system controls operated correctly prior to shipment.

B. A factory representative with complete knowledge of proper operation and maintenance shall be provided for a minimum of one (1) 8-hour day to instruct representatives of the OWNER and/or the ENGINEER on proper operation and maintenance of the blower/flare system. If there are difficulties in operation of

the equipment due to CONTRACTOR's or manufacturer's design or fabrication, additional service shall be provided at no cost to the OWNER.

C. Functional and Validation Tests. Upon completion of the installation, functional and validation tests shall be performed by the CONTRACTOR with the assistance of the supplier's representative, in the presence of the ENGINEER, as described in Section 01650.

3.3 DEMONSTRATIONS

A. Demonstrations shall be separate from the installation, startup, and equipment adjustment services described in 3.2 above. System operations under all alarm conditions shall be demonstrated. Some of these alarm conditions may be simulated (e.g., via electrical jumpers) for demonstration purposes.

B. The Demonstration Test shall demonstrate that all items of these Specifications have been met by the equipment as installed and shall include, but not be limited to, the following tests:

1. That the system has been properly installed and all parts are in correct alignment.

2. That the system performs satisfactorily during continuous operation for at least 3 consecutive days.

3. That there are no mechanical or electrical defects in any of the parts.

4. That the controls perform satisfactorily, including automatic starting and stopping, manual operation, safety shutdowns, autodialer operation, and under all alarm conditions.

3.4 CLEANING

A. The CONTRACTOR shall clean exposed surface of all greases, dirt, and other foreign materials.

B. The CONTRACTOR shall touch up all marred or abraded surfaces as specified herein.

END OF SECTION

SECTION 11200

CONDENSATE SUMPS

PART 1 GENERAL

1.1 DESCRIPTION

A. Provide all materials, equipment, and labor needed to install, test, and make ready for use the condensate sumps, and appurtenances in accordance with the Drawings.

B. Related work Described Elsewhere

1. Section 02200: Earthwork
2. Section 11170: Skid-Mounted Landfill Gas Blower/Flare System
3. Section 11300: Liquid Transfer Pumps
4. Section 15050: Pipe, Pipe Fittings, and Valves

1.2 SUBMITTALS

A. Within fifteen (15) calendar days after the CONTRACTOR has received the OWNER's Notice To Proceed, the CONTRACTOR shall submit to the ENGINEER for review and approval two (2) sets of manufacturer's literature, shop Drawings, or other information pertaining to the assembly, operation, adjustments, and other maintenance and repairs of equipment installed under this Section, together with detailed parts lists, Drawings, and/or photographs. The CONTRACTOR shall also prepare and submit shop Drawings showing the layout, orientation and dimensions of the condensate sump, sump enclosure, and pump to be installed.

B. The CONTRACTOR shall prepare and submit to the ENGINEER an OSHA-compliant confined space entry program addressing health and safety procedures for work inside confined spaces. (if required)

PART 2 MATERIALS

2.1 CONDENSATE SUMPS

A. The unit shall be a stand alone device with all components rated for service in harsh and explosive environments.

B. The sumps shall be welded, single-walled HDPE assembly. The sumps shall be fabricated of PE 3408 Extra High Molecular Weight (EHMW) High

Density Polyethylene (HDPE) Cell Class 345464C, or equal. The reservoirs shall be designed to withstand:

1. A vacuum of 80 inches-w.c. and a pressure of 1 PSIG at 130 degrees F.

2. Provide resistance to buoyancy force in a saturated soil condition.

3. An earthen backfill fluid pressure of 35 pcf.

4. The forces and impacts that typically occur in loading, unloading, shipping, handling at the job site, and installation.

C. Joints shall be fused for their entire lengths. The complete sump shall be airtight, air-tested, and air-test results provided. Air testing shall be similar to the testing described in Section 15050; i.e., @5 psig the pressure drop shall not exceed one percent over a period of one hour.

D. The condensate sumps shall have a pump access casing that allows use of a portable pump or vacuum truck.

E. The general piping configuration of the condensate sumps shall be as shown on the Drawings.

2.2 APPURTENANCES

Appurtenances such as the pipe stub-outs, access, interior piping, and handles to pick up and handle each unit shall be fabricated of like material or compatible HDPE material

PART 3 EXECUTION

3.1 EXCAVATION AND BACKFILL

A. Excavation, temporary sheeting, shoring, bracing, and backfill shall comply with Section 02200.

B. If groundwater is encountered, the CONTRACTOR shall dewater the excavation during installation.

C. Excavated material may be used for backfill in accordance with Section 02200. If any refuse is encountered, the CONTRACTOR shall haul it to the working face for disposal.

D. Backfill shall be compacted in 1-foot lifts using suitable equipment approved by the ENGINEER. If the ENGINEER suspects adequate compaction is not being achieved, the CONTRACTOR shall test the backfill material to demonstrate a density of at least 90 percent of the maximum density as determined by ASTM D698 (Standard Proctor).

3.2 INSTALLATION

A. The CONTRACTOR shall use care in handling and installing the sump assemblies, and in backfilling so as to avoid damage. The CONTRACTOR shall be responsible for repairing any damage. Installation shall comply with the manufacturers' recommendations and approved by the ENGINEER.

B. The 2 inch condensate piping from the blower/flare station to the blower station sump will be considered, for payment purposes, to be a part of the installation of the condensate sump.

C. Condensate sump CS-1 will include an air-driven, pneumatic pump to automatically pump liquid condensate to the condensate storage tanks. The 3-inch condensate force main piping from CS-1 to the condensate storage tanks will be considered, for payment purposes, to be part of the installation of the condensate sump.

3.3 TESTING

A. CONTRACTOR shall performance test all condensate sumps. Performance testing must include ensuring the full operation of the condensate sump vacuum breaks, etc. All testing to be coordinated and witnessed by the ENGINEER.

END OF SECTION

SECTION 11300

LIQUID TRANSFER PUMPS

PART 1 GENERAL

1.1 DESCRIPTION

The CONTRACTOR shall provide all materials, equipment, and labor needed to install, complete and ready for use, pumps and flow meters as specified herein and as indicated on the Drawings. Pumps and flow meters shall be designed to operate in corrosive conditions typical for landfill leachate/condensate handling systems.

1.2 SUBMITTALS

Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, two (2) copies of certificates of compliance on materials furnished, catalog cuts, and manufacturers' brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each type of pump or flow meter furnished.

PART 2 MATERIALS

2.1 CONTROLLERLESS PNEUMATIC PUMP

A. Description: The controllerless pneumatic pump shall be used to automatically pump liquid condensate form condensate sump CS-1 to the condensate storage tank. A pneumatic displacement pump fills and discharges in alternating cycles. When air pressure is shut off, the inlet check valve allows liquid to enter the pump under the hydrostatic pressure in the well. After the pump fills, air pressure is turned on, seating the inlet check valve and forcing the liquid out through the discharge check valve and tubing. In a controllerless pump, the on/off cycle is regulated by an internal float, which trips air valve actuators when it reaches the "full" and "empty" positions.

B. Operation & Performance: Manufacturer shall have published flow curves to validate pump flow rate specifications. Pump(s) shall be capable of the following

benchmark flow rates:

1. Pump shall deliver flow up to 10 GPM at a depth of 25 feet with 20 feet of submergence, when equipped with 1-1/4" discharge fittings and tubing.

2. Pump shall deliver flow up to 5 GPM at a depth of 25 feet with 20 feet of submergence, when equipped with 3/4" discharge fittings and tubing.

3. Pump shall have a maximum lift of at least 200 feet. Pump manufacturer shall have complete testing to validate this depth, with documentation available upon request.

4. Pump shall automatically conserve air (and minimize air consumption costs) by only demanding air when the water level is high enough for pumping to occur (i.e., high enough to completely fill the pump).

5. Pump mode of operation shall prevent air from entering discharge tubing or hose. Entrained air in the discharge liquid or pump "over-drive" shall not occur.

6. Pump shall be capable of operation in the condensate sump under pressure or vacuum without requiring any pump modifications.

2.2 TRANSFER PUMP

A. Description: Transfer pumps shall be used to drain liquid from the condensate storage tank, and shall discharge to a truck-mounted container, for the purpose of hauling to a treatment facility.

B. Performance: The transfer pump shall be capable of delivering a minimum flow of 150 GPM at 28 feet TDH. Higher flows are acceptable.

C. The transfer pump shall:

1. Be centrifugal, close coupled design;
2. Operate on 3-phase electrical service;
3. Be suitable for exterior installation;
4. Not require sealing water;
5. Have an air-cooled motor;
6. Have 4-20 mA analog signal output to monitor operation and temperature.

D. The transfer pump shall be Model 3298 S as manufactured by Goulds Pumps, or approved equal.

E. CONTRACTOR shall install the transfer pump on a concrete pad, at the location shown on the Drawings, with all fasteners and mounting hardware, complete and in place, as recommended by the manufacturer and as shown on the Drawings and to the satisfaction of the ENGINEER.

2.3 SUMP PUMP

A. Description: The sump pump shall be used to drain the landfill gas condensate containment sump area in the event of storm water accumulation, or in the case of storage tank failure.

B. Performance: The sump pump shall be capable of delivering a minimum flow of 68 GPM at 28 feet TDH, through a 2-inch diameter discharge. Higher flows are acceptable.

C. The sump pump shall:

1. Operate on 115V single-phase electrical service;
2. Be equipped with a manual operation switch;
3. Have a single, field-replaceable seal;
4. Have a cast iron body with a shop-applied epoxy-coating on all exposed surfaces;

D. The pump shall be Model ME50 S-11 as manufactured by Myers/Pentair Pumps, or approved equal.

E. CONTRACTOR shall install the sump pump at the location shown on the Drawings, with all fasteners and mounting hardware, complete and in place, as recommended by the manufacturer and as shown on the Drawings and to the satisfaction of the ENGINEER.

2.4 FLOW METER

A. Description: The flow meter shall be used to determine the quantity of landfill gas condensate removed from the storage tanks, for the purpose of payment. The flow meter includes the detector and amplifier together, as a single operational unit.

B. Performance: The flow meter shall utilize a magnetic measurement principle, and shall be capable of measuring flow from 1 to 300 gallons per minute, with an accuracy of +/-0.25%.

C. The flow meter shall:

1. Be 2-inch nominal diameter, and shall be installed in accordance with the manufacturer's recommendations regarding upstream and downstream lengths of straight pipe;
2. Operate on 115V single-phase electrical service;
3. Be suitable for outdoor, full exposure installation;
4. Have a PTFE liner
5. Have a shop-applied epoxy-coating on all exposed, exterior surfaces;
6. Have a 4-20 mA analog signal output, as well a digital output capacity;
7. Provide indication of empty pipe conditions.

D. The flow meter shall be Model M-2000 as manufactured by Badger Meter, or approved equal.

E. CONTRACTOR shall install the flow at the location shown on the Drawings, with all fasteners and mounting hardware, complete and in place, as recommended by the manufacturer and as shown on the Drawings and to the satisfaction of the ENGINEER.

PART 3 EXECUTION

3.1 INSTALLATION

A. Pumps and flow meter shall be installed in accordance with the manufacturer's recommendations and as shown on the Drawings; care shall be taken to avoid stripping bolts when tightening.

B. Installation shall include all air/liquid lines, tubing hoses, quick connectors, and electrical connections necessary to be fully functioning.

C. The CONTRACTOR shall coordinate the electrical work with the equipment manufacturer and panel fabricator to provide a complete, integrated, and automatic system for the controllerles pneumatic pump.

3.2 TESTING

A. CONTRACTOR shall performance test all pumps and flow meters. Performance testing must include ensuring the full operation of the pumps and measurement/readout of the flow meter. All testing to be coordinated and witnessed by the ENGINEER.

END OF SECTION

SECTION 13200

POLYETHYLENE STORAGE TANKS

PART 1 GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall supply all materials, equipment, appurtenances, specialty items, and all necessary services to install complete and make ready for use all polyethylene storage tanks as specified herein and as indicated on the Drawings for the LFG control system.

B. Each tank is to be molded in one-piece seamless construction according to ASTM D 1998 (laminated or fabricated tanks will not be accepted), will be upright (vertical), single-wall, flat-bottom, closed-top, polyethylene storage tank, and will be capable of storing landfill gas condensate at atmospheric pressure.

1.2 SUBMITTALS

A. Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, two (2) copies of certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, and installation of polyethylene storage tanks.

B. The Contractor shall submit for review sufficient literature, detailed specifications, and drawings to show dimensions, materials used, design features, internal construction, weights and any other information required by the Engineer for review of storage tanks and accessories. Manufacturer data shall include, but shall not be limited to the following:

1. Technical Manuals: The tank manufacturer's installation and maintenance documents shall be submitted for review.

2. Resin - A copy of the resin data sheet from the resin manufacturer for the tank is to be supplied and the tank manufacturer is to certify that it will be the resin used in the manufacture of the tank.

3. Wall thickness - Prior to the manufacture of the tank the designed wall thickness audit is to be supplied based upon 600 psi hoop stress (ASTM D 1998) @ 100 degrees F.

4. Factory Test Report: Upon completion of the tank the manufacturer's inspection report is to be supplied for each tank, including:

   a. Verification of wall thickness
   b. Impact test
   c. Hydrostatic test
   d. Verification of fitting placement
   e. Visual inspection
   f. Verification of materials

5. Manufacturer's warranty

C. Drawings and Data: The manufacturer's shop drawings shall be approved by the Engineer prior to the manufacturing of the tank(s). Data and specifications for the equipment shall include, but shall not be limited to the following:

1. Service Conditions: Chemical environment and temperature.

2. Sizing and description of the fittings and accessories for each tank that is to be supplied by the tank manufacturer.

3. Layouts and assembly schedules for each tank identifying the location and elevation from the bottom of the tank for all inlet, outlet and other integrally molded connections and appurtenances supplied by the tank manufacturer.

4. Tank restraint – If supplied, the drawings and calculations for the system are to be supplied. Calculations shall be certified by a North Carolina registered professional engineer.

5. Supporting information on fittings and accessories to be supplied; heat system, insulation, mastic coating, etc.

1.3 REFERENCE

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D618	Conditioning Plastics and Electrical Insulating Materials for Testing
ASTM D638	Tensile Properties of Plastics
ASTM D790	Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D883	Definitions of Terms Relating to Plastics
ASTM D1505	Density of Plastics by the Density-Gradient Technique
ASTM D1525	Test Method for Vicat Softening Temperature of Plastics
ASTM D1693	Test Method for Environmental Stress-Cracking of Ethylene Plastics
ASTM D1998	Standard Specification for Polyethylene Upright Storage Tanks
ASTM D2837	Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
ASTM D3892	Practice for Packaging/Packing of Plastics
ASTM F412	Definitions of Terms Relating to Plastic Piping Systems

2. AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI B-16.5	Pipe Flanges and Flanged Fittings.

1.4 QUALITY ASSURANCE

A. Provide only polyethylene storage tanks conforming to the requirements of the referenced ASTM standards and ANSI standards.

B. Manufacturer Qualifications: The manufacturer is to have regularly rotationally molded tanks based upon ASTM D 1998 utilizing Type I resins for a minimum of 10 years.

C. Follow all ASTM practices and standards in the manufacture and fabrication of polyethylene storage tanks.

D. Follow manufacturer’s written instructions for handling, storage, and installation.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Snyder Industries, Inc. of Lincoln, NE.

B. Chem-Tainer Industries, Inc. of W. Babylon, NY

C. Approved equal.

2.2 POLYETHYLENE STORAGE TANKS

A. Tank Service Conditions:

1. Tank contents: Landfill gas condensate, which ranges from slightly alkaline to slightly acidic.

2. Temperature: Tanks will be stored outside, and exposed to a design temperature ranging from 10 degrees F to 95 degrees F.

3. The tank shall be designed to contain liquid with a specific gravity of 1.9 at 73 degrees F.

B. Tank Properties

1. Material: High Density Linear Polyethylene (Type II)

2. The exterior, exposed surfaces of the tank shall be coated with mastic or paint, as indicated by and in accordance with the manufacturer's recommendations, for the purpose of limiting exposure to ultra-violet radiation.

3. Tanks shall have a minimum of three (3) lifting lugs integrally molded into the top head. The lifting lugs shall be designed to allow erection of an empty tank.

4. The tank shall have a minimum of 4 tie-down lugs integrally molded into the top head. The tie-down lugs shall be designed to allow tank retention in wind and seismic loading. The Contractor shall provide and install a tank restraint system in accordance with the tank manufacturer's recommendations

5. Service piping for the condensate storage tanks shall be insulated to prevent freezing. Heat tracing shall be provided for all above ground piping.

C. Fittings

1. General
   a. All seals and gaskets in contact with landfill gas condensate shall be Viton©.
   b. All bolts, nuts, studs, washers and related appurtenances shall be 304 stainless steel. All threaded components shall have an application of anti-seize compound prior to installation, and in accordance with the compound manufacturer's recommendations.

2. Ball Valves
   a. Ball valves shall be in accordance with section 15052.
   b. Ball valves shall be equipped with Viton (FKM) seals.
   c. Ball valves shall be Schedule 80 PVC
   d. Ball valves shall be Type 21 true union valves as manufactured by Asahi/America, Inc., or approved equal

3. Tank Connections
   a. Connection to the tank larger than 2" shall be made with a bolted double flange fitting, constructed with 2 ea. 150 lb. flanges, 2 ea. 150 lb. flange gaskets, and the correct number and size of all-thread bolts for the flange specified by the flange manufacturer. The flanges shall be constructed of Schedule 80 PVC.

   b. Gaskets shall be a minimum of 1/4" thickness and constructed of 60-70 durometer Viton©.

   c. Bolted connections - There shall be a minimum of 4 ea. full thread bolts available at all bolted connections. The bolt diameter shall comply with ASNI standards based upon the flange size. The bolts may have gasketed flanged metal heads or bolt heads encapsulated in Type II polyethylene material. The encapsulated bolt shall be designed to prevent metal exposure to the liquid in the tank and prevent bolt rotation during installation. The polyethylene encapsulation shall fully encapsulate the bolt head. The polyethylene shall be color coded to distinguish bolt material (white - 316 S.S., yellow - Hastelloy C276, red - Monel, green - Titanium). Each encapsulated bolt shall have a gasket to provide a sealing surface against the inner flange.

d. Bolted double flange fittings shall have bolt holes straddling the principal centerline of the tank in accordance with ANSI/ASME B-16.5 unless otherwise specified.

4. Flexible Connections - Locate flexible connections as indicated by the Drawings. Flexible connections shall be “Flexmaster” PVC flexible tubing as manufactured by Snyder Industries, Inc., or approved equal.

5. Fill - A 3-inch diameter fill pipe shall be installed through the roof of the tank, as shown on the plans. The opening shall have a grommet installed such that the pipe is free to move during expansion and contraction events, and yet not permit the admission of water.

6. Vent - A 4-inch diameter vent shall be provided to prevent the buildup of gasses and to admit air when draining the tank. This vent shall exit the top of the tank, and shall complete a 180 degree bend such that it does not permit the intrusion of rain water into the tank. The open end of the vent shall be fitted with stainless steel screen to prevent access by birds and vermin.

7. Manway - The tank shall have a 30-inch diameter manway, with a gasketed cover, to permit access to the tank interior for inspection.

8. Sight Glass - The tank shall be installed with a sight glass for monitoring the liquid level. The sight glass shall be provided by the manufacturer of the tank and shall incorporate two (2) ¾-inch threaded bulkhead fittings with two (2) ¾-inch valves such that the sight glass can be removed in the event of freezing weather.

D. Warranty: The polyethylene storage tank manufacturer shall provide a warranty against defects in materials and workmanship for a period of time not less than three (3) years.

PART 3 EXECUTION

3.1 PREPARATION

A. The area where the tank is to be installed shall be thoroughly swept and inspected for protrusions or debris that could compromise the integrity of the tank. Installation shall not occur if such conditions are present

B. Field-verify required dimensions. Coordinate with supporting construction to ensure adequate attachment and support.

3.2 INSTALLATION

A. Installation shall be in strict accordance with the manufacturer's recommendations.

B. The Contractor shall provide completed copies of the manufacturer's installation checklist or installation certification form, or both, as the case may be, to the Engineer for approval. In the absence of the aforementioned forms, the Contractor shall create a similar document in accordance with standard industry practice, complete the form, and submit to the Engineer for approval,

END OF SECTION

SECTION 15050

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall supply all materials, equipment, and labor needed to install complete and make ready for use all pipe, pipe fittings, and valves as specified herein and as indicated on the Drawings for the LFG control system.

1.2 SUBMITTALS

A. Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, two (2) copies of certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of each type of pipe and pipe fitting furnished.

1.3 REFERENCE

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 1248	Specification for Polyethylene Plastics Molding and Extrusion Materials
ASTM D 1784	Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D 1785	Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
ASTM D 2321	Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe
ASTM D 2467	Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

ASTM D 2513	Specification for Thermoplastic Gas Pressure Pipe Tubing and Fittings
ASTM D 2564	Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
ASTM D 2774	Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D 2855	Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings
ASTM D 3350	Specification for Polyethylene Plastics Pipe and Fittings Materials

AMERICAN NATIONAL STANDARD INSTITUTE (ANSI)

ANSI B 31.8	Code for Pressure Piping, Appendix N

PLASTICS PIPING INSTITUTE (PPI)

PPI TR-31/9-79	Technical Report

1.4 QUALITY ASSURANCE

A. Provide only pipe and fittings conforming to the requirements or the referenced ASTM standards, ANSI standards, or PPI standards.

B. Utilize only factory trained and certified welders, equipment, and installers.

C. Follow all ASTM practices and standards in the manufacture and fabrication of piping and fittings.

D. Follow manufacturer's written instructions for handling, storage, and installation.

1.5 QUALITY CONTROL

A. Provide permanent markings on piping, clearly showing ASTM conformance, size and SDR, pressure rating, cell classification number, and the manufacturer's name.

B. Provide certification of all welders and installers.

C. Certify compliance with ASTM practices and standards during

manufacture and fabrication.

D. Remove from site any pipe and fittings damaged during shipment, construction, or rejected during testing and/or inspection. Replace with acceptable products without additional expense to OWNER.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. All PVC pipe and pipe fittings shall be Schedule 80 PVC conforming to ASTM D 1784, ASTM D 1785 (for pipe), and ASTM D 2467 (for fittings). Perforated pipe shall be slotted in accordance with the Drawings.

B. PVC pipe and pipe fittings shall be manufactured from a compound which meets the requirements of Type 1, Grade 1, Polyvinyl Chloride PVC 1120, Class 12454-B, as outlined in ASTM D 1784. A Type 1, Grade 1 compound is characterized as having the highest requirements for mechanical properties and chemical resistance.

1. Compound from which pipe is produced shall have a design stress rating of 2000 psi at 73 degrees F, listed by the Plastic Piping Institute.

2. Materials from which pipe and pipe fittings are manufactured shall have been tested and approved by NSF International.

3. Pipe shall conform to the requirements of ASTM D 2241. Pipe shall be homogenous throughout and shall be free from cracks, holes, foreign inclusions, and other defects.

C. PVC Pipe Storage:

1. PVC pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be 6 feet. For storage over 5 days, a location shall be chosen out of direct sunlight, or the piping and fittings shall be covered.

2.2 PVC FLANGES

A. Flanges shall be Schedule 80 PVC and shall be plate type, ANSI Class 150 pounds.

B. The bolts, studs, nuts, and washers for the flanges shall be galvanized steel conforming to ASTM A-325. All studs and bolts shall be coated, just prior to

installation, with an anti-seize compound as manufactured by Kopr-Kote, or equal.

C. Flange gaskets shall be full-face Neoprene.

2.3 FLEXIBLE PVC PIPE

A. Flexible PVC pipe shall be as manufactured by Kanaflex Corporation, Compton, California (310-637-1616), Series 101-PS, or approved equal.

B. Fasteners for flexible PVC pipe shall be Kanaflex 101-PS power lock clamps, or approved equal.

2.4 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

A. General:

1. Unless otherwise noted on the Drawings, all HDPE pipe and fittings greater than or equal to 6-inch-diameter shall be Standard Dimension Rating (SDR) 17 high density polyethylene pipe using a 3408 type resin (2306 type resin for fittings less than 4-inch-diameter), or approved equal. HDPE pipe and fittings that are 2-inch-diameter and less shall be SDR 9. HDPE pipe and fittings that are 3-inch and 4-inch in diameter shall be SDR 11.

2. Pipe shall be extruded from a Type III, Class C, Category 5, Grade P34 compound as described in ASTM D 1248. It shall be classified as cell 345434C according to ASTM D 3350 and have the material designation of PE 3408. The pipe shall be manufactured to meet the requirements of ASTM D 2513. Manufacturers' literature shall be adhered to when "manufacturers' recommendations" are specified. All pipe and fittings shall be provided by one manufacturer. Acceptable manufacturers include Plexco (630-350-3700), Driscopipe (300-527-0662), or approved equal.

B. HDPE Pipe Storage:

1. HDPE pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be 6 feet. For storage over 5 days, a location shall be chosen out of direct sunlight, or the piping and fittings shall be covered.

2.5 FLANGES FOR HDPE PIPE

A. Provide molded HDPE flange adaptors with ANSI B16.5 drilling.

B. Flanges for HDPE pipe shall be convoluted ductile iron back-up rings with a minimum thickness of 1-inch, as manufactured by Improved Piping Products, Inc., of Orinda, California or approved equal. Back-up rings shall be finished with an iron oxide primer.

C. Studs and bolts, nuts, and washers for above grade flanges shall be as specified in 2.2 above with no coating. Bolts, nuts, and washers for buried flanges shall be as specified in 2.2 above and shall be coated and wrapped as indicated.

PART 3 EXECUTION

3.1 PVC PIPE HANDLING

A. PVC pipe and pipe fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists and lowered on skidways in such a manner as to avoid shock. Derricks, ropes, or other suitable equipment shall be used for lowering the pipe into the extraction well borings. Pipe and pipe fittings shall not be dropped or dumped.

3.2 PVC PIPE INSTALLATION

A. PVC pipe installation shall conform to these specifications, the manufacturer's recommendations, and as outlined in ASTM D 2774.

3.3 JOINING OF PVC PIPE

A. Joining of pipe shall be in accordance with ASTM D 2855.

B. Preparation:

1. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used. All burrs, chips, etc. shall be removed from pipe interior and exterior. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting. All pipe cuts shall be square, perpendicular to the center line of pipe. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement does not get wiped off during insertion into the fitting socket.

C. Solvent Welding:

1. A coating of primer as recommended by pipe supplier shall be applied to the entire interior surface of the fitting socket and to an equivalent area on the exterior of the pipe prior to applying solvent cement. The solvent cement shall comply with the requirements of ASTM D 2564 and shall be

applied in strict accordance with manufacturer's specifications. Pipe shall not be primed or solvent welded when it is raining, when atmospheric temperature is below 40 degrees F, or above 90 degrees F.

D. Curing:

1. After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint setting time, use 1 hour for ambient temperatures of 60 to 90 degrees F, or 2 hours when ambient temperature is 40 to 60 degrees F.

E. Alignment:

1. Pipe and pipe fittings shall be selected so that there will be as small a linear deviation as possible at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

3.4 FLEXIBLE PVC PIPE CONNECTIONS

A. Connections to HDPE or PVC pipe shall be made with clamps following manufacturers' recommendations and step by step procedures.

3.5 HDPE PIPE HANDLING

A. HDPE pipe shall not be bent more than the minimum radius recommended by the manufacturer for type, grade, and SDR. Care shall be taken to avoid imposing strains that will overstress or buckle the HDPE piping or impose excessive stress on the joints.

B. Joining HDPE Pipe:

1. Only three methods shall be utilized to joining HDPE pipe: heat fusion, mechanical joining, and electrofusion.

a. Mechanical Joining shall be accomplished with HDPE flange adapters, neoprene gaskets, and ductile iron back-up flanges, and shall be used only where shown on the Drawings.

b. Heat Fusion joints shall be made in accordance with the manufacturer's recommendations and step by step procedures. The CONTRACTOR shall provide fusion equipment and a trained operator. Pipe fusion equipment shall be of the size and nature to adequately weld all pipe sizes and fittings necessary to complete the project. Branch saddle fusions shall be made in accordance

with manufacturer's recommendations and step-by-step procedures. Branch saddle fusion equipment shall be of the size to facilitate saddle fusion within the trench. Please note that all branch saddle fusions must be pre-approved by the ENGINEER. Heat fusion shall be performed outside of the trench whenever practical. Before heat fusing pipe, each length shall be inspected for the presence of dirt, sand, mud, shavings, and other debris. Any foreign material shall be completely removed. At the end of each day, all open ends of fused pipe shall be capped or otherwise covered to prevent entry by animals or debris.

c. No HDPE heat fusion shall be performed in the rain.

d. Electrofusion welding will (at a minimum) be performed at all connections to the existing LFG collection system. Electrofusion welding will be performed in accordance with the manufacturer's recommendations and procedures. The CONTRACTOR shall provide a certified and trained electrofusion welder for any electrofusion over 12-inches in diameter.

3.6 HDPE PIPE INSTALLATION

A. Pipe installation shall comply with the requirements of ASTM D 2321, PPI TR-31/9-79, and the manufacturers' recommendations.

B. Lengths of fused pipe to be handled as one section shall not exceed 500 feet, without prior approval from the ENGINEER.

C. The ENGINEER shall be notified at least 24 hours prior to any pipe being installed in a trench in order for him/her to have an opportunity to inspect the following items:

1. All butt, saddle, and electrofusion fusions.
2. Pipe integrity.
3. Trench excavation for rocks and foreign material.
4. Proper trench slope.
5. Trench contour to ensure the pipe will have uniform and continuous support.

D. Any irregularities found by the ENGINEER must be corrected before lowering the pipe into the trench. Pipe shall be allowed sufficient time to adjust to trench temperature prior to any testing, segment tie-ins, and/or backfilling.

E. Any landfilled waste encountered during excavation shall be removed and hauled by the CONTRACTOR to the active landfill working face daily for disposal or

temporarily stored in covered roll-off containers for up to 24 hours, as approved by the OWNER.

F. CONTRACTOR shall have a survey level and survey rod and trained personnel available to check pipe grade and slope at the discretion of the ENGINEER.

G. Header and lateral HDPE piping will be installed on-grade to allow for future phasing with landfill operations. The on-grade piping must be set at appropriate grade and fully supported in all areas. Re-bar stakes placed on opposing sides of the piping will be required at a spacing of every 25 feet throughout the length of the on-grade sections. Additional measures may be required by the ENGINEER to prevent pipe movement (i.e., soil, berms, etc.) and will direct the CONTRACTOR in the field.

3.7 FLANGED CONNECTIONS

A. Flanged connections for PE pipe shall be made with two PE flange adapters with ductile iron back-up rings for bolting.

3.8 PIPE SUPPORTS

A. All piping and valves shall be supported so as to prevent stress being transmitted between sections and connected equipment and appurtenances.

B. Release of any joint shall result in no transverse piping movement and shall allow easy removal and replacement of any piping component.

3.9 SEGMENT TESTING

A. All PE pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The CONTRACTOR shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.

B. Like sizes of polyethylene piping shall be butt welded together into testing segments not to exceed 1,000 feet without the ENGINEER's approval. Segments shall be connected to a testing apparatus on one end and fitted with caps on all openings.

C. The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.

D. Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.

E. The test pressure shall be a minimum of 5 psig (138.5 inches, w.c.) and the CONTRACTOR shall use a digital gauge.

F. Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. (See Section 3.10 for test failures). The ENGINEER shall sign off on the test form to indicate test compliance.

G. The ENGINEER shall be notified at least 24 hours prior to commencement of the testing procedure and shall be present during the test.

H. All equipment for this testing procedure shall be furnished by the CONTRACTOR. This shall consist of a portable air compressor, generator, air hoses, and polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge 0 to 100 degrees C: a Schraeder tire valve to facilitate pressurization with an air compressor hose; a ball valve to release pipe pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gasses over a range of 0 to 100 PSI.

3.10 TEST FAILURE

A. The following steps shall be performed when a pipe segment fails the one percent - one-hour test described in Section 3.9 F above.

1. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.

2. All blocked risers and capped ends shall be inspected for leaks.

3. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.

B. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.

C. After all leaks are repaired, a retest shall be performed in accordance with Section 3.9.

END OF SECTION

SECTION 15052

LANDFILL GAS SYSTEM VALVES

PART 1 GENERAL

1.1 DESCRIPTION

The CONTRACTOR shall provide all materials, equipment, and labor needed to install, complete and ready for use, valves as specified herein and as indicated on the Drawings.

1.2 SUBMITTALS

Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, four (4) copies of certificates of compliance on materials furnished, catalog cuts, and manufacturers' brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each type of valve furnished.

PART 2 MATERIALS

2.1 GENERAL

A. All valves shall be installed complete with all necessary operators, actuators, handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, wrenches, and other accessories or appurtenances which are required for the proper completion of the work. Operators, actuators, and other accessories shall be sized and furnished by the valve supplier and factory mounted.

B. Valves shall be suitable for the intended service. Renewable parts including discs, packing, and seats shall be of types recommended by the valve manufacturer for intended service, but not of a lower quality than specified herein.

C. Valves and operators shall be suitable for the exposure they are subject to: buried, interior or exterior, as applicable. Valves shall have all safety features required by OSHA.

D. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

2.2 BUTTERFLY VALVES

A. Header isolation valves shall be butterfly bubble-tight, wafer design, with a PVC body, nitrile seat, and compatible with a flat face flange, as manufactured by Asahi/America or equal. Stem extensions shall be stainless steel in an epoxy coated steel outer housing with a gear box assembly mounted on top and equipped with a removable manual operating wheel. Monitoring ports at the butterfly valves shall be quick connects mounted on SCH 80 PVC risers as shown on the Drawings.

2.2 GATE VALVES

A. Refer to Section 02670 for the wellhead gate valves

2.3 LABCOCK VALVES

A. Quick connects used for monitoring ports may be replaced by Labcock valves at all monitoring ports in the system, subject to approval by ENGINEER. Labcock valves shall be ¼-inch PVC with EPDM seats and seals. Valves shall have ¼-inch NPT on one end and hose connection on the other end.

2.4 BALL VALVES

A. Ball valves shall be Schedule 80 PVC Type 21 true union, as manufactured by Asahi/America, Inc., or approved equal. Ball valves shall be suitable for exterior installation. Ball valves shall be equipped with Viton (FKM) interior seals.

PART 3 EXECUTION

3.1 INSTALLATION

A. Valves shall be installed in accordance with the manufacturer's recommendations and as shown on the Drawings; care shall be taken to avoid stripping bolts when tightening. All bolts, nuts, and washers to be zinc-coated steel. CONTRACTOR to use washers with bolts and nuts on both sides of all flanges and valves.

B. Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the CONTRACTOR shall install valve spacers, subject to the approval by the ENGINEER.

C. All buried valves to be wrapped in a 5-mil plastic sheeting and duct taped to seal out water, dirt, and debris.

END OF SECTION

SECTION 15880

COMPRESSED AIR SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

The CONTRACTOR shall provide all materials, equipment, and labor needed to install, complete and ready for use, a compressed air system as specified herein and as indicated on the Drawings.

1.2 SUBMITTALS

Within fifteen (15) calendar days of receiving the OWNER's Notice To Proceed, the CONTRACTOR shall prepare and submit to the ENGINEER, for review and approval, four (4) copies of certificates of compliance on materials furnished, catalog cuts, and manufacturers' brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, operation, and repair of each furnished compressed air system component.

PART 2 MATERIALS

2.1 GENERAL

The materials supplied under these Specifications shall consist of new, products designed and manufactured specifically for the purpose of this work, which shall have been satisfactorily demonstrated, by prior use, to be suitable and durable for such purposes.

2.2 AIR COMPRESSOR

The Air Compressor shall be of reciprocating piston type or rotary screw type compressors with design life of not less than 20,000 hours elapsed running time before major overhaul is required. The Air Compressor shall be capable of operation under conditions listed below:

Number of Air Compressors: 1

Pressure (psig): 125

Max Pressure (psig): 175

Capacity @ Max Pressure (scfm): 24

Air Tank Volume (gallons): 80

Motor Horespower (hp): 7.5

Voltage (V): 230

Motor Phase: Single

Frequency (Hz): 60

2.3 MEMBRANE COMPRESSED AIR DRYER

The Compressed Air System shall be furnished with a Membrane Compressed Air Dryer on the discharge side of the compressor. The Membrane Compressed Air Dryer is to be completed as a single element consisting of bundled hollow fiber permeable membranes in a corrosion resistant pressure rated shell.

Inlet and outlet fittings shall be located axially (in-line) and integrated into the end caps of the dryer. Sweep air shall result from permeation and shall not be fed back from the outlet flow, purge rate regulation shall not be required as operating pressure changes. Sweep vent ports (two) are to include threaded, removable vent screen fittings to allow removal of vent line attachment.

Tags are to indicate maximum operating pressure, maximum operating temperature and model numbers. Normal pressure drop through the dryer shall be less than 3 psi but can be as high as 5 psi if maximum recommended flow ratings are used. The dryer shall not contain moving parts, wearing parts, refrigerants, or dessicants.

The Membrane Compressed Air Dryer shall be capable of conditioning incoming air to a dewpoint of 20° F or less at the outlet at the operating conditions of the Air Compressor. The maximum entrained particle size shall be of more than 5 microns. The Air Dryer shall be as Manufactured by Hankinson or approved equal.

2.4 BASE

The compressor and its motor shall be provided with a cast iron or steel base which shall be mounted on air tank or on separate concrete foundation with vibration isolation padding. Tank shall be ASME approved. Sized for no more than 12 compressor starts per hour, 33% run time.

2.5 MOTOR AND CONTROLS

The compressor shall be driven by a high efficiency electric motor wound for the current available. Each motor shall be controlled by pressure operated, enclosed pilot switch connected to motor starter. Pressure switches for start/stop control shall be set to operate between 100 and 125 psi.

This system shall be equipped with electrical simplex controller, starters, and disconnect switches, thus permitting automatic operation of system.

2.6 GAUGES AND VALVES

The compressor shall include intake air cleaner, discharge stop valve, and pressure relief valve and pressure gauges. The relief valve shall be placed between the compressor and the discharge stop valve and shall be set for pressure of 10 psi above control switch cutout pressure. Intake air cleaners shall be of cleanable impingement type.

PART 3 EXECUTION

3.1 INSTALLATION

Work shall be performed in accordance with the Manufacturer's written instructions and installation detail drawings.

A. The compressed air system shall be lifted and handled according to written instructions supplied by the Manufacturer.
B. Under normal circumstances the dryer shall be capable of being mounted on steel piping without additional support.

3.2 FIELD TESTS

The Contractor shall provide the services of the Compressed Air System manufacturer's representative to check the installation, make adjustments, and place the equipment in operation. Provide a minimum of one eight hour day onsite for start-up and checks of the system. At the time of system start-up, the Contractor shall demonstrate to the satisfaction of the CQA Engineer that all compressed air systems are fully operational.

3.3 EQUIPMENT IDENTIFICATION

The Compressed Air System shall be provided with a substantial stainless steel nameplate, securely fastened in a conspicuous place and clearly inscribed with the manufacturer's name, year of manufacture, serial number, and principal rating data. Nameplate data shall include the rating in standard cubic feet per minute, rated capacity, and efficiency.

END OF SECTION

APPENDIX I

NCDENR Air Quality Permit

North Carolina Department of Environment and Natural Resources
Division of Air Quality

Pat McCrory
Governor

Sheila C. Holman
Director

John E. Skvarla, III
Secretary

January 16, 2013

Mr. Lorenzo Carmon
County Manager
Edgecombe County Landfill
PO Box 10 - 201 St. Andrew Street
Tarboro, NC 27886

Subject: Air Permit No. 10196R01
Edgecombe County Landfill
Tarboro, Edgecombe County, North Carolina
Permit Class: Small
Facility ID# 3300191

Dear Mr. Carmon:

In accordance with your completed application received December 13, 2012, we are forwarding herewith Permit No. 10196R01 to Edgecombe County Landfill, Tarboro, Edgecombe County, North Carolina for the construction and operation of air emissions sources or air cleaning devices and appurtenances. Please note the records retention requirements are contained in General Condition 2 of the General Conditions and Limitations.

If any parts, requirements, or limitations contained in this permit are unacceptable to you, you have the right to request a formal adjudicatory hearing within 30 days following receipt of this permit, identifying the specific issues to be contested. Such a request will stay the effectiveness of the entire permit. This hearing request must be in the form of a written petition, conforming to G.S. 150B-23 of the North Carolina General Statutes, and filed with the Office of Administrative Hearings, 6714 Mail Service Center, Raleigh, NC 27699-6714. The form for requesting a formal adjudicatory hearing may be obtained upon request from the Office of Administrative Hearings. Unless a request for a hearing is made pursuant to G.S. 150B-23, this air permit shall be final and binding.

You may request modification of your air permit through informal means pursuant to G.S. 150B-22. This request must be submitted in writing to the Director and must identify the specific provisions or issues for which the modification is sought. Please note that the permit will become final and binding regardless of a request for informal modification unless a request for a hearing is also made under G.S. 150B-23.

Raleigh Regional Office - Division of Air Quality
3800 Barrett Drive, Raleigh, North Carolina 27609
Phone: 919-791-4200 / FAX: 919-571-4718
Internet: www.ncair.org

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Unless exempted by a condition of this permit or the regulations, construction of new air pollution sources or air cleaning devices, or modifications to the sources or air cleaning devices described in this permit must be covered under a permit issued by the Division of Air Quality prior to construction. Failure to do so is a violation of G.S. 143-215.108 and may subject the Permittee to civil or criminal penalties as described in G.S. 143-215.114A and 143-215.114B.

This permit shall be effective from January 16, 2013 until September 30, 2016, is nontransferable to future owners and operators, and shall be subject to the conditions and limitations as specified therein.

For PSD increment tracking purposes, SO2 emissions from this modification are increased by 1.3 pounds per hour and NOx emissions from this modification are increased by 2.2 pounds per hour.

Changes have been made to the permit stipulations. The Permittee is responsible for carefully reading the entire permit and evaluating the requirements of each permit stipulation. The Permittee shall comply with all terms, conditions, requirements, limitations and restrictions set forth in this permit. Noncompliance with any permit condition is grounds for enforcement action, for permit termination, revocation and reissuance, or modification, or for denial of a permit renewal application. Specific changes and additions are summarized below (note: this list may not include all changes and additions):

- Added two landfill gas-fired engine generators (ID Nos. ES-02 and ES-03) to the permitted equipment list.
- Added permit condition describing the NSPS Subpart JJJJ requirements.
- Added hydrogen chloride to the 2Q .0711 TPERs list.
- Added a reference to NESHAP Subpart ZZZZ. This rule applies to the two engines, but has no requirements if compliance with NSPS Subpart JJJJ is met.
- General Assembly of North Carolina, Session Law 2007-397, Senate Bill 3 (SB3) - Under the provisions of a Renewable Energy and Energy Efficiency Portfolio Standard (REPS), the Permittee would be categorized as a new renewable energy facility that delivers electric power to an electric power supplier. SB3, 62-133.7(g) requires biomass combustion processes at a new renewable energy facility to meet Best Available Control Technology (BACT). As of the issuance of this permit, the Permittee has not submitted a BACT analysis to the Division of Air Quality.

Should you have any questions concerning this matter, please contact Charles McEachern at (919) 791-4200.

Sincerely,

Patrick Butler, P.E.
Regional Air Quality Supervisor

cmm
Enclosures

c: Raleigh Regional Office
Connie Horne, Cover letter only

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NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

DIVISION OF AIR QUALITY

AIR PERMIT NO. 10196R01

Issue Date: January 16, 2013 | Effective Date: January 16, 2013
Expiration Date: September 30, 2016 | Replaces Permit: 10196R00

To construct and operate air emission source(s) and/or air cleaning device(s), and for the discharge of the associated air contaminants into the atmosphere in accordance with the provisions of Article 21B of Chapter 143, General Statutes of North Carolina (NCGS) as amended, and other applicable Laws, Rules and Regulations,

Edgecombe County Landfill
2872 Colonial Road
Tarboro, Edgecombe County, North Carolina
Permit Class: Small
Facility ID# 3300191

(the Permittee) is hereby authorized to construct and operate the air emissions sources and/or air cleaning devices and appurtenances described below:

Emission Source ID	Emission Source Description	Control System ID	Control System Description
ES-01	300 scfm open flare (9.0 million Btu per hour heat input) installed on a landfill gas collection system	N/A	N/A
ES-02 (**NSPS,NESHAP**)	landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric)	N/A	N/A
ES-03 (**NSPS,NESHAP**)	landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric)	N/A	N/A

in accordance with the completed application 3300191.12A received December 13, 2012 including any plans, specifications, previous applications, and other supporting data, all of which are filed with the Department of Environment and Natural Resources, Division of Air Quality (DAQ) and are incorporated as part of this permit.

This permit is subject to the following specified conditions and limitations including any TESTING, REPORTING, OR MONITORING REQUIREMENTS:

A. SPECIFIC CONDITIONS AND LIMITATIONS

1. Any air emission sources or control devices authorized to construct and operate above must be operated and maintained in accordance with the provisions contained herein. The Permittee shall comply with applicable Environmental Management Commission Regulations, including Title 15A North Carolina Administrative Code (NCAC), Subchapter 2D .0202, 2D .0516, 2D .0521, 2D .0524 (40 CFR 60, Subpart JJJJ), 2D .0535, 2D .0540, 2D .1111 (40 CFR 63, Subpart ZZZZ), 2D .1806 and 2Q .0711.

2. PERMIT RENEWAL AND EMISSION INVENTORY REQUIREMENT - The Permittee, at least 90 days prior to the expiration date of this permit, shall request permit renewal by letter in accordance with 15A NCAC 2Q .0304(d) and (f). Pursuant to 15A NCAC 2Q .0203(i), no permit application fee is required for renewal of an existing air permit (without a modification request). The renewal request (with AA application form) should be submitted to the Regional Supervisor, DAQ. Also, at least 90 days prior to the expiration date of this permit, the Permittee shall submit the air pollution emission inventory report (with Certification Sheet) in accordance with 15A NCAC 2D .0202, pursuant to N.C. General Statute 143 215.65. The report shall be submitted to the Regional Supervisor, DAQ and shall document air pollutants emitted for the 2015 calendar year.

3. SULFUR DIOXIDE CONTROL REQUIREMENT - As required by 15A NCAC 2D .0516 "Sulfur Dioxide Emissions from Combustion Sources," sulfur dioxide emissions from the combustion sources shall not exceed 2.3 pounds per million Btu heat input.

4. VISIBLE EMISSIONS CONTROL REQUIREMENT - As required by 15A NCAC 2D .0521 "Control of Visible Emissions," visible emissions from the emission sources, manufactured after July 1, 1971, shall not be more than 20 percent opacity when averaged over a six-minute period, except that six-minute periods averaging not more than 87 percent opacity may occur not more than once in any hour nor more than four times in any 24-hour period. However, sources which must comply with 15A NCAC 2D .0524 "New Source Performance Standards" or .1110 "National Emission Standards for Hazardous Air Pollutants" must comply with applicable visible emissions requirements contained therein.

5. 15A NCAC 2D .0524 "NEW SOURCE PERFORMANCE STANDARDS" - For the following equipment, the Permittee shall comply with all applicable provisions, including the notification, testing, reporting, recordkeeping, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .0524 "New Source Performance Standards" (NSPS) as promulgated in 40 CFR Part 60, Subpart indicated below, and including Subpart A "General Provisions."

Emission Source(s)	Regulation
landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric) (ID No. ES-02) and landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric) (ID No. ES-03)	**Subpart JJJJ** Standards of Performance for Stationary Spark Ignition Combustion Engines (SI ICE)

a. NSPS Fuel Requirements - As required by 15A NCAC 2D .0524, the following fuel requirements shall apply:

   i. Any SI ICE subject to this Subpart that uses gasoline must use gasoline that has a sulfur content of no more than 30 parts per million, per the requirements of 40 CFR 80.195.[60.4235]

   ii. For the purposes of this Subpart, stationary SI ICE using alcohol-based fuels are considered gasoline engines.[60.4230(d)]

b. NSPS Compliance Requirements - As required by 15A NCAC 2D .0524, the following compliance requirements shall apply:

   i. Owners and operators of stationary SI ICE must operate and maintain stationary SI ICE that achieve the emission standards as required in 40 CFR 60.4233 over the entire life of the engine.[60.4234]

   ii. Any SI ICE subject to this subpart must meet the emissions standards as listed in 40 CFR 60.4233.[60.4233]

   iii. Owners and operators of stationary SI ICE who conduct performance tests must follow the procedures in 40 CFR 60.4244.[60.4244]

   iv. If your SI ICE is manufactured after July 1, 2008, and must comply with the emission standards specified in 40 CFR 60.4233(a) through (c), you must comply by purchasing an engine certified to the emission standards in 40 CFR 60.4231(a) through (c), as applicable, for the same engine class and maximum engine power. In addition, you must meet **one** of the requirements specified in (A) and (B) of this section.[60.4243(a)]

      A. If you operate and maintain the certified stationary SI ICE and control device according to the manufacturer's emission-related written instructions, you must keep records of conducted maintenance to demonstrate compliance, but no performance testing is required. You must also meet the requirements as specified in 40 CFR part 1068, subparts A through D, as they apply to you. If you adjust engine settings according to and consistent with the manufacturer's instructions, your stationary SI ICE will not be considered out of compliance.[60.4243(a)(1)]

      B. If you do not operate and maintain the certified stationary SI ICE and control device according to the manufacturer's emission-related written instructions, your engine will be considered a non-certified engine, and you must demonstrate compliance according to the following, as appropriate.[60.4243(a)(2)]

         I. If your stationary SI ICE is less than 100 HP, you must keep a maintenance plan and records of conducted maintenance to demonstrate compliance and must, to the extent practicable,

maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions, but no performance testing is required.[60.4243(a)(2)(i)]

II. If your stationary SI ICE is greater than or equal to 100 HP and less than or equal to 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test within 1 year of engine startup to demonstrate compliance.[60.4243(a)(2)(ii)]

III. If your stationary SI ICE is greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test within 1 year of engine startup and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.[60.4243(a)(2)(iii)]

v. If your stationary SI ICE must comply with the emission standards specified in 40 CFR 60.4233(d) or (e), you must demonstrate compliance according to one of the methods specified in paragraphs (A) and (B) of this section.[60.4243(b)]

A. Purchasing an engine certified according to procedures specified in this subpart, for the same model year and demonstrating compliance according to one of the methods specified in paragraph (b)(iv) of this section.[60.4243(b)(1)]

B. Purchasing a non-certified engine and demonstrating compliance with the emission standards specified in 40 CFR 60.4233(d) or (e) and according to the requirements specified in 40 CFR 60.4244, as applicable, and according to the following:[60.4243(b)(2)]

I. If your stationary SI ICE is greater than 25 HP and less than or equal to 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test to demonstrate compliance.[60.4243(b)(2)(i)]

II. If your stationary SI ICE is greater than 500 HP, you must keep a maintenance plan and records of conducted maintenance and must, to the extent practicable, maintain and

operate the engine in a manner consistent with good air pollution control practice for minimizing emissions. In addition, you must conduct an initial performance test and conduct subsequent performance testing every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance.[60.4243(b)(2)(ii)]

vi. If your stationary SI ICE must comply with the emission standards specified in 40 CFR 60.4233(f), you must demonstrate compliance according to paragraph (b)(v)(B)(I) or (II) of this section, except that if you comply according to paragraph (b)(v)(B)(I) of this section, you demonstrate that your non-certified engine complies with the emission standards specified in 40 CFR 60.4233(f).[60.4243(c)]

vii. Emergency stationary ICE may be operated for the purpose of maintenance checks and readiness testing, provided that the tests are recommended by Federal, State or local government, the manufacturer, the vendor, or the insurance company associated with the engine. Maintenance checks and readiness testing of such units is limited to 100 hours per year. There is no time limit on the use of emergency stationary ICE in emergency situations. The owner or operator may petition the Administrator for approval of additional hours to be used for maintenance checks and readiness testing, but a petition is not required if the owner or operator maintains records indicating that Federal, State, or local standards require maintenance and testing of emergency ICE beyond 100 hours per year. Emergency stationary ICE may operate up to 50 hours per year in non-emergency situations, but those 50 hours are counted towards the 100 hours per year provided for maintenance and testing. The 50 hours per year for non-emergency situations cannot be used for peak shaving or to generate income for a facility to supply power to an electric grid or otherwise supply power as part of a financial arrangement with another entity. For owners and operators of emergency engines, any operation other than emergency operation, maintenance and testing, and operation in non-emergency situations for 50 hours per year, as permitted in this section, is prohibited.[60.4243(d)]

viii. If your stationary SI ICE is natural gas fired, you may operate this engine using propane for a maximum of 100 hours per year as an alternative fuel solely during emergency operations, but must keep records of such use. If propane is used for more than 100 hours per year in an engine that is not certified to the emission standards when using propane, you are required to conduct a performance test to demonstrate compliance with the emission standards of 40 CFR 60.4233.[60.4243(e)]

ix. If your stationary SI ICE is less than or equal to 500 HP and you purchase a non-certified engine or you do not operate and maintain your certified stationary SI ICE and control device according to the manufacturer's written emission-related instructions, you are required to perform initial performance testing as indicated in this section, but you are not required to conduct

subsequent performance testing unless the stationary engine is rebuilt or undergoes major repair or maintenance. A rebuilt stationary SI ICE means an engine that has been rebuilt as that term is defined in 40 CFR 94.11(a).[60.4243(f)]

x. It is expected that air-to-fuel ratio controllers will be used with the operation of three-way catalysts/non-selective catalytic reduction. The AFR controller must be maintained and operated appropriately in order to ensure proper operation of the engine and control device to minimize emissions at all times.[60.4243(g)]

xi. If your stationary SI ICE is greater than or equal to 500 HP, is manufactured after July 1, 2007 and before July 1, 2008, and must comply with the emission standards specified in 40 CFR 60.4233(b) or (c), you must comply by one of the methods specified in paragraphs (A) through (D) of this section.[60.4243(h)]

A. Purchasing an engine certified according to 40 CFR part 1048. The engine must be installed and configured according to the manufacturer's specifications.[60.4243(h)(1)]

B. Keeping records of performance test results for each pollutant for a test conducted on a similar engine. The test must have been conducted using the same methods specified in this subpart and these methods must have been followed correctly.[60.4243(h)(2)]

C. Keeping records of engine manufacturer data indicating compliance with the standards.[60.4243(h)(3)]

D. Keeping records of control device vendor data indicating compliance with the standards.[60.4243(h)(4)]

xii. If you are an owner or operator of a modified or reconstructed stationary SI internal combustion engine and must comply with the emission standards specified in 40 CFR 60.4233(f), you must demonstrate compliance according to one of the methods specified in paragraphs (A) or (B) of this section.[60.4243(i)]

A. Purchasing, or otherwise owning or operating, an engine certified to the emission standards in 40 CFR 60.4233(f), as applicable.

B. Conducting a performance test to demonstrate initial compliance with the emission standards according to the requirements specified in 40 CFR 60.4244. The test must be conducted within 60 days after the engine commences operation after the modification or reconstruction.

c. <u>NSPS Monitoring Requirements</u> - As required by 15A NCAC 2D .0524, the following monitoring requirements shall apply:

i. Starting on July 1, 2010, if the emergency stationary SI ICE that is greater than or equal to 500 HP that was built on or after July 1, 2010, does not meet the standards applicable to non-emergency engines, the owner or operator must install a non-resettable hour meter.[60.4237(a)]

ii. Starting on January 1, 2011, if the emergency stationary SI ICE that is greater than or equal to 130 HP and less than 500 HP that was built on or after January 1, 2011, does not meet the standards applicable to non-emergency engines, the owner or operator must install a non-resettable hour meter.[60.4237(b)]

iii. If you are an owner or operator of an emergency stationary SI ICE that is less than 130 HP, was built on or after July 1, 2008, and does not meet the standards applicable to non-emergency engines, you must install a non-resettable hour meter upon startup of your emergency engine.[60.4237(c)]

d. NSPS Recordkeeping Requirements - As required by 15A NCAC 2D .0524, the following recordkeeping requirements shall apply:

i. Owners and operators of all stationary SI ICE must keep records as follows:[60.4245]

A. All notifications submitted to comply with this subpart and all documentation supporting any notification.[60.4245(a)(1)]

B. Maintenance conducted on the engine.[60.4245(a)(2)]

C. If the stationary SI ICE is a certified engine, documentation from the manufacturer that the engine is certified to meet the emission standards and information as required in 40 CFR parts 90, 1048, 1054, and 1060, as applicable.[60.4245(a)(3)]

D. If the stationary SI ICE is not a certified engine or is a certified engine operating in a non-certified manner and subject to 40 CFR 60.4243(a)(2), documentation that the engine meets the emission standards.[60.4245(a)(4)]

ii. For all stationary SI emergency ICE greater than or equal to 500 HP manufactured on or after July 1, 2010, that do not meet the standards applicable to non-emergency engines, the owner or operator of must keep records of the hours of operation of the engine that is recorded through the non-resettable hour meter. For all stationary SI emergency ICE greater than or equal to 130 HP and less than 500 HP manufactured on or after July 1, 2011 that do not meet the standards applicable to non-emergency engines, the owner or operator of must keep records of the hours of operation of the engine that is recorded through the non-resettable hour meter. For all stationary SI emergency ICE greater than 25 HP and less than 130 HP manufactured on or after July 1, 2008, that do not meet the standards applicable to non-emergency engines, the owner or operator of must keep

records of the hours of operation of the engine that is recorded through the non-resettable hour meter. The owner or operator must document how many hours are spent for emergency operation, including what classified the operation as emergency and how many hours are spent for non-emergency operation.[60.4245(b)]

iii. Owners and operators of stationary SI ICE greater than or equal to 500 HP that have not been certified by an engine manufacturer to meet the emission standards in 40 CFR 60.4231 must submit an initial notification as required in 40 CFR 60.7(a)(1). The notification must include the information in paragraphs (A) through (E) of this section.[60.4245(c)]

A. Name and address of the owner or operator;[60.4245(c)(1)]

B. The address of the affected source;[60.4245(c)(2)]

C. Engine information including make, model, engine family, serial number, model year, maximum engine power, and engine displacement;[60.4245(c)(3)]

D. Emission control equipment;[60.4245(c)(4)] and

E. Fuel used.[60.4245(c)(5)]

iv. If required per sections (b)(iv)(A) or (b)(iv)(B), a copy of the maintenance plan and conducted maintenance.[60.4243(a)(1)]

v. Copies of any performance testing required under this Subpart.[60.4245(d)]

vi. All records required under this section shall be maintained for a period of two years following the date of such record. All records shall be kept on-site and made available to DAQ personnel upon request. The Permittee shall be deemed in noncompliance with 15A NCAC 2D .0524 if recordkeeping requirements are not maintained.[40 CFR 60.7(f)]

e. <u>NSPS Reporting Requirements</u> - As required by 15A NCAC 2D .0524, the following reporting requirements shall apply:

i. If your SI ICE is subject to performance testing as required in section (b)(iv)(B), (b)(v)(B), (b)(viii), (b)(ix) or (b)(xii)(B), and conducted according to the requirements of 40 CFR 60.4244, you must submit a copy of each performance test within 60 days after the test has been completed.[60.4243(a)(2), (b)(2), (e), and (f)]

ii. Notification of the actual date of initial startup of an affected facility postmarked within 15 days after such date.

6. <u>NOTIFICATION REQUIREMENT</u> - As required by 15A NCAC 2D .0535, the Permittee of a source of excess emissions that last for more than four hours and that results from a

malfunction, a breakdown of process or control equipment or any other abnormal conditions, shall:

a. Notify the Director or his designee of any such occurrence by 9:00 a.m. Eastern time of the Division's next business day of becoming aware of the occurrence and describe:

   i. the name and location of the facility,

   ii. the nature and cause of the malfunction or breakdown,

   iii. the time when the malfunction or breakdown is first observed,

   iv. the expected duration, and

   v. an estimated rate of emissions.

b. Notify the Director or his designee immediately when the corrective measures have been accomplished.

This reporting requirement does not allow the operation of the facility in excess of Environmental Management Commission Regulations.

7. FUGITIVE DUST CONTROL REQUIREMENT - As required by 15A NCAC 2D .0540 "Particulates from Fugitive Dust Emission Sources," the Permittee shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints or excess visible emissions beyond the property boundary. If substantive complaints or excessive fugitive dust emissions from the facility are observed beyond the property boundaries for six minutes in any one hour (using Reference Method 22 in 40 CFR, Appendix A), the owner or operator may be required to submit a fugitive dust plan as described in 2D .0540(f).

   "Fugitive dust emissions" means particulate matter that does not pass through a process stack or vent and that is generated within plant property boundaries from activities such as: unloading and loading areas, process areas stockpiles, stock pile working, plant parking lots, and plant roads (including access roads and haul roads).

8. 15A NCAC 2D .1111 "MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY" - For the following equipment, the Permittee shall comply with all applicable provisions, including the notification, testing, and monitoring requirements contained in Environmental Management Commission Standard 15A NCAC 2D .1111, "Maximum Achievable Control Technology" as promulgated in 40 CFR 63, Subpart(s) below, including Subpart A "General Provisions."

Emission Source(s)	Regulation
landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric) (ES-02)	Subpart ZZZZ -- Reciprocating Internal Combustion Engines
landfill gas-fired engine generator (510 brake horsepower and 370 kilowatts electric) (ES-03)	

9. CONTROL AND PROHIBITION OF ODOROUS EMISSIONS - As required by 15A NCAC 2D .1806 "Control and Prohibition of Odorous Emissions" the Permittee shall not operate the facility without implementing management practices or installing and operating odor control equipment sufficient to prevent odorous emissions from the facility from causing or contributing to objectionable odors beyond the facility's boundary.

10. TOXIC AIR POLLUTANT EMISSIONS LIMITATION REQUIREMENT - Pursuant to 15A NCAC 2Q .0711 "Emission Rates Requiring a Permit," for each of the below listed toxic air pollutants (TAPs), the Permittee has made a demonstration that facility-wide actual emissions do not exceed the Toxic Permit Emission Rates (TPERs) listed in 15A NCAC 2Q .0711. The facility shall be operated and maintained in such a manner that emissions of any listed TAPs from the facility, including fugitive emissions, will not exceed TPERs listed in 15A NCAC 2Q .0711.

    a. A permit to emit any of the below listed TAPs shall be required for this facility if actual emissions from all sources will become greater than the corresponding TPERs.

    b. PRIOR to exceeding any of these listed TPERs, the Permittee shall be responsible for obtaining a permit to emit TAPs and for demonstrating compliance with the requirements of 15A NCAC 2D .1100 "Control of Toxic Air Pollutants".

    c. In accordance with the approved application, the Permittee shall maintain records of operational information demonstrating that the TAP emissions do not exceed the TPERs as listed below:

Pollutant	Carcinogens (lb/yr)	Chronic Toxicants (lb/day)	Acute Systemic Toxicants (lb/hr)	Acute Irritants (lb/hr)
Acrylonitrile (107-13-1)		0.4	0.22	
Benzene (71-43-2)	8.1			
CFC-12 (Dichlorodifluoromethane) (75-71-8)		5200		
Carbon disulfide (75-15-0)		3.9		
Carbon tetrachloride (56-23-5)	460			
Chlorobenzene (108-90-7)		46		
Chloroform (67-66-3)	290			
Dichlorobenzene(p), 1,4- (106-46-7)				16.8
Dichlorofluoromethane (75-43-4)		10		
Ethyl mercaptan (75-08-1)			0.025	

Ethylene dibromide (dibromoethane) (106-93-4)	27			
Ethylene dichloride (1,2-dichloroethane) (107-06-2)	260			
Hexane, n- (110-54-3)		23		
Hydrogen chloride (hydrochloric acid) (7647-01-0)				0.18
Hydrogen sulfide (7783-06-4)		1.7		
MEK (methyl ethyl ketone, 2-butanone) (78-93-3)		78		22.4
MIBK (methyl isobutyl ketone) (108-10-1)		52		7.6
Mercury, vapor (Component of HGC) (7439-97-6)		0.013		
Methyl chloroform (71-55-6)		250		64
Methyl mercaptan (74-93-1)			0.013	
Methylene chloride (75-09-2)	1600		0.39	
Perchloroethylene (tetrachloroethylene) (127-18-4)	13000			
TCE (trichloroethylene) (79-01-6)	4000			
Tetrachloroethane, 1,1,2,2- (79-34-5)	430			
Toluene (108-88-3)		98		14.4
Vinyl chloride (75-01-4)	26			
Xylene (mixed isomers) (1330-20-7)		57		16.4

B. GENERAL CONDITIONS AND LIMITATIONS

1. TWO COPIES OF ALL DOCUMENTS, REPORTS, TEST DATA, MONITORING DATA, NOTIFICATIONS, REQUESTS FOR RENEWAL, AND ANY OTHER INFORMATION REQUIRED BY THIS PERMIT shall be submitted to the:

   Regional Air Quality Supervisor
   North Carolina Division of Air Quality
   Raleigh Regional Office
   3800 Barrett Drive
   Raleigh, NC 27609
   919-791-4200

   For identification purposes, each submittal should include the facility name as listed on the permit, the facility identification number, and the permit number.

2. RECORDS RETENTION REQUIREMENT - Any records required by the conditions of this permit shall be kept on site and made available to DAQ personnel for inspection upon request. These records shall be maintained in a form suitable and readily available for expeditious inspection and review. These records must be kept on site for a minimum of 2 years, unless another time period is otherwise specified.

3. ANNUAL FEE PAYMENT - Pursuant to 15A NCAC 2Q .0203(a), the Permittee shall pay the annual permit fee within 30 days of being billed by the DAQ. Failure to pay the fee in a timely manner will cause the DAQ to initiate action to revoke the permit.

4. EQUIPMENT RELOCATION - A new air permit shall be obtained by the Permittee prior to establishing, building, erecting, using, or operating the emission sources or air cleaning equipment at a site or location not specified in this permit.

5. REPORTING REQUIREMENT - Any of the following that would result in previously unpermitted, new, or increased emissions must be reported to the Regional Supervisor, DAQ:

   a. changes in the information submitted in the application regarding facility emissions;

   b. changes that modify equipment or processes of existing permitted facilities; or

   c. changes in the quantity or quality of materials processed.

   If appropriate, modifications to the permit may then be made by the DAQ to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause a violation of the emission limitations specified herein.

6. This permit is subject to revocation or modification by the DAQ upon a determination that information contained in the application or presented in the support thereof is incorrect, conditions under which this permit was granted have changed, or violations of conditions contained in this permit have occurred. The facility shall be properly operated and maintained at all times in a manner that will effect an overall reduction in air pollution.

Unless otherwise specified by this permit, no emission source may be operated without the concurrent operation of its associated air cleaning device(s) and appurtenances.

7. This permit is nontransferable by the Permittee. Future owners and operators must obtain a new air permit from the DAQ.

8. This issuance of this permit in no way absolves the Permittee of liability for any potential civil penalties which may be assessed for violations of State law which have occurred prior to the effective date of this permit.

9. This permit does not relieve the Permittee of the responsibility of complying with all applicable requirements of any Federal, State, or Local water quality or land quality control authority.

10. Reports on the operation and maintenance of the facility shall be submitted by the Permittee to the Regional Supervisor, DAQ at such intervals and in such form and detail as may be required by the DAQ. Information required in such reports may include, but is not limited to, process weight rates, firing rates, hours of operation, and preventive maintenance schedules.

11. A violation of any term or condition of this permit shall subject the Permittee to enforcement pursuant to G.S. 143-215.114A, 143-215.114B, and 143-215.114C, including assessment of civil and/or criminal penalties.

12. Pursuant to North Carolina General Statute 143-215.3(a)(2), no person shall refuse entry or access to any authorized representative of the DAQ who requests entry or access for purposes of inspection, and who presents appropriate credentials, nor shall any person obstruct, hamper, or interfere with any such representative while in the process of carrying out his official duties. Refusal of entry or access may constitute grounds for permit revocation and assessment of civil penalties.

13. The Permittee must comply with any applicable Federal, State, or Local requirements governing the handling, disposal, or incineration of hazardous, solid, or medical wastes, including the Resource Conservation and Recovery Act (RCRA) administered by the Division of Waste Management.

14. <u>PERMIT RETENTION REQUIREMENT</u> - The Permittee shall retain a current copy of the air permit at the site. The Permittee must make available to personnel of the DAQ, upon request, the current copy of the air permit for the site.

15. <u>CLEAN AIR ACT SECTION 112(r) REQUIREMENTS</u> - Pursuant to 15A NCAC 2D .2100 "Risk Management Program," if the Permittee is required to develop and register a risk management plan pursuant to Section 112(r) of the Federal Clean Air Act, then the Permittee is required to register this plan with the USEPA in accordance with 40 CFR Part 68.

16. <u>PREVENTION OF ACCIDENTAL RELEASES - GENERAL DUTY</u> - Pursuant to Title I Part A Section 112(r)(1) of the Clean Air Act "Hazardous Air Pollutants - Prevention of Accidental Releases - Purpose and General Duty," although a risk management plan may not

be required, if the Permittee produces, processes, handles, or stores any amount of a listed hazardous substance, the Permittee has a general duty to take such steps as are necessary to prevent the accidental release of such substance and to minimize the consequences of any release. **This condition is federally-enforceable only.**

17. GENERAL EMISSIONS TESTING AND REPORTING REQUIREMENTS - If emissions testing is required by this permit, or the DAQ, or if the Permittee submits emissions testing to the DAQ in support of a permit application or to demonstrate compliance, the Permittee shall perform such testing in accordance with 15A NCAC 2D .2600 and follow all DAQ procedures including protocol approval, regional notification, report submittal, and test results approval.

Permit issued this the 16th of January, 2013.
NORTH CAROLINA ENVIRONMENTAL MANAGEMENT COMMISSION

_____
Patrick Butler, P.E.
Regional Air Quality Supervisor
By Authority of the Environmental Management Commission

Air Permit No. 10196R01

APPENDIX J

Photographic Log

1	Typical set-up for drilling new LFG extraction wells.

2	Drill rig and waste material excavated for installation of new LFG extraction wells.

3	Typical waste material recovered from landfill excavation during the installation of LFG extraction wells.

4	Slotted Sch-80 PVC pipe with well centralizer in the LFG extraction well. (Protective safety grate in the foreground)

S&ME	**LFGCCS - Edgecombe County Landfill** **Tarboro, North Carolina**	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

5 Stone backfill placed in the well bore annulus of screened section of an LFG extraction well.

6 Constructing a pair of LFG extraction wells 'nested' in the upper C&D waste and the lower MSW waste.

7 8-inch HDPE header pipe and condensate sump CS-2.

8 Placement of 6-inch HDPE lateral pipe in a trench near the working face of the C&D landfill.

S&ME	LFGCCS - Edgecombe County Landfill Tarboro, North Carolina	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

9 Installation of 8-inch HDPE header pipe in protective corrugated metal pipe beneath the landfill haul road.

10 Installation of 8-inch HDPE header pipe in protective corrugated metal pipe beneath the landfill haul road.

11 Pressure test of a section of the collection pipe for the LFG collection system.

12 Close up photo of the pressure gauge during the pressure test of the piping for the LFG collection system.

S&ME	**LFGCCS - Edgecombe County Landfill** **Tarboro, North Carolina**	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

13 Completion of the LFG extraction wellhead with LandTec control valves.

14 Completion of the LFG extraction wellhead with LandTec control valves.

15 Photograph of a LFG vent to be abandoned with grout.

16 Photo of capped LFG vent.

S&ME	**LFGCCS - Edgecombe County Landfill** **Tarboro, North Carolina**	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

17 Typical single LFG extraction well.

18 Typical isolation valves in the 8-inch header pipe.

19 Typical nested pair of LFG extraction wells.

20 Typical saddle weld connection – 4-inch lateral to 8-inch header.

S&ME	**LFGCCS - Edgecombe County Landfill** **Tarboro, North Carolina**	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

21 Typical header pipe run above-grade.

22 Blower -flare skid installation. (Dual containment condensate sump in the foreground.)

23 Connecting the blower-flare skid with the dual containment condensate sump.

24 Electrical connection of the blower-flare skid.

S&ME	LFGCCS - Edgecombe County Landfill Tarboro, North Carolina	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

25 Edgecombe County landfill gas lower-flare skid with condensate storage tanks in the background.

26 Landtec LFG Analyzer mounted on the blower-flare skid. View of exterior f cabinet and interior

27 Main Blower Flare System control panel screen

28 VFD displays for Blower 1 and 2

S&ME	**LFGCCS - Edgecombe County Landfill** **Tarboro, North Carolina**	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

29 Actuated valve on the blower-flare skid used to divert gas from the flare to the containerized LFGTE facility.

30 Flame arrester on the blower-flare skid.

31 Preparing footings for the LFGTE facility.

32 Preparing footings for the LFGTE facility.

33 Placement of the container-mounted, LFG-fueled, internal combustion engine modules (gen-sets).

34 Container-mounted generators and LFG treatment equipment.

35 Sump being installed for the LFGTE facility to collect additional condensate from the LFG treatment.

36 LFG piping from the blower-flare skid to the sump and the container-mounted generators.

37 Pressure test on the sump and additional piping installed for the LFGTE facility.

38 Photo of the completed LFGTE facility, with the blower-flare-skid in the foreground.

39 The Edgecombe County LFGCCS blower-flare skid running in 'dual mode' (gas going to the flare and to the LFG-fueled generators.)

40 Security fence installed around the completed LFGTE facility.

S&ME	LFGCCS - Edgecombe County Landfill Tarboro, North Carolina	S&ME Project No. 1054-12-331	
		Taken by: SPW, GWR, BB	Date Taken: 3/5/12-10/21/13

APPENDIX K

Building/Structure and Electrical Permit

Edgecombe County Building Inspections

P. O. Box 10 ■ Tarboro, NC 27886
Phone: (252)641-7802 ■ **Fax:** (252)641-6913

CONSTRUCTION PERMIT

The granting of this permit does not presume to give authority to violate or cancel the provisions of any other statement, local or state law regulating construction or the performance of construction. This permit shall become invalid if the authorized work is not commenced within six (6) months after the issuance of the permit, or if the authorized work is suspended or abandoned for a period of six (6) months after commencement of the work.

Name of Applicant EDGECOMBE COUNTY Date Issued 03/05/2012
Mailing Address Bldg. Permit No. B12-03397
City State Zip Code
Property Owner EDGECOMBE COUNTY
Location 2861 COLONIAL RD/2759 COLONIAL RD
Pin 4725-77-9941-00 Twp 08 Lot Size 166.0000 Zoning
Utility Provider: Water/Sewer Electrical

Permit Type: CO COMMERCIAL

Type	Description	Permit Fees
BLDG	BUILDING & STRUCTURE	$50.00
ELEC	ELECTRIC	$56.00
	Total Permit Cost	$106.00

Square Footage Value
Description of Work NEW CONSTRUCTION

Contractor License# Phone#
Address

Signature of Applicant/Owner or Agent

Permit Issuer

Building Official

3-5-12
Date

Dennis Allen Pearce
BUILDING INSPECTOR
EDGECOMBE COUNTY

CP1-05/07

EDGECOMBE COUNTY PLANNING & INSPECTIONS
P.O. BOX 10, 201 St. Andrew Street
Tarboro, NC 27886
Phone: 252-641-7802 Fax: 252-641-6913

ELECTRICAL PERMIT APPLICATION
Effective 07-01-09

Application Date: 2-28-2012

Tax/Parcel ID #: 4725779941

Construction Address: 2861 Colonial Rd., Tarboro, NC 27886

Owner's Name: Edgecombe County

Owner's Phone #: 252-641-7888

Owner Address (*if different from construction address*): Same

Contractor's Name: BS Allman Electric / Advance One Development, LLC

Contractor's Phone #: 828-779-0239 (*office*) ——— (*mobile*)

Contractor's Address: 10000 Nations Ford Rd, Charlotte, NC 28273

License #: 14230L

Power Supplier: Edgecombe-Martin County EMC

Description of Work: Inst all 200amp Service for Blower-Flare at Landfill

Will this be for Farm Use? (circle one) yes no

Fees:

0 - 100 amp	$ 35.00	Minimum Fee:	$ 40.00
100 - 200 amp	$ 50.00	Temporary Pole:	$ 35.00
400 amp	$ 80.00	Swimming Pool:	$ 40.00
		Signs:	$ 40.00

$7,500 > $56 per Allen Peacock

I hereby certify that all information is this application is correct and all work will comply with the National Electrical Code, the State Building Code, and all other applicable State and Local laws and ordinances and regulations. The Inspections Department will be notified of any changes in the approved plans and specifications for the project permitted herein.

Applicant Signature

Date 2-28-2012

EDGECOMBE COUNTY

BUILDING PERMIT APPLICATION
COMMERCIAL & RESIDENTIAL BUILDINGS

Application Date: 2-28-2012 Tax/Parcel ID #: 4725779941

Commercial ?: X (Landfill) Residential ?: _____

Applicant Name: Advance One Development, LLC Phone #: 704-507-2881 cell / 704-841-1610 office

Current or Future Resident: — Phone #: —

Current Mailing Address for New Resident: —

Job Site Address: 2861 Colonial Rd, Tarboro, NC 27886

Property Owner: Edgecombe County Phone #: 252-641-7888

Description of work: (exp. Bldg. New House) _____

Building Contractor: Advance One Development, LLC License #: 64088

Telephone #: 704-841-1610 *(office)* 704-507-2881 *(mobile)*

Sub-Contractors: Elec: RS Allman Electric License #: 14230 L

Plumb: _____ License #: _____

Mech: _____ License #: _____

Insul: _____ License #: _____

Type of Building: ____ New House ____ Addition/Garage X Commercial ____ Renovation

If new construction, has driveway been installed on property? NO *(yes or no)*

Building Use: ____ Single Family ____ Storage ____ Accessory Bldg. ____ Business

Contractor's Total Estimated Cost: $ TBD **(BLDG. ONLY-Do not include other trades)**

Heated Square Feet: _____ Unheated Square Feet: _____ Total Square Feet: _____

Bldg. Height: _____ Feet _____ Number of Stories _____ Amp Elec. Service _____ Ton HVAC

PLEASE ATTACH 2 COPIES OF PLANS FOR INSPECTOR REVIEW

I hereby certify that all the information in this application is correct and all work will comply with the State Building Code and all other applicable State and local laws ordinances and regulations. The inspections department will be notified of any changes in approved plans and specifications for the project permitted herein. I further understand that this is not an authorization to begin work. **Work may only commence after approval and issuance of the permit.**

Applicant Signature 2-28-2012 Date

Fee is $50.00 per Allen Peacock

APPENDIX L

Zoning Consistency Determination

July 27, 2011

Edgecombe County Planning Office
201 St. Andrew Street
Tarboro, NC 27886

Attention: Mr. Brian Hassell, Senior Planner

Reference: **Zoning Consistency Determination**
300 scfm Landfill Gas Open Flare
Edgecombe County Landfill - Tarboro, North Carolina
S&ME Project No. 1054-10-240F

Dear Mr. Hassell:

On behalf of Edgecombe County (County), S&ME, Inc (S&ME) and Carlson Environmental Consultants, PC (CEC) is writing to request a Zoning Consistency Determination for the existing Edgecombe County Landfill (Landfill) located in Tarboro, North Carolina. It is our understanding, Edgecombe County is the only municipality with jurisdictions over any part of the land on which the Landfill and its appurtenances are located.

On behalf of the County, we are applying to the North Carolina Department of Natural Resources (NCDENR) for an Air Quality Permit to construct and operate a 300-SCFM Landfill Gas Open Flare. As part of this application process, NCDENR requests that all applicants submit a request to the applicable zoning authorities to ensure that the facilities are suitable for permitting in their existing or proposed locations.

In accordance with § 143-215.108(f) of the North Carolina General Statutes, we hereby request that you issue a determination as to whether the Edgecombe County has in effect any zoning or subdivision ordinance that is applicable to the proposed facility.

For your convenience, I have included a form with which you may remit your determination and a copy of the draft air permit application. As a means of demonstrating proof of transmittal, please sign, title, stamp, and date the enclosed form and mail to the following address at your earliest convenience.

Mr. Patrick Butler
Regional Supervisor
NCDENR – Division of Air Quality
Raleigh Regional Office 1628 Mail Service Center Raleigh, NC 27699

If you have any questions regarding this request, please contact me at (919) 872-2660.

Sincerely,
S&ME, Inc.

Samuel P. Watts, P.G.
Senior Project Manager
swatts@smeinc.com

cc: Kristofer L. Carlson, CEC
Stevia Morton, CEC

Zoning Consistency Determination

Facility Name	Edgecombe County Landfill
Facility Street Address	2872 Colonial Road
Facility City	Tarboro, NC 27886
Description of Process	300 scfm Landfill Gas Open Flare at Edgecombe County Landfill
SIC/NAICS Code	4953
Facility Contact	Mike Cummings, Manager
Phone Number	(252) 827-4253
Mailing Address	Edgecombe County Solid Waste Management Department
Mailing City, State Zip	P.O. Box 10 Tarboro, NC 27886

Based on the information given above:

- [x] I have received a copy of the air permit application (draft or final) AND...
- [ ] There are no applicable zoning ordinances for this facility at this time
- [x] The proposed operation IS consistent with applicable zoning ordinances
- [ ] The proposed operation IS NOT consistent with applicable zoning ordinances (please include a copy of the rules in the package sent to the air quality office)
- [ ] The determination is pending further information and can not be made at this time
- [ ] Other: _____

Agency	Edgecombe County Planning Department
Name of Designated Official	Brian D. Hassell
Title of Designated Official	Senior Planner
Signature	Bri D. Hassell
Date	7-28-11

Please forward to the facility mailing address listed above and the air quality office at the appropriate address as checked on the back of this form.

Courtesy of the Small Business Environmental Assistance Program
toll free at 1-877-623-6748 or on the web at www.envhelp.org/sb

All PSD and Title V Applications

☐ Attn: Dr. Donald van der Vaart, PE
DAQ – Permitting Section
1641 Mail Service Center
Raleigh, NC 27699-1641

Local Programs

☐ Attn: David Brigman
Western NC Regional Air Quality Agency
49 Mount Carmel Road
Asheville, NC 28806
(828) 250-6777

☐ Attn: Donald R. Willard
Mecklenburg County Air Quality
700 N. Tryon Street, Suite 205
Charlotte, NC 28202-2236
(704) 336-5500

☐ Attn: Robert R. Fulp
Forsyth County
Environmental Affairs Department
537 N. Spruce Street
Winston-Salem, NC 27101-1362
(336) 703-2440

Division of Air Quality Regional Offices

☐ Attn: Paul Muller
Asheville Regional Office
2090 U.S. Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ Attn: Steven Vozzo
Fayetteville Regional Office
225 Green Street Suite 714
Fayetteville, NC 28301
(910) 433-3300

☐ Attn: Ron Slack
Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

X **Attn: Patrick Butler, PE**
Raleigh Regional Office
1628 Mail Service Center
Raleigh, NC 27699-1628
(919) 791-4200

☐ Attn: Robert Fisher
Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481

☐ Attn: Wayne Cook
Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215

☐ Attn: Margaret Love, PE
Winston-Salem Regional Office
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-5000

APPENDIX M

Project Completion Certifications

FORM 3

Final Completion Certification

Date: 8-23-2012 **Certification #** 02

Project Owner: County of Edgecombe, NC
Edgecombe County Administration Dept.
Attn: Purchasing Manager
201 St. Andrew Street
Tarboro, NC 27886

Contractor: Advance One Development, LLC
William P. Brinker
President
10600 Nations Ford Rd
Charlotte, NC 28273

EDGECOMBE COUNTY LANDFILL GAS CONTROL & COLLECTION SYSTEM PROJECT (the "Project")

In accordance with Section 4.3 that certain Construction and Installation Services Agreement ("Agreement"), dated as of February 8th, 2012, by and between Project Owner and Contractor", by signing below, Contractor hereby certifies that, in its reasonable judgment, the following is true:

a. Contractor has satisfactorily completed the installation and construction of the Project landfill gas control and collection system facility ("Facility"), which is the subject of the Agreement, and

i. The Facility is capable of functioning for its intended purpose;

ii. All necessary permits have been obtained;

iii. All critical tests for all major components of the Facility have been performed;

iv. Daily operation of the Facility has begun or could begin; and

v. Contractor has turned over control and operation of the Facility to Project Owner.

b. All items identified on any punch list have been completed (except for such items that Contractor and Project Owner agree in writing may be delayed);

c. All warranties, design materials, operation and maintenance manuals, schematics, spare parts lists, design and engineering documents, performance testing data, "as-built" drawings and surveys, and such other items as are required by the Agreement have been delivered to Project Owner;

d. All other duties and obligations of Contractor and its subcontractors under the Agreement have been fully performed; and

e. Any subcontractors, personnel, supplies, equipment, waste materials, rubbish and temporary facilities have been removed from the Land.

Project Company acknowledges and Agrees:

COUNTY OF EDGECOMBE

By: Sam Watts

SAM WATTS, SAME, Inc., Clerk

Engineer or County Representative

Contractor certifies the foregoing:

ADVANCEONE DEVELOPMENT, LLC.

By:

William P. Brinker

President

FORM 5

GCCS Completion Certification

Date: April 4th, 2012 **Certification #** 01

EDGECOME COUNTY LANDFILL GAS CONTROL & COLLECTION SYSTEM PROJECT (the "Project")

Project Owner: County of Edgecombe, NC
Edgecombe County Administration Dept.
Attn: Purchasing Manager
201 St. Andrew Street
Tarboro, NC 27886

Contractor: Advance One Development, LLC
William P. Brinker
President
10600 Nations Ford Rd
Charlotte, NC 28273

In accordance with Section 4.2 of that certain Construction and Installation Services Agreement ("Agreement"), dated as of February 8th, 2012, by and between Project Owner and Contractor, by signing below, Contractor hereby certifies that, in its reasonable judgment, the following is true:

a. Contractor has satisfactorily completed the installation and construction of the Project landfill gas control and collection system facility ("GCCS"), which is the subject of the Agreement, and

i. The Facility is capable of functioning for its intended purpose;

ii. All necessary permits have been obtained;

iii. All critical tests for all major components of the GCCS have been performed;

iv. All header and lateral lines are at appropriate grade with staking in place to mitigate movement.

b. All items identified on any punch list have been completed (except for such items that Contractor and Project Owner agree in writing may be delayed); Blower Flare System is being fabricated off-site.

c. All other duties and obligations of Contractor and its subcontractors under the Agreement have been fully performed; and

d. Any subcontractors, personnel, supplies, equipment, waste materials, rubbish and temporary facilities have been removed from the Land.

Project Company acknowledges and agrees:
COUNTY OF EDGECOMBE
By: _____
SAM WATTS, SWME, INC.,
Engineer or County Representative

Contractor certifies the foregoing:
ADVANCE ONE DEVELOPMENT, LLC.
By: _____
William P. Brinker
President

SECTION D

CORRECTIVE ACTION PERMIT MODIFICATION APPLICATION [RULES .1635, .1636, AND .1637]

SECTION D-1

North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application

Corrective Action Permit Modification Application

Section C-1: North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility near the north-northeastern property boundary Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for a selected remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

The enclosed Solid Waste Section Form (GWCA Permit Modification), Corrective Action Plan, amendment to financial assurance mechanism and other supporting documents constitute the Corrective Action Permit Modification Application.

North Carolina Department of Environment and Natural Resources
Division of Waste Management
Solid Waste Section

North CarolinaSolid Waste Groundwater Corrective Action Permit Modification Application

Pursuant to 15A NCAC 13B .1636, "Within 14 days of selecting a remedy, the permittee shall submit an application to modify the permit describing the selected remedy to the Division for evaluation and approval." The application shall include the demonstrations necessary to comply with the financial assurance requirements set forth in Paragraph (d) of Rule .1628.

Please attach the following: (1) a copy of the minutes from the public meeting discussing the Assessment of Corrective Measures, (2) a signed resolution/proclamation/document adopting the remedy, (3) a site map designating locations of groundwater monitoring wells and surface water monitoring locations that will be impacted by the remedy, (4) any draft conceptual schematics/figures/plans relating to the selected remedy, (5) a list of any required registrations, permits, and approvals, (6) a copy of most recent permit issued by the Solid Waste Section, and (7) an amendment to the Financial Assurance Mechanism, including a break-down of the cost estimates for closure, post-closure and corrective action.

Send the application and attachments to NCDENR-DWM, Solid Waste Section, Compliance Unit, 1646 Mail Service Center, Raleigh, NC 27699-1646. This application and any documents attached to this application are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Please type or print all information legibly.

I. Site Identification

Permit Number: 33-01

Solid Waste Rule Designation (.0500 or .1600): .1600

Facility Name: Edgecombe County Landfill

Facility Physical Address: SR 1601 (Colonial Road)

City: Tarboro

Zip: 27886

County: Edgecombe

Waste Type: Construction & Demolition Landfill

II. Owner and Operator Information

☒ Check box, if owner and operator are the same.

Owner

Name: County of Edgecombe

Address: P.O. Box 10, Tarboro, NC 27886

Phone Number: (252) 827-4253

Operator

Name: SAME

Address:

Phone Number:

III. Groundwater Corrective Action

Selected remedy (include addition lines if needed):

(1) In-Situ Isolation – Installation of a upgradient groundwater barrier wall

(2) In-Situ Isolation – Maintaining a consistent contour with pre-1998 waste area

(3) In-Situ Isolation – Increase slope of closed MSW area

(4) In-Situ Isolation – Stormwater improvements on the western half of the landfill

(5) Monitored Natural Attenuation (MNA)

Contingency Plan A: In-Situ Isolation - Stormwater improvements on the eastern half of the landfill

Contingency Plan B: Enhance landfill cap

Contingency Plan C: Landfill gas extraction

IV. Financial Assurance

Financial Assurance Mechanism: Local Government Financial Test

Total Cost Estimate for 30 Years (based upon ACM): $ 2,235,000.00

V. Project Schedule (upon Division approval)

Approximate Date of Remedy Construction Completion (if applicable): 06/30/2008

Approximate Date of Implementation of Remedy: 24-42 months from CAP Approval

Approximate Date of Baseline Sampling Completion (it applicable): 48-66 months from CAP Approval

Approximate Date of First Remedy Performance and Effectiveness Report Submittal: 48-66 months from CAP Approval

VI. Environmental Consultant

Consulting Company: S&ME, Inc.

Address: 3201 Spring Forest Road, Raleigh, NC 27616

Phone Number: (919) 872-2660

VII. Signatures

To the best of my knowledge, the information reported and statements made in this North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application are true and correct. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of fine and imprisonment.

If Owner and Operator are the same, please sign for Owner and type or write SAME for Operator.

Owner

Owner Name (Printed or Typed): Danny Bagley - Edgecombe County Solid Waste Director

Owner Signature: Danny Bagley Date: 6-30-08

Operator

Operator Name (Printed or Typed): SAME

Operator Signature: Date:

NC Professional Geologist or NC Professional Engineer

Name (Printed or Typed): Sam Watts - S&ME, Inc.

Signature: Samuel P Watts Date: 6/30/08

AffixNCProfessional Geologist/Engineer Seal:

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS

SECTION D-2

Public Meeting Minutes

Corrective Action Permit Modification Application

Section C-2: Public Meeting Minutes

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility near the north-northeastern property boundary, Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for a selected remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County is held a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. The schedule for this public meeting and review of corrective measures was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed in the agenda. The public meeting was held, Monday, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

On June 25, 2008, S&ME, Inc. submitted to the NCDENR-DWM Solid Waste Section (Section) a copy of the legal advertisement to County intended to post in their local newspaper on July 3, 2008. The intended advertisement and a copy of the transmittal of this advertisement to the Section are enclosed along with a copy of the published advertisement. The advertisement was published in *The Daily Southerner* and *The Rocky Mount Telegram* newspapers which serve Edgecombe County. An excerpt of the minutes from the public meeting held on August 4, 2008 to discuss the Assessment of Corrective

Measures is enclosed. Also enclosed is written material used at the meeting which includes a copy of Table 3, Detailed Evaluation of Retained Remedial Action Alternatives from the ACM, and Figure 1, Site Location Map which depicts the locations of the proposed corrective measures.

Classifieds

Edgecombe Public Meeting

The Daily Southerner
THURSDAY, JULY 3, 2008

Public Meeting
to Review Groundwater Findings and Corrective Measures for the Edgecombe County Landfill

In accordance with Title 15A NCAC 13 B.1635(d),the Solid Waste Department of Edgecombe County is holding a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County Landfill C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. After the public meeting, Edgecombe County will select a remedy(ies) in accordance with the requirements of 15A NCAC 13B. 1636 and submit the corrective measure(s) in a Corrective Action Plan for approval by the Solid Waste Section of the NC Department of Environment and Natural Resources.

The Public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

The Assessment of Corrective Measures, Nature and Extent Study and Alternative Source Demonstration are Available for public review at the following location during normal business hours:

Edgecombe County Landfill Office/Weigh Station
2861 Colonial Rd.
Tarboro, NC 27886

Rocky Mount TELEGRAM

EDGE COUNTY MANAGER
P.O. BOX 10

TARBORO, NC 27886

CopyLine:	igtoReviewGroundwaterFindings
Lines:	64
Total Price:	$96.00

PUBLISHER'S AFFIDAVIT

AD ID: 7002307

NORTH CAROLINA
NASH COUNTY:

JUANITA COOPER-FORD affirms that she is clerk of the Rocky Mount Telegram, a newspaper published daily at Rocky Mount, Nash County, North Carolina, and tha : the advertisement, a true copy of which is hereto attached, entitled PublicMeetingtoReviewGroundwaterFinding: was published in said the Rocky Mount Telegram on the following dates:

Thursday, July 3, 2008 Page: D1

and that the said newspaper in which such notice, p document or legal advertisement was published, w the time of each and every publicatio , a newspaper meeting all of the requirements and qualifications of Chapter 1, Section 597 of the General Statutes of North Carolina and was a qualified newspaper within the meaning of Chapter 1, Section 597 of the General Statutes of North Carolin .

Juanita Cooper Ford

Affirmed and subscribed before me this 03 day of July 2008

Michelle W. Parker

(Notary Public Signature)

Michelle W. Parker

(Notary Public P inted Name)

My commission expires 11-15-12

MICHELLE W. PARKER
NOTARY PUBLIC
NASH COUNTY
NORTH CAROLINA

Public Meeting to Review Groundwater Findings and Corrective Measures for the Edgecombe County Landfill

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County is holding a public meeting to review the findings and to discuss potential corrective measures related to impacted groundwater associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998. The Edgecombe County C&D Landfill is located at 2872 Colonial Road in Tarboro, NC. After the public meeting, Edgecombe County will select a remedy(ies) in accordance with the requirements of 15A NCAC 13B. 1636 and submit the corrective measure(s) in a Corrective Action Plan for approval by the Solid Waste Section of the NC Department of Environment and Natural Resources.

The public meeting will be held on Monday, August 4, 2008 in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

The Assessment of Corrective Measures, Nature and Extent Study, and Alternative Source Demonstration are available for public review at the following location during normal business hours:

Edgecombe County Landfill
Office/Weigh Station
2861 Colonial Rd.
Tarboro, NC 27886

M I N U T E S

REGULAR SCHEDULED MEETING OF THE BOARD OF COMMISSIONERS
OF EDGECOMBE COUNTY
AUGUST 4, 2008 AT 2:00 P.M.
IN THE COMMISSIONERS' ROOM, COUNTY ADMINISTRATIVE BUILDING
TARBORO, NORTH CAROLINA

****

1. MEETING CALLED TO ORDER BY CHAIRMAN HARRELL AT 2:00 P.M.

MEMBERS PRESENT: Mr. Charlie R. Harrell, Chairman, Mr. Leonard Wiggins, Vice-Chairman, Mr. Calvin Anderson, Mr. T. C. Cherry, Mr. Jonathan Felton, Ms. Viola Harris and Rev. E. Wayne Hines.

MEMBERS ABSENT: None

OTHERS PRESENT: Mr. Lorenzo Carmon, County Manager, Mr. Mahlon DeLoatch, County Attorney and Ms. Carolyn S. Hedgepeth, Clerk to the Board.

2. PRAYER

Invocation provided by Rev. E. Wayne Hines.

3. MINUTES OF PREVIOUS MEETING PRESENTED FOR APPROVAL

Mr. Felton moved to approve the minutes of the July 7, 2008 meeting as presented. Rev. Hines seconded the motion which carried by unanimous vote.

4. PUBLIC HEARING (s)

(1) Mr. Harrell called a public hearing to order to receive citizen comments or questions relative to an order to adopt the 2009 Revaluation Schedule of values.

Mr. DeLoatch read the public notice.

Mr. Carmon said that the agenda packet included an order to adopt the 2009 standards and rules. He said that during the July meeting a public hearing was held and no comments were received, however there was a 7-day waiting period required prior to the adoption of the order. He recommended adoption at this meeting.

Mr. Harrell called for public comments.

Mr. Glenn Hill, Melvin Road, Edgecombe County homeowner came forward to ask if the schedule took in consideration the current real estate market that negatively impacted the value of homes in the county.

Mr. Harrell explained that the law required the use of values set forth by the North Carolina Tax office in Raleigh, however; he said that since our last valuation was eight years ago he did not expect the recent market to have that strong of an impact on the values.

There being no further comments, the public hearing was adjourned.

Mr. Anderson moved to approve the Order adopting the Schedules, Standards and Rules to be used in the 2009 Revaluation of Real Property in Edgecombe County.

Mr. Felton seconded the motion which carried by unanimous vote.

(2) Mr. Harrell called a public hearing to order to receive citizen comments or questions relative to the County's intent to apply for a Capacity Building grant from the North Carolina Department of Commerce, Division of Community Assistance.

Mr. Harrell called the hearing to order and called on Mr. DeLoatch to read the public notice.

Mr. Carmon stated that the NC Department of Commerce, division of Community Assistance has solicited applications for grants up to $75,000 through its CDBG Capacity Building Grant program to assist non-profits to develop its capacity. He said that Rocky Mount Edgecombe CDC has presented a plan to use the funds to develop its capacity to carry out its proposed development at Crossings at 64. He said the proposed project is intended to undertake single family and elderly housing development at the Crossings at 64.

Mr. Harrell called for public comments.

Ms. Joyce Dickens, Director of RMECDC came forward and thanked the Board for allowing them to compete for this capacity grant. She said they had an outstanding partnership with the NC Department of Commerce in their past relationship with the Fountain Industrial Park project. She said that they currently have 210 employees at the Fountain Industrial Park facility.

She explained that housing development is their primary focus for the capacity building grant. She said that she intends to use the funds to supplement the salary of a project manager, finance officer and administrative support staff that will be directly involved in the development of the project. She further stated that the grant is proposed to provide training for the staff in low income housing tax credits, mixed use project development and fiscal management. She also provided an update on the projects underway and or completed at 64 Crossings.

There being no further comment, the public hearing was adjourned.

Rev. Hines moved to approve the proposed project and authorize staff to submit an application to the North Carolina Department of commerce, Division of Community Assistance as presented.

Ms. Harris seconded the motion which carried by unanimous vote.

(3) Mr. Harrell called a public hearing to order to inform the community of the planned re-permitting of the County's Construction and Demolition (C&D) landfill located on SR 1601, Colonial Road approximately 4.5 miles south of Tarboro.

Mr. DeLoatch read the public notice as published.

Mr. Carmon said that a permit application fact sheet was presented as part of the agenda package relative to the continued operations of the Edgecombe County Construction and Demolition (C&D) landfill and Municipal Solid Waste (MSW) transfer station. He said that a public hearing was required prior to submitting the permit application to the State. He said that the expected life of the landfill under its current conditions is 45 years. He stated that Mr. Sam Watts, Engineer for SM&E and Mr. Danny Bagley, Solid Waste Director was present to address any questions from the Board.

Mr. Harrell called for public comments. There being none the public hearing was adjourned.

Mr. Felton moved to adopt the resolution to approve the submittal of a landfill permit application for the issuance of a landfill permit by the North Carolina Division of Waste Management for continued operations of the Edgecombe County C&D Landfill

Rev. Hines seconded the motion which carried by unanimous vote.

(4) Mr. Harrell called a public hearing to order to review the findings and discuss potential corrective measures related to impacted groundwater

associated with the portion of the Edgecombe County Landfill which was permitted to receive municipal solid waste from 1980 to 1998.

Mr. DeLoatch read the public notice as published.

Mr. Carmon presented a copy of information regarding the corrective action plan with the landfill to the Board of Commissioners. He said that groundwater testing is required as part of the monitoring program performed at the landfill and whenever a material is found that exceeds the State limits a corrective action plan must be implemented. He said the County had received a positive test result for cobalt at the landfill. He said several corrective measures had been proposed for consideration and once those proposals have gone to the state he will bring back a final correction action plan. He recommended approval of a resolution to adopt a groundwater contamination corrective measure for the closed portion of the landfill.

Mr. Harrell called for public comments. There being none, the public hearing was adjourned.

Mr. Anderson moved to approve a resolution to adopt a groundwater contamination corrective measure for the closed portion of the Edgecombe County landfill as presented.

Ms. Harris seconded the motion which carried by unanimous vote.

5. SCHEDULED APPOINTMENT(S) 2:00 P.M.

A. Ms. Gloria Lyndaker, Tax Collector to present the 2007 Annual Settlement.

Ms. Lyndaker, Tax Collector came forward to present the settlement which she stated reflected a decrease in the collection rate of 1.12%. She said that the economy and vehicle tax collection was an ongoing problem.

The Board discussed in detail the problems related to the low collection rate. Ms. Lyndaker assured the Board that her and staff were doing everything they were legally able to do to collect the taxes.

Mr. Carmon said that if the Board approved he would see what could be done about collecting taxes and issuing tags simultaneously in Edgecombe County as is done is other counties. He said that the delinquent tax collection position is working steady to pursue the taxes.

Ms. Harris moved to approve the Tax Collector's Settlement as of June 30, 2008 subject to independent audit and to recharge the Tax Collector with the outstanding taxes and the responsibility for collecting the same for the years 1998 through 2008.

Rev. Hines seconded the motion which carried by unanimous vote.

6. PUBLIC PETITIONS:

Mr. Glenn Hill, Melvin Road, Edgecombe County resident for 40 years said the taxes on his property had doubled in the last year since he was unable to apply for the senior citizens discount. He said the Assessor advised him that the State had changed the law and would no longer base the senior citizen wage cap on Adjusted Gross Income (AGI) and instead it would be based on total gross income. He said that puts him slightly above the $25, 000 maximum, which has lost him the exemption. He said his tax has increased over $700.00 from the previous year.

The Board stated that they were unaware of the change in the law and asked Ms. Coker, Tax Assessor to explain.

Ms. Coker explained that the law had changed in the last year's session as Mr. Hill stated; however the General Assembly had recently passed legislation to put it back to AGI in the next year.

Mr. Wiggins commented that there should be some attempt to identify the population and notify them of the change that affects them. The Board charged the Attorney to investigate the tax changes.

7. OTHER BUSINESS:

A. Amending the Rocky Mount Wilson Airport budget to delete the $10,000 Capital Outlay appropriation and increase the operations appropriations to $46,970.

Mr. Carmon explained that Edgecombe County had decreased the appropriation by $6,558.00 in 08-09 but also added $10,000 in capital outlay to cover the cost of a matching grant for land acquisition. However, Nash County did not fund the additional capital outlay cost therefore he was recommending that part of the $10,000 be used to increase the operations budget by $6,558.00 to match the other funding partners and that the capital outlay be revisited when necessary.

Mr. Wiggins moved to approve the budget amendment as submitted. Mr. Anderson seconded the motion which carried by unanimous vote.

B. Approval of an application for the Public School Building Capital fund to reroof the vocation building at Tarboro High School.

Mr. Cherry moved to approve the application for the Public School Building Capital fund as presented. Mr. Anderson seconded the motion which carried by unanimous vote.

C. Approving a grant project ordinance, budget amendment and rate resolution for the extension of a waterline to Speed and District #4.

Mr. Carmon said that the Rural Center had awarded Edgecombe County Water & Sewer District #3 $500,000 to assist in extending a waterline to Speed and District #4. He said the remaining $650,000 of the project is funds remaining from District #4 construction grant. He recommended approval of a grant project ordinance, budget amendment and a resolution affirming the water & sewer rates for 5,000 gallons usage at 1.5% of the annual median household income as of the last census.

Mr. Felton moved to approve the budget amendment, grant project ordinance and the Certification and Resolution establishing water and sewer rates as presented.

Rev. Hines seconded the motion which carried by unanimous vote.

D. Budget amendments.

Mr. Anderson moved to approve the budget amendments as presented. Rev. Hines seconded the motion which carried by unanimous vote.

E. Resolution authorizing the Finance Director to file an application to the Local Government Commission (LGC) for approval to finance various Capital Improvement Projects.

Mr. Carmon explained the projects included roof repairs for library, health department, mental health and DSS buildings and vehicles for Sheriff Department. He recommended approval.

Ms. Harris moved to approve the resolution authorizing the Finance Director to file an application to the Local Government Commission for approval to finance various Capital Improvement projects as presented.

Mr. Anderson seconded the motion which carried by unanimous vote.

F. Approval of a Resolution of Appreciation for services provided by the Pinetops Rescue Squad from May 5, 1972 through June 30, 2008.

Mr. Felton moved to approve the resolution of appreciation for services provided by the Pinetops Rescue Squad from May 5, 1972 through June 30, 2008 as presented. Mr. Cherry seconded the motion which carried by unanimous vote.

G. Resolution ordering the Building Inspector of Edgecombe County to effectuate the purposes of minimum building code of the State of North Carolina on property located at Lot 16-B Fillmore Subdivision in Edgecombe County and owned by Greater St. Stevens Church of Christ.

Mr. Carmon presented a resolution ordering the building inspector of Edgecombe County to effectuated the purpose of NCGS 153-A 336 as to the Building at Lot #16-B Fillmore Estates Subdivision, Township No. 10, Pinetops NC. He said the resolution directs the property owner to repair, alter, improve or demolish the building within ninety days of the order or it shall be the responsibility of Edgecombe County to demolish the structure and attach a lien for the expenses incurred to the property.

Mr. Anderson moved to approve the resolution ordering the Building Inspector of Edgecombe County to effectuate the purposes of minimum building code of the State of North Carolina on property located at Lot 16-B Fillmore Subdivision and owned by Greater St. Stevens Church of Christ.

Mr. Cherry seconded the motion which carried by unanimous vote.

H. Adoption of a resolution naming a portion of US Highway 64 in Edgecombe County in honor of Mr. Robert Barnhill, Sr.

Mr. Cherry moved to adopt a resolution naming the portion of US Highway 64 in Edgecombe County beginning at the Tar River in Tarboro and running east to the Martin County Line "Robert E. Barnhill Memorial Highway" as presented and to forward a copy to the North Carolina Department of Transportation.

Mr. Felton seconded the motion which carried by unanimous vote.

SUPPLEMENTAL AGENDA:

a. Approval of FY 07 CDBG Infrastructure Project Ordinance and budget amendment for $800,000 for the Cutchin Farm Road Water Extension project.

Mr. Cherry moved to approve the project ordinance and budget amendment as presented. Ms. Harris seconded the motion which carried by unanimous vote.

b. Approving the bid of $59,000 for the sale of timber located on Kingsboro Highway 64 Bypass.

Mr. Cherry moved to approve the bid of $59,000 for the sale of timber as presented. Mr. Anderson seconded the motion which carried by unanimous vote.

Mr. Carmon said he had a public hearing notice that had been published but was not included on the agenda, however; he asked the Board's approval to amend the agenda and hear comments regarding the public hearing.

Mr. Anderson moved to modify the agenda to include the public hearing as presented. Mr. Cherry seconded the motion which carried by unanimous vote.

Mr. Harrell called the public hearing to order to hear citizen comments relative to the county's intent to apply to the North Carolina Department of Commerce for Small Cities Community Development Block Grant (CDBG) for a proposed revitalization project in the New Hope Church Road neighborhood at a cost of up to $1,000,000. He called on Mr. DeLoatch to read the public notice as published.

Mr. Donald Harvey, The Wooten Company came forward and apologized about the confusion in getting the public hearing on the agenda. He said the application is due on August 28, 2008 and therefore was important to proceed at this time. He said this was a concentrated needs project and in looking at the county he discovered there is a sewer line from Phillips School along New Hope Church Road and he hoped that they could do housing, drainage and sewer work in the area if the funds are secured. He said the project cost of approximately $800,000 would benefit approximately 10 structures and provide about 700 feet of sewer line and a pump station which could be the beginning of gravity sewer service in the area. He said the area had severe failing septic tanks, which means the need is significant. He said the State requires a local commitment but hoped that the county would permit some funds into the project to be competitive.

Mr. Wiggins said that if there is a need for public dollars then we should move forward with it depending on the amount of funds required.

Mr. Felton agreed but hoped that other areas in the county should be looked at as well.

Mr. Harvey explained that the CDBG grants are for low and moderate income sects and they have looked at certain areas that match the criteria and also have the need to implement these programs. He said that the county has put in around 50- 75 K for the local match and sometimes those funds have been found from other sources but to have the commitment going in it helps the state to know the county's seriousness in the project.

Mr. Harrell called for public comments. There being none the public hearing was adjourned

Mr. Cherry moved to submit the grant application and authorize the county manager to match up to $50,000. Mr. Anderson seconded the motion which carried by unanimous vote.

8. PLANNING BOARD REPORT: Presented by Ms. Ola Pittman, Planning Director.

A. Rezoning Request by Mr. Robert A. Proctor. Item tabled.

B. Rezoning request by Mr. Robert A. Proctor. Public hearing recommended for the September 2, 2008 meeting.

Mr. Cherry moved to call for and conduct a public hearing on September 2, 2008 at 2:00 p.m. relative to a rezoning request by Mr. Robert A. Proctor. Mr. Felton seconded the motion which carried by unanimous vote.

C. Naming and/or renaming lanes and roads. Public hearing recommended for the September 2, 2008 meeting.

Mr. Cherry moved to call for and conduct a public hearing on September 2, 2008 at 2:00 p.m. relative to the naming and/or renaming of lanes and roads.

Ms. Harris seconded the motion which carried by unanimous vote.

D. Other Business: ***Received***
1. Land Development Plan – completed and will be in your hands at next mtg.
2. Comprehensive Transportation Plan- continue to work on the plan
3. Rules of Procedure for Planning Board-updating the procedures
4. Enhanced 911 Addressing Project.-continue to work on Battleboro, then Pinetops for completion

E. Draft Minutes
F. Next Meeting scheduled for August 18, 2008 at 6:00 p.m.

Mr. Wiggins recommended attendance records be submitted for all future re-appointments.

9. APPOINTMENTS:
   A. Edgecombe County Board of Adjustment. (1 position) Deferred
   B. Edgecombe County Council on Aging. (2 positions) Deferred
   C. Edgecombe County Adult Care Home Advisory Committee. (2 positions) Deferred
   D. Membership slate for the Edgecombe County Voluntary Agricultural District.

   Mr. Cherry moved to approve the slate of the following as presented:

   Mr. Tom Porter, Mr. Paul Drake, Mr. Ben Shelton, Mr. Fred Hampton, Mr. Joe Dickens, Mr. John Grimes, Mr. Alton Skinner, Mr. Shane Varnell, Mr. Don Anderson, Mr. Vernon Rhodes and Ms. Renee Long.

   Mr. Felton seconded the motion which carried by unanimous vote.

10. AFTERLIST AND RELEASES PRESENTED FOR APPROVAL.
   Mr. Felton moved to approve the afterlists and releases as presented.
   Ms. Harris seconded the motion which carried by unanimous vote.

11. CONTRACTS PRESENTED FOR REVIEW AND APPROVAL.
   Mr. Cherry moved to approve the contracts as presented. Mr. Anderson seconded the motion which carried by unanimous vote.

12. DEPARTMENTAL REPORTS FOR REVIEW. **Received**
   A. Water Report

   Mr. Carmon said Town of Tarboro experienced waterline break and used Code Red to notify residents and it did work like it should. Contractors are moving along on District 5.

   B. Rocky Mount Wilson Airport
   C. Veterans Services

13. MANAGER'S REPORT. **Received**
   A. Town of Princeville feasibility study to assume water & sewer system
      Mr. Carmon said that he recommended looking around for grant assistance to perform the feasibility study to see what the needs are with that District.

      Mr. Wiggins asked if the lines could be redrawn in District 4 to increase the users. The Board provided consensus to move forward.

   B. County tax authority
      Machinery Act provided and states that the county's limitations restrict adjustments based on mathematical errors only.

      Mr. Felton said that staff should be customer friendly with the taxpaying citizens of the county on a regular basis.

   C. Code Red
   D. Calendar of Events:

      September Board of Commissioners Meeting – Tuesday, September 2, 2008
      NCACC Annual Conference – August 21 - 24, 2008. (Voting Delegate Needed)
         Rev. Hines moved to nominate Ms. Harris seconded by Mr. Felton and approved by unanimous vote.
      Golden Leaf Community Forum – August 13, 2008 from 2:00 – 4:00
         Location TBA

14. COMMISSIONERS' REPORT.
   Mr. Harrell said a citizen asked the county to return to allow spotlighting deer. Following discussion, the Board consensus was to leave the ordinance as is and not to proceed further with the matter.

15. ATTORNEY'S REPORT.

16. CLOSED SESSION ITEM(s).

Rev. Hines moved to go into closed session for economic development and a personnel matter. Ms. Harris seconded the motion which carried by unanimous vote.

a. Economic Development
b. Personnel Matter.

Mr. Cherry moved to go out of closed session and resume regular meeting seconded by Rev. Hines and approved by unanimous vote.

17. REV. HINES MOVED TO ADJOURN MEETING UNTIL TUESDAY, SEPTEMBER 2, 2008 AT 2:00 P.M. MR. CHERRY SECONDED THE MOTION WHICH CARRIED BY UNANIMOUS VOTE.

Mr. Leonard Wiggins, Vice-Chairman

Ms. Carolyn S. Hedgepeth, Clerk

Table 3
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
1 – Monitored Natural Attenuation (MNA) of GW	MNA provides a long term method of reducing impact to environment. MNA will not eliminate potential for human exposure, groundwater & surface water will be monitored.	MNA is allowable under current federal and state regulations.	**Short:** MNA will provide no short term reductions in GW impact. **Long:** MNA will provide method to monitor long term attenuation mechanisms, reduce impact to environment and reduce potential for future human exposure. Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. The GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering, permitting, groundwater flow modeling, and installing additional monitoring wells as required is approx. **$120,000** Annual Maintenance, GW sampling & reporting is approx. **$40,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$555,000** 30 yr total: Approx. **$1,355,000**	MNA is a common and often used remedial option. Must prove viability of MNA. Concurrence of MNA by downgradient property owners may be required.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2A – Groundwater Collection with Off-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures.	Groundwater recovery and disposal as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators.	**Short**: CoCs will be recovered from groundwater recovery system. There may be short term reductions in GW impact. **Long**: GW recovery reduces and possibly eliminates COCs, reduces impact to environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require hauling/discharge permit. System installation may take less than four (4) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, and recovery system is approx. $300,000 Annual Maintenance, GW sampling, 100gpm groundwater disposal & reporting is approx. **$1,500,000+/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$15,000,000** 30 yr total: Approx. **$45,000,000**	GW recovery and treatment and a permitted discharge at an off-site permitted facility are acceptable remedial options.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals
gpm – gallons per minute

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2B – Groundwater Collection with On-Site Water Treatment System and On-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures.	Groundwater recovery and treatment as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators.	**Short**: COCs will be recovered from groundwater recovery system. There may short term reductions in GW impact. **Long**: GW recovery reduces and possibly eliminates COCs, reduces impact to environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require a discharge permit and possible bench and/or pilot testing. System installation may take less than four (4) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery system, and treatment system is approx. **$750,000** Annual Maintenance, GW sampling & reporting is approx. **$200,000/yr** Site Closure is approx: **$77,000** 10 yr total: Approx. **$3,000,000** 30 yr total: Approx. **$7,000,000**	GW recovery and treatment and a permitted discharge into a water body are common and often used remedial options.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
2C – Groundwater Collection with Constructed Wetland and On-Site Disposal	A groundwater recovery system will capture COCs in groundwater near the source and reduce down gradient migration and protect down gradient groundwater and surface water exposures. Will require limited access to constructed wetlands area.	Groundwater recovery and treatment as a COC mass recovery and containment technology is a demonstrated and often used technology, and is acceptable to regulators. Constructed wetlands is a newer technology, but is favorable as an improvement and wildlife habitat.	**Short:** COCs will be recovered from groundwater recovery system. There may short term reductions in GW impact. **Long:** GW recovery reduces and possibly eliminates COCs, reduces impact to . environment, and reduces potential for future human exposure. Reductions may be gradual but permanent.	Short term reductions of volume, toxicity, and mobility are attainable with a GW recovery and treatment system. Long term reductions in toxicity of GW impact are likely.	Will require discharge permit and possible bench and or pilot testing. System installation may take less than six (6) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery system, and constructed wetlands is approx. **$1,300,000** Annual Maintenance, GW sampling & reporting is approx. **$110,000/yr** Site Closure is approx: $85,000 10 yr total: Approx. **$2,500,000** 30 yr total: Approx. **$4,700,000**	GW recovery and treatment and a permitted discharge into a water body are common and often used remedial options. Constructed wetlands is a newer technology, but, is favorable as an improvement and wildlife habitat.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
3 – Gas Extraction: Convert existing vents to wells and install additional wells to extract landfill gas (LFG). **Option 1 – MNA will also have to be performed.**	The system will extract LFG from the landfill and reduce the pressure buildup of the LFG to prevent migration and potential groundwater contamination.	Extracting LFG to reduce LFG migration and contamination of GW is a demonstrated and often used technology, and is acceptable to regulators.	**Short:** There should be short term reductions in GW impact. **Long:** Extracting the LFG will reduce a source of GW contamination. Eventually the landfill will stop producing LFG at a rate where migration outside of the landfill will no longer be a concern.	Short term reductions of volume, toxicity & mobility is attainable with a gas extraction system Long term reductions in toxicity of GW impact are likely.	Will require air permit and possible bench and or pilot testing. System installation may take less than six (6) months. GW remediation estimated to take 10 - 30 years or more to achieve RGs.	Capital Cost engineering, tests, recovery wells, and treatment system is approx. **$500,000** Annual Maintenance, GW sampling & reporting is approx. **$170,000/yr** Site Closure is approx: **$25,000** 10 yr total: Approx. **$2,225,000** 30 yr total: Approx. **$6,000,000**	A gas extraction systems is a common and often used remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4A – In-Situ Isolation: Install a 2,200' Long, 30' Deep Barrier Wall **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and barrier wall installation is approx. **$615,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$1,100,000** 30 yr total: Approx. **$2,000,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.
4B – In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm, surface and groundwater will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap and/or install a barrier wall; the GW remediation may take 20-30 years or more to achieve RGs.	Annual Contouring, Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$485,000** 30 yr total: Approx. **$1,385,000**	GW redirection with barrier walls and/or landfill grading is common and often used as a remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4C – In-Situ Isolation: Increase Slope of Closed MSW Area **Option 1 – MNA will also have to be performed**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$25,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$510,000** 30 yr total: Approx. **$1,410,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option.
4D – In-Situ Isolation: Stormwater Improvements on Western Half of Landfill. **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$30,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$515,000** 30 yr total: Approx. **$1,415,000**	GW redirection with landfill grading and stormwater improvements is common and an often used remedial option

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

Table 3 (Cont.)
Detailed Evaluation of Retained Remedial Action Alternatives

OPTION	OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	COMPLIANCE WITH REGULATORY AND PERMITTING REQUIREMENTS	EFFECTIVENESS (SHORT AND LONG TERM)	REDUCTIONS OF TOXICITY, MOBILITY OR VOLUME	IMPLEMENTABILITY (TECHNICAL & LOGISTICAL)	COST	STATE AND COMMUNITY ACCEPTANCE
4E – In-Situ Isolation: Stormwater Improvements on Eastern Half of Landfill. **Option 1 – MNA will also have to be performed.**	Reduction of water contacting the waste source in the landfill will reduce and eventually nearly eliminate COCs from entering groundwater.	Management of storm and surface water is considered a best management practice.	**Short:** Redirection of storm and surface water will immediately begin to reduce migration of COCs. **Long:** Reductions will be gradual but permanent.	Long term reductions in toxicity of down gradient GW impact are possible through MNA.	Easily implemented, no significant access problems or special engineering constraints required. May take up to six (6) months or more to grade the landfill cap; the GW remediation may take 20-30 years or more to achieve RGs.	Capital Cost engineering and stormwater control installation is approx. **$30,000** Annual Maintenance, GW sampling & reporting is approx. **$45,000/yr** Site Closure is approx: **$35,000** 10 yr total: Approx. **$515,000** 30 yr total: Approx. **$1,415,000**	GW redirection with stormwater improvements is common and an often used remedial option.

Notes:
GW – Groundwater
COC – Contaminant of Concern
RGs – Remedial Goals

SCALE: 1" = 300'	PROJECT NUMBER: 1054-07-241	DRAWING NUMBER: B-1092
DATE: JULY 2008	DRAWN BY: BTR	CHECKED BY:

S&ME
WWW.SMEINC.COM

SITE LOCATION MAP

CORRECTIVE ACTION PLAN - EDGECOMBE CO. LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.
1

SECTION D-3

Resolution/Proclamation/Document Adopting the Remedy

Corrective Action Permit Modification Application

Section C-3: Resolution Adopting the Remedy

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). Due to constituents of concern (COCs) detected above North Carolina groundwater protection standards in groundwater at the facility S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

The Assessment of Corrective Measures (ACM) Report has been submitted to the Solid Waste Section for approval. The selection process of the ACM has been fully completed, following the meetings for public questions and input. There were no changes to the CAP required based on public comments.

In accordance with Title 15A NCAC 13B.1635(d), the Solid Waste Department of Edgecombe County held a public meeting to review the findings and to discuss potential corrective measures described in the ACM Report. The schedule for this public meeting and review of corrective measures was announced at the Edgecombe County Commissioners meeting on July 7, 2008, and the public meeting was listed on the agenda for the following County Commissioners meeting held on August 4, 2008. The public meeting was held, August 4, 2008, in the Commissioner's Room on the 2nd floor of the County Administration Building located at 201 St. Andrews Street, Tarboro, North Carolina at 2:00 p.m.

Following the public meeting to discuss the corrective measures remedy at the August 4, 2008 Edgecombe County Commissioners meeting, the commissioners **approved** the selected remedy in the form of a resolution. In accordance with 15A NCAC 13B .1636, within 14 days of selecting the remedy, Edgecombe County is submitting notification to the Division. Enclosed is a copy of the resolution adopting the remedy.

RESOLUTION OF THE EDGECOMBE COUNTY BOARD OF COMMISSIONERS TO ADOPT A GROUNDWATER CONTAMINATION CORRECTIVE MEASURE FOR THE CLOSED PORTION OF THE EDGECOMBE COUNTY LANDFILL

WHEREAS, Edgecombe County, herein referred to as COUNTY, owns and operates a facility for disposal of solid waste known as the Edgecombe County Landfill, herein referred to as LANDFILL; and

WHEREAS, a portion of the LANDFILL which received municipal solid waste (MSW) has been closed in accordance with North Carolina Solid Waste Section Rules in effect at the time of closure; and a portion of the landfill which receives construction & demolition (C&D) waste operates over top of the closed MSW unit under Permit No. 33-01 issued by the North Carolina Division of Waste Management (DWM) for operation in compliance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Solid Waste Management, Section .0547(4); and

WHEREAS, the COUNTY is required to monitor groundwater at the LANDFILL in accordance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Section .1633; and

WHEREAS, certain chemical constituents detected in groundwater at the LANDFILL exceeded the North Carolina groundwater protection standards, thereby triggering an Assessment of Corrective Measures in accordance with North Carolina Administrative Code, Title 15A, Department of Environment, Health and Natural Resources, Division of Solid Waste Management, Subchapter 13B, Section .1634; and

WHEREAS, the COUNTY, through its engineering consultant, S&ME, Inc., herein referred to as S&ME, has submitted a report to the Solid Waste Section to characterize the nature and extent groundwater impact from a release of chemical constituents from the LANDFILL in accordance with North Carolina Solid Waste Rule .1634 (*Nature and Extent Study*, dated June 25, 2008); and

WHEREAS, the COUNTY, through its engineering consultant, S&ME, has submitted a report to the North Carolina Solid Waste Section describing an analysis of the effectiveness of potential corrective measures for the LANDFILL in accordance with North Carolina Solid Waste Rule .1634 (*Assessment of Corrective Measures*, dated June 26, 2008); and

WHEREAS, the North Carolina Solid Waste Section has approved the referenced reports; and

WHEREAS, the COUNTY conducted a public information meeting on August 4, 2008, to review the results of the nature and extent study and the corrective measures assessment and receive public comment prior to the selection of a remedy; and

WHEREAS, COUNTY staff has recommended Monitored Natural Attenuation in conjunction with In-Situ Isolation as the preferred corrective measure alternative due to its effectiveness and relative low cost when compared with other alternatives; and

NOW, THEREFORE, BE IT RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY adopts Monitored Natural Attenuation and In-Situ Isolation as the preferred groundwater contamination corrective measure alternative. Because In-Situ Isolation consists of several different corrective measures, IT IS FURTHER RESOLVED by the Edgecombe County Board of Commissioners that the COUNTY, in coordination with its engineering consultant, shall endeavor to implement only the In-Situ Isolation corrective measures necessary to provide remediation of groundwater in the most cost effective manner.

Motion was made by Commissioner CALVIN ANDERSON *and duly seconded by Commissioner* VIOLA HARRIS *to approve the resolution pending review by the County Attorney. Vote: Motion unanimously approved, this 4th day of August, 2008.*

Attest:

Carolyn S Hedgepeth

Carolyn S Hedgepeth, Clerk to the Board

SECTION D-4

Site Map Illustrating Groundwater and Surface Water Monitoring Locations

Corrective Action Permit Modification Application

Section C-4: Site Map Illustrating Groundwater and Surface Water Monitoring Locations

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

A site map designating locations of groundwater monitoring wells and surface water monitoring locations that will be impacted by the remedy, can be found in **Section B** Operation and Waste Acceptance Plan, **Appendix II** Water Quality Monitoring Plan.

SECTION D-5

Corrective Action Plan

EDGECOMBE COUNTY LANDFILL
CORRECTIVE ACTION PLAN
(PERMIT #33-01)
TARBORO, NORTH CAROLINA
S&ME Project No. 1054-07-241

Prepared For:

Edgecombe County
P. O. Box 10
Tarboro, North Carolina 27886

Prepared By:

S&ME, Inc.
3201 Spring Forrest Road
Raleigh, North Carolina 27616

June 30, 2008

CORRECTIVE ACTION PLAN
Edgecombe County Landfill
(Permit #33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-241

I hereby certify this 30th of June, 2008, that this report was prepared by me or under my direct supervision.

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

6/30/08

Thomas P. Raymond, P.E.
Environmental Department Manager
NC Licensed Engineer No. 18760

Michelle L. Logue
Environmental Scientist

SR: SPW

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FIGURES

Figure 1 –Vicinity Map
Figure 2 – Site Map
Figure 3 – Proposed Corrective Measures

EXECUTIVE SUMMARY

Edgecombe County (County) currently operates a construction and demolition (C&D) debris landfill on top of a closed municipal solid waste (MSW) landfill in general accordance with North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Facility Permit No. 33-01. The landfill is located off of State Road 1601 (Colonial Road), south of Tarboro, North Carolina. The C&D landfill is used for the disposal of waste generated within Edgecombe County and from surrounding counties.

The NCAC 2L Groundwater Quality Standards (2L Standard) for several target constituents in groundwater have been exceeded at the facility near the north-northeastern property boundary. The nearest receptor north-northwest of the facility is Jerry's Creek.

S&ME previously performed a Nature and Extent Study (NES) and an Assessment of Corrective Measures (ACM) to characterize the nature and extent of the release and identify several potential solutions or corrective measures which could be implemented to address the migration of groundwater contaminants beyond the compliance boundary.

NCDENR, Division of Waste Management (DWM), Solid Waste Section (SWS) Solid Waste Rules defined under 15A NCAC 13B .1636 & .1637 require that the County perform a Corrective Action Plan (CAP) for the selection of a remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

The ACM Report has been submitted to the Solid Waste Section for approval, however, the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this CAP, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect any changes based on public comments.

In-situ isolation and monitored natural attenuation (MNA) have been selected as the remedies at the Edgecombe County Landfill, which will involve the following:

- Installation of an upgradient groundwater barrier wall;
- Maintaining a consistent contour with pre-1998 waste area;
- Increase slope of the closed MSW area;
- Stormwater improvements on the western half of the landfill; and,
- Implementation of a MNA program to address impacted groundwater.

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

1. INTRODUCTION

1.1 Site Background

The Edgecombe County Landfill is owned and operated by Edgecombe County (County). The landfill is located off of State Road 1601 (Colonial Road), south of Tarboro, North Carolina. The landfill location and site vicinity are shown on **Figure 1**. The active C&D landfill is accessed off of Colonial Road and is regulated under the North Carolina Department of Environment and Natural Resources (NCDENR) Solid Waste Facility Permit No. 33-01. The C&D landfill is used for the disposal of waste generated within Edgecombe County and from surrounding counties. The C&D landfill is located over a closed MSW landfill cell which is also regulated under Facility Permit 33-01.

The C&D landfill and closed MSW landfill are bounded by Jerry's Creek to the north and by woodlands to the west and south-southwest. The topography of the landfill facility generally slopes downward from south to north, toward Jerry's Creek. Agricultural fields are located immediately adjacent to the facility to the south and Colonial Road is immediately adjacent to the east. Across Colonial Road farther to the east is an Edgecombe County MSW convenience center, MSW transfer station, and borrow areas for landfill cover soils. Three residential single-family homes are located to the northeast.

A closed pre-Subtitle D Landfill (northern old landfill), which stopped receiving waste in 1979, is located just north of the active landfill, across Jerry's Creek. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory and is located between Jerry's Creek and Wright's Creek off of Colonial Road. Wright's Creek is present along the northern property boundary of the old landfill and converges with Jerry's Creek to the east of the old landfill.

Figure 2 is a site map illustrating site features. For the purposes of this report, the "landfill" or "waste disposal unit" refers to the Edgecombe County Landfill facility regulated under Facility Permit 33-01, located south of Jerry's Creek at 1601 Colonial Road, comprised of the active C&D landfill unit and the underlying closed MSW unit.

1.2 Purpose

The County performs landfill gas monitoring on a quarterly basis and performs semi-annual groundwater and surface water monitoring from a monitor well network consisting of seven monitor well locations surrounding the boundary of the waste disposal unit, two surface water sample locations, and eleven gas monitoring wells. The network of monitor wells was designed for compliance monitoring in the event that concentrations of contaminants originating from the landfilled waste materials were released to the environment. Groundwater and surface water compliance monitoring is performed to comply with the requirements of North Carolina Solid Waste Management Rules (Solid Waste Rules), 15A NCAC 13B § .600, §.1632 and §.1634 of the Solid Waste Rules.

Volatile organic compounds (VOCs) and inorganic constituents have been detected above North Carolina groundwater protection standards in groundwater samples collected from groundwater compliance monitoring points used to monitor the Edgecombe County Landfill. In addition, statistical evaluation of groundwater monitoring data indicates a release of VOCs and inorganic constituents from the landfill.

In accordance with NCDENR Division of Waste Management (DWM), Solid Waste Section (SWS) Solid Waste Rules defined under 15A NCAC 13B, S&ME has completed the following activities on behalf of Edgecombe County in response to the detections of these constituents:

- Statistical analyses of semi-annual water quality results of compliance well monitoring system in accordance with the facility's *Water Quality Monitoring Plan* (WQMP);
- Alternate Source Demonstration (ASD) study in accordance with Solid Waste Rules defined under 15A NCAC 13B.1633(c)(3) and .1634(g)(2);
- Nature and Extent Study (NES) prepared in accordance with Solid Waste Rules defined under 15A NCAC 13B.1634(g)(1); and,
- Assessment of Corrective Measures (ACM) in accordance with Solid Waste Rules defined under 15A NCAC 13B.1635.

These previous assessments identified five organic compounds (vinyl chloride, benzene, cis-1, 2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene) and one inorganic analyte (cobalt) as constituents of concern (COCs) at the Edgecombe County Landfill. This Corrective Action Plan (CAP) has been prepared in accordance with 15A NCAC 13B.1636, for the selection of a remedy that is protective of human health and the environment, and will attain the approved groundwater protection standards.

1.3 Previous Studies

1.3.1 Water Quality Monitoring Plans

Groundwater has been monitored at the landfill facility since 1994 in accordance with the facility's *Water Quality Monitoring Plan* (WQMP), dated September 1994. Statistical analyses of the groundwater monitoring data indicated a statistical release from the waste disposal unit.

On March 31, 1999, on behalf of Edgecombe County, S&ME submitted a *Work Plan for Groundwater Assessment – Edgecombe County Landfill* (Work Plan) to the Solid Waste Section (Section). The Section approved the Work Plan, with comments, on May 10, 1999. The Section comments were addressed in a revision to the Work Plan. Using the revised Work Plan, the County began to assess potential impacts to groundwater quality from the waste disposal unit.

As the County began these activities to implement the groundwater assessment Work Plan, several significant events occurred affecting conditions at the facility. These events

included: closure of the MSW landfill (1997-1999); Hurricane Floyd (1999); a revision to the WQMP groundwater sampling and analysis plan (1998), and revisions to the surface water locations and monitor wells included in the water quality monitoring network (1998-2002). These events so altered the water quality observed at the facility that a re-evaluation of the site-wide water quality was performed.

The results of a baseline statistical re-evaluation were reported to the Section in S&ME's report titled *January 2003 Semi-Annual Sampling/Baseline Statistical Analysis*, dated August 19, 2003. These findings indicated a release of Appendix I constituents in the area of monitor well MW-5. However, no statistical evidence of a release of any Appendix II constituents was found.

1.3.2 Semi-Annual Groundwater and Surface Water Sampling

Eleven monitor wells (MW-1A, MW-3B, MW-4, MW-5, MW-5S, MW-5D, MW-6, MW-7A, MW-8A, MW-9, and MW-10) and three piezometers (P-1, P-2A, and P-3A) currently comprise the groundwater quality monitoring network for the facility. Of these eleven monitor wells and three piezometers, seven of the monitor wells are sampled on a semi-annual basis for water quality indicators and laboratory analyses. The remaining seven monitor wells/piezometers are only used to measure groundwater elevations to enhance the potentiometric mapping.

Water Quality Monitoring Network
Groundwater Sampling Locations

Background Monitor Wells	Compliance Monitor Wells
MW-3B	MW-1A
MW-4	MW-5
MW-9	MW-6
	MW-7A

Two surface water sampling locations (upstream and downstream) located on Jerry's Creek currently comprise the surface water monitoring system for the landfill facility.

The facility's water quality monitoring network has been sampled on a semi-annual basis since 1994. These wells and surface water locations were selected in order to monitor constituent concentrations migrating hydraulically downgradient towards Jerry's Creek. Groundwater and surface water samples collected from the water quality monitoring network have historically been analyzed for Appendix I constituents including VOCs and metals and Appendix II constituents including VOCs, semi-volatile organic compounds (SVOCs), metals, sulfide, and cyanide. In addition, groundwater and surface water samples have also been historically analyzed for several other constituents including polychlorinated biphenyls (PCBs), pesticides, and herbicides.

Several organic as well as inorganic constituents have been historically detected in some water samples above the 15A North Carolina Administrative Code (NCAC), Subchapter

2L Groundwater Standards (2L Standards), the NCDENR DWM Groundwater Protection Standard (GWPST), and NCAC, Subchapter 2B Surface Water Standards (2B Standards). The organic constituents detected above standards include the following VOCs: vinyl chloride, benzene, 1,1-dichloroethane, 1,2-dichloroethane, cis-1,2-dichloroethene, trichloroethene, 1,2-dichloropropane, tetrachloroethene, 1,4-dichlorobenzene, and methylene chloride. The SVOC 4-methylphenol has also historically detected above its respective 2L Standard/2B Standard in the samples collected from sampling locations at the waste disposal unit. The inorganic constituents detected above standards include the following metals: cadmium, beryllium, cobalt, chromium, lead, silver, nickel, vanadium, and thallium.

A statistical evaluation of the laboratory analytical data from the historical groundwater monitoring data set was last performed as part of the July 2006 Monitoring Report for the Edgecombe County Landfill prepared by S&ME. The historical data pool has been updated and included in the subsequent sampling events, however, no statistical analysis was performed due to the changes in sample analytical methods. According to the July 2006 Monitoring Report, four analytes (vinyl chloride, 1,1-dichloroethane, cis-1,2-dichlorethene, and trichloroethene) were shown to have statistical evidence of a release at the facility and were detected at both monitor wells MW-1A and MW-5. Two additional analytes (benzene and cobalt) were detected at monitor well MW-5 and were shown to have statistical evidence of a release at the facility at that location. Only one analyte (cis-1,2-dichloroethene) was detected at monitor well MW-7A and was shown to have a statistical evidence of a release at the facility. These statistically significant constituents along with additional historically detected constituents are further discussed in **Section 2.1**.

1.3.3 Alternate Source Demonstration

On behalf of Edgecombe County, S&ME previously performed an Alternate Source Demonstration (ASD) in response to the detection of inorganic constituents at concentrations exceeding their respective 2L Standards/GWPST in several monitoring wells. (*Alternate Source Demonstration*, dated June 10, 2008)

During the January 2008 groundwater monitoring event, lead was detected in the groundwater sample from monitor well MW-7A at a reported concentration exceeding its respective 2L Standard. Additionally, three metals for which there is no corresponding 2L Standard (cobalt, thallium, and, vanadium) were detected above their GWPST during the four most recent groundwater monitoring events (July 2006, January 2007, June 2007, and January 2008). In order to examine whether naturally occurring metals concentrations within the in-situ native soils on-site could be influencing groundwater quality, an ASD for metals was undertaken.

The concentrations of several naturally occurring metals within the in-situ soil at the facility were found to be sufficient to influence the concentrations of these metals in groundwater samples from the downgradient compliance monitoring wells. Other metals were found to not represent a statistically significant increase (SSI) above background

values. Therefore, the concentrations of some constituents could be attributed to naturally occurring background values of these metals within the hydrogeologic regime.

The results of the ASD analyses did not support influence to groundwater quality from the natural occurrence of the metal cobalt because, while cobalt was detected in the in-situ soils at the facility, the levels of cobalt detected in the groundwater samples from monitoring well MW-5 could not be attributed solely to its natural occurrence in the overlying soils. Therefore, cobalt remains an inorganic constituent of concern at the facility.

1.3.4 Nature and Extent Study

Due to the detection of VOCs and inorganic constituents in excess of the 2L Standards/GWPST in groundwater samples from the landfill facility compliance wells and the determination that those findings indicated significant increases of some of the constituents, S&ME has performed a Nature and Extent Study (NES) in compliance with the Solid Waste Rules. (*Nature and Extent Study*, dated June 25, 2008)

As a part of the NES, S&ME reviewed the recent and historical groundwater and surface water analytical data at the landfill facility to identify the constituents of concern (COCs) and trends in their concentration and distribution. The extent of the contaminant plume in the area of groundwater compliance monitor wells was characterized and delineated. In addition, S&ME evaluated the limits of waste placed at the former MSW landfill site. The contaminant distribution in the groundwater within the waste disposal unit was also evaluated for the potential of contaminant migration to and beyond the waste boundary. S&ME personnel also identified possible receptors within 1,500 feet of the landfill facility.

The NES identified five organic compounds and one inorganic analyte as the COCs at the Edgecombe County Landfill. These constituents include the VOCs: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene, as well as the metal cobalt.

The results of this NES indicated that the area impacted by these constituents of concern is limited to areas within the Edgecombe County Landfill facility boundary. The COC concentrations do not appear to have adversely impacted surface water quality. The concentrations of the organic and inorganic COCs detected within the plume are relatively low. In addition, there are no identified drinking water wells located downgradient of the landfill facility. Therefore, the NES determined that the level of risk to human health from the identified release is expected to be low.

1.3.5 Assessment of Corrective Measures

On behalf of Edgecombe County, S&ME previously prepared an Assessment of Corrective Measures (ACM) to identify the options for potential corrective measures, to consider the advantages and disadvantages, including costs, for these methods and to

recommend, with public input, measures that are appropriate to address the constituents and conditions at the Edgecombe County Landfill. (*Assessment of Corrective Measures*, dated June 26, 2008)

The ACM evaluated the performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination; the time required to begin and complete the remedy; the costs of remedy implementation; and the institutional requirements such as State and Local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s), in accordance with 15A NCAC 13.B1635.

The following techniques were considered as possible effective corrective measures:

- Institutional Controls – Monitored Natural Attenuation (MNA), Access Restrictions, and Deed Restrictions
- Groundwater Collection –Pumping Wells/Hydraulic Barrier and Interceptor Trenches
- Gas Extraction – Volatilization
- On-Site Treatment – Physical: Air Stripping, Carbon Adsorption, Filtration, Ion Exchange, Reverse Osmosis

  Chemical: Neutralization, Physical/Chemical Separation

  Biological: Constructed Wetlands
- In Situ Isolation – Surface Cap / Grade and Barrier / Containment Wall
- Off-Site Disposal – POTW Discharge
- On-Site Disposal – Discharge to Surface Water

Of these potential measures, the facility will choose the most feasible method which will achieve the combined goals of protection of human health and the environment with a reasonable allocation of County resources. The ACM report was submitted to the Solid Waste Section (SWS) of NCDENR, Division of Waste Management (DWM), however the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this Corrective Action Plan, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the waste disposal unit. MNA will be incorporated into the facility's water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to

this CAP will be submitted, if necessary, to reflect any changes based on public comments.

1.4 Regional Geology

Edgecombe County lies within the Coastal Plain Physiographic Province of North Carolina. In general, geologic units in the Coastal Plain Region consist of deep, unconsolidated clastic deposits overlying crystalline basement rocks. The Coastal Plain sedimentary formations in this region include, from youngest to oldest (top to bottom):

- The Surficial Deposits (Quaternary)
- The Yorktown Formation (Tertiary)
- The Upper Cape Fear Formation (Cretaceous)

In the site vicinity, the Quaternary surficial sediments are comprised of the Penholoway, Wicomico, and Sunderland Formations. These formations are generally less than 50 feet in total thickness, with an average of 20 to 30 feet and consist of yellow silty sand and sandy clays. The Yorktown Formation lies beneath these surficial sediments. The Yorktown consists of 30 to 60 feet of blue gray fossiliferous silty clay with sandy clay, shell beds and fine sands. The Yorktown is extensive throughout the county forming an almost continuous layer. Beneath the Yorktown are Cretaceous-aged Cape Fear Formation sediments of reddish brown to brown clay, sand and sandy clay with some gravel resting on the irregular bedrock surface. These sediments range in thickness from 30 in the west to 400 feet or more in thickness in the eastern area of the county.

The Cretaceous sediments are underlain by crystalline igneous and metamorphic rocks, with an irregular surface that dips gently to the east. The depth to the bedrock is approximately 300 feet below National Geodetic Vertical Datum (NGVD) (approximately 240 to 400 feet below land surface).

1.5 Site Geology

S&ME personnel have previously performed several test pits, soil borings, and the installation of temporary piezometers throughout the site to identify the soil conditions at the landfill facility. Sand and silty sand were identified from the ground surface to typical depths of 4 to 6 feet below ground surface (ft bgs). The soil underlying the sand and silty sand surface layer generally consisted of the following: sandy silty clay; sandy clayey silt; silty sandy gravel; and sandy clayey silt. The subsurface exploration identified a marine clay (Yorktown Formation) underlying the near surface soils at the landfill site at depths ranging from 3 to 20 ft bgs. The full thickness of the Yorktown clay has not been determined. However, two deep borings (MW-5D and CPT-1) have been performed at the site which indicate the Yorktown formation is at least 25 feet thick. On the north side of the landfill at MW-5D the clayey soils associated with the Yorktown formation were encountered from approximately 10 ft bgs to the termination of the boring at 40 ft bgs (40 ft AMSL to 10 ft AMSL). On the south southeast corner of the landfill at CPT-1, the clayey soils associated with the Yorktown formation were

encountered from approximately 10 ft bgs to the termination of the boring at approximately 35 ft bgs (55 ft AMSL to 30 ft AMSL).

The MSW landfill is constructed largely within and above the surficial Quaternary deposits, with embankment and cover soils derived largely from these sandy and silty sand soils. The Yorktown clays form a hydraulic base for the landfill.

1.6 Hydrologic Setting

1.6.1 Surface Water

The local surface water features in the immediate vicinity of the landfill include: Jerry's Creek; Wright's Creek; the drainage features in the waste disposal unit including a former sediment basin; and the farm pond located in the southeast corner of the site. The undisturbed natural topography in the areas surrounding the waste management units at the facility is characterized as gradual to moderate slopes toward these local surface water features. The surface of the landfill facility generally mimics these natural slope gradients and also discharges to these surface water features. Jerry's Creek is the primary receptor of surface water runoff from the landfill. Some areas of the landfill drain surface water directly to Jerry's Creek, while much of the central portion of the waste disposal unit drains to a topographic "horseshoe" feature in the northern boundary of the landfill. A sedimentation pond which is a remnant of former MSW operations collects the surface drainage in this area. Infiltration and percolation into the upper soil horizon is expected to be moderate due to the sandy loam content within this stratum. The uppermost aquifer underlying the landfill is expected to discharge to the local surface water features. During periods of rainfall with high surface water runoff, Jerry's Creek, Wright's Creek, the sediment pond, the southwest perimeter trench, and the farm pond may recharge the aquifer. Surface water features are shown on **Figure 2**.

1.6.2 Groundwater Hydrogeology

The Coastal Plain Physiographic Region of North Carolina is located between the uplands of the Piedmont and the Atlantic Ocean. Investigations of the Coastal Plain Region have identified as many as 10 aquifers separated by 9 confining units. However, these aquifers can basically be divided into three major deep aquifer systems in North Carolina: the Quaternary Aquifer System, the Tertiary Aquifer System, and the Cretaceous Aquifer System. Each of these three major aquifer systems are separated from each other by units of lower permeability composed of clays and silts. The Quaternary Aquifer is composed of surficial deposits of sandy silt and clay. The Tertiary Aquifer is composed of glauconitic sands, clayey sands, and limestone. The Cretaceous Aquifer is composed of sand, silty and clayey sand, and clay separated by confining units of clay and silt.

The uppermost aquifer at the site is unconfined and is found in the silty sands of the Quaternary-age Sunderland formation. This aquifer is recharged by inflow from upgradient areas and by infiltration of precipitation. The Tertiary-age Yorktown clay layer appears to act as a confining layer below the landfill. In some areas, this water may

be "perched" over the Yorktown clays beneath the Quaternary sands, rather than forming a true unconfined aquifer.

Groundwater within and below the landfill appears to result partially from lateral flow recharge through the sandy surficial soils from upland areas to the south flowing downgradient through the waste disposal unit toward Jerry's Creek. Surface water from the waste disposal unit surface also infiltrates through the sandy cap and cover soils and buried wastes to further recharge groundwater within and beneath the landfill. Just north of the waste disposal unit, groundwater levels are very near the ground surface and the water surface in the old sediment pond, which is likely further recharging groundwater in this area.

1.7 Site Conceptual Model

The Edgecombe County landfill is unlined and was constructed in the sandy soils of the geologically recent Quaternary deposits which overlie the Yorktown Formation in this area. The Quaternary deposits typically extend for a few feet below the base of the landfill, where they rest on a medium gray marine clay of the Yorktown. This Yorktown clay appears to form an aquitard beneath the sandy Quaternary deposits.

The topography of the area around the landfill slopes naturally from the south toward Jerry's Creek to the north. The unconfined aquifer is contained within the Quaternary sands and may be "perched" in some locations on the Yorktown clay. The groundwater in this unconfined aquifer generally follows the topography and flows from south to north over the basal Yorktown clay toward Jerry's Creek. In the area of Jerry's Creek, the groundwater is thought to converge with groundwater flowing south toward Jerry's Creek from the old landfill to the north. Thus, the Jerry's Creek topographic depression is thought to form a hydraulic barrier to groundwater flow from the active landfill. The mingled groundwaters from the active landfill and the northern old landfill apparently flow along the trace of the creek topographic depression, in a more easterly direction.

The detected groundwater contamination consists of mostly VOCs, one SVOC, and several metals, appearing at the compliance wells to the north, just downgradient of the limits of the landfill. The contaminants are limited to the shallow unconfined aquifer and no contaminants have been detected in the deeper aquifer beneath the Yorktown clay layer. The VOC concentrations at compliance wells MW-1A, MW-6, and MW-7 have a decreasing trend in recent years. The VOC levels at MW-5 have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring.

The mechanism for the release of contaminants from the MSW landfill appears to be largely due to surface water from precipitation infiltrating through the waste disposal unit cap, percolating through the buried MSW, and impinging as leachate on the groundwater flowing beneath the waste disposal unit. The geochemical indicator parameters support the interpretation that the generation of leachate in the MSW landfill is the primary contaminant mechanism. Analysis of collected landfill gas samples for non-methane

organic compounds indicate that some portion of the contamination reaching the underlying groundwater may also be attributed to landfill gas. Once the leachate reaches the groundwater, the contaminants are then carried by groundwater flow beyond the limits of the waste disposal unit toward Jerry's Creek.

Contributing factors to the release of contaminants from the waste disposal unit include:

- The western half of the MSW landfill cap is very flat with some soil berms that create ponding on the waste disposal unit surface.

- The closed MSW unit was capped with sandy soils because more clayey soils were not available. To achieve an effective permeability of approximately 1×10^{-5} cm/sec, an extra vegetative layer was added.

- On the eastern half of the landfill an active C&D unit overlies the closed MSW unit. Although the C&D materials may add additional components to the leachate percolating through the waste disposal unit, the combination of additional daily cover soils and the increased surface slope enhances the drainage of precipitation surface water from this portion of the waste disposal unit, reducing the total volume of water available for the generation of leachate.

- Until recently, the waste disposal unit cap supported very little vegetation. Vegetation protects the integrity of the cap and reduces the volume of surface water percolating through the cap by evapotranspiration.

- Due to the shallow water table aquifer and the elevation of the land surface to the south of the waste disposal unit, infiltrated surface water and/or shallow groundwater appears to enter the south side of the waste disposal unit into the wastes. This is providing another source of water for the generation of leachate.

- The waste disposal unit was constructed in what was previously a swampy area, indicating that the unconfined groundwater was at or very close to the ground surface. Ditches and drainage channels may have actually extended into the water table aquifer during wet seasons. A combination of possible filling of such ditches and channels and a rise in groundwater levels due to settlement of the waste disposal unit base from the weight of the waste may mean that some buried waste may be in direct contact with the groundwater.

- The old sedimentation pond located on the north side of the landfill in the "horseshoe" provides a collection point for shallow leachate seeps along the north face during wet seasons. The increased surface water directed to the center of the "horseshoe" from three sides also provides an infiltration source recharging and likely mounding the groundwater at the toe of the waste disposal unit.

2. CONTAMINANT CHARACTERIZATION

2.1 Constituents of Concern

Historical groundwater monitoring results have been compiled since the facility initiated groundwater monitoring in September of 1994. Several organic and inorganic constituents have been both historically detected exceeding 2L Standards/GWPST and *consistently* detected at compliance monitor well locations at the landfill facility. *Consistently* detected constituents are defined as those constituents that have been detected exceeding their respective groundwater quality standard during at least two separate semi-annual sampling events and also have been detected at least one time within the last three semi-annual sampling events at the landfill facility. S&ME reviewed historical monitoring results and previous statistical data for Edgecombe County Landfill to identify which organic and inorganic constituents are constituents of concern. Five organic compounds and one inorganic constituent have been identified as the COCs at the Edgecombe County Landfill. These organic compounds include the VOCs: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene. The inorganic constituent is the metal cobalt.

2.2 Background Concentrations

Three upgradient (background) monitor wells (MW-3B, MW-4, and MW-9) are currently sampled for water quality indicators and laboratory analyses as part of the semi-annual groundwater monitoring at the landfill facility. Review of historical groundwater monitoring data indicate that no VOCs or SVOCs have been detected exceeding 2L Standards/GWPST in the groundwater samples collected from upgradient monitor wells MW-3B, MW-4, and MW-9. Therefore, vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene remain organic COCs at the landfill facility.

Several inorganic constituents have been historically detected exceeding their respective groundwater quality standards in the groundwater samples collected from the upgradient wells. Four of these historically detected inorganics (cobalt, lead, thallium, and vanadium) have also been *consistently* detected at background and compliance monitor well locations. As discussed in **Section 1.3.3**, S&ME performed an ASD for metals in response to these inorganic constituent exceedances. The ASD found that concentrations of the naturally occurring lead and vanadium within the in-situ soil at the facility were sufficient to influence the concentrations of these metals in groundwater samples from the monitoring wells. Thallium was found to not represent a statistically significant increase above background values. Therefore, the concentrations of these constituents could be attributed to naturally occurring background values of these metals within the hydrogeologic regime. However, the results of the ASD analyses did not support influence to groundwater quality from the natural occurrence of the metal cobalt. Cobalt remains an inorganic COC at the facility.

2.3 Source Area Determination

The Nature and Extent Study indicates that the source area(s) for the contaminant plume are located within the landfilled MSW. The contaminant plume appears to be migrating outside of the waste boundary, north-northeast toward Jerry's Creek, but remaining on the landfill property. Historical surface water and temporary piezometer data indicate that the topographically low area located along Jerry's Creek is acting as a hydraulic barrier. The downgradient extent of the contaminant plume has been delineated along the northern property boundary and the contaminant plume is contained within the facility boundaries. In addition, the contaminant plume located within the waste disposal unit is confined to the surficial, uppermost aquifer.

Concentrations of the COCs at compliance monitor wells MW-1A, MW-6, and MW-7, located along the northern property boundary, have a decreasing trend or no trend, due to lack of detections, in recent years. The VOC levels at MW-5, located along the north-northeast property boundary, have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring. Elevated concentrations of the chlorinated compound tetrachloroethene and its daughter products have been historically detected at monitor well MW-5. Chlorinated COC trends in concentration over time are further discussed in **Section 5.1**. It appears that the source area(s) for the chlorinated COCs are located within the landfilled MSW hydraulically upgradient of monitor well MW-5.

The concentration of benzene in groundwater samples from monitor well MW-5 has strong evidence of a decreasing trend in recent years. Based on our interpretation of these conditions, benzene concentrations will likely not cause future compliance issues in the area of monitor well MW-5. Elevated concentrations of 1,4-dichlorobenzene have also been historically detected in the groundwater samples collected from compliance monitor well MW-5. However, no trend is evident for 1,4-dichlorobenzene concentrations in monitor well MW-5. It appears that the presence of benzene and 1,4-dichlorobenzene at the landfill is likely due to the direct transport from an upgradient source within the waste disposal unit.

In addition, the concentration of cobalt in groundwater samples from monitor well MW-5 has strong evidence of an increasing trend. The historical increasing trend of cobalt concentrations in groundwater suggests a potential source of cobalt hydraulically upgradient of this area.

2.4 Exposure Pathways

The landfilled waste disposed at the site is the most likely source of groundwater contamination observed in the area surrounding the waste disposal unit. Historical data indicate that geochemical leachate indicator parameters detected in groundwater samples collected from temporary piezometers and monitor wells were more elevated in the downgradient groundwater samples, along the northern property boundary, than in the upgradient groundwater samples. These data suggest that leachate from the MSW is contributing to the contamination observed in the downgradient piezometers and wells. It

appears that the infiltration of precipitation through the disposed waste mass is "leaching" contaminants from the waste, through the bottom of the unlined waste disposal unit, and to the groundwater below the waste management unit. Subsequent lateral migration of groundwater further transports and distributes the contamination to a surrounding larger area. In addition, shallow groundwater flowing into the waste disposal unit and through the landfilled waste is further aiding in the transport of contamination outside of the waste boundary. Therefore, soil leachate from landfilled MSW to groundwater is the most likely source of groundwater contamination at the landfill.

In general, potential exposure pathways from soil leachate to groundwater include the use of potable wells or surface water within the area of the facility. The NES has delineated the downgradient extent of the groundwater contaminant plume along the northern property boundary of the waste disposal unit and found that the contaminant plume is contained within the facility boundaries. In addition, historical surface water data indicate that no VOCs or SVOCs have been detected exceeding 2B Standards in the surface water samples collected at the landfill since semi-annual sampling was initiated in 1994. Several inorganic constituents have been historically detected exceeding 2B Standards in the surface water samples collected at the landfill including beryllium, cadmium, chromium, cobalt, lead, and zinc. However, no inorganic constituents have been detected exceeding 2B Standards in the surface water samples collected since January 2003. Therefore, it appears that the groundwater contaminant plume has not impacted surface water quality at the landfill.

The potential for direct exposure to MSW and the contaminants of concern by direct contact is low. The MSWs are covered by daily cover soils and the landfill cap. A large portion of the MSW landfill is further covered by the C&D landfill wastes. Therefore, exposure from contaminated soil at the landfill is limited.

Landfill gas is another potential exposure pathway for the VOCs at the facility. Eleven gas wells located along the perimeter of the waste disposal unit and five building structures currently comprise the regular methane gas monitoring system for the landfill. The locations of methane gas wells for the landfill facility are shown on **Figure 2**. The regular network methane gas monitor wells and building structures at the landfill are monitored on a quarterly basis. At various times (June 2001 - November 2002) the methane concentrations have exceeded the North Carolina Solid Waste Standards as promulgated in 15A North Carolina Administrative Code 13B (13B Standard). Edgecombe County has performed corrective measures to reduce the concentrations of methane at the facility's compliance points. These corrective actions were described in the following reports previously submitted to the Section: *Response to Environmental Assessment Requirements* dated June 2001 and *Methane Monitoring and Corrective Action Report* dated March 2002. Methane gas concentrations have not exceeded the 13B Standards in any of the monitored gas wells or building structures at the landfill since November 2002. Exposure from landfill gas at the facility is limited to methane vents located on the top of the waste disposal unit and the potential for significant direct exposure to these gases is considered low.

It appears that the potential for exposure to landfill contaminants, either through migrating leachate from the buried waste to the groundwater, contaminated soil, or landfill gas, is limited to the site.

2.5 Receptor Survey

As part of the Nature and Extent Study, S&ME completed visual observations for evidence of drinking water wells within a 1,500-foot radius of the waste disposal unit. The results of the survey show that there are nine (9) identified potable wells within a 1,500-foot radius of the waste disposal unit, including one potable well located on-site at the County-owned property comprising part of the facility. The potable well located on-site at the facility has been removed from service. The water for the facility is supplied from the County-wide municipal water distribution system. Eight properties were identified within 1,500 feet of the waste disposal unit where the potential presence of a potable well is unknown. Two (2) of the nine potable wells identified are known to be used for drinking water purposes. The use for two (2) of the nine potable wells identified is unknown. The majority of the properties containing potable wells are located at least 1,200 feet away from the waste disposal unit and at a topographically higher elevation than the landfill. However, three (3) potable wells, located at 2549, 2577, and 2595 Colonial Road, were identified approximately 600 to 900 feet northeast of the waste disposal unit and at a similar topographic elevation as the landfill facility. Property owners at all three addresses indicated that they are currently connected to the municipal water supply and use their potable wells for non-drinking water purposes, i.e. washing vehicles. Based on groundwater levels collected at the site vicinity, and the resulting potentiometric contours calculated, it appears that all of the potable wells identified within 1,500 feet of the landfill are hydraulically upgradient. Therefore, the level of risk to human health is expected to be low.

Jerry's Creek is the primary receptor of surface water runoff from the landfill. Wright's Creek is present along the northern property boundary of the northern old landfill. Wright's Creek converges with Jerry's Creek to the east of the old landfill and continues east to the Tar River.

3. SELECTED REMEDY/TECHNICAL APPROACH

3.1 Introduction

The selection process of the ACM has not yet been fully completed, pending meetings for public comment and input. Due to schedule requirements for submission of this Corrective Action Plan, alternatives for in-situ isolation combined with monitored natural attenuation (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the COCs at the waste disposal unit. MNA will be incorporated into the facility's water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect possible changes based on public comments.

In-situ isolation and MNA as the selected remedies at the Edgecombe County Landfill will involve the following:

- Installation of an upgradient groundwater barrier wall (Option 4A from ACM);
- Maintaining a consistent contour with pre-1998 waste area (Option 4B from ACM)
- Increase slope of the closed MSW area (Option 4C from ACM);
- Stormwater improvements on the western half of the landfill (Option 4D from ACM); and,
- Implementation of a MNA program to address impacted groundwater (Option 1 from ACM).

See **Figure 3** for a plan view of the conceptual remedies.

3.2 Technical Approach

3.2.1 Upgradient Groundwater Barrier Wall

Because of the shallow depth to groundwater in the upgradient region of the waste disposal unit, as well as the available space between the waste boundary and the facility boundary, an upgradient physical barrier that diverts groundwater around the landfill will restore groundwater quality at the facility. Diverting the flow of groundwater around the waste disposal unit would minimize interaction of the groundwater with the waste mass, thereby reducing leachate production. Installation of a barrier wall consisting of interlocking sheet piles will be designed. See **Figure 3** for a plan view of the barrier wall location.

An approximately 1,900 feet long, barrier wall will be installed to approximately 15 – 30 feet below ground surface along the southern boundary of the landfill. The barrier wall

will be anchored into the low permeability confining unit of the Tertiary-age marine clay layer (Yorktown Formation).

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; underground utility location and management; clearing, grading and erosion control.
- Installation of Barrier Wall: submittal of sheet pile materials make-up formulation for pre-approval by the Engineer; methods to determine the varying depth of the barrier wall in the field during construction to ensure that the barrier wall extends into the confining layer; installation of sheet pile wall methods; handling and relocation of excavated soil; quality control methods and testing.
- Site Restoration Requirements.

3.2.2 Maintaining a Consistent Contour with Pre-1998 Waste Area

Maintaining consistent contour elevations across the waste disposal unit where C&D waste is not currently being placed (western portion of waste disposal unit) will reduce groundwater contamination by reducing vertical percolation of pounded rain water into the waste mass which can produce leaching. Maintaining a consistent contour entails some initial grading operations to remove or regrade existing stormwater slope diversion berms on the landfill cap and maintenance to those areas where ditches, slumps, and sinkholes have formed from waste decomposition. Maintenance would involve filling or grading over only those anomalous surface deficiencies that facilitate the influx of water into the waste mass.

Maintaining a consistent contour would involve a continuous process of inspection and backfilling on a quarterly basis for existing or potential surface water collection locations followed by timely addition of backfill soil and reseeding.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; clearing, grading and erosion control.
- Site Grading and Backfilling Operation: grading and soil application plans to maximize transfer of stormwater off the waste disposal unit; specifications for acceptable types of fill (backfill materials will likely be supplied from Edgecombe County's on-site borrow sources); reseeding and establishment of vegetation; quality control methods and testing.
- Site Restoration Requirements.

3.2.3 Increase Slope of the Closed MSW Area

Increasing the slope of the cap will decrease the infiltration of stormwater into the MSW waste and reduce the potential for groundwater contamination. The eastern portion of the waste disposal unit is where the current C&D waste disposal is being conducted. The C&D waste has been placed over the existing MSW landfill cap and has increased the slope in this area. The waste placement also provides an additional barrier to stormwater infiltrating into the MSW landfill.

The slopes in the western portion of the MSW landfill are relatively flat with a majority of the area at a slope of approximately 5 to 6 percent. Increasing the slope in this area would involve moving the current C&D waste placement operations from the eastern portion of the waste disposal unit to the western portion. The C&D waste placement would increase the slope in this area and also provides an additional barrier to stormwater infiltrating into the MSW landfill.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; clearing, grading and erosion control.
- Site Grading and Filling Operation: soil and C&D waste application plans to maximize transfer of stormwater off the waste disposal unit; specifications for acceptable types of fill (backfill materials will likely be supplied from Edgecombe County's on-site borrow sources); an approximation of the application schedule versus project backfill and C&D waste applications; establishment of target fill grades and methods to measure the grades; quality control methods and testing.
- Site Restoration Requirements.

3.2.4 Stormwater Improvements on the Western Half of the Landfill

There are currently stormwater diversion trenches which run parallel to the direction of groundwater flow on both sides (eastern and western) of the waste disposal unit. A stormwater diversion trench located along the southern boundary of the waste disposal unit runs perpendicular to the direction of groundwater flow.

The diversion trenches located along the western and southwestern boundaries of the waste disposal unit (totaling approximately 3,100 feet in length) will be expanded and improved to serve as groundwater diversion ditches to transport groundwater and surface water diverted from the top of the waste disposal unit and from around the sides of the upgradient physical barrier wall. Water diverted in the upgradient region of the waste disposal unit, before interaction with the landfilled wastes, would likely not require pre-treatment before discharging to the downgradient receiving creek. See **Figure 3** for a plan view of the ditch locations.

The old sedimentation pond just north of the landfill is to be lined with low permeability fill material and improved to capture stormwater run-off from the waste disposal unit before discharging off-site. Reference the Edgecombe County Landfill *Closure and Post-Closure Plan*, dated June 30, 2008, for details on the stormwater management system. The remainder of this "horseshoe-shaped" area will be backfilled with low permeability fill material. **See Figure 3** for the location of this area. The old sedimentation pond in the horseshoe provides a collection point for shallow leachate seeps along the north face during wet seasons. The surface water directed from the landfill cap and side slopes to the sedimentation pond also provides an infiltration source recharging and likely mounding the groundwater at the toe of the waste disposal unit. The sedimentation pond will be improved in order to isolate stormwater run-off collecting in the pond from shallow groundwater and leachate migrating from the waste disposal unit.

The old sedimentation pond is less than one acre in size and may have been up to eight feet deep in some locations before the pond filled with sediment and plant growth. The total volume of the old sedimentation pond before it filled may have been approximately 8,000 cubic yards or more.

The rest of the horseshoe area, minus the area of the old sedimentation pond, is approximately 2 ½ acres in size. This area will be capped with low permeable fill and graded to direct surface water flow over this area rather than percolating into the groundwater.

Following approval of this CAP, a detailed design and contractor specifications package will be developed. Details that will be presented in the specifications package will include:

- Site Preparation Requirements: health and safety planning; securing construction permits; underground utility location and management; clearing, grading and erosion control.
- Stormwater Diversion Ditches: specifications of dimensions (width and depth) along the center line of the ditches; surveying to confirm grade points; excavation and placement of engineered fill requirements; quality control methods and testing.
- Grade and Line Old Sedimentation Pond: submittal of design and low permeable fill materials for pre-approval by the Engineer; plant removal and disposal; mucking out of sediment; handling and relocation of excavated sediment; placement and grading of low permeable fill material (backfill materials may be supplied from Edgecombe County's on-site borrow sources); and quality control methods and testing.
- Cap and Grade Horseshoe Area: backfill and compaction requirements; surveying to confirm grade points; and quality control methods and testing.
- Site Restoration Requirements.

3.2.5 Monitored Natural Attenuation for Groundwater

The COCs in groundwater at the landfill include the organic parameters: vinyl chloride, benzene, cis-1,2-dichloroethene, trichloroethene, and 1,4-dichlorobenzene, and the inorganic constituent: cobalt. Following construction of the corrective measures presented above, surface water and groundwater coming in contact with waste materials in the waste disposal unit will be minimized. Waste material leachate coming into contact with groundwater will then be minimized. The COCs in groundwater are then expected to naturally attenuate and trend toward cleanup goals. MNA will be implemented as the corrective measure for impacted groundwater.

Based on the years of groundwater monitoring, analytical data coupled with the various studies throughout the groundwater monitoring history of the facility, including the previously discussed NES, the primary substrate at the facility should contain a sufficient quantity of anthropogenic organic carbon to support biodegradation of the chlorinated solvent COCs. In addition, there is likely native organic carbon in trace amounts which will further enhance biodegradation rates of these constituents.

The contaminant of concern, cobalt, was detected in groundwater samples at levels of only up to 0.131 milligrams per liter (mg/L) within the last two years of groundwater monitoring (July 2006, January 2007, June 2007, and January 2008). The GWPST for cobalt is 0.07 mg/L. Cobalt in groundwater at the facility would be expected to attenuate by dispersion and absorption.

For the Edgecombe County Landfill, it has not yet been determined if the contaminant plume is still in a growth phase, stable phase, or if the plume has already reached its peak and is now a shrinking plume. At a time of one to three years following implementation of the isolation and water management correction measures presented above, the groundwater plume status at the facility would be determined during the MNA process.

This process would involve sampling the appropriate property boundary groundwater monitoring wells for the constituents found exceeding their respective 2L Standards/GWPST. After an appropriate amount of samples have been taken, assumptions may be drawn concerning the constituent magnitude concentration trend (increasing, decreasing, or static) in order to re-evaluate the dispersion and natural attenuation process effectiveness. The objectives for a MNA groundwater remediation program include the following:

- Demonstrate that natural attenuation is occurring;
- Be protective of human health and the environment;
- Monitor natural attenuation and environmental impact; and,
- Restore groundwater at the edges of the plume to below the 2L Standard and GWPST.

The existing monitoring network, plus additional monitor wells to be installed, will be used to monitor groundwater quality and trends. Monitoring wells MW-3B, MW-4, and MW-9, the upgradient wells, would allow determination of geochemical conditions in the

groundwater prior to entering the source area. Monitoring well MW-5 is located in the plume and will be utilized to collect data for bioremediation rate calculations. Additional wells will be installed along the downgradient facility boundary to define the edge of the plume and act as sentinel wells. These wells would be monitored and evaluated to determine if bioremediation is working as well as to determine if re-evaluation triggers have been exceeded. For additional information on the proposed evaluation of water quality at the landfill, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**.

4. WATER QUALITY MONITORING PLAN

An updated Water Quality Monitoring Plan (WQMP) is included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. The updated WQMP summarizes the activities and protocol recommended to perform monitoring at the subject site in general accordance with the requirements as specified in Sections .0600 and .1637(a)(1) of the North Carolina Solid Waste Management Rules (15A NCAC 13B). The WQMP is designed to effectively monitor groundwater and surface water quality in order to detect a release from the landfill into the uppermost aquifer underlying the landfill; monitor groundwater and surface water diverted and discharged from the facility as part of the proposed corrective actions; and monitor surface water downgradient of the facility during the implementation of corrective measures for the closed landfill.

5. EVALUATION OF CORRECTIVE ACTION EFFECTIVENESS

5.1 Evaluation of Natural Attenuation

Geochemical data and changes of site constituent concentrations with time are important in evaluating the effectiveness of natural attenuation. The NES Report previously prepared for the landfill discussed the changes of site constituent concentrations and plume characteristics with time.

The facility's water quality monitoring network has been sampled on a semi-annual basis since 1994. Groundwater and surface water samples collected from the water quality monitoring network have historically been analyzed for Appendix I constituents including VOCs and metals and Appendix II constituents including VOCs, SVOCs, metals, sulfide, and cyanide. In addition, groundwater and surface water samples have also been historically analyzed for several other constituents including PCBs, pesticides, and herbicides. However, the facility's water quality monitoring network has only been sampled for geochemical parameters on two occasions, in January 2003 and June 2007. Therefore, the current historical pool of geochemical data collected from the facility's water quality monitoring network is insufficient to evaluate geochemical parameter trends over time.

According to historical groundwater analytical data, concentrations of the COCs at compliance monitor wells MW-1A, MW-6, and MW-7, located along the northern property boundary, have a decreasing trend or no trend, due to lack of detections, in recent years. The evidence suggests that natural degradation is likely occurring in the area of monitor wells MW-1A, MW-6, and MW-7.

The VOC levels at MW-5, located along the north-northeast property boundary, have remained relatively consistent with some increase in the degradation "daughter" products of the detected VOCs, indicating that degradation of the primary VOCs is occurring. Elevated concentrations of the chlorinated compound tetrachloroethene have been historically detected at monitor well MW-5, until 2004. Trichloroethene is a daughter product from the degradation of tetrachloroethene. Concentrations of trichloroethene detected at MW-5 show a significant downward trend in concentrations over time. Two of the daughter products from the degradation of trichloroethene are cis-1, 2-dichloroethene and 1,1-dichloroethane. The concentration of cis-1,2-dichloroethene in groundwater samples from monitor well MW-5 has strong evidence of an increasing trend. This increase is likely due to the degradation of trichloroethene through natural attenuation processes. The concentration of 1,1-dichloroethane in groundwater samples from monitor well MW-5 has strong evidence of a decreasing trend. Vinyl chloride is a degradation product of cis-1,2-dichloroethene and 1,1-dichloroethane, and further breaks down to water and carbon dioxide through natural processes. The analysis of vinyl chloride concentrations shows no significant upward or downward trend in concentration over time at monitor well MW-5. Due to the degradation characteristics of vinyl chloride, relatively steady concentrations are expected while the larger alkene compounds degrade (Montgomery, 1996). Therefore, it appears that the site conditions are condusive

to natural attenuation processes and that natural attenuation is occurring within and surrounding the waste disposal unit.

Semi-annual groundwater and surface water monitoring of the water quality monitoring network for Appendix I constituents, and possibly Appendix II constituents, will continue. Annual groundwater and surface water monitoring of select monitor wells and surface water locations for geochemical parameters and Appendix I constituents, and possibly Appendix II constituents, will begin with the approval of this CAP. For additional information on the semi-annual compliance monitoring and annual corrective measures monitoring, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. Changes of site constituent concentrations and plume characteristics with time will be included in the annual corrective measures monitoring reports.

5.2 Evaluation of In-Situ Isolation

Changes in groundwater elevation data within the waste disposal unit are important in evaluating the effectiveness of the in-situ isolation program. In-situ isolation is proposed as part of the corrective measures in this report. However, there are currently no in-situ isolation structures in-place at the landfill facility.

Groundwater elevation data will be collected from the facility's water quality monitoring network, as discussed in the updated WQMP, on a quarterly basis. A decrease in groundwater levels under the waste disposal unit is expected after the in-situ isolation program is implemented. For additional information on the proposed collection of groundwater elevation data, see the updated Water Quality Monitoring Plan included in **Appendix II of the Facility Operation and Waste Acceptance Plan**. Operation and maintenance inspections of the in-situ isolation program will be conducted on a quarterly basis. Updated assessments of the effectiveness of the in-situ isolation program will be included in the annual reports.

6. CONTINGENCY PLAN

If it is determined that MNA in conjunction with in-situ isolation are not effectively reducing groundwater contamination at the landfill facility, then one or more of the following contingency plan options may be implemented.

6.1 Option 1 – Stormwater Improvements on the Eastern Half of the Landfill

If groundwater elevation data collected from monitor wells and piezometers at the landfill facility do not indicate a decrease in groundwater levels under the waste disposal unit, then improvement of stormwater structures on the eastern portion of the waste disposal unit will be implemented. Improving the stormwater structures on the eastern half of the landfill will decrease the infiltration of stormwater into the ground which could come in contact with the MSW waste and produce leaching. Structures that would be improved include the perimeter ditch which flows north along the eastern portion of the landfill, installing a new ditch between the southern access road and property line, and removing the pond located south of the maintenance building.

The eastern perimeter ditch would be re-graded to improve its slope and flow and be extended as necessary to convey stormwater away from the landfill. This would reduce the amount of stormwater infiltrating from the ditch and becoming groundwater which could come in contact with the waste and potentially produce leaching.

A new ditch will be installed between the southern access road and the property boundary. This ditch would intercept stormwater prior to reaching the landfill at a location farther away from the landfill than the existing perimeter ditch. During periods of high groundwater, the ditch would intercept a portion of the groundwater and divert it around the landfill.

The pond south of the maintenance building would be removed. This would reduce infiltration into groundwater and therefore reduce the groundwater level under the landfill.

6.2 Option 2 – Enhance Landfill CAP

If groundwater elevation data do not indicate a decrease in groundwater levels under the waste disposal unit after Option 1 of the contingency plan is implemented, then an alternate cover system will be placed on the eastern and western portions of the waste disposal unit to enhance the cap of the landfill. Enhancing the landfill cap will decrease the infiltration of stormwater into the ground which could come in contact with the MSW waste and produce leaching.

A proposed alternate cover system for the facility would be the following:

- erosion layer;
- low-permeability barrier; and
- geosynthetic clay liner (GCL).

The alternate cover system will be planted with grass to stabilize the cover soils, minimize erosion, and reduce maintenance. The soil will be prepared by fertilizing, amending the soil, and seeding in accordance with the North Carolina Erosion and Sediment Control Guidelines.

6.3 Option 3 – Landfill Gas Extraction

If statistically significant increasing trends are noted for the COCs trichloroethene, benzene, or 1,4-dichlorobenzene, then monitoring for that parameter(s) in the area of the increase may be expanded to quarterly for one year. During this time, a review of the contribution of landfill gas (LFG) to contaminant migration in that area will be completed to establish whether LFG extraction is needed if the trend continues. Groundwater contamination from LFG can occur through direct contact of groundwater with LFG; rising groundwater or infiltrating water washing contaminants from the vadose zone contaminated by LFG; LFG cooling in the soil outside the landfill causing condensate to form, which percolates to the groundwater; and acids in the LFG causing some naturally occurring metals in the soil to dissolve into the groundwater.

The waste disposal unit currently has a passive LFG system consisting of 60 vertical wells which vent the LFG to the atmosphere. The number of passive vents can be increased if a review of the spatial distribution and effective influence of the vents indicates a need for additional vents. Also, the passive system can be converted to an active system by installing new well heads which can be connected to a piping system which will connect to a blower. The blower will create a vacuum which will extract the LFG from the landfill. This reduces the pressure buildup of the LFG to prevent migration and potential groundwater contamination. Additional vertical wells can be installed to increase the effectiveness of the system.

Statistically significant increasing trends currently exist for the remaining COCs, vinyl chloride, cis-1,2-dichloroethene, and cobalt. If these increasing trends continue, the distribution of constituent concentrations will be evaluated to determine if quarterly monitoring and subsequent corrective actions are necessary.

7. SCHEDULE AND MAINTENANCE

Once the CAP is approved and a schedule has been finalized, implementation of the CAP will be initiated. An estimated schedule of tasks to be performed is provided below. The schedule assumes certain time frames for the regulator's review of submittals. Tasks and subtasks that are dependent on responses from the Section will be initiated after receipt of the Section's response. Per the North Carolina Solid Waste Management Rules, the Section has 90 days to complete their review of the submitted CAP and provide their comments.

The ACM Report has been submitted to the Section for approval, however, the selection process of the ACM has not yet been fully completed, pending meetings for public questions and input. Due to schedule requirements for submission of this CAP, alternatives for in-situ isolation combined with monitored natural attention (MNA) have been selected for completion of this plan. In-situ isolation was chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated Water Quality Monitoring Plan to evaluate the effectiveness of the remedial measures. After completion of the ACM subsequent to the public meeting process, an addendum to this CAP will be submitted, if necessary, to reflect any changes based on public comments.

The first phase of the project involves the preparation, submittal, and review of this CAP. The second phase involves the ACM public meeting process and possible preparation, submittal, and review of an addendum to this CAP, if needed. The third phase of the project involves implementation of MNA in conjunction with in-situ isolation. The performance of the MNA and in-situ isolation program will be evaluated annually and will coincide with one of the groundwater and surface water compliance monitoring events conducted semi-annually at the landfill facility. In addition, the physical structures installed as part of the in-situ isolation program (i.e. barrier walls, monitor wells, trenches) will be evaluated quarterly and will coincide with the current quarterly methane and maintenance inspection monitoring. Groundwater elevation data will be collected from the facility's water quality monitoring network on a quarterly basis. This schedule will be revised periodically to reflect knowledge developed with the implementation of the monitoring program.

If the contingency plan is required, a schedule of response will be developed based on the appropriate activity needed. If a failure of the in-situ isolation program is observed, no immediate negative response would be anticipated and no emergency actions would be required. However, notification of the change in status will be provided immediately and a proposed plan of action will be developed within 30 days.

A proposed scheduled of activities from date of CAP approval (expected by the end of 2008) is as follows:

	Duration	Time from CAP Approval
• Design and Specifications	90 days	90 days
• Specifications Out to Bid/ Pre-Bid Meeting	60 days	150 days
• Selection of Contractor(s)	30 days	180 days
• Installation of In-Situ Isolation Program ➢ Improve Diversion Ditches ➢ Install Barrier Wall ➢ Install Type II Monitor Wells ➢ Grade Cap ➢ Place Fill in Sedimentation Pond	18 months – 36 months	24 months – 42 months
• In-Situ Isolation Operation and Maintenance	Quarterly	N/A
• Collection of Groundwater Elevation Data	Quarterly	N/A
• Monitored Natural Attenuation (MNA) and Hydrogeological Monitoring	Annually	N/A
• Estimated Time Frame to Achieve Goals and Project Completion	Natural Attenuation Program and Performance Monitoring will be implemented until cleanup goals are achieved.	N/A

8. FINANCIAL ASSURANCE

The County has prepared a written estimate, in current dollars, of the cost of hiring a third party to implement the Corrective Action Plan for the facility. The CAP cost estimate is based on the most expensive total costs of implementation of the proposed corrective measures and accounts for annual and periodic costs over the entire performance monitoring period.

The County shall annually adjust the CAP cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Section.

The County shall increase the CAP cost estimate and the amount of financial assurance provided if changes in the CAP or facility conditions increase the maximum costs of the implementation of corrective measures.

The County may reduce the CAP cost estimate and the amount of financial assurance provided if the cost estimate exceeds the maximum remaining costs of corrective action. Prior to any reduction of the CAP cost estimate by the County, a written justification for the reduction shall be submitted to the Section. No reduction of the CAP cost estimate shall be allowed without the Section's approval.

The capital costs for the implementation of the CAP in-situ isolation program will be approximately $700,000. The CAP costs for maintenance and monitoring of the landfill facility will be approximately $50,000 annually. The CAP costs for closure of the corrective actions will be approximately $35,000. The total CAP costs will be approximately $2,235,000 over a 30-year period.

9. COMPLETION OF CORRECTIVE ACTIONS

Because the MSW remains in place at the waste disposal unit and the MSW is covered by daily cover soils and the landfill cap, the proposed remedy is expected to continue for an extended period of time. At some future point, after the achievement of 2L Standards/GWPST, the monitoring program will be revised from MNA and into a long-term maintenance monitoring. Once the in-situ isolation program is no longer required, the effectiveness of the in-situ isolation structures (i.e. barrier walls, monitor wells, trenches) will be evaluated to determine if the structures require maintenance and can remain in-place or require removal.

10. REFERENCES

Department of Environment and Natural Resources, Division of Water Quality, *15A NC Administrative Code Subchapter 2B .0200 Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of NC*, August 2004.

Department of Environment and Natural Resources, Division of Water Quality, *15A NC Administrative Code Subchapter 2L .0200 Groundwater Quality Standards*, December 2005.

Department of Environment and Natural Resources, Division of Waste Management, *15A NC Administrative Code Subchapter 13B .1634(h) Solid Waste Groundwater Protection Standard, Solid Waste Management Rules*, November 2004.

Montgomery, John H., *Groundwater Chemicals, Second Edition Desk Reference*, CRC Press, Inc., 1996.

S&ME, Inc., *Alternate Source Demonstration Report, Edgecombe County Landfill*, June 10, 2008.

S&ME, Inc., *Assessment of Corrective Measures Report, Edgecombe County Landfill*, June 26, 2008.

S&ME, Inc., *Closure and Post-Closure Plan, Edgecombe County Landfill*, June 30, 2008.

S&ME, Inc., *Nature and Extent Study, Edgecombe County Landfill*, June 25, 2008.

S&ME, Inc., *Methane Monitoring and Corrective Action Report, Edgecombe County Landfill*, March 2002.

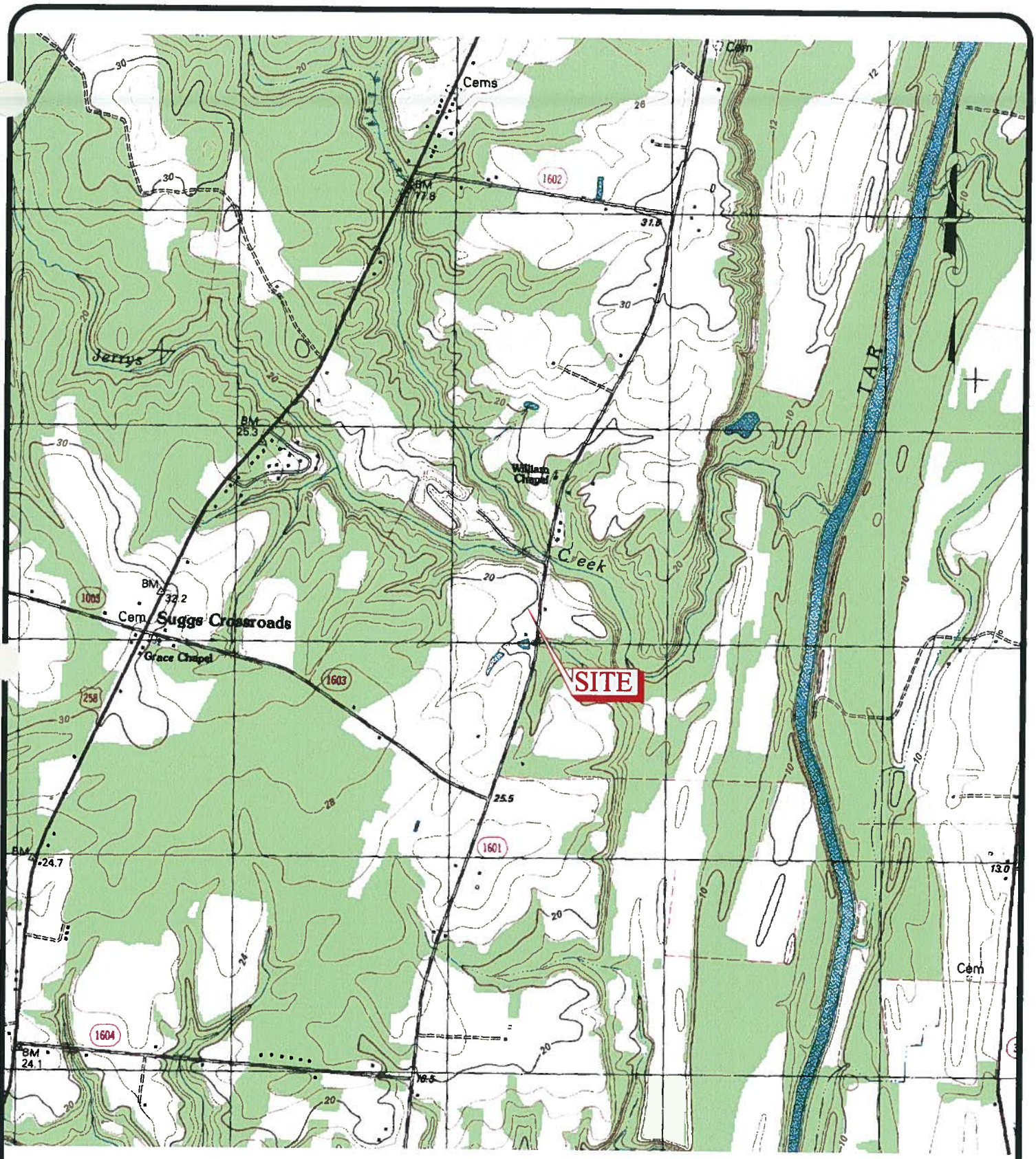
S&ME, Inc., *Response to Environmental Assessment Requirements, Edgecombe County Landfill,* June 2001.

S&ME, Inc, *Revision to the Sampling and Analysis Plan (SAP), Edgecombe County Landfill*, November 9, 1998.

S&ME, Inc., *Water Quality Monitoring Plan, Edgecombe County Landfill,* May 10, 1994.

US Department of Agriculture, Soil Conservation Service, *Soil Survey of Edgecombe County, NC*, November 1979.

FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

A-1105

SCALE:	1" = 2,000'
DATE:	JUNE 2008
DRAWN BY:	
PROJECT NO:	1054-07-241

S&ME
WWW.SMEINC.COM

VICINITY MAP

CORRECTIVE ACTION PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

FIGURE NO.
1

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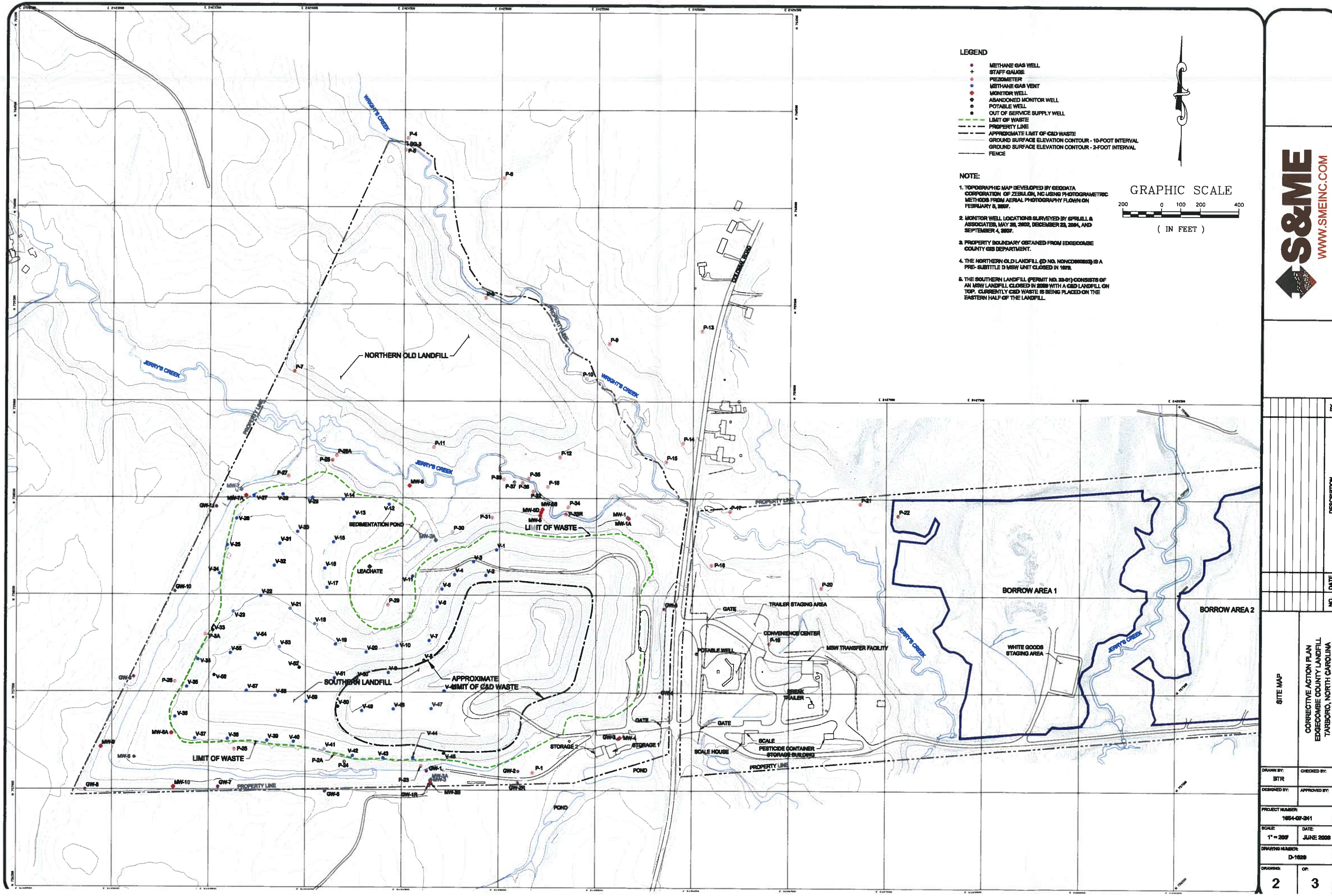
LEGEND
METHANE GAS WELL
STAFF GAUGE
PIEZOMETER
METHANE GAS VENT
MONITOR WELL
ABANDONED MONITOR WELL
POTABLE WELL
OUT OF SERVICE SUPPLY WELL
LIMIT OF WASTE
PROPERTY LINE
APPROXIMATE LIMIT OF C&D WASTE
GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
FENCE
NOTE:
1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES, MAY 28, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
4. THE NORTHERN OLD LANDFILL (ID NO. NONCD000000) IS A PRE- SUBTITLE D MSW UNIT CLOSED IN 1979.
5. THE SOUTHERN LANDFILL (PERMIT NO. 33-01) CONSISTS OF AN MSW LANDFILL CLOSED IN 2000 WITH A C&D LANDFILL ON TOP. CURRENTLY C&D WASTE IS BEING PLACED ON THE EASTERN HALF OF THE LANDFILL.
GRAPHIC SCALE
200
0
100
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400
(IN FEET)
S&ME
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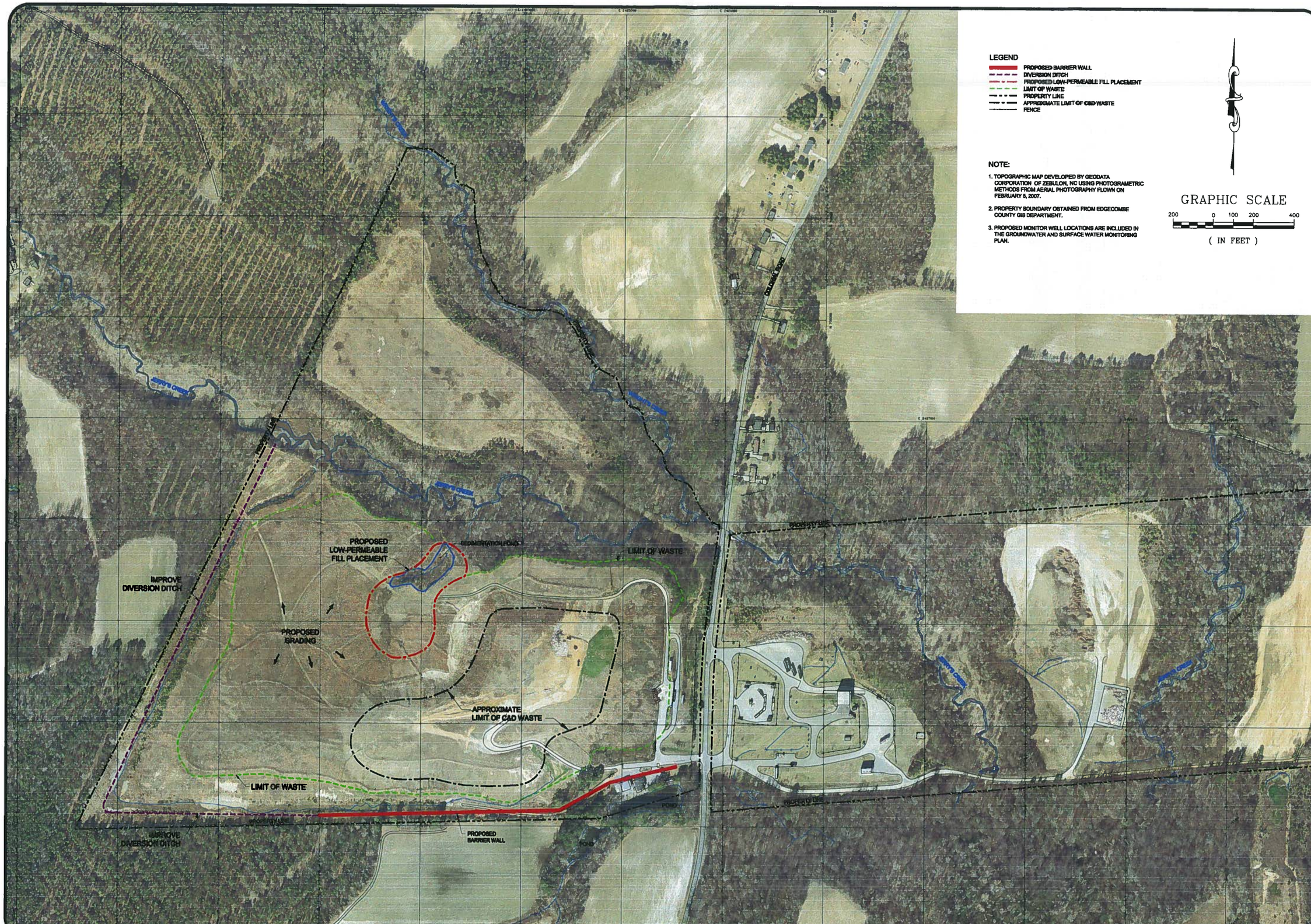
NORTHERN OLD LANDFILL
SOUTHERN LANDFILL
APPROXIMATE LIMIT OF C&D WASTE
LIMIT OF WASTE
SEDIMENTATION POND
LEACHATE
WRIGHT'S CREEK
JERRY'S CREEK
PROPERTY LINE
COLONIAL ROAD
BORROW AREA 1
BORROW AREA 2
WHITE GOODS STAGING AREA
TRAILER STAGING AREA
CONVENIENCE CENTER
MSW TRANSFER FACILITY
POTABLE WELL
BREAK TRAILER
GATE
SCALE
SCALE HOUSE
PESTICIDE CONTAINER STORAGE BUILDING
STORAGE 1
STORAGE 2
POND
NO.
DATE
DESCRIPTION
BY
SITE MAP
CORRECTIVE ACTION PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA
DRAWN BY:
BTR
CHECKED BY:
DESIGNED BY:
APPROVED BY:
PROJECT NUMBER:
1054-07-241
SCALE:
1" = 200'
DATE:
JUNE 2008
DRAWING NUMBER:
D-1029
DRAWING:
2
OF:
3



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NO.	DATE	DESCRIPTION	BY

PROPOSED CORRECTIVE MEASURES

CORRECTIVE ACTION PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241	
SCALE: 1" = 200'	DATE: JUNE 2008
DRAWING NUMBER: D-1030	
DRAWING: 3	OF: 3

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SECTION D-6

Registrations, Permits and Approvals

Corrective Action Permit Modification Application

Section C-6: Registrations, Permits, and Approvals

Edgecombe County is applying to continue operating their existing construction and demolition (C&D) landfill located at 2872 Colonial Road, south of Tarboro, North Carolina. The Edgecombe County C&D Landfill currently operates under Solid Waste Permit # 33-01 from the North Carolina Department of Environment and Natural Resources, Division of Waste Management (NCDENR-DWM).

In accordance with 15A NCAC 13B .1636, Edgecombe County is also applying to modify Solid Waste Permit # 33-01 to include a Corrective Action Plan (CAP). S&ME, Inc., on behalf of Edgecombe County, has prepared a CAP for remedial alternatives which combine in-situ isolation combined with monitored natural attenuation (MNA). These remedial alternatives were chosen because the site conceptual model indicates that water management issues are the primary mechanism for addressing the release and migration of the constituents of concern at the landfill. MNA has been incorporated into the facility's updated water quality monitoring plan (WQMP) to evaluate the effectiveness of the remedial measures.

Required registrations, permits, and approvals for the implementation of the CAP include the following:

- Land Disturbance Permit;
- Construction Permit;
- Erosion Control Permit; and,
- National Pollutant Discharge Elimination System (NPDES) Permit.

SECTION D-7

Edgecombe County Landfill Permit #33-01

NCDENR

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Division of Waste Management

Beverly Eaves Perdue
Governor

Dexter R. Matthews
Director

Dee Freeman
Secretary

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION

CONSTRUCTION AND DEMOLITION DEBRIS LANDFILL
Permit No. 33-01

Edgecombe County
is hereby issued a

PERMIT TO OPERATE

EDGECOMBE COUNTY C&D LANDFILL
A C&D LANDFILL UNIT ON TOP OF A CLOSED MSW LANDFILL – PHASES 1 & 2

AND POST-CLOSURE CARE REQUIREMENTS FOR THE CLOSED UNLINED MSW UNIT

located on 2872 Colonial Road (S.R. 1601), approximately 4.5 miles south of Tarboro, Edgecombe County, North Carolina, in accordance with Article 9, Chapter 130A, of the General Statutes of North Carolina and all rules promulgated thereunder and subject to the conditions set forth in this permit. The facility is located and described by the legal description identified on the deeds recorded for this property listed in Attachment 1 of this permit.

DN: cn=Edward F. Mussler III, P. E., o=Solid Waste Section, ou=Permitting Branch, email=ed.mussler@ncdenr.gov, c=US
Reason: I am approving this document
Date: 2010.03.31 15:44:47 -04'00'

Edward F. Mussler, III, P.E.,
Permitting Branch Supervisor
Solid Waste Section

ATTACHMENT 1

PART I: PERMITTING HISTORY

Permit Type	Date Issued	Document Identification Number (Doc ID No.)
Permit to Operate (PTO) MSWLF	July 05, 1979	9203
PTO C&DLF on top of MSWLF, Phase 1	December 30,1997	9204
PTO C&DLF, modification of Phase 1	April 28, 1998	9205
PTO C&DLF, amendment of Phase 1 in compliance with .0547 requirements and Phase 2	March 31, 2010	9853

1. From 1979 to 1997, the Edgecombe County Municipal Solid Waste Landfill (MSWLF) operated on this property as a permitted MSWLF under Permit No. 33-01, with a disposal area of 68 acres. The landfill was not constructed with a liner below the waste. The unlined MSWLF was incrementally operated from eastern section toward the western section. The eastern section, encompassing approximately 33 acres, began receiving waste in 1979 and was closed in 1991. The western section, encompassing approximately 35 acres, began receiving waste in 1991, stopped receiving wastes in 1997, and was closed in 2000. The size of the closed MSWLF disposal area is 68 acres. The volume of the closed MSWLF is approximately 340,618 tons or approximately 681,236 cubic yards.

2. In 1997, the transition plan for the MSWLF included a permit modification request to construct and operate a Construction and Demolition Debris Landfill (C&DLF) on top of the closed MSWLF. On December 30, 1997 the C&DLF on top of the closed MSWLF – Phase 1 began receiving waste. The total C&D waste foot prints consists of 21.2 acres.

PART II: LIST OF DOCUMENTS FOR APPROVED PLAN

1. *Transition Plan for the Edgecombe County Municipal Solid Waste Landfill*, Permit # 33-01. Prepared for: Edgecombe County, North Carolina. Prepared by: The Wooten Company. May 18, 1994. Amended July 1996.

2. *Amendment No. 15 to the Transition Plan for Edgecombe County, North Carolina.* Prepared for: Edgecombe County, North Carolina. Prepared by: The Wooten Company. December 8, 1997.

3. *Site Plans.* Prepared for: Edgecombe County, North Carolina. December, 1997.

4. Modification dated 28 April 1998: Certification letter dated 6 February 1998 addressing the placing of additional cover soil in a one acre area at the Edgecombe County landfill.

5. *Nature and Extent Study, Edgecombe County Landfill.* Prepared by: S&ME, Inc. June 25 2008.

6. *Assessment of Corrective Measures Report, Edgecombe County Landfill.* Prepared by: S&ME, Inc. June 26 2008. DIN 5253

7. *Permit Application, Edgecombe County C&D Landfill, Permit # 33-01, Tarboro, North Carolina.* Prepared by: S&ME, Inc. Dated June 2008. Revised through December 2009. The application includes *North Carolina Solid Waste Groundwater Corrective Action Permit Modification Application,* dated June 30, 2008, and *Water Quality Monitoring Plan,* dated June 30, 2008, revised August 2009. (Doc ID 9206).

PART III: PROPERTIES APPROVED FOR THE SOLID WASTE FACILITY

Edgecombe County, N.C. Register of Deeds				
Book	Page	Grantee	Grantor	Acres
889	562 - 564	Edgecombe County	Webb, J.B. Jr. and wife Webb, Mary S.	169.31*
787	315 - 317	Edgecombe County	Webb, J.B. Jr. and wife Webb, Mary S.	105.0
				Total Site Acreage: 274.31 acres

* The portions of the landfill facility property, 126.5 acres are occupied by the permitted Municipal Solid Waste Transfer Facility (Permit No. 33-02T) and other miscellanies waste management units. The C&D waste footprints encompass approximately 21.2 acres which is overlain the MSWLF unit.

PART IV: GENERAL PERMIT CONDITIONS

1. This permit is issued by the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section (Section). In accordance with North Carolina Solid Waste Management Rule 15A NCAC 13B .0201(d), a solid waste management facility permit shall have two parts: a Permit to Construct and a Permit to Operate. The Permit to Operate for Phase 2 shall expire March 31, 2015. The Permit to Operate must be implemented in accordance with Attachment 3 of this permit.

2. The persons to whom this permit is issued ("permittee") are the owners and operators of the solid waste management facility.
3. This permit shall not be effective until the certified copy of this permit which references legal descriptions for all land within the solid waste management facility boundary is recorded in the Register of Deeds office and indexed in the grantor index under the name of the owner of the land in the county or counties in which the land is located. The certified copy of the permit, affixed with the Register's seal and the date, book, and page number of recording, must be returned to the Section within 30 calendar days of issuance of this permit. If the Section does not receive the certified copy of the recorded permit within 30 calendar days of issuance of the permit, then and in that event, the permit is suspended and of no effect until the date the Section receives the certified copy of the recorded permit.

4. When this property is sold, leased, conveyed, or transferred in any manner, the deed or other instrument of transfer must contain in the deed description section, in no smaller type than that used in the body of the deed or instrument, a statement that the property has been used as a sanitary landfill and a reference by book and page to the recordation of the permit.

5. By beginning construction or receiving waste at this facility the permittee shall be considered to have accepted the terms and conditions of this permit.

6. Construction and operation of this solid waste management facility must be in accordance with the Solid Waste Management Rules, 15A NCAC 13B, Article 9 of Chapter 130A of the North Carolina General Statutes (NCGS 130A-290, et seq.), the conditions contained in this permit, and the approved plan. Should the approved plan and the rules conflict, the Solid Waste Management Rules shall take precedence unless specifically addressed by permit condition.

7. This permit is issued based on the documents submitted in support of the application for permitting the facility including those identified in Attachment 1, "List of Documents for Approved Plan," and which constitute the approved plan for the facility. Where discrepancies exist, the most recent submittals and the Conditions of Permit shall govern.

8. This permit may be transferred only with the approval of the Section, through the issuance of a new or substantially amended permit in accordance with applicable statutes and rules. In accordance with NCGS 130A-295.2(g), the permittee must notify the Section thirty (30) days prior to any significant change in the identity or business structure of either the owner or the operator, including but not limited to, a proposed transfer of ownership of the facility or a change in the parent company of the owner or operator of the facility.

9. The permittee is responsible for obtaining all permits and approvals necessary for the development of this project including approval from appropriate agencies for sedimentation and erosion control, and a General or Individual National Pollutant Discharge Elimination System (NPDES) Stormwater Discharge Permit, if applicable. Issuance of this permit does not remove the permittee's responsibilities for compliance with any other local, state or federal rule, regulation or statute.

- End of Section -

ATTACHMENT 2
CONDITIONS OF PERMIT TO CONSTRUCT

1. Construction of any C&D landfill future phases or cells requires written approval of the Section. An application for Permit to Construct must be prepared in accordance with applicable statutes and rules in effect on that date and will be subject to a permitting fee.

- End of Section -

ATTACHMENT 3
CONDITIONS OF OPERATING PERMIT

PART I: OPERATING CONDITIONS

1. The Permit to Operate for Phase 2 shall expire March 31, 2015. Pursuant to 15A NCAC 13B .0201(g), no later than September 30, 2014, the permittee must submit to the Section:

    a. A permit amendment application prepared in accordance with 15A NCAC 13B .0535 (b), and

    b. A Corrective Action Evaluation Report to demonstrate the effectiveness of the implemented corrective action program in accordance with 15A NCAC 13B .0547(4)(c) and the approved Corrective Action Plan (Attachment 1, Part II, Document No. 7).

2. This permit approves the continued operation of the C&DLF on top of the closed MSWLF- Phases 1 and 2, as well as the onsite environmental management protection facilities as described in the approved plans. Operation of any C&DLF future phases or cells requires written approval of the Section and must be constructed in accordance with applicable statutes and rules in effect at the time of review.

3. The following table lists the dimensions and details for the existing C&DLF on top of the closed MSWLF. Total gross capacity for the C&DLF unit is defined as the volume measured from the bottom of C&D waste (the top of the cover system of the MSWLF) through the top of final cover of the C&DLF. Fill operations must be contained within the approved elevation contours as shown on Drawing 4 of 7/Drawing No. D-1103-1) and Drawing 5 of 7/Drawing No. D-1103-2 (Doc ID 9206). The maximum approved fill elevation, as shown on Drawing 3 of 7/Drawing No. D-1096 is up to the elevation of 158 feet above mean sea level. The estimated service life of the facility is 38.5 years, as stated in the approved plan, Table 1 (Attachment 1, Part II, Document No. 7, Doc ID 9206).

C&D Landfill Unit on Top of Closed MSWLF	Gross Capacity (cubic yards)	Estimate Service Life (year)	Status
Phase 1 (filled as of 2008)	605,500	-	Filled
Phase 2 (lateral expansion)	111,500	5	To be filled
Phase 3 (lateral expansion)	112,000	5	Not developed
Phase 4 (lateral expansion)	115,000	5	Not developed

Phase 5 (vertical expansion)	167,500	5	Not developed
Phase 6 (vertical expansion)	174,800	5	Not developed
Phase 7 (vertical expansion)	156,400	5	Not developed
Phase 8 (vertical expansion)	178,600	5	Not developed
Phase 9 (vertical expansion)	78,700	5	Not developed
Total	1,7000,000	38.5	

4. The permittee must maintain permanent markers that accurately identify the edge of the approved waste disposal boundary. The boundaries of both the C&DLF unit and the closed MSWLF unit must be marked.

5. The C&DLF is permitted to receive the following waste types:

   a. "Construction or demolition debris" as defined in NCGS 130A-290 (a)(4) means solid waste resulting solely from construction, remodeling, repair or demolition operations on pavement, buildings, or other structures, but does not include inert debris, land-clearing debris or yard debris.

   b. "Inert debris" as defined in NCGS 130A-290 (a)(14) means solid waste that consists solely of material such as concrete, brick, concrete block, uncontaminated soil, rock, and gravel.

   c. "Land-clearing debris" as defined in NCGS 130A-290 (a)(15) means solid waste that is generated solely from land-clearing activities, limited to stumps, trees, limbs, brush, grass, and other vegetative material.

   d. "Asphalt" in accordance with NCGS 130-294(m).

   e. Solid waste that is generated by mobile or modular home manufacturers and asphalt shingle manufacturers in Edgecombe County. The waste must be source separated at the manufacturing site and must exclude municipal solid waste, hazardous wastes, and other wastes prohibited from disposal at this landfill. It must be transported to the landfill in a shipment or container that consists solely of the separated waste to be disposed.

6. Regulated asbestos-containing material as defined in 40 CFR 61 must be managed in accordance with 40 CFR 61. Disposal of asbestos waste must be in accordance with 15 NCAC 13B .0542 (c).

7. Those wastes listed in 15A NCAC 13B .0542 (e) must not be accepted for disposal, including, but not limited to, hazardous waste, municipal solid waste, liquid waste, commercial or industrial wastes, and yard trash.

8. Wastewater treatment sludge is not approved for disposal. Wastewater treatment sludge may be accepted, with the approval of the Section, for utilization as a soil conditioner and incorporated into or applied onto the vegetative growth layer. The wastewater treatment sludge must not be applied at greater than agronomic rates nor to a depth greater than six inches.

9. The facility is approved to accept average 42 tons per day or approximately 12,600 tons per year based on 300 working days per year in accordance with the approved plans. Maximum variance shall be in accordance with NCGS 130A-294(b1)(1).

10. This facility is permitted to receive C&D waste generated in the following North Carolina counties: Edgecombe, Nash, Halifax, Wilson, Pitt, and Martin.

11. The permittee must not knowingly dispose of C&D waste that is generated within the boundaries of a unit of local government that by ordinance:

    a. Prohibits generators or collectors of C&D waste from disposing of that type or form of C&D waste.

    b. Requires generators or collectors of C&D waste to recycle that type or form of C&D waste.

12. The facility operator must complete an approved operator training course in compliance with NCGS 130A-309.25.

    a. A responsible individual certified in landfill operations must be on-site during all operating hours of the facility at all times while open for public use to ensure compliance with operational requirements.

    b. All pertinent landfill-operating personnel must receive training and supervision necessary to properly operate the C&DLF unit in accordance with NCGS 130A-309.25 and addressed by memorandum dated November 29, 2000.

13. The permittee must actively employ a training and screening program at the facility prepared in accordance with 15A NCAC 13B .0544(e) for detecting and preventing the disposal of excluded or unauthorized wastes. At a minimum, the program must include:

    a. Random inspections of incoming loads or other comparable procedures;

    b. Records of any inspections;

c. Training of personnel to recognize hazardous, liquid, and other excluded waste types.

d. Development of a contingency plan to properly manage any identified hazardous, liquid, MSW, or other excluded or unauthorized wastes. The plan must address identification, removal, storage, and final disposition of these wastes.

14. The use of alternative periodic cover requires approval, prior to implementation, by the Section. Requests for alternative periodic cover approval must include a plan detailing the comprehensive use and a demonstration of the effectiveness of the alternative cover, developed according to Section guidelines. Plans that are approved by the Section will be incorporated into, and made a part of, the approved documents listed in Attachment 1.

15. Financial assurance must be continuously maintained for the duration of the facility in accordance with Rules 15A NCAC 13B .0547 (4)(e), 15A NCAC 13B .1628, and NCGS130A-295.2(h). During the active life of the C&DLF, the owner and operator must annually adjust the cost estimates including closure and post-closure activities for inflation within 60 days prior to the anniversary date of the establishment of the financial instrument(s).

16. All sedimentation and erosion control activities must be conducted in accordance with the Sedimentation Control Act NCGS 113A-50, et seq., and rules promulgated under 15A NCAC 4. All required sedimentation and erosion control measures must be installed and operable to mitigate excessive on-site erosion and to prevent silt from leaving the area of the landfill unit during the service life of the facility.

17. Facility construction, operations or practices must not cause or result in a discharge of pollution, dredged material, and/or fill material into waters of the state in violation of the requirements under Sections 401 and 404 of the Clean Water Act, as amended.

18. Modifications to the approved sedimentation and erosion control activities require approval by the North Carolina Land Quality Section. The Section must be notified of any sedimentation and erosion control plan modifications.

PART II: MONITORING AND REPORTING REQUIREMENTS

19. Groundwater and surface water monitoring must be conducted in compliance with Rules 15A NCAC 13B .1630 through .1637, and .0602, and the approved monitoring plan (Attachment 1, Part II, Document No 7, Doc ID 9206). Any proposed modification to an approved plan must be submitted to the Section and approved prior to implementation.

20. Groundwater quality is subject to 15A NCAC 2L – Groundwater Classifications Standards and the Groundwater Protection Standards (GPS) established under Rule .1634(i). Surface water is subject to 15A NCAC 2B – Surface Water and Wetlands Standards.

21. A total of twelve (12) ground water wells (MW-1B, MW-3B, MW-4, MW-5, MW-6, MW-9A, MW-11 through MW-16), and two (2) surface water locations (SW-1 and SW-2), comprise the approved groundwater and surface water monitoring network for the facility, unless otherwise specified by the Section (Attachment 1, Part II, Document No. 7, Doc ID 9206).

    a. The permittee must obtain approval from the Section for the design, installation, and abandonment of any monitoring well or corrective action program well.

    b. A licensed geologist must be present to supervise the installation of groundwater monitoring wells and corrective action program wells. The exact locations, screened intervals, and nesting of the wells must be established after consultation with the Section Hydrogeologist prior to well installation.

    c. Each groundwater monitoring well and corrective action program well must be surveyed in accordance with 15A NCAC 13B .1632 (d)(1).

    d. Each groundwater monitoring well and corrective action program well must have an identification plate permanently attached to the well, in accordance with 15A NCAC 2C .0108(o).

    e. Hydraulic conductivity and effective porosity values must be established for each screened interval in order to develop groundwater flow characteristics.

    f. Within thirty (30) days of completed construction of each new groundwater monitoring well and corrective action program well, the well construction record (GW-1b form), well schematic, boring log, field log and notes, and description of well development activities must be submitted to the Section. The submittal must also include a scaled topographic map, showing the location and identification of new, existing, and abandoned wells and piezometers, and hydraulic conductivity and effective porosity values, as described in subparagraphs c and e of this Permit Condition.

    g. Within thirty (30) days of the abandonment of a groundwater monitoring well or corrective action program well, the well abandonment record (GW-30 form) and any additional information included in the abandonment record must be submitted

to the Section, consistent with 15A NCAC 2C .0114(b), and must be certified by a Licensed Geologist.

h. Documentation of well completion, development details, repair, abandonment, and all other pertinent activities associated with each monitoring well and corrective action program well must be maintained in the facility operating record.

i. A readily accessible, unobstructed path must be maintained so that monitoring wells, corrective action program wells, and surface water sampling locations are accessible using four-wheel drive vehicles.

22. The permittee must sample groundwater monitoring wells and surface water locations semi-annually unless otherwise specified by the Section. Water samples must be analyzed for constituents listed in Appendices I of 40 CFR Part 258, cobalt, mercury, chloride, manganese, sulfate, iron, specific conductance, pH, temperature, alkalinity, and total dissolved solids according to the approved Water Quality Monitoring Plan (Doc ID 9206). Sampling frequency and sampling constituents are subject to change according to requirements of the applicable corrective action program.

23. Monitoring reports of the analytical results for surface water and groundwater monitoring sampling events, and for corrective action program monitoring, must be submitted to the Section within 120 days of the sample collection date. Analytical laboratory data must be submitted in electronic portable document format (pdf) and in a spreadsheet format in an Electronic Data Deliverable (EDD) Template. All monitoring reports must contain:

a. a potentiometric surface map for the current sampling event,

b. analytical laboratory reports and summary tables,

c. statistical analysis of laboratory data, in accordance with 15A NCAC 13B .1634,

d. a completed Solid Waste Environment Monitoring Data Form, and

e. laboratory data submitted in accordance with the EDD Template.

24. All groundwater, surface water, corrective action program, and methane gas monitoring forms, reports, maps, plans, data, and correspondence submitted to the Section must include an electronic (pdf) copy.

25. The permittee must maintain a record of all monitoring events and analytical data in the operating record.

26. After completion of the post-closure monitoring period, in accordance with 15A NCAC 13B .1627, and completion of the corrective action program, the Section will determine if further monitoring and post-closure maintenance will be required.

GROUNDWATER CORRECTIVE ACTION PROGRAM SPECIFIC CONDITIONS

27. Pursuant to Rule 15A NCAC 13B .1637, the permittee must implement a corrective action program to remediate elevated constituents in groundwater in accordance with the approved Corrective Action Plan (CAP), Attachment 1, Part II, Document No. 7, Doc ID 9206. The approved corrective action program consists of Monitored Natural Attenuation (MNA) coupled with in-situ isolation by installing an upgradient groundwater barrier wall and with stormwater improvement on the western half of the landfill. Stormwater improvements on the eastern half of the landfill, construction of an alternate cover system, and/or extension of the landfill gas control system are selected as the contingency plan. Any proposed modifications to the approved CAP must be submitted to the Section and approved prior to implementation. Letter from the Section approving the CAP is Doc ID 6622.

28. The MNA performance monitoring network consists of twelve (12) monitoring wells (MW-1B, MW-3B, MW-4, MW-5, MW-6, MW-9A, MW-11 through MW-16), unless otherwise specified by the Section. Sampling frequency and constituents to be analyzed must be conducted in accordance with the approved CAP and the Water Quality Monitoring Plan (Doc ID 9206).

29. Institutional controls (deed recordation, land and groundwater use restrictions) must be implemented as part of a groundwater treatment system consisting of MNA pursuant to NCGS 143B-279.9 and 143B-279.10. The land and groundwater use restrictions will be imposed on the permitted facility and any buffer property that has been acquired to reduce or eliminate the danger to public health or the environment posed by the presence of contamination on the property. The permittee must submit to the Section, within 180 days of being notified to do so, a survey plat, in accordance with the requirements of NCGS 143B-279.10, and as directed by the Section.

30. The permittee must provide a Corrective Action Evaluation Report to describe of the performance and effectiveness of the implemented corrective action program, including a technical evaluation of MNA as a remedy at the facility. The first report must be submitted in accordance with Permit Condition 1, Attachment 3, Part I. Subsequent reports are required every 5 (five) years unless otherwise specified by the Section.

31. After the MNA baseline has been established, an EPA approved MNA screening model is required at least annually to simulate the groundwater remediation at the facility and determine the mass flux and mass balance. The model must be submitted annually with a monitoring report.

32. If the objectives of the corrective action program are not being met, as specified in the approved CAP, Rules, or as determined by the Section, the permittee must immediately implement the Contingency Plan in the approved CAP.

33. If constituents in groundwater migrate beyond the landfill property boundary, or it is suspected to have occurred based on sampling results near the property boundary, the permittee must immediately notify all persons in writing who own land or reside on land that directly overlies any part of the contaminant plume with details of the migration. The permittee must mitigate further releases to the groundwater, reduce threats to human health and the environment, and immediately implement the Contingency Plan in the approved CAP.

34. If the corrective action program is modified to include an active groundwater treatment system:

    a. The permittee must operate the groundwater treatment system in a manner that will prevent spills, releases or other adverse affects to human health and the environment.

    b. The permittee must maintain an inspection schedule for the inspection of all parts of the groundwater treatment system as outlined in the approved CAP.

    c. The permittee must train all personnel operating the groundwater treatment system as outlined in the approved CAP.

    d. The permittee must sample the groundwater in the impacted aquifer, the groundwater as it enters and exits the groundwater treatment system and measure the volume and rate of flow of groundwater through the groundwater treatment system as indicated in the approved CAP. The data must be submitted to the Section with a monitoring report.

35. The permittee must continue to operate the corrective action program until the 15A NCAC 2L Groundwater standards and the GPS have been met at all points within the plume of contamination that lie beyond the relevant point of compliance for 3 (three) consecutive years, in accordance with 15A NCAC 13B .1637.

LANDFILL GAS MONITORING REQUIREMENTS

36. Landfill gas monitoring must be conducted at the facility in accordance with the approved landfill gas monitoring plan (Doc ID 9206) and Rule .1626 (4). The permittee must

sample landfill gas quarterly unless otherwise required for corrective action or specified by the Section.

37. A total of eleven (11) landfill gas probes (GW-1R, GW-2R, GW-3 through GW-11) comprise the approved monitoring network for the facility (Attachment 1, Part II, Document No. 7, Doc ID 9206), unless otherwise approved or specified by the Section.

    a. The permittee must obtain approval from the Section for the design, installation, and abandonment of any landfill gas monitoring probe or well.

    b. A licensed geologist must be present to supervise the installation of landfill gas monitoring probes or wells. The exact locations, screened intervals, and nesting of the probes or wells must be established after consultation with the Section hydrogeologist prior to probe or well installation.

    c. Each landfill gas monitoring probe or well must be surveyed for location and elevation by a North Carolina Registered Land Surveyor.

    d. Each landfill gas monitoring probe or well must have an identification plate permanently attached to the well, in accordance with 15A NCAC 2C .0108 (o).

    e. Within thirty (30) days of the completed construction of each new landfill gas monitoring probe or well, a schematic of the probe or well, to include boring log, depth, and screened interval, must be submitted to the Section. The submittal must also include a scaled topographic map, showing the location and identification of new, existing, and abandoned landfill gas monitoring probes and wells.

    f. Within thirty (30) days of the abandonment of a landfill gas monitoring probe or well, an abandonment record must be submitted to the Section. The boring must be abandoned in accordance with 15A NCAC 2C .0113(d) and be certified by a Licensed Geologist.

    g. All records of landfill gas monitoring probe or well installation, repair, abandonment, and all other pertinent activities associated with each landfill gas monitoring probe or well must be placed in the facility's operating record.

    h. A readily accessible, unobstructed path must be maintained so that landfill gas monitoring probes or wells are accessible using four-wheel drive vehicles.

38. All landfill gas monitoring must be conducted by properly trained personnel. Methane monitoring must include interior monitoring of onsite buildings.

39. Landfill gas monitoring reports must be added to the facility's operating record within 7 days of the monitoring event, and must include a description of the monitoring method used, the sampling results of each well and onsite buildings in percent of the lower explosive limit (LEL), date of monitoring, weather conditions, calibration report, and signature of the sampling personnel.

40. The permittee must maintain records of all landfill gas monitoring events in the operating record, in accordance with 15A NCAC 13B .0542 (n).

41. If landfill gas monitoring reveals detections of methane of at least 25 percent of the LEL in onsite buildings, or detections of LEL at the compliance boundary, the permittee must comply with the requirements of 15A NCAC 13B .1626 (4).

REPORTING REQUIREMENTS

42. Copies of this permit, the approved plans, and all records required to be maintained in the operating record by the permittee must be maintained at the facility, unless otherwise approved by the Section, and made available to the Section upon request during normal business hours.

43. The permittee must maintain records of :

    a. The amount of all accepted solid waste materials as (i) C&D wastes, (ii) alternative cover material used as alternate periodic cover, and (iii) recyclable material.

    b. Daily records of waste received, and origins of the loads.

    Scales must be used to weigh the amount of waste received. The daily records are to be summarized into a monthly report for use in the required annual reports.

44. On or before August 1 annually, the permittee must submit an annual facility report to the Section, on forms prescribed by the Section.

    a. The reporting period shall be for the previous year beginning July 1 and ending June 30.

    b. The annual report must list the amount of waste received and landfilled in tons and be compiled:

i. On a monthly basis.
ii. By county, city or transfer station of origin.
iii. By specific waste type.
iv. By disposal location within the facility.
v. By diversion to alternative management facilities.

c. A measurement of volume utilized in the C&D cells must be performed during the second quarter of the calendar year. The date and volumes, in cubic yards, must be included in the report.

d. The amount of C&D waste, in tons from scale records, disposed in landfill cells since December 30, 1997, through the date of the annual volume survey must be included in the report.

e. The tons of C&D waste recycled, recovered or diverted from disposal including a description of how and where the material was ultimately managed, as applicable, must be included in the report.

f. The completed report must be forwarded to the Regional Environmental Senior Specialist for the facility by the date due on the prescribed annual facility report form.

g. A copy of the completed report must be forwarded to each county manager for each county from which waste was received at the facility. Documentation that a copy of the report has been forwarded to the county managers must be sent to the Regional Environmental Specialist by the date due on the prescribed annual facility report form.

PART III: CLOSURE AND POST-CLOSURE

45. The permittee must conduct closure and post-closure activities in accordance with the approved plans (Attachment 1, Part II, Document No 7) and Rule 15A NCAC 13B .1627. An updated closure and post-closure plan must be submitted for approval at least ninety (90) days prior to closure or partial closure of any landfill unit. The plan must include all steps and measures necessary to close and maintain the C&DLF in accordance with all rules in effect at that time. At a minimum, the plan must address the following:

a. Design of a final cover system in accordance with 15 NCAC 13B .1627 (c) or the solid waste management rules in effect at the time of closure;

b. Construction and maintenance/operation of the final cover system and erosion control structures; and

c. Surface water, ground water, and explosive gas monitoring.

46. If the minimum 30-year post-closure period ends before the groundwater corrective action program is terminated, pursuant to Rule .1627 (d)(2)(B) of 15A NCAC 13B, the post-closure care period shall be extended at least until such time as the required corrective action program has been completed.

PART IV: MISCELLANEOUS SOLID WASTE MANAGEMENT UNIT SPECIFIC CONDITIONS

GENERAL CONDITIONS

47. Wastes received and product stored shall be temporary stockpiled in the designated area as shown on Figure 2 of 7/Drawing No. D-1093 in the approved Facility Plan.

48. The permittee shall operate and manage each unit in accordance with all applicable statutes and rules of the State of North Carolina.

49. Wastes received and product stored shall be maintained in reasonably sized piles with adequate fire breaks and lanes in accordance with the approved operational plans and the pertinent rules.

50. Surface water shall be diverted from all operational and storage areas to prevent standing water in operational areas and under or around storage piles. Water that comes in contact with solid waste is deemed to be leachate and shall be contained on-site or properly treated prior to discharge.

51. These areas shall be operated and maintained with sufficient dust control measures to minimize airborne emissions and to prevent dust from becoming a nuisance or safety hazard.

52. These areas shall be operated and maintained in a manner so as to minimize odors, prevent the creation of a nuisance, potential health hazard, or a potential fire hazard.

53. Effective vector control measures shall be applied as necessary to control flies, rodents, insects, and vermin.

MOBILE HOME DECONSTRUCTION AREA CONDITIONS

54. Mobile homes that are defined in NCGS 105 - 164.3(20) and generated from mobile or modular home manufacturers located in Edgecombe County will be accepted for deconstruction.

55. The permittee must implement the approved plan (Appendix IV of the Operation and Waste Acceptance Plan in Attachment 1, Part II, Document No. 7) to temporary store mobile homes, stockpile recyclable materials, and conduct deconstruction activities. The storage and deconstruction activities shall take place only at an area adjacent to the working face of the C&DLF. The permittee shall notify the facility Waste Management Specialist, and receive approval, prior to moving the deconstruction activities from the approved area, and shall modify the approved plan prior to changing the designated area.

56. Regulated-asbestos containing material as defined in 40 CFR 61 must be managed in accordance with 40 CFR 61. The permittee must follow the approved plan to properly remove asbestos-containing material from a mobile home. Disposal of asbestos waste must be in accordance with 15 NCAC 13B .0542 (c).

57. Inside the mobile home white goods, as defined in NCGS Article 9, Chapter 130A-290(44) must be managed according to all applicable statutes and rules of the State of North Carolina and be properly removed to White Goods and Scrap Metal Staging Area prior to deconstruction activities.

58. All mobile homes must be deconstructed within 45 days from acceptance into the deconstruction area. The date of receipt at the landfill shall be posted on the mobile home or its frame.

59. All material not planned for recycling will be placed in an appropriate approved disposal unit before the end of the day in which deconstruction takes place.

60. Recyclable materials may be stockpiled at the mobile home deconstruction area for no more than 45 days from the date of deconstruction.

61. Records shall be kept at the facility in accordance with the approved plan (Attachment 1, Part II, Document No. 7).

OPERATIONAL CONDITIONS – TIRE COLLECTION AREA

62. The facility as shown on Figure 2 of 7/Drawing No. D-1093 is permitted to receive tires and scrap tires as defined in NCGS Article 9, Chapter 130A-309.53(6) & (7) and must temporary store the used tires in an open top trailer.

63. The permittee shall operate and manage the tire collection area in accordance with the requirements of 15A NCAC 13B .1107 and the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

OPERATIONAL CONDITIONS – ELECTRONICS AND OIL FILTER COLLECTION BUILDING

64. All received electronics as defined in NCGS Article 9, Chapter 130A-309.91 and spent oil filters, as defined in NCGS Article 9, Chapter 130A-290(a)(18) must be stored in the containers inside the storage building shown on Figure 2 of 7/Drawing No. D-1093.

65. The permittee, acting as a discarded computer equipment collector as defined in NCGS Article 9, Chapter 130A-309.91(4) must manage the electronic wastes in accordance with the requirements of NCGS Article 9, Chapter 130A-309.94 and the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

OPERATIONAL CONDITIONS – CONVENIENCE CENTER

66. The Convenience Center as shown on Figure 2 of 7/Drawing No. D-1093 is permitted to receive municipal solid wastes (MSW), glass, plastic, paper, cardboard, scrap metals/ white goods, oyster shell, cooking oil, bulk wastes, battery, used oil, antifreeze, CFL bulbs/mercury thermostats.

67. The permittee shall operate and manage the Convenience Center in accordance with all applicable statutes and rules, and the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

68. Each received wastes must be temporarily stored in the designated containers in accordance with the wastes types. A proper isle spaces between waste containers - drums and roll-off boxes must be maintained all the time for inspection, firefighting, and container removal.

69. No mixing waste is allowed. Visible labels of the containers for each collected wastes must be posted on the containers.

70. The permittee must dispose of the received MSW and bulk wastes, after weighted by the scale, at the Edgecombe County MSW transfer facility – Solid Waste Permit Number 33-02T.

71. The convenience center receiving used oil as defined in NCGS Article 9, Chapter 130A-290.(b)(5) is a public used oil collection center as defined in NCGS Article 9, Chapter 130A-290.(b)(1)a; therefore, the permittee must operate and manage collected used oil in accordance with NCGS Article 9, Chapter 130A-309.15 & Chapter 130A-309.20.

OPERATIONAL CONDITIONS – CONCRETE DISPOSAL AREA

72. The area encompassing 0.4 acres as shown on Figure 2 of 7/Drawing No. D-1093 is permitted to receive beneficial fill, as defined in 15A NCAC 13B .0562(1), to increase the extent of the transfer trailer staging area.

73. This area shall be operated and managed in accordance with the requirements of 15A NCAC 13B .0562 and the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

OPERATIONAL CONDITIONS – PESTICIDE CONTAINER STORAGE BUILDING

74. The Pesticide Container Storage Building, a metal structure seated on a concrete floor as shown on Figure 2 of 7/Drawing No. D-1093 is permitted to receive pesticide container.

75. The permittee shall operate and manage the Pesticide Container Storage Building in accordance with the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

76. The permittee shall inspect the containers delivered to the facility to ensure that the containers are thoroughly rinsed with labels removed, and holes punched in them prior to being taken to the building for shredding and off-site shipping at least annually.

OPERATIONAL CONDITIONS – LAND CLEARING/ YARD WASTE PROCESSING AREA

77. The facility is permitted to operate a treatment and processing facility as defined in 15A NCAC 13B, Rule .0101(49) and is up to 2-acre in size inside the Borrow Area 1 as shown on Figure 2 of 7/Drawing No. D-1093.

78. The facility is permitted to receive land clearing debris and yard trash, as defined in 15A NCAC 13B, Rules .0101(23) and .0101(55), respectively.

79. The sizes of acceptable land clearing debris and yard trash are less than 6-inch in diameter and less than 4-feet in length.

80. The maximum volume of wastes that can be allowed at the 2-acre collection and storage area is 816 tons per year.

81. The permittee must manage the temporary storage and processing by grinding at the time for off-site hauling according to the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

OPERATIONAL CONDITIONS – WHITE GOODS AND SCRAP METAL STAGING AREA

82. The area is permitted to receive and temporary store white goods as defined in NCGS Article 9, Chapter 130A-290(44) and scrap metal on a 180-foot by 120-foot concrete pad in the designated area as shown on Figure 2 of 7/Drawing No. D-1093.

83. The permittee must operate and manage white goods according to the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

84. White goods collection areas shall provide for the proper removal of chlorofluorocarbon refrigerants.

OPERATIONAL CONDITIONS – WOOD PALLET STAGING AREA

85. The area consisting of a 120-foot by 120-foot concrete pad as shown on Figure 2 of 7/Drawing No. D-1093 is permitted to receive and temporary store wood pallet as defined in NCGS Article 9, Chapter 130A-290(44a).

86. The permittee must operate and manage wood pallet according to the Facility Plan included in Attachment 1, Part II, Document No. 7. Any revisions to the approved plan shall be approved by the Section, prior to implementation.

87. The wood pallet will only be ground into mulch when the stockpile area is full and ready to be hauled off-site.

PART V: POST CLOSURE CONDITIONS FOR THE UNLINED MSWLF UNIT

88. The unlined MSWLF unit (below the active C&DLF) was incrementally closed in 2000. Post-closure maintenance and monitoring of the landfill unit must be conducted in accordance with Documents 1 and 7, Attachment 1, Part II, and the N.C. Solid Waste Management Rules.

89. The permittee must maintain the integrity and effectiveness of the cap system, including making repairs to the cover as necessary to correct the effects of settlement, subsidence,

erosion, leachate outbreaks, or other events; preventing surface water from impounding over waste; and preventing run-on and run-off from eroding or otherwise damaging the cap system.

90. Post-closure use of the property is subject to review and approval by the Section and must not disturb the integrity of the cap system, or the function of the monitoring systems. The Section may approve any other disturbance if the owner or operator demonstrates that disturbance of the cap system, including any removal of waste, will not increase the potential threat to human health or the environment.

91. Any proposed lateral expansion to the closed C&DLF unit and/or the unlined MSWLF unit would be considered a new landfill for purposes of Solid Waste Management permitting.

- End of Permit Conditions -

SECTION D-8

Amendment to Financial Assurance Mechanism

Phone: (252) 641-7840
Fax: (252) 641-0456

Finance Department

August 28, 2009

Shawn McKee-NCDENR
Division of Waste Management
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Edgecombe County Financial Assurance

Dear Shawn,

I am the chief financial officer of Edgecombe County, 201 St. Andrew Street, Tarboro, NC 27886. This letter is in support of this unit of local government's use of the financial test to demonstrate financial assurance, as specified in 15A NCAC 13 B.1628 (e) (1) (F). This letter is an update of the letter sent on June 25, 2009. I do not have the AFIR numbers for June 30, 2009. I have used the June 30, 2008 figures and I will resubmit a letter once I have the 2009 numbers.

This unit of local government is the owner or operator of the following facility for which financial assurance for closure, post-closure, or corrective action is demonstrated through the financial test specified in 15A NCAC 13B.1628 (e) (1) (F). The current closure, post-closure, or corrective action cost estimates covered by the test are shown for the facility:

Permit Number - #33-01
Edgecombe County Sanitary Landfill
Address – Rt 3 State Road 1601

Closure cost estimates -	$ 905,587
Post-closure cost estimates	2,350,069
Corrective Action	2,342,000
Total -	$5,597,656

The fiscal year of this unit of local government ends on June 30, 2009. The figures for the following items marked with an asterisk are derived from this unit of local government's Annual Financial Information Report (AFIR) for the latest completed fiscal year, ended June 30, 2009.

I hereby certify that the wording of this letter is identical to the wording in 15A NCAC 13B .1628 (e) (2) (G) as such rules were constituted on the date shown immediately below. I further certify the following: (1) that the unit of local government has not operated at a total operating fund deficit equal to five percent or more total annual revenue in either of the past two fiscal years, (2) that the unit of local government is not in default on any outstanding general obligation bond or long-term obligations, and (3) does not have any outstanding general obligation bonds rated lower than Baa as issued by Moody's, BBB as issued by Standard & Poor's, BBB as issued by Fitch's, or 75 as issued by the Municipal Council.

JoAnne J. Harrell
Director of Fiscal Services

August 28, 2009

BOND RATING INDICATOR OF FINANCIAL STRENGTH
(AFIR Figures from June 30, 2008)

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shown in paragraphs above] — $ 5,597,656

2. Current bond rating of most recent issuance and name of rating service — Moodys-**A3**, Standard & Poors-**A**

3. Date of Issuance bond — Feb. 1, 2006

4. Date of maturity bond — Feb. 1, 2026

5. Assured environmental cost to demonstrate financial responsibility in the following amounts under Division rules:

MSWLF under 15A NCAC 13B .1600	$5,597,656
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 .0010 And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$5,597,656

6. Total Annual Revenue (AFIR Part 2) — $65,690,330

Circle either "yes" or "no" to the following question.

7. Is line 5 divided by line 6 less than or equal to 0.43? — (yes)/no

APPENDIX

RATIOS INDICATORS OF FINANCIAL STRENGTH
(AFIR Figures from June 30, 2008)

1. Sum of current closure, post-closure and corrective action cost estimates [total of all cost estimates shown in the paragraphs above]	$ 5,597,656
*2. Sum of cash and investments (AFIR Part 7)	$20,946,892
*3. Total expenditures (AFIR Part 4 Columns a & b Part 5 for municipalities or Part 5 excluding educational capital outlays for counties)	$67,636,205
*4. Annual debt service (AFIR Part 4 Section I)	$ 3,009,293
5. Assured environmental costs to demonstrate financial Responsibility in the following amount under Division rules:	
MSWLF under 15A NCAC 13B .1600	$ 5,597,656
Hazardous waste treatment, storage and disposal facilities under 15 a NCAC 13A .0009 and .00010	$_____
Petroleum underground storage tanks under 15A NCAC 2N .0100 -.0800	$_____
Underground Injection Control System facilities under 15A NCAC 2D .0400 and 15A NCAC 2C .0200	$_____
PCB commercial storage facilities under 15A NCAC 20 . And 15A NCAC 2N .0100.	$_____
Total assured environmental costs	$ 5,597,656
*6. Total Annual Revenue (AFIR Part 2)	$65,690,330

Circle either "yes" or "no" to the following questions.

7. Is line 5 divided by line 6 less than or equal to 0.43?	yes /no
8. Is line 2 divided by line 3 greater than or equal to 0.05?	yes /no
9. Is line 4 divided by line 3 less than or equal to 0.20?	yes /no

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: August 2009

General Site Information

Cap System Construction		
Total area Requiring Closure	21.7	ac
Area of Landfill Requiring Regrading and Cover Material (10 Percent of the Closure Area)	2.2	ac
Volume of Soil required for 18-inch Low Permeability Layer	54,140	cy
Volume of Soil required for 18-inch Erosion Layer	54,140	cy
Stormwater Downchutes	2,000	lf
Perimeter Channels	500	lf
Stormwater Benches	4,000	lf
Gas Collection System Construction (Assumes Phases I, II, and II Constructed)		
Number of Gas Wells Replaced	4	ea
Total Length of Gas Well to be Installed (42.5' Avg Depth)	170	lf

Closure Cost Estimate

	Quantity	Unit	Unit Price	Total
Task 1- Engineering Services				
Prepare Construction Drawings and Specifications	1	lump sum	$10,000	$10,000
Bid Process (Including Announcements)	1	lump sum	$5,000	$5,000
			Subtotal Task 1 =	**$15,000**
Task 2 - Mobilization				
Mobilization/Demobilization (5% of Construction Cost)	1	lump sum	$32,331	$32,331
Construction and Record Surveying and Deed Notation	21.7	acre	$1,350	$29,295
			Subtotal Task 2 =	**$61,626**
Task 3 - Low Permeability Layer				
Regrade Existing C&D Waste and Complete Intermediate Cover	2.2	acre	$750	$1,650
Place 18-inch Low Permeability Layer	54,140	cy	$5.50	$297,770
			Subtotal Task 3 =	**$299,420**
Task 4 - Erosion Layer				
Place 18-inch Erosion Layer	54,140	cy	$4.75	$257,165
Seeding and Fertilizing the Topsoil Layer	21.7	acre	$1,200	$26,040
			Subtotal Task 4 =	**$283,205**
Task 5 - Surface Drainage Structures				
Downchute Channels	2,000	lf	$15.00	$30,000
Stormwater Benches	4,000	lf	$6.00	$24,000
Perimeter Channels	500	lf	$20.00	$10,000
			Subtotal Task 5 =	**$64,000**
Task 6 - Construction Survey				
Construction Survey	1	lump sum	$7,500	$7,500
			Subtotal Task 6 =	**$7,500**

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: August 2009

Task 7 - Gas System Mobilization and Installation				
Mobilization/Demobilization	1	lump sum	$5,500	$5,500
Install Gas Wells	170	lf	$75.00	$12,750
Install Gas Well Heads	4	ea	$500.00	$2,000
Re-attached Laterals and Headers	1	lump sum	$20,000	$20,000
			Subtotal Task 7 =	**$40,250**
Task 8 - CQA and Certification				
Low Permeability Layer CQA	140	hrs	$45.00	$6,300
Low Permeability Layer Lab Testing (per 3,000 cy w/ 15% Shrinkage)	21	ea	$695.00	$14,595
Erosion Layer CQA	120	hrs	$45.00	$5,400
Erosion Layer Laboratory Testing (per 10,000 cy w/ 15% Shrinkage)	7	ea	$295.00	$2,065
Gas System CQA	120	hrs	$45.00	$5,400
CQA Project Management	100	hrs	$85.00	$8,500
CQA Report and Certification	1	lump sum	$10,000	$10,000
			Subtotal Task 8 =	**$52,260**
			Project Subtotal=	**$823,261**
Contingency Fee (10%)	1	10% total	$82,326	$82,326
			Project Total=	**$905,587**
			Cost Per Acre=	**$41,732**

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Post-Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-07-242

Date: August 2009

General Site Information

Post-Closure Monitoring and Maintenance		
Total Area Requiring Post-Closure (Permitted Area)	68.0	ac
Post-Closure Period	30	years
Number of Groundwater Monitoring Wells	7	ea
Number of Methane Gas Monitoring Wells	11	ea
Number of Surface Water Sampling Points	2	ea

Post-Closure Cost Estimate

	Quantity	Unit	Unit Price	Total
Task 1 - Groundwater and Surface Water Sampling and Analysis				
Sampling Crew (2 man crew)	82	hours	$75	$6,150
Equipment	1	lump sum	$1,900	$1,900
Laboratory Analysis	1	lump sum	$6,100	$6,100
Report (Includes Surface Water Reporting)	1	lump sum	$5,750	$5,750
Project Coordination	1	lump sum	$1,500	$1,500
			Cost per Sampling Event =	$21,400
Cost for Groundwater Monitoring for Post-Closure Period	60	events	$21,400	$1,284,000
(Assuming Biannual Sampling Frequency or 60 Sampling Events)			**Subtotal Task 1 =**	**$1,284,000**
Task 2 - Gas Probe Monitoring				
Sampling Crew (1 man crew)	8	hours	$75	$600
Project Management and Report	1	lump sum	$175	$175
Equipment and Expenses	1	lump sum	$250	$250
			Cost per Sampling Event =	$1,025
Cost for Gas Probe Monitoring for Post-Closure Period	120	events	$1,025	$123,000
(Assuming Quarterly Sampling Frequency or 120 Sampling Events)			**Subtotal Task 2 =**	**$123,000**

Task 3 - Erosion and Settlement Repairs

Assume that 10% of the post-closure area will require repair in the first 5 years from erosion and settlement at an average depth of 1.0' (6.8 ac @ 1.0 ft deep = 10,971 cy). Assume that 5% of the post-closure area will require repair repair from settlement and erosion for the remaining post-closure period. (3.4 ac @ 1.0 ft deep = 5,485 cy)

Erosion and Settlement Repair	16,456	cy	$6.00	$98,736
Reseeding	10.2	ac	$1,200	$12,240
			Subtotal Task 3 =	**$110,976**

Task 4 - Reseeding and Fertilizing

Assume that the post-closure area will require reseeding and fertilizing of 30% of the post-closure area annually for the first 2 years of the post-closure period. For the remaining 28 years, it is assumed that 5% of the post-closure area will require reseeding and fertilizing annually (2 years * 0.30 * 57.9 ac/year = 57.9 ac) + (28 years * 0.05 * 57.9 ac = 81.1 ac).

Reseeding and Fertilizing	136.00	ac	$1,200	$163,200
			Subtotal Task 4 =	**$163,200**

Table 1A
Summary of Corrective Action Costs
Edgecombe County Landfill (Permit No. 33-01)
Tarboro, North Carolina
S&ME Project No. 1054-07-240A

CAPITAL COSTS		
	Remedial Option	Cost
1	Monitored Natural Attenuation (MNA) of Groundwater	$120,000
4A	In-Situ Isolation: **Barrier Wall**	$572,000
4B	In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area	$0
4C	In-Situ Isolation: Increase Slope of Closed MSW Area	$25,000
4D	In-Situ Isolation: Stormwater Improvements on Western Half of Landfill	$240,000
	TOTAL:	$957,000

ANNUAL COSTS		
	Remedial Option	Cost
1	Monitored Natural Attenuation (MNA) of Groundwater	$45,000
4A	In-Situ Isolation: Barrier Wall	$0
4B	In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area	$0
4C	In-Situ Isolation: Increase Slope of Closed MSW Area	$0
4D	In-Situ Isolation: Stormwater Improvements on Western Half of Landfill	$0
	30-YEAR TOTAL:	$1,350,000

Note: Annual Costs for 4B, 4C, and 4D are included in the Post-Closure Cost Estimate.

CLOSURE COSTS		
	Remedial Option	Cost
1	Monitored Natural Attenuation (MNA) of Groundwater	$35,000
4A	In-Situ Isolation: Barrier Wall	$0
4B	In-Situ Isolation: Maintain Consistent Contours with pre-1988 Waste Area	$0
4C	In-Situ Isolation: Increase Slope of Closed MSW Area	$0
4D	In-Situ Isolation: Stormwater Improvements on Western Half of Landfill	$0
	TOTAL:	$35,000

TOTAL COSTS FOR CORRECTIVE ACTION:	**$2,342,000**

SECTION D-9

Report Submittal References

Report Submittal References
Corrective Actions
Edgecombe County Landfill
Tarboro, North Carolina
S&ME Project No. 1054-07-242

Document	Submittal Date
Alternate Source Demonstration (ASD)	June 10, 2008
NCDENR Response Letter - ASD Approval	June 24, 2008
Public Notice Requirements	June 25, 2008
Nature and Extent Study (NES)	June 25, 2008
Assessment of Corrective Measures (ACM)	June 26, 3008
NCDENR Response Letter - NES/ACM Approval	July 16, 2008
Corrective Action Plan (CAP) - C&D Landfill Permit Application Renewal, Section C	June 30, 2008
Amendment to Permit Appendices - Addendum 1 (Section C: Corrective Action Permit Modification Application)	November 10, 2008
NCDENR Response Letter - CAP Approval Notification	January 16, 2009
Revised Permit Appendices - Added Section C-9: Report Submittal References	August 31, 2009

SECTION E

CLOSURE AND POST-CLOSURE PLAN
[RULE .1627]

CLOSURE AND POST-CLOSURE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-13-277A

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

August 2014

Kenneth S. Obenauf, P.E.
Senior Engineer
NC Licensed Engineer No. 038223

Samuel P. Watts, P.G.
Senior Project Manager
NC Licensed Geologist No. 1806

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Appendix X-E Slope Stability Analysis

CLOSURE AND POST-CLOSURE PLAN
EDEGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

1. BACKGROUND INFORMATION

1.1 Introduction

This Closure and Post-Closure Plan was prepared to establish criteria for the closure of all waste units and subsequent requirements for post-closure compliance of the above-referenced construction and demolition (C&D) landfill in accordance with Solid Waste Management Rules, Section .1627. The information contained in this Plan will be used to assist Edgecombe County in the closure of active waste units at any point during the active life of the C&D landfill, and the maintenance and monitoring of the facility required during the post-closure care period.

1.2 Project Information

The Edgecombe County C&D Landfill is located on State Route 1601 (Colonial Road) approximately 4.5 miles south of Tarboro, North Carolina. The existing landfill site is bounded to the north by Jerry's Creek, to the east by State Route 1601 and to the west and south by undeveloped agricultural land. The landfill site is shown on the Site Vicinity Map (**Drawing 1**). Beyond Jerry's Creek to the north is the "old landfill," a pre-Subtitle D landfill which stopped receiving waste in 1979. The northern old landfill is identified as Facility No. NONCD0000653 on the North Carolina Inactive Hazardous Sites Branch (IHSB) Inactive Hazardous Waste Sites Inventory. North of the northern old landfill is Wright's Creek, which merges with Jerry's Creek east (downstream) of the site.

The existing C&D landfill is operated on top of a closed municipal solid waste (MSW) landfill. The MSW unit consists of two sections, an eastern section and a western section. The eastern section is approximately 33 acres, began receiving waste in 1979, and was closed prior to 1991. The cap in the eastern section consists of two feet of soil. The western section is approximately 35 acres, began receiving MSW waste in 1991, stopped receiving MSW waste in 1997, and was closed in 2000. The cap in the western section consists of 2.5 feet of soil.

The North Carolina Department of Environment and Natural Resources (NCDENR) issued Permit No. 33-01 to construct and operate a C&D landfill unit over the existing closed MSW unit on December 30, 1997. The County has continued to operate the C&D landfill in accordance with that permit since that time. The landfill currently receives an average of approximately 43 tons of C&D waste per day based on waste receipts over the past five years, although it received as much as 600 tons per day of waste in fiscal year 1999-2000 following Hurricane Floyd.

Waste operations on the facility property, which are located west of State Route 1601 (Colonial Road) include:

- Tire collection area for shipment to an off-site vendor;
- Mercury Containing Products Facility for shipment to an off-site vendor;
- Electronics and Oil Filter Collection building for shipment to an off-site vendor;
- Equipment Maintenance buildings; and
- Employee break trailer.

Other waste operations on the facility property, which are located east of State Route 1601 (Colonial Road) include:

- MSW Transfer Facility which operates under Permit No. 33-02T;
- Convenience Center;
- Concrete Disposal Area;
- Yard Waste Processing Area;
- Pesticide Container Storage Building for shipment to an off-site vendor;
- White Goods Staging Area for shipment to an off-site vendor;
- Wood Pallet Staging Area;
- Scale and Scale House;
- Borrow areas for landfill cover soils; and
- Several buildings used for office, equipment maintenance, and employee break trailer.

A water supply well is located on-site at the County-owned property on the east side of Colonial Road; however, this well is used for irrigation only. The water for the facility is supplied from the County-wide municipal water distribution system.

Existing conditions at the landfill are depicted on **Drawing 2**.

2. CLOSURE PLAN

2.1 Cap System

The cap system has been designed to minimize stormwater infiltration into the landfill and to resist erosive forces. A construction plan including construction drawings and bid documents shall be prepared for construction of the cap system. The construction plan shall incorporate the design provided in this section, the accompanying drawings, the Construction Quality Assurance (CQA) Plan, and the Technical Specifications. The drawings for the cap system are provided in the Drawings section. The CQA Plan is included as **Appendix VI-E**. The Technical Specifications are included as **Appendix VII-E**.

The proposed cap system will consist of the following:

- 18-inch thick Low-Permeability Barrier; and
- 18-inch thick Vegetation/Erosion Layer.

The surface of the landfill will be sloped to a minimum post-settlement grade of 5 percent and maximum grade of 25 percent. The Slope Stability Analysis is provided in **Appendix X-E.**

2.1.1 Low-Permeability Barrier

The low-permeability barrier is designed to minimize infiltration into the landfill and to provide a sound working platform over the C&D waste prior to placement of the erosion layer. The low-permeability barrier will consist of at least 18 inches of compacted soil with a coefficient of permeability of approximately $1x10^{-5}$ cm/sec. The low-permeability barrier will extend over the entire C&D waste area and onto the existing perimeter embankment.

Edgecombe County uses two soil borrow areas located east of State Route 1601 for operational soil requirements. The County intends to use soil from these borrow areas to construct the low-permeability barrier. A borrow study was conducted to evaluate the presence and location of suitable soil in the borrow areas to meet the requirements for the cap system including the low permeability barrier. Selected soil samples were submitted to S&ME's soil laboratory for soil classification and testing. A copy of the report (Borrow Area Wetland and Geotechnical Evaluation, S&ME May 30, 2008), including test pit locations, sample depths, and test results is provided in **Appendix I-E**. Additional laboratory testing was performed in June 2009 on three samples collected from the two borrow areas during the borrow study. The permeability test results are provided in **Appendix VIII-E**.

The laboratory soil test results indicated that the samples obtained from Borrow Area 1 and 2 have material suitable for the cap system and for daily operations.

2.1.2 Vegetation/Erosion Layer

The vegetation/erosion layer consists of at least 18 inches of earthen material capable of supporting native plant growth, prohibiting vector intrusion, and protecting the underlying low-permeability barrier from damage due to desiccation (from drying) and from freeze-thaw.

The cover system will be planted with grass to stabilize the cover soils, minimize erosion, and reduce cover system maintenance. The soil will be prepared by fertilizing, amending the soil, and seeding in accordance with the North Carolina Erosion and Sediment Control Guidelines. Stormwater management and erosion and sedimentation control details are shown in **Drawings 6 through 9**.

2.1.3 Landfill Gas Collection System

The former landfill gas passive venting system for the landfill consists of perforated 6-inch diameter high density polyethylene (HDPE) pipe surround by gravel. Twelve (12) of the existing vents (V-1 thru V-9 and V-43 thru V- 45) were extended vertically with perforated HDPE pipe to accommodate an additional lift of waste. Five (5) existing vents (V-46 thru V-49 and V-60) were extended vertically using schedule 40 or Schedule 80

PVC pipe surrounded by gravel. Six additional vents (V-52 thru V-54 and V-57 thru V-59) were extended vertically using solid 6-inch diameter HDPE pipe. The gas vents are extended vertically prior to placing C&D waste in an area. An inventory of the landfill gas wells is provided in Appendix III-A of the Facility Plan.

A landfill gas collection and control system (LFGCCS) was constructed in 2012 at the Edgecombe County landfill and consists of a series of biogas wells, LFG piping and valves, condensate sumps, and a blower/flare system (BFS), which directs the collected biogas to a blower flare system (**Drawing 3**). The system is connected to a Containerized Landfill Gas to Energy (LFGTE) Facility for electricity generation.

LFG Extraction Wells

In the Spring of 2012, Edgecombe County converted 24 passive Landfill Gas (LFG) vent wells to active LFG extraction wells and installed 24 new landfill gas extraction wells. A total of 48 active LFG extraction wells are currently installed at the Southern Landfill. Nine of the LFG extraction wells are installed in the C&D landfill waste while the remaining 39 LFG extraction wells are installed in MSW. The LFGCCS began operation on September 7, 2012.

LFG Blower-Flare System Skid

The LFGCCS features a 4-inch diameter candlestick flare system, manufactured by Product Recovery Management (PRM). The flare is supplied with up to 300 standard cubic feet per minute (scfm) of LFG by two centrifugal, regenerative vacuum blowers, manufactured by Gardner-Denver, Incorporated® (GDI). Each blower is equipped with a 25 hp electric motor and can achieve a maximum flow rate of 300 scfm. The vacuum blower speeds are controlled by variable frequency drive (VFD).

The flare is 20 feet tall and the top three feet are equipped with a wind shroud to protect the propane pilot ignition assembly. A propane gas train provides gas for start-up procedures, when necessary.

A stainless-steel moisture separator (MS-80) removes moisture and any debris from the LFG stream before the LFG enters the vacuum blowers. LFG discharged from the blowers passes through a second stainless steel moisture separator (MS-60) before being sent to either the two landfill-fueled generators or to the flare. Moisture removed by the MS-80 and MS-60 are collected in moisture knock-out pots and subsequently gravity drain to a condensate storage sump.

The BFS is fully automated and is capable of shut-down and start-up. The blower-flare system operation is monitored at a programmable logic controller (PLC) panel adjacent to the flare. The PLC, equipped with a datalogger, and monitors critical operating parameters such as gas flow, gas temperature, gas pressure and flare temperature.

Containerized Landfill Gas-To-Energy Facility

Edgecombe County purchased a modular containerized landfill gas-to-energy (LFGTE) System, manufactured by 2G-Cenergy, consisting of two (2) container-mounted, LFG-fueled, internal combustion engine modules (gen-sets) capable of producing 370 kW each. In June 2013, Edgecombe County began construction of a containerized landfill gas-to-energy facility to support the gen-sets.

New concrete foundations were constructed for the two containerized LFGTE systems and two concrete pads for the associated landfill gas treatment equipment (chiller/re-heaters and carbon vessels). The containerized LFGTE modules were connected to the LFG pipeline from the blower-flare station (BFS) to fuel the gen-sets. A new condensate sump and condensate force main were connected to the to the main BFS condensate sump to handle additional condensate produced by the gas treatment equipment. Electrical service to the gen-sets is provided by the on-site 1000 kVA transformer. Electrical components installed at the site for the containerized LFGTE facility also include, but are not limited to, a main distribution panel (MDP) inside the adjacent support building electrical control room; a disconnect switch with lockout assembly between the MDP and the 1,000 kVA electric transformer; and an electric grounding grid.

The containerized LFGTE facility is located in the southwest portion of the landfill facility within a secured, fenced compound.

Prior to placing the soil layers of the cap system, the gas collection piping shall be temporarily disconnected and moved out of the way for construction. The gas wells will be extended, as necessary, so that there is a minimum three feet of stick-up above the cap system vegetation/erosion layer. New gas wells installed shall consist of perforated 6-inch diameter HDPE pipe or Schedule 80 PVC pipe surrounded by gravel. The perforations in the HDPE or PVC pipe shall end 15 feet below the final elevation of the cap system and the remainder of the pipe shall be solid. A bentonite plug shall be installed along the solid section of the pipe. The detail drawings for the single and the nested gas wells is provided on **Drawing 5**. The gas collection piping shall be reconnected following completion of the cap system.

At closure of the landfill, the active gas extraction wells will be converted to passive vents. And equipment associated with the landfill gas collection and control system (piping, valves, sumps, condensate tanks and blower flare system) will be removed from the site.

2.2 Stormwater Management Systems

The proposed landfill is designed with a network of various stormwater controls and conveyances to manage stormwater during active operations, over interim cover soils, and upon final closure. Stormwater will be conveyed to sediment basins and sediment traps located around the landfill perimeter. During active operations, stormwater will be managed by interim cover soils, temporary drainage swales, down-drain pipes, and perimeter drainage channels. Upon landfill closure, stormwater will be collected and

conveyed through a network of drainage benches and down-drain pipes to the perimeter surface water management system. Plans and details illustrating the stormwater management system are provided in the Drawings section. Engineering analyses supporting the stormwater management system design are provided in **Appendix II-E**.

2.3 Largest Area Requiring Capping

The maximum area of the landfill that would require closure is approximately 21.4 acres. This area includes the eastern portion of the landfill where C&D waste has already been placed and extends west to the year five filling area shown on **Drawing 3B**.

2.4 Estimated Maximum Inventory of Wastes

The maximum amount of C&D waste at the facility will be approximately 835,414 tons. The amount of MSW in the landfill beneath the C&D landfill is approximately 1,218,816 tons. The waste volume calculation is provided in **Appendix IX-E**.

2.5 Closure Schedule

Prior to closure of any area, the County shall notify NCDENR, Division of Waste Management that a notice of intent to close the area has been placed in the Operating Record.

The County shall begin closure activities of each area no later than 30 days after the final known date on which the area receives wastes. If the area has remaining capacity and there is a reasonable likelihood that the area will receive additional wastes, the area will be closed no later than one year after the most recent receipt of wastes. If an extension beyond the one-year deadline for beginning closure is required, the County will demonstrate to NCDENR that the area has the capacity to receive additional wastes and the County has taken and will continue to take all steps necessary to prevent threats to human health and the environment from the unclosed area.

The County shall complete closure activities of each area in accordance with the closure plan within 180 days following the beginning of closure. If an extension of the closure period is required, the County will demonstrate to NCDENR that closure will, of necessity, take longer than 180 days and County has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed area.

Following closure of each area, the County shall submit a certification report documenting construction activities associated with the closure of the area to the Division for their review and approval.

Following closure of all units, the County shall record a notation on the deed to the landfill facility property, or some other instrument that is normally examined during title search, and notify the Division that the notation has been recorded and a copy has been placed in the operating record. The notation on the deed shall in perpetuity notify any potential purchaser of the property that:

- The land has been used as a landfill facility; and

- Its use is restricted under the closure plan approved by the Division.

The County may request permission from the Division to remove the notation from the deed if all wastes are removed from the facility.

2.6 Financial Assurance

The County has prepared a detailed written estimate, in current dollars, of the cost of hiring a third party to close the largest area of the C&D landfill at any time during the active life of the facility. A copy of the detailed closure cost estimate is included as **Appendix III-E** and shall be placed in the facility Operating Record.

The largest area to be closed is 21.4 acres. The cost estimate includes the following items:

- Final cap system (including soil, aggregate, testing, and documentation);
- Sedimentation and erosion control devices;
- Gas controls;
- Final landscaping (including seeding, fertilizing, and mulching);
- Mobilization/demobilization;
- Engineering construction management and construction quality assurance (CQA);
- Administration (including announcements, deeds, and fees); and
- Labor.

The cost estimate assumes that the soils required for the final closure are available on-site. Soil laboratory testing was performed on on-site soils that appear to be suitable for construction of the low permeability soil layer (i.e., permeability approximately $1x10^{-5}$ cm/sec). Other borrow areas (**Drawing 4**) and stockpiles are available on the site for the cover soil and vegetation/erosion layer. The laboratory analyses results are provided in **Appendix I-E** and **Appendix VIII-E**.

During the active life of the landfill, the County shall annually adjust the closure cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Division. The County shall increase the closure cost estimate and the amount of financial assurance provided if changes to the closure plan or facility conditions increase the maximum cost of closure at any time during the remaining active life.

The County may reduce the closure cost estimate and the amount of financial assurance if the cost estimate exceeds the maximum cost of closure at any time during the remaining life of the landfill. Prior to any reduction of the closure cost estimate by the County, a written justification for the reduction shall be submitted to NCDENR, Division of Waste Management. No reduction of the closure cost estimate shall be allowed without Division approval. The reduction justification and the NCDENR approval shall be placed in the facility Operating Record.

The County shall establish financial assurance for closure of the C&D landfill in compliance with Rule .1628(e). The County shall provide continuous coverage for closure until released from financial assurance requirements by demonstrating compliance with Rule .1627(c) for final closure certification.

3. POST-CLOSURE PLAN

3.1 General

The Post-Closure Plan outlines the monitoring and maintenance activities intended to maintain cover system integrity during the post-closure period. The area to be monitored and maintained is 68 acres. The post-closure period is a minimum of 30 years. During the post-closure period the landfill cover system and related facilities must be monitored and maintained.

3.2 Maintenance Activities

Maintenance required for the final cover is anticipated to be minimal. The vegetative cover shall be mowed a minimum of once a year. The vegetative cover shall be amended and fertilized as needed to maintain healthy vegetation. Depressions in the cover that pond water or otherwise impair the function of the final cover will be filled and/or regraded. Areas subject to regrading will be revegetated. Animal burrows and eroded areas should be filled in with compacted soil and reseeded. If vegetative cover is not adequate in a particular area, fertilizer should be applied and the area re-seeded in order to re-establish vegetation. Insecticides may be used to eliminate insect populations that are detrimental to the vegetation. Any deep-rooted or woody vegetation that may have established itself on the cover soil will be removed. If leachate seeps are observed at the landfill, qualified personnel will evaluate the area to determine the most appropriate method to correct the problem. Methods to correct the problem include, but are not limited to, over excavating the area backfilling with stone and replacing the final cover system.

Surface water structures shall be maintained in accordance with the approved Erosion and Sediment Control Plan.

The operation and maintenance (O&M) of the active LFG collection system shall be performed in accordance with the prepared O&M Manual for the system. O&M for the system includes, but is not limited to, the following:

- System Monitoring;
- Condensate Management and Disposal;
- Electricity and Phone Service; and
- LFG System Parts and Supplies.

For cost estimation purposes, it has been assumed that O&M of the containerized LFGTE facility will be paid for by revenue from the production of electricity. O&M of the LFG collection system, after the LFGTE facility is no longer producing electricity, has been assumed as a separate cost presented in the Post Closure Cost Estimate (**Table B**).

For cost estimation purposes, it has been assumed the active LFG collection system will be decommissioned at the end of the 30-year post-closure period, although decommissioning could be performed earlier based on the viability of the LFGTE facility to provide a revenue stream from electricity production. For decommissioning, the active LFG extraction wells will be converted to passive vents and the piping, valves, sumps, condensate tank, and flare will be removed. Cost for decommissioning the LFGTE facility and the LFG collection system presented in the Closure Cost Estimate (**Table A**).

3.3 Monitoring Activities

Post-closure monitoring will be conducted semi-annually for the post-closure period. The following cover system and landfill components will be monitored:

- Security measures such as fences, gates, locks, and other measures that control site and facility access;
- Surface water management systems for signs of erosion, sedimentation, and condition;
- Cover system for signs of erosion;
- Cover system for evidence of settlement or subsidence;
- Cover system for evidence of leachate seeps;
- Condition and/or presence of vegetation (for distressed or dying vegetation, woody vegetation with potential to penetrate the low permeability barrier);
- Condition of the landfill gas system (passive vents and monitoring probes); and
- Condition of the groundwater monitoring system.

Post-closure monitoring will be documented on post-closure monitoring forms. Sample Post-Closure Monitoring Form sheets are provided in **Appendix IV-E**. Completed post-closure monitoring forms will be maintained in the facility Operating Record. Deficiencies shall be reported to the facility contact (**Section 3.4**) and repairs conducted to correct the deficiencies shall be documented in the facility Operating Record. The previous post-closure monitoring forms shall be reviewed by the person(s) conducting the monitoring prior to performing the current monitoring of the facility.

3.3.1 Groundwater Monitoring

Groundwater monitoring will be conducted consistent with the Water Quality Monitoring Plan (Appendix II-C of the Operations and Waste Acceptance Plan) during the post-closure period. Consistent with current landfill operations, it is anticipated that groundwater monitoring will be conducted semiannually. Groundwater monitoring results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.3.2 Surface Water Monitoring

Surface water monitoring will be conducted consistent with the facility Water Quality Monitoring Plan (Appendix II-C of the Operations and Waste Acceptance Plan) during the post-closure period. Consistent with current landfill operations, it is anticipated that surface water monitoring will be conducted semiannually. Surface water monitoring

results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.3.3 Gas Monitoring

Landfill gas monitoring will be conducted during the post-closure period consistent with the Gas Monitoring Plan (Appendix III-C of the Operations and Waste Acceptance Plan). Gas monitoring results will be provided in regular compliance monitoring reports submitted to the Solid Waste Section.

3.4 Facility Contact

The post-closure maintenance of the landfill will be the responsibility of the Supervisor of Solid Waste for Edgecombe County and will be the contact for the facility during the post-closure period. The Supervisor's address and telephone number is as follows:

Supervisor of Solid Waste
Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886
(252) 827-4253

3.5 Post-Closure Planned Use

Following closure operations, the landfill will be developed as a grassed area or possibly a recreational/wildlife area. Any post-closure use of the property shall not disturb the integrity of the cap system, base liner system, or any other components of the containment system, or the function of the monitoring systems unless necessary to comply with the requirements in Rule .1629. If the post-closure planned use is changed and may disturb the facility, the County shall obtain prior approval from NCDENR by demonstrating that disturbance of the cap system, base liner system, or other component of the containment system, including any removal of waste, will not increase the potential threat to human health or the environment.

3.6 Financial Assurance

The County has prepared a detailed written estimate, in current dollars, of the cost of hiring a third party to conduct post-closure care for the facility. The post-closure cost estimate is based on the most expensive total costs of post-closure care and accounts for annual and periodic costs as described above over the entire post-closure care period. A copy of the detailed post-closure cost estimate is included as **Appendix V-E** and shall be placed in the facility Operating Record.

The County shall annually adjust the post-closure cost estimate for inflation within 30 days after the close of the local government's fiscal year and before submission of updated information to the Division. The County shall increase the post-closure care cost estimate and the amount of financial assurance provided if changes in the post-closure plan or facility conditions increase the maximum costs of post-closure care.

The County may reduce the post-closure cost estimate and the amount of financial assurance provided if the cost estimate exceeds the maximum costs of post-closure care remaining over the post-closure care period. Prior to any reduction of the post-closure cost estimate by the County, a written justification for the reduction shall be submitted to NCDENR, Division of Waste Management. No reduction of the post-closure cost estimate shall be allowed without Division approval. The reduction justification and NCDENR approval shall be placed in the Operating Record.

3.7 Certification

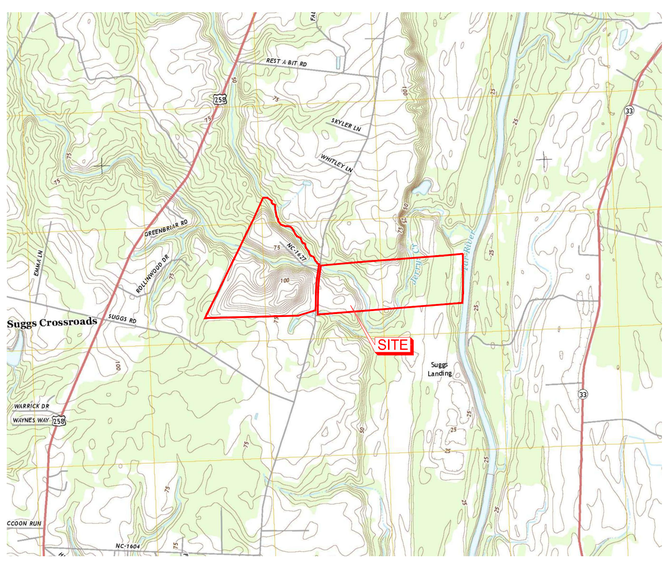
Consistent with regulations, the end of the closure-post closure period must be certified by a registered professional engineer. To accomplish certification over the required 30 year duration, a registered professional engineer will prepare annual certifications. The annual certifications will document that the cover system has been monitored and maintained in accordance with the Post-Closure Plan. The annual certifications shall be based on observations and results documented on regular post-closure monitoring reports, maintenance records, and compliance monitoring reports maintained in the operating record.

DRAWINGS

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
PERMIT # 33-01

EDGECOMBE COUNTY
TARBORO, NORTH CAROLINA

AUGUST 2014



SITE VICINITY MAP
NOT TO SCALE

INDEX OF DRAWINGS

DRAWING	TITLE
1.	TITLE SHEET
2.	EXISTING CONDITIONS
3.	LANDFILL GAS COLLECTION SYSTEM
3A.	PROPOSED FINAL GRADING
3B.	MAXIMUM AREA REQUIRING CLOSURE
4.	BORROW AREA PLAN
5.	FINAL COVER AND GAS WELL DETAILS
6.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS I
7.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS II
8.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS III
9.	STORMWATER MANAGEMENT/EROSION AND SEDIMENT CONTROL DETAILS IV

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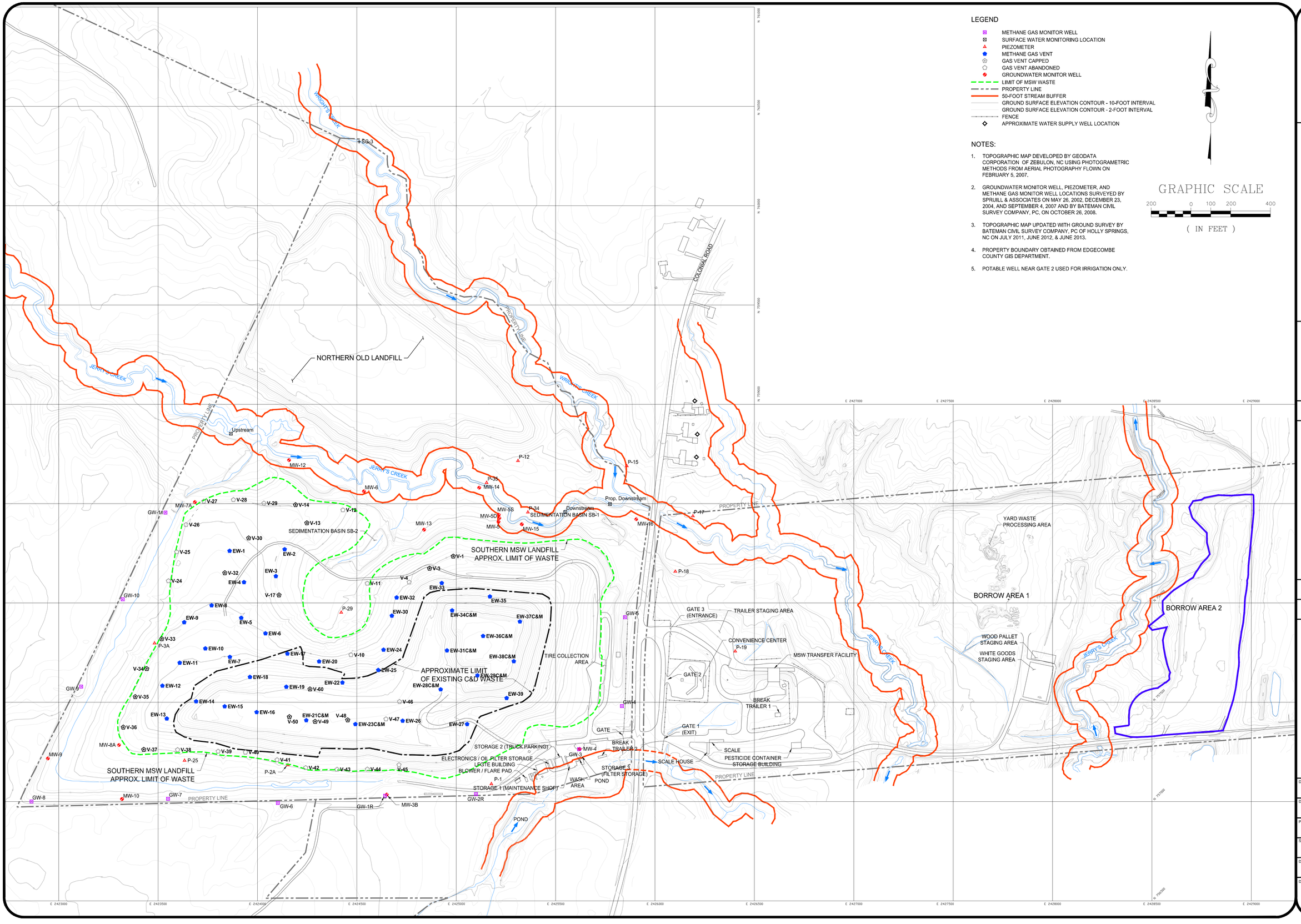
TITLE SHEET

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: KSO
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1386	
DRAWING: 1	OF: 9

T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Closure Plan\D1386.dwg, FIG1, 9/2/2014 10:40:11 AM, 1:1



LEGEND

- METHANE GAS MONITOR WELL
- SURFACE WATER MONITORING LOCATION
- PIEZOMETER
- METHANE GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- GROUNDWATER MONITOR WELL
- LIMIT OF MSW WASTE
- PROPERTY LINE
- 50-FOOT STREAM BUFFER
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- APPROXIMATE WATER SUPPLY WELL LOCATION

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. POTABLE WELL NEAR GATE 2 USED FOR IRRIGATION ONLY.

GRAPHIC SCALE

200 0 100 200 400

(IN FEET)

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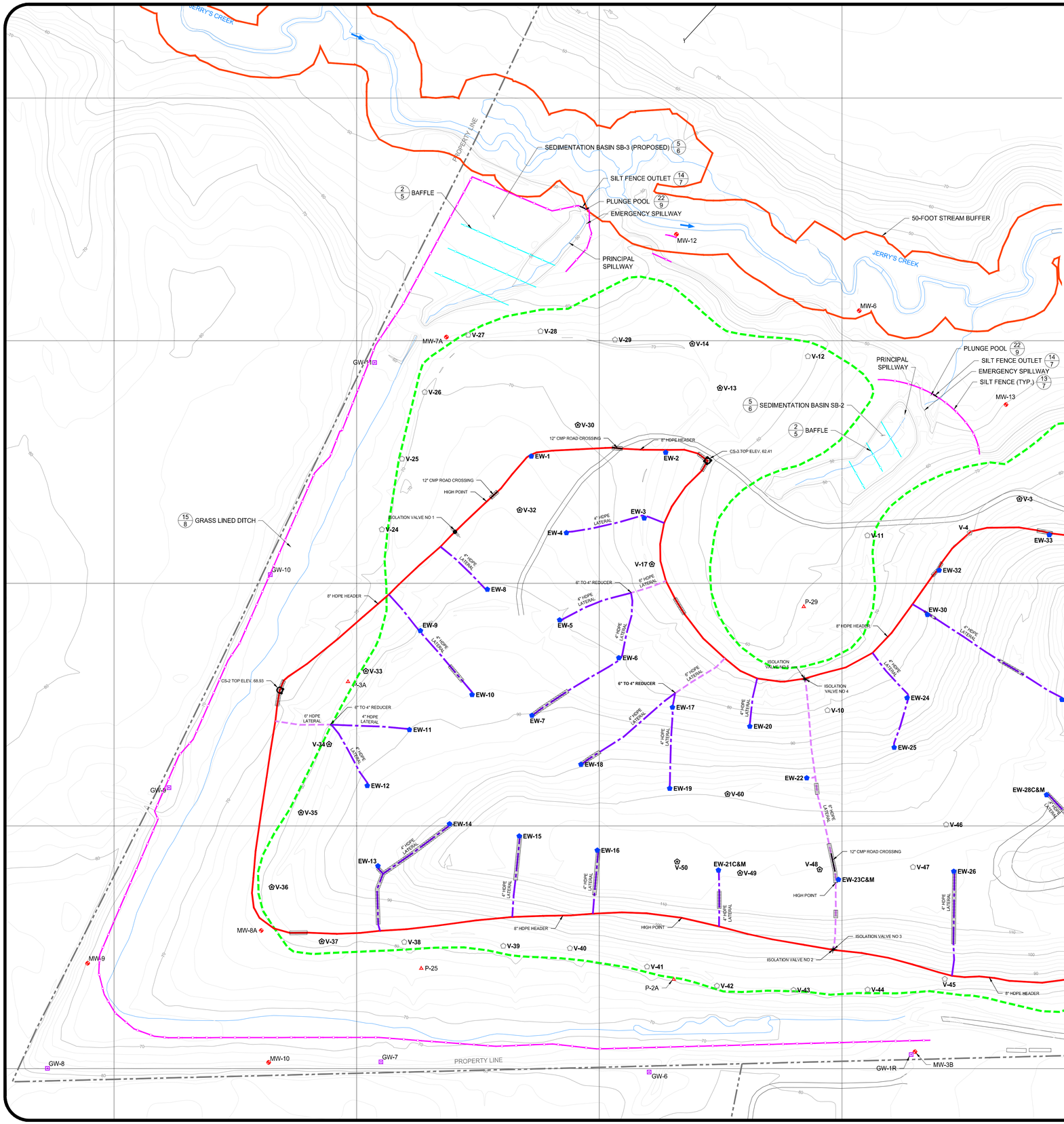
1	6-3-2014	June 2014 Permit Renewal	KSO

EXISTING CONDITIONS

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 200'	DATE: AUG 2014
DRAWING NUMBER: D-1387	
DRAWING: 2	OF: 9

T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Closure Plan\D1387.dwg, FIG2, 9/20/2016 10:43:00 AM, 1:1



LEGEND

- GROUNDWATER MONITOR WELL
- PIEZOMETER
- METHANE GAS MONITOR WELL
- EXISTING VENT USED FOR PHASE I EXPANSION
- PROPOSED VERTICAL GAS EXTRACTION WELL (PHASE II)
- EXISTING VENT USED FOR PHASE III EXPANSION
- EXISTING VENT CAPPED
- LIMIT OF MSW WASTE
- PROPERTY LINE
- 50-FOOT STREAM BUFFER
- COIR BAFFLE
- SILT FENCE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- 1 / 7 — DETAIL NUMBER / FIGURE NUMBER

GRAPHIC SCALE

200 0 100 200

(IN FEET)

NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
3. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. LOCATIONS AND EXTENT OF PROPOSED ACTIVE LANDFILL GAS COLLECTION PIPING AND VALVES, VERTICAL WELLS, AND CONDENSATE SUMPS ARE CONCEPTUAL AND SUBJECT TO CHANGE BASED UPON ACTUAL SOLID WASTE FILLING SEQUENCE, OPERATIONAL REQUIREMENTS OF THE LANDFILL GAS SYSTEM, AND COMPLIANCE WITH APPLICABLE AIR REGULATIONS.
6. THE GAS COLLECTION HEADER AND LATERAL PIPING WILL BE INSTALLED ON-GRADE AND SIZED PRIOR TO INSTALLATION BASED ON PROJECTED LANDFILL GAS FLOW RATES.
7. IT IS ASSUMED THAT THE ACTIVE LANDFILL GAS COLLECTION SYSTEM WILL BE INSTALLED PRIOR TO CLOSURE OF THE C&D LANDFILL.

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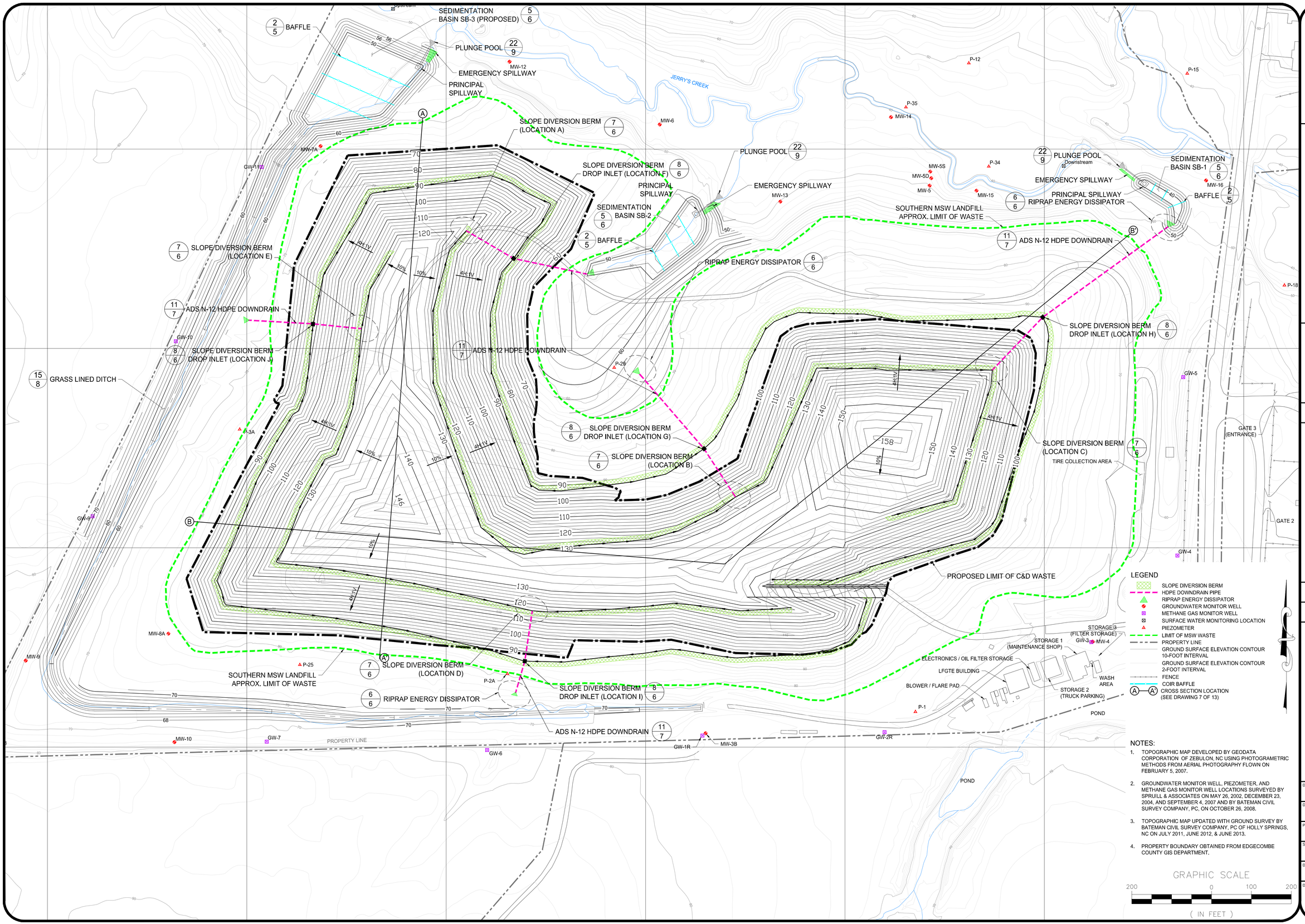
LANDFILL GAS COLLECTION SYSTEM

CLOSURE DRAWINGS
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1388-01	
DRAWING: 3	OF: 9

T:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Closure Plan\D1388.dwg, FIG3, 9/3/2014 10:57:55 AM, 1:1



NOTES:

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2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

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1	5-3-2014	2014 Permit Renewal	KSO
	June		

PROPOSED FINAL GRADING

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY: DBW	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1389	
DRAWING: 3A	OF: 9

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LEGEND

- MONITOR WELL
- PIEZOMETER
- GAS PROBE
- GAS VENT
- GAS VENT CAPPED
- GAS VENT ABANDONED
- 8" HDPE HEADER
- 6" HDPE LATERAL
- 4" HDPE LATERAL
- LIMIT OF MSW WASTE
- PROPERTY LINE
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

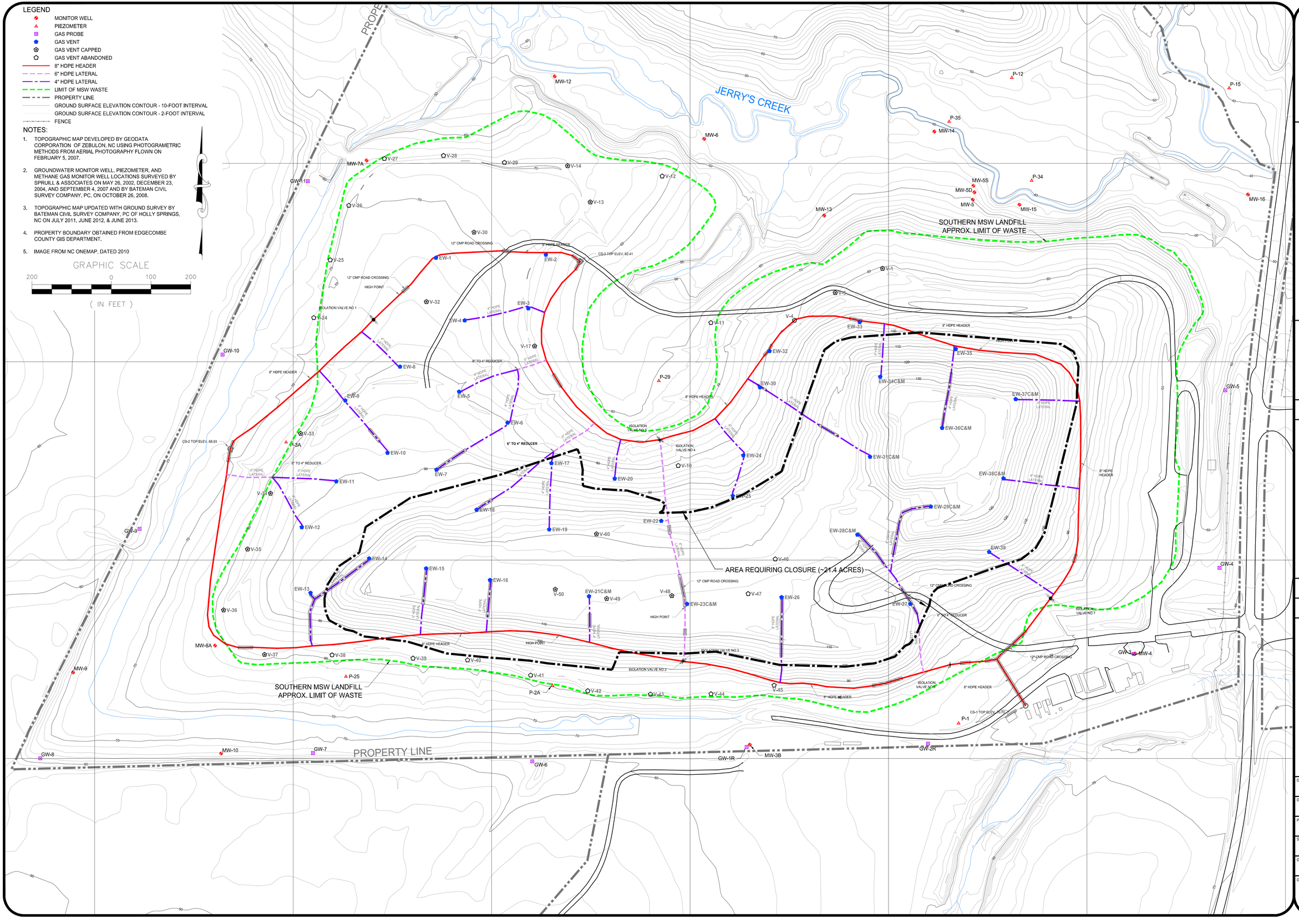
NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.
3. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
4. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
5. IMAGE FROM NC ONEMAP, DATED 2010

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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MAXIMUM AREA REQUIRING CLOSURE

CLOSURE CRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY: KSO	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1390	
DRAWING: 3B	OF: 9

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LEGEND

- GROUNDWATER MONITOR WELL
- PIEZOMETER
- METHANE GAS MONITOR WELL
- 50-FOOT STREAM BUFFER
- PROPERTY LINE
- COIR BAFFLE
- SILT FENCE
- WETLANDS
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT & 5-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- 2/7 DETAIL NUMBER / FIGURE NUMBER

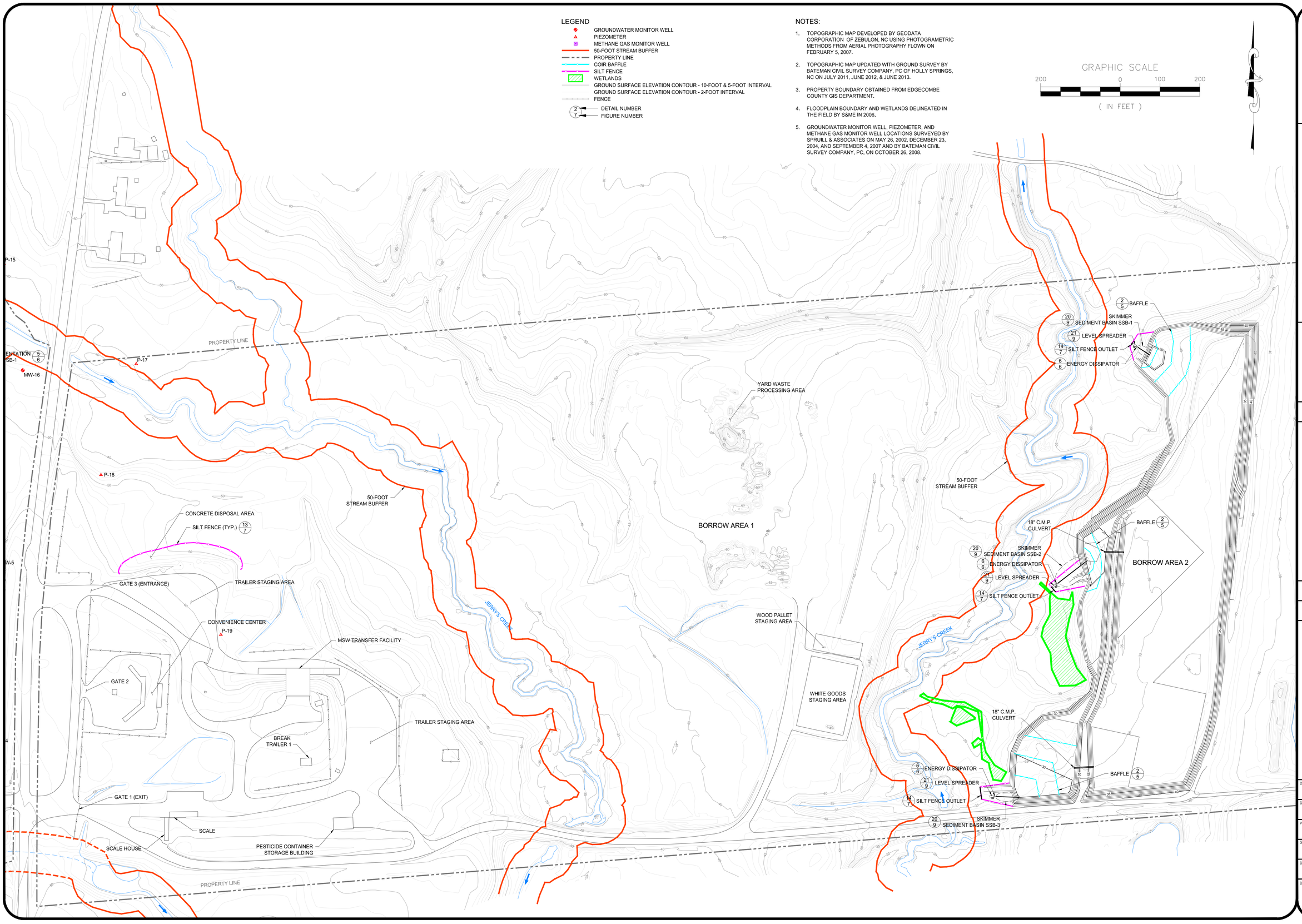
NOTES:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON JULY 2011, JUNE 2012, & JUNE 2013.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
4. FLOODPLAIN BOUNDARY AND WETLANDS DELINEATED IN THE FIELD BY S&ME IN 2006.
5. GROUNDWATER MONITOR WELL, PIEZOMETER, AND METHANE GAS MONITOR WELL LOCATIONS SURVEYED BY SPRUILL & ASSOCIATES ON MAY 26, 2002, DECEMBER 23, 2004, AND SEPTEMBER 4, 2007 AND BY BATEMAN CIVIL SURVEY COMPANY, PC, ON OCTOBER 26, 2008.

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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3201 SPRING FOREST ROAD, RALEIGH, NC 27616

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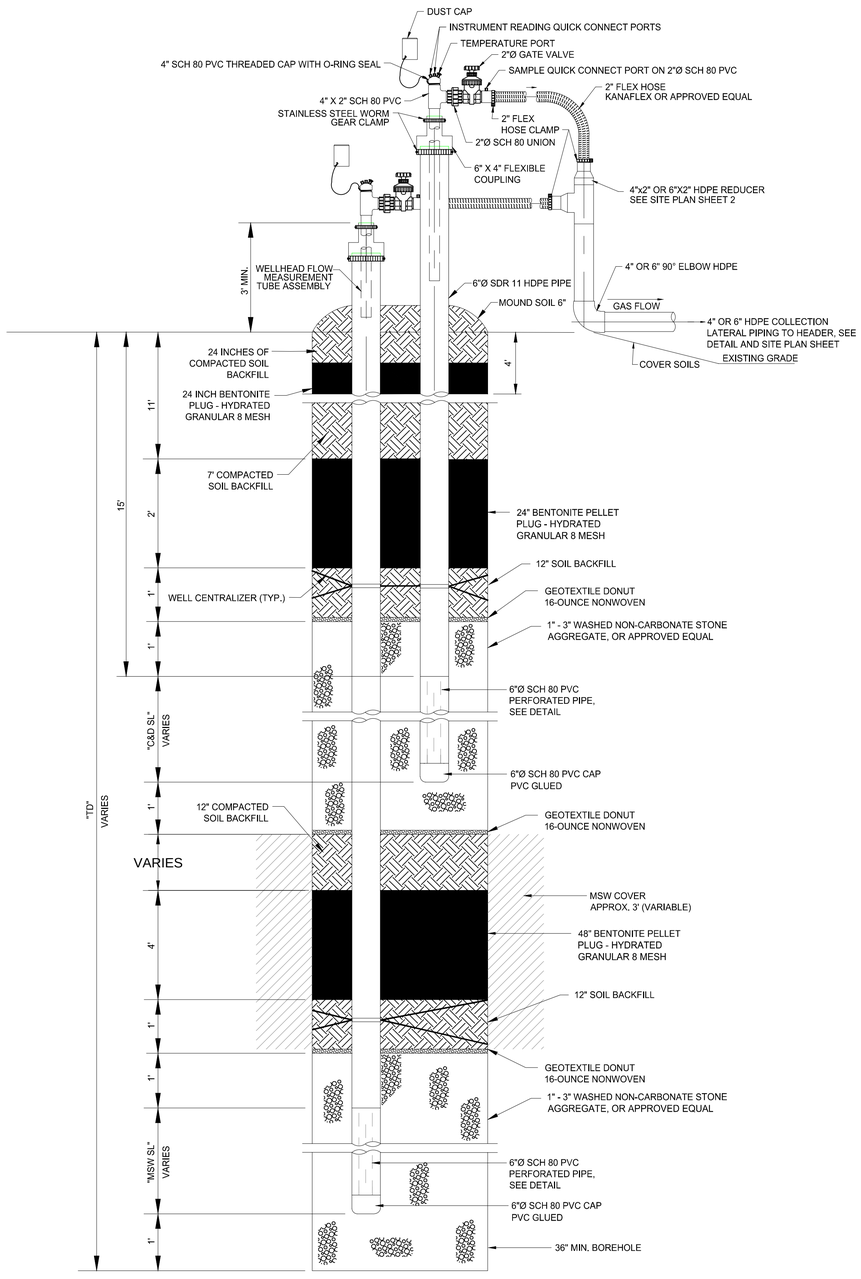
BORROW AREA PLAN

CLOSURE DRAWINGS
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

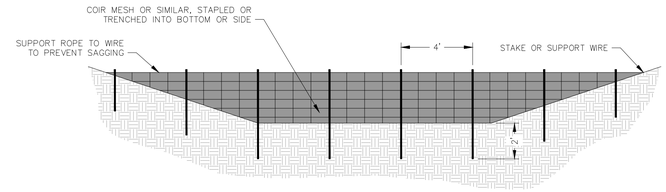
DRAWN BY: BTR	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: 1" = 100'	DATE: AUG 2014
DRAWING NUMBER: D-1388-02	
DRAWING: 4	OF: 9

Y:\Projects\2013\EN\13-277A Edgecombe Permit Application\CAD\Drawings from KSO\Closure Plan\D1388.dwg, FIG4, 6/3/2014 10:58:01 AM, 1:1



NOTES:
1. WELLHEAD ASSEMBLY SHOWN REPRESENTS 2" LANDTEC ACCU-FLO MODEL AF2V WELLHEAD ASSEMBLY, TEL. 1-800-LANDTEC, FAX 213-895-5866.
2. WELL CENTRALIZERS TO BE INSTALLED AT EVERY 25' OF BORE DEPTH TO KEEP WELL CASING CENTERED IN BORE HOLE.

NESTED VERTICAL EXTRACTION WELL DETAIL
NOT TO SCALE



CONSTRUCTION SPECIFICATION:

1. GRADE THE BASIN SO THAT THE BOTTOM IS LEVEL FRONT TO BACK AND SIDE TO SIDE.
2. INSTALL POSTS OR SAW HORSES ACROSS THE WIDTH OF THE SEDIMENT TRAP (PRACTICE 6.62, SEDIMENT FENCE).
3. STEEL POSTS SHOULD BE DRIVEN TO A DEPTH OF 24 INCHES, SPACED A MAXIMUM OF 4 FEET APART, AND INSTALLED UP THE SIDES OF THE BASIN AS WELL. THE TOP OF THE FABRIC SHOULD BE 6 INCHES HIGHER THAN THE INVERT OF THE SPILLWAY. TOPS OF BAFFLES SHOULD BE 2 INCHES LOWER THAN THE TOP OF THE BERMS.
4. INSTALL AT LEAST THREE ROWS OF BAFFLES BETWEEN THE INLET AND OUTLET DISCHARGE POINT. BASINS LESS THAN 20 FEET IN LENGTH MAY USE 2 BAFFLES.
5. WHEN USING POSTS, ADD A SUPPORT WIRE OR ROPE ACROSS THE TOP OF THE MEASURE TO PREVENT SAGGING.
6. WRAP POROUS MATERIAL, LIKE JUTE BACKED BY COIR MATERIAL, OVER A SAWHORSE OR THE TOP WIRE. HAMMER REBAR INTO THE SAWHORSE LEGS FOR ANCHORING. THE FABRIC SHOULD HAVE FIVE TO TEN PERCENT OPENINGS IN THE WEAVE. ATTACH FABRIC TO A ROPE AND A SUPPORT STRUCTURE WITH ZIP TIES, WIRE, OR STAPLES.
7. THE BOTTOM AND SIDES OF THE FABRIC SHOULD BE ANCHORED IN A TRENCH OR PINNED WITH 8-INCH EROSION CONTROL MATTING STAPLES.
8. DO NOT SPLICE THE FABRIC, BUT USE A CONTINUOUS PIECE ACROSS THE BASIN.

MAINTENANCE:

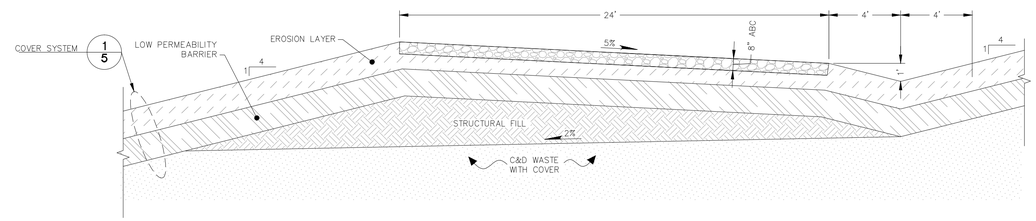
INSPECT BAFFLES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.

BE SURE TO MAINTAIN ACCESS TO THE BAFFLES. SHOULD THE FABRIC OF A BAFFLE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.

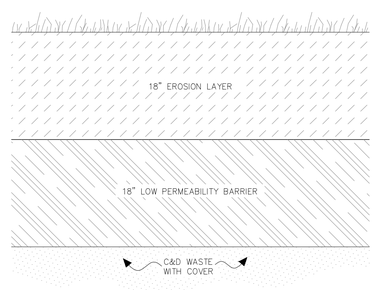
REMOVE SEDIMENT DEPOSITS WHEN IT REACHES HALF FULL TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE BAFFLES. TAKE CARE TO AVOID DAMAGING THE BAFFLES DURING CLEANOUT. SEDIMENT DEPTH SHOULD NEVER EXCEED HALF THE DESIGNED STORAGE DEPTH.

AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED, REMOVE ALL BAFFLE MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, BRING THE AREA TO GRADE, AND STABILIZE IT.

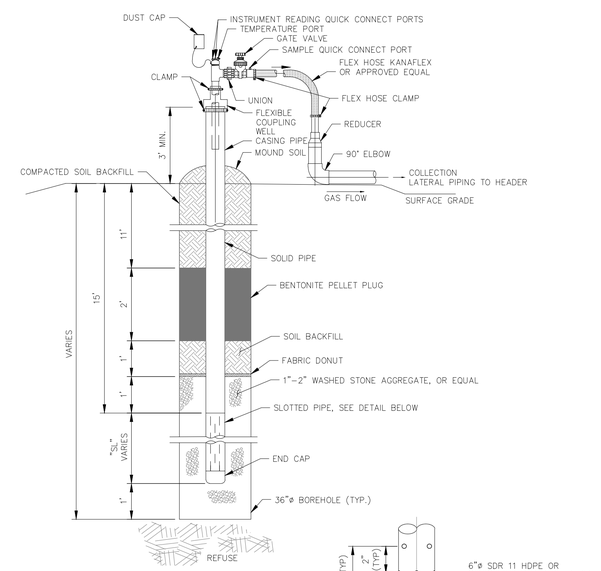
2/5 POROUS BAFFLE DETAIL
SCALE: NTS



3/5 ACCESS ROAD DETAIL
SCALE: 1"=4'



1/5 COVER SYSTEM
SCALE: 1"=1'



NOTES:
1. WELL TO BE INSTALLED NO DEEPER THAN 10 FEET ABOVE THE LANDFILL BASE
2. SDR 11 HDPE OR SCH80 PVC PIPE MAY BE USED.
3. SLOTTED OR PERFORATED PIPE MAY BE USED.

PERFORATED PIPE FOR VERTICAL WELLS DETAIL
NO SCALE

4/5 VERTICAL GAS EXTRACTION WELL DETAIL
SCALE: 1"=2'

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NO.	DATE	DESCRIPTION	BY
1	6-3-2014	June 2014 Permit Renewal	KSO

FINAL COVER AND GAS WELL DETAILS

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY: SPW
DESIGNED BY:	APPROVED BY: KSO
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1391	
DRAWING: 5	OF: 9

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CONSTRUCTION SPECIFICATIONS

1. SITE PREPARATIONS: CLEAR, GRUB, AND STRIP TOPSOIL FROM AREAS UNDER THE EMBANKMENT TO REMOVE TREES, VEGETATION, ROOTS, AND OTHER OBJECTIONABLE MATERIAL. TO FACILITATE SEDIMENT CLEANOUT AND RESTORATION, CLEAR THE POOL AREA OF ALL BRUSH, TREES, AND OTHER OBJECTIONABLE MATERIALS. STOCKPILE ALL TOPSOIL OF SOIL CONTAINING ORGANIC MATTER FOR USE ON THE OUTER SHELL OF THE EMBANKMENT TO FACILITATE VEGETATIVE ESTABLISHMENT. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW THE BASIN AS NEEDED.

2. CUT-OFF TRENCH: EXCAVATE A CUT-OFF TRENCH ALONG THE CENTERLINE OF THE EARTH FILL EMBANKMENT. CUT THE TRENCH TO STABLE SOIL MATERIAL, BUT IN NO CASE MAKE IT LESS THAN 2 FT. DEEP. THE CUT-OFF TRENCH MUST EXTEND INTO BOTH ABUTMENTS TO AT LEAST THE ELEVATION OF THE RISER CREST. MAKE THE MINIMUM BOTTOM WIDTH WIDE ENOUGH TO PERMIT OPERATION OF EXCAVATION AND COMPACTION EQUIPMENT BUT IN NO CASE LESS THAN 2 FT. MAKE SIDE SLOPES OF THE TRENCH NO STEEPER THAN 1:1. COMPACTION REQUIREMENTS ARE THE SAME AS THOSE FOR THE EMBANKMENT. KEEP THE TRENCH DRY DURING BACKFILLING AND COMPACTION OPERATIONS.

3. EMBANKMENT: TAKE FILL MATERIAL FROM THE APPROVED AREAS SHOWN ON THE PLANS. IT SHOULD BE CLEAN MINERAL SOIL, FREE OF ROOTS, WOODY VEGETATION, ROCKS, AND OTHER OBJECTIONABLE MATERIAL. SCARIFY AREAS ON WHICH FILL IS TO BE PLACED BEFORE PLACING FILL. THE FILL MATERIAL MUST CONTAIN SUFFICIENT MOISTURE SO IT CAN BE FORMED BY HAND INTO A BALL WITHOUT CRUMBLING. IF WATER CAN BE SQUEEZED OUT OF THE BALL, IT IS TOO WET FOR PROPER COMPACTION. PLACE FILL MATERIAL IN 6 TO 8-INCH CONTINUOUS LAYERS OVER THE ENTIRE LENGTH OF THE FILL AREA AND THEN COMPACT IT. COMPACTION MAY BE OBTAINED BY ROUTING THE CONSTRUCTION HAULING EQUIPMENT OVER THE FILL SO THAT THE ENTIRE SURFACE OF EACH LAYER IS TRAVERSED BY AT LEAST WHEEL OR TREAD TRACK OF THE HEAVY EQUIPMENT, OR A COMPACTOR MAY BE USED. CONSTRUCT THE EMBANKMENT TO AN ELEVATION 10% HIGHER THAN THE DESIGN HEIGHT TO ALLOW FOR SETTLING.

4. CONDUIT SPILLWAYS: SECURELY ATTACH THE RISER TO THE BARREL OR BARREL STUB TO MAKE A WATERTIGHT STRUCTURAL CONNECTION. SECURE ALL CONNECTIONS BETWEEN BARREL SECTIONS BY APPROVED WATERTIGHT ASSEMBLIES. PLACE THE BARREL AND RISER ON A FIRM, SMOOTH FOUNDATION OR IMPERVIOUS SOIL. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE OR ANTI-SEEP COLLARS. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FT. OF HAND-COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. ANCHOR THE RISER IN PLACE BY CONCRETE OR OTHER SATISFACTORY MEANS TO PREVENT FLOTATION. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.

5. EMERGENCY SPILLWAY: INSTALL THE EMERGENCY SPILLWAY IN UNDISTURBED SOIL. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE EMERGENCY SPILLWAY.

6. INLETS: DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY (REFERENCES: RUNOFF CONTROL MEASURES AND OUTLET PROTECTION).

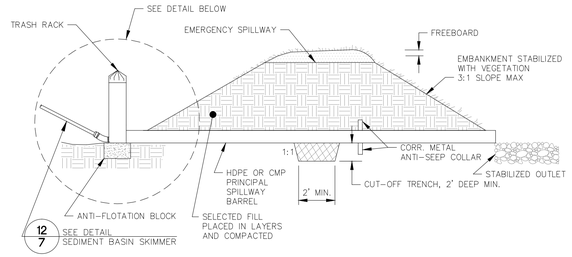
7. EROSION CONTROL: CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION (REFERENCES: SURFACE STABILIZATION).

8. SAFETY: SEDIMENT BASINS MAY ATTRACT CHILDREN AND CAN BE DANGEROUS. AVOID STEEP SIDE SLOPES, AND FENCE AND MARK BASINS WITH WARNING SIGNS IF TRESPASSING IS LIKELY. FOLLOW ALL STATE AND LOCAL REQUIREMENTS.

MAINTENANCE

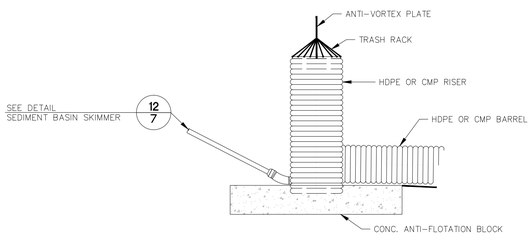
CHECK SEDIMENT BASINS AFTER PERIODS OF SIGNIFICANT RUNOFF. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE DESIGN DEPTH.

CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE RISER AND POOL AREA.



SCHEDULE FOR SEDIMENT BASINS

	SB-1	SB-2	SB-3
SKIMMER ORIFICE (in)	2	3	4
RISER DIAMETER (in)	24	36	54
BARREL DIAMETER (in)	18	24	42
BARREL INVERT @ RISER (ft.)	40	46	48.5
BARREL INVERT @ OUTLET (ft.)	39.5	45.5	48
RISER CREST ELEV. (ft.)	44	49.5	52
TOP OF DAM ELEV. (ft.)	46.0	52	56
EMERGENCY SPILLWAY ELEV. (ft.)	44.7	50.8	53.5
EMERGENCY SPILLWAY WIDTH (ft)	10	12	20
ANTI FLOTATION BLOCK (CONCRETE)	2'x5'x5'	2'x5'x5'	2'x6'x6'
ANTI SEEP COLLAR (CORR. METAL)	6'x6'	6'x6'	6'x6'



5/6 SEDIMENT BASIN DETAIL
SCALE: NTS

DEFINITION

A STRUCTURE DESIGNED TO CONTROL EROSION AT THE INLET OR OUTLET OF A CHANNEL OR CONDUIT.

PURPOSE

TO PREVENT EROSION AT THE OUTLET OF A CHANNEL OR CONDUIT BY REDUCING THE VELOCITY OF FLOW AND DISSIPATING THE ENERGY.

CONSTRUCTION SPECIFICATIONS

1. ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING DISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.

2. THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.

3. FILTER CLOTH, WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP A MINIMUM OF 1 FT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.

4. RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.

5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER.

6. RIPRAP MAY BE FIELD STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.

7. CONSTRUCT THE APRON ON ZERO GRADE WITH NO OVERFALL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.

8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECEIVING STEAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT SITE CONDITIONS, PLACE IN THE UPPER SECTION OF THE APRON.

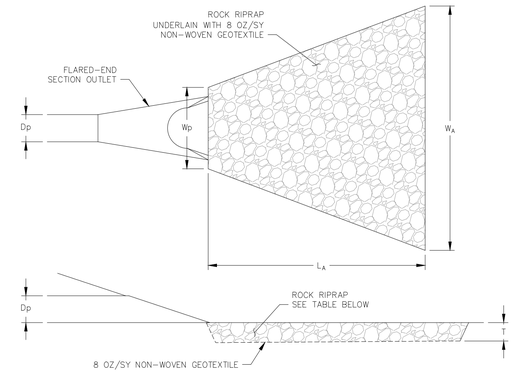
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

MAINTENANCE

INSPECT RIPRAP OUTLET STRUCTURES AFTER HEAVY RAINS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

REFERENCE

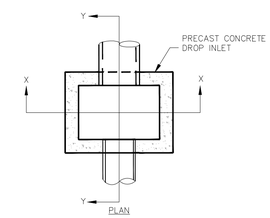
N.C. EROSION AND SEDIMENTATION CONTROL PLANNING AND DESIGN MANUAL, 2006.



SUMMARY OF PROTECTION APRONS

APRON LABEL	DISCHARGE PIPE LOCATION	Dp (FT)	LA (FT)	Wp (FT)	WA (FT)	T (IN)	D50 (IN)	DMAX. (IN)
SSB-1	OUTLET FROM SKIMMER SED BASIN	0.25	6	3.00	9.00	9.00	4.00	6.00
SSB-2	OUTLET FROM SKIMMER SED BASIN	0.33	6	3.00	9.00	9.00	4.00	6.00
SSB-3	OUTLET FROM SKIMMER SED BASIN	0.25	6	3.00	9.00	9.00	4.00	6.00

6/6 ENERGY DISSIPATOR DETAIL
SCALE: NTS

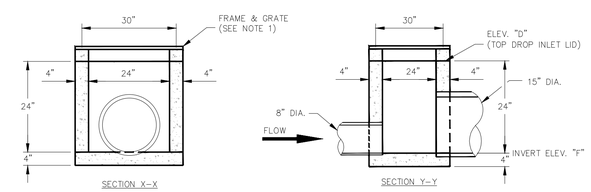


DROP INLET SCHEDULE

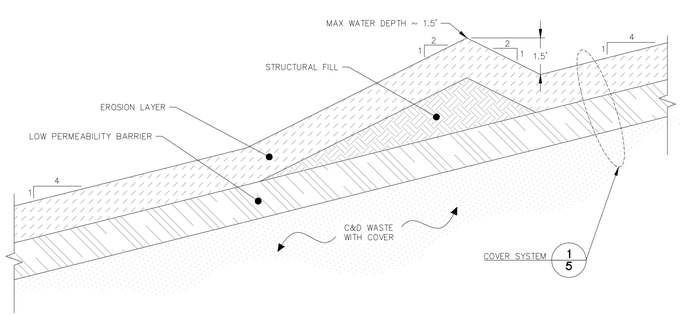
DROP INLET NO.	ELEVATIONS TOP	ELEVATIONS INVERT
	D	F
F	80.0	78.0
G	86.0	84.0
H	93.0	91.0
I	86.0	84.0
J	88.0	86.0

NOTES:

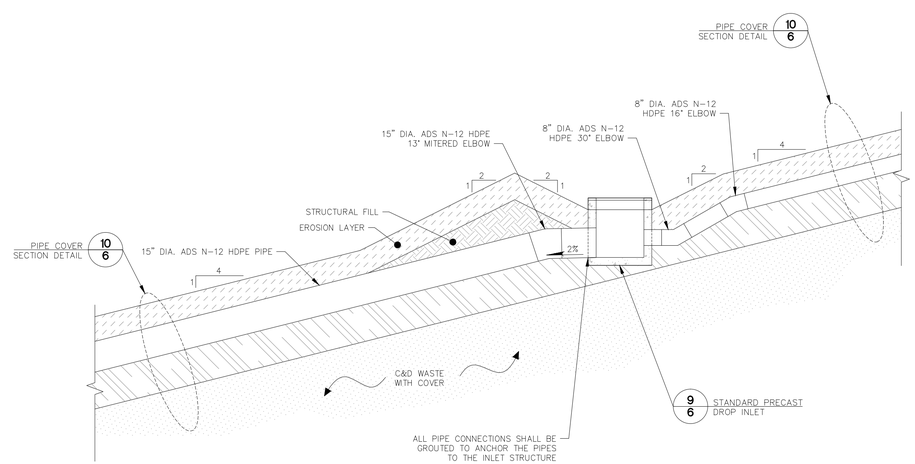
1. STORM GRATE SHALL CONSIST OF AN ELEVATED LID PROVIDING 6" (MIN.) CLEAR SPACE ABOVE DROP INLET.



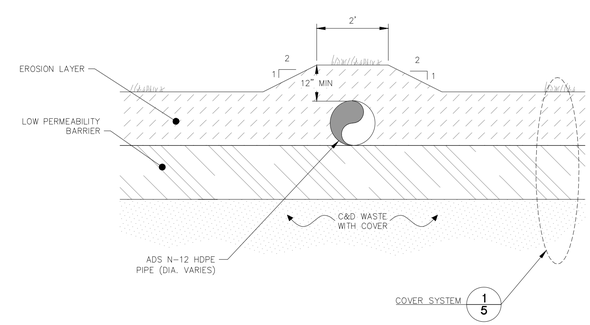
9/6 STANDARD PRECAST DROP INLET DETAIL
NTS



7/6 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



8/6 SLOPE DIVERSION BERM DROP INLET DETAIL
SCALE: 1"=3'



10/6 PIPE COVER SECTION DETAIL
SCALE: 1"=2'

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NO.	DATE	DESCRIPTION	BY
1	6-3-2014	June 2014 Permit Renewal	KSO

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS I

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY: KSO
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1392-01	
DRAWING: 6	OF: 9

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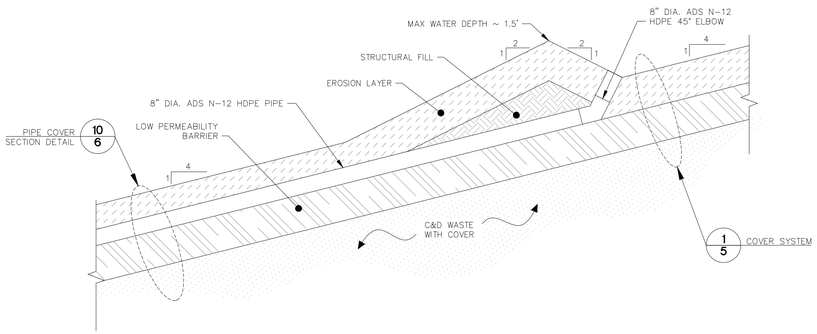
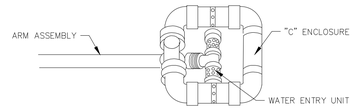
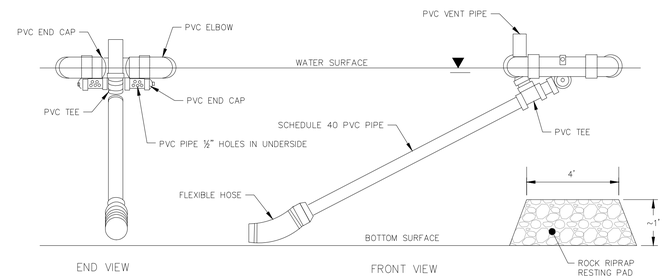


11/7 SLOPE DIVERSION BERM DETAIL
SCALE: 1"=3'



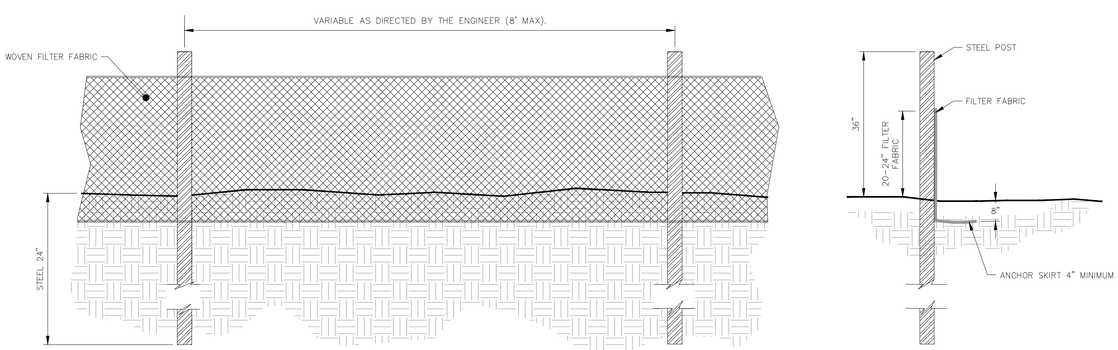
PERSPECTIVE VIEW



Faircloth Skimmer		
Skimmer	Size	Orifice Size
SB-1	3"	2.5"
SB-2	4"	3.9"
SB-3	8"	6.2"

Borrow Area		
Skimmer	Size	Orifice Size
SSB-1	3"	2.4"
SSB-2	4"	2.8"
SSB-3	3"	3.0"

12/7 SEDIMENT BASIN SKIMMER DETAIL
N.T.S.



GENERAL NOTES:

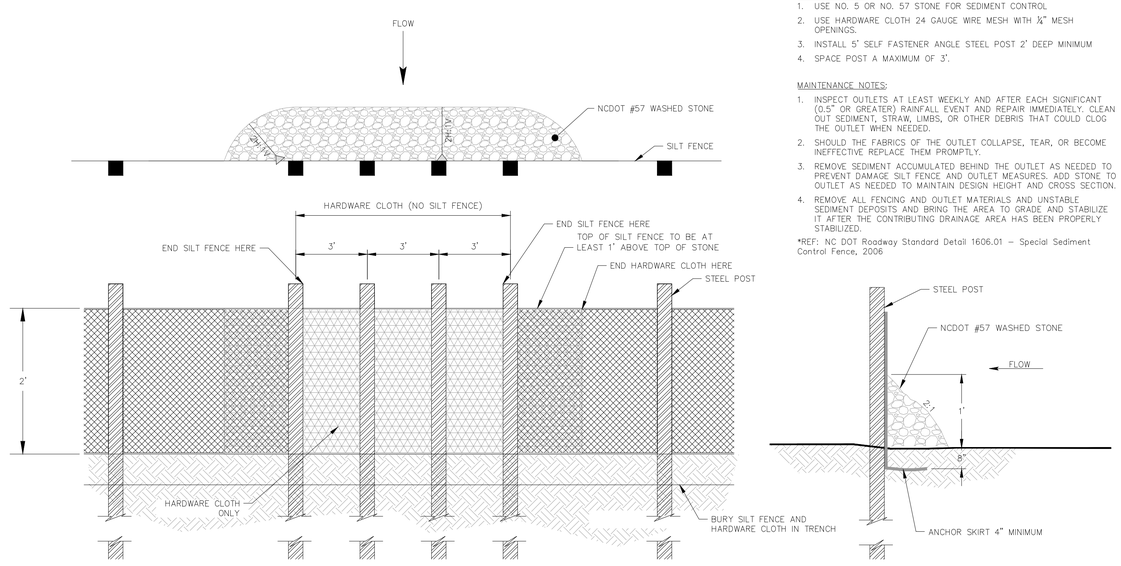
1. PREFABRICATED SILT FENCE IS NOT ACCEPTABLE ON THIS PROJECT.
2. STEEL POSTS SHALL BE USED ON THIS PROJECT INSTEAD OF WOOD POSTS.
3. FILTER FABRIC FENCE SHALL BE A MINIMUM OF 32" IN WIDTH AND SHALL HAVE A MINIMUM OF 6 LINE WIRES WITH 12" STAY SPACING.
4. WOVEN FILTER FABRIC SHALL BE USED WHERE SILT FENCE IS TO REMAIN FOR A PERIOD OF MORE THAN 30 DAYS.
5. STEEL POSTS SHALL BE 5'-0" IN HEIGHT AND BE OF THE SELF-FASTENER ANGLE STEEL TYPE.
6. TURN SILT FENCE UP SLOPE AT ENDS.
7. SILT FENCE SHALL BE STANDARD STRENGTH FILTER FABRIC WITH WIRE MESH REINFORCEMENT OR EXTRA STRENGTH FILTER FABRIC.
8. WHEN FABRIC IS USED WITH WIRE MESH, 8' CENTERED POSTS MAY BE USED.
9. THE USE OF SILT FENCE IN AREAS OF CONCENTRATED FLOW IS INAPPROPRIATE

MAINTENANCE NOTES:

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS AS NECESSARY TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. TAKE CARE TO AVOID UNDERMINING THE FENCE DURING CLEANOUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: 6.62.7 NC Erosion and Sediment Control Planning and Design Manual, 2006

13/7 SILT FENCE DETAIL
NTS



GENERAL NOTES:

1. USE NO. 5 OR NO. 57 STONE FOR SEDIMENT CONTROL
2. USE HARDWARE CLOTH 24 GAUGE WIRE MESH WITH ¼" MESH OPENINGS.
3. INSTALL 5' SELF FASTENER ANGLE STEEL POST 2' DEEP MINIMUM
4. SPACE POST A MAXIMUM OF 3'.

MAINTENANCE NOTES:

1. INSPECT OUTLETS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE OUTLET WHEN NEEDED.
2. SHOULD THE FABRICS OF THE OUTLET COLLAPSE, TEAR, OR BECOME INEFFECTIVE REPLACE THEM PROMPTLY.
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE OUTLET AS NEEDED TO PREVENT DAMAGE SILT FENCE AND OUTLET MEASURES. ADD STONE TO OUTLET AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.
4. REMOVE ALL FENCING AND OUTLET MATERIALS AND UNSTABLE SEDIMENT DEPOSITS AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

*REF: NC DOT Roadway Standard Detail 1606.01 – Special Sediment Control Fence, 2006

14/7 SILT FENCE OUTLET DETAIL
NTS

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NO.	DATE	DESCRIPTION	BY
1	6-3-2014	June 2014 Permit Renewal	KSO

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS II

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY: KSO
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1392-02	
DRAWING: 7	OF: 9

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DEFINITION
Controlling runoff and erosion on disturbed areas by establishing perennial vegetative : cover with seed.

PURPOSE
To reduce erosion and decrease sediment yield from disturbed areas, and to permanently stabilize such areas in a manner that is economical, adapts to site conditions, and allows selection of the most appropriate plant materials.

SPECIFICATIONS

SEEDBED REQUIREMENTS
Establishment of vegetation should not be attempted on sites that are unsuitable due to excessive soil compaction, inappropriate soil texture, poor drainage, concentrated overland flow, or steepness of slope until measures have been taken to correct these problems.

To maintain a good stand of vegetation, the soil must meet certain minimum requirements as a growth medium. The existing soil should have these criteria:

- Enough fine–grained (silt and clay) material to maintain adequate moisture and nutrient supply (available water capacity of at least .05 inches water to 1 inch of soil).
- Sufficient pore space to permit root penetration.
- Sufficient depth of soil to provide an adequate root zone. The depth to rock or impermeable layers such as hardpans should be 12 inches or more, except on slopes steeper than 2:1 where the addition of soil is not feasible.
- A favorable pH range for plant growth, usually 6.0 – 6.5.
- Free from large roots, branches, stones, large clods of earth, or trash of any kind. Clods and stones may be left on slopes steeper than 3:1 if they are to be hydro seeded.

If any of the above criteria are not met – i.e., if existing soil is too coarse, dense, shallow or acidic to foster vegetation – special amendments are required. The soil conditioners described below may be beneficial or, preferably, topsoil may be applied.

SEEDBED PREPARATION
Install necessary mechanical erosion and sedimentation control practices before seeding, and complete grading according to the approved plan.

Lime and fertilizer needs should be determined by soil tests. Directions, sample cartons, and information sheets are available through county Agricultural Extension offices. Testing is also done by commercial laboratories.

When soil tests results are not available, follow rates suggested in the seeding specifications shown at right. Application rates usually fall into the following ranges:

- Ground agricultural limestone:
  Light–textured, sandy soils: 1 to 1–1/2 tons/acre
  Heavy–textured, clayey soils: 2–3 tons/acre
- Fertilizer:
  Grasses: 800–1200 lb/acre of 10–10–10 (or the equivalent)
  Grass–legume mixtures: 800–1200 lb/acre of 5–10–10 (or the equivalent)

Apply lime and fertilizer evenly and incorporate into the top 4–6 inches of soil by disking or other suitable means. Operate machinery on the contour. When using a hydro seeder, apply lime and fertilizer to a rough, loose surface.

Roughen surfaces prior to seeding.

Complete seedbed preparation by breaking up large clods and raking into a smooth, uniform surface (slopes less than 3:1). Fill in or level depressions that can collect water. Broadcast seed into a freshly loosened seedbed that has not been sealed by rainfall.

SEEDING
Seeding dates given in the seeding mixture specifications are designated as "best" or "possible". Seedings properly carried out within the "best" dates have a high probability of success. It is also possible to have satisfactory establishment when seeding outside these dates. However, as you deviate from them, the probability of failure increases rapidly. Seeding on the last date shown under "possible" may reduce changes of success by 30–50%. Always take this into account in scheduling land–disturbing activities.

Use certified seed for permanent seeding whenever possible.

Labeling of non–certified seed is also required by law. Labels contain important information on seed purity, germination, and presence of wood seeds. Seeds must meet State standards for content of noxious weeds. Do no accept seed containing "prohibited" noxious weed seed.

Inoculate legume seed with the Rhizobium bacteria appropriate to the species of legume. Apply seed uniformly with a cyclone seeder, drop–type spreader, drill, cultipacker seeder, or hydro seeder on a firm, friable seedbed.

When using a drill or cultipacker seeder, plant small grains no more than 1 inch deep, grasses and legumes no more than 1/2 inch. Equipment should be calibrated in the field for the desired seeding rate.

When using broadcast–seeding methods, subdivide the area into workable sections and determine the amount of seed needed for each section. Apply one–half the seed while moving back and forth across the area, making a uniform pattern; then apply the second half in the same way, but moving at right angles to the first pass.

Mulch all plantings immediately after seeding.

HYDRO SEEDING
Surface roughening is particularly important when hydro seeding, as a roughened slope will provide some natural coverage for lime, fertilizer, and seed. The surface should not be compacted or smooth. Fine seedbed preparation is not necessary for hydro seeding operations: large clods, stones, and irregularities provide cavities in which seeds can lodge.

Rate of wood fiber (cellulose) application should be at least 2,000 lb/acre.

Apply legume inoculants at four times the recommended rate when adding inoculant to a hydro seeder slurry.

If a machinery breakdown of 1/2 to 2 hours occurs, add 50% more seed to the tank, based on the proportion of the slurry remaining. This should compensate for damage to seed. Beyond 2 hours, a full rate of new seed may be necessary.

Lime is not normally applied with a hydraulic seeder because it is abrasive. It can be blown onto steep slopes in dry form.

MAINTENANCE
Generally, a stand of vegetation cannot be determined to be fully established until soil cover has been maintained for one full year from planting. Inspect seeded areas for failure and make necessary repairs and reseedings within the same season, if possible.

Reseeding––If a stand has inadequate cover, re–evaluate choice of plant materials and quantities of lime and fertilizer. Re–establish the stand after seedbed preparation or over– seed the stand. Consider seeding temporary, annual species if the time of year is not appropriate for permanent seeding.

If vegetation fails to grow, soil must be tested to determine if acidity or nutrient imbalance is responsible.

Fertilization––On the typical disturbed site, full establishment usually requires re–fertilization in the second growing season. Fine turf requires annual maintenance fertilization. Use soil tests if possible or follow the guidelines given for the specific seeding mixture.

TEMPORARY SEEDING SPECIFICATIONS:

Seeding mixture (fall)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120

Seeding Mixture (late winter early spring)

Species*	Rate (lb/acre)
Rye Grain (*Secale cereale*)	120
Annual (Korean) Lespedeza (*Kummerowia stipulacea*)	50

Seeding mixture (summer)

Species*	Rate (lb/acre)
German Millet (*Setaria italica*)	40

Seeding dates (Piedmont)

Fall:	Aug. 15 – Dec. 30
Late winter (early spring):	Jan. 1 – May 1 Late
Summer:	May 1 – Aug. 15

Soil amendments
Follow recommendations of soil tests or apply 2,000 lb/acre ground agricultural limestone and 750 lb/acre 10–10–10 fertilizer.

Mulch
Apply 4,000 lb/acre straw. Anchor mulch by tacking with asphalt, roving or a mulch anchoring tool. A disk with blades set nearly straight can be used as a mulch anchoring. tool.

Maintenance
Re–fertilize if growth is not fully adequate. Reseed, re–fertilize and mulch immediately following erosion or other damage.

Pursuant to G.S. 113A–57(2), the angle for graded slopes and fills shall be no greater than the angle that can be retained by vegetative cover or other adequate erosion–control devices or structures. In any event, slopes left exposed will, within 21 calendar days of completion of any phase of grading, be planted or otherwise provided with temporary or permanent ground cover, devices, or structures sufficient to restrain erosion.

Pursuant to G.S. 113A–57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.10 A,B and C, NC Erosion and Sediment Control Planning and Design Manual, 2006

PERMANENT SEEDING SPECIFICATIONS

Seeding mixture

Species*	Rate (lb/acre)
Centipede Grass (*Eremochloa ophiuroides*) (Grass lined Channels)	200
Centipede Grass (*Eremochloa ophiuroides*) (Other Areas)	100

Nurse plants
Between May 1 and Aug. 15, add 10 lb/acre German millet (*Setaria italica*) or 15 lb/acre Sudan grass.
Prior to May 1 or after Aug. 15, add 40 lb/acre Rye Grain (*Festuca arundinacea*).

Seeding dates

	Best	Possible
Fall:	Aug. 25 – Sept. 15	Aug. 20 – Oct. 25
Late winter:	Feb. 15 – Mar. 21	Feb. 1 –Apr. 15

Soil amendments
Apply lime and fertilizer according to soil tests, or apply 4,000 lb/acre ground agricultural limestone and 1,000 lb/acre 10–10–10 fertilizer.

Mulch
Apply 4,000–5,000 lb/acre grain straw or equivalent cover of another suitable mulching material. Anchor mulch by tacking with asphalt, roving, or netting. Netting is the preferred anchoring method on steep slopes.

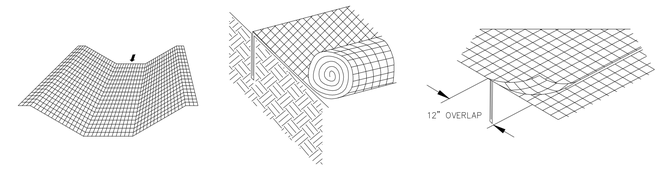
Maintenance
Re–fertilize in the second year unless growth is fully adequate. May be mowed once or twice a year, but mowing is not necessary. Reseed, fertilize, and mulch damaged areas immediately.

Pursuant to G.S. 113A–57(3), provisions for permanent groundcover sufficient to restrain erosion must be accomplished for all disturbed areas within 15 working days or 90 calendar days (whichever is shorter) following completion of construction or development.

*REF: 6.11L NC Erosion and Sediment Control Planning and Design Manual, 2006

Contact Person Responsible for Maintenance
Mr. Danny Bagley
Telephone: (252) 827–4253
Cell: (252) 813–3947
Fax: (252) 827–6618

GENERAL SEEDING SPECIFICATIONS



IN CHANNELS, ROLL OUT STRIPS OF MATTING PARALLEL TO THE DIRECTION OF FLOW.

ANCHOR MATTING IN A 12" TRENCH

JOIN STRIPS BY ANCHORING AND OVERLAPPING

GENERAL NOTES:

1. DITCH LINES OVER 3 PERCENT MUST BE MATTED WITH NORTH AMERICAN GREEN DS–75 MATTING OR EQUIVALENT.
2. APPLY SEED BEFORE LAYING THE NET OR MAT. IF OPEN–WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND FERTILIZER AND SEED MAY BE SPRAYED ON AFTERWARD.
3. START LAYING THE NET FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES–DO NOT STRETCH.
4. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 12 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END EVERY 3 FEET AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER, EVERY 3 FEET.

MAINTENANCE NOTES:

1. INSPECT ROLLED EROSION CONTROL PRODUCTS (RECP) AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAIN FALL EVENT.
2. GOOD CONTACT WITH THE GROUND MUST BE MAINTAINED, AND EROSION MUST NOT OCCUR BENEATH THE RECP.
3. ANY AREAS OF THE RECP THAT ARE DAMAGED OR NOT IN CLOSE CONTACT WITH THE GROUND SHALL BE REPAIRED AND STAPLED.
4. IF EROSION OCCURS DUE TO POORLY CONTROLLED DRAINAGE, THE PROBLEM SHALL BE FIXED AND THE ERODED AREA PROTECTED.
5. MONITOR AND REPAIR THE RECP AS NECESSARY UNTIL GROUND COVER IS ESTABLISHED.

*REF: 6.17.12 NC Erosion and Sediment Control Planning and Design Manual, 2006

16/8 TYPICAL TEMPORARY MATTING DETAIL
NTS

DEFINITION

A CHANNEL WITH VEGETATIVE LINING CONSTRUCTED TO DESIGN CROSS SECTION AND GRADE FOR CONVEYANCE OF RUNOFF.

PURPOSE

TO CONVEY AND DISPOSE OF CONCENTRATED SURFACE RUNOFF WITHOUT DAMAGE FROM EROSION, DEPOSITION, OR FLOODING.

CONSTRUCTION SPECIFICATIONS

1. REMOVE ALL TREES, BRUSH, STUMPS, AND OTHER OBJECTIONABLE MATERIAL FROM THE FOUNDATION AREA AND DISPOSE OF PROPERLY.
2. PLACE FILL TO CONSTRUCT THE CHANNEL AND SHAPE IT TO DIMENSIONS SHOWN ON THE PLANS PLUS A 0.2–FT OVERCUT AROUND THE CHANNEL PERIMETER TO ALLOW FOR BULKING DURING SEEDBED PREPARATIONS AND SOD BUILDUP.
3. REMOVE AND PROPERLY DISPOSE OF ALL EXCESS SOIL SO THAT SURFACE WATER MAY ENTER THE CHANNEL FREELY.
4. THE PROCEDURE USED TO ESTABLISH GRASS IN THE CHANNEL WILL DEPEND UPON THE SEVERITY OF THE CONDITIONS AND SELECTION OF SPECIES. PROTECT THE CHANNEL WITH MULCH OR A TEMPORARY LINER SUFFICIENT TO WITHSTAND ANTICIPATED VELOCITIES DURING THE ESTABLISHMENT PERIOD (SEE SEEDING SPECIFICATIONS).
5. APPLY LIME, FERTILIZER AND SEED BEFORE LAYING THE NET (WITHOUT MULCH) OR MAT (WITH MULCH OR SYNTHETIC). IF OPEN–WEAVE NETTING IS USED, LIME MAY BE INCORPORATED BEFORE INSTALLING THE NET AND THE FERTILIZER AND SEED CAN BE SPRAYED ON AFTERWARD, OTHERWISE APPLY SEED AND FERTILIZER BEFORE INSTALLATION.
6. START LAYING THE NET OR MAT, AS REQUIRED, FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL IT DOWN THE GRADE. ALLOW NETTING TO LAY LOOSELY ON THE SOIL BUT WITHOUT WRINKLES – DO NOT STRETCH.
7. TO SECURE THE NET, BURY THE UPSLOPE END IN A SLOT OR TRENCH NO LESS THAN 6 INCHES DEEP, COVER WITH SOIL, AND TAMP FIRMLY. STAPLE THE NET EVERY 12 INCHES ACROSS THE TOP END AND EVERY 3 FT AROUND THE EDGES AND BOTTOM. WHERE 2 STRIPS OF NET ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHOULD BE OVERLAPPED 3 INCHES AND STAPLED TOGETHER. EACH STRIP OF NETTING OR MATTING SHOULD ALSO BE STAPLED DOWN THE CENTER OR EVERY 3 FT IF THE STRIP IS NOT WIDER THAN 8 FEET. DO NOT STRETCH THE NET/MAT WHEN APPLYING STAPLES.
8. STAPLES SHOULD BE THE "U"–SHAPED TYPE AND 4" TO 6" LONG (DEPENDING ON SOIL CONDITIONS).
9. TO JOIN ENDS OF TWO STRIPS OF NETTING, CUT A TRENCH TO ANCHOR THE END OF THE DOWN GRADIENT NET. OVERLAP THE END OF THE PREVIOUS ROLL 18 INCHES AND STAPLE EVERY 12 INCHES JUST BELOW THE ANCHOR SLOT.
10. TO JOIN ENDS OF TWO STRIPS OF MATTING, OVERLAP THE UPGRADIENT STRIP OVER THE DOWNGRADIENT ONE AT LEAST 4 INCHES. STAPLE THE OVERLAP AT THE ENDS AND EVERY 12 INCHES ALONG THE CENTER OF THE OVERLAP.

MAINTENANCE

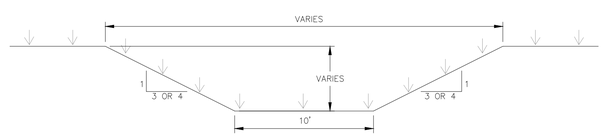
DURING THE ESTABLISHMENT PERIOD, CHECK GRASS–LINED CHANNELS AFTER EVERY RAINFALL. AFTER GRASS IS ESTABLISHED, PERIODICALLY CHECK THE CHANNEL; CHECK IT AFTER EVERY HEAVY RAINFALL EVENT. IMMEDIATELY MAKE REPAIRS. IT IS PARTICULARLY IMPORTANT TO CHECK THE CHANNEL OUTLET AND ALL ROAD CROSSINGS FOR BANK STABILITY AND EVIDENCE OF PIPING OR SCOUR HOLES.

REMOVE ALL SIGNIFICANT SEDIMENT ACCUMULATIONS TO MAINTAIN THE DESIGN CARRYING CAPACITY. KEEP THE GRASS IN A HEALTHY, VIGOROUS CONDITION AT ALL TIMES, SINCE IT IS THE PRIMARY EROSION PROTECTION FOR THE CHANNEL (SEE SEEDING SPECIFICATIONS).

INSPECT ALL MULCHES PERIODICALLY, AND AFTER RAINSTORMS TO CHECK FOR RILL EROSION, DISLOCATION, OR FAILURE. WHERE EROSION IS OBSERVED, APPLY ADDITIONAL MULCH. IF WASHOUT OCCURS, REPAIR THE SLOPE GRADE, RESEED, AND REINSTALL MULCH. CONTINUE INSPECTIONS UNTIL VEGETATION IS FIRMLY ESTABLISHED.

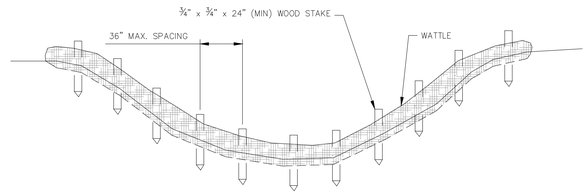
GENERAL NOTES

1. CHANNELS ARE TO BE LINED WITH NORTH AMERICAN GREEN MATTING OR APPROVED EQUIVALENT, AS REQUIRED.
2. NETTING AND MATTING PRODUCTS SHOULD BE INSTALLED ACCORDING TO MANUFACTURER'S GUIDELINES. IF THE MANUFACTURER DOES NOT PROVIDE GUIDELINES, THE ABOVE GUIDELINES FOR NETTING AND MATTING MAY BE USED.



CHANNELS ARE TO BE LINED WITH DS75.
CHANNEL SOUTH AND WEST OF LANDFILL TO BE CONSTRUCTED AT A 0.65% SLOPE.

15/8 GRASS LINED DITCH DETAIL
NTS



GENERAL NOTES:

1. SPACE WATTLES ACCORDING TO TABLE 1 ALONG ANY PORTION OF DITCHLINE WITH A SLOPE OF 5 PERCENT OR GREATER AND A SLOPE LENGTH OF 50 FEET OR GREATER.

TABLE 1: WATTLE SPACING

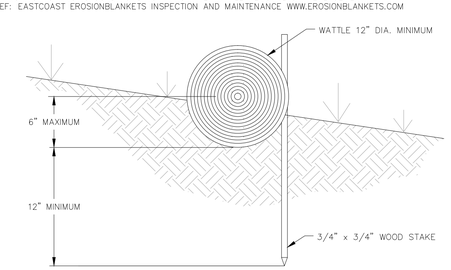
SLOPE (%)	SPACING DISTANCE (FT. O.C.) 12" DIA.	18" DIA.
5	20	30
6	17	25
7	14	21
8	13	19
9	11	17
10	10	15

2. PLACE FIRST WATTLE 1/2 SPACING DISTANCE FROM CREST OF QUALIFYING SLOPE.
3. SPACE WOODEN STAKES 3 FEET O.C. ON DOWNSTREAM SIDE THROUGH A MINIMUM OF 2 APERTURES.
4. PLACE CHECK DAMS OR WATTLES AT THE LOWER LIMITS OF EACH DAYS WORK.

MAINTENANCE NOTES:

1. IT IS IMPERATIVE THAT WATTLES BE INSPECTED AFTER INSTALLATION AND SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENTS.
2. THERE ARE TO BE NO GAPS BETWEEN ADJACENT WATTLES OR BETWEEN SOIL SURFACE AND WATTLE BOTTOM.
3. REPAIR ANY UPSLOPE OR UNDERCUTTING DEFICIENCIES FOR PROPER PERFORMANCE.
4. REMOVE ALL FILTRATION IMPEDIMENTS INCLUDING SEDIMENT DEPOSITS AND LOOSE DEBRIS WHEN SUCH CONDITIONS IMPACT WATTLE FUNCTIONALITY.
5. SEDIMENT BUILD UP SHOULD NOT BE ALLOWED TO EXCEED ONE THIRD OF WATTLE HEIGHT.
6. MONITOR CHANGING CONDITIONS TO ANTICIPATE WATTLE REMOVAL OR REPLACEMENT.

*REF: EASTCOAST EROSIONBLANKETS INSPECTION AND MAINTENANCE WWW.EROSIONBLANKETS.COM



17/8 TYPICAL WATTLE DETAIL
NTS

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-3-2014	June 2014 Permit Renewal	KSO

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS III

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY: KSO
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1392-03	
DRAWING: 8	OF: 9

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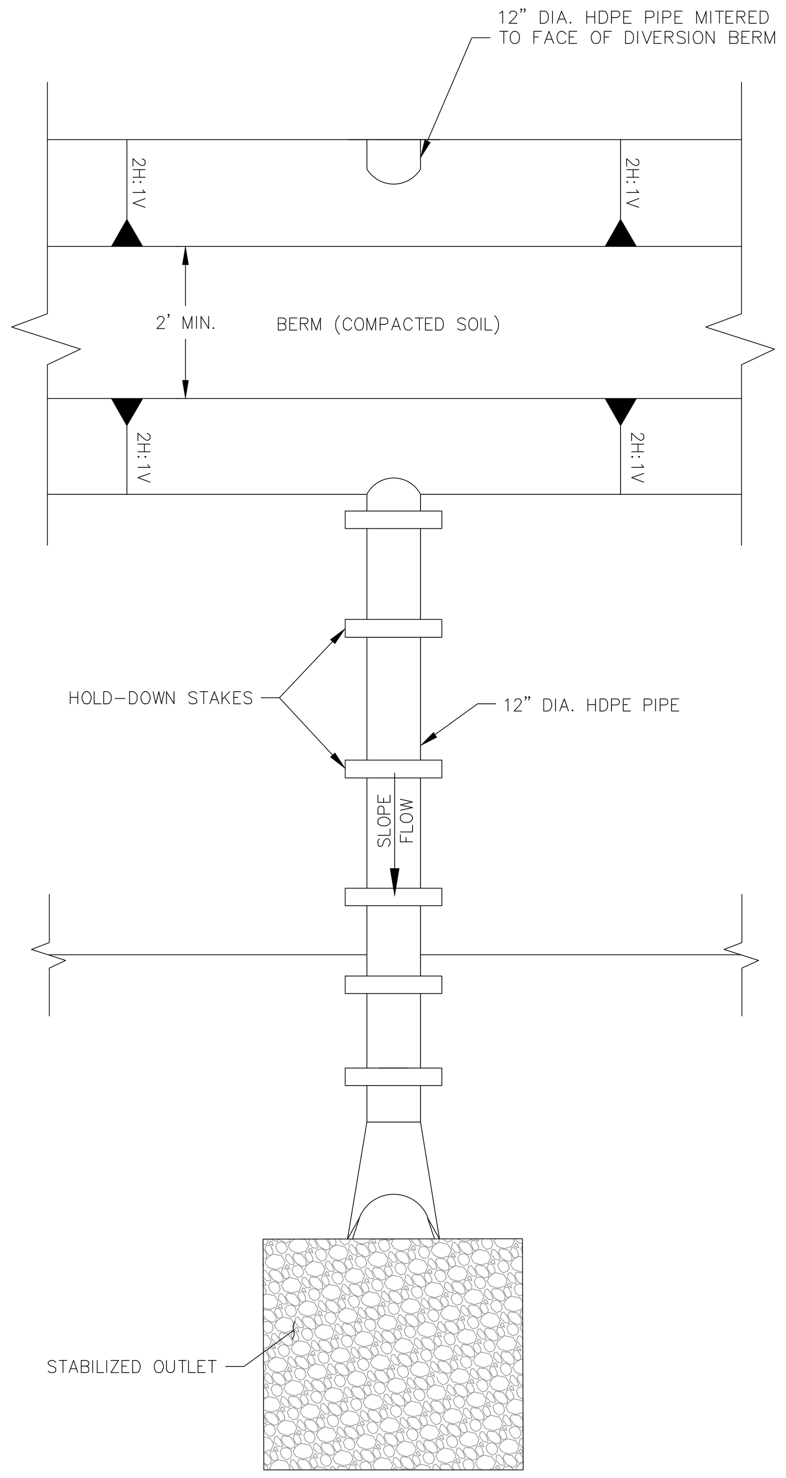
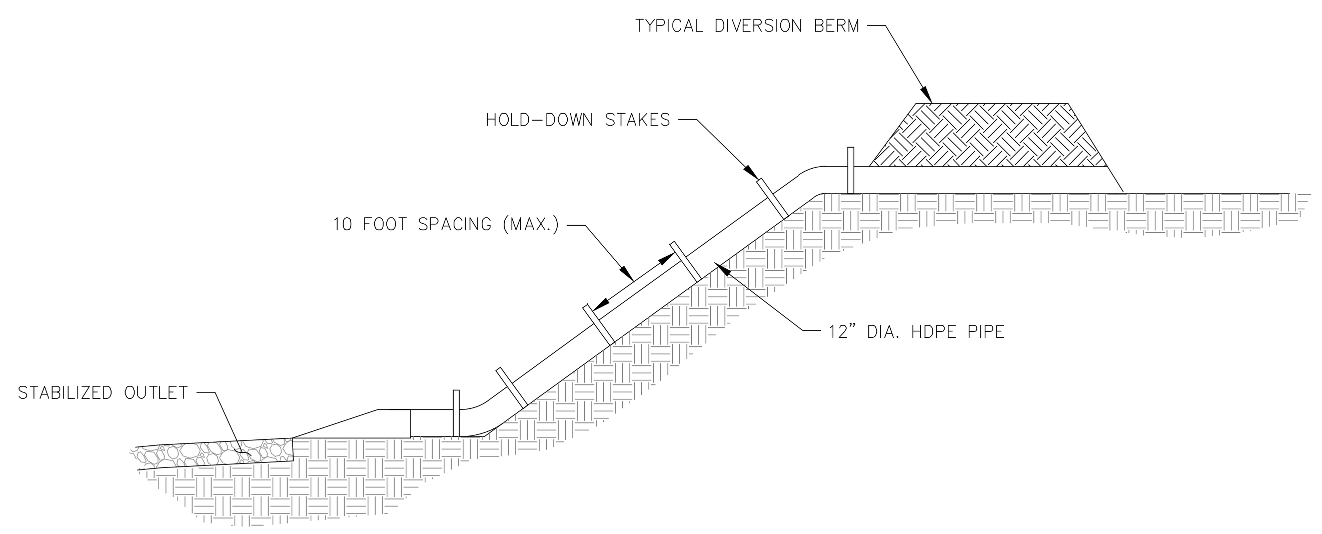




CONSTRUCTION SPECIFICATION:

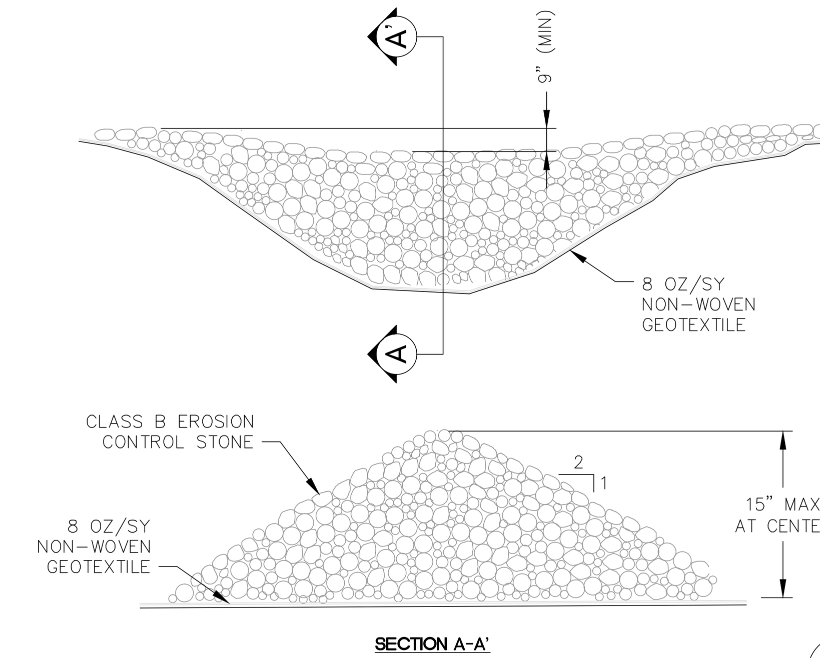
1. PLACE SLOPE DRAINS ON UNDISTURBED SOIL OR WELL COMPACTED FILL AT LOCATIONS AND ELEVATIONS SHOWN ON THE PLAN.
2. SLIGHTLY SLOPE THE SECTION OF PIPE UNDER THE DIKE TOWARD ITS OUTLET.
3. HAND TAMP THE SOIL UNDER AND AROUND THE ENTRANCE SECTION IN LIFTS NOT TO EXCEED 6 INCHES.
4. ENSURE THAT FILL OVER THE DRAIN AT THE TOP OF THE SLOPE HAS MINIMUM DEPTH OF 1.5 FEET.
5. ENSURE THAT ALL SLOPE DRAIN CONNECTIONS ARE WATERTIGHT.
6. ENSURE THAT ALL FILL MATERIAL IS WELL-COMPACTED. SECURELY FASTEN THE EXPOSED SECTION OF THE DRAIN WITH GROMMETS OR STAKES SPACED NO MORE THAN 10 FEET APART.
7. EXTEND THE DRAIN BEYOND THE TOE OF THE SLOPE, AND ADEQUATELY PROTECT THE OUTLET FROM EROSION.
8. MAKE THE SETTLED, COMPACTED DIKE RIDGE NO LESS THAN 1 FEET ABOVE THE TOP OF THE PIPE AT EVERY POINT.
9. IMMEDIATELY STABILIZE ALL DISTURBED AREAS FOLLOWING CONSTRUCTION.

MAINTENANCE NOTES:

INSPECT THE SLOPE DRAIN AND SUPPORTING DIVERSION AFTER EVERY RAINFALL, AND PROMPTLY MAKE NECESSARY REPAIRS. WHEN THE PROTECTED AREA HAS BEEN PERMANENTLY STABILIZED, TEMPORARY MEASURES MAY BE REMOVED, MATERIALS DISPOSED OF PROPERLY, AND ALL DISTURBED AREAS STABILIZED APPROPRIATELY.

*REF: 6.32.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

18/9 SLOPE DRAIN DETAIL
NTS



MAINTENANCE NOTES:

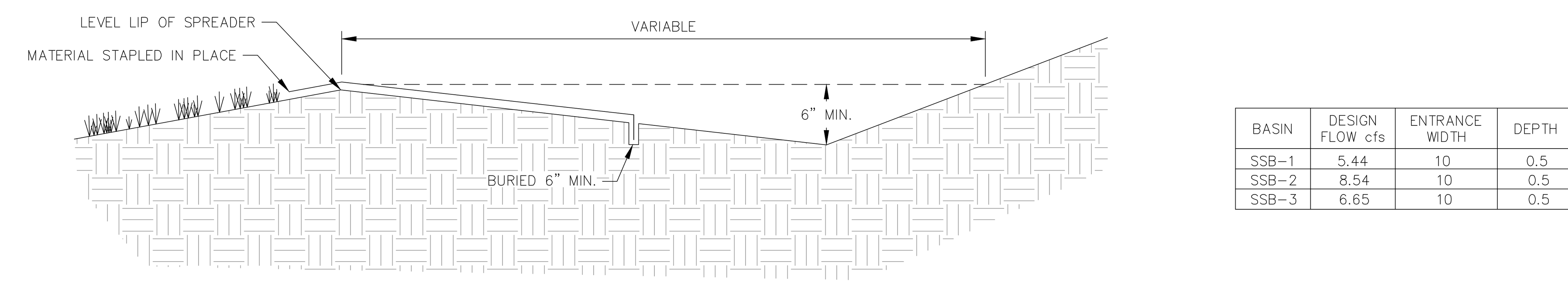
1. INSPECT CHECK DAMS AND CHANNELS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (0.5" OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. CLEAN OUT SEDIMENT, STRAW, LIMBS, OR OTHER DEBRIS THAT COULD CLOG THE CHANNEL WHEN NEEDED.
2. ANTICIPATE SUBMERGENCE AND DEPOSITION ABOVE THE CHECK DAM AND EROSION FROM HIGH FLOWS AROUND THE EDGES OF THE DAM. CORRECT ALL DAMAGE IMMEDIATELY. IF SIGNIFICANT EROSION OCCURS BETWEEN DAMS, ADDITIONAL MEASURES CAN BE TAKEN SUCH AS, INSTALLING A PROTECTIVE RIPRAP LINER IN THAT PORTION OF THE CHANNEL (PRACTICE 6.31, RIPRAP-LINE AND PAVED CHANNELS).
3. REMOVE SEDIMENT ACCUMULATED BEHIND THE DAMS AS NEEDED TO PREVENT DAMAGE TO CHANNEL VEGETATION, ALLOW THE CHANNEL TO DRAIN THROUGH THE STONE CHECK DAM, AND PREVENT LARGE FLOWS FROM CARRYING SEDIMENT OVER THE DAM. ADD STONES TO DAMS AS NEEDED TO MAINTAIN DESIGN HEIGHT AND CROSS SECTION.

*REF: 6.83.3 NC Erosion and Sediment Control Planning and Design Manual, 2006

GENERAL NOTES:

1. SPACE CHECK DAM IN A CHANNEL SO THAT THE CREST OF DOWNSTREAM DAM IS AT ELEVATION OF THE TOE OF UPSTREAM CHECK DAM.
2. STONE SHOULD BE PLACED OVER THE CHANNEL BANKS TO KEEP WATER FROM CUTTING AROUND THE DAM.

19/9 CHECK DAM DETAIL
NTS



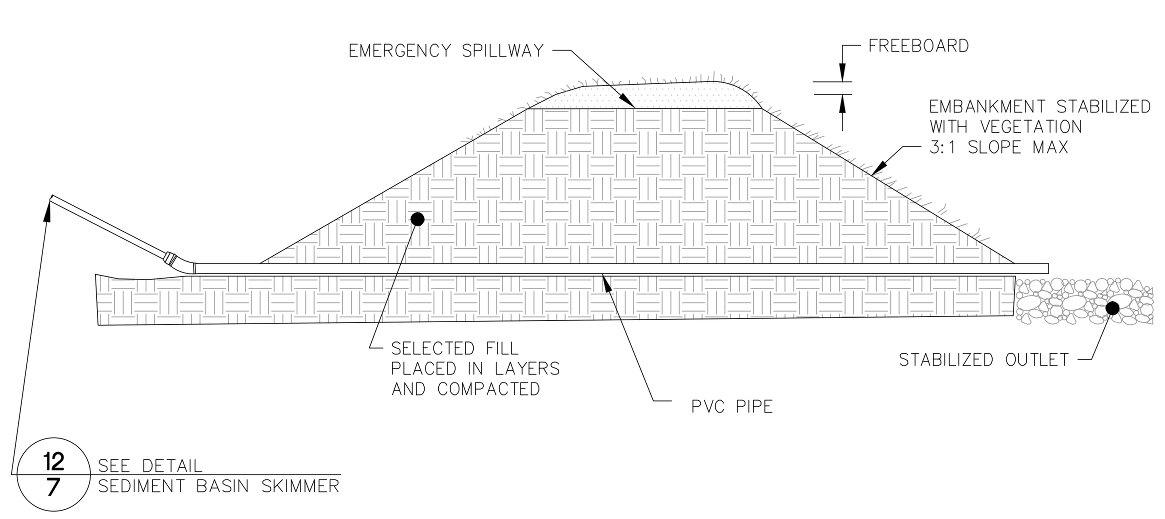
BASIN	DESIGN FLOW cfs	ENTRANCE WIDTH	DEPTH	END WIDTH	LENGTH
SSB-1	5.44	10	0.5	3	10
SSB-2	8.54	10	0.5	3	10
SSB-3	6.65	10	0.5	3	10

21/9 LEVEL SPREADER CROSS SECTION
NTS

CONSTRUCTION SPECIFICATIONS

1. CLEAR, GRUB, AND STRIP THE AREA UNDER THE EMBANKMENT OF ALL VEGETATION AND ROOT MAT. REMOVE ALL SURFACE SOIL CONTAINING HIGH AMOUNTS OF ORGANIC MATTER AND STOCKPILE OR DISPOSE OF IT PROPERLY. HAUL ALL OBJECTIONABLE MATERIAL TO THE DESIGNATED DISPOSAL AREA. PLACE TEMPORARY SEDIMENT CONTROL MEASURES BELOW BASIN AS NEEDED
2. ENSURE THAT FILL MATERIAL FOR THE EMBANKMENT IS FREE OF ROOTS, WOODY VEGETATION, ORGANIC MATTER, AND OTHER OBJECTIONABLE MATERIAL. PLACE THE FILL IN LIFTS NOT TO EXCEED 9 INCHES, AND MACHINE COMPACT IT. OVER FILL THE EMBANKMENT 6 INCHES TO ALLOW FOR SETTLEMENT.
3. SHAPE THE BASIN TO THE SPECIFIED DIMENSIONS. PREVENT THE SKIMMING DEVICE FROM SETTLING INTO THE MUD BY EXCAVATING A SHALLOW PIT UNDER THE SKIMMER OR PROVIDING A LOW SUPPORT UNDER THE SKIMMER OF STONE OR TIMBER.
4. PLACE THE BARREL (TYPICALLY SCHEDULE 40 PVC PIPE) ON A FIRM, SMOOTH FOUNDATION OF IMPERVIOUS SOIL OVERLAIN BY FILTER FABRIC. DO NOT USE PERVIOUS MATERIAL SUCH AS SAND, GRAVEL, OR CRUSHED STONE AS BACKFILL AROUND THE PIPE. PLACE THE FILL MATERIAL AROUND THE PIPE SPILLWAY IN 4-INCH LAYERS AND COMPACT IT UNDER AND AROUND THE PIPE TO AT LEAST THE SAME DENSITY AS THE ADJACENT EMBANKMENT. CARE MUST BE TAKEN NOT TO RAISE THE PIPE FROM THE FIRM CONTACT WITH ITS FOUNDATION WHEN COMPACTING UNDER THE PIPE HAUNCHES.

   PLACE A MINIMUM DEPTH OF 2 FEET OF COMPACTED BACKFILL OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT. IN NO CASE SHOULD THE PIPE CONDUIT BE INSTALLED BY CUTTING A TRENCH THROUGH THE DAM AFTER THE EMBANKMENT IS COMPLETE.
5. ASSEMBLE THE SKIMMER FOLLOWING THE MANUFACTURER'S INSTRUCTIONS, OR AS DESIGNED.
6. LAY THE ASSEMBLED SKIMMER ON THE BOTTOM OF THE BASIN WITH THE FLEXIBLE JOINT AT THE INLET OF THE BARREL PIPE. ATTACH THE FLEXIBLE JOINT TO THE BARREL PIPE AND POSITION THE SKIMMER OVER THE EXCAVATED PIT OR SUPPORT. BE SURE TO ATTACH A ROPE TO THE SKIMMER AND ANCHOR IT TO THE SIDE OF THE BASIN. THIS WILL BE USED TO PULL THE SKIMMER TO THE SIDE FOR MAINTENANCE.
7. EARTHEN SPILLWAYS-INSTALL THE SPILLWAY IN UNDISTURBED SOIL TO THE GREATEST EXTENT POSSIBLE. THE ACHIEVEMENT OF PLANNED ELEVATIONS, GRADE, DESIGN WIDTH, AND ENTRANCE AND EXIT CHANNEL SLOPES ARE CRITICAL TO THE SUCCESSFUL OPERATION OF THE SPILLWAY. THE SPILLWAY SHOULD BE LINED WITH LAMINATED PLASTIC OR IMPERMEABLE GEOTEXTILE FABRIC. THE FABRIC MUST BE WIDE AND LONG ENOUGH TO COVER THE BOTTOM AND SIDES AND EXTEND ONTO THE TOP OF THE DAM FOR ANCHORING IN A TRENCH. THE EDGES MAY BE SECURED WITH 8-INCH STAPLES OR PINS. THE FABRIC MUST BE LONG ENOUGH TO EXTEND DOWN THE SLOPE AND EXIT ONTO STABLE GROUND. THE WIDTH OF THE FABRIC MUST BE ONE PIECE, NOT JOINED OR SPLICED; OTHERWISE WATER CAN GET UNDER THE FABRIC. IF THE LENGTH OF THE FABRIC IS INSUFFICIENT FOR THE ENTIRE LENGTH OF THE SPILLWAY, MULTIPLE SECTIONS, SPANNING THE COMPLETE WIDTH, MAY BE USED. THE UPPER SECTION(S) SHOULD OVERLAP THE LOWER SECTION(S) SO THAT WATER CANNOT FLOW UNDER THE FABRIC. SECURE THE UPPER EDGE AND SIDES OF THE FABRIC IN A TRENCH WITH STAPLES OR PINS. (ADAPTED FROM "A MANUAL FOR DESIGNING, INSTALLING AND MAINTAINING SKIMMER SEDIMENT BASINS". FEBRUARY, 1999. J. W. FAIRCLOTH & SON.).
8. INLETS-DISCHARGE WATER INTO THE BASIN IN A MANNER TO PREVENT EROSION. USE TEMPORARY SLOPE DRAINS OR DIVERSIONS WITH OUTLET PROTECTION TO DIVERT SEDIMENT-LADEN WATER TO THE UPPER END OF THE POOL AREA TO IMPROVE BASIN TRAP EFFICIENCY (REFERENCES: RUNOFF CONTROL MEASURES AND OUTLET PROTECTION).
9. EROSION CONTROL-CONSTRUCT THE STRUCTURE SO THAT THE DISTURBED AREA IS MINIMIZED. DIVERT SURFACE WATER AWAY FROM BARE AREAS. COMPLETE THE EMBANKMENT BEFORE THE AREA IS CLEARED. STABILIZE THE EMERGENCY SPILLWAY EMBANKMENT AND ALL OTHER DISTURBED AREAS ABOVE THE CREST OF THE PRINCIPAL SPILLWAY IMMEDIATELY AFTER CONSTRUCTION (REFERENCES: SURFACE STABILIZATION).
10. AFTER ALL THE SEDIMENT-PRODUCING AREAS HAVE BEEN PERMANENTLY STABILIZED, REMOVE THE STRUCTURE AND ALL THE UNSTABLE SEDIMENT. SMOOTH THE AREA TO BLEND WITH THE ADJOINING AREAS AND STABILIZE PROPERLY (REFERENCES: SURFACE STABILIZATION).



MAINTENANCE

INSPECT SKIMMER SEDIMENT BASINS AT LEAST WEEKLY AND AFTER EACH SIGNIFICANT (ONE-HALF INCH OR GREATER) RAINFALL EVENT AND REPAIR IMMEDIATELY. REMOVE SEDIMENT AND RESTORE THE BASIN TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT ACCUMULATES TO ONE-HALF THE HEIGHT OF THE FIRST BAFFLE. PULL THE SKIMMER TO ONE SIDE SO THAT THE SEDIMENT UNDERNEATH IT CAN BE EXCAVATED. EXCAVATE THE SEDIMENT FROM THE ENTIRE BASIN, NOT JUST AROUND THE SKIMMER OR THE FIRST CELL. MAKE SURE VEGETATION GROWING IN THE BOTTOM OF THE BASIN DOES NOT HOLD DOWN THE SKIMMER.

REPAIR THE BAFFLES IF THEY ARE DAMAGED. RE-ANCHOR THE BAFFLES IF WATER IS FLOWING UNDERNEATH OR AROUND THEM.

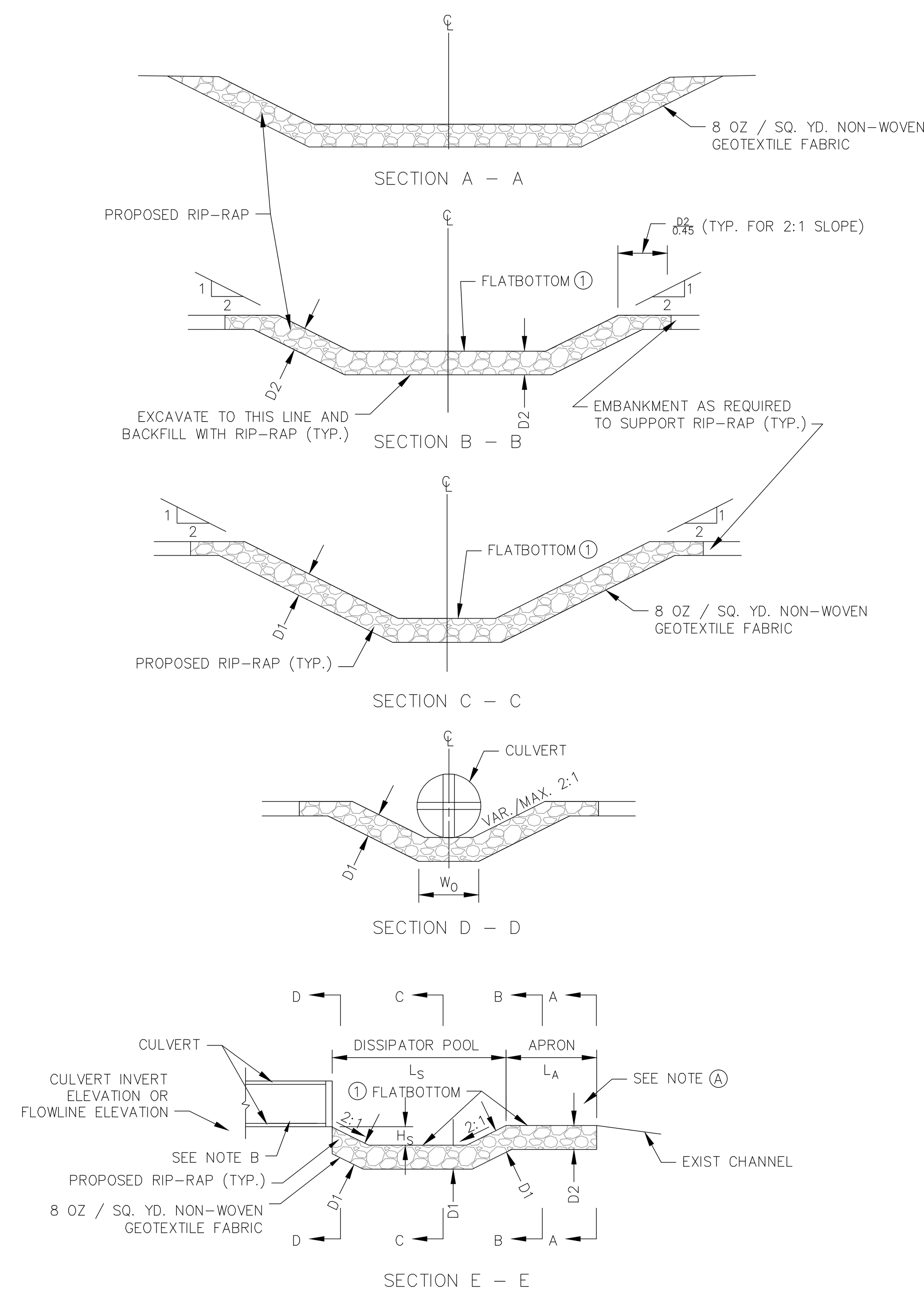
IF THE SKIMMER IS CLOGGED WITH TRASH AND THERE IS WATER IN THE BASIN, USUALLY JERKING ON THE ROPE WILL MAKE THE SKIMMER BOB UP AND DOWN AND DISLODGE THE DEBRIS AND RESTORE FLOW. IF THIS DOES NOT WORK, PULL THE SKIMMER OVER TO THE SIDE OF THE BASIN AND REMOVE THE DEBRIS. ALSO CHECK THE ORIFICE INSIDE THE SKIMMER TO SEE IF IT IS CLOGGED; IF SO REMOVE THE DEBRIS.

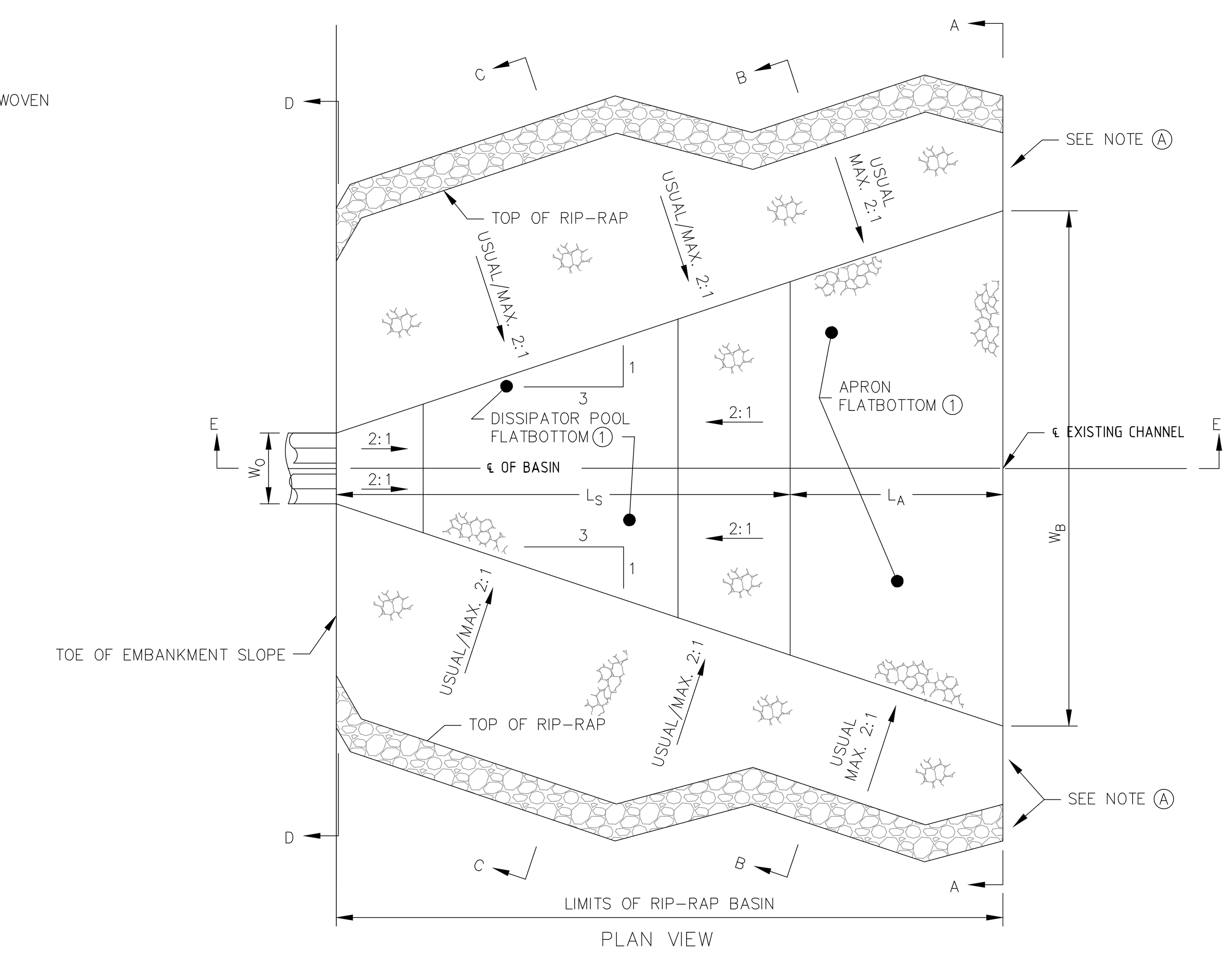
IF THE SKIMMER ARM OR BARREL PIPE IS CLOGGED, THE ORIFICE CAN BE REMOVED AND THE OBSTRUCTION CLEARED WITH A PLUMBER'S SNAKE OR BY FLUSHING WITH WATER. BE SURE AND REPLACE THE ORIFICE BEFORE REPOSITIONING THE SKIMMER.

CHECK THE FABRIC LINED SPILLWAY FOR DAMAGE AND MAKE ANY REQUIRED REPAIRS WITH FABRIC THAT SPANS THE FULL WIDTH OF THE SPILLWAY. CHECK THE EMBANKMENT, SPILLWAYS, AND OUTLET FOR EROSION DAMAGE, AND INSPECT THE EMBANKMENT FOR PIPING AND SETTLEMENT. MAKE ALL NECESSARY REPAIRS IMMEDIATELY. REMOVE ALL TRASH AND OTHER DEBRIS FROM THE SKIMMER AND POOL AREAS.

FREEZING WEATHER CAN RESULT IN ICE FORMING IN THE BASIN. SOME SPECIAL PRECAUTIONS SHOULD BE TAKEN IN THE WINTER TO PREVENT THE SKIMMER FROM PLUGGING WITH ICE.

20/9 SKIMMER SEDIMENT BASIN DETAIL
NTS





RIP-RAP BASIN AND DIMENSIONS									
	BASIN DIMENSIONS (FT.)					RIP-RAP DEPTHS (FT.)		GEOTEXTILE FABRIC (S.V.)	RIP-RAP CLASS
	W_B	W_O	H_S	L_S	L_A	D1	D2		
SB-1	5.5	1.5	0	4.5	1.5	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B
SB-2	13.6	2.0	1.2	11.6	5.6	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B
SB-3	16.0	3.5	1.25	12.5	6.25	1.5	1.5	8 OZ/SY NON-WOVEN	NCDOT CLASS B

GENERAL NOTE

Ⓐ WARP BASIN TO CONFORM TO THE NATURAL STREAM CHANNEL. TOP OF RIP-RAP IN FLOOR OF BASIN DISSIPATOR POOL OR APRON SHALL BE AT THE SAME OR LOWER ELEVATION THAN THE NATURAL CHANNEL BOTTOM SECTION A-A. MODIFY FLATBOTTOM WIDTH IF THE OPTIONAL EXTENDED TRANSITION IS REQUIRED.

SPECIAL NOTE

① DESIRABLE SLOPE IS 0.0% IN DISSIPATOR POOL FLATBOTTOM AND IN APRON FLATBOTTOM.

22/9 PLUNGE POOL DETAIL
NTS

S&ME
WWW.SMEINC.COM
NC ENG. LICENSE #F-0176 PHONE: (919) 872-2660
3201 SPRING FOREST ROAD, RALEIGH, NC 27616

NO.	DATE	DESCRIPTION	BY
1	6-3-2014	June 2014 Permit Renewal	KSO

STORMWATER MANAGEMENT / EROSION AND SEDIMENT CONTROL DETAILS IV

CLOSURE DRAWINGS
EDGECOMBE COUNTY C&D LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: ELH	CHECKED BY: KSO
DESIGNED BY: JMB	APPROVED BY:
PROJECT NUMBER: 1054-13-277A	
SCALE: AS SHOWN	DATE: AUG 2014
DRAWING NUMBER: D-1392-04	
DRAWING: 9	OF: 9

T:\Projects\2013\ENV\13-277A Edgecombe Permit Applications\CAD\Drawings from KSO\Closure Plan\D1392.dwg, FIG9, 9/3/2014 2:26:19 PM, 1:1

APPENDIX I-E

Borrow Area Wetland and Geotechnical Evaluation

BORROW AREA
WETLAND AND GEOTECHNICAL EVALUATION
EDGECOMBE COUNTY LANDFILL

S&ME Project No. 1040-01-545G

Prepared for:
Edgecombe County Solid Waste Department
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME, Inc.

3201 Spring Forest Road
Raleigh, North Carolina, 27616

Kenneth Daly, PE
Project Engineer

Samuel P. Watts, PG
Senior Reviewer

NORTH CAROLINA LICENSED SEAL 1806 GEOLOGIST SAMUEL P. WATTS

May 30, 2008

S&ME

Celebrating 35 Years
1973 • 2008

May 30, 2008

Mr. Danny Bagley
Edgecombe County Solid Waste Manager
P.O. Box 10
Tarboro, North Carolina 27886

Reference: Borrow Area – Wetland and Geotechnical Consulting Services
Edgecombe County Construction & Demolition Landfill
Tarboro, North Carolina
S&ME Project No. 1040-01-545G

Dear Mr. Carmon:

S&ME is pleased to submit this report of our engineering and consulting services to Edgecombe County for the evaluation of borrow soils and wetland areas at the Edgecombe County Construction & Demolition Landfill located near Tarboro, North Carolina. These services were provided in accordance with our proposal P3745-05V, dated September 2, 2005. The work was authorized under our existing contract with Edgecombe County as a Change to Agreement for Services, S&ME Form CA-041, incorporated into our proposal.

The opinions expressed in the attached report are based on the observations of S&ME personnel on the site, consultation with Edgecombe County Solid Waste Department personnel and maps and other documents from our files or provided by the County. S&ME appreciates the opportunity to continue our services to Edgecombe County and we hope that the information included in the report meets your needs. If you have any questions or if we can be of additional service to you, please contact us at 919-872-2660.

Sincerely,
S&ME, Inc.

Kenneth Daly/jah

Kenneth Daly, P. E.
Project Engineer

Samuel P. Watts, P.G.
Senior Project Manager

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1. INTRODUCTION

1.1 Background

Edgecombe County currently operates a C&D landfill facility on a tract of land located off of State Road 1601 in Edgecombe County, south of Tarboro, North Carolina. S&ME is currently assisting the County with environmental engineering services to meet reporting requirements for groundwater, surface water, and methane at the facility as required by the North Carolina Solid Waste Management Rules.

Edgecombe County owns an approximate 45-acre tract to the east of the existing C&D Landfill. Figure 1 shows the vicinity of the Edgecombe County Landfill site and the location of the subject 45-acre tract. This tract is currently being used by Edgecombe County as a source of cover soils for the landfill. Edgecombe County requested that S&ME delineate the extent of wetlands on the property and evaluate the remaining soils on site for use as cover borrow and to estimate the approximate volume of such soils. S&ME developed a proposed Scope of Work to address Edgecombe County's request, which was submitted to Edgecombe County in our proposal P3745-05V, dated September 2, 2005.

Edgecombe County provided to S&ME an orthographic aerial photograph of the subject site and a site topographic map based on that photography. This photograph and map were produced by GeoData Corporation of Zebulon, North Carolina. The aerial photograph was flown on February 5, 2007. This mapping has been used as a basemap for our attached Figures 2 through 5. The site features and elevations shown on this mapping have been used as the basis of our wetlands delineations and borrow soil estimates.

In order to evaluate the usefulness of the site for use as a borrow soil source, it was necessary to perform many of the property tasks in sequence, rather than concurrently. The wetland areas and floodplains for Jerry's Creek and the Tar River were first evaluated and mapped to locate those protected areas where clearing and excavation activities could not encroach. After the protected areas were mapped and confirmed by the US Army Corps of Engineers (USACE), the approximate limits of the borrow areas were defined and the test pits were excavated. Samples were selected for laboratory testing for evaluation of the primary soil units. The site was then flown for aerial photography and the site map produced. The location and elevation of the test pits were surveyed. Once these work tasks were completed, the data were evaluated and this report produced.

1.2 Objective

The objective of the Scope of Services described in this report includes the delineation of jurisdictional wetlands on the 45-acre tract and a description and general inventory of borrow soils on the property available for use as cover soils for the C&D Landfill. The wetlands delineation portion of the project included review of available mapping of

jurisdictional wetlands for the property, walking the property to identify and flag the limits of these wetlands, co-ordination with Edgecombe County's surveyor to produce a site map showing these areas and an on-site meeting with representatives of the USAC to obtain their concurrence with these delineations. The objective of the borrow study was to identify the primary soil types available for borrow soils on the property by the use of test pits, an evaluation of the primary soil types identified through the use of physical laboratory testing, and an approximation of the available volume of such cover soils on the property based on topography and the findings at the test pits.

2. JURISDICTIONAL DELINEATION, VERIFICATION AND SURVEY COORDINATION

Waters of the U.S., which include wetlands, are regulated by the USACE through Section 404 of the Clean Water Act, and by the North Carolina Division of Water Quality (DWQ) through Section 401 of the Clean Water Act. The term *waters of the U.S.* refers to waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the ebb and flow of the tide as well as all other waters such as intrastate lakes, rivers, streams (including intermittent streams), or natural ponds that the use, degradation or destruction of which could affect interstate or foreign commerce. The term *wetlands* refers to those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

2.1 Background Research

S&ME reviewed selected maps of the subject site and documents that regulatory agencies use to indicate the presence or absence of jurisdictional features, which included a USGS Topographic Map, NRCS Soils Map, Aerial Imagery, and a National Wetland Inventory Map (NWI). These documents are included in Appendix II.

2.2 Jurisdictional Stream/Wetland Delineation

S&ME staff flagged wetland and stream boundaries in accordance with the protocols set forth in the 1987 USACE Wetlands Delineation Manual. Indicators (e.g., vegetation, hydrology, soils) were used to locate the boundaries of jurisdictional streams and wetland within the site boundary. The site boundary is identified on Figure 3.

The delineation identified areas that appeared to have jurisdictional wetland status or appeared to be Waters of the U.S. In general, these features included the eastern side of the floodplain of Jerry's Creek, the stream banks of Jerry's Creek located on the western portion of the site as it flows back across the central portion of the site in a northerly direction, a few wetland areas east of Jerry's Creek, and a man-made water impoundment and ditch connected to the large wetland adjacent to the Tar River. This large wetland on the east side of the site was also delineated.

2.3 Wetland/Stream Verification

S&ME coordinated a site visit with USACE in order to obtain concurrence with our classification of the identified streams and jurisdictional status of identified wetlands on the subject property. Mr. Jason Volker with S&ME met with Mr. Thomas Brown with the USACE at the above referenced site on November 21, 2006 to review our delineations.

Based on the guidance provided by Mr. Brown on November 21, 2006, a portion of our preliminary wetland delineation was modified. A revised map that indicated the approximate location and extent of the modification was emailed to Mr. Brown and Jamie Shern, also with USACE, on November 28, 2006. The final delineated wetland areas and surface waters reviewed by Mr. Brown during our meeting are presented in Figure 3. The GPS point locations (ID, northing, easting) are presented in Appendix I.

At the time of our site meeting, Mr. Brown informed us that his office was not issuing jurisdictional determinations due to a recent Supreme Court case. He did state that he could process wetland permit applications based on his assessment of our delineations.

2.4 Path Forward

Based on Mr. Brown's comments, it appears that it would be prudent to move forward with borrow area activities based on the USACE verbal approval of the delineation to date. S&ME recommends the following guidelines during clearing/grubbing and excavation activities:

- No disturbance of the 50-ft stream buffer as shown on the attached maps.
- No disturbance of the wetland; recommend maintaining an approximately 10-ft setback from the wetland boundary line with vegetation.
- Maintain an approximately 20-ft setback from the wetland boundary line with excavations of more than 3 feet deep to prevent drainage effects on the wetland.

The USACE is now issuing formal written documents related to jurisdictional determinations, but has a large backlog to process. It is now common practice that USACE will sign a surveyed site plat showing the wetland boundaries that will lock the delineation for a period of five years.

3. LIMITED GEOTECHNICAL EVALUATION

3.1 Test Pits/Exploration Activities

As shown on Figure 2, the subject site is approximately 45 acres in size and is rectangular in shape. The western end of the property borders Road 1601, across from the landfill site. This end of the property is used as a transfer and drop-off station. To the east of the drop-off station is Jerry's Creek. Borrow Area No. 1 is located across Jerry's Creek from the drop-off station. Jerry's Creek in this area flows to the southeast but once off-site; it turns to the northeast and once again crosses the subject site. Borrow Area No. 2 is located to the east of this second leg of Jerry's Creek. Farther to the east of Borrow Area No. 2 is a relative lowland area with wetlands and the Tar River forming the eastern boundary of the property.

On September 13, 2006, a representative of S&ME visited the site to explore the borrow areas by means of test pits. Edgecombe County Landfill provided a backhoe and operator for the test pit excavation. Test pits TP-1 through TP-5 were excavated in Borrow Area No. 2 and test pits TP-6 through TP-8 were excavated in Borrow Area No. 1 on that date. Our personnel returned to the site on October 12, 2006 to perform additional test pits in Borrow Area No. 1 (TP-9 through TP-11).

The method used for the test pit excavation was to remove the soil from the test pit by means of the backhoe and to examine the soils in the exposed side of the excavation. As the test pits became deeper, the soils in the backhoe bucket were examined. The thickness and depth of the soil units was logged from the ground surface. Moisture conditions such as wetness, seepage and water bearing zones were noted. The depth of excavation of the test pits in most cases was limited by caving due to water conditions in the test pit. The logs of the test pits are included in Appendix III.

Representative soil samples were collected for laboratory testing. The collected samples were returned to S&ME's physical properties soil testing laboratory in Raleigh, North Carolina. In the laboratory, the soil samples were classified according to the Unified Soil Classification System (USCS) and tested for grain size analysis (sieve), natural moisture content, and Atterberg Limits. The results of the laboratory testing are included in Appendix IV and are summarized on Table 1.

3.2 Soil Conditions

Based on the test pit logs, several primary soil types were described in the test pits. The upper few feet of soil at most of the test pits consisted of orange, tan and brown fine or medium to fine sand with minor amounts of silt and clay. At some locations in the Borrow Area No. 1 area, the upper soils appeared as an orange to gray sandy clay. With depth, a gray medium to fine sand with shells was observed. Where water conditions allowed excavation through this gray sandy layer, the underlying soils were described as dark gray medium sand with shells.

The results of the laboratory testing indicate that the soils in the borrow areas are more consistent than they appear on the test pit logs. These results indicate that there are two primary soil types encountered, with one being predominant with each of the two borrow areas. Within each borrow area, the variables in soil lithology appear to be color, the presence of shells and soil moisture.

Test pits TP-6 through TP-11 were excavated within Borrow Area No. 1. Soil samples were collected for testing from test pits TP-6, TP-8 and TP-10. The test results indicate a relatively uniform soil in this area consisting of tan, orange, brown and gray silty and/or clayey fine to medium sand. The percent of fines (silts and clays) varies in the samples from about 24% to 49%, with an average of 33 %. The plasticity index, a measure of the relative plasticity of the soils, varied from 14% to 27%, averaging 21%. Although the sieve analyses show that the soils are predominantly sand, the relatively high secondary percentages of fines give the soils some of the typical physical properties of silts and clays, such as increased plasticity and moisture content.

By comparison, the soils tested from Borrow Area No. 2 contain relatively few fines and have physical properties more typical of granular soils. The soils in the test pits were described as orange and brown grading to gray medium to fine sand. Below depths of 2.5 to 5 feet below the surface, the sand was observed to contain shells and grade to a darker gray color. These soil samples are classified as a medium to fine sand with a fines content ranging between 5% and 13%, averaging about 7%. The plasticity index ranges between non-plastic to 3%.

Based on the laboratory testing of the representative soil samples collected from the exploratory test pits, the soils in both Borrow Area No. 1 and Borrow Area No. 2 are generally suitable for use as cover soils for the C&D Landfill. The laboratory testing indicates that the soils within either borrow area are reasonably consistent within the borrow area but that there are some lithologic differences between the soils in the two areas. Since both borrow areas are currently in use, actual experience with the excavation and use of these soils is likely the best guide to the ongoing use of these materials. However, the results of the laboratory testing may be useful in maximizing the productive use of these soils, particularly in longer term planning for cover soil volumes and landfill closure.

The soils within Borrow Area No. 2 consist largely of medium to fine sand with relatively few fines (silts and clays). Because of the low fines content, these soils should drain effectively and are not expected to be very moisture sensitive. Therefore, these soils should be relatively more manageable to spread and compact over a wider range of soil moisture contents. However, also because of the low fines content, these soils will not be very effective in limiting water infiltration. Therefore, the soils from Borrow Area No. 2 will generally be more suitable for use as intermediate cover rather than final cover. These soils should also be more workable during wet weather conditions.

The soils in Borrow Area No. 1 contain relatively more fines than those from Borrow Area No. 2. Although still composed largely of sand, the fines content is high enough that these soils will exhibit many of the properties of finer grained soils. These soils may be more difficult to spread and compact during wet weather conditions. Although these soils are also suitable for use as intermediate cover, they should be less water transmissive than the soils from Borrow Area No. 2 and therefore more useful as final cover and cap construction. If borrow soil volumes allow, soils in the more clayey areas of Borrow Area No. 1 should be reserved for potential use as final cover soils. Additional laboratory testing should be performed on these soils for compactive and water transmissive properties to further evaluate their use for final cover and cap construction.

3.3 Groundwater Conditions

Groundwater was found at the test pit locations and varied within a few feet to several feet below existing ground surface throughout both borrow areas. This groundwater appears to be related to the infiltration of precipitation into the soils from the surface, making this a groundwater recharge area. The groundwater is somewhat mounded in the borrow areas, reflecting the balance between the rate of this infiltration and the rate at

which the water can drain away through the soils. Due to this mounding of groundwater at higher elevations than those wetland areas to the east and west of the borrow areas, the use of ditching should be effective in lowering groundwater levels in the borrow areas, increasing the volume of practically available borrow soils.

In Borrow Area No. 1, the groundwater was found in the test pits ranged from one foot to more than six feet below the ground surface. The elevation of the water varied substantially across this area, ranging between Elevation 35 feet to Elevation 46 feet. The elevation of the water appeared to vary with the topography and the distance from given locations to open drainage (groundwater discharge) areas. Water levels in Borrow Area No. 2 reflected the nature of the soils in that area. These soils appear to drain more effectively than the soils in Borrow Area No. 1, producing a more uniform groundwater level ranging between Elevation 33 feet and Elevation 35 feet. The groundwater levels can be expected to vary over time, depending on precipitation rates and patterns.

There are lower surrounding areas to the east and west of both borrow areas. Borrow Area No. 1 is located within a bend of Jerry's Creek and can drain to the floodplain to both the east and west. Borrow Area No. 2 is located between Jerry's Creek to the west and the Tar River to the east.

3.4 Borrow Soil Quantity Estimate

The projected volume of borrow soils available from each borrow area was estimated under two scenarios. The first scenario is "Limited Draining/Ditching", and was calculated based on recorded existing groundwater elevations and topography with little or no dewatering of the borrow areas. The second scenario is the "Extensive Drainage/Ditching" using the maximum effective use of dewatering efforts for the borrow areas. Surface elevations at the time of the GeoData survey (February 5, 2007) and water elevations in the test pits at the time of excavation were used for both scenarios. Under both scenarios, the maximum depth of excavation was projected as being one (1) foot over the projected groundwater elevations for the traffickability of earthmoving equipment. Depending on soil and groundwater conditions and the actual equipment used, the actual depth of excavation relative to the water levels may vary.

For the calculation of borrow soil volumes, Borrow Area No. 1 has been divided into two sub-areas (A & B) based on groundwater elevations, as illustrated on Figure 4. For the first scenario (excavation without dewatering), the projected available borrow soil volume has been calculated based on a limit of excavation to approximately Elevation 40 in Sub-Area A and Elevation 38 in Sub-Area B. The projected volume of available soils in Borrow Area No. 1 under this scenario is 200,000 cubic yards. Due to the fines content of soils in this area, some limited ditching and trenching for drainage may be necessary to achieve these volumes under Scenario 1. Under the second scenario with the maximum practical use of dewatering, we have estimated that the groundwater may be effectively lowered by more extensive ditching and trenching by an average of about two feet. Using a depth of excavation for Sub-Area A to Elevation 38 and to Elevation 36 for Sub-Area B and enlarging those areas as shown on Figure 4, we estimate that about 275,000 cubic yards of soil would be available for use.

As previously discussed, the observed water levels in the test pits in Borrow Area No. 2 ranged between Elevation 33 and Elevation 35 feet. Therefore, we used an average excavation depth to site Elevation 35 (average elevation 34 plus 1 foot buffer) to calculate the approximate volume of soils available under Scenario 1. Using this base elevation and the area shown on Figure 5, we estimate that approximately 40,000 cubic yards may be available for use from Borrow Area No. 2. Drainage and ditching can likely be used in this area also to lower groundwater levels by about two feet. By the use of effective site drainage, we estimate that the excavation of soils to about site Elevation 33 can be used. The calculated volume of borrow soils from Borrow Area No. 2 under Scenario 2 will be about 80,000 cubic yards.

Summary of Estimated Available Soil Volumes

	Scenario 1: Limited Drainage/Ditching	**Scenario 2: Extensive Drainage/Ditching**
Borrow Area No. 1	200,000	275,000
Borrow Area No. 2	40,000	80,000
Totals	240,000	355,000

Note: All Values in Cubic Yards of In-Place Volume

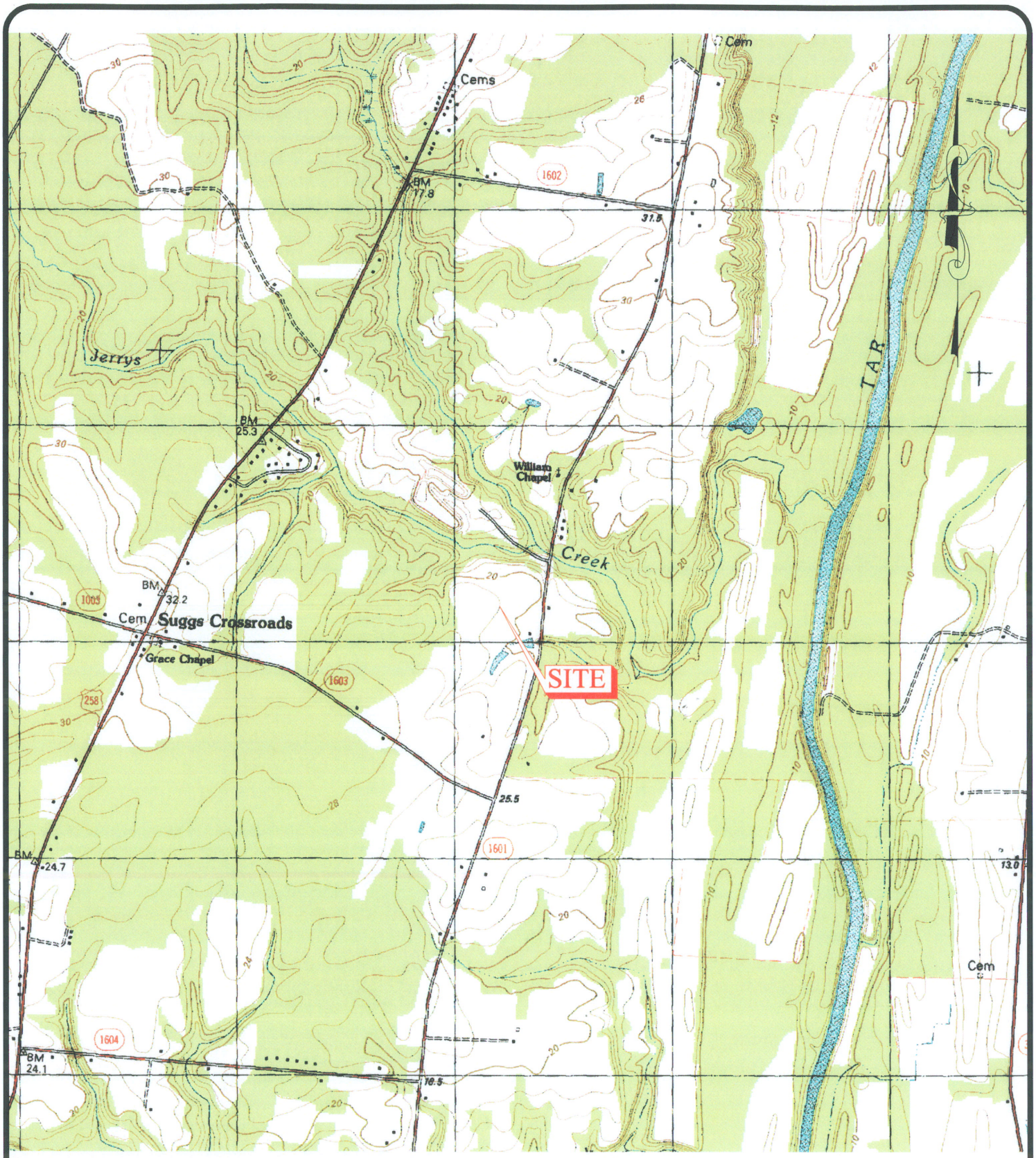
4. LIMITATIONS

The purpose of this study has been to evaluate the nature of available soils on the subject tract relative to their suitability for use as intermediate and final cover for the Edgecombe County C&D landfill and to develop an approximation of the volume of suitable soils available for those purposes. The methods used to address these issues have included a delineation of wetlands, riparian buffer and floodplain portions of the property that are not suitable as a borrow source and to evaluate two portions of the remaining property as a source of these borrow materials. The nature and extent of the soils in these two areas have been evaluated by the use of widely-spaced test pits and the collection of a limited number of soil samples for laboratory physical testing. The variations in soil and groundwater conditions within these borrow areas are assumed to be reasonably represented by the conditions observed at these test pits. The volume estimates are based on similar conditions as those observed and the effectiveness of measures to drain and lower groundwater levels. The volumes described represent the volumes of undisturbed soils in-place and some volume shrinkage of soil volumes due to spreading and compaction may be expected.

Portions of the two borrow areas on the subject property are currently being used for the staging and storage of white good and other wastes. Other portions of the property may be used by landfill personnel for other purposes. At least one large concrete storage pad exists in Borrow Area No. 1. No allowances for these current uses have been made in our borrow volume estimates and it is assumed that these current uses will ultimately be moved or ceased so that the soils in these areas are available for borrow soil.

This report is solely intended for the use of Edgecombe County for its C&D landfill. No other use is authorized by S&ME, Inc.

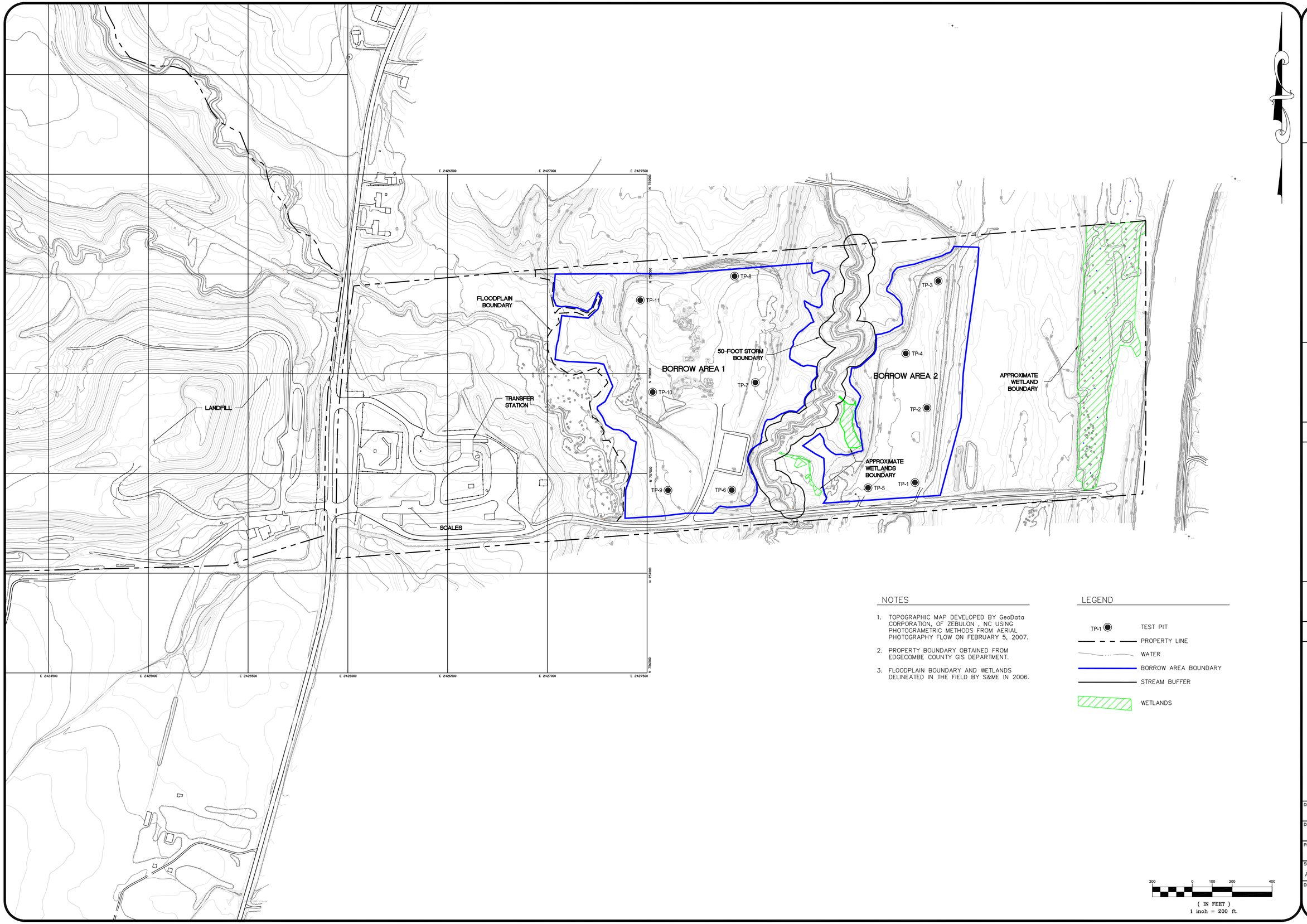
FIGURES



TOPO SOURCE: NCGS DRG
OLD SPARTA, NC (035077G5) DATED 1981

SCALE: 1" = 2,000'	S&ME WWW.SMEINC.COM	VICINITY MAP
DATE: APRIL 2008		EDGECOMBE COUNTY LANDFILL
DRAWN BY:		TARBORO, NORTH CAROLINA
PROJECT NO: 1040-01-545G		

FIGURE NO. 1



NOTES

1. TOPOGRAPHIC MAP DEVELOPED BY GeoData CORPORATION, OF ZEBULON , NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOW ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
3. FLOODPLAIN BOUNDARY AND WETLANDS DELINEATED IN THE FIELD BY S&ME IN 2006.

LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

200 0 100 200 400

(IN FEET)
1 inch = 200 ft.

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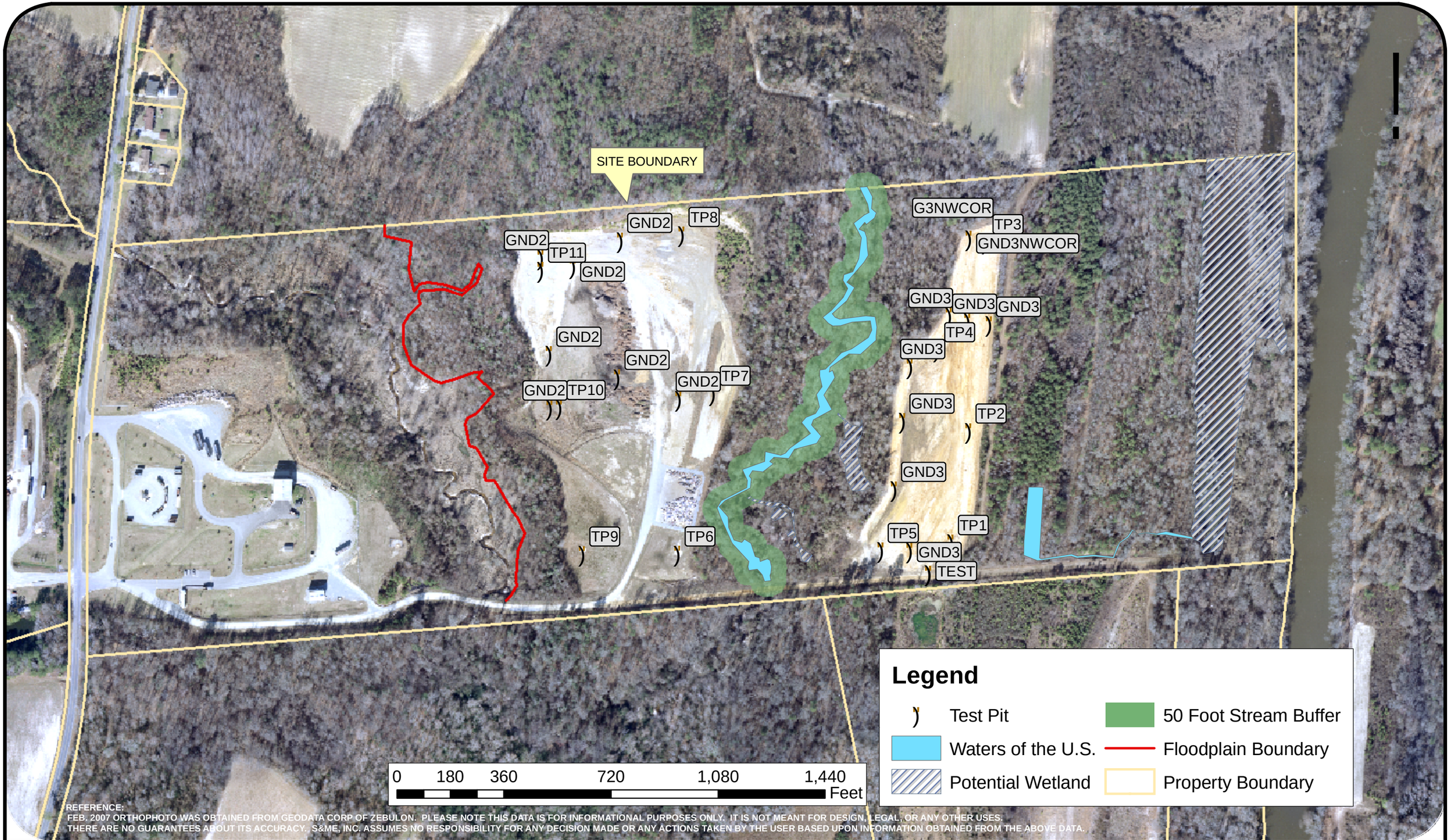
NO.	DATE	DESCRIPTION	BY

EXISTING CONDITIONS

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 2	OF:

DRAWING PATH: Q:\CADDATA\ACTIVE\2001\01-5450\1040-01-5450FIG 02.DWG



REFERENCE:
FEB. 2007 ORTHOPHOTO WAS OBTAINED FROM GEODATA CORP OF ZEBULON. PLEASE NOTE THIS DATA IS FOR INFORMATIONAL PURPOSES ONLY. IT IS NOT MEANT FOR DESIGN, LEGAL, OR ANY OTHER USES.
THERE ARE NO GUARANTEES ABOUT ITS ACCURACY. S&ME, INC. ASSUMES NO RESPONSIBILITY FOR ANY DECISION MADE OR ANY ACTIONS TAKEN BY THE USER BASED UPON INFORMATION OBTAINED FROM THE ABOVE DATA.

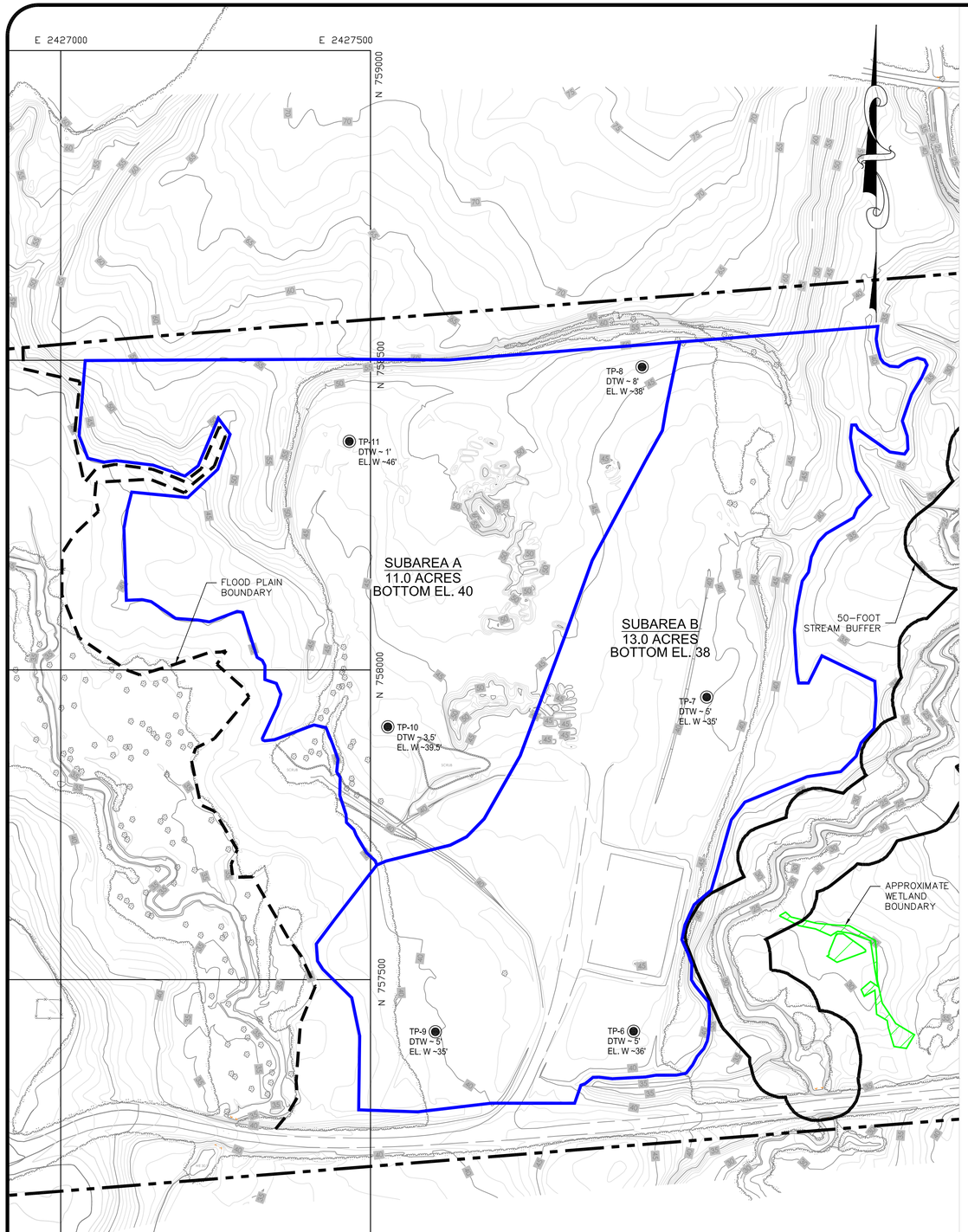
SCALE:	DATE:	
AS SHOWN	MAY 2008	
PROJECT NO:	DRAWN BY:	CHECKED BY:
1040-01-545G	JLV	JD

S&ME
3201 SPRING FOREST RD
RALEIGH, N.C. 27616
PH. 919-872-2660
FAX. 919-876-3958
WWW.SMEINC.COM

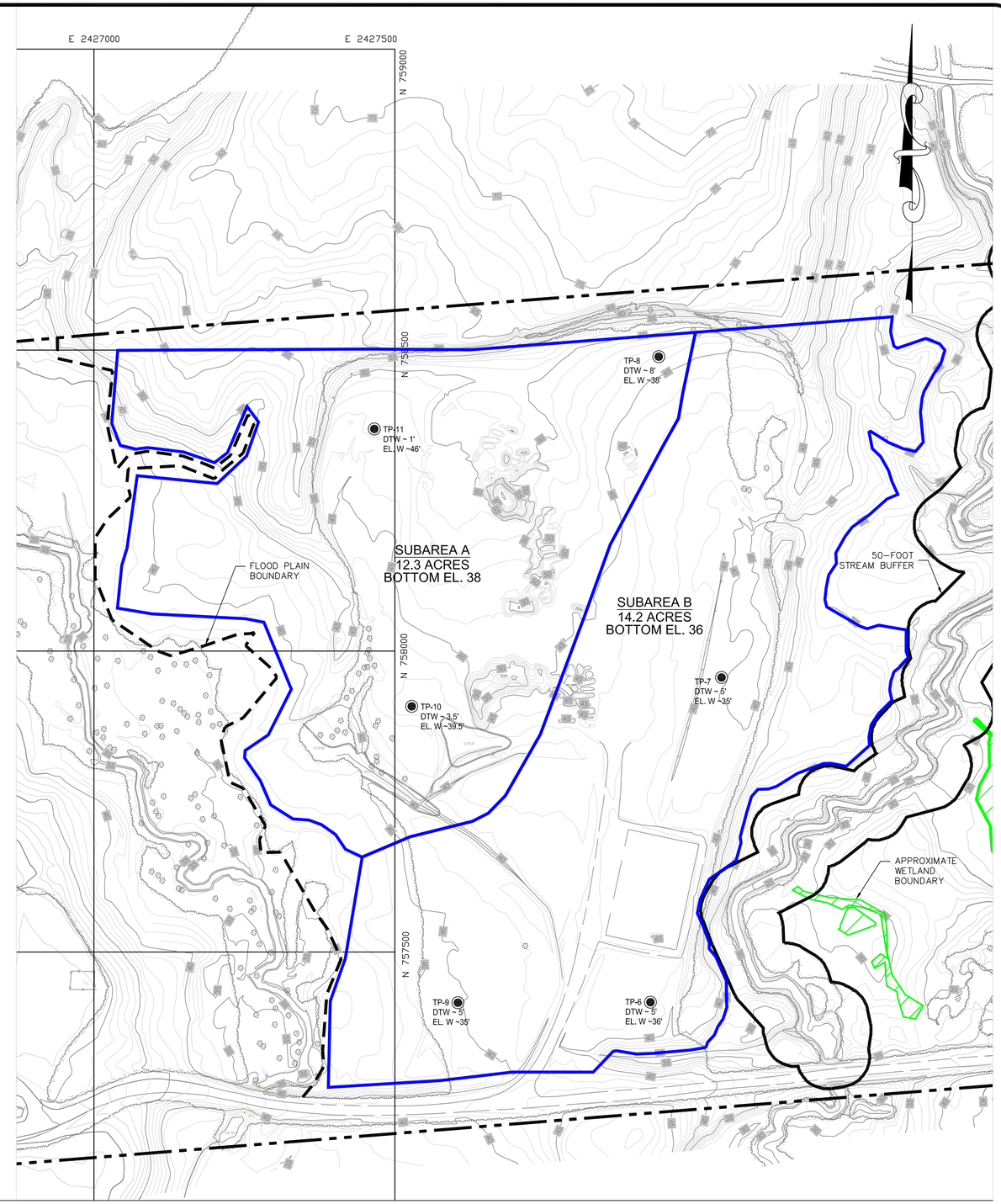
Preliminary Jurisdictional Stream/Wetland Delineation

Edgecombe County Landfill
Tarboro, North Carolina

FIGURE NO.
3



SCENARIO 1 - LIMITED DRAINAGE/DITCHING
~200,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~275,000 CY BORROW MATERIAL

NOTES

1. TOPOGRAPHIC MAP DEVELOPED BY GeoData CORPORATION, OF ZEBULON , NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOW ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
3. FLOODPLAIN BOUNDARY AND WETLANDS DELINEATED IN THE FIELD BY S&ME IN 2006.

LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

S&ME
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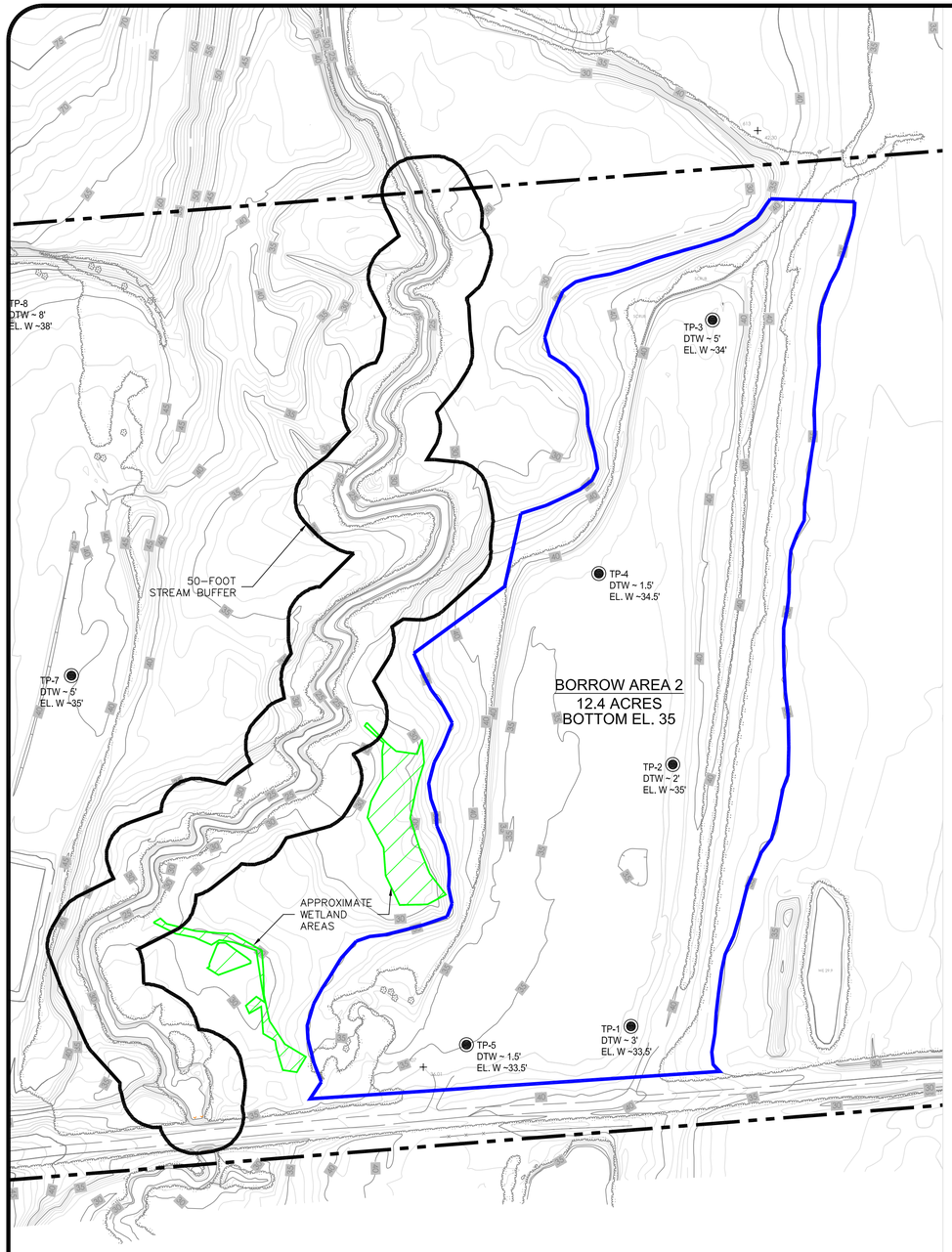
NO.	DATE	DESCRIPTION	BY

BORROW AREA 1
CONCEPTUAL GRADING PLAN

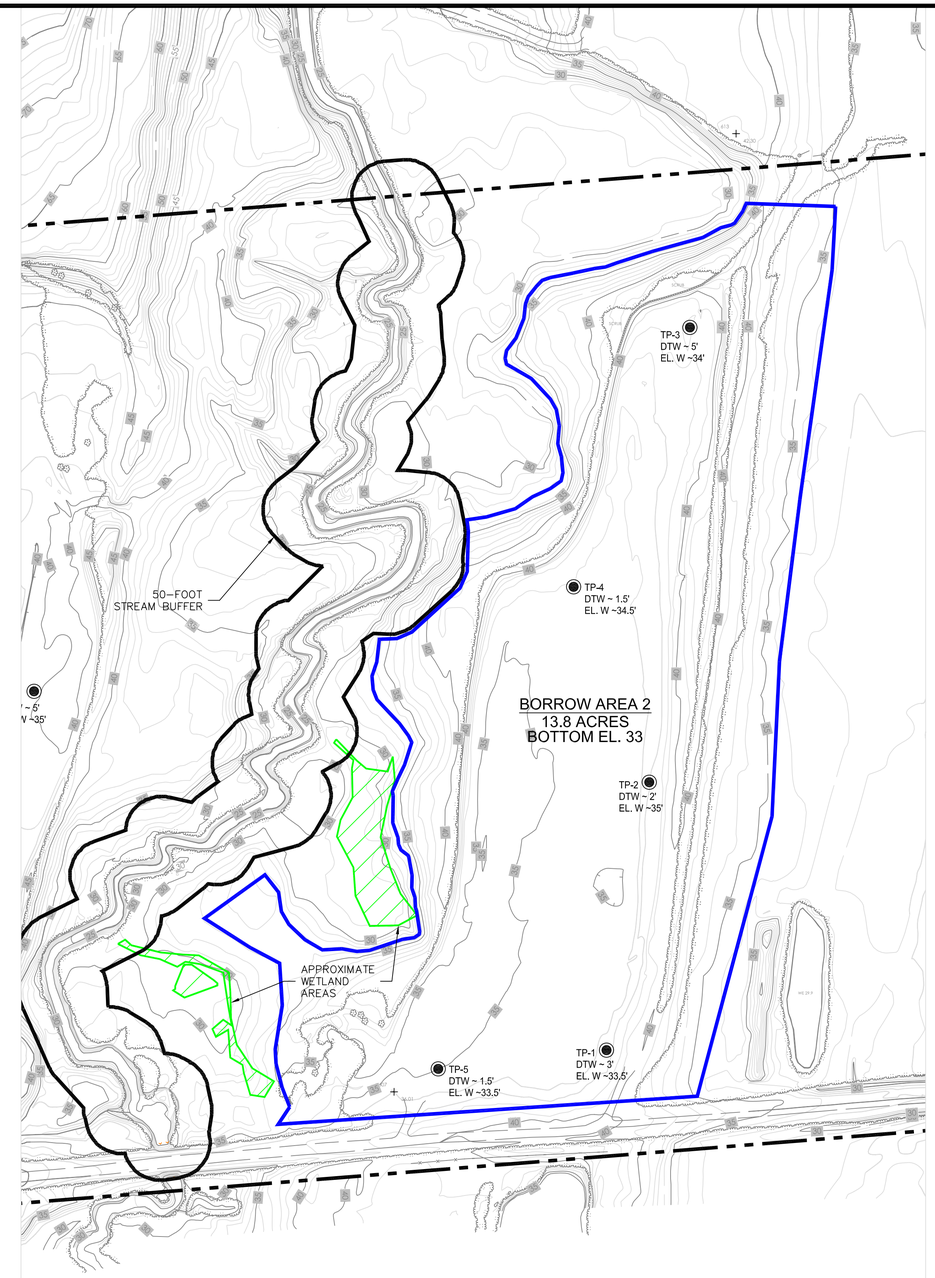
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 4	OF:

DRAWING PATH: G:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G.FIG 04.DWG



SCENARIO 1 - LIMITED DRAINAGE/DITCHING
~40,000 CY BORROW MATERIAL



SCENARIO 2 - EXTENSIVE DRAINAGE/DITCHING
~80,000 CY BORROW MATERIAL

NOTES

1. TOPOGRAPHIC MAP DEVELOPED BY GeoData CORPORATION, OF ZEBULON , NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOW ON FEBRUARY 5, 2007.
2. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.
3. FLOODPLAIN BOUNDARY AND WETLANDS DELINEATED IN THE FIELD BY S&ME IN 2006.

LEGEND

- TP-1 — TEST PIT
- PROPERTY LINE
- WATER
- BORROW AREA BOUNDARY
- STREAM BUFFER
- WETLANDS

100 0 50 100 200
(IN FEET)
1 inch = 100 ft.

S&ME
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NO.	DATE	DESCRIPTION	BY

BORROW AREA 2
CONCEPTUAL GRADING PLAN

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JAM	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER 1040-01-545G	
SCALE: AS SHOWN	DATE: MAY 2008
DRAWING: 5	OF:

DRAWING PATH: G:\CADDATA\ACTIVE\2001\01-545G\1040-01-545G.FIG 05.DWG

TABLES

Table 1

Summary of Laboratory Test Results
Edgecombe County Landfill - Soil Borrow Areas
Tarboro, North Carolina
S&ME Project No. 1040-01-545G

SAMPLE NUMBER	SAMPLE DEPTH (ft-bgs) (1)	VISUAL SOIL DESCRIPTION (2)	Lab USCS Symbol	Laboratory Grain Size Analysis (3)			Natural Moisture Content %	Atterberg Limits		
				Silt and Clay%	% Sand	% Gravel		Liquid Limit	Plastic Limit	Plasticity Index
TP-2	1.0	Brown SAND with Silt	SP	4.8	95.1	0.1	9.0	--	--	--
TP-2	4.0	Tan Silty SAND	SM	4.8	95.1	0.1	9.0	18	15	3
TP-3	5.0	Olive-Brown Silty SAND	SM	12.6	86.9	0.5	19.9	22	19	3
TP-4	7.5	Olive-Brown Silty SAND	SM	6.9	89.3	3.8	26.3	18	17	1
TP-6	6.0	Tan-Brown Clayey SAND	SC	23.5	76.5	0	16.3	30	16	14
TP-8	1.0	Olive-Gray Clayey SAND	SC	36.9	63.1	0	38.2	51	24	27
TP-10	2.0	Olive Silty SAND	SM	48.7	51.3	0	46.2	60	39	21
TP-10	4.0	Orange Red Silty SAND	SM	24.8	71.1	4.1	33.8	53	30	23

Notes:

1) ft. bgs.= Depth in feet below ground surface
2) Classification is based on visual analysis and/or Atterberg limits test results
3) Grain size analysis laboratory data are included in the report appendix.
4) -- = No data or parameter not collected

APPENDIX I

(GPS POINT LOCATIONS)

GPS Point Locations

LOCATION ID	NORTHING	EASTING	No.
w4-38	757428.051	2429750.335	1
w4-39	757458.914	2429758.518	2
w4-40	757569.226	2429781.004	3
w4-41	757867.201	2429812.958	4
w4-43	758143.115	2429870.962	6
w4-44	758136.845	2429928.343	7
w4-45	758084.531	2429955.373	8
w4-46	758101.971	2429972.438	9
w4-47	758152.372	2429972.760	10
w4-48	758233.020	2429945.156	13
w4-49	758332.274	2429947.966	14
w4-50	758460.973	2429946.862	15
w5-46	758466.296	2427031.377	16
w5-47	758486.498	2426940.567	17
w5-48	758559.392	2426939.405	18
w5-44	758376.777	2427022.582	19
43	758302.973	2427038.895	20
42	758326.261	2427058.566	21
41	758332.003	2427088.321	22
40	758324.011	2427148.038	23
40a1	758286.144	2427200.228	24
40xtie	758311.561	2427184.046	25
40a2	758301.988	2427214.168	26
40a3	758329.677	2427248.227	27
40a4	758393.843	2427256.540	28
40a5	758378.186	2427266.484	29
40a	758325.124	2427227.700	30
40a7	758304.548	2427200.729	31
36	758280.674	2427055.348	32
37	758303.102	2427057.150	33
38	758304.270	2427075.024	34
39	758308.761	2427144.901	35
35	758256.189	2427061.039	36
34	758219.166	2427022.384	37
33	758188.663	2427002.962	38
32	758121.715	2427002.512	39
31	758052.134	2427030.321	40
30	757992.962	2427128.913	42
21	757854.341	2427211.136	43
21b	757874.696	2427218.601	44
22	757889.392	2427248.626	45
24	757970.611	2427296.256	46
23	757956.157	2427304.920	47
25	758009.769	2427252.984	48
26	758031.829	2427267.197	49
27	758029.015	2427259.979	50
28	758028.953	2427239.695	51
29	758009.088	2427184.039	52
20	757782.003	2427226.328	53
19	757772.945	2427248.691	54
18	757710.504	2427285.513	55
17	757686.929	2427275.203	56

16	757665.346	2427278.921	57
15	757666.143	2427310.287	58
10	757564.796	2427369.564	64
9	757540.015	2427387.632	65
9-a	757489.302	2427411.337	66
2	757281.242	2427365.850	72
3	757310.125	2427382.940	73
3a	757336.878	2427380.800	74
w5-1	757259.189	2427347.468	75
w4-7	757415.877	2429249.471	77
w4-8	757408.540	2429247.577	78
w4-5	757406.886	2429190.887	80
w4-6	757401.103	2429192.392	81
w4-3	757399.318	2429148.168	82
w4-4	757395.018	2429146.790	83
w4-1	757402.414	2429141.240	84
w4-2	757393.944	2429134.920	85
a-1	757411.657	2429088.354	86
a-2	757458.354	2429089.177	88
a-3	757640.884	2429104.777	89
a-4	757640.017	2429154.108	90
w4-37	757417.751	2429690.091	1
w436	757431.965	2429684.051	2
w4-34	757456.151	2429683.192	3
w4-32	757465.953	2429657.676	4
w4-33	757472.665	2429653.081	5
w4-35	757495.498	2429649.670	6
w4-37	757527.948	2429660.559	7
x1	757604.932	2429666.968	8
x2	757645.781	2429654.392	9
x3	757742.066	2429667.585	10
x4	757812.201	2429668.819	11
x5	757879.211	2429673.924	12
x6	757899.669	2429662.356	13
x7	757934.156	2429658.125	14
13	757968.866	2429666.475	15
12	758021.861	2429665.024	16
11	758054.374	2429673.578	17
10	758091.118	2429654.616	18
10	758133.974	2429664.120	19
9	758192.673	2429667.142	20
8	758247.520	2429674.437	21
7	758313.827	2429678.747	22
6	758389.255	2429687.654	23
5	758442.842	2429687.816	24
4	758505.707	2429690.644	25
3	758540.058	2429684.612	26
1	758606.561	2429697.510	27
s2	757343.319	2428236.986	31
s1	757326.433	2428239.166	32
s3	757352.430	2428239.122	33
s4	757372.233	2428241.780	34
s5	757394.598	2428236.958	35
s6	757400.152	2428227.245	36
s7	757396.754	2428204.883	37
s8	757407.736	2428186.437	38
s7-a	757390.604	2428203.573	39

s8a	757402.384	2428201.241	40
s9	757451.793	2428172.659	41
s10	757465.323	2428151.056	42
s11	757454.803	2428141.436	43
s12	757462.984	2428115.940	44
s13	757505.178	2428097.580	45
s14	757540.987	2428095.424	46
s15	757575.110	2428065.587	47
s16	757594.966	2428085.835	48
s17	757638.102	2428170.521	49
s18	757668.389	2428173.806	50
s19	757677.966	2428166.385	51
s20	757695.941	2428177.488	52
s21	757691.918	2428212.801	53
s22	757718.638	2428247.258	54
93	757727.053	2428235.786	55
91	757740.680	2428249.849	56
89	757736.354	2428299.235	57
87	757767.893	2428319.091	58
85	757787.929	2428393.912	59
83	757811.312	2428408.274	60
83	757849.707	2428375.844	61
81	757866.364	2428382.467	62
79	757900.234	2428444.901	63
w3-1	757889.429	2428465.689	64
77	757949.885	2428417.239	66
75	758008.247	2428454.287	67
71	758032.586	2428447.086	68
69	758026.613	2428435.427	69
65	758042.640	2428438.485	70
61	758086.506	2428540.537	71
ukn	758087.898	2428501.778	72
59	758134.009	2428593.040	74
57	758146.841	2428592.290	75
55	758177.428	2428596.054	76
53	758212.924	2428589.458	77
49	758215.701	2428558.386	78
47	758205.032	2428470.379	79
45	758211.025	2428455.288	80
43	758222.624	2428446.094	81
41	758266.909	2428494.573	82
39	758310.705	2428520.515	83
35	758328.271	2428494.618	84
3	758363.278	2428515.091	85
ukn	758394.852	2428551.766	86
31	758418.877	2428566.690	87
29	758443.439	2428563.569	88
27	758478.706	2428561.662	89
25	758498.858	2428554.752	90
23	758506.964	2428535.489	91
21	758529.447	2428554.477	92
19	758522.522	2428560.895	93
17	758544.773	2428587.489	94
15	758562.085	2428593.412	95
13	758576.181	2428577.264	96
11	758615.763	2428580.348	97
10	758591.062	2428564.211	105

8	758640.782	2428541.100	106
14	758562.485	2428569.633	107
16	758554.554	2428553.209	108
18	758526.609	2428517.884	109
24	758478.171	2428543.501	112
26	758407.779	2428534.862	113
32	758354.121	2428484.631	115
32	758334.304	2428481.710	116
34	758307.342	2428498.036	117
34	758277.938	2428482.892	118
36	758233.298	2428442.987	120
36b	758210.453	2428413.154	121
38	758190.623	2428432.530	122
38b	758181.690	2428447.560	123
40	758182.629	2428473.827	124
42	758194.710	2428512.772	125
44	758198.780	2428573.480	126
46	758167.564	2428578.939	127
46b	758143.114	2428566.974	128
50	758104.980	2428510.693	130
52	758091.234	2428476.352	131
58	758037.176	2428422.248	132
64	758033.995	2428403.116	133
66	758012.373	2428403.154	134
70	757977.443	2428411.207	136
72	757951.954	2428392.928	137
74	757909.386	2428402.932	138
76	757888.113	2428389.687	139
78	757874.628	2428357.561	140
80	757857.323	2428342.288	141
80b	757820.509	2428372.286	142
82	757771.235	2428303.439	143
86	757754.270	2428288.125	144
88	757747.728	2428272.319	145
90	757759.618	2428221.084	146
92	757726.888	2428218.654	147
96	757699.552	2428143.433	148
98	757662.655	2428160.284	149
100	757639.076	2428158.961	150
104	757570.590	2428058.584	152
106	757531.554	2428074.052	153
118	757390.602	2428165.902	159
120	757372.639	2428162.471	160
122	757360.352	2428165.677	161
124	757364.340	2428193.398	162
126	757358.346	2428199.140	163
128	757345.296	2428210.625	164
129	757323.348	2428218.751	165
w12	757411.594	2428378.312	176
w13	757389.081	2428365.168	177
w14	757392.134	2428345.340	178
w15	757422.475	2428336.157	179
w16	757434.545	2428334.591	180
w11	757429.512	2428348.810	181
16	757444.021	2428317.929	182
9	757462.097	2428326.314	183
w18	757473.792	2428297.766	184

w19	757484.401	2428292.890	185
w20	757497.335	2428307.351	186
w17	757483.652	2428314.737	187
w21	757489.902	2428319.597	188
8	757499.458	2428318.345	189
w22	757511.143	2428315.938	190
w7	757537.308	2428317.667	191
w6	757563.885	2428315.540	192
w23	757563.736	2428307.290	193
w24	757575.873	2428274.706	194
ukn	757587.814	2428273.791	195
w4	757588.748	2428252.547	196
w25	757571.425	2428243.595	197
w26	757582.973	2428218.710	198
w3	757591.424	2428220.136	199
w27	757587.274	2428192.170	200
w2	757601.234	2428179.978	201
end	757603.626	2428160.577	202
w1	757609.714	2428170.175	203
w2-2	757574.016	2428263.266	204
w2-1	757574.640	2428252.167	205
w2-11	757544.528	2428240.454	206
w2-10	757540.178	2428240.418	207
w2-9	757538.300	2428237.646	208
w2-8	757528.462	2428253.263	209
w2-5	757545.734	2428299.798	212
w2-4	757548.425	2428299.817	213
w2-3	757553.991	2428293.819	214
w3-15	757670.521	2428492.139	215
w3-14	757628.296	2428512.345	216
w3-13	757629.007	2428552.576	217
w3-12	757643.716	2428578.162	218
w3-11	757673.938	2428555.833	219
w3-10	757708.571	2428541.687	220
w3-9	757752.964	2428527.888	221
w3-8	757796.020	2428536.357	222
w3-7	757832.820	2428547.502	223
w3-5	757865.960	2428544.455	224
w3-4	757844.375	2428537.815	225
w3-3	757848.930	2428507.691	226
w3-2	757859.458	2428494.564	227
w3-20	757848.469	2428487.046	229
w3-22 to 1	757884.460	2428462.271	231
w3-19	757808.642	2428488.511	232
w3-18	757776.218	2428471.926	233
w3-17	757753.711	2428466.517	234
w3-16	757710.898	2428489.419	235
27	757901.209	2429662.639	258
w4-33	757473.065	2429655.051	260
w4-29	757483.529	2429597.835	262
w4-30	757475.274	2429593.988	263
w4-27	757491.433	2429566.767	264
w4-28	757481.019	2429567.031	265
26	757479.930	2429541.518	266
w4-25	757484.798	2429535.160	267
w4-24	757485.507	2429498.237	268
w4-23	757488.487	2429500.616	269

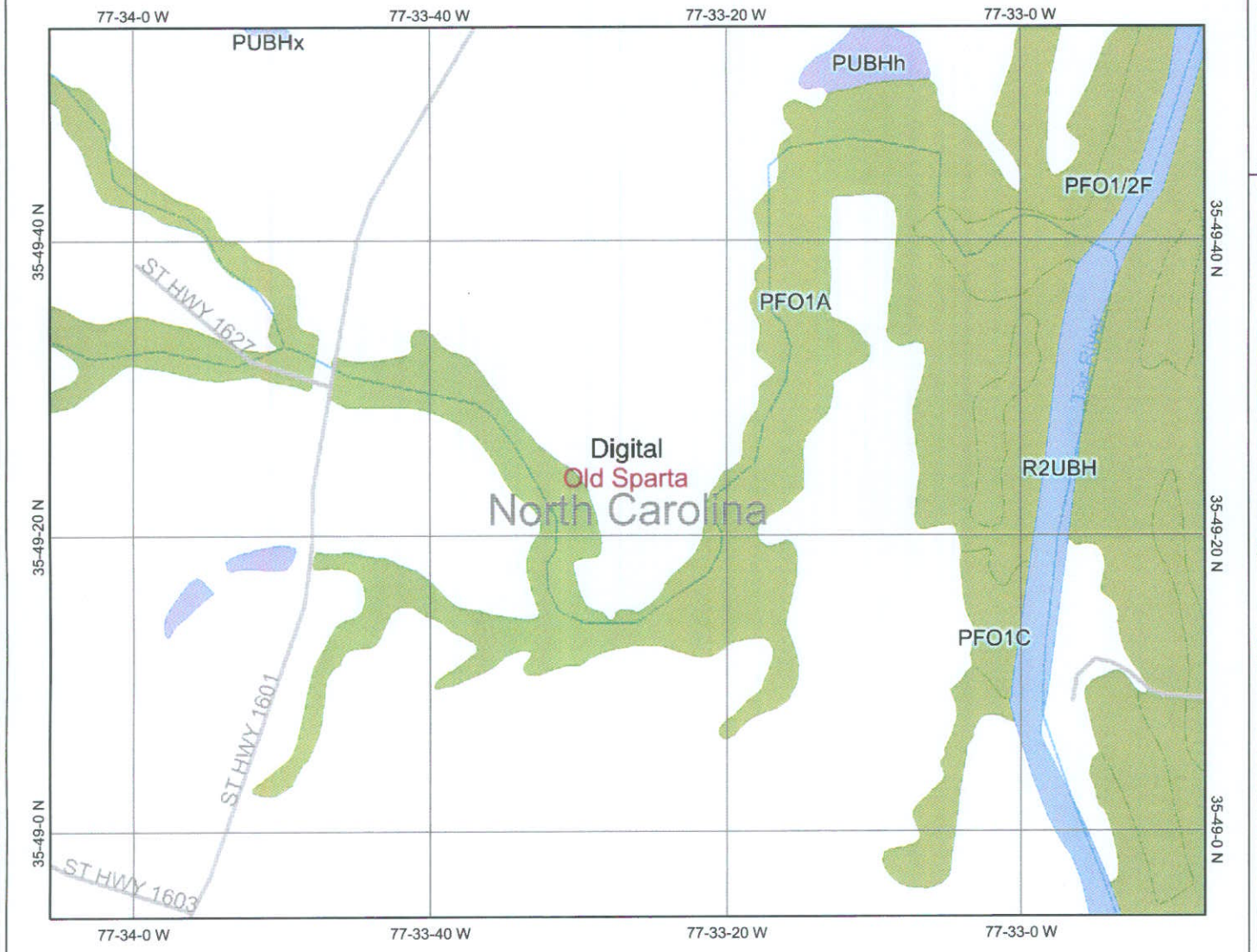
w4-21	757484.029	2429472.241	270
w4-22	757480.747	2429474.497	271
w4-20	757484.383	2429449.790	272
w4-19	757498.604	2429453.214	273
w4-18	757481.128	2429443.029	274
w4-17	757474.998	2429436.694	275

APPENDIX II

(SUPPORTING WETLAND DOCUMENTS)

STATION 1+00
STATION 1+50

USFWS NWI Wetlands



Map center: 35° 49' 24" N, 77° 33' 27" W

Legend

CONUS_wet_scan
- 0
- 1
- Out of range

Interstate
Major Roads
- Other Road
- Interstate
- State highway
- US highway

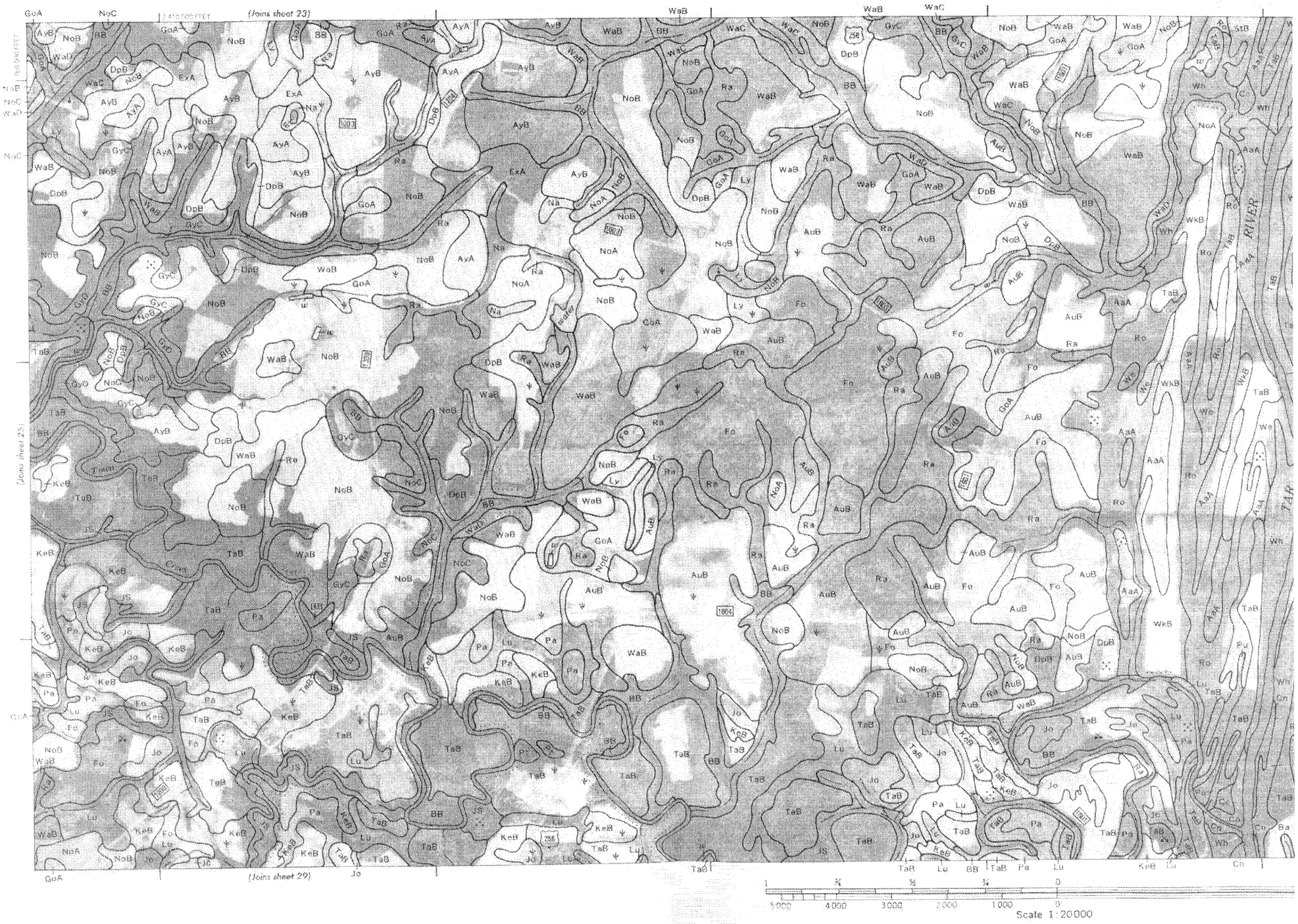
Roads
Cities
USGS Quad Index 24K
Lower 48 Wetland Polygons
- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Lower 48 Available Wetland Data
- Non-Digital
- Digital
- No Data
- Scan

NHD Streams
Counties 100K
Urban Areas 300K
States 100K
South America

Scale: 1:17,316

This map is a user generated static output from an Internet mapping site and is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. THIS MAP IS NOT TO BE USED FOR NAVIGATION.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TAR RIVER
Scale 1:20000

APPENDIX III

(BORROW AREA TEST PIT SUMMARY)

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-1	0.0 - 3.0	Orange brown medium SAND, with trace of silt. Seepage at 3 ft bgs and sloughing was observed
		3.0 - 5.0	Gray medium-fine SAND with shells, wet and saturated
		5.0	Test Pit Terminated
9/13/2006	TP-2	0.0 - 2.0	Orange brown medium SAND, water at 2 ft.
		2.0 - 4.0	Gray medium-fine SAND with shells
		4.0	Test Pit Terminated
9/13/2006	TP-3	0.0 - 1.5	Orange tan , fine SAND
		1.5 - 4.5	Orange tan , medium-fine SAND
		4.5 - 5.0	Brown-orange, medium-fine SAND with clay, wet (SC)
		5.0	Gray medium-fine SAND (SW-SP) with shells. Water at 5 ft.
		5.0	Test Pit Terminated

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-4	0.0 - 1.5	Orange/ orange brown medium-course SAND. Slow seepage observed at 1.5 ft-bgs
		1.5 - 5.0	Gray medium-fine SAND with shells
		5.0 - 7.5	Dark gray medium SAND with shells
		7.5 - 8.0	Dark gray, clayey SAND with shells
		8.0	Test Pit Terminated.
9/13/2006	TP-5	0.0 - 1.5	Tan / light gray sandy CLAY
		1.5 - 2.0	Tan, medium SAND. Water/ seepage observed at 1.5-2 ft.
		2.0 - 4.5	Tan medium-fine SAND
		4.5	Dark gray medium-fine SAND with shells. Sloughing observed
		4.5	Test Pit Terminated.
9/13/2006	TP-6	0.0 - 1.5	Orange-brown CLAY to tan sandy CLAY
		1.5 - 3.5	Tan clayey SAND
		3.5 - 6.0	Tan/orange fine SAND
		6.0 - 8.0	Tan/orange clayey SAND
		8.0 - 9.0	Gray clayey SAND, wet
		9.0	Gray clayey SAND, saturated
		9.0	Test Pit Terminated.

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
9/13/2006	TP-7	0.0 - 2.0	Rust-red SAND
		2.0 - 4.5	Brown-orange clayey SAND, wet 2.5' bgs (seepage observed)
		4.5 - 5.0	Tan and gray medium-fine SAND with shells.
		5.0	Test Pit Terminated.
9/13/2006	TP-8	0.0 - 0.5	Orange sandy CLAY
		0.5 - 5.0	Gray sandy CLAY
		5.0 - 6.0	Gray sandy CLAY with shells
		6.0 - 8.0	Gray clayey SAND
		8.0	Test Pit Terminated.

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

TEST PIT EXCAVATION SUMMARY

Project Name: Edgecombe County Borrow Area
Project Location: Tarboro, North Carolina
S&ME Project No.: 1040-01-545G

DATE	BORING LOCATION	DEPTH (ft-bgs)	SOIL DESCRIPTION
10/12/2006	TP-9	0.0 - 0.5	Silty LOAM with organics
		0.5 - 5.5	Tan, medium-fine SAND, moist
		5.5 - 6.5	Tan, medium-fine SAND, trace of coarse-medium sand. Seepage observed ~6.0 ft-bgs
		6.5	Tan, fine-medium SAND with shells, wet.
		6.5	Test Pit Terminated
10/12/2006	TP-10	0.0 - 3.5	Tan CLAY, mottling below 2.5 ft.
		3.5 - 7.0	Orange CLAY with trace of mdium sand. Water entered test pit at 4.0 ft-bgs.
		7.0 - 8.0	Orange-brown sandy CLAY
		8.0 - 8.5	Orange-brown sandy CLAY with shells
		8.5 - 9.0	Gray medium SAND with shells
		9.0	Test Pit Terminated
10/12/2006	TP-11	0.0 - 2.5	Light tan medium SAND, moist, wet below 1.0 ft.
		2.5	Test Pit Terminated due to collapsing side walls

Notes:

ft. bgs.= Depth in feet below ground surface

-- = No data or parameter not collected

APPENDIX IV

(LABORATORY TEST RESULTS)

S&ME

LAB ASSIGNMENT SHEET

Request Completion Date:
Date Assigned: 9-18-06
Sampling Date:
Date Completed:

Log Number

Project #: 1040-09-5456 Project Name: EDGECOMB Co. LANDFILL BORROW STUDY
Project Address: Engineer in Charge: KEN DALY
Client Name: ~~EDGECOMB COUNTY~~ Sampled By: KEN DALY
Client Address: Sample Location: BORROW AREAS

Alternate Test
AASHTO ☐
NCDOT ☐
Other ☐

	Boring #	Sample #	DEPTH	Moisture Content D2216	Plastic Index D4318	Grain Size (200 Wash) D422	Hydrometer D422	Standard Proctor D698	Modified Proctor D1557	Soil Specific Gravity D854	Aggregate Gradation C136	Fine Aggregate Specific Gravity C	Coarse Agg. Specific Gravity C12	Marshall Test D1559 o D5581 o	Extraction / Gradation D2172 / D	Maximum Theoretical D2041	Core Bulk Specific Gravity D2726	Compressive Str. Concrete Core	CMU Prism Compressive Stength	Flex. Strenght Concrete Beam	CBR D1883 Compaction	CBR D1883 Moisture	CBR D1883 Soak	One-Dimensional Consolidation Test D2435 Preload	One-Dimensional Consolidation Test D2435 Saturate	One-Dimensional Consolidation Test D2435 Loads	Permeability D5084	Triaxial Shear CU D4767 ☐ UU D2850 ☐ Confining Pressures			
1	TP2	–	0-1'			X																									
2	TP2	–	4'		X	X																									
3	TP3	–	5'		X	X																									
4	TP4	–	7.5'		X	X																									
5	TP6	–	6'		X	X																									
6																															
7																															
8																															
9																															
10																															
11																															
12																															
13																															
14																															
15																															
16																															
17																															
18																															
19																															
20																															

NOTE: Field Samples obtained from: Stockpiles ☐ Roadway ☐ Conveyor belt ☐ Aggregate Stream ☐ Borehole ☐
Material Suppliers, Sampling Parameters, and Project Specifications.

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Test Date(s): 09/18 - 09/25/2006
Report Date: 09/25/2006

Boring #: TP-2 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Depth (ft): 0 - 1.0'
Sample Description: Brown SAND with Silt (SP)

Particle Size Analysis / Without Hydrometer Analysis					
	Tare Number	7		Moisture Content	Natural
				Tare #	7
A	Tare Weight	146.72	A	Tare Weight	146.72
B	Total Sample Dry Wt. + Tare Wt.	622.24	B	Wet Weight + Tare Wt.	665.01
C	Total Sample Dry Weight (B-A)	475.52	C	Dry Weight + Tare Wt.	622.24
D	Total Sample Wt. After #200 Wash	456.37	D	Water Wt. (B-C)	42.77
E	Percent Passing #200 (1-D/C)x100	4.0%	E	Dry Wt.(C-A)	475.52
				Moisture Content (100 x D/E) (%)	9.0%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.71	0.1%	**99.9%**
2.00	#10	16.20	3.4%	**96.6%**
0.85	#20	132.63	27.9%	**72.1%**
0.43	#40	346.09	72.8%	**27.2%**
0.25	#60	437.99	92.1%	**7.9%**
0.15	#100	449.63	94.6%	**5.4%**
0.075	#200	452.56	95.2%	**4.8%**

Notes:						
	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.1%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**3.3%**
Liquid Limit	ND	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**69.4%**
Plastic Limit	ND	Cu = D60/D10: **2.5**	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**22.4%**
Plastic Index	ND	Cc =$(D30)^2$/ (D10xD60): **1.0**	% Silt and Clay	< 0.075 mm	**4.8%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = **0.28** D30 = **0.45** D60 = **0.69** D50 = **0.6** D90 = **1.5**

ASTM D 422: Particle Size Analysis of Soils
Hydrometer portion of test method not utilized.
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

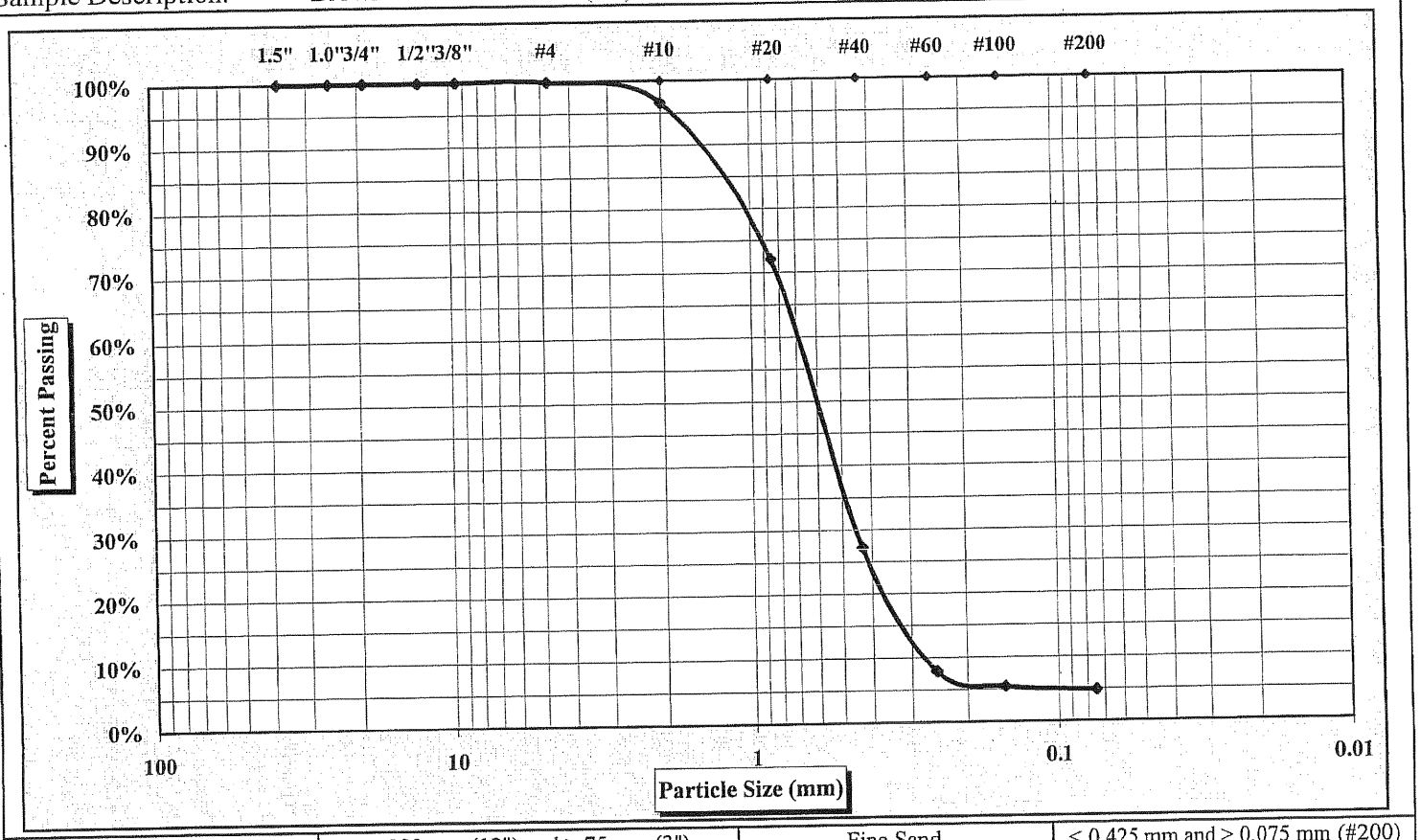
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill Borrow Study**
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #:	TP-2	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	0 - 1.0'
Sample Description:	Brown SAND with Silt (SP)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	0%	Medium Sand	69%
Silt & Clay (% Passing #200)	4.8%	Coarse Sand	3%	Fine Sand	22%
Apparent Relative Density	ND	Moisture Content	9.0%	Organic Content	ND
Liquid Limit	ND	Plastic Limit	ND	Plastic Index	ND

ND=Not determined

Description of Sand & Gravel
Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Hydrometer portion of test method not utilized.

References: ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Test Date(s): 09/18 - 09/25/2006
Report Date: 09/25/2006

Boring #: TP-2 Sample #: N/A
Location: Borrow Area
Sample Description: Tan Silty SAND (SM)

w / shells?

					Natural
					98
			A		161.21
			B	Wet Weight + Tare Wt.	570.12
			C	Dry Weight + Tare Wt.	540.12
			D	Water Wt. (B-C)	30.00
			E	Dry Wt.(C-A)	378.91
				Moisture Content (100 x D/E) (%)	7.9%

Particle Size Analysis / Without Hydrometer Analysis

	Tare Number	98
A	Tare Weight	161.21
B	Total Sample Dry Wt. + Tare Wt.	540.12
C	Total Sample Dry Weight (B-A)	378.91
D	Total Sample Wt. After #200 Wash	347.77
E	Percent Passing #200 (1-D/C)x100	8.2%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.35	0.1%	**99.9%**
4.75	#4	10.76	2.8%	**97.2%**
2.00	#10	24.47	6.5%	**93.5%**
0.85	#20	46.41	12.2%	**87.8%**
0.43	#40	125.22	33.0%	**67.0%**
0.25	#60	264.22	69.7%	**30.3%**
0.15	#100	338.75	89.4%	**10.6%**
0.075	#200	346.40	91.4%	**8.6%**

Notes:

Maximum Particle Size	1/2"		
Apparent Relative Density	ND		
Liquid Limit	18	Fineness Modulus	
Plastic Limit	15	Cu = D60/D10:	**2.5**
Plastic Index	3	Cc =$(D30)^2$/ (D10xD60):	**1.1**

ND=Not determined

Gravel	< 75 mm and > 4.75 mm (#4)	**2.8%**
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**3.7%**
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**26.5%**
Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**58.4%**
% Silt and Clay	< 0.075 mm	**8.6%**

Description of Sand & Gravel Rounded ☐ Angular ☐
Hard & Durable ☐ Soft ☐ Weathered & Friable ☐
Organic Content **ND**

D10 = **0.15** D30 = **0.25** D60 = **0.38** D50 = **0.34** D90 = **1**

ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Hydrometer portion of test method not utilized.
ASTM D 854: Specific Gravity of Soils

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

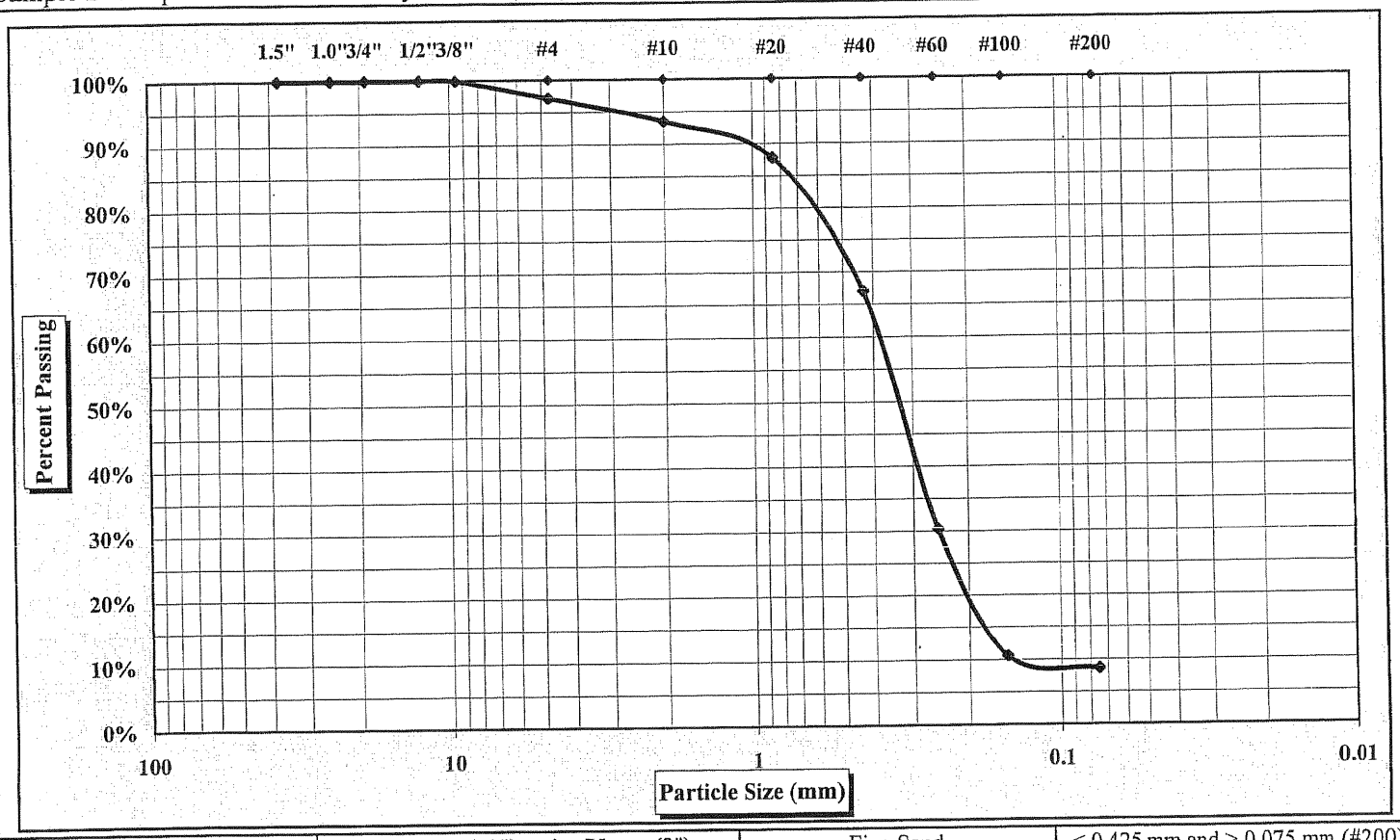
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill Borrow Study**
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #:	TP-2	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Area			Depth (ft):	- 4.0'
Sample Description:	Tan Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Gravel	3%	Medium Sand	27%
Silt & Clay (% Passing #200)	8.6%	Coarse Sand	4%	Fine Sand	58%
Apparent Relative Density	ND	Moisture Content	7.9%	Organic Content	ND
Liquid Limit	18	Plastic Limit	15	Plastic Index	3

ND=Not determined

Description of Sand & Gravel
Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Hydrometer portion of test method not utilized.

References: ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

S&ME

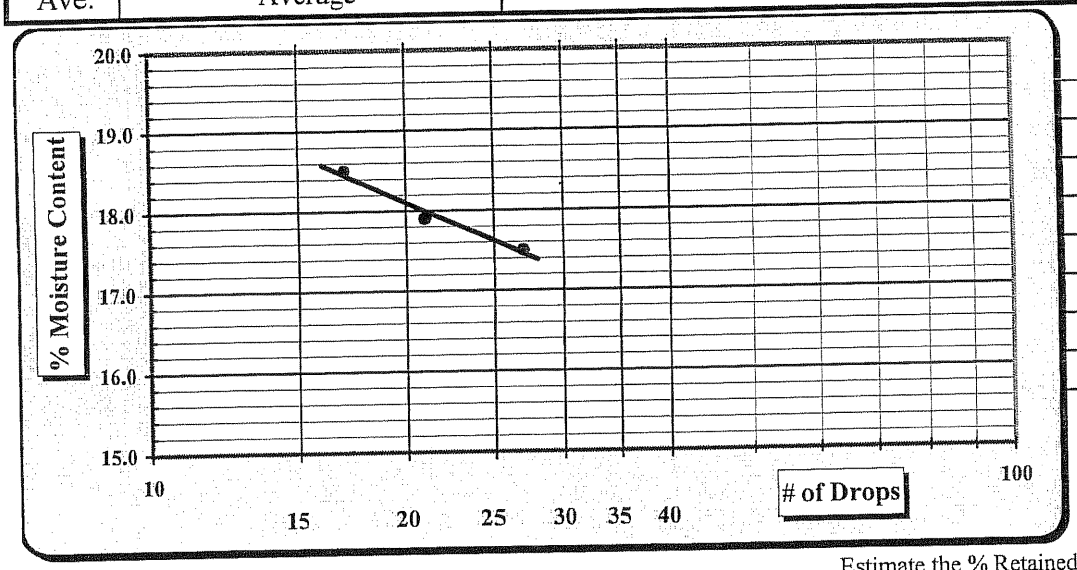
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #: TP-2 Sample #: N/A Sample Date: Unknown
Location: Borrow Area Offset: NA Depth (ft): - 4.0'
Sample Description: Tan Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	5	11	16				46	27	
A	Tare Weight	11.05	21.13	21.04				21.02	20.90	
B	Wet Soil Weight + A	30.93	35.04	36.16				31.65	30.48	
C	Dry Soil Weight + A	27.82	32.93	33.91				30.24	29.22	
D	Water Weight (B-C)	3.11	2.11	2.25				1.41	1.26	
E	Dry Soil Weight (C-A)	16.77	11.80	12.87				9.22	8.32	
F	% Moisture Content (D/E)*100	18.5%	17.9%	17.5%				15.3%	15.1%	
N	# OF DROPS	17	21	27				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							15.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Estimate the % Retained on the #40 Sieve

Notes:

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	18
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	15
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	3
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Test Date(s): 09/18 - 09/25/2006
Report Date: 09/25/2006

Boring #: TP-3 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Depth (ft): - 5.0'
Sample Description: Olive-Brown Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	9
	Tare Number	9	A	Tare Weight	138.77
A	Tare Weight	138.77	B	Wet Weight + Tare Wt.	515.76
B	Total Sample Dry Wt. + Tare Wt.	453.30	C	Dry Weight + Tare Wt.	453.30
C	Total Sample Dry Weight (B-A)	314.53	D	Water Wt. (B-C)	62.46
D	Total Sample Wt. After #200 Wash	276.06	E	Dry Wt.(C-A)	314.53
E	Percent Passing #200 (1-D/C)x100	12.2%		Moisture Content (100 x D/E) (%)	19.9%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	1.61	0.5%	**99.5%**
2.00	#10	4.17	1.3%	**98.7%**
0.85	#20	24.34	7.7%	**92.3%**
0.43	#40	108.63	34.5%	**65.5%**
0.25	#60	217.74	69.2%	**30.8%**
0.15	#100	269.14	85.6%	**14.4%**
0.075	#200	274.92	87.4%	**12.6%**

Notes:					
	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.5%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.8%**
Liquid Limit	22	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.2%**
Plastic Limit	19	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**52.9%**
Plastic Index	3	Cc =$(D30)^2$/ (D10xD60):	% Silt and Clay	< 0.075 mm	**12.6%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Hydrometer portion of test method not utilized.
ASTM D 854: Specific Gravity of Soils

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

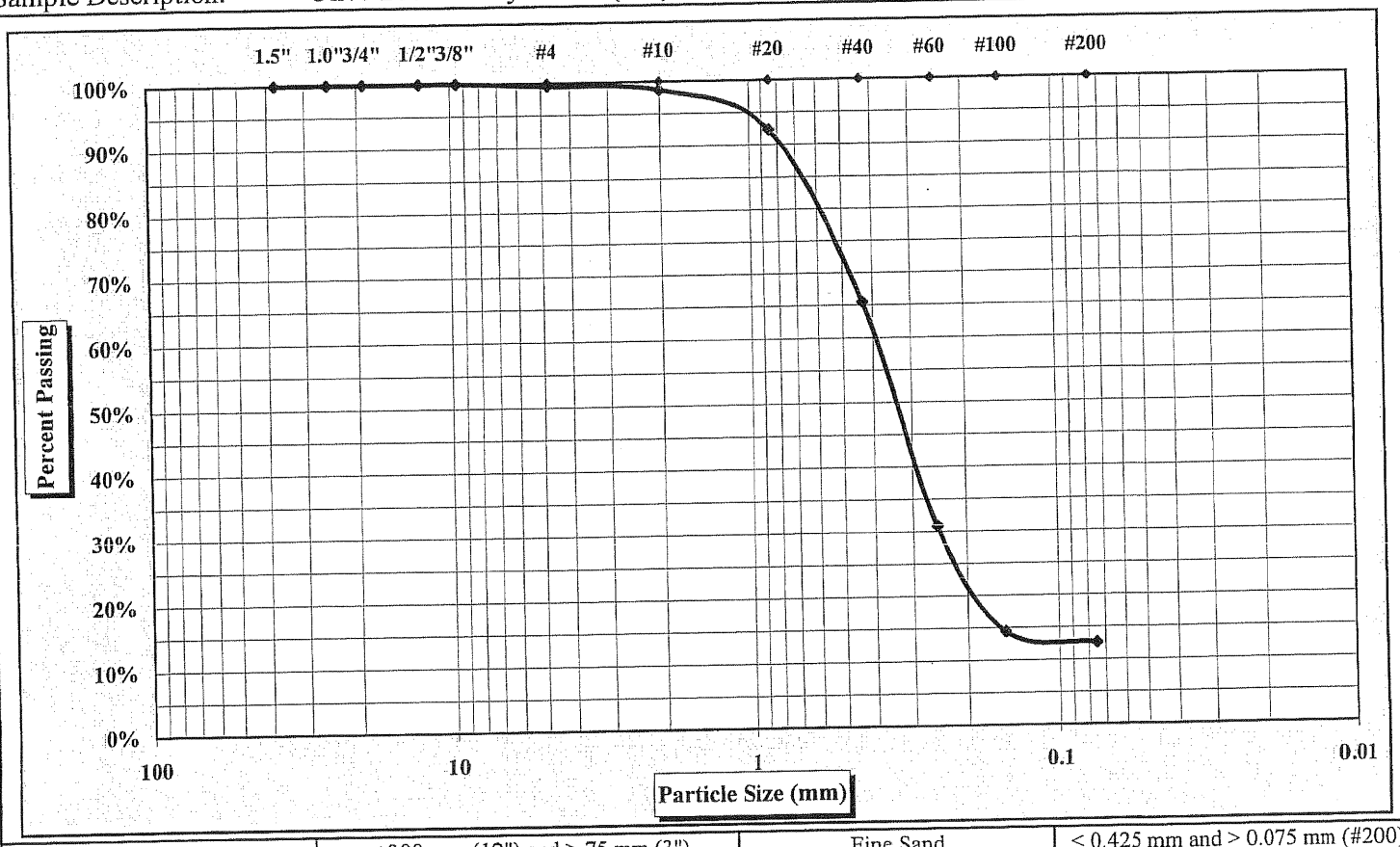
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill Borrow Study**
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #:	TP-3	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 5.0'
Sample Description:	Olive-Brown Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	1%	Medium Sand	33%
Silt & Clay (% Passing #200)	12.6%	Coarse Sand	1%	Fine Sand	53%
Apparent Relative Density	ND	Moisture Content	19.9%	Organic Content	ND
Liquid Limit	22	Plastic Limit	19	Plastic Index	3

ND=Not determined

Description of Sand & Gravel
Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

Hydrometer portion of test method not utilized.

References: ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

S&ME

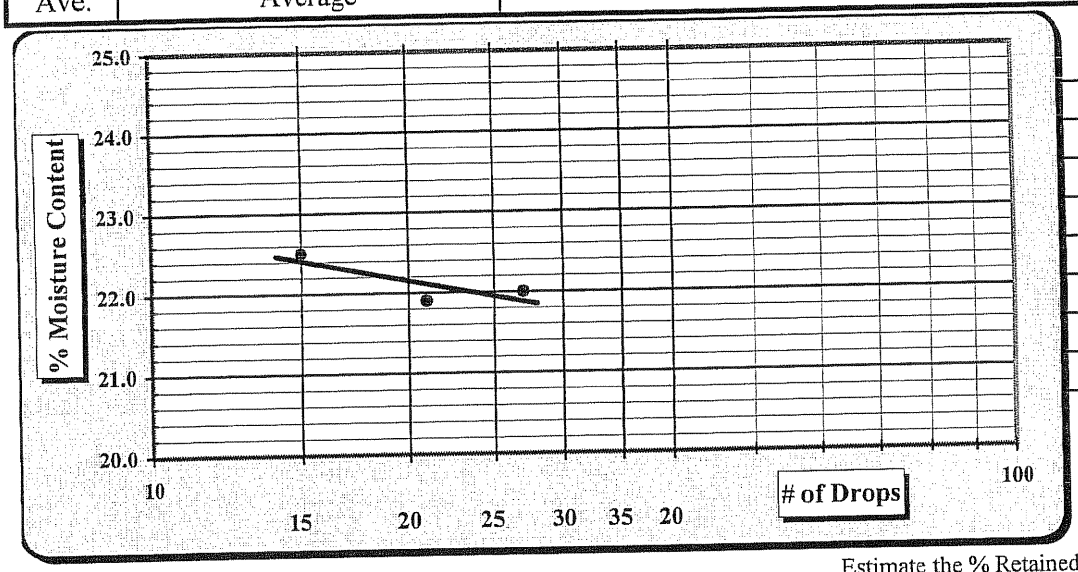
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #: TP-3 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Offset: NA Depth (ft): - 5.0'
Sample Description: Olive-Brown Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	2	54	57				5	22	
A	Tare Weight	15.31	18.60	18.55				17.79	21.11	
B	Wet Soil Weight + A	37.09	38.55	41.42				31.07	33.33	
C	Dry Soil Weight + A	33.09	34.97	37.30				29.01	31.38	
D	Water Weight (B-C)	4.00	3.58	4.12				2.06	1.95	
E	Dry Soil Weight (C-A)	17.78	16.37	18.75				11.22	10.27	
F	% Moisture Content (D/E)*100	22.5%	21.9%	22.0%				18.4%	19.0%	
N	# OF DROPS	15	21	27				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							18.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Estimate the % Retained on the #40 Sieve

Notes:

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	22
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	19
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	3
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Test Date(s): 09/18 - 09/25/2006
Report Date: 09/25/2006

Boring #: TP-4 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Depth (ft): - 7.5'
Sample Description: Olive-Gray Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**60M**
	Tare Number	60M	A	Tare Weight	221.85
A	Tare Weight	221.85	B	Wet Weight + Tare Wt.	681.47
B	Total Sample Dry Wt. + Tare Wt.	585.81	C	Dry Weight + Tare Wt.	585.81
C	Total Sample Dry Weight (B-A)	363.96	D	Water Wt. (B-C)	95.66
D	Total Sample Wt. After #200 Wash	341.56	E	Dry Wt.(C-A)	363.96
E	Percent Passing #200 (1-D/C)x100	6.2%		Moisture Content (100 x D/E) (%)	26.3%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	1.97	0.5%	**99.5%**
9.50	3/8"	6.34	1.7%	**98.3%**
4.75	#4	13.91	3.8%	**96.2%**
2.00	#10	31.85	8.8%	**91.2%**
0.85	#20	60.54	16.6%	**83.4%**
0.43	#40	155.16	42.6%	**57.4%**
0.25	#60	280.71	77.1%	**22.9%**
0.15	#100	327.05	89.9%	**10.1%**
0.075	#200	338.73	93.1%	**6.9%**

Notes:

Maximum Particle Size	**3/4"**		
Apparent Relative Density	ND		
Liquid Limit	18	Fineness Modulus	
Plastic Limit	17	Cu = D60/D10:	**3.0**
Plastic Index	1	Cc =(D30)^2/ (D10xD60):	**1.2**

ND=Not determined

Gravel	< 75 mm and > 4.75 mm (#4)	**3.8%**
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**5.0%**
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.8%**
Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**50.5%**
% Silt and Clay	< 0.075 mm	**6.9%**

Description of Sand & Gravel Rounded ☒ Angular ☒
Hard & Durable ☐ Soft ☐ Weathered & Friable ☒
Organic Content **ND**

D10 = **0.15** D30 = **0.28** D60 = **0.45** D50 = **0.38** D90 = **1.8**

ASTM D 422: Particle Size Analysis of Soils
Hydrometer portion of test method not utilized.
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

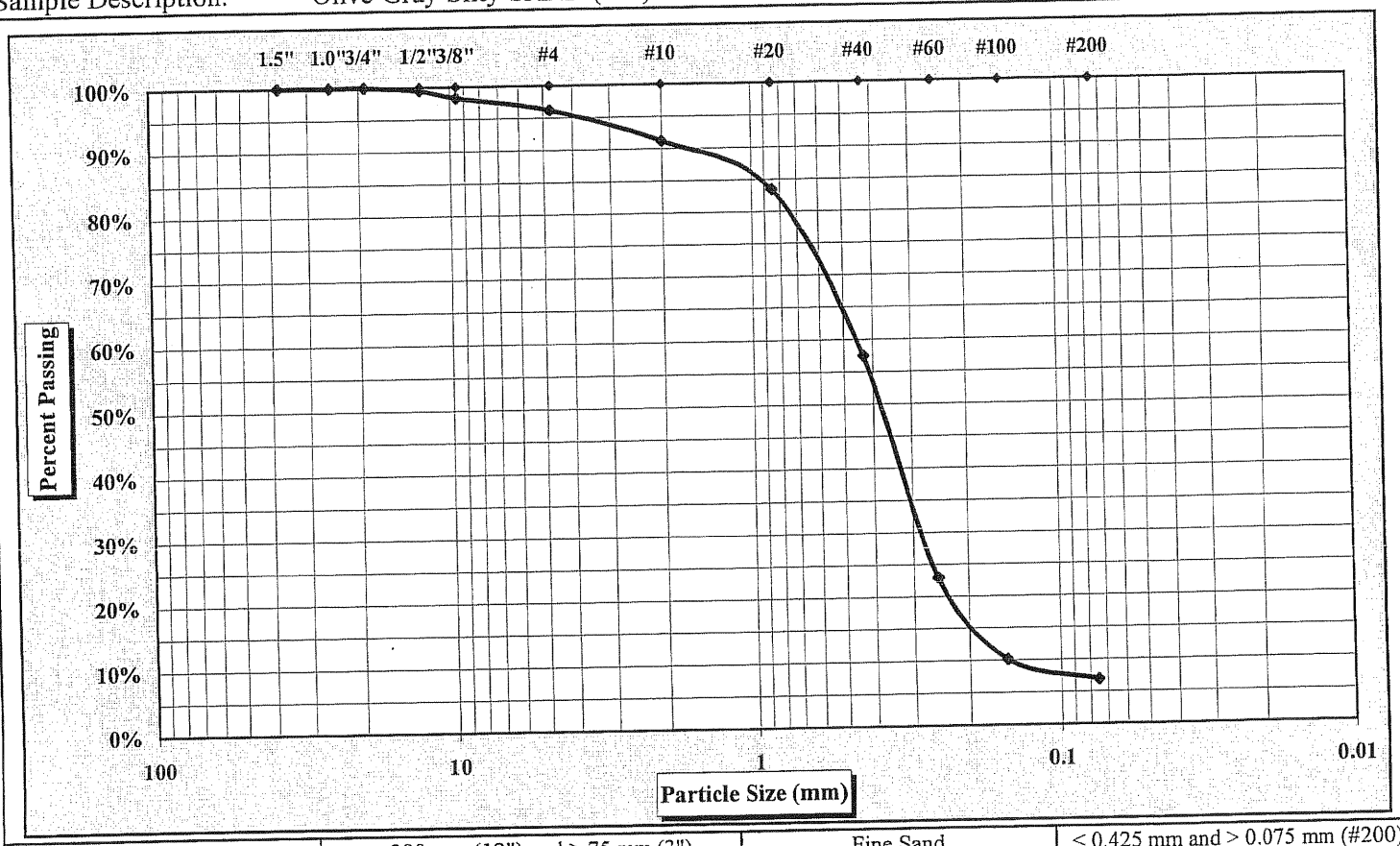
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill Borrow Study**
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #:	TP-4	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 7.5'
Sample Description:	Olive-Gray Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/4"	Gravel	4%	Medium Sand	34%
Silt & Clay (% Passing #200)	6.9%	Coarse Sand	5%	Fine Sand	51%
Apparent Relative Density	ND	Moisture Content	26.3%	Organic Content	ND
Liquid Limit	18	Plastic Limit	17	Plastic Index	1

ND=Not determined

Description of Sand & Gravel
Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

Hydrometer portion of test method not utilized.

References: ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

S&ME

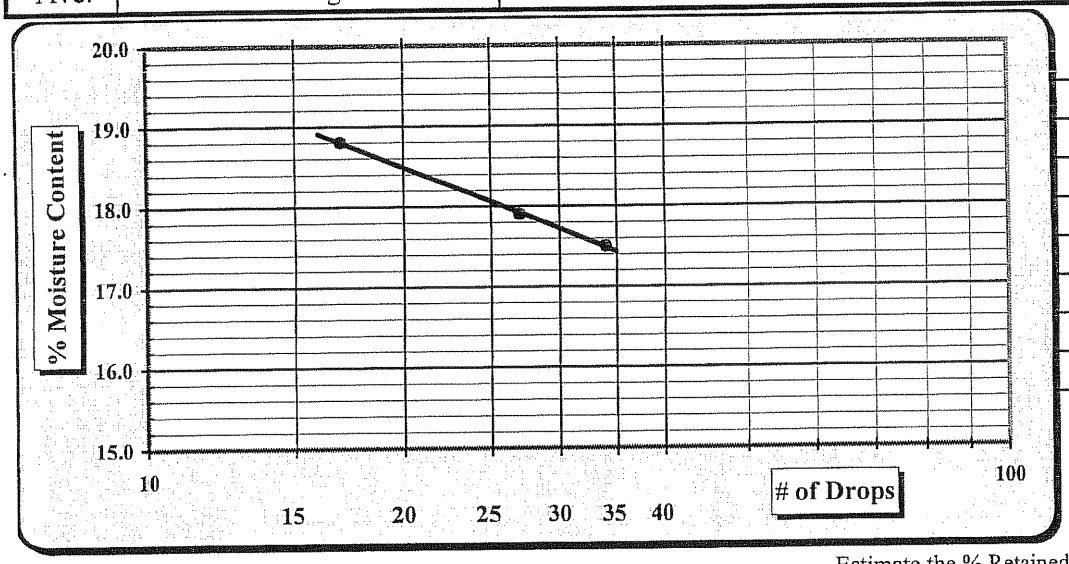
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #: TP-4 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Offset: NA Depth (ft): - 7.5'
Sample Description: Olive-Gray Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	14	0	9				43	39	
A	Tare Weight	18.47	18.42	18.39				21.07	21.02	
B	Wet Soil Weight + A	37.55	40.98	38.64				34.48	30.65	
C	Dry Soil Weight + A	34.53	37.55	35.63				32.50	29.28	
D	Water Weight (B-C)	3.02	3.43	3.01				1.98	1.37	
E	Dry Soil Weight (C-A)	16.06	19.13	17.24				11.43	8.26	
F	% Moisture Content (D/E)*100	18.8%	17.9%	17.5%				17.3%	16.6%	
N	# OF DROPS	17	27	34				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							17.0%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	18
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	17
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	1
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Test Date(s): 09/18 - 09/25/2006
Report Date: 09/25/2006

Boring #: TP-6 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Depth (ft): - 6.0'
Sample Description: Tan-Brown Clayey SAND (SC)

	Particle Size Analysis / Without Hydrometer Analysis			Moisture Content	Natural
				Tare #	**AA**
	Tare Number	AA	A	Tare Weight	217.31
A	Tare Weight	217.31	B	Wet Weight + Tare Wt.	593.08
B	Total Sample Dry Wt. + Tare Wt.	540.32	C	Dry Weight + Tare Wt.	540.32
C	Total Sample Dry Weight (B-A)	323.01	D	Water Wt. (B-C)	52.76
D	Total Sample Wt. After #200 Wash	247.60	E	Dry Wt.(C-A)	323.01
E	Percent Passing #200 (1-D/C)x100	23.3%		Moisture Content (100 x D/E) (%)	16.3%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.12	0.0%	**100.0%**
2.00	#10	1.78	0.6%	**99.4%**
0.85	#20	23.34	7.2%	**92.8%**
0.43	#40	107.90	33.4%	**66.6%**
0.25	#60	207.89	64.4%	**35.6%**
0.15	#100	238.37	73.8%	**26.2%**
0.075	#200	247.11	76.5%	**23.5%**

Notes:					
	Maximum Particle Size	**3/8"**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.6%**
Liquid Limit	30	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**32.8%**
Plastic Limit	16	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**43.1%**
Plastic Index	14	Cc =(D30)^2/ (D10xD60):	% Silt and Clay	< 0.075 mm	**23.5%**
ND=Not determined			Description of Sand & Gravel	Rounded ☒	Angular ☒
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☒
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Hydrometer portion of test method not utilized.
ASTM D 854: Specific Gravity of Soils

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

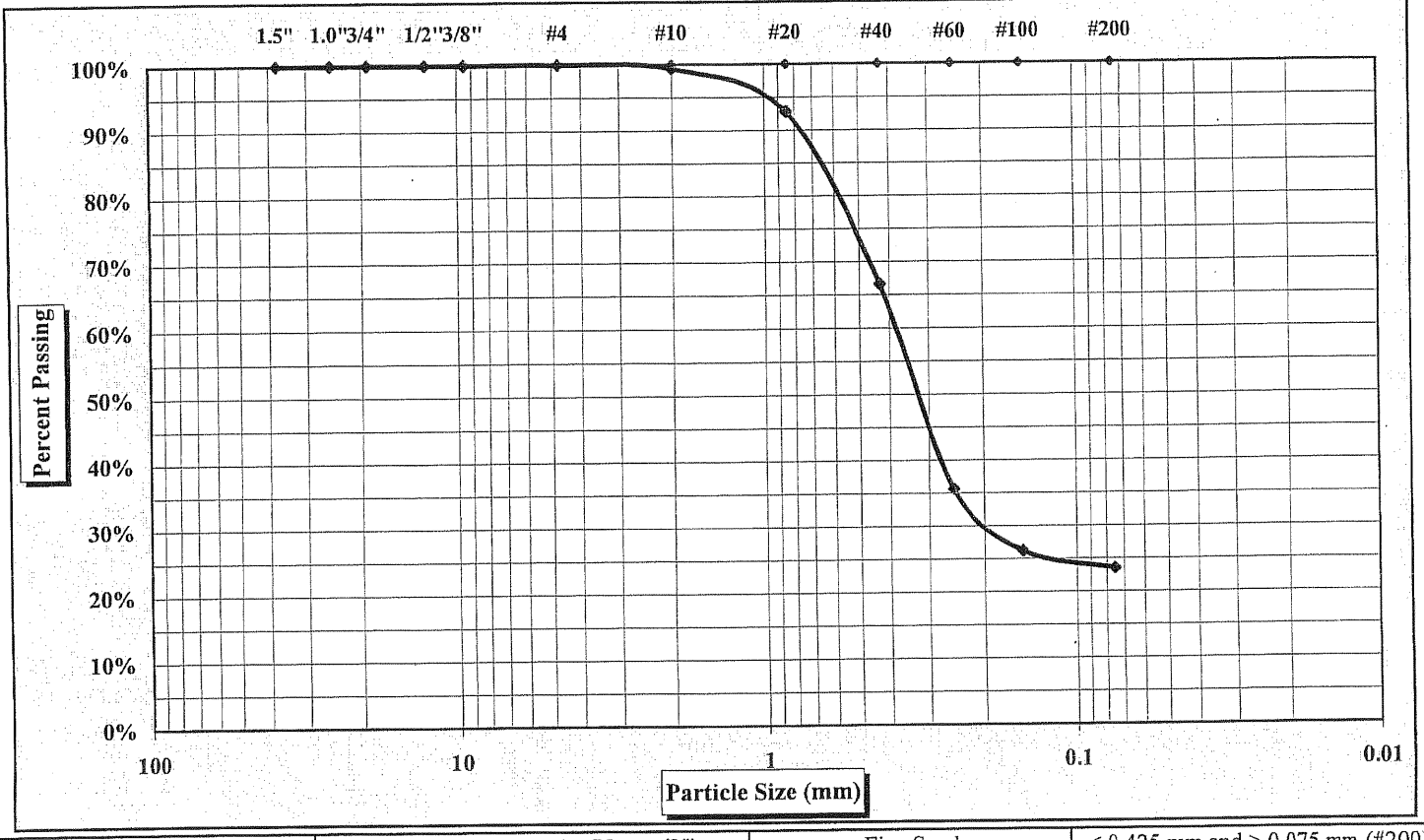
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill Borrow Study**
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #:	TP-6	Sample #:	N/A	Sample Date:	Unknown
Location:	Borrow Areas			Depth (ft):	- 6.0'
Sample Description:	Tan-Brown Clayey SAND (SC)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	3/8"	Gravel	0%	Medium Sand	33%
Silt & Clay (% Passing #200)	23.5%	Coarse Sand	1%	Fine Sand	43%
Apparent Relative Density	ND	Moisture Content	16.3%	Organic Content	ND
Liquid Limit	30	Plastic Limit	16	Plastic Index	14

ND=Not determined

Description of Sand & Gravel
Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

Hydrometer portion of test method not utilized.

References: ASTM D 422: Particle Size Analysis of Soils
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor (Position)

S&ME

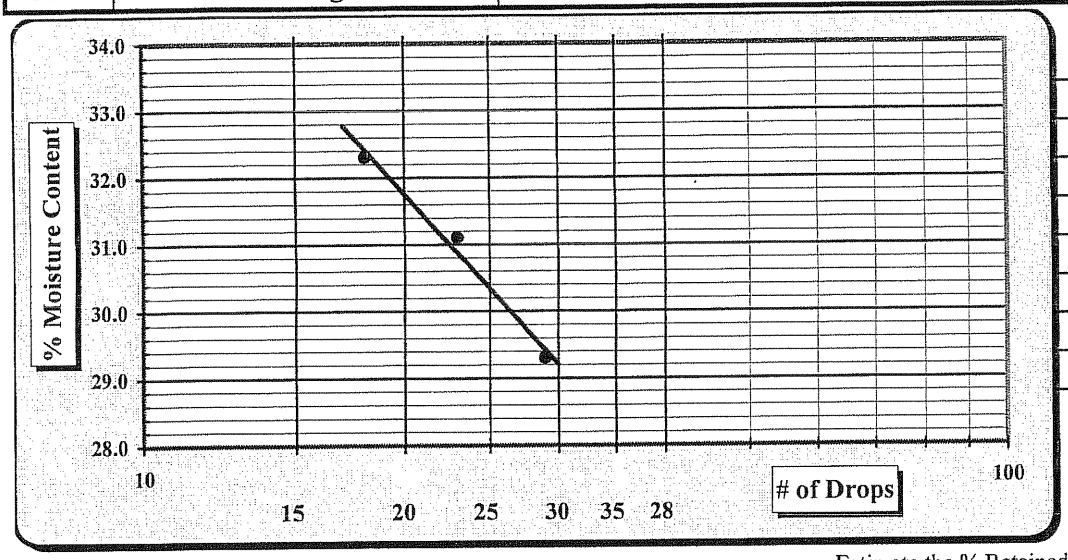
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill Borrow Study
Client Name:
Client Address:

Report Date: 09/25/2006
Test Date(s): 09/18 - 09/25/2006

Boring #: TP-6 Sample #: N/A Sample Date: Unknown
Location: Borrow Areas Offset: NA Depth (ft): - 6.0'
Sample Description: Tan-Brown Clayey SAND (SC)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	7	52	32				23	30	
A	Tare Weight	15.39	18.58	18.38				21.04	21.07	
B	Wet Soil Weight + A	28.67	36.86	35.47				33.23	31.10	
C	Dry Soil Weight + A	25.66	32.52	31.30				31.53	29.70	
D	Water Weight (B-C)	3.01	4.34	4.17				1.70	1.40	
E	Dry Soil Weight (C-A)	10.27	13.94	12.92				10.49	8.63	
F	% Moisture Content (D/E)*100	29.3%	31.1%	32.3%				16.2%	16.2%	
N	# OF DROPS	29	23	18				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							16.2%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	30
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	16
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	14
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SC

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

S&ME

LAB ASSIGNMENT SHEET

Request Completion Date: 10/23/06
Date Assigned: ~~10-2~~
Sampling Date:
Date Completed:

Log Number

Project #: 1040-01-5456 Project Name: EDGECOMBE CO. LANDFILL - BURROW STUDY
Project Address:
Engineer in Charge: KEN DALY
Client Name:
Sampled By: KEN DALY
Client Address:
Sample Location: BURROW AREA 3

Alternate Test
AASHTO ☐
NCDOT ☐
Other ☐

	Boring #	Sample #	DEPTH	Moisture Content D2216	Plastic Index D4318	Grain Size (200 Wash) D422	Hydrometer D422	Standard Proctor D698	Modified Proctor D1557	Soil Specific Gravity D854	Aggregate Gradation C136	Fine Aggregate Specific Gravity C	Coarse Agg. Specific Gravity C12	Marshall Test D1559 o D5581 o	Extraction / Gradation D2172 / D	Maximum Theoretical D2041	Core Bulk Specific Gravity D2726	Compressive Str. Concrete Core	CMU Prism Compressive Stength	Flex. Strenght Concrete Beam	CBR D1883 Compaction	CBR D1883 Moisture	CBR D1883 Soak	One-Dimensional Consolidation Test D2435 Preload	One-Dimensional Consolidation Test D2435 Saturate	One-Dimensional Consolidation Test D2435 Loads	Permeability D5084	Triaxial Shear CU D4767 ☐ UU D2850 ☐ Confining Pressures				UD Tube / Remold Samp U/R
1	TP8	—	1'		X	X																										
2	TP10	—	2'		X	X																										
3	TP10	—	4'		X	X																										
4																																
5																																
6																																
7																																
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NOTE: Field Samples obtained from: Stockpiles ☐ Roadway ☐ Conveyor belt ☐ Aggregate Stream ☐ Borehole ☐
Material Suppliers, Sampling Parameters, and Project Specifications.

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill - Borrow Study
Client Name:
Client Address:

Test Date(s): 10/24 - 10/27/06
Report Date: 10/27/2006

Boring #: TP-8 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Depth (ft): - 1.0'
Sample Description: Olive-Gray Clayey SAND (SC)

	Particle Size Analysis / Without Hydrometer Analysis			Moisture Content	Natural
				Tare #	**16M**
	Tare Number	16M	A	Tare Weight	185.79
A	Tare Weight	185.79	B	Wet Weight + Tare Wt.	519.93
B	Total Sample Dry Wt. + Tare Wt.	427.53	C	Dry Weight + Tare Wt.	427.53
C	Total Sample Dry Weight (B-A)	241.74	D	Water Wt. (B-C)	92.40
D	Total Sample Wt. After #200 Wash	152.77	E	Dry Wt.(C-A)	241.74
E	Percent Passing #200 (1-D/C)x100	36.8%		Moisture Content (100 x D/E) (%)	38.2%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.00	0.0%	**100.0%**
2.00	#10	0.25	0.1%	**99.9%**
0.85	#20	8.31	3.4%	**96.6%**
0.43	#40	49.77	20.6%	**79.4%**
0.25	#60	116.99	48.4%	**51.6%**
0.15	#100	136.01	56.3%	**43.7%**
0.075	#200	152.54	63.1%	**36.9%**

Notes:					
	Maximum Particle Size	**#4**	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.1%**
Liquid Limit	51	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**20.5%**
Plastic Limit	24	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**42.5%**
Plastic Index	27	Cc =(D30)^2/ (D10xD60):	% Silt and Clay	< 0.075 mm	**36.9%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor
Position

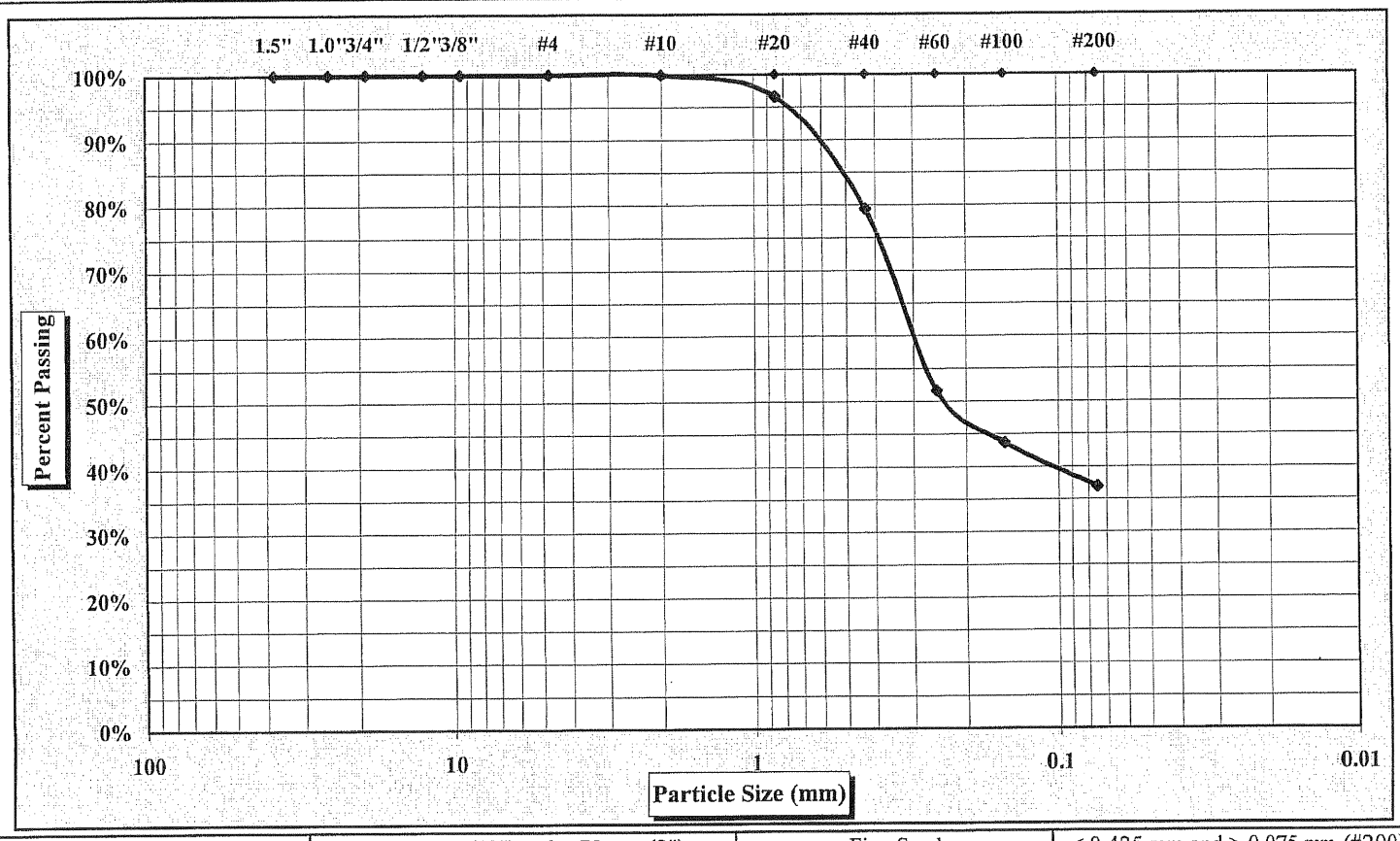
Particle Size Analysis of Soils

ASTM D 422

S&ME Project #: **1040-01-545G**
Project Name: **Edgecomb County Landfill - Borrow Study**
Client Name:
Client Address:

Report Date: 10/27/2006
Test Date(s): 10/24 - 10/27/06

Boring #:	TP-8	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 1.0'
Sample Description:	Olive-Gray Clayey SAND (SC)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	#4	Gravel	0%	Medium Sand	21%
Silt & Clay (% Passing #200)	36.9%	Coarse Sand	0%	Fine Sand	43%
Apparent Relative Density	ND	Moisture Content	38.2%	Organic Content	ND
Liquid Limit	51	Plastic Limit	24	Plastic Index	27

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils
Hydrometer portion of test method not utilized.
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

Liquid Limit, Plastic Limit, and Plastic Index

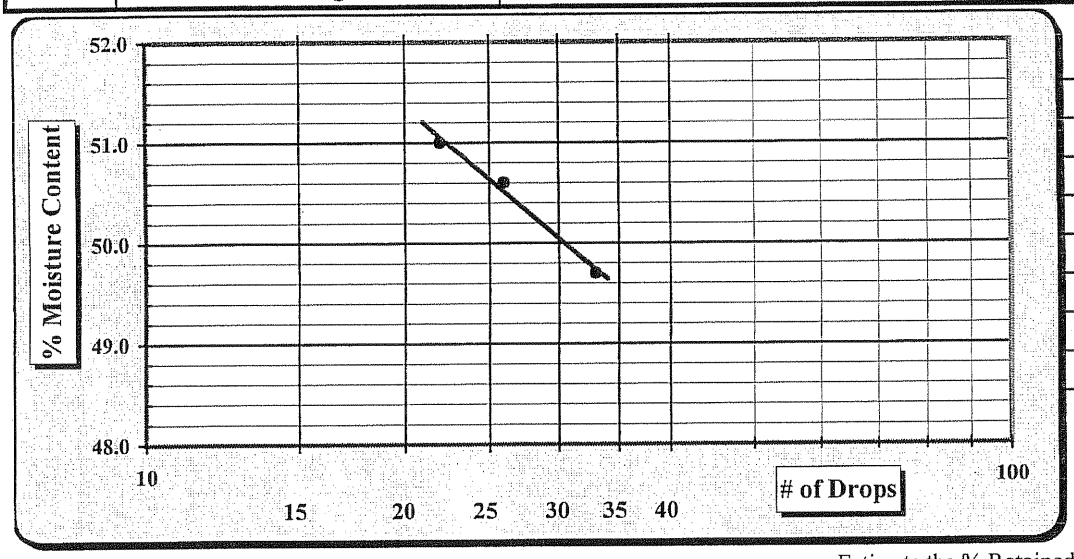
S&ME

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill - Borrow Study
Client Name:
Client Address:

Report Date: 10/27/2006
Test Date(s): 10/24 - 10/27/06

Boring #: TP-8 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 1.0'
Sample Description: Olive-Gray Clayey SAND (SC)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	52	2	54				15	13	
A	Tare Weight	18.58	15.32	18.60				20.93	20.97	
B	Wet Soil Weight + A	33.77	29.78	31.77				30.99	30.26	
C	Dry Soil Weight + A	28.64	24.92	27.40				29.07	28.43	
D	Water Weight (B-C)	5.13	4.86	4.37				1.92	1.83	
E	Dry Soil Weight (C-A)	10.06	9.60	8.80				8.14	7.46	
F	% Moisture Content (D/E)*100	51.0%	50.6%	49.7%				23.6%	24.5%	
N	# OF DROPS	22	26	33				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							24.1%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	51
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	24
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	27
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SC

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G
Project Name: Edgecomb County Landfill - Borrow Study
Client Name:
Client Address:

Test Date(s): 10/24 - 10/27/06
Report Date: 10/27/2006

Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Depth (ft): - 2.0'
Sample Description: Olive Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis				Moisture Content	Natural
				Tare #	**2M**
	Tare Number	2M	A	Tare Weight	190.57
A	Tare Weight	190.57	B	Wet Weight + Tare Wt.	511.92
B	Total Sample Dry Wt. + Tare Wt.	410.35	C	Dry Weight + Tare Wt.	410.35
C	Total Sample Dry Weight (B-A)	219.78	D	Water Wt. (B-C)	101.57
D	Total Sample Wt. After #200 Wash	114.40	E	Dry Wt.(C-A)	219.78
E	Percent Passing #200 (1-D/C)x100	47.9%		Moisture Content (100 x D/E) (%)	46.2%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	0.00	0.0%	**100.0%**
4.75	#4	0.00	0.0%	**100.0%**
2.00	#10	0.19	0.1%	**99.9%**
0.85	#20	6.66	3.0%	**97.0%**
0.43	#40	42.43	19.3%	**80.7%**
0.25	#60	88.84	40.4%	**59.6%**
0.15	#100	101.88	46.4%	**53.6%**
0.075	#200	112.83	51.3%	**48.7%**

Notes:					
	Maximum Particle Size	#4	Gravel	< 75 mm and > 4.75 mm (#4)	**0.0%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**0.1%**
Liquid Limit	60	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**19.2%**
Plastic Limit	39	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**32.0%**
Plastic Index	21	Cc =(D30)^2/ (D10xD60):	% Silt and Clay	< 0.075 mm	**48.7%**
ND=Not determined			Description of Sand & Gravel	Rounded ☐	Angular ☐
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☐
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils
Hydrometer portion of test method not utilized.
ASTM D 421: Dry Preparation of Soil Samples
ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technician Name: Chana Savanapridi NICET 116132
Certification #

Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

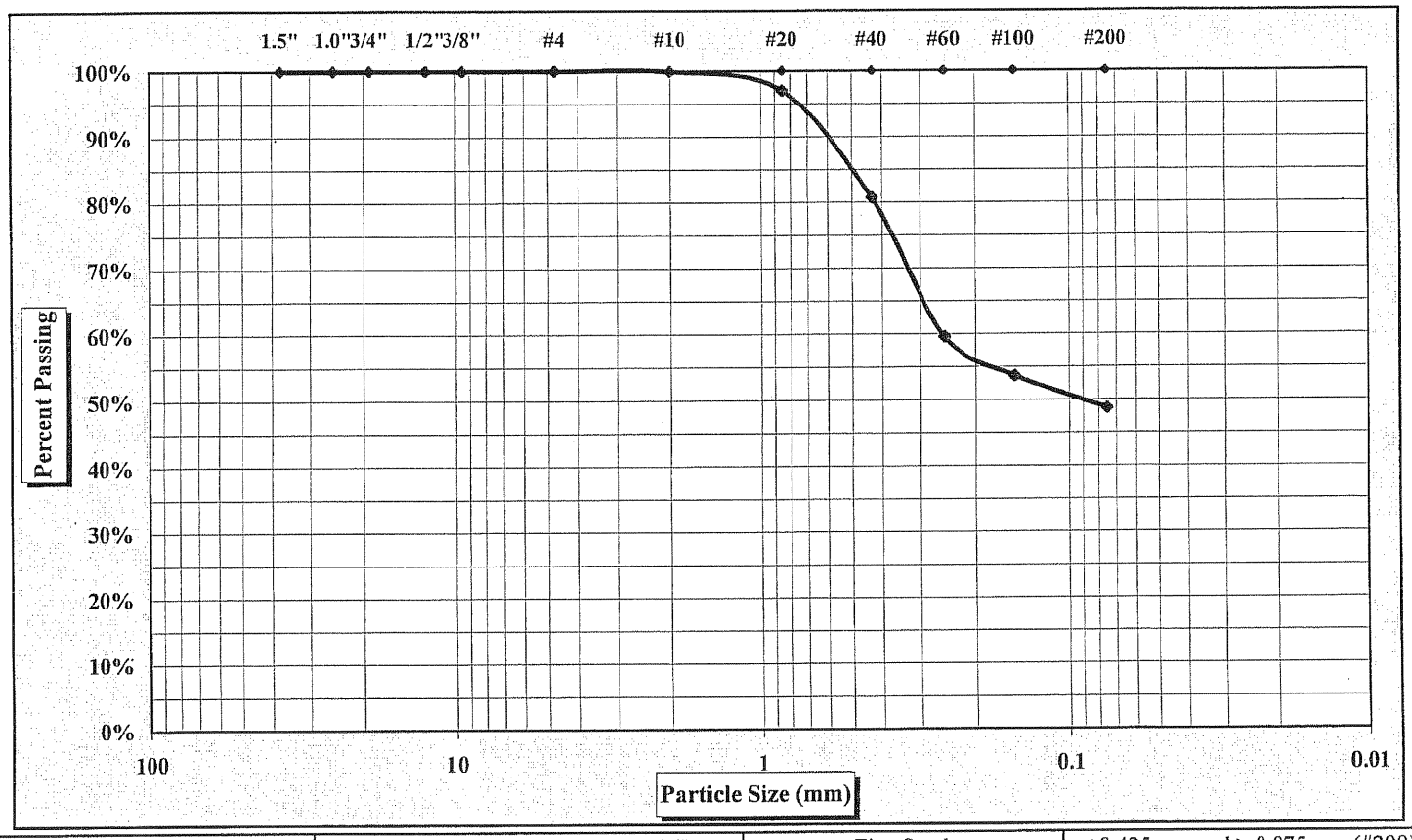
S&ME Project #: **1040-01-545G** Report Date: 10/27/2006

Project Name: **Edgecomb County Landfill - Borrow Study** Test Date(s): 10/24 - 10/27/06

Client Name:

Client Address:

Boring #:	TP-10	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 2.0'
Sample Description:	Olive Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	#4	Gravel	0%	Medium Sand	19%
Silt & Clay (% Passing #200)	48.7%	Coarse Sand	0%	Fine Sand	32%
Apparent Relative Density	ND	Moisture Content	46.2%	Organic Content	ND
Liquid Limit	60	Plastic Limit	39	Plastic Index	21

ND=Not determined

Description of Sand & Gravel

Rounded ☐ Angular ☐ Hard & Durable ☐ Soft ☐ Weathered & Friable ☐

References: ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*

ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan Laboratory Supervisor

Signature *Position*

Liquid Limit, Plastic Limit, and Plastic Index

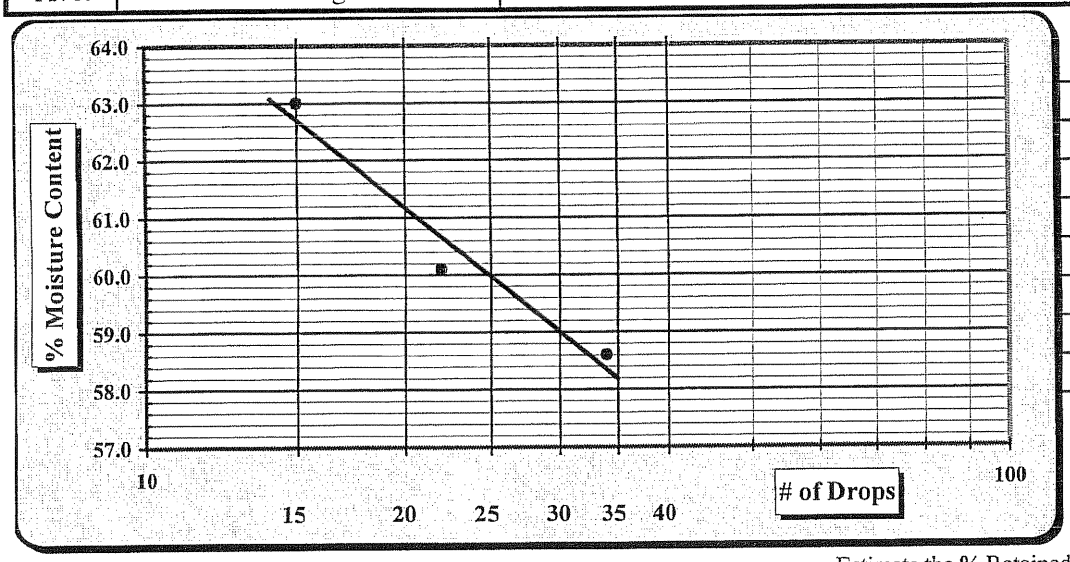
S&ME

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill - Borrow Study
Client Name:
Client Address:

Report Date: 10/27/2006
Test Date(s): 10/24 - 10/27/06

Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 2.0'
Sample Description: Olive Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	16	52	0				25	39	
A	Tare Weight	18.48	18.39	18.42				20.97	21.03	
B	Wet Soil Weight + A	30.69	32.93	27.84				29.82	30.61	
C	Dry Soil Weight + A	25.97	27.47	24.36				27.37	27.94	
D	Water Weight (B-C)	4.72	5.46	3.48				2.45	2.67	
E	Dry Soil Weight (C-A)	7.49	9.08	5.94				6.40	6.91	
F	% Moisture Content (D/E)*100	63.0%	60.1%	58.6%				38.3%	38.6%	
N	# OF DROPS	15	22	34				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							38.5%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Notes: Estimate the % Retained on the #40 Sieve

Special Sampling Methods:

Sample Preparation:	Wet Preparation	☐	Dry Preparation	☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method	☒	One-point Method	☐		Liquid Limit	60
Classification:	ASTM D 2487	☒	AASHTO M 145	☐		Plastic Limit	39
Liquid limit Test:	ASTM D 4318	☒	AASHTO T 89	☐		Plastic Index	21
Plastic limit Test:	ASTM D 4318	☒	AASHTO T 90	☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

Particle Size Analysis of Soils

ASTM D 422

S&ME

Project #: 1040-01-545G Test Date(s): 10/27/2006
Project Name: Edgecomb County Landfill - Borrow Study Report Date: 10/27/2006
Client Name:
Client Address:

Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Depth (ft): - 4.0'
Sample Description: Orange Red Silty SAND (SM)

Particle Size Analysis / Without Hydrometer Analysis			Moisture Content		Natural
				Tare #	**4M**
	Tare Number	4M	A	Tare Weight	180.98
A	Tare Weight	180.98	B	Wet Weight + Tare Wt.	512.57
B	Total Sample Dry Wt. + Tare Wt.	428.88	C	Dry Weight + Tare Wt.	428.88
C	Total Sample Dry Weight (B-A)	247.90	D	Water Wt. (B-C)	83.69
D	Total Sample Wt. After #200 Wash	188.22	E	Dry Wt.(C-A)	247.90
E	Percent Passing #200 (1-D/C)x100	24.1%	Moisture Content (100 x D/E) (%)		33.8%

Sieve Size (mm)	Sieve Size	Retained Weight	Percent Retained	**Percent Passing Total Sample**
37.50	1.5"	0.0	0.0%	**100.0%**
25.00	1.0"	0.00	0.0%	**100.0%**
19.00	3/4"	0.00	0.0%	**100.0%**
12.50	1/2"	0.00	0.0%	**100.0%**
9.50	3/8"	1.31	0.5%	**99.5%**
4.75	#4	10.16	4.1%	**95.9%**
2.00	#10	20.46	8.3%	**91.7%**
0.85	#20	38.06	15.4%	**84.6%**
0.43	#40	103.99	41.9%	**58.1%**
0.25	#60	167.90	67.7%	**32.3%**
0.15	#100	180.13	72.7%	**27.3%**
0.075	#200	186.32	75.2%	**24.8%**

Notes:					
	Maximum Particle Size	**1/2"**	Gravel	< 75 mm and > 4.75 mm (#4)	**4.1%**
	Apparent Relative Density	ND	Coarse Sand	< 4.75 mm and >2.00 mm (#10)	**4.2%**
Liquid Limit	53	Fineness Modulus	Medium Sand	< 2.00 mm and > 0.425 mm (#40)	**33.6%**
Plastic Limit	30	Cu = D60/D10:	Fine Sand	< 0.425 mm and > 0.075 mm (#200)	**33.3%**
Plastic Index	23	Cc =$(D30)^2$/ (D10xD60):	% Silt and Clay	< 0.075 mm	**24.8%**
ND=Not determined			Description of Sand & Gravel	Rounded ☒	Angular ☒
			Hard & Durable ☐	Soft ☐	Weathered & Friable ☒
				Organic Content	**ND**

D10 = D30 = D60 = D50 = D90 =

ASTM D 422: Particle Size Analysis of Soils *Hydrometer portion of test method not utilized.*
ASTM D 421: Dry Preparation of Soil Samples ASTM D 854: Specific Gravity of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils
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Technician Name: Chana Savanapridi NICET 116132 *Certification #*

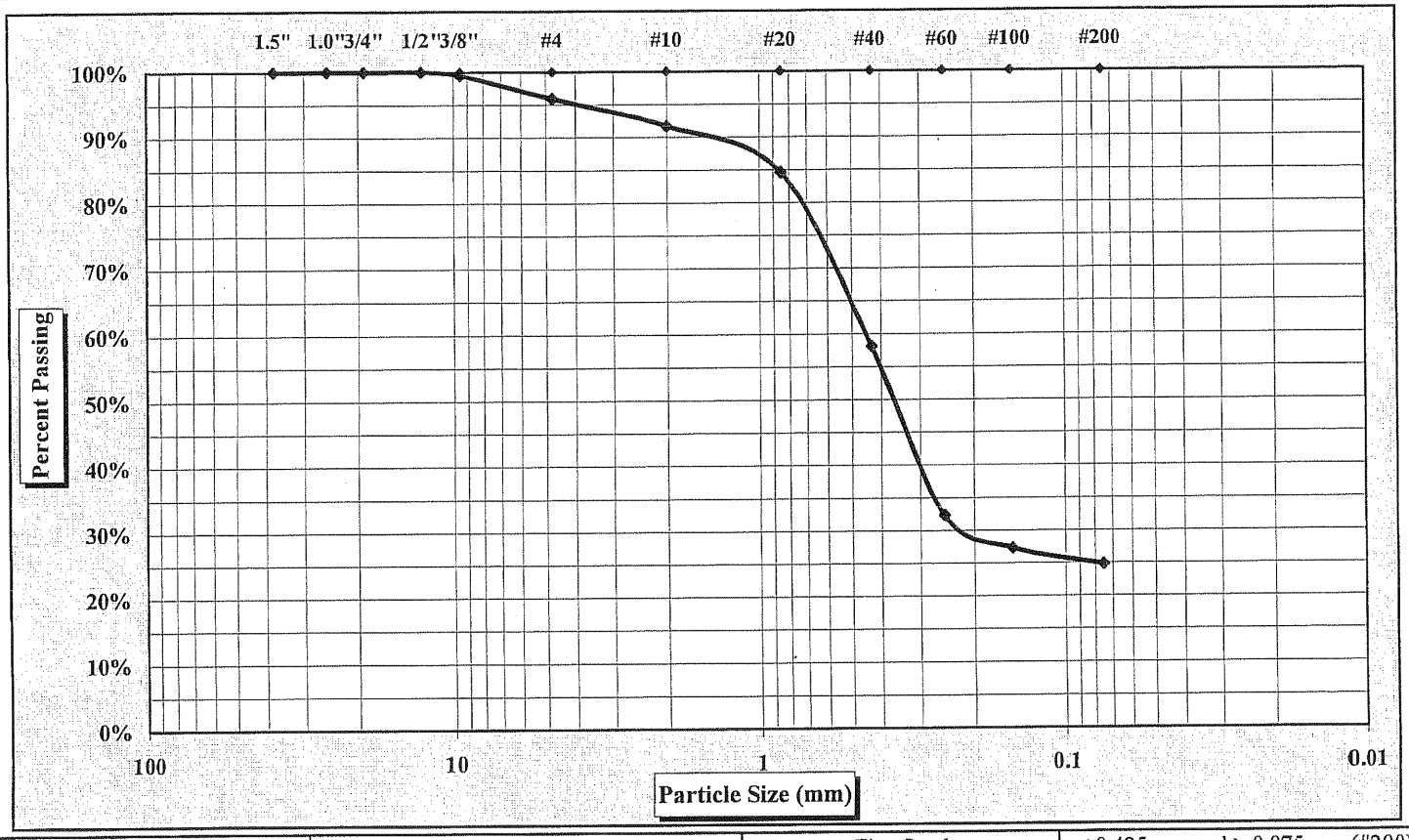
Technical Responsibility: Mal Krajan *Signature* Laboratory Supervisor *Position*

Particle Size Analysis of Soils

ASTM D 422

S&ME Project #:	**1040-01-545G**	Report Date:	10/27/2006
Project Name:	**Edgecomb County Landfill - Borrow Study**	Test Date(s):	10/27/2006
Client Name:			
Client Address:			

Boring #:	TP-10	Sample #:	Bulk Bag	Sample Date:	Unknown
Location:	Borrow Area 3			Depth (ft):	- 4.0'
Sample Description:	Orange Red Silty SAND (SM)				



Cobbles	< 300 mm (12") and > 75 mm (3")	Fine Sand	< 0.425 mm and > 0.075 mm (#200)
Gravel	< 75 mm and > 4.75 mm (#4)	Silt	< 0.075 and > 0.005 mm
Coarse Sand	< 4.75 mm and >2.00 mm (#10)	Clay	< 0.005 mm
Medium Sand	< 2.00 mm and > 0.425 mm (#40)	Colloids	< 0.001 mm

Maximum Particle Size	1/2"	Gravel	4%	Medium Sand	34%
Silt & Clay (% Passing #200)	24.8%	Coarse Sand	4%	Fine Sand	33%
Apparent Relative Density	ND	Moisture Content	33.8%	Organic Content	ND
Liquid Limit	53	Plastic Limit	30	Plastic Index	23

ND=Not determined

Description of Sand & Gravel

Rounded ☒ Angular ☒ Hard & Durable ☐ Soft ☐ Weathered & Friable ☒

References: ASTM D 422: Particle Size Analysis of Soils

Hydrometer portion of test method not utilized.

ASTM D 421: Dry Preparation of Soil Samples

ASTM D 854: Specific Gravity of Soils

ASTM D 4318: Liquid Limit, Plastic Limit, & Plastic Index of Soils

ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)

Technical Responsibility: Mal Krajan — Signature — Laboratory Supervisor — Position

S&ME

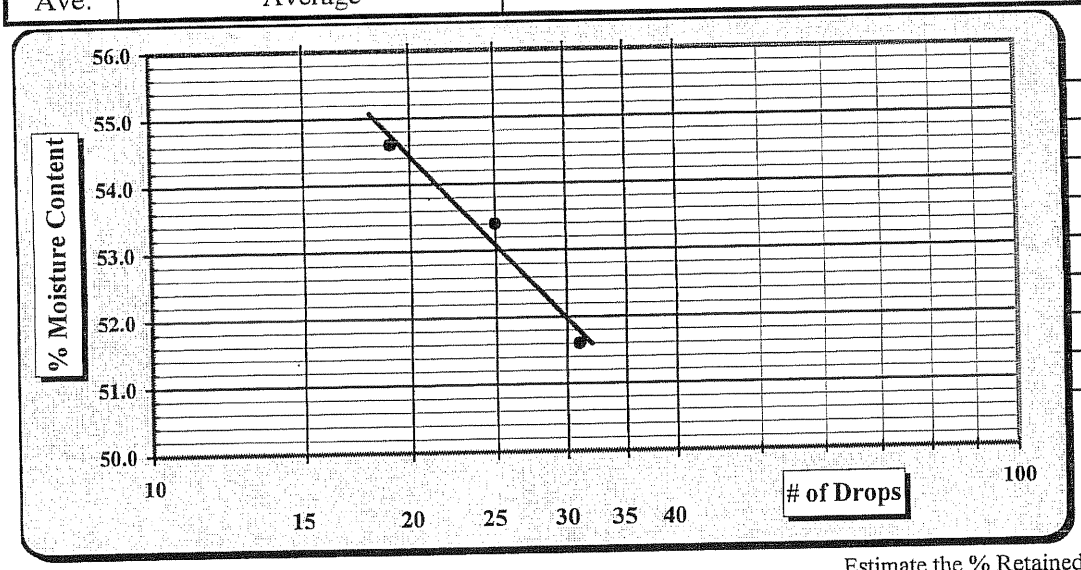
Liquid Limit, Plastic Limit, and Plastic Index

Project #: **1040-01-545G**
Project Name: Edgecomb County Landfill - Borrow Study
Client Name:
Client Address:

Report Date: 10/27/2006
Test Date(s): 10/27/2006

Boring #: TP-10 Sample #: Bulk Bag Sample Date: Unknown
Location: Borrow Area 3 Offset: NA Depth (ft): - 4.0'
Sample Description: Orange Red Silty SAND (SM)

Pan #		Liquid Limit						Plastic Limit		
	Test #	1	2	3	4	5	6	1	2	3
	Tare #	57	7	14				31	51	
A	Tare Weight	18.56	15.39	18.45				21.07	20.89	
B	Wet Soil Weight + A	37.34	26.88	34.05				30.70	30.75	
C	Dry Soil Weight + A	30.95	22.88	28.54				28.52	28.47	
D	Water Weight (B-C)	6.39	4.00	5.51				2.18	2.28	
E	Dry Soil Weight (C-A)	12.39	7.49	10.09				7.45	7.58	
F	% Moisture Content (D/E)*100	51.6%	53.4%	54.6%				29.3%	30.1%	
N	# OF DROPS	31	25	19				*Moisture Contents determined by ASTM D 2216*		
LL	LL = F * FACTOR									
Ave.	Average							29.7%		



One Point Liquid Limit			
N	Factor	N	Factor
20	0.974	26	1.005
21	0.979	27	1.009
22	0.985	28	1.014
23	0.990	29	1.018
24	0.995	30	1.022
25	1.000		

Estimate the % Retained on the #40 Sieve

Notes:

Special Sampling Methods:

Sample Preparation:	Wet Preparation ☐	Dry Preparation ☐	Air Dried ☒	NP, Non-Plastic	☐
Liquid limit Test:	Multipoint Method ☒	One-point Method ☐		Liquid Limit	53
Classification:	ASTM D 2487 ☒	AASHTO M 145 ☐		Plastic Limit	30
Liquid limit Test:	ASTM D 4318 ☒	AASHTO T 89 ☐		Plastic Index	23
Plastic limit Test:	ASTM D 4318 ☒	AASHTO T 90 ☐		Group Symbol	SM

Technician Name: Chana Savanapridi NICET 116132 (Certification #)

Technical Responsibility: Mal Krajan (Signature) Laboratory Supervisor (Position)

APPENDIX II-E

Stormwater Calculations

PROJECT NO.	1054-07-242
SHEET NO.	1 / 5
DATE	March 2, 2009
JOB NAME	Edgecombe County C&D Landfill
COMPUTED BY	KB
SUBJECT	Storm Water, Sedimentation, and Erosion Control Devices
REVISED BY	JMB

OBJECTIVE: Based on a 25 yr design storm:

1. Design proposed grass-lined channels for the proposed C&D expansion's closure system.
2. Design the proposed drop-inlets, down-chute piping, outlet aprons, and sediment basins for the proposed C&D expansion's closure system.

REFERENCE:

1. Erosion and Sediment Control Planning and Design Manual, NCDENR, June 1, 2006.
2. Erosion Control Materials Design Software; V4.1, North American Green.
3. Edgecombe County C&D Landfill Closure Plan, S&ME, Inc., 2008.
4. CulvertMaster v. 3.1, Haestad Methods.
5. FlowMaster v. 8.01, Haestad Methods.
6. PondPack v. 10.01, Haestad Methods.
7. Advanced Drainage Systems, Inc. (ADS). http://www.ads-pipe.com

PARAMETERS:

Drainage Areas obtained from AutoCad drawings.

Use a 25-yr storm to obtain design flows.

Assume 100% disturbed area (bare earth)

Assume Class C Vegetation Retardance [Ref. 1, Table 8.05c]

Calculate Flows (Q):

Use Rational Formula to determine Q

Q = c x i x A c = Runoff Coefficient [Ref. 1]

i = Rainfall Intensity Factor (in/hr)

A = Drainage Area (acres)

c = 0.3 for drainage areas within C&D limits (A1-J2); (Agricultural Lands:Bare Packed Soil, Rough)

c = 0.2 for drainage areas around sedimentation basins (K1-K3); (Lawns: Sandy soil, steep, 7%)

c = 0.1 for drainage area to far west (K4); (Woodlands)

(Ref. 1, Table 8.03b)

Determine Tc (Time of Concentration)

Assume minimum Tc = 5 minute

Determine i

Let i = 7.78 in/hr (Ref. 1, Figure 8.03c, 25yr storm, use Tc = 5 min to be conservative) for all areas

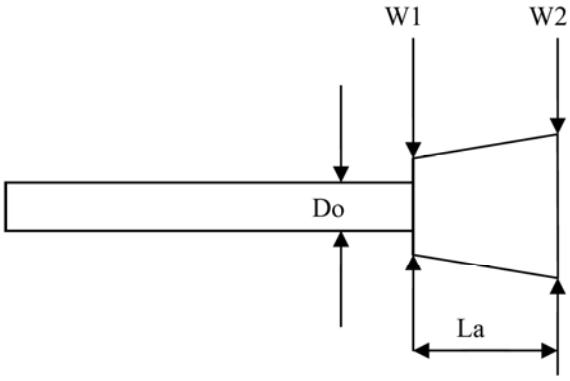
PROJECT NO.	1054-07-242
SHEET NO.	2 / 5
DATE	March 2, 2009
JOB NAME	Edgecombe County C&D Landfill
COMPUTED BY	KB
SUBJECT	Storm Water, Sedimentation, and Erosion Control Devices
REVISED BY	JMB

Outlet Apron Design:

Pipe	Diam, D_o (ft)	Q (cfs)	Flows Into/Onto	L_a (ft) [Ref. 1; Fig. 8.06a][1]	d_{50} Rip-Rap Size (ft) [Ref.1; Fig.8.06a][1]	d_{max} Rip-Rap Size = d_{50} x 1.5 (ft) [Ref. 1]	$W_1=3xD_o$ (ft) [Ref. 1; Fig. 8.06a][1]	$W_2=D_o+L_a$ (ft) [Ref. 1; Fig. 8.06a][1]	Apron Thickness = d_{max} x 1.5 ft [Ref. 1]
SB-1	2.00[1]	54.22	Apron	27	0.75	1.13	7.50	29.50	1.69
SB-2	1.50[1]	14.75	Apron	13	0.40	0.60	4.50	14.50	0.90
SB-3	3.50[1]	107.43	Apron	37	1.30	1.95	15.00	42	2.93

[1] **Note: Minimum Tailwater assumed (free outfall).**

Outlet Apron



JOB NAME	Edgecombe County C&D Landfill	PROJECT NO.	1054-07-242
SUBJECT	Storm Water, Sedimentation, and Erosion Control Devices	SHEET NO.	3 / 5
		DATE	March 2, 2009
		COMPUTED BY	KB
		REVISED BY	JMB

Sediment Basin SB-1:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = C1 + C2 + H1 + H2

= 0.64 + 0.90 + 0.85 + 3.93 = 6.32 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 6.32 Ac = **11,376 ft^3**

Volume Provided = **19,733 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 3.0 inch

Orifice Diameter = 2.5 inch

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED1,\ 10yr} = c \times i \times A_{BENCHES}$

$Q_{SED1,\ 10yr}$ = 0.3 x 7.08 in/hr x 6.32 Acres

$Q_{SED1,}$ 10yr = 13.42 cfs

Required Surface Area = 0.01 x 13.42 cfs = 0.1342 Acres = **5,847 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED1,\ 2yr} = c \times i \times A_{BENCHES}$

$Q_{SED1,\ 2yr}$ = 0.3 x 5.58 in/hr x 6.32 Acres

$Q_{SED1,\ 2yr}$ = 10.58 cfs

Use 2' Riser pipe – Crest at EL. 44

Use 1.5' Culvert pipe – US invert at EL. 40

DS invert at EL. 39.5

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED1,\ 10yr}$ = 13.42 cfs

$Q_{SED1,\ 25yr}$ = 0.3 x 7.78 in/hr x 6.32

$Q_{SED1,\ 25yr}$ = 14.75 cfs

Use 1.3' deep trapezoidal emergency spillway – Bottom width 10' at EL 44.7

JOB NAME	Edgecombe County C&D Landfill	PROJECT NO.	1054-07-242
SUBJECT	Storm Water, Sedimentation, and Erosion Control Devices	SHEET NO.	4 / 5
		DATE	March 2, 2009
		COMPUTED BY	KB
		REVISED BY	JMB

Sediment Basin SB-2:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = A1 + B1 + B2 + F1 + F2 + G1 + G2 + K1

= 2.13 + 1.12 + 1.81 + 1.38 + 2.86 + 1.40 + 2.20 + 10.33 = 23.23 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 23.23 Ac = **41,814 ft^3**

Volume Provided = **57,107 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 4.0 inch

Orifice Diameter = 3.9 inch

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED2,\ 10yr} = (c \times i \times A_{BENCHES}) + (c \times i \times A_{SED2})$

$Q_{SED2,\ 10yr}$ = (0.3 x 7.08 in/hr x 12.90 Acres) + (0.2 x 7.08 in/hr x 10.33 Acres)

$Q_{SED2,}$ 10yr = 42.03 cfs

Required Surface Area = 0.01 x 42.03 cfs = 0.4203 Acres = **18,307 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED2,\ 2yr} = (c \times i \times A_{BENCHES}) + (c \times i \times A_{SED2})$

$Q_{SED2,\ 2yr}$ = (0.3 x 5.58 in/hr x 12.90 Acres) + (0.2 x 5.58 in/hr x 10.33 Acres)

$Q_{SED2,\ 2yr}$ = 33.12 cfs

Use 3' Riser pipe – Crest at EL. 49.5

Use 2' Culvert pipe – US invert at EL. 46

DS invert at EL. 45.5

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED2,\ 10yr}$ = 42.03 cfs

$Q_{SED2,\ 25yr}$ = (0.3 x 7.78 in/hr x 12.90 Acres) + (0.2 x 7.78 in/hr x 10.33 Acres)

$Q_{SED2,\ 25yr}$ = 46.18 cfs

Use 1.2' deep trapezoidal emergency spillway – Bottom width 12' at EL 50.8

JOB NAME	Edgecombe County C&D Landfill	PROJECT NO.	1054-07-242
SUBJECT	Storm Water, Sedimentation, and Erosion Control Devices	SHEET NO.	5 / 5
		DATE	March 2, 2009
		COMPUTED BY	KB
		REVISED BY	JMB

Sediment Basin SB-3:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = D1 + D2 + I1 + I2 + K2 + E1 + E2 + J1 + J2 + K3 + K4

= 1.15 + 1.76 + 2.43 + 2.02 + 6.76 +1.65 + 0.34 + 1.98 + 0.82 + 9.06 + 70.01 = 97.98 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 97.98 Ac = **176,364 ft^3**

Volume Provided = **179,162 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 8.0 inch

Orifice Diameter = 6.2 inch

Determine Trapping Efficiency:

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED3,\ 10yr}$ = [c x i x (D1+D2+I1+I2+E1+E2+J1+J2)] + [c x i x (K2+K3)] + [c x i x (K4)]

$Q_{SED3,\ 10yr}$ = (0.3 x 7.08 in/hr x 12.15 Acres) + (0.2 x 7.08 in/hr x 15.82 Acres) + (0.1 x 7.08 in/hr x 70.01 Acres)

$Q_{SED3,\ 10yr}$ = 97.77 cfs

Required Surface Area = 0.01 x 97.77 cfs = 0.9777 Acres = **42,591 ft^2**

Size Riser and Culvert for 2 year peak discharge.

$Q_{SED3,\ 2yr}$ = [c x i x (D1+D2+I1+I2+E1+E2+J1+J2)] + [c x i x (K2+K3)] + [c x i x (K4)]

$Q_{SED3,\ 2yr}$ = (0.3 x 5.58 in/hr x 12.15 Acres) + (0.2 x 5.58 in/hr x 15.82 Acres) + (0.1 x 5.58 in/hr x 70.01 Acres)

$Q_{SED3,\ 2yr}$ = 77.06 cfs

Use 4.5' Riser pipe – Crest at EL. 52

Use 3.5' Culvert pipe – US invert at EL. 48.5

DS invert at EL. 48

Size emergency spillway for 10 and 25 year peak discharges.

$Q_{SED3,\ 10yr}$ = 97.77 cfs

$Q_{SED3,\ 25yr}$ = (0.3 x 7.78 in/hr x 12.15 Acres) + (0.2 x 7.78 in/hr x 15.82 Acres) + (0.1 x 7.78 in/hr x 70.01 Acres)

$Q_{SED3,\ 25yr}$ = 107.44 cfs

Use 2.5' deep trapezoidal emergency spillway – Bottom width 20' at EL 53.5

[Ref 1]

Raleigh, North Carolina 35.8706N, 78.7864W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	5.58	4.46	3.74	2.58	1.62	0.94	0.66	0.40	0.24	0.14
10	7.08	5.66	4.78	3.46	2.25	1.33	0.95	0.58	0.34	0.021
25	7.78	6.19	5.24	3.88	2.58	1.54	1.11	0.68	0.41	0.24
100	8.64	6.86	5.78	4.43	3.05	1.85	1.36	0.84	0.51	0.30

Fayetteville, North Carolina 35.0583N, 78.8583W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.11	4.88	4.09	2.83	1.77	1.04	0.74	0.44	0.26	0.15
10	7.96	6.36	5.36	3.88	2.53	1.54	1.10	0.66	0.39	0.23
25	8.94	7.13	6.02	4.46	2.97	1.83	1.32	0.80	0.47	0.28
100	10.44	8.29	6.99	5.35	3.69	2.29	1.69	1.03	0.62	0.36

Wilmington, North Carolina 34.2683N, 77.9061W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.39	5.92	4.96	3.42	2.15	1.28	0.91	0.56	0.33	0.19
10	9.70	7.75	6.54	4.74	3.08	1.94	1.39	0.87	0.51	0.30
25	10.98	8.75	7.40	5.48	3.65	2.38	1.73	1.08	0.64	0.38
100	12.92	10.27	8.65	6.63	4.56	3.18	2.37	1.49	0.89	0.53

Washington, North Carolina 35.5333N, 77.0167W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.41	5.12	4.29	2.96	1.86	1.10	0.78	0.47	0.27	0.16
10	8.38	6.70	5.65	4.09	2.66	1.64	1.19	0.72	0.42	0.25
25	9.48	7.55	6.38	4.73	3.15	1.99	1.46	0.88	0.52	0.31
100	11.16	8.87	7.47	5.72	3.94	2.58	1.93	1.18	0.70	0.42

Manteo Airport, North Carolina 35.9167N, 75.7000W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	6.46	5.16	4.32	2.99	1.87	1.08	0.79	0.48	0.29	0.17
10	8.47	6.77	5.71	4.14	2.69	1.62	1.20	0.74	0.44	0.27
25	9.56	7.62	6.44	4.77	3.17	1.96	1.47	0.91	0.54	0.33
100	11.26	8.95	7.54	5.77	3.98	2.54	1.95	1.21	0.73	0.44

Cape Hatteras, North Carolina, 35.2322N, 75.6225W

ARI* (years)	5 min.	10 min.	15 min.	30 min.	60 min.	120 min.	3 hr.	6 hr.	12 hr.	24 hr.
2	7.20	5.75	4.82	3.33	2.09	1.29	0.94	0.58	0.34	0.20
10	9.41	7.52	6.35	4.60	2.99	1.93	1.43	0.89	0.53	0.31
25	10.66	8.49	7.18	5.31	3.54	2.33	1.75	1.09	0.65	0.38
100	12.53	9.95	8.39	6.42	4.42	3.03	2.32	1.45	0.88	0.51

Table 8.03b
Value of Runoff Coefficient (C) for Rational Formula

Land Use	C
Business:	
Downtown areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential:	
Single-family areas	0.30-0.50
Multi units, detached	0.40-0.60
Multi units, Attached	0.60-0.75
Suburban	0.25-0.40
Industrial:	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad yard areas	0.20-0.40
Unimproved areas	0.10-0.30
Streets:	
Asphalt	0.70-0.95
Concrete	0.80-0.95
Brick	0.70-0.85
Drives and walks	0.75-0.85
Roofs	0.75-0.85

Land Use	C
Lawns:	
Sandy soil, flat, 2%	0.05-0.10
Sandy soil, ave., 2-7%	0.10-0.15
Sandy soil, steep, 7%	0.15-0.20
Heavy soil, flat, 2%	0.13-0.17
Heavy soil, ave., 2-7%	0.18-0.22
Heavy soil, steep, 7%	0.25-0.35
Agricultural land:	
Bare packed soil	0.30-0.60
Smooth	0.20-0.50
Rough	0.20-0.40
Cultivated rows	0.10-0.25
Heavy soil no crop	0.15-0.45
Heavy soil with crop	0.05-0.25
Sandy soil no crop	0.05-0.25
Sandy soil with crop	0.10-0.25
Pasture	
Heavy soil	0.15-0.45
Sandy soil	0.05-0.25
Woodlands	0.05-0.25

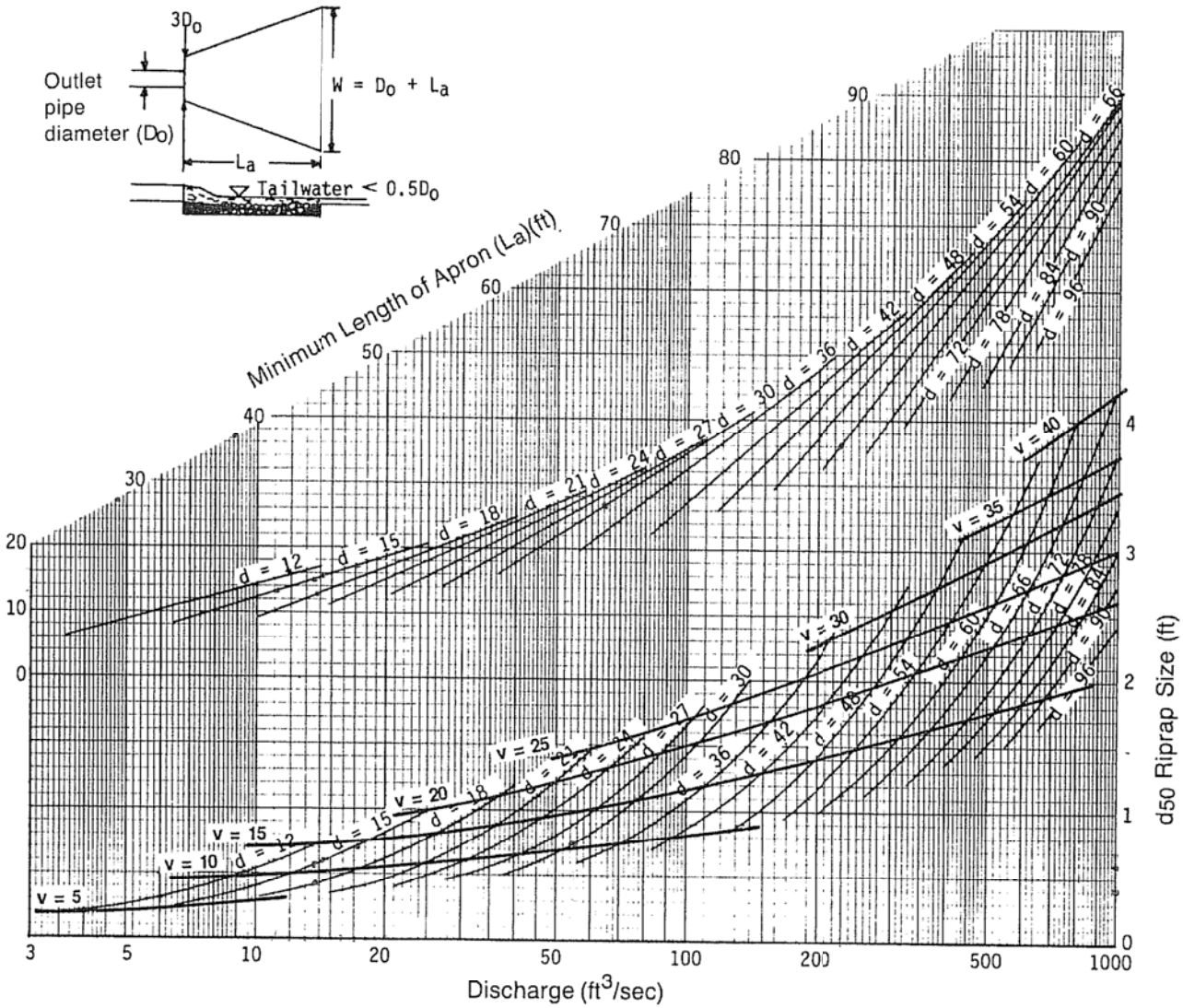
NOTE: The designer must use judgement to select the appropriate C value within the range for the appropriate land use. Generally, larger areas with permeable soils, flat slopes, and dense vegetation should have lowest C values. Smaller areas with slowly permeable soils, steep slopes, and sparse vegetation should be assigned highest C values.

Source: American Society of Civil Engineers

C = 0.30 → A1 - J2

C = 0.20 → K1, K2, K3

C = 0.10 → K4



Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

HY-8 Analysis Results

Culvert Summary Table - SB-1

Culvert Crossing: SB-1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	40.50	0.50	0.00	1-S2n	0.30	0.37	0.30	0.22	3.97	0.98
2.38	2.38	40.80	0.80	0.00	1-S2n	0.46	0.58	0.46	0.36	5.12	1.30
3.75	3.75	41.04	1.04	0.00	1-S2n	0.59	0.74	0.59	0.46	5.78	1.50
5.13	5.13	41.25	1.25	0.05	1-S2n	0.70	0.87	0.71	0.55	6.24	1.65
6.50	6.50	41.44	1.44	0.12	1-S2n	0.81	0.98	0.81	0.62	6.63	1.77
7.88	7.88	41.65	1.65	0.19	5-S2n	0.92	1.08	0.92	0.69	6.95	1.88
9.25	9.25	41.88	1.88	0.25	5-S2n	1.03	1.17	1.03	0.75	7.18	1.96
10.58	10.58	42.13	2.13	0.31	5-S2n	1.15	1.24	1.15	0.81	7.29	2.04
12.00	12.00	42.44	2.44	2.31	2-M2c	1.33	1.31	1.31	0.86	7.37	2.11
13.38	13.38	42.77	2.77	2.68	7-M2c	1.50	1.37	1.37	0.91	7.89	2.18
14.75	14.75	43.13	3.13	3.12	7-M2c	1.50	1.43	1.43	0.96	8.55	2.24

HY-8 Energy Dissipation Report

External Energy Dissipator

Parameter	Value	Units
Select Culvert and Flow		
Crossing	SB-1	
Culvert	SB-1	
Flow	14.75	cfs
Culvert Data		
Culvert Width	1.5	ft
Culvert Height	1.5	ft
Outlet Depth	1.43	ft
Outlet Velocity	8.55	ft/s
Froude Number	1.26	
Tailwater Depth	0.96	ft
Tailwater Velocity	2.24	ft/s
Tailwater Slope (SO)	0.0100	
External Dissipator Data		
External Dissipator Category	Streambed Level Structures	
External Dissipator Type	Riprap Basin	
Restrictions		
Froude Number	<3	
Input Data		
Condition to be used to Compute Basin Outlet Velocity	Envelope Curve	
D50 of the Riprap Mixture		
Note:	Minimum HS/D50 = 2 is Obtained if D50 = 0.231 ft	
D50 of the Riprap Mixture	0.472	ft
DMax of the Riprap Mixture	1.000	ft
Results		
Brink Depth	1.431	ft
Brink Velocity	8.552	ft/s
Depth (YE)	0.929	ft
Riprap Thickness	1.500	ft
Riprap Foreslope	2.0000	ft
Check HS/D50		
Note:	OK if HS/D50 > 2.0	
HS/D50	0.000	
HS/D50 Check	HS/D50 is NOT OK	
Check HS/D50		
Note:	OK if 0.1 < D50/YE < 0.7	
Check D50/YE	0.508	
D50/YE Check	D50/YE is OK	
Basin Length (LB)	6.000	ft
Basin Width	5.500	ft
Apron Length	1.500	ft
Pool Length	4.500	ft
Pool Depth (HS)	0.000	ft
TW/YE	1.031	
Tailwater Depth (TW)	0.957	ft
Average Velocity with TW	2.078	ft/s

Critical Depth (Yc)	0.565	ft
Average Velocity with Yc	3.939	ft/s
Downstream Riprap for High TW		
Distance: 1 LB		
Velocity	7.793	ft/s
Size	0.396	ft
Distance: 2 LB		
Velocity	6.066	ft/s
Size	0.240	ft
Distance: 3 LB		
Velocity	4.274	ft/s
Size	0.119	ft
Distance: 4 LB		
Velocity	3.199	ft/s
Size	0.067	ft

HY-8 Analysis Results

Culvert Summary Table - SB-2

Culvert Crossing: SB-2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	46.46	0.46	0.00	1-S2n	0.26	0.33	0.26	0.22	3.99	0.98
5.52	5.52	47.15	1.15	0.07	1-S2n	0.64	0.83	0.65	0.57	6.28	1.69
10.04	10.04	47.62	1.62	0.28	1-S2n	0.89	1.13	0.89	0.78	7.39	2.01
14.55	14.55	48.04	2.04	0.45	5-S2n	1.11	1.37	1.11	0.95	8.12	2.23
19.07	19.07	48.51	2.51	0.59	5-S2n	1.33	1.57	1.33	1.09	8.60	2.41
23.59	23.59	49.10	3.10	0.71	5-S2n	1.58	1.71	1.58	1.21	8.87	2.55
28.11	28.11	49.80	3.80	3.54	7-M2c	2.00	1.84	1.84	1.32	9.25	2.67
32.63	32.63	50.61	4.61	4.39	7-M2c	2.00	1.98	1.98	1.42	10.45	2.78
33.12	33.12	50.70	4.70	4.48	7-M2c	2.00	1.99	1.99	1.43	10.57	2.79
41.66	41.66	52.59	6.59	6.21	5-S2n	2.00	2.00	2.00	1.60	13.26	2.96
46.18	45.06	53.54	7.54	7.01	5-S2n	2.00	2.00	2.00	1.68	14.34	3.05

HY-8 Energy Dissipation Report

External Energy Dissipator

Parameter	Value	Units
Select Culvert and Flow		
Crossing	SB-2	
Culvert	SB-2	
Flow	46.18	cfs
Culvert Data		
Culvert Width	2.0	ft
Culvert Height	2.0	ft
Outlet Depth	2.00	ft
Outlet Velocity	14.34	ft/s
Froude Number	1.79	
Tailwater Depth	1.68	ft
Tailwater Velocity	3.05	ft/s
Tailwater Slope (SO)	0.0100	
External Dissipator Data		
External Dissipator Category	Streambed Level Structures	
External Dissipator Type	Riprap Basin	
Restrictions		
Froude Number	<3	
Input Data		
Condition to be used to Compute Basin Outlet Velocity	Envelope Curve	
D50 of the Riprap Mixture		
Note:	Minimum HS/D50 = 2 is Obtained if D50 = 0.505 ft	
D50 of the Riprap Mixture	0.472	ft
DMax of the Riprap Mixture	1.000	ft
Results		
Brink Depth	2.000	ft
Brink Velocity	14.342	ft/s
Depth (YE)	1.253	ft
Riprap Thickness	1.500	ft
Riprap Foreslope	2.0000	ft
Check HS/D50		
Note:	OK if HS/D50 > 2.0	
HS/D50	2.448	
HS/D50 Check	HS/D50 is OK	
Check HS/D50		
Note:	OK if 0.1 < D50/YE < 0.7	
Check D50/YE	0.377	
D50/YE Check	D50/YE is OK	
Basin Length (LB)	17.334	ft
Basin Width	13.556	ft
Apron Length	5.778	ft
Pool Length	11.556	ft
Pool Depth (HS)	1.156	ft
TW/YE	1.339	
Tailwater Depth (TW)	1.678	ft
Average Velocity with TW	1.588	ft/s

Critical Depth (Yc)	0.677	ft
Average Velocity with Yc	4.466	ft/s
Downstream Riprap for High TW		
Distance: 1 LB		
Velocity	9.663	ft/s
Size	0.609	ft
Distance: 2 LB		
Velocity	5.009	ft/s
Size	0.164	ft
Distance: 3 LB		
Velocity	3.330	ft/s
Size	0.072	ft
Distance: 4 LB		
Velocity	2.492	ft/s
Size	0.040	ft

HY-8 Analysis Results

Culvert Summary Table - SB-3

Culvert Crossing: SB-3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth(ft)	Outlet Control Depth(ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
1.00	1.00	48.82	0.32	0.00	1-S2n	0.15	0.25	0.16	0.15	2.82	0.80
11.64	11.64	49.90	1.40	0.12	1-S2n	0.76	1.03	0.76	0.62	7.48	1.90
22.29	22.29	50.51	2.01	0.39	1-S2n	1.07	1.44	1.08	0.89	8.88	2.34
32.93	32.93	51.01	2.51	0.61	1-S2n	1.31	1.77	1.43	1.11	8.94	2.63
43.58	43.58	51.45	2.95	0.78	1-S2n	1.53	2.05	1.67	1.28	9.58	2.86
54.22	54.22	51.87	3.37	0.94	1-S2n	1.74	2.30	1.91	1.44	10.13	3.05
64.86	64.86	52.32	3.82	1.08	5-S2n	1.94	2.52	2.12	1.58	10.65	3.21
75.51	75.51	52.81	4.31	1.22	5-S2n	2.14	2.71	2.33	1.72	11.11	3.35
77.06	77.06	52.89	4.39	1.23	5-S2n	2.17	2.74	2.36	1.73	11.18	3.37
96.80	96.80	54.00	5.50	1.45	5-S2n	2.57	3.01	2.73	1.95	12.06	3.59
107.44	107.44	54.70	6.20	1.55	5-S2n	2.82	3.14	2.97	2.05	12.40	3.69

HY-8 Energy Dissipation Report

External Energy Dissipator

Parameter	Value	Units
Select Culvert and Flow		
Crossing	SB-3	
Culvert	SB-3	
Flow	107.44	cfs
Culvert Data		
Culvert Width	3.5	ft
Culvert Height	3.5	ft
Outlet Depth	2.97	ft
Outlet Velocity	12.40	ft/s
Froude Number	1.27	
Tailwater Depth	2.05	ft
Tailwater Velocity	3.69	ft/s
Tailwater Slope (SO)	0.0100	
External Dissipator Data		
External Dissipator Category	Streambed Level Structures	
External Dissipator Type	Riprap Basin	
Restrictions		
Froude Number	<3	
Input Data		
Condition to be used to Compute Basin Outlet Velocity	Envelope Curve	
D50 of the Riprap Mixture		
Note:	Minimum HS/D50 = 2 is Obtained if D50 = 0.507 ft	
D50 of the Riprap Mixture	0.472	ft
DMax of the Riprap Mixture	1.000	ft
Results		
Brink Depth	2.966	ft
Brink Velocity	12.402	ft/s
Depth (YE)	2.081	ft
Riprap Thickness	1.500	ft
Riprap Foreslope	2.0000	ft
Check HS/D50		
Note:	OK if HS/D50 > 2.0	
HS/D50	2.644	
HS/D50 Check	HS/D50 is OK	
Check HS/D50		
Note:	OK if 0.1 < D50/YE < 0.7	
Check D50/YE	0.227	
D50/YE Check	D50/YE is OK	
Basin Length (LB)	18.720	ft
Basin Width	15.980	ft
Apron Length	6.240	ft
Pool Length	12.480	ft
Pool Depth (HS)	1.248	ft
TW/YE	0.987	
Tailwater Depth (TW)	2.054	ft
Average Velocity with TW	2.605	ft/s

Critical Depth (Yc)	1.069	ft
Average Velocity with Yc	5.547	ft/s
Downstream Riprap for High TW		
Distance: 1 LB		
Velocity	10.451	ft/s
Size	0.712	ft
Distance: 2 LB		
Velocity	6.682	ft/s
Size	0.291	ft
Distance: 3 LB		
Velocity	4.441	ft/s
Size	0.129	ft
Distance: 4 LB		
Velocity	3.324	ft/s
Size	0.072	ft

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
46.00	-----	.1430	.0000	.000	.000
48.00	-----	.3490	.7154	.477	.477
50.00	-----	.4891	1.2513	.834	1.311

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 1.311 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 57{,}107 \text{ ft}^3 > 41{,}814 \text{ ft}^3$$

$$A = 0.4891 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 21{,}305 \text{ ft}^2 > 18{,}307 \text{ ft}^2$$

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
40.00	-----	.0642	.0000	.000	.000
42.00	-----	.1130	.2623	.175	.175
44.00	-----	.1671	.4175	.278	.453

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 0.453 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 19{,}733 \text{ ft}^3 > 11{,}376 \text{ ft}^3$$

$$A = 0.1671 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 7{,}279 \text{ ft}^2 > 5{,}847 \text{ ft}^2$$

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Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
48.00	-----	.9113	.0000	.000	.000
50.00	-----	1.0275	2.9064	1.938	1.938
52.00	-----	1.1493	3.2635	2.176	4.113

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

$$V = 4.113 \text{ acre-ft} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 179{,}162 \text{ ft}^3 > 176{,}364 \text{ ft}^3$$

$$A = 1.1493 \text{ acres} \times \left(\frac{43560 \text{ ft}^2}{1 \text{ acre}}\right) = 50{,}064 \text{ ft}^2 > 42{,}591 \text{ ft}^2$$

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 44.00 ft
Increment = .10 ft
Max. Elev.= 46.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	R0	--->	C0	44.000	46.000
Culvert-Circular	C0	--->	TW	40.000	46.000
Weir-XY Points	W0	--->	TW	44.700	46.000
TW SETUP, DS Channel					

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = R0
Structure Type    = Stand Pipe
------------------------------------
# of Openings     =         1
Invert Elev.      =     44.00 ft
Diameter          =    2.0000 ft
Orifice Area      =    3.1416 sq.ft
Orifice Coeff.    =      .600
Weir Length       =      6.28 ft
Weir Coeff.       =     3.100
K, Reverse        =     1.000
Mannings n        =     .0000
Kev,Charged Riser =      .000
Weir Submergence  = No
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = C0
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    1.5000 ft
Upstream Invert   =     40.00 ft
Dnstream Invert   =     39.50 ft
Horiz. Length     =     55.00 ft
Barrel Length     =     55.00 ft
Barrel Slope      =    .00909 ft/ft

OUTLET CONTROL DATA...
Mannings n        =     .0120
Ke                =     .2000  (forward entrance loss)
Kb                =   .015519  (per ft of full flow)
Kr                =     .2000  (reverse entrance loss)
HW Convergence    =      .001  +/- ft

INLET CONTROL DATA...
Equation form     =         1
Inlet Control K   =     .0018
Inlet Control M   =    2.0000
Inlet Control c   =    .02920
Inlet Control Y   =     .7400
T1 ratio (HW/D)   =     1.058
T2 ratio (HW/D)   =     1.203
Slope Factor      =     -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     41.59 ft  --->  Flow =      7.58 cfs
At T2 Elev =     41.80 ft  --->  Flow =      8.66 cfs
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
.00	46.00
3.90	44.70
13.90	44.70
17.80	46.00

Lowest Elev. = 44.70 ft

Weir Coeff. = 3.100000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
44.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
44.10	.62	44.10	Free	40.41	.000	.000	Free Outfall	
		Weir: H =.10ft						
44.20	1.74	44.20	Free	40.71	.000	.000	Free Outfall	
		Weir: H =.20ft						
44.30	3.20	44.30	Free	40.99	.000	.000	Free Outfall	
		Weir: H =.30ft						
44.40	4.93	44.40	Free	41.27	.000	.000	Free Outfall	
		Weir: H =.40ft						
44.50	6.89	44.50	Free	41.56	.000	.000	Free Outfall	
		Weir: H =.50ft						
44.60	9.05	44.60	Free	41.87	.000	.000	Free Outfall	
		Weir: H =.60ft						
44.70	11.41	44.70	Free	42.32	.000	.000	Free Outfall	
		Weir: H =.70ft						
44.80	13.52	44.80	Free	42.81	.000	.000	Free Outfall	
		Orifice: H =.80; Riser orifice equation controlling.						
44.90	14.34	44.90	Free	43.05	.000	.000	Free Outfall	
		Orifice: H =.90; Riser orifice equation controlling.						
45.00	15.12	45.00	Free	43.30	.000	.000	Free Outfall	
		Orifice: H =1.00; Riser orifice equation controlling.						
45.10	15.86	45.10	Free	43.54	.000	.000	Free Outfall	
		Orifice: H =1.10; Riser orifice equation controlling.						
45.20	16.56	45.20	Free	43.78	.000	.000	Free Outfall	
		Orifice: H =1.20; Riser orifice equation controlling.						
45.30	17.24	45.30	44.02	44.02	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.30						
45.40	17.89	45.40	44.25	44.25	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.40						
45.50	18.52	45.50	44.49	44.49	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.50						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
45.60	19.13	45.60	44.72	44.72	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.60						
45.70	19.71	45.70	44.96	44.96	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.70						
45.80	20.29	45.80	45.19	45.19	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
45.90	20.84	45.90	45.43	45.43	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.90						
46.00	21.38	46.00	45.67	45.67	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=2.00						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 11.67 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
44.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
44.10	.62	40.41	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .102ft	Dcr= .291ft	CRIT.DEPTH Hev= .00ft			
44.20	1.75	40.71	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .181ft	Dcr= .497ft	CRIT.DEPTH Hev= .00ft			
44.30	3.20	40.99	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .261ft	Dcr= .681ft	CRIT.DEPTH Hev= .00ft			
44.40	4.92	41.27	Free	Free	.000	.004	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .349ft	Dcr= .854ft	CRIT.DEPTH Hev= .00ft			
44.50	6.89	41.56	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .454ft	Dcr= 1.016ft	CRIT.DEPTH Hev= .00ft			
44.60	9.05	41.87	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL	Vh= .588ft	Dcr= 1.164ft	CRIT.DEPTH Hev= .00ft			
44.70	11.41	42.32	Free	Free	.000	.001	Free Outfall	
		INLET CONTROL...	Submerged:	HW =2.32				
44.80	13.52	42.81	Free	Free	.000	.000	Free Outfall	
		INLET CONTROL...	Submerged:	HW =2.81				
44.90	14.34	43.05	Free	Free	.000	.000	Free Outfall	
		FULL FLOW...Lfull=47.57ft	Vh=1.024ft	HL=1.985ft Hev= .00ft				
45.00	15.12	43.30	Free	Free	.000	.000	Free Outfall	
		FULL FLOW...Lfull=50.37ft	Vh=1.138ft	HL=2.255ft Hev= .00ft				
45.10	15.86	43.54	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...Lfull=51.91ft	Vh=1.252ft	HL=2.510ft Hev= .00ft				
45.20	16.56	43.78	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...Lfull=52.84ft	Vh=1.365ft	HL=2.758ft Hev= .00ft				
45.30	17.24	44.02	Free	Free	.000	.002	Free Outfall	
		FULL FLOW...Lfull=53.78ft	Vh=1.479ft	HL=3.009ft Hev= .00ft				
45.40	17.89	44.25	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...Lfull=53.91ft	Vh=1.593ft	HL=3.244ft Hev= .00ft				
45.50	18.52	44.49	Free	Free	.000	.001	Free Outfall	
		FULL FLOW...Lfull=54.09ft	Vh=1.707ft	HL=3.481ft Hev= .00ft				

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 11.67 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
45.60	19.12	44.72	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.26ft		Vh=1.820ft	HL=3.717ft	Hev= .00ft	
45.70	19.72	44.96	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.39ft		Vh=1.935ft	HL=3.955ft	Hev= .00ft	
45.80	20.29	45.19	Free	Free	.000	.001	Free	Outfall
		FULL FLOW...	Lfull=54.53ft		Vh=2.048ft	HL=4.191ft	Hev= .00ft	
45.90	20.84	45.43	Free	Free	.000	.002	Free	Outfall
		FULL FLOW...	Lfull=54.59ft		Vh=2.162ft	HL=4.427ft	Hev= .00ft	
46.00	21.38	45.67	Free	Free	.000	.001	Free	Outfall
		FULL FLOW...	Lfull=54.74ft		Vh=2.275ft	HL=4.664ft	Hev= .00ft	

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q cfs	Tail Water TW Elev ft	Converge +/-ft	Notes Computation Messages
44.00	.00	Free Outfall		WS below an invert; no flow.
44.10	.00	Free Outfall		WS below an invert; no flow.
44.20	.00	Free Outfall		WS below an invert; no flow.
44.30	.00	Free Outfall		WS below an invert; no flow.
44.40	.00	Free Outfall		WS below an invert; no flow.
44.50	.00	Free Outfall		WS below an invert; no flow.
44.60	.00	Free Outfall		WS below an invert; no flow.
44.70	.00	Free Outfall		WS below an invert; no flow.
44.80	1.00	Free Outfall		Max.H=.10; Max.Htw=free out;; W(ft)=10.60
44.90	2.89	Free Outfall		Max.H=.20; Max.Htw=free out;; W(ft)=11.20
45.00	5.42	Free Outfall		Max.H=.30; Max.Htw=free out;; W(ft)=11.80
45.10	8.51	Free Outfall		Max.H=.40; Max.Htw=free out;; W(ft)=12.40
45.20	12.12	Free Outfall		Max.H=.50; Max.Htw=free out;; W(ft)=13.00
45.30	16.24	Free Outfall		Max.H=.60; Max.Htw=free out;; W(ft)=13.60
45.40	20.85	Free Outfall		Max.H=.70; Max.Htw=free out;; W(ft)=14.20

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q cfs	Tail Water TW Elev ft	Converge +/-ft	Notes Computation Messages
45.50	25.95	Free Outfall		Max.H=.80; Max.Htw=free out;; W(ft)=14.80
45.60	31.52	Free Outfall		Max.H=.90; Max.Htw=free out;; W(ft)=15.40
45.70	37.58	Free Outfall		Max.H=1.00; Max.Htw=free out;; W(ft)=16.00
45.80	44.11	Free Outfall		Max.H=1.10; Max.Htw=free out;; W(ft)=16.60
45.90	51.12	Free Outfall		Max.H=1.20; Max.Htw=free out;; W(ft)=17.20
46.00	58.62	Free Outfall		Max.H=1.30; Max.Htw=free out;; W(ft)=17.80

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
44.00	.00	Free Outfall		(no Q: R0,C0,W0)
44.10	.62	Free Outfall		R0,C0 (no Q: W0)
44.20	1.74	Free Outfall		R0,C0 (no Q: W0)
44.30	3.20	Free Outfall		R0,C0 (no Q: W0)
44.40	4.92	Free Outfall		R0,C0 (no Q: W0)
44.50	6.89	Free Outfall		R0,C0 (no Q: W0)
44.60	9.05	Free Outfall		R0,C0 (no Q: W0)
44.70	11.41	Free Outfall		R0,C0 (no Q: W0)
44.80	14.53	Free Outfall		R0,C0,W0
44.90	17.23	Free Outfall		R0,C0,W0
45.00	20.54	Free Outfall		R0,C0,W0
45.10	24.37	Free Outfall		R0,C0,W0
45.20	28.69	Free Outfall		R0,C0,W0
45.30	33.48	Free Outfall		R0,C0,W0
45.40	38.74	Free Outfall		R0,C0,W0
45.50	44.47	Free Outfall		R0,C0,W0
45.60	50.65	Free Outfall		R0,C0,W0
45.70	57.29	Free Outfall		R0,C0,W0
45.80	64.40	Free Outfall		R0,C0,W0
45.90	71.97	Free Outfall		R0,C0,W0
46.00	80.00	Free Outfall		R0,C0,W0

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 50.00 ft
Increment = .10 ft
Max. Elev.= 53.50 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	R0	--->	C0	49.500	53.500
Culvert-Circular	C0	--->	TW	46.000	53.500
Weir-XY Points	W0	--->	TW	50.800	53.500
TW SETUP, DS Channel					

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = R0
Structure Type    = Stand Pipe
------------------------------------
# of Openings     =         1
Invert Elev.      =     49.50 ft
Diameter          =    3.0000 ft
Orifice Area      =    7.0686 sq.ft
Orifice Coeff.    =      .600
Weir Length       =      9.42 ft
Weir Coeff.       =     3.100
K, Reverse        =     1.000
Mannings n        =     .0000
Kev,Charged Riser =      .000
Weir Submergence  = No
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = C0
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    2.0000 ft
Upstream Invert   =     46.00 ft
Dnstream Invert   =     45.50 ft
Horiz. Length     =     50.00 ft
Barrel Length     =     50.00 ft
Barrel Slope      =    .01000 ft/ft

OUTLET CONTROL DATA...
Mannings n        =     .0120
Ke                =     .2000  (forward entrance loss)
Kb                =   .010575  (per ft of full flow)
Kr                =     .2000  (reverse entrance loss)
HW Convergence    =      .001  +/- ft

INLET CONTROL DATA...
Equation form     =         1
Inlet Control K   =     .0018
Inlet Control M   =    2.0000
Inlet Control c   =    .02920
Inlet Control Y   =     .7400
T1 ratio (HW/D)   =     1.057
T2 ratio (HW/D)   =     1.202
Slope Factor      =     -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     48.11 ft  --->  Flow =     15.55 cfs
At T2 Elev =     48.40 ft  --->  Flow =     17.77 cfs
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
.00	53.50
8.10	50.80
20.10	50.80
28.20	53.50

Lowest Elev. = 50.80 ft

Weir Coeff. = 3.100000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
49.50	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
50.00	10.33	50.00	Free	47.72	.000	.000	Free Outfall	
		Weir: H =.50ft						
50.10	13.58	50.10	Free	48.03	.000	.000	Free Outfall	
		Weir: H =.60ft						
50.20	17.11	50.20	Free	48.36	.000	.000	Free Outfall	
		Weir: H =.70ft						
50.30	20.91	50.30	Free	48.76	.000	.000	Free Outfall	
		Weir: H =.80ft						
50.40	24.95	50.40	Free	49.31	.000	.000	Free Outfall	
		Weir: H =.90ft						
50.50	29.22	50.50	50.00	50.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.00ft						
50.60	33.71	50.60	50.60	50.60	.001	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.10ft						
50.70	37.27	50.70	50.70	50.70	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.20						
50.80	38.79	50.80	50.80	50.80	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.30						
50.90	40.25	50.90	50.90	50.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.40						
51.00	41.67	51.00	51.00	51.00	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.50						
51.10	43.03	51.10	51.10	51.10	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.60						
51.20	44.36	51.20	51.20	51.20	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.70						
51.30	45.64	51.30	51.30	51.30	.001	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
51.40	*	51.40	51.40	51.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
51.50	*	51.50	51.50	51.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
51.60	*	51.60	51.60	51.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
51.70	*	51.70	51.70	51.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
51.80	*	51.80	51.80	51.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
51.90	*	51.90	51.90	51.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.00	*	52.00	52.00	52.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.10	*	52.10	52.10	52.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.20	*	52.20	52.20	52.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.30	*	52.30	52.30	52.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.40	*	52.40	52.40	52.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.50	*	52.50	52.50	52.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.60	*	52.60	52.60	52.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.70	*	52.70	52.70	52.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.80	*	52.80	52.80	52.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
52.90	*	52.90	52.90	52.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.00	*	53.00	53.00	53.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.10	*	53.10	53.10	53.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.20	*	53.20	53.20	53.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.30	*	53.30	53.30	53.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.40	*	53.40	53.40	53.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
53.50	*	53.50	53.50	53.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
49.50	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
50.00	10.33	47.72	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH CONTROL Vh= .473ft Dcr= 1.151ft CRIT.DEPTH Hev= .00ft						
50.10	13.59	48.03	Free	Free	.000	.009	Free Outfall	
		CRIT.DEPTH CONTROL Vh= .586ft Dcr= 1.327ft CRIT.DEPTH Hev= .00ft						
50.20	17.11	48.36	Free	Free	.000	.004	Free Outfall	
		CRIT.DEPTH CONTROL Vh= .721ft Dcr= 1.491ft CRIT.DEPTH Hev= .00ft						
50.30	20.91	48.76	Free	Free	.000	.003	Free Outfall	
		INLET CONTROL... Submerged: HW =2.76						
50.40	24.95	49.31	Free	Free	.000	.005	Free Outfall	
		INLET CONTROL... Submerged: HW =3.31						
50.50	29.22	50.00	Free	Free	.000	.001	Free Outfall	
		INLET CONTROL... Submerged: HW =4.00						
50.60	32.52	50.60	Free	Free	.000	1.187	Free Outfall	
		INLET CONTROL... Submerged: HW =4.60						
50.70	33.03	50.70	Free	Free	.000	4.236	Free Outfall	
		INLET CONTROL... Submerged: HW =4.70						
50.80	33.55	50.80	Free	Free	.000	5.245	Free Outfall	
		INLET CONTROL... Submerged: HW =4.80						
50.90	34.05	50.90	Free	Free	.000	6.208	Free Outfall	
		INLET CONTROL... Submerged: HW =4.90						
51.00	34.53	51.00	Free	Free	.000	7.133	Free Outfall	
		INLET CONTROL... Submerged: HW =5.00						
51.10	35.02	51.10	Free	Free	.000	8.010	Free Outfall	
		INLET CONTROL... Submerged: HW =5.10						
51.20	35.50	51.20	Free	Free	.000	8.858	Free Outfall	
		INLET CONTROL... Submerged: HW =5.20						
51.30	35.98	51.30	Free	Free	.000	9.667	Free Outfall	
		INLET CONTROL... Submerged: HW =5.30						
51.40	36.44	51.40	Free	Free	.000	10.453	Free Outfall	
		INLET CONTROL... Submerged: HW =5.40						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
51.50	36.91	51.50	Free	Free	.000	11.206	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.50			
51.60	37.36	51.60	Free	Free	.000	11.941	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.60			
51.70	37.81	51.70	Free	Free	.000	12.649	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.70			
51.80	38.25	51.80	Free	Free	.000	13.342	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.80			
51.90	38.70	51.90	Free	Free	.000	14.010	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.90			
52.00	39.13	52.00	Free	Free	.000	14.662	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.00			
52.10	39.56	52.10	Free	Free	.000	15.298	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.10			
52.20	39.98	52.20	Free	Free	.000	15.920	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.20			
52.30	40.41	52.30	Free	Free	.000	16.523	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.30			
52.40	40.82	52.40	Free	Free	.000	17.119	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.40			
52.50	41.23	52.50	Free	Free	.000	17.692	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.50			
52.60	41.64	52.60	Free	Free	.000	18.261	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.60			
52.70	42.05	52.70	Free	Free	.000	18.814	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.70			
52.80	42.44	52.80	Free	Free	.000	19.358	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.80			
52.90	42.84	52.90	Free	Free	.000	19.888	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.90			
53.00	43.24	53.00	Free	Free	.000	20.411	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.00			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 26.36 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.10	43.62	53.10	Free	Free	.000	20.926	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.10			
53.20	44.01	53.20	Free	Free	.000	21.429	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.20			
53.30	44.39	53.30	Free	Free	.000	21.926	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.30			
53.40	44.77	53.40	Free	Free	.000	22.418	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.40			
53.50	45.14	53.50	Free	Free	.000	22.898	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.50			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q, cfs	Tail Water TW Elev ft	Converge +/-ft	Notes Computation Messages
49.50	.00	Free Outfall		WS below an invert; no flow.
50.00	.00	Free Outfall		WS below an invert; no flow.
50.10	.00	Free Outfall		WS below an invert; no flow.
50.20	.00	Free Outfall		WS below an invert; no flow.
50.30	.00	Free Outfall		WS below an invert; no flow.
50.40	.00	Free Outfall		WS below an invert; no flow.
50.50	.00	Free Outfall		WS below an invert; no flow.
50.60	.00	Free Outfall		WS below an invert; no flow.
50.70	.00	Free Outfall		WS below an invert; no flow.
50.80	.00	Free Outfall		WS below an invert; no flow.
50.90	1.20	Free Outfall		Max.H=.10; Max.Htw=free out;; W(ft)=12.60
51.00	3.44	Free Outfall		Max.H=.20; Max.Htw=free out;; W(ft)=13.20
51.10	6.44	Free Outfall		Max.H=.30; Max.Htw=free out;; W(ft)=13.80
51.20	10.08	Free Outfall		Max.H=.40; Max.Htw=free out;; W(ft)=14.40
51.30	14.31	Free Outfall		Max.H=.50; Max.Htw=free out;; W(ft)=15.00

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
51.40	19.12	Free Outfall		Max.H=.60; Max.Htw=free out;; W(ft)=15.60
51.50	24.48	Free Outfall		Max.H=.70; Max.Htw=free out;; W(ft)=16.20
51.60	30.38	Free Outfall		Max.H=.80; Max.Htw=free out;; W(ft)=16.80
51.70	36.82	Free Outfall		Max.H=.90; Max.Htw=free out;; W(ft)=17.40
51.80	43.78	Free Outfall		Max.H=1.00; Max.Htw=free out;; W(ft)=18.00
51.90	51.26	Free Outfall		Max.H=1.10; Max.Htw=free out;; W(ft)=18.60
52.00	59.27	Free Outfall		Max.H=1.20; Max.Htw=free out;; W(ft)=19.20
52.10	67.81	Free Outfall		Max.H=1.30; Max.Htw=free out;; W(ft)=19.80
52.20	76.87	Free Outfall		Max.H=1.40; Max.Htw=free out;; W(ft)=20.40
52.30	86.46	Free Outfall		Max.H=1.50; Max.Htw=free out;; W(ft)=21.00
52.40	96.58	Free Outfall		Max.H=1.60; Max.Htw=free out;; W(ft)=21.60
52.50	107.23	Free Outfall		Max.H=1.70; Max.Htw=free out;; W(ft)=22.20
52.60	118.42	Free Outfall		Max.H=1.80; Max.Htw=free out;; W(ft)=22.80
52.70	130.15	Free Outfall		Max.H=1.90; Max.Htw=free out;; W(ft)=23.40
52.80	142.42	Free Outfall		Max.H=2.00; Max.Htw=free out;; W(ft)=24.00

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
52.90	155.23	Free Outfall		Max.H=2.10; Max.Htw=free out;; W(ft)=24.60
53.00	168.60	Free Outfall		Max.H=2.20; Max.Htw=free out;; W(ft)=25.20
53.10	182.52	Free Outfall		Max.H=2.30; Max.Htw=free out;; W(ft)=25.80
53.20	196.99	Free Outfall		Max.H=2.40; Max.Htw=free out;; W(ft)=26.40
53.30	212.03	Free Outfall		Max.H=2.50; Max.Htw=free out;; W(ft)=27.00
53.40	227.64	Free Outfall		Max.H=2.60; Max.Htw=free out;; W(ft)=27.60
53.50	243.81	Free Outfall		Max.H=2.70; Max.Htw=free out;; W(ft)=28.20

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
49.50	.00	Free Outfall		(no Q: R0,C0,W0)
50.00	10.33	Free Outfall		R0,C0 (no Q: W0)
50.10	13.59	Free Outfall		R0,C0 (no Q: W0)
50.20	17.11	Free Outfall		R0,C0 (no Q: W0)
50.30	20.91	Free Outfall		R0,C0 (no Q: W0)
50.40	24.95	Free Outfall		R0,C0 (no Q: W0)
50.50	29.22	Free Outfall		R0,C0 (no Q: W0)
50.60	32.52	Free Outfall		R0,C0 (no Q: W0)
50.70	33.03	Free Outfall		R0,C0 (no Q: W0)
50.80	33.55	Free Outfall		R0,C0 (no Q: W0)
50.90	35.24	Free Outfall		R0,C0,W0
51.00	37.98	Free Outfall		R0,C0,W0
51.10	41.46	Free Outfall		R0,C0,W0
51.20	45.58	Free Outfall		R0,C0,W0
51.30	50.29	Free Outfall		R0,C0,W0
51.40	55.57	Free Outfall		R0,C0,W0
51.50	61.39	Free Outfall		R0,C0,W0
51.60	67.74	Free Outfall		R0,C0,W0
51.70	74.63	Free Outfall		R0,C0,W0
51.80	82.03	Free Outfall		R0,C0,W0
51.90	89.96	Free Outfall		R0,C0,W0
52.00	98.40	Free Outfall		R0,C0,W0
52.10	107.37	Free Outfall		R0,C0,W0
52.20	116.86	Free Outfall		R0,C0,W0
52.30	126.87	Free Outfall		R0,C0,W0
52.40	137.40	Free Outfall		R0,C0,W0
52.50	148.47	Free Outfall		R0,C0,W0
52.60	160.06	Free Outfall		R0,C0,W0
52.70	172.19	Free Outfall		R0,C0,W0
52.80	184.86	Free Outfall		R0,C0,W0
52.90	198.08	Free Outfall		R0,C0,W0
53.00	211.83	Free Outfall		R0,C0,W0
53.10	226.14	Free Outfall		R0,C0,W0
53.20	241.01	Free Outfall		R0,C0,W0

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
53.30	256.43	Free Outfall		R0,C0,W0
53.40	272.41	Free Outfall		R0,C0,W0
53.50	288.96	Free Outfall		R0,C0,W0

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

REQUESTED POND WS ELEVATIONS:

Min. Elev.= 52.00 ft
Increment = .10 ft
Max. Elev.= 56.00 ft

****
OUTLET CONNECTIVITY
****

---> Forward Flow Only (UpStream to DnStream)
<--- Reverse Flow Only (DnStream to UpStream)
<---> Forward and Reverse Both Allowed

Structure	No.		Outfall	E1, ft	E2, ft
Stand Pipe	R0	--->	C0	52.000	56.000
Culvert-Circular	C0	--->	TW	48.500	56.000
Weir-XY Points	W0	--->	TW	53.500	56.000
TW SETUP, DS Channel					

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = R0
Structure Type    = Stand Pipe
------------------------------------
# of Openings     =         1
Invert Elev.      =     52.00 ft
Diameter          =    4.5000 ft
Orifice Area      =   15.9043 sq.ft
Orifice Coeff.    =      .600
Weir Length       =     14.14 ft
Weir Coeff.       =     3.100
K, Reverse        =     1.000
Mannings n        =     .0000
Kev,Charged Riser =      .000
Weir Submergence  = No
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

```
Structure ID      = C0
Structure Type    = Culvert-Circular
-----------------------------------
No. Barrels       =         1
Barrel Diameter   =    3.5000 ft
Upstream Invert   =     48.50 ft
Dnstream Invert   =     48.00 ft
Horiz. Length     =     50.00 ft
Barrel Length     =     50.00 ft
Barrel Slope      =    .01000 ft/ft

OUTLET CONTROL DATA...
Mannings n        =     .0120
Ke                =     .2000  (forward entrance loss)
Kb                =   .005015  (per ft of full flow)
Kr                =     .2000  (reverse entrance loss)
HW Convergence    =      .001  +/- ft

INLET CONTROL DATA...
Equation form     =         1
Inlet Control K   =     .0018
Inlet Control M   =    2.0000
Inlet Control c   =    .02920
Inlet Control Y   =     .7400
T1 ratio (HW/D)   =      .000
T2 ratio (HW/D)   =     1.202
Slope Factor      =     -.500

Use unsubmerged inlet control Form 1 equ. below T1 elev.
Use   submerged inlet control Form 1 equ. above T2 elev.

In transition zone between unsubmerged and submerged inlet control,
interpolate between flows at T1 & T2...
At T1 Elev =     48.50 ft  --->  Flow =     63.00 cfs
At T2 Elev =     52.71 ft  --->  Flow =     72.00 cfs
```

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

OUTLET STRUCTURE INPUT DATA

Structure ID = W0
Structure Type = Weir-XY Points

# of Openings = 1
WEIR X-Y GROUND POINTS

X, ft	Elev, ft
.00	56.00
7.50	53.50
27.50	53.50
35.00	56.00

Lowest Elev. = 53.50 ft

Weir Coeff. = 3.100000

Weir TW effects (Use adjustment equation)

Structure ID = TW
Structure Type = TW SETUP, DS Channel

FREE OUTFALL CONDITIONS SPECIFIED

CONVERGENCE TOLERANCES...
Maximum Iterations= 40
Min. TW tolerance = .01 ft
Max. TW tolerance = .01 ft
Min. HW tolerance = .01 ft
Max. HW tolerance = .01 ft
Min. Q tolerance = .00 cfs
Max. Q tolerance = .00 cfs

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
52.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
52.10	1.39	52.10	Free	48.99	.000	.000	Free Outfall	
		Weir: H =.10ft						
52.20	3.92	52.20	Free	49.34	.000	.000	Free Outfall	
		Weir: H =.20ft						
52.30	7.20	52.30	Free	49.65	.000	.000	Free Outfall	
		Weir: H =.30ft						
52.40	11.09	52.40	Free	49.94	.000	.000	Free Outfall	
		Weir: H =.40ft						
52.50	15.49	52.50	Free	50.23	.000	.000	Free Outfall	
		Weir: H =.50ft						
52.60	20.37	52.60	Free	50.50	.000	.000	Free Outfall	
		Weir: H =.60ft						
52.70	25.67	52.70	Free	50.77	.000	.000	Free Outfall	
		Weir: H =.70ft						
52.80	31.36	52.80	Free	51.05	.000	.000	Free Outfall	
		Weir: H =.80ft						
52.90	37.42	52.90	Free	51.32	.000	.000	Free Outfall	
		Weir: H =.90ft						
53.00	43.83	53.00	Free	51.59	.000	.000	Free Outfall	
		Weir: H =1.00ft						
53.10	50.56	53.10	Free	51.87	.000	.000	Free Outfall	
		Weir: H =1.10ft						
53.20	57.61	53.20	52.16	52.16	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.20ft						
53.30	64.96	53.30	52.45	52.45	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.30ft						
53.40	72.60	53.40	52.75	52.75	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.40ft						
53.50	80.51	53.50	53.12	53.12	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.50ft						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.60	88.70	53.60	53.55	53.55	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.60ft						
53.70	97.14	53.70	53.70	53.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER: ADJUSTED TO WEIR: H =1.70ft						
53.80	102.70	53.80	53.80	53.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER: Orifice Equation Control to Crest; H=1.80						
53.90	*	53.90	53.90	53.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.00	*	54.00	54.00	54.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.10	*	54.10	54.10	54.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.20	*	54.20	54.20	54.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.30	*	54.30	54.30	54.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.40	*	54.40	54.40	54.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.50	*	54.50	54.50	54.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.60	*	54.60	54.60	54.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.70	*	54.70	54.70	54.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.80	*	54.80	54.80	54.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
54.90	*	54.90	54.90	54.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.00	*	55.00	55.00	55.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.10	*	55.10	55.10	55.10	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = R0 (Stand Pipe)

Upstream ID = (Pond Water Surface)
DNstream ID = C0 (Culvert-Circular)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
55.20	*	55.20	55.20	55.20	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.30	*	55.30	55.30	55.30	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.40	*	55.40	55.40	55.40	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.50	*	55.50	55.50	55.50	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.60	*	55.60	55.60	55.60	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.70	*	55.70	55.70	55.70	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.80	*	55.80	55.80	55.80	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
55.90	*	55.90	55.90	55.90	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						
56.00	*	56.00	56.00	56.00	.000	.000	Free Outfall	
		FULLY CHARGED RISER, DOWNSTREAM CONTROL: Kev=0. Hev=0.000						

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
52.00	.00	...	...	...	...	...	Free Outfall	
		WS below an invert; no flow.						
52.10	1.39	48.99	Free	Free	.000	.000	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .119ft	Dcr= .351ft		CRIT.DEPTH	Hev= .00ft
52.20	3.93	49.34	Free	Free	.000	.005	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .206ft	Dcr= .593ft		CRIT.DEPTH	Hev= .00ft
52.30	7.20	49.65	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .285ft	Dcr= .808ft		CRIT.DEPTH	Hev= .00ft
52.40	11.08	49.94	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .362ft	Dcr= 1.009ft		CRIT.DEPTH	Hev= .00ft
52.50	15.48	50.23	Free	Free	.000	.011	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .439ft	Dcr= 1.199ft		CRIT.DEPTH	Hev= .00ft
52.60	20.35	50.50	Free	Free	.000	.017	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .516ft	Dcr= 1.382ft		CRIT.DEPTH	Hev= .00ft
52.70	25.67	50.77	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .596ft	Dcr= 1.560ft		CRIT.DEPTH	Hev= .00ft
52.80	31.37	51.05	Free	Free	.000	.009	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .678ft	Dcr= 1.732ft		CRIT.DEPTH	Hev= .00ft
52.90	37.43	51.32	Free	Free	.000	.010	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .765ft	Dcr= 1.900ft		CRIT.DEPTH	Hev= .00ft
53.00	43.82	51.59	Free	Free	.000	.001	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .857ft	Dcr= 2.063ft		CRIT.DEPTH	Hev= .00ft
53.10	50.55	51.87	Free	Free	.000	.015	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= .956ft	Dcr= 2.223ft		CRIT.DEPTH	Hev= .00ft
53.20	57.61	52.16	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.065ft	Dcr= 2.378ft		CRIT.DEPTH	Hev= .00ft
53.30	64.96	52.45	Free	Free	.000	.002	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.186ft	Dcr= 2.527ft		CRIT.DEPTH	Hev= .00ft
53.40	72.60	52.75	Free	Free	.000	.003	Free Outfall	
		CRIT.DEPTH	CONTROL	Vh= 1.322ft	Dcr= 2.669ft		CRIT.DEPTH	Hev= .00ft
53.50	80.51	53.12	Free	Free	.000	.002	Free Outfall	
		INLET CONTROL...	Submerged:	HW =4.62				

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
53.60	88.69	53.55	Free	Free	.000	.004	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.05			
53.70	91.27	53.70	Free	Free	.000	5.873	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.20			
53.80	92.98	53.80	Free	Free	.000	9.717	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.30			
53.90	94.68	53.90	Free	Free	.000	10.838	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.40			
54.00	96.32	54.00	Free	Free	.000	11.934	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.50			
54.10	97.97	54.10	Free	Free	.000	12.962	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.60			
54.20	99.56	54.20	Free	Free	.000	13.975	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.70			
54.30	101.14	54.30	Free	Free	.000	14.954	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.80			
54.40	102.71	54.40	Free	Free	.000	15.877	Free Outfall	
		INLET CONTROL...		Submerged:	HW =5.90			
54.50	104.24	54.50	Free	Free	.000	16.796	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.00			
54.60	105.74	54.60	Free	Free	.000	17.691	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.10			
54.70	107.24	54.70	Free	Free	.000	18.541	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.20			
54.80	108.70	54.80	Free	Free	.000	19.394	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.30			
54.90	110.15	54.90	Free	Free	.000	20.207	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.40			
55.00	111.58	55.00	Free	Free	.000	21.005	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.50			
55.10	112.99	55.10	Free	Free	.000	21.790	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.60			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = C0 (Culvert-Circular)

Mannings open channel maximum capacity: 117.24 cfs
UPstream ID = R0 (Stand Pipe)
DNstream ID = TW (Pond Outfall)

Pond WS. Elev. ft	Device Q cfs	(into) HW HGL ft	Converge DS HGL ft	Next DS HGL ft	DS HGL Error +/-ft	Q SUM Error +/-cfs	DS Chan. TW ft	TW Error +/-ft
55.20	114.39	55.20	Free	Free	.000	22.540	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.70			
55.30	115.78	55.30	Free	Free	.000	23.280	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.80			
55.40	117.14	55.40	Free	Free	.000	24.012	Free Outfall	
		INLET CONTROL...		Submerged:	HW =6.90			
55.50	118.47	55.50	Free	Free	.000	24.738	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.00			
55.60	119.81	55.60	Free	Free	.000	25.434	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.10			
55.70	121.12	55.70	Free	Free	.000	26.126	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.20			
55.80	122.43	55.80	Free	Free	.000	26.792	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.30			
55.90	123.72	55.90	Free	Free	.000	27.455	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.40			
56.00	124.98	56.00	Free	Free	.000	28.117	Free Outfall	
		INLET CONTROL...		Submerged:	HW =7.50			

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev,Device Q		Tail Water		Notes
WS Elev. ft	Q cfs	TW Elev ft	Converge +/-ft	Computation Messages
52.00	.00	Free Outfall		WS below an invert; no flow.
52.10	.00	Free Outfall		WS below an invert; no flow.
52.20	.00	Free Outfall		WS below an invert; no flow.
52.30	.00	Free Outfall		WS below an invert; no flow.
52.40	.00	Free Outfall		WS below an invert; no flow.
52.50	.00	Free Outfall		WS below an invert; no flow.
52.60	.00	Free Outfall		WS below an invert; no flow.
52.70	.00	Free Outfall		WS below an invert; no flow.
52.80	.00	Free Outfall		WS below an invert; no flow.
52.90	.00	Free Outfall		WS below an invert; no flow.
53.00	.00	Free Outfall		WS below an invert; no flow.
53.10	.00	Free Outfall		WS below an invert; no flow.
53.20	.00	Free Outfall		WS below an invert; no flow.
53.30	.00	Free Outfall		WS below an invert; no flow.
53.40	.00	Free Outfall		WS below an invert; no flow.

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q cfs	Tail Water TW Elev ft	Tail Water Converge +/-ft	Notes Computation Messages
53.50	.00	Free Outfall		WS below an invert; no flow.
53.60	1.98	Free Outfall		Max.H=.10; Max.Htw=free out;; W(ft)=20.60
53.70	5.66	Free Outfall		Max.H=.20; Max.Htw=free out;; W(ft)=21.20
53.80	10.51	Free Outfall		Max.H=.30; Max.Htw=free out;; W(ft)=21.80
53.90	16.35	Free Outfall		Max.H=.40; Max.Htw=free out;; W(ft)=22.40
54.00	23.08	Free Outfall		Max.H=.50; Max.Htw=free out;; W(ft)=23.00
54.10	30.65	Free Outfall		Max.H=.60; Max.Htw=free out;; W(ft)=23.60
54.20	39.01	Free Outfall		Max.H=.70; Max.Htw=free out;; W(ft)=24.20
54.30	48.13	Free Outfall		Max.H=.80; Max.Htw=free out;; W(ft)=24.80
54.40	57.99	Free Outfall		Max.H=.90; Max.Htw=free out;; W(ft)=25.40
54.50	68.58	Free Outfall		Max.H=1.00; Max.Htw=free out;; W(ft)=26.00
54.60	79.87	Free Outfall		Max.H=1.10; Max.Htw=free out;; W(ft)=26.60
54.70	91.87	Free Outfall		Max.H=1.20; Max.Htw=free out;; W(ft)=27.20
54.80	104.57	Free Outfall		Max.H=1.30; Max.Htw=free out;; W(ft)=27.80
54.90	117.95	Free Outfall		Max.H=1.40; Max.Htw=free out;; W(ft)=28.40

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

RATING TABLE FOR ONE OUTLET TYPE

Structure ID = W0 (Weir-XY Points)

Upstream ID = (Pond Water Surface)
DNstream ID = TW (Pond Outfall)

WS Elev, ft	Device Q cfs	Tail Water TW Elev ft	Converge +/-ft	Notes Computation Messages
55.00	132.02	Free Outfall		Max.H=1.50; Max.Htw=free out;; W(ft)=29.00
55.10	146.77	Free Outfall		Max.H=1.60; Max.Htw=free out;; W(ft)=29.60
55.20	162.20	Free Outfall		Max.H=1.70; Max.Htw=free out;; W(ft)=30.20
55.30	178.31	Free Outfall		Max.H=1.80; Max.Htw=free out;; W(ft)=30.80
55.40	195.10	Free Outfall		Max.H=1.90; Max.Htw=free out;; W(ft)=31.40
55.50	212.56	Free Outfall		Max.H=2.00; Max.Htw=free out;; W(ft)=32.00
55.60	230.70	Free Outfall		Max.H=2.10; Max.Htw=free out;; W(ft)=32.60
55.70	249.52	Free Outfall		Max.H=2.20; Max.Htw=free out;; W(ft)=33.20
55.80	269.02	Free Outfall		Max.H=2.30; Max.Htw=free out;; W(ft)=33.80
55.90	289.20	Free Outfall		Max.H=2.40; Max.Htw=free out;; W(ft)=34.40
56.00	310.06	Free Outfall		Max.H=2.50; Max.Htw=free out;; W(ft)=35.00

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
52.00	.00	Free Outfall		(no Q: R0,C0,W0)
52.10	1.39	Free Outfall		R0,C0 (no Q: W0)
52.20	3.93	Free Outfall		R0,C0 (no Q: W0)
52.30	7.20	Free Outfall		R0,C0 (no Q: W0)
52.40	11.08	Free Outfall		R0,C0 (no Q: W0)
52.50	15.48	Free Outfall		R0,C0 (no Q: W0)
52.60	20.35	Free Outfall		R0,C0 (no Q: W0)
52.70	25.67	Free Outfall		R0,C0 (no Q: W0)
52.80	31.37	Free Outfall		R0,C0 (no Q: W0)
52.90	37.43	Free Outfall		R0,C0 (no Q: W0)
53.00	43.82	Free Outfall		R0,C0 (no Q: W0)
53.10	50.55	Free Outfall		R0,C0 (no Q: W0)
53.20	57.61	Free Outfall		R0,C0 (no Q: W0)
53.30	64.96	Free Outfall		R0,C0 (no Q: W0)
53.40	72.60	Free Outfall		R0,C0 (no Q: W0)
53.50	80.51	Free Outfall		R0,C0 (no Q: W0)
53.60	90.67	Free Outfall		R0,C0,W0
53.70	96.93	Free Outfall		R0,C0,W0
53.80	103.50	Free Outfall		R0,C0,W0
53.90	111.03	Free Outfall		R0,C0,W0
54.00	119.40	Free Outfall		R0,C0,W0
54.10	128.61	Free Outfall		R0,C0,W0
54.20	138.57	Free Outfall		R0,C0,W0
54.30	149.27	Free Outfall		R0,C0,W0
54.40	160.70	Free Outfall		R0,C0,W0
54.50	172.81	Free Outfall		R0,C0,W0
54.60	185.61	Free Outfall		R0,C0,W0
54.70	199.12	Free Outfall		R0,C0,W0
54.80	213.26	Free Outfall		R0,C0,W0
54.90	228.10	Free Outfall		R0,C0,W0
55.00	243.60	Free Outfall		R0,C0,W0
55.10	259.76	Free Outfall		R0,C0,W0
55.20	276.60	Free Outfall		R0,C0,W0
55.30	294.09	Free Outfall		R0,C0,W0

Title... Project Date: 6/23/2008
Project Engineer: jbell
Project Title: Watershed
Project Comments:

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Notes		
		Converge		
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
55.40	312.23	Free Outfall		R0,C0,W0
55.50	331.03	Free Outfall		R0,C0,W0
55.60	350.51	Free Outfall		R0,C0,W0
55.70	370.64	Free Outfall		R0,C0,W0
55.80	391.45	Free Outfall		R0,C0,W0
55.90	412.92	Free Outfall		R0,C0,W0
56.00	435.04	Free Outfall		R0,C0,W0

NORTHERN OLD LANDFILL

ENERGY DISSIPATOR
EMERGENCY SPILLWAY

PRINCIPAL SPILLWAY

SEDIMENTATION BASIN SB-2

PRINCIPAL SPILLWAY
ENERGY DISSIPATOR
EMERGENCY SPILLWAY

SEDIMENTATION BASIN SB-1
ENERGY DISSIPATOR
EMERGENCY SPILLWAY
PRINCIPAL SPILLWAY

Prop. Downstream

SOUTHERN LANDFILL

GATE
STORAGE 2
STORAGE 3
ELECTRONICS / OIL FILTER STORAGE
STORAGE 1
BREAK TRAILER
POND
POND

PROPERTY LINE

K4= 70.01 acres
K3= 9.05 acres
K2 = 6.76 acres
I2=2.02 acres
I1=2.43 acres
D2=1.76 acres
D1=1.15 acres
B1=1.12 acres
B2=1.81 acres
H2=2.93 acres
H1=0.85 acres
C1=0.84 acres
C2=0.80 acres
G2=2.20 acres
G1=1.40 acres
F1=2.38 acres
F2=2.66 acres
E1=1.66 acres
E2=0.34 acres
J1=1.88 acres
J2=0.62 acres
A1=2.13 acres
K1=10.33 acres

N 759000
N 758500
N 758000
N 757500
N 757000
N 756500
E 2422500
E 2423000
E 2423500
E 2424000
E 2424500
E 2425000
E 2425500
E 2426000

LEGEND

- PROPERTY LINE
- DRAINAGE AREAS
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE
- LIMIT OF C&D WASTE PLACEMENT

NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

300 0 150 300

(IN FEET)

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THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY JOHN A. MOODY, P.E. (N.C.) #024294 ON JULY 28, 2009. THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT.

NO.	DATE	DESCRIPTION	BY

DRAINAGE AREA DELINEATION MAP
LANDFILL AREA

EROSION AND SEDIMENT CONTROL PLAN
EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: BTR	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241A	
SCALE: 1" = 150'	DATE: JULY 2009
DRAWING NUMBER: D-1106	
DRAWING: 1	OF: 1

S:\PROJECTS\2007\07-241 Edgecombe-Asset of Connelly Museum\CAD\D1106.dwg, D1106, 9/1/2009 4:05:19 PM, 1:1

Determining the Skimmer Size and the Required Orifice for the *Faircloth Skimmer®* Surface Drain

November 2007

Important note: *The orifice sizing chart in the Pennsylvania Erosion Control Manual and reproduced in the North Carolina Design Manual* ***DOES NOT APPLY*** *to our skimmers. It will give the wrong size orifice and not specify which size skimmer is required. Please use the information below to choose the size skimmer required for the basin volume provided and determine the orifice size required for the drawdown time, typically 4-7 days in Pennsylvania and 3 days in North Carolina.*

The **size** of a Faircloth Skimmer®, for example a 4" skimmer, refers to the maximum diameter of the skimmer inlet. The inlet on each of the 8 sizes offered can be reduced to adjust the flow rate by cutting a hole or ***orifice*** in a plug using an adjustable cutter (both supplied).

Determining the skimmer size needed and the orifice for that skimmer required to drain the sediment basin's volume in the required time involves two steps: **First**, determining the size skimmer required based on the volume to be drained and the number of days to drain it; and **Second,** calculate the orifice size to adjust the flow rate and "customize" the skimmer for the basin's volume. *The second step is not always necessary* if the flow rate for the skimmer with the inlet wide open equals or is close to the flow rate required for the basin volume and the drawdown time.

Both the skimmer size and the required orifice radius for the skimmer should be shown for each basin on the erosion and sediment control plan. Make it clear that the dimension is either the radius or the diameter. It is also helpful to give the basin volume in case there are questions. During the skimmer installation the required orifice can be cut in the plastic plug using the supplied adjustable cutter and installed in the skimmer using the instructions provided.

The plan review and enforcement authority may require the calculations showing that the skimmer used can drain the basin in the required time.

Determining the Skimmer Size

Step 1. Below are approximate **skimmer maximum flow capacities** based on typical draw down requirements, which can vary between States and jurisdictions and watersheds. If one 6" skimmer does not provide enough capacity, multiple skimmers can be used to drain the basin. For drawdown times not shown, multiply the 24-hour figure by the number of days required.

Example: A basin's volume is 29,600 cubic feet and it must be drained in 3 days. A 3" skimmer with the inlet wide open will work perfectly. (Actually, the chart below gives 29,322 cubic feet but this is well within the accuracy of the calculations and the basin's constructed volume.)
Example: A basin's volume is 39,000 cubic feet and it must be drained in 3 days. The 3" skimmer is too small; a 4" skimmer has enough capacity but it is too large, so the inlet will need

to be reduced using step 2 to adjust the flow rate for the basin's volume. (It needs a 3.2" diameter orifice.)

1½" skimmer:	1,728 cubic feet in **24 hours**	6,912 cubic feet in **4 days**
with a 1½" head	3,456 cubic feet in **2 days**	12,096 cubic feet in **7 days**
	5,184 cubic feet in **3 days**	
2" skimmer:	3,283 cubic feet in **24 hours**	13,132 cubic feet in **4 days**
with a 2" head	6,566 cubic feet in **2 days**	22,982 cubic feet in **7 days**
	9,849 cubic feet in **3 days**	
2½" skimmer:	6,234 cubic feet in **24 hours**	24,936 cubic feet in **4 days**
with a 2.5" head	12,468 cubic feet in **2 days**	43,638 cubic feet in **7 days**
Revised 11-6-07	18,702 cubic feet in **3 days**	
3" skimmer:	9,774 cubic feet in **24 hours**	39,096 cubic feet in **4 days**
with a 3" head	19,547 cubic feet in **2 days**	68,415 cubic feet in **7 days**
	29,322 cubic feet in **3 days**	
4" skimmer:	20,109 cubic feet in **24 hours**	80,436 cubic feet in **4 days**
with a 4" head	40,218 cubic feet in **2 days**	140,763 cubic feet in **7 days**
Revised 11-6-07	60,327 cubic feet in **3 days**	
5" skimmer:	32,832 cubic feet in **24 hours**	131,328 cubic feet in **4 days**
with a 4" head	65,664 cubic feet in **2 days**	229,824 cubic feet in **7 days**
	98,496 cubic feet in **3 days**	
6" skimmer:	51,840 cubic feet in **24 hours**	207,360 cubic feet in **4 days**
with a 5" head	103,680 cubic feet in **2 days**	362,880 cubic feet in **7 days**
	155,520 cubic feet in **3 days**	
8" skimmer:	97,978 cubic feet in **24 hours**	391,912 cubic feet in **4 days**
with a 6" head	195,956 cubic feet in **2 days**	685,846 cubic feet in **7 days**
CUSTOM	293,934 cubic feet in **3 days**	
MADE BY ORDER	**CALL!**	

Determining the Orifice

Step 2. To determine the orifice required to reduce the flow rate for the basin's volume and the number of days to drain the basin, simply use the formula volume ÷ **factor** (from the chart below) for the same size skimmer chosen in the first step and the same number of days. This calculation will give the **area** of the required orifice. Then calculate the orifice radius using Area = πr^2 and solving for *r*, $r = \sqrt{(Area/3.14)}$ .The supplied cutter can be adjusted to this radius to cut the orifice in the plug. The instructions with the plug and cutter has a ruler divided into tenths of inches. Again, this step is not always necessary as explained above.

An alternative method is to use the orifice equation with the head for a particular skimmer shown on the previous page and determine the orifice needed to give the required flow for the volume and draw down time. C = 0.59 is used in this chart.

Example: A 4" skimmer is the smallest skimmer that will drain 39,000 cubic feet in 3 days but a 4" inlet will drain the basin too fast (in 1.9 days) To determine the orifice required use the factor of 4,803 from the chart below for a 4" skimmer and a drawdown time of 3 days. 39,000 cubic

feet ÷ 4,803 = 8.12 square inches of orifice required. Calculate the orifice radius using Area = πr^2 and solving for r, $r = \sqrt{(8.12/3.14)}$ and r = 1.61". As a practical matter 1.6" is about as close as the cutter can be adjusted and the orifice cut..

Factors (in cubic feet of flow per square inch of opening through a **round** orifice with the head for that skimmer and for the drawdown times shown) for determining the **orifice radius** for a basin's volume to be drained. This quick method works because the orifice is centered and has a constant head (given above in Step 1).

1½" skimmer:	960 to drain in **24 hours**	3,840 to drain in **4 days**
	1,920 to drain in **2 days**	6,720 to drain in **7 days**
	2,880 to drain in **3 days**	
2" skimmer:	1,123 to drain in **24 hours**	4,492 to drain in **4 days**
	2,246 to drain in **2 days**	7,861 to drain in **7 days**
	3,369 to drain in **3 days**	
2½" skimmer:	1,270 to drain in **24 hours**	5,080 to drain in **4 days**
Revised 11-6-07	2,540 to drain in **2 days**	8,890 to drain in **7 days**
	3,810 to drain in **3 days**	
3" skimmer:	1,382 to drain in **24 hours**	5,528 to drain in **4 days**
	2,765 to drain in **2 days**	9,677 to drain in **7 days**
	4,146 to drain in **3 days**	
4" skimmer:	1,601 to drain in **24 hours**	6,404 to drain in **4 days**
Revised 11-6-07	3,202 to drain in **2 days**	11,207 to drain in **7 days**
	4,803 to drain in **3 days**	
5" skimmer:	1,642 to drain in **24 hours**	6,568 to drain in **4 days**
	3,283 to drain in **2 days**	11,491 to drain in **7 days**
	4,926 to drain in **3 days**	
6" skimmer:	1,814 to drain in **24 hours**	7,256 to drain in **4 days**
	3,628 to drain in **2 days**	12,701 to drain in **7 days**
	5,442 to drain in **3 days**	
8" skimmer:	1,987 to drain in **24 hours**	7,948 to drain in **4 days**
	3,974 to drain in **2 days**	13,909 to drain in **7 days**
	5,961 to drain in **3 days**	

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Post Office Box 757
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FairclothSkimmer.com jwfaircloth@embarqmail.com

Orifice sizing Revised 2-2-01; 3-3-05; 2-1-07; 11-6-07

SEDIMENT BASIN 1

Calculate Skimmer Size				
Basin Volume in Cubic Feet	19,733	Cu.Ft	**Skimmer Size**	**3.0** Inch
Days to Drain*	3	Days	Orifice Radius	**1.2** Inch[es]
			Orifice Diameter	**2.5** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

SEDIMENT BASIN

Calculate Skimmer Size

Basin Volume in Cubic Feet	57,107	Cu.Ft	**Skimmer Size**	**4.0** Inch
Days to Drain*	3	Days	Orifice Radius	**1.9** Inch[es]
			Orifice Diameter	**3.9** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin

	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

Sediment Basin 3

Calculate Skimmer Size

Basin Volume in Cubic Feet	179,162	Cu.Ft	**Skimmer Size**	**8.0** Inch
Days to Drain*	3	Days	Orifice Radius	**3.1** Inch[es]
			Orifice Diameter	**6.2** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin

	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

JOB NAME	Edgecombe County Landfill – Erosion and Sediment Control Plan	JOB NO.	1054-07-242
SUBJECT	Riser Anti-flotation Block Sizing	SHEET NO.	1 / 3
		DATE	3/27/09
		COMPUTED BY	JMB
		CHECKED BY	

OBJECTIVE

Determine foundation size to effectively function as an anti-flotation block for sediment basin riser structures during normal operation conditions.

DEFINITION OF TERMS

$EL_{r.}$ = riser crest elevation (ft)
EL_{afb} = elevation of top of anti-flotation block (ft)
FS = Flotation Factor of Safety (unitless)
H = height of riser (ft)
D = diameter of riser (ft)
L_{AB} = length of anti-flotation block (ft)
H_{AB} = height of anti-flotation block (ft)
U_{riser} = uplift force on riser (lb)
W_{AB} = weight of anti-flotation block (lb)
W_r = weight of hollow riser (lb)
W_T = Total weight of riser and block (lb)
γ_w = unit weight of water (lb/ft^3)
γ_c = unit weight of concrete (lb/ft^3)

GIVEN

Design for operating conditions at riser crest $FS \geq 1.1$ - NCDENR Erosion and Sediment Control Planning Design Manual

Sediment Basin 1

EL_r = 44 ft
EL_{afb} = 40 ft
D = 2 ft

Sediment Basin 2

EL_r = 616.5 ft
EL_{afb} = 613.0 ft
D = 3 ft

Sediment Basin 3

EL_r = 616.5 ft
EL_{afb} = 613.0 ft
D = 4.5 ft

$H = EL_r - EL_{afb}$
γ_w = 62.4 lb/ft^3
γ_c = 150 lb/ft^3

JOB NAME	Edgecombe County Landfill – Erosion and Sediment Control Plan	JOB NO.	1054-07-242
SUBJECT	Riser Anti-flotation Block Sizing	SHEET NO.	2 / 3
		DATE	3/27/09
		COMPUTED BY	JMB
		CHECKED BY	

ASSUMPTIONS

- Assume entire riser is submerged, thus H = H_{sub}.
- Assume H_{AB} = 1 foot for SB-1 and SB-2 and 1.5 feet for SB-3.
- Assume L_{AB} = D + 2 feet for initial calcs.

CALCULATIONS

Sediment Basin 1

1. Determine the weight of the proposed anti-flotation block:

$$W_{AB} = (L_{AB}{}^2 \times H_{AB}) \times (\gamma_c)$$
$$W_{AB} = ((2\,ft + 2\,ft)^2 \times 1\,ft) \times (150 lbs / ft^3) = 2{,}400 lbs$$

2. Determine the total uplift force acting on the riser $\uparrow$:

$$U_{Riser} = (\pi D^2 / 4) \times H \times \gamma_w + (L_{AB})^2 \times (H_{AB}) \times \gamma_W$$
$$U_{Riser} = (\pi (2\,ft)^2 / 4) \times 4\,ft \times (62.4 lbs / ft^3) + (2\,ft + 2\,ft)^2 \times 1\,ft \times (62.4 lbs / ft^3) = 1{,}783 lbs \uparrow$$

3. Determine the Flotation Factor of Safety ≥ 1.1 for normal operation conditions

$$FS = \frac{W_{AB}}{U_{Riser}} = \frac{2{,}400 lbs}{1{,}783 lbs} = 1.35$$ [Ref. 1]

Sediment Basin 2

4. Determine the weight of the proposed anti-flotation block:

$$W_{AB} = (L_{AB}{}^2 \times H_{AB}) \times (\gamma_c)$$
$$W_{AB} = ((3\,ft + 2\,ft)^2 \times 1\,ft) \times (150 lbs / ft^3) = 3{,}750 lbs$$

5. Determine the total uplift force acting on the riser $\uparrow$:

$$U_{Riser} = (\pi D^2 / 4) \times H \times \gamma_w + (L_{AB})^2 \times (H_{AB}) \times \gamma_W$$
$$U_{Riser} = (\pi (3\,ft)^2 / 4) \times 3.5\,ft \times (62.4 lbs / ft^3) + (3\,ft + 2\,ft)^2 \times 1\,ft \times (62.4 lbs / ft^3) = 3{,}104 lbs \uparrow$$

6. Determine the Flotation Factor of Safety ≥ 1.1 for normal operation conditions

$$FS = \frac{W_{AB}}{U_{Riser}} = \frac{3{,}750 lbs}{3{,}104 lbs} = 1.21$$ [Ref. 1]

Sediment Basin 3

7. Determine the weight of the proposed anti-flotation block:

$$W_{AB} = (L_{AB}{}^2 \times H_{AB}) \times (\gamma_c)$$
$$W_{AB} = ((4.5\,ft + 2\,ft)^2 \times 1.5\,ft) \times (150 lbs/\,ft^3) = 9{,}506 lbs$$

8. Determine the total uplift force acting on the riser $\uparrow$:

$$U_{Riser} = (\pi D^2/4) \times H \times \gamma_w + (L_{AB})^2 \times (H_{AB}) \times \gamma_W$$
$$U_{Riser} = (\pi(4.5\,ft)^2/4) \times 3.5\,ft \times (62.4 lbs/\,ft^3) + (4.5\,ft + 2\,ft)^2 \times 1.5\,ft \times (62.4 lbs/\,ft^3) = 7{,}428 lbs \uparrow$$

9. Determine the Flotation Factor of Safety ≥ 1.1 for normal operation conditions

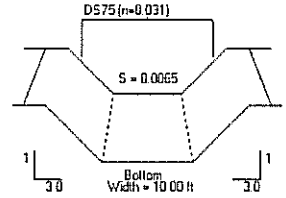
$$FS = \frac{W_{AB}}{U_{Riser}} = \frac{9{,}506 lbs}{7{,}428 lbs} = 1.28$$ [Ref. 1]

DITCH TO SB-3 - MATTING

North American Green - ECMDS Version 4.3		3/30/2009 03:59 PM	COMPUTED BY: mb
PROJECT NAME: Edgecombe County Landfill		PROJECT NO.: 1054-07-242	
FROM STATION/REACH: Drainage	TO STATION/REACH:	DRAINAGE AREA:	DESIGN FREQUENCY: 10-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
97.8	24.0	4.26	22.94	1.15	1.55



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	DS75	Unvegetated					1.55	0.63	2.45	STABLE
	Staple D									

Back to Input Screen

DITCH TO SB-3 - VEGETATED, NO MATTING

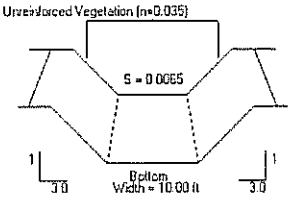
UNVEGETATED, NO MATTING

North American Green - ECMDS Version 4.3		3/30/2009 03:28 PM	COMPUTED BY: jmb
PROJECT NAME: Edgecombe County Landfill		PROJECT NO.: 1054-07-242	
FROM STATION/REACH: Drainage	TO STATION/REACH:	DRAINAGE AREA:	DESIGN FREQUENCY: 10-year

HYDRAULIC RESULTS

Discharge (cfs)	Peak Flow Period (hrs)	Velocity (fps)	Area (sq ft)	Hydraulic Radius(ft)	Normal Depth (ft)
97.8	24.0	3.90	25.05	1.22	1.67

Unreinforced Vegetation (n=0.035)



Not to Scale

LINER RESULTS

Reach	Matting Type	Stability Analysis	Vegetation Characteristics				Permissible Shear Stress (psf)	Calculated Shear Stress (psf)	Safety Factor	Remarks
	Staple Pattern		Phase	Class	Type	Density				
Straight	Unreinforced	Vegetation		E	Bunch	<50%	2.16	0.69	3.19	STABLE
		Soil	Sandy Loam				0.035	0.101	0.35	UNSTABLE

Back to Input Screen

PROJECT NO.	1054-07-242
SHEET NO.	1 / 4
DATE	March 30, 2009
JOB NAME	Edgecombe County C&D Landfill
COMPUTED BY	JMB
SUBJECT	Borrow Area Erosion Control
CHECKED BY	

OBJECTIVE: Based on a 25 yr design storm:
1. Design skimmer sediment basins for the borrow area.
2. Design corrugated metal pipe culverts to pass flows under the haul road in the borrow area.

REFERENCE:
1. Erosion and Sediment Control Planning and Design Manual, NCDENR, June 1, 2006.
2. Edgecombe County C&D Landfill Closure Plan, S&ME, Inc., 2008.
3. CulvertMaster v. 3.1, Haestad Methods.
4. PondPack v. 10.01, Haestad Methods.

PARAMETERS:

Drainage Areas obtained from AutoCad drawings.

Use the 10-yr and 25-yr storms to obtain design flows.

Assume 100% disturbed area (bare earth)

DESIGN:

Calculate Flows (Q):

Use Rational Formula to determine Q

Q = c x i x A c = Runoff Coefficient [Ref. 1]

i = Rainfall Intensity Factor (in/hr)

A = Drainage Area (acres)

c = 0.3 for drainage areas within borrow area; (Agricultural Lands:Bare Packed Soil, Rough)

(Ref. 1, Table 8.03b)

Determine Tc (Time of Concentration)

Assume minimum Tc = 5 minute

Determine i

Let i = 7.78 in/hr (Ref. 1, Figure 8.03c, 25yr storm, use Tc = 5 min to be conservative) for all areas

Determine peak flow for each drainage area.

Channel Data		
Drainage Area ID	Area	Total Q (cfs)
DA1	2.56	5.98
DA2a	3.19	7.44
DA2b	0.83	1.95
DA3a	2.17	5.07
DA3b	0.73	1.70

JOB NAME	Edgecombe County C&D Landfill	PROJECT NO.	1054-07-242
SUBJECT	Borrow Area Erosion Control	SHEET NO.	2 / 4
		DATE	March 30, 2009
		COMPUTED BY	JMB
		CHECKED BY	

Skimmer Sediment Basin SSB-1:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = 2.56 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 2.56 Ac = **4,611 ft^3**

Volume Provided = **19,262 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 3.0 inch

Orifice Diameter = 2.4 inch

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED1,\ 10yr}$ = (0.3 x 7.08 in/hr x 2.56 Acres)

$Q_{SED1,\ 10yr}$ = 5.44 cfs

Required Surface Area = 325 sq. ft. / cfs x 5.44 cfs = **1,769 ft^2**

Size overflow spillway for 25 year peak discharge.

$Q_{SED1,\ 10yr}$ = 5.44 cfs

$Q_{SED1,\ 25yr}$ = 5.98 cfs

Use 2' deep trapezoidal emergency spillway – Bottom width 10' at EL 31

Skimmer Sediment Basin SSB-2:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = 4.03 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 4.03 Acres = **7,239 ft^3**

Volume Provided = **30,248 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 4.0 inch

Orifice Diameter = 2.8 inch

Skimmer Sediment Basin SSB-2 (cont'd):

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED2,\ 10yr}$ = (0.3 x 7.08 in/hr x 4.03 Acres)

$Q_{SED2,\ 10yr}$ = 8.54 cfs

Required Surface Area = 325 sq. ft. / cfs x 8.54 cfs = 2**,777 ft^2**

Size overflow spillway for 25 year peak discharge.

$Q_{SED2,\ 10yr}$ = 8.54 cfs

$Q_{SED2,\ 25yr}$ = 9.39 cfs

Use 2' deep trapezoidal emergency spillway – Bottom width 10' at EL 31

Skimmer Sediment Basin SSB-3:

The minimum volume of the sediment basin should be 1,800 ft^3/acre disturbed.

Areas contributing to existing sediment basin = 2.90 Acres

Required Volume = 1,800 ft^3/Ac x Drainage Area

= 1,800 ft^3/Ac x 2.90 Ac = **5,215 ft^3**

Volume Provided = **28,792 ft^3**

Skimmer Sizing:

From Faircloth Skimmer Sizing worksheet (attached)-

Skimmer Size = 3.0 inch

Orifice Diameter = 3.0 inch

Required Surface Area (Ac) = 0.01 x Peak Inflow Rate (cfs)

$Q_{SED1,\ 10yr}$ = (0.3 x 7.08 in/hr x 2.90 Acres)

$Q_{SED1,\ 10yr}$ = 6.15 cfs

Required Surface Area = 325 sq. ft. / cfs x 6.15 cfs = **2,000 ft^2**

Size overflow spillway for 25 year peak discharge.

$Q_{SED1,\ 10yr}$ = 6.15 cfs

$Q_{SED1,\ 25yr}$ = 6.76 cfs

Use 2' deep trapezoidal emergency spillway – Bottom width 10' at EL 32

Culvert Sizing:

The maximum flow passing through either of the two culverts is 7.44 cfs for the 25 year storm event. For a 50-foot long corrugated metal pipe culvert 18 inches in diameter, the required headwater elevation is 1.1 feet. Use an 18-inch diameter corrugated metal pipe culvert for both crossings.

		PROJECT NO.	1054-07-242
		SHEET NO.	4 / 4
		DATE	March 30, 2009
JOB NAME	Edgecombe County C&D Landfill	COMPUTED BY	JMB
SUBJECT	Borrow Area Erosion Control	CHECKED BY	

Riprap Apron Sizing:

All skimmer pipes are smaller than the minimum size for riprap apron sizing charts which is 12 inches. The riprap aprons will be sized to the minimum apron size, with a length of 6 feet, a width at the pipe outlet of 3 feet, a length at the end of the apron of 9 feet, and using NCDOT Class A riprap with a d_{50} of 4 inches.

Determining the Skimmer Size and the Required Orifice for the *Faircloth Skimmer®* Surface Drain

November 2007

Important note: *The orifice sizing chart in the Pennsylvania Erosion Control Manual and reproduced in the North Carolina Design Manual* ***DOES NOT APPLY*** *to our skimmers. It will give the wrong size orifice and not specify which size skimmer is required. Please use the information below to choose the size skimmer required for the basin volume provided and determine the orifice size required for the drawdown time, typically 4-7 days in Pennsylvania and 3 days in North Carolina.*

The **size** of a Faircloth Skimmer®, for example a 4" skimmer, refers to the maximum diameter of the skimmer inlet. The inlet on each of the 8 sizes offered can be reduced to adjust the flow rate by cutting a hole or ***orifice*** in a plug using an adjustable cutter (both supplied).

Determining the skimmer size needed and the orifice for that skimmer required to drain the sediment basin's volume in the required time involves two steps: **First**, determining the size skimmer required based on the volume to be drained and the number of days to drain it; and **Second,** calculate the orifice size to adjust the flow rate and "customize" the skimmer for the basin's volume. *The second step is not always necessary* if the flow rate for the skimmer with the inlet wide open equals or is close to the flow rate required for the basin volume and the drawdown time.

Both the skimmer size and the required orifice radius for the skimmer should be shown for each basin on the erosion and sediment control plan. Make it clear that the dimension is either the radius or the diameter. It is also helpful to give the basin volume in case there are questions. During the skimmer installation the required orifice can be cut in the plastic plug using the supplied adjustable cutter and installed in the skimmer using the instructions provided.

The plan review and enforcement authority may require the calculations showing that the skimmer used can drain the basin in the required time.

Determining the Skimmer Size

Step 1. Below are approximate **skimmer maximum flow capacities** based on typical draw down requirements, which can vary between States and jurisdictions and watersheds. If one 6" skimmer does not provide enough capacity, multiple skimmers can be used to drain the basin. For drawdown times not shown, multiply the 24-hour figure by the number of days required.

Example: A basin's volume is 29,600 cubic feet and it must be drained in 3 days. A 3" skimmer with the inlet wide open will work perfectly. (Actually, the chart below gives 29,322 cubic feet but this is well within the accuracy of the calculations and the basin's constructed volume.)
Example: A basin's volume is 39,000 cubic feet and it must be drained in 3 days. The 3" skimmer is too small; a 4" skimmer has enough capacity but it is too large, so the inlet will need

to be reduced using step 2 to adjust the flow rate for the basin's volume. (It needs a 3.2" diameter orifice.)

1½" skimmer:	1,728 cubic feet in **24 hours**	6,912 cubic feet in **4 days**
with a 1½" head	3,456 cubic feet in **2 days**	12,096 cubic feet in **7 days**
	5,184 cubic feet in **3 days**	
2" skimmer:	3,283 cubic feet in **24 hours**	13,132 cubic feet in **4 days**
with a 2" head	6,566 cubic feet in **2 days**	22,982 cubic feet in **7 days**
	9,849 cubic feet in **3 days**	
2½" skimmer:	6,234 cubic feet in **24 hours**	24,936 cubic feet in **4 days**
with a 2.5" head	12,468 cubic feet in **2 days**	43,638 cubic feet in **7 days**
Revised 11-6-07	18,702 cubic feet in **3 days**	
3" skimmer:	9,774 cubic feet in **24 hours**	39,096 cubic feet in **4 days**
with a 3" head	19,547 cubic feet in **2 days**	68,415 cubic feet in **7 days**
	29,322 cubic feet in **3 days**	
4" skimmer:	20,109 cubic feet in **24 hours**	80,436 cubic feet in **4 days**
with a 4" head	40,218 cubic feet in **2 days**	140,763 cubic feet in **7 days**
Revised 11-6-07	60,327 cubic feet in **3 days**	
5" skimmer:	32,832 cubic feet in **24 hours**	131,328 cubic feet in **4 days**
with a 4" head	65,664 cubic feet in **2 days**	229,824 cubic feet in **7 days**
	98,496 cubic feet in **3 days**	
6" skimmer:	51,840 cubic feet in **24 hours**	207,360 cubic feet in **4 days**
with a 5" head	103,680 cubic feet in **2 days**	362,880 cubic feet in **7 days**
	155,520 cubic feet in **3 days**	
8" skimmer:	97,978 cubic feet in **24 hours**	391,912 cubic feet in **4 days**
with a 6" head	195,956 cubic feet in **2 days**	685,846 cubic feet in **7 days**
CUSTOM	293,934 cubic feet in **3 days**	
MADE BY ORDER	**CALL!**	

Determining the Orifice

Step 2. To determine the orifice required to reduce the flow rate for the basin's volume and the number of days to drain the basin, simply use the formula volume ÷ **factor** (from the chart below) for the same size skimmer chosen in the first step and the same number of days. This calculation will give the **area** of the required orifice. Then calculate the orifice radius using Area = π r^2 and solving for *r*, $r = \sqrt{(Area/3.14)}$ .The supplied cutter can be adjusted to this radius to cut the orifice in the plug. The instructions with the plug and cutter has a ruler divided into tenths of inches. Again, this step is not always necessary as explained above.

An alternative method is to use the orifice equation with the head for a particular skimmer shown on the previous page and determine the orifice needed to give the required flow for the volume and draw down time. C = 0.59 is used in this chart.

Example: A 4" skimmer is the smallest skimmer that will drain 39,000 cubic feet in 3 days but a 4" inlet will drain the basin too fast (in 1.9 days) To determine the orifice required use the factor of 4,803 from the chart below for a 4" skimmer and a drawdown time of 3 days. 39,000 cubic

feet ÷ 4,803 = 8.12 square inches of orifice required. Calculate the orifice radius using Area = πr^2 and solving for r, $r = \sqrt{(8.12/3.14)}$ and r = 1.61". As a practical matter 1.6" is about as close as the cutter can be adjusted and the orifice cut..

Factors (in cubic feet of flow per square inch of opening through a **round** orifice with the head for that skimmer and for the drawdown times shown) for determining the **orifice radius** for a basin's volume to be drained. This quick method works because the orifice is centered and has a constant head (given above in Step 1).

1½" skimmer:	960 to drain in **24 hours**	3,840 to drain in **4 days**
	1,920 to drain in **2 days**	6,720 to drain in **7 days**
	2,880 to drain in **3 days**	
2" skimmer:	1,123 to drain in **24 hours**	4,492 to drain in **4 days**
	2,246 to drain in **2 days**	7,861 to drain in **7 days**
	3,369 to drain in **3 days**	
2½" skimmer:	1,270 to drain in **24 hours**	5,080 to drain in **4 days**
Revised 11-6-07	2,540 to drain in **2 days**	8,890 to drain in **7 days**
	3,810 to drain in **3 days**	
3" skimmer:	1,382 to drain in **24 hours**	5,528 to drain in **4 days**
	2,765 to drain in **2 days**	9,677 to drain in **7 days**
	4,146 to drain in **3 days**	
4" skimmer:	1,601 to drain in **24 hours**	6,404 to drain in **4 days**
Revised 11-6-07	3,202 to drain in **2 days**	11,207 to drain in **7 days**
	4,803 to drain in **3 days**	
5" skimmer:	1,642 to drain in **24 hours**	6,568 to drain in **4 days**
	3,283 to drain in **2 days**	11,491 to drain in **7 days**
	4,926 to drain in **3 days**	
6" skimmer:	1,814 to drain in **24 hours**	7,256 to drain in **4 days**
	3,628 to drain in **2 days**	12,701 to drain in **7 days**
	5,442 to drain in **3 days**	
8" skimmer:	1,987 to drain in **24 hours**	7,948 to drain in **4 days**
	3,974 to drain in **2 days**	13,909 to drain in **7 days**
	5,961 to drain in **3 days**	

J. W. Faircloth & Son, Inc.
Post Office Box 757
412-A Buttonwood Drive
Hillsborough, North Carolina 27278
Telephone (919) 732-1244 FAX (919) 732-1266
FairclothSkimmer.com jwfaircloth@embarqmail.com

Orifice sizing Revised 2-2-01; 3-3-05; 2-1-07; 11-6-07

Skimmer Basin 1

Calculate Skimmer Size

Basin Volume in Cubic Feet	19,262	Cu.Ft	**Skimmer Size**	**3.0** Inch
Days to Drain*	3	Days	Orifice Radius	**1.2** Inch[es]
			Orifice Diameter	**2.4** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin

	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

SKIMMER BASIN 2

Calculate Skimmer Size				
Basin Volume in Cubic Feet	30,248	Cu.Ft	**Skimmer Size**	**4.0** Inch
Days to Drain*	3	Days	Orifice Radius	**1.4** Inch[es]
			Orifice Diameter	**2.8** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

SKIMMER BASIN 3

Calculate Skimmer Size				
Basin Volume in Cubic Feet	28,792	Cu.Ft	**Skimmer Size**	**3.0** Inch
Days to Drain*	3	Days	Orifice Radius	**1.5** Inch[es]
			Orifice Diameter	**3.0** Inch[es]

*In NC assume 3 days to drain

Estimate Volume of Basin	Length	Width			
Top of water surface in feet			Feet	**VOLUME**	**0 Cu. Ft.**
Bottom dimensions in feet			Feet		
Depth in feet			Feet		

LEGEND

- PROPERTY LINE
- DRAINAGE AREAS
- GROUND SURFACE ELEVATION CONTOUR - 10-FOOT INTERVAL
- GROUND SURFACE ELEVATION CONTOUR - 2-FOOT INTERVAL
- FENCE

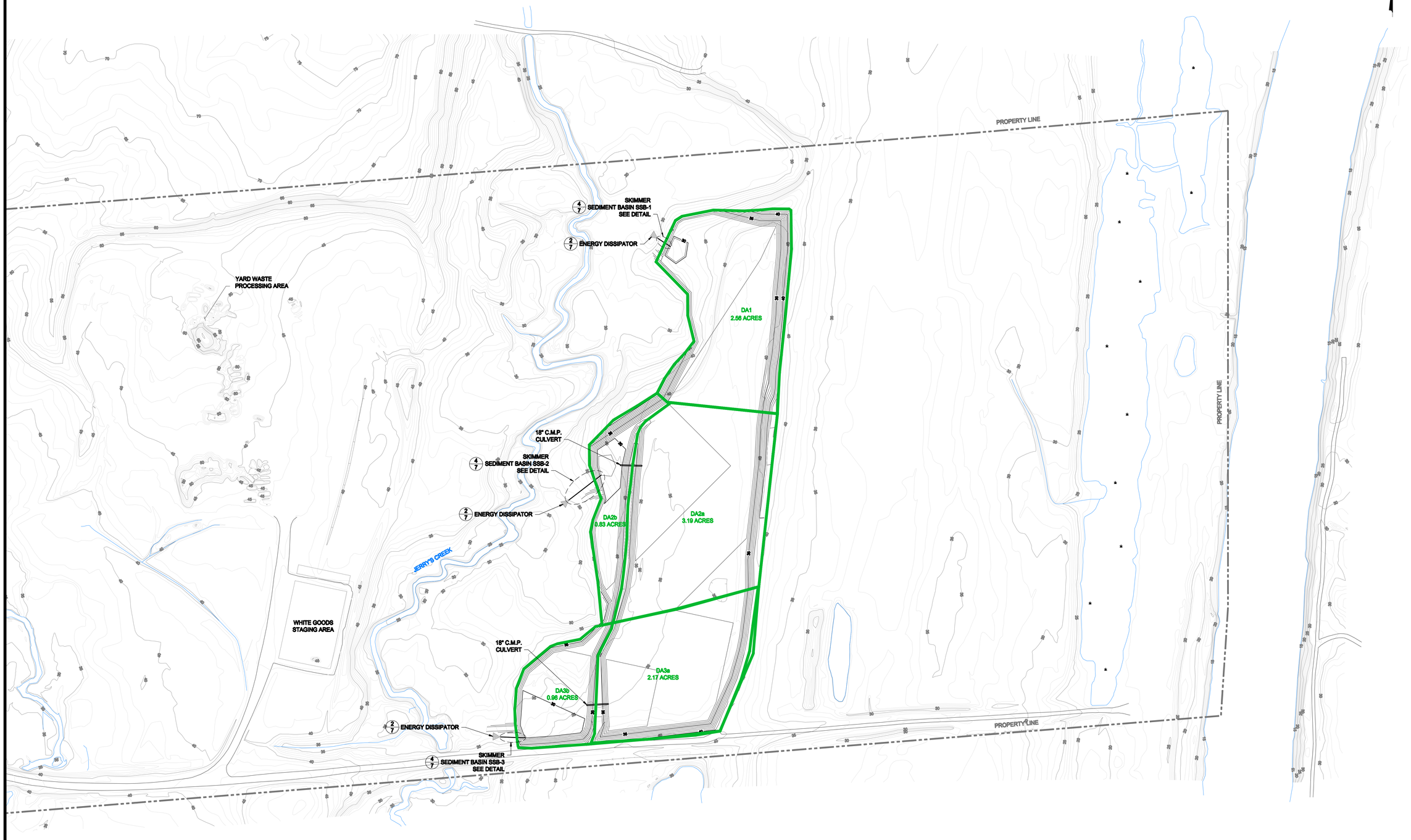
NOTE:

1. TOPOGRAPHIC MAP DEVELOPED BY GEODATA CORPORATION OF ZEBULON, NC USING PHOTOGRAMETRIC METHODS FROM AERIAL PHOTOGRAPHY FLOWN ON FEBRUARY 5, 2007.
2. TOPOGRAPHIC MAP UPDATED WITH GROUND SURVEY BY BATEMAN CIVIL SURVEY COMPANY, PC OF HOLLY SPRINGS, NC ON OCTOBER 26, 2008.
3. PROPERTY BOUNDARY OBTAINED FROM EDGECOMBE COUNTY GIS DEPARTMENT.

GRAPHIC SCALE

200 0 100 200

(IN FEET)



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NO.	DATE	DESCRIPTION	BY

PROPOSED GRADING
BORROW AREA

EDGECOMBE COUNTY LANDFILL
TARBORO, NORTH CAROLINA

DRAWN BY: JMB	CHECKED BY:
DESIGNED BY:	APPROVED BY:
PROJECT NUMBER: 1054-07-241A	
SCALE: 1" = 100'	DATE: MARCH 2009
DRAWING NUMBER: D-1084	
FIGURE: 1	OF: 1

S:\PROJECTS\2007\07-241 Edgecombe-Axsel of Comodite Management\CADD\1084.dwg, D1084, 9/1/2009 4:16:28 PM, 1:1

APPENDIX III-E

Closure Cost Estimate

TABLE A
CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-13-277A

Date: August 2014

General Site Information

Cap System Construction		
Total area Requiring Closure	21.4	ac
Area of Landfill Requiring Regrading and Cover Material (10 Percent of the Closure Area)	2.1	ac
Volume of Soil required for 18-inch Low Permeability Layer	51,790	cy
Volume of Soil required for 18-inch Vegetation/Erosion Layer	51,790	cy
Stormwater Downslope Pipes	1,170	lf
Slope Diversion Berms	8,490	lf
Perimeter Channels	730	lf
Gas Well System		
Number of Gas Wellhead Extensions	18	ea

Closure Cost Estimate

	Quantity	Unit	Unit Price	Total
Task 1- Engineering Services				
Prepare Construction Drawings and Specifications	1	lump sum	$10,000	$10,000
Bid Process (Including Announcements)	1	lump sum	$5,000	$5,000
			Subtotal Task 1 =	**$15,000**
Task 2 - Mobilization				
Mobilization/Demobilization (5% of Construction Cost)	1	lump sum	$32,060	$32,060
Construction and Record Surveying and Deed Notation	21.4	acre	$1,350	$28,890
			Subtotal Task 2 =	**$60,950**
Task 3 - Low Permeability Layer				
Regrade Existing C&D Waste and Complete Intermediate Cover	2.1	acre	$750	$1,575
Place 18-inch Low Permeability Layer	51,790	cy	$5.50	$284,845
			Subtotal Task 3 =	**$286,420**
Task 4 - Vegetation/Erosion Layer				
Place 18-inch Vegetation/Erosion Layer	51,790	cy	$4.75	$246,003
Seeding and Fertilizing the Topsoil Layer	21.4	acre	$1,200	$25,680
			Subtotal Task 4 =	**$271,683**
Task 5 - Surface Drainage Structures				
Downslope Pipes	1,170	lf	$15.00	$17,550
Slope Diversion Berms	8,490	lf	$6.00	$50,940
Perimeter Channels	730	lf	$20.00	$14,600
			Subtotal Task 5 =	**$83,090**
Task 6 - Landfill Gas Collection System				
Decommission Containerized LFGTE Facility (pipes & sump)	1	ea	$2,000.00	$2,000
Decommission Blower Flare Skid, Condensate Pipes & Storage Tanks	1	ea	$2,500.00	$2,500
Decommission LFG Header/Lateral Pipes & Condensate Sumps	1	ea	$8,000.00	$8,000
Install Gas Wellhead Extensions (Convert to Passive Vents)	48	ea	$500.00	$24,000
			Subtotal Task 6 =	**$36,500**
Task 7 - CQA and Certification				
Low Permeability Layer CQA	140	hrs	$45.00	$6,300
Low Permeability Layer Laboratory Testing	6	ea	$300.00	$1,800
Erosion Layer CQA	120	hrs	$45.00	$5,400
Erosion Layer Laboratory Testing	6	ea	$100.00	$600
Gas System CQA	120	hrs	$45.00	$5,400
CQA Project Management	100	hrs	$85.00	$8,500
CQA Report and Certification	1	lump sum	$10,000	$10,000
			Subtotal Task 7 =	**$38,000**
			Project Subtotal=	**$791,642**
Contingency Fee (10%)	1	10% total	$79,164	$79,164
			Project Total=	**$870,806**
			Cost Per Acre=	**$40,692**

APPENDIX IV-E

Post-Closure Monitoring Form

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date: _____ Observation Personnel: _____

_____

Time: _____ _____

_____

Observed Weather Conditions: _____

SITE SECURITY
Condition of Fences, Gates, Locks:
Evidence of vandalism (wells, vents, protective cover damage):
Evidence of penetrations (poles, posts, stakes):
Evidence of human encroachment (trash, fire pits, tire/footprints):
General site condition:
Additional Comments:

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM **Date** _____

COVER SYSTEM
Evidence of erosion, settlement, rutting, potholes:
Evidence of cover system intrusion (ruts, burrows, excavation):
Evidence of stressed vegetation or bare spots. Evidence of woody vegetation (small trees and/or shrubs):
Condition of storm water channels, talk-on benches, drainage swales, down drain pipes – sings of erosion or sedimentation?:
Sediment basin, sediment traps – evidence of erosion, sedimentation, sediment accumulation:
Additional Comments:

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM **Date** _____

METHANE GAS MONITORING WELLS
Evidence of damage to probes or surrounding area (cracking, misalignment, missing pieces):
Evidence of cover system subsidence or upheaval near probes:
Evidence of wildlife intrusion (nests, burrows, wasp nests):
Evidence of spilled liquids (probe tampering):
GAS PROBES: Probe covers in place & secure:
Additional Comments:

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM **Date** _____

ACTIVE LANDFILL GAS COLLECTION SYSTEM
Evidence of damage to wells, piping, valves, sumps, condensate tank, flare, or surrounding area (cracking, misalignment, missing pieces):
Evidence of cover system subsidence or upheaval near wells, piping, valves, or sumps:
Evidence of wildlife intrusion (nests, burrows, wasp nests):
Evidence of spilled liquids (wells, sumps, and condensate tank):
GAS WELLS: Unusual conditions – belching, whistling, excessive gas (odor) production:
GAS PIPING: Doe the piping still have positive drainage toward the sumps:
Additional Comments:

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

GROUNDWATER MONITORING WELLS
Evidence of damage to wells or surrounding area (cracking, misalignment, missing pieces):
Evidence of cover system subsidence or upheaval near wells:
Evidence of wildlife intrusion (nests, burrows, wasp nests):
Evidence of spilled liquids (well tampering):
Well covers in place & secure:
Additional Comments:

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM

Date _____

OTHER

EDGECOMBE COUNTY C&D LANDFILL

POST-CLOSURE MONITORING FORM **Date** _____

PHOTOGRAPHIC LOG

Photograph No.	Description
1:	
2:	
3:	
4:	
5:	
6:	
7:	
8:	
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10:	
11:	
12:	
13:	
14:	
15:	
16:	
17:	
18:	
19:	
20:	

APPENDIX V-E

Post-Closure Cost Estimate

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill Date: August 2014
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-13-277A

General Site Information

Post-Closure Monitoring and Maintenance

Total Area Requiring Post-Closure (Permitted Area)	68.0	ac
Post-Closure Period	30	years
Number of Groundwater Monitoring Wells	7	ea
Number of Gas Monitoring Probes	11	ea
Number of Surface Water Sampling Points	2	ea

	Quantity	Unit	Unit Price	Total
Task 1 - Groundwater and Surface Water Sampling and Analysis				
Sampling Crew (2 man crew)	48	hours	$75	$3,600
Equipment	1	lump sum	$1,301	$1,301
Laboratory Analysis	1	lump sum	$3,600	$3,600
Report (Includes Surface Water Reporting)	1	lump sum	$5,750	$5,750
Project Coordination	1	lump sum	$1,000	$1,000
			Cost per Sampling Event =	$15,251
Cost for Groundwater Monitoring for Post-Closure Period	60	events	$15,251	$915,075
(Assuming Biannual Sampling Frequency or 60 Sampling Events)			**Subtotal Task 1 =**	**$915,075**
Task 2 - Gas Probe Monitoring				
Sampling Crew (1 man crew)	8	hours	$75	$600
Project Management and Report	1	lump sum	$175	$175
Equipment and Expenses	1	lump sum	$250	$250
			Cost per Sampling Event =	$1,025
Cost for Gas Probe Monitoring for Post-Closure Period	120	events	$1,025	$123,000
(Assuming Quarterly Sampling Frequency or 120 Sampling Events)			**Subtotal Task 2 =**	**$123,000**

Task 3 - Erosion and Settlement Repairs

Assume that 10% of the post-closure area will require repair in the first 5 years from erosion and settlement at an average depth of 1.0' (6.8 ac @ 1.0 ft deep = 10,971 cy). Assume that 5% of the post-closure area will require repair repair from settlement and erosion for the remaining post-closure period. (3.4 ac @ 1.0 ft deep = 5,485 cy)

Erosion and Settlement Repair	16,456	cy	$6.00	$98,736
Reseeding	10.2	ac	$1,200	$12,240
			Subtotal Task 3 =	**$110,976**

Task 4 - Reseeding and Fertilizing

Assume that the post-closure area will require reseeding and fertilizing of 30% of the post-closure area annually for the first 2 years of the post-closure period. For the remaining 28 years, it is assumed that 5% of the post-closure area will require reseeding and fertilizing annually (2 years * 0.30 * 57.9 ac/year = 57.9 ac) + (28 years * 0.05 * 57.9 ac = 81.1 ac).

Reseeding and Fertilizing	136.00	ac	$1,200	$163,200
			Subtotal Task 4 =	**$163,200**

Task 5 - Mowing

Assume the post-closure area will be mowed 2 times each year during the post-closure period.

Mowing	68.0	ac	$50	$3,400
			Cost per Event =	$3,400
Cost for Mowing for Post-Closure Period	60	events	$3,400	$204,000
(Assuming Biannual or 60 Events)			**Subtotal Task 5 =**	**$204,000**

TABLE B
POST-CLOSURE COST ESTIMATE
PROJECT NAME: Edgecombe County C&D Landfill Date: August 2014
DESCRIPTION: Closure Cost Estimate
CLIENT: Edgecombe County
PROJECT NO.: 1054-13-277A

Task 6 - Surface Water Control Structures Maintenance
Assume the surface water control structures will be maintained on an annual basis at an estimated cost of $100 per hour.

Surface Water Control Structure Maintenance	20	hr	$100	$2,000
			Cost per Event =	$2,000
Cost for Surface Water Control Structure Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 6 =	**$60,000**

Task 7 - Security and Maintenance
Assume that the annual cost for security, fencing repairs, gate repairs, road maintenance and signs is $2,000.

Cost for Security and Maintenance for Post-Closure Period	30	events	$2,000	$60,000
			Subtotal Task 7 =	**$60,000**

Task 8 - Groundwater Monitoring Well Repair
Assume the annual cost for groundwater well repair is $2,000.

Cost for Groundwater Well Repair for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$2,000	$60,000
			Subtotal Task 8 =	**$60,000**

Task 9 - Gas System Repair and Maintenance
Assume that 10 gas vents at an average depth of 50 feet will be replaced during the post-closure period. Assume that 10 gas monitoring probes will be replaced during the post-closure period. Assume the gas system will require 100 hours per year to complete.

Gas Vent Replacement	50	ft	$70.00	$3,500
Gas Monitoring Probe Replacement	1	ea	$750.00	$750
			Cost per Event =	$4,250
Cost for Gas Vent and Gas Probe Replacement for Post-Closure Period (Assuming 10 Events)	10	events	$4,250	$42,500
			Subtotal =	**$42,500**
Gas System Monitoring and Maintenance	100	hrs	$40.00	$4,000
			Cost per Event =	$4,000
Cost for Gas System Monitoring and Maintenance for Post-Closure Period (Assuming Annual or 30 Events)	30	events	$4,000	$120,000
			Subtotal =	**$120,000**
			Subtotal Task 9 =	**$162,500**
			Post-Closure Subtotal=	**$1,858,751**
Contingency Fee (10%)	1	10% total	$185,875	$185,875
			Post-Closure Total=	**$2,044,626**

APPENDIX VI-E

Construction Quality Assurance Plan

CONSTRUCTION QUALITY ASSURANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

S&ME Project No. 1054-13-277A

Prepared for:

Edgecombe County
P.O. Box 10
Tarboro, North Carolina 27886

Prepared by:

S&ME, Inc.
3201 Spring Forest Road
Raleigh, North Carolina 27616

June 2014

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CONSTRUCTION QUALITY ASSURANCE PLAN
EDGECOMBE COUNTY C&D LANDFILL
(PERMIT # 33-01)
TARBORO, NORTH CAROLINA

1. PROJECT TEAM AND RESPONSIBILITIES

The Edgecombe County Construction and Demolition (C&D) landfill closure shall be observed in general accordance with the guidelines outlined in this Construction Quality Assurance (CQA) Plan. The landfill closure activities include, but are not limited to, installing: structural fill material; a low-permeability barrier; high density polyethylene (HDPE) piping; and, erosion control structures. Observing the closure activities for quality shall be provided by an engineering and testing firm independent of the Contractor who specializes in the construction installation observations and testing of soils, geosynthetics, piping, and erosion control measures. Applicable sections of the Technical Specifications for the Edgecombe County C&D Landfill Closure shall be adhered to for required construction and testing activities. Testing methods and procedures listed in this plan shall be performed according to the current methods and procedures at the time closure is implemented.

1.1 CQA Project Team

1.1.1 Design Engineer of Record (Engineer)

The Engineer is:

S&ME, Inc.
3201 Spring Forest Road
Raleigh, NC 27616
(919) 872-2660

The Engineer is responsible for reviewing and approving shop drawings, design changes (as approved by the State Solid Waste Section), clarifications, and specification addenda. The responsibility to stop work is held by the Owner.

1.1.2 CQA Consultant

CQA Consultant is the person or persons responsible for observing and documenting all construction activities described on and in the Contract Drawings and Specifications. The CQA Consultant and the Engineer can be one in the same. The CQA Consultant is responsible for preparing quality assurance memorandums and quality assurance reports. The CQA Consultant shall review field and laboratory test data before the data are reported or entered into the data base for analysis. CQA documents shall be prepared, signed, and sealed by a registered Professional Engineer in the State of North Carolina. The CQA Consultant will report to Edgecombe County.

1.1.3 Construction Quality Assurance Officer (CQAO)

The Construction Quality Assurance Officer (CQAO) works for the CQA Consultant and shall be experienced in quality assurance testing and observing. The CQAO serves as the on-site representative of the Owner and is responsible for the field implementation of the approved quality assurance program as follows:

- Observe the quality assurance activities of the field testing for conformance with test procedures and the Technical Specifications of the Edgecombe County C&D Landfill Closure;
- Inform the CQA Consultant of non-conformance to the approved CQA program;
- Inventory of construction materials delivered to the site for use on this project;
- Assign and direct field technicians; and
- Maintain an awareness of the overall field testing operation to identify conditions that may jeopardize the quality of testing.

1.1.4 CQA Technicians

The CQA technicians (technicians) are responsible for field observations and testing under the direction of the CQAO. Technicians will be assigned to the project as deemed necessary by the CQAO. Technicians will be under the direct supervision of the CQAO.

1.2 Pre-Construction Meeting

A pre-construction meeting shall be conducted prior to the start of construction. The meeting shall include, but not be limited to, discussion of:

- Project safety;
- The construction management organization;
- Respective duties of the construction management organization and the Contractors;
- Proposed construction schedule;
- Testing requirements and procedures; and
- The periodic reporting requirements for test results and construction activities.

1.3 Progress Meetings

Progress meetings will be held on a weekly basis, or as needed, between the Owner, CQA Consultant, the CQAO, the Contractor, and representatives of other involved parties. The status of the project, planned activities for the following week, and construction related issues will be discussed.

1.4 Troubleshooting Meetings

If problems develop or should deficiencies arise during construction, troubleshooting meetings shall be held between the Owner, CQA Consultant, the CQAO, the Contractor, Engineer, if necessary, and representatives of other involved parties. The problem(s) shall be defined and a resolution shall be discussed within a time frame that does not pose substantial delays to the schedule.

2. STRUCTURAL FILL

2.1 Material

Structural fill is defined as compacted fill required for landfill closure grading including perimeter berms and excluding the low permeability barrier and erosion layer. Structural fill may consist of on-site or off-site soils that are relatively free of organic material, refuse, or debris and shall be constructed and compacted so as to meet the requirements outlined in **Section 02320** of the Technical Specifications for the Edgecombe County C&D Landfill Closure.

2.2 Construction

Structural fill shall be compacted in lifts not exceeding 6 inches compacted thickness. The CQA Consultant may modify maximum allowable lift thickness depending on soil type used, construction equipment, and compaction methods employed.

2.3 Observations

Prior to fill placement, the base surface or surface of the previous lift shall be visually observed. If present, obvious problems, not limited to wet areas, vegetative cover, surface debris, or organic rich materials shall be reported to the CQA Consultant and corrected before proceeding with placement of a new lift of fill material. Borrow soils used for construction shall be observed to evaluate that they are relatively free of deleterious materials and that they meet the Technical Specifications requirements for the Edgecombe County C&D Landfill Closure. During fill placement, observations of lift thickness and uniform mixing of soils shall be performed.

2.4 Testing

The CQAO or his CQA technician representative shall observe the construction of the structural fill and perform field and laboratory tests to verify that the soils and construction methods are capable of meeting the specification performance criteria outlined in the Technical Specifications for the Edgecombe County C&D Landfill Closure.

2.4.1 In-Place Testing

In-place Sampling and testing of the structural fill shall be as follows:

Test	*ASTM Method*	*Frequency*
Field Density	D-2937 or D-6938 or D-1556	Once per acre per lift.
Natural Moisture Content	D-2216	At every density test location.

2.4.2 Laboratory Testing

Laboratory testing shall be conducted on samples including:

Test	*ASTM Method*	*Frequency*
Standard Proctor	D-698	Once per every 10,000 cubic yards at stockpile or borrow area.
Atterberg Limits	D-4318	Once per every 10,000 cubic yards at stockpile or borrow area.
Grain Size with Hydrometer	D-422	Once per every 10,000 cubic yards at stockpile or borrow area.
Water (Moisture) Content	D-2216	Once per every 10,000 cubic yards at stockpile or borrow area.

3. LOW PERMEABILITY BARRIER

The final cover system consists of an 18-inch thick low permeability soil barrier overlain by an 18-inch thick erosion layer.

3.1 Material

The low permeability barrier will consist of on-site or off-site soils meeting the requirements outlined in Technical Specification **Section 02321** for the Edgecombe County C&D Landfill Closure.

3.2 Stockpiling, Borrow Area, and Material Approval

Material to be used as the low permeability barrier shall be approved in advance by the CQA Consultant. Final acceptance of low permeability barrier material is based on upon successful completion of CQA testing outlined herein and in the Technical Specifications for the Edgecombe County C&D Landfill Closure. Such testing can be performed either during excavation and stockpiling or from existing stockpiles prior to their use.

The procedure for testing during excavation and stockpiling is outlined below:

- Soil shall be observed either at the borrow source or the stockpile area. Unsuitable material shall be routed to separate stockpiles consistent with its end use.
- During stockpiling operations, one bulk sample shall be collected for every 3,000 cubic yards of material stockpiled and tested in accordance with **Section 3.4** below.

A test pad shall be constructed in accordance with Technical Specification **Section 02321** for the Edgecombe County C&D Landfill Closure to evaluate soil suitability and a range of allowable compaction moisture contents.

Approval reports for the material to be used as the low permeability barrier shall be prepared by the CQA Consultant and shall include a summary of laboratory test data; a drawing showing sample and test locations and limits of stockpile or borrow area investigated; and a summary of construction, sampling and testing methods, and recommendations.

3.3 Construction

The low permeability barrier shall be at least 18 inches thick with a maximum hydraulic conductivity of 1.0×10^{-5} cm/sec and shall be placed and in three 6-inch compacted lifts in accordance with Technical Specifications **Section 02321** for the Edgecombe County C&D Landfill Closure. Only soil previously approved by the CQA Consultant shall be used in construction of the low permeability barrier. Unsuitable material shall be removed.

Required field density, moisture content, Atterberg limits, and permeability tests shall be completed before overlying lifts of soil are placed. The surface preparation (i.e. wetting,

drying, scarification, etc.) shall be completed before the CQA Consultant shall allow placement of subsequent lifts.

Moisture content shall be observed by the CQAO or his representative prior to compaction as described in **Section 3.4**. If the soil is below the specified minimum moisture content, water shall be added to the lift and the lift shall be disced to distribute the moisture evenly. Conversely, if the soil is above the maximum specified moisture content, the soil shall be disced and dried to within acceptable moisture limits. The surface of each lift shall be scarified prior to placement of subsequent lifts.

The thickness of loose lifts shall be measured at random locations after spreading and leveling is completed. Final compacted lift thickness should not exceed 6 inches. Lifts shall be checked visually for oversized particles which are greater than 1 inch in any dimension. Oversized particles shall be identified and removed prior to and during the compaction process.

The exposed surface of the low permeability barrier shall be rolled with a smooth drum roller or equivalent at the end of each work day or when required for protection from adverse weather conditions. The low permeability barrier shall be either overbuilt a thickness of at least 3 inches or covered with a sacrificial 10 mil plastic sheeting to protect the finished surface from erosion, desiccation, or other damage. Overbuilt conditions are not reflected on construction drawing grading plans.

3.4 Testing

The CQAO or his technician shall observe the construction of the low permeability barrier and perform field and laboratory tests to verify that the soils and construction compaction methods are capable of meeting the specification performance criteria.

3.4.1 In-Place Testing

In-place sampling and testing of the low permeability barrier shall be as follows:

Test	*ASTM Method*	*Frequency*
Field Density	D-2937 or D-6938 or D-1556	Once per every other 100 foot by 100 foot grid per lift. Adjacent grids shall have alternate lifts tested.
Natural Moisture Content	D-2216	At every density test location and at least once per every 800 cubic yards placed.

3.4.2 Laboratory Testing

Laboratory testing shall be conducted on samples including:

Test	*ASTM Method*	*Frequency*
Standard Proctor	D-698	Once per every 3,000 cubic yards at stockpile or borrow area.
Atterberg Limits	D-4318	Once per every 3,000 cubic yards at stockpile or borrow area.
Grain Size with Hydrometer	D-422	Once per every 3,000 cubic yards at stockpile or borrow area.
Remolded Permeability	D-5084	Once per every 3,000 cubic yards at stockpile or borrow area.

4. HDPE AND PVC PIPES

HDPE piping shall be used as part of the active landfill gas collection system.

4.1 Material

HDPE and PVC pipes consist of perforated and non-perforated piping and pipe fittings. Pipe thickness and perforation size and orientation shall be a shown on the drawings.

4.2 Pipe Manufacturer and Contractor Submittals

The supplier of the HDPE and PVC pipe shall provide the CQAO with the manufacture's Technical Specifications for the Edgecombe County C&D Landfill Closure and quality control information.

4.3 Pipe Installation

Butt fusion welding or mechanical connecting of the pipe shall be observed by the CQAO or his representative.

5. LANDFILL GAS SYSTEM VALVES

Landfill gas system valves shall be used as part of the active landfill gas collection system.

5.1 Material

Valves shall be constructed to be suitable for the intended service.

5.2 Valve Manufacturer and Contractor Submittals

The supplier of the valves shall provide the CQAO with the manufacture's Technical Specifications for the Edgecombe County C&D Landfill Closure and quality control information.

5.3 Valve Installation

Installation of the valves shall be observed by the CQAO or his representative.

6. EROSION LAYER

The erosion layer consists of 12 inches of structural fill overlain by 6 inches of vegetative cover as outlined in Technical Specification **Section 02320** for the Edgecombe County C&D Landfill Closure.

6.1 Material

Structural fill is defined as compacted fill required for landfill closure grading including erosion soil layer and perimeter berms and excluding the low-permeability barrier and vegetative cover. Structural fill may consist of on-site or off-site soils that are relatively free of organic material, refuse, or debris and shall be constructed and compacted so as to meet the requirements outlined in **Section 02320** of the Technical Specifications for the Edgecombe County C&D Landfill Closure.

Vegetative cover is defined as soil fill capable of sustaining vegetation.

6.2 Construction

Structural fill shall be compacted in lifts not exceeding 6 inches in compacted thickness. The CQA Consultant may modify maximum allowable lift thickness depending on soil type used, construction equipment and compaction methods employed, provided the required compaction can be achieved.

Vegetative cover shall be placed in one lift and tracked in with a dozer or backhoe.

6.3 Observations

Prior to fill placement, the base surface or surface of the previous lift shall be visually observed. The borrow soils used for construction shall be observed to evaluate that they are relatively free of deleterious materials and meet the specification requirements. During fill placement, observations of lift thickness and uniform mixing of soils shall be performed.

6.4 Testing

The CQAO or his CQA representative shall observe the construction of the erosion layer and perform field and laboratory tests on the structural fill portion of the erosion layer to verify that the soils and construction methods are capable of meeting the specification performance criteria.

6.4.1 In-Place Testing

In-place Sampling and testing of the structural fill pertaining to landfill cap construction shall be as follows:

Test	*ASTM Method*	*Frequency*
Field Density	D-2937 or D-6938 or D-1556	Once per acre per lift
Natural Moisture Content	D-2216	At every density test location

6.4.2 Laboratory Testing

Laboratory testing shall be conducted on structural fill samples including:

Test	*ASTM Method*	*Frequency*
Standard Proctor	D-698	Once per every 10,000 cubic yards at stockpile or borrow area.
Atterberg Limits	D-4318	Once per every 10,000 cubic yards at stockpile or borrow area.
Grain Size with Hydrometer	D-422	Once per every 10,000 cubic yards at stockpile or borrow area.
Water (Moisture) Content	D-2216	Once per every 10,000 cubic yards at stockpile or borrow area.

7. RECORD CONDITIONS

The finished lines and grades of the surface of the erosion layer shall be presented to the CQA Consultant by the Contractor. The submittal shall include the survey coordinates relative to the State Plane coordinate system datum NAD 83 for horizontal and the vertical relative to NGVD 29. Final topographic surveys for the top of subgrade, top of low permeability barrier, and top of erosion layer should be performed in the same grid locations as established for density testing, and shall include points at the top and bottom of slopes with a minimum of one point on the slope in between and grade breaks at benches.

Record location and details with survey coordinates of the stormwater systems and active landfill gas collection system will also be submitted to the CQA Consultant by the Contractor.

The Contractor shall be responsible for submitting in hard copy and electronic file (compatible to the system utilized by the CQA Consultant) to the CQA Consultant the following:

- Survey drawings verifying that finished lines and grades of the soil cover have been obtained;
- All material certifications and warranty information for the installed material and equipment;
- Active landfill gas collection system; and
- Installed stormwater structure elevations and locations.

8. CERTIFICATION REPORT

The certification report shall be prepared under the direction of the CQA Consultant and shall contain test results and observation documentation performed for construction including:

- Low permeability barrier;
- Erosion layer.

Record drawings and a narrative of the construction process and CQA activities, including daily reports from the CQAO and documentation of progress meetings, shall be included with the certification report. Photographs of key elements for landfill construction shall also be included in the certification report.

The certification report shall be submitted within 60 days following completion of construction.

9. REFERENCED LIST OF STANDARDS

ASTM D422	Standard Test Method for Particle - Size Analysis of Soils
ASTM D698	Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft 3) (600 KN-m/m 3)
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
ASTM D2937	Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method
ASTM D4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D5084	Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D6938	Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)

APPENDIX VII-E

Technical Specifications

TECHNICAL SPECIFICATIONS

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DIVISION 1 - GENERAL REQUIREMENTS

SECTION 01100
SUMMARY

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Definitions for Reference.
2. Contract Description.
3. Qualifications.
4. Contractor's use of site.
5. Work Sequence.
6. Owner occupancy.

1.2 DEFINITIONS FOR REFERENCE

A. Atterberg Limits: the liquid limit and plastic limit (ASTM D4318).

B. Authorized Representative: shall mean the CQA Consultant or his authorized agent of who has the authority to approve construction quality assurance testing on behalf of the Owner.

C. Classification System: the soil classification system shall be in accordance with the standard test method for classification of soils for engineering purposes (ASTM D2487).

D. Compaction: the process of increasing the dry density or unit weight of soil by rolling, tamping, vibrating, or other mechanical means. Compaction tests are determined by the Sand Cone Method (ASTM D1556), Drive Cylinder Method (ASTM D2937), or Nuclear Density Gauge (ASTM D6938).

E. Contract: either a purchase order placed by "Owner" and accepted by "Contractor" together with these Specifications and all other documents referred to in such purchase order, or a formal contract executed by "Owner" and "Contractor", together with these Specifications and all other documents referred to in such a formal contract.

F. Contractor: the organization that will be retained by the "Owner" for all construction activities (i.e.: site preparation, earthwork construction, etc.) in accordance with the design and construction criteria, drawings, and specifications. The "Contractor" shall submit all the shop drawings and other necessary documents for approval by the "Engineer". The "Contractor" is also responsible for cooperating with the "CQA Consultant" to help conduct all CQA observation and testing.

G. CQA: Construction Quality Assurance.

H. CQA Consultant: The CQA Consultant is the person or persons employed by the Owner and is responsible for observing and documenting all construction activities described on and in the Contract Drawings and Technical Specifications.

I. CQAO: Construction Quality Assurance Officer, employed by the CQA Consultant.

J. CQA Technicians: personnel responsible for field observations and testing under the direction of the CQAO.

K. Density: mass density of a soil is its weight per unit volume; usually reported in pounds per cubic foot. Maximum dry density as determined by Standard Proctor Test (ASTM D698) or Modified Proctor Test (ASTM D1557).

L. Dewatering: process of lowering the groundwater level or removing surface water from the construction area to permit construction activities to proceed "in the dry".

M. Engineer: the authorized representative or registered professional engineer who is employed by the Owner to review and approve shop drawings, design changes (as approved by the State Solid Waste Section), clarifications, and specification addenda.

N. In-Situ: "As is", or as it exists in-place naturally.

O. Manufacturer: the organization(s) that will manufacture and supply the geosynthetic materials for this project.

P. Minimum Average Roll Value (MARV): the minimum average value of a particular physical property of a material, for 95 percent of all of the material in the lot.

Q. Moisture Content: ratio of quantity of water in the soil (by weight) to the weight of the soil solids (dry soil), expressed in percentage; also referred to as water content (ASTM D2216).

R. NCDOT: North Carolina Department of Transportation.

S. Optimum Moisture Content (OMC): moisture content corresponding to maximum dry density as determined by the Standard Proctor Test (ASTM D698) or Modified Proctor Test (ASTM D1557).

T. Overlap: the distance measuring perpendicular from the overlying edge of one roll of material to the underlying edge of the adjacent roll of the same material.

U. Owner: the entity who possesses the landfill. The Owner has the authority to select and dismiss the Contractor, the Liner Installer, and/or the Manufacturer. The Owner also has the authority to accept or reject design plans and specifications, recommendations of the Engineer and CQA Consultant, the materials supplied, and the workmanship of the “Contractor(s)”.

V. Permeability: ability of pore fluid to travel through a soil mass via interconnected voids. "High" permeability indicates relatively rapid flow of pore fluid and vice versa. Coefficients of permeability are generally reported in centimeters per second (cm/sec) and are determined by a flexible wall permeameter test (ASTM D5084).

W. Plasticity: ability of a soil mass to be remolded without raveling or breaking apart. The plasticity index, numerically equal to the difference between the liquid and plastic limit, is a comparative number which describes the range of moisture contents over which a soil behavior is plastic.

X. Work: any and all labor, supervision, services, materials, supplies, utilities, machinery, equipment, tools, and facilities called for by the “Contract”.

1.3 CONTRACT DESCRIPTION

A. Work of the Project includes and consists of furnishing all labor, materials, supervision, equipment, and services necessary to complete the construction of the landfill closure and all associated facilities and structures. The work will include installation of: (i) required Erosion and Sedimentation (E&S) Control measures; (ii) low permeability soil liner; (iii) erosion and

vegetative soil layers; (iv) landfill gas wells; and (v) all incidental items necessary to complete this work.

B. Perform Work of Contract under stipulated sum with Owner in accordance with Conditions of Contract.

C. Work of Contract shall be constructed to the lines and elevations as shown on the Drawings and as identified in these Technical Specifications. Any deviations from the Drawings or Technical Specifications require the prior written approval of the Engineer and State Solid Waste Section and must be documented by "record" revisions to the Drawings and/or Technical Specifications.

D. During all phases of construction, construction will be observed, tested, and evaluated prior to approval.

1.4 CONTRACTOR AND SUBCONTRACTOR QUALIFICATIONS

A. General Contractor (Contractor):
1. The Contractor must be qualified and experienced in construction work. Contractors must provide a list of three construction projects which include grading completed within the last five years, including brief project descriptions along with names, addresses and phone numbers of contact persons relative to each project.
2. The Contractor shall provide a full-time Health & Safety professional on-site during construction activities.

B. Surveyor:
1. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

1.5 CONTRACTOR'S USE OF SITE

A. Limit use of site and premises to allow:
1. Owner occupancy.

B. Access to site: as established by the Owner.

C. Construction Operations limited to areas noted on Drawings.

D. Time Restrictions for Performing Work:
1. In accordance with Owner’s designated schedule or as otherwise agreed upon by the Owner.

1.6 WORK SEQUENCE

A. General Order of Construction. During and prior to construction period, coordinate construction schedule and operations with Owner, CQA Consultant, and any other applicable parties.
1. Installation of required E&S Control Measures/Devices.
2. Place low permeability soil liner.
3. Place erosion and vegetative soil layers.
4. Install landfill gas wells.
5. Grade perimeter berms and roadways.

1.7 OWNER OCCUPANCY

A. Access must be maintained for other site activities.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations. Primary Owner operation includes work associated with support facilities. Lay down space and Contractor movement on the site must be accommodated.

C. Schedule the Work to accommodate Owner occupancy.

END OF SECTION

SECTION 01200
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Allowances.
2. Applications for payment.
3. Change Procedures.
4. Defect Assessment.
5. Unit prices.
6. Alternates.

1.2 ALLOWANCES

A. OVERHEAD AND PROFIT
1. Allowance for overhead and profit combined shall not exceed fifteen percent (15%) of the net cost except where the change involves a subcontractor; allowances shall not exceed fifteen percent (15%) for the subcontractor and seven and one-half percent (7-1/2%) for the Prime Contractor.
2. Work covered by unit prices will have no allowance for overhead and profit.
3. In the case of deductible Change Orders other than for unit prices, the Contractor shall include not less than ten percent (10%) profit but no allowance for overhead.

1.3 APPLICATIONS FOR PAYMENT

A. The Contractor shall submit to the CQA Consultant an original itemized Application for Payment, notarized, in accordance with EJCDC Document C-700, supported by such data substantiating the Contractor's right to payment as the Owner or the CQA Consultant may require, and reflecting retainage amounts as indicated elsewhere in the documents. This Application for Payment will be submitted on a date to be mutually agreed upon by all Prime Contractors, the CQA Consultant, and the Owner at preconstruction conference.

B. The Contractor shall include in his Contract Sum and shall pay all County, State and Federal Sales or Use Taxes applicable to performance of the Work. The Contractor shall submit with each payment request, submitted on quarter months, an original notarized statement showing all taxes paid on the project. The statement shall list each subcontractor and supplier by name and the amount of Sales Tax paid to and by each of them and the total amount of Sales Tax paid.

C. Applications for Payment shall be accompanied by a North Carolina Local Sales or Use Tax Statement. This statement shall be submitted on the forms provided by the Owner and shall show the North Carolina, County, and/or Local Sales Tax and any other applicable Taxes paid. It shall also list any payments made directly to the North Carolina Department of Revenue. If no sales tax has been paid, "NONE" shall be entered on the statement form.

D. When requesting payment for materials stored, the Contractor shall submit with his request a Certificate of Insurance showing proof of coverage for the materials. Payment will be made for up to ninety percent (90%) of invoice amount only for the stored materials. No payment will be made for anticipated overhead and profit. Requests for payment for materials stored shall be accompanied by the supplier's invoices, or other indications of the value of the stored materials, satisfactory to the Owner. The Contractor shall notify the CQA Consultant of this intention to bill

for stored materials seven (7) days prior to the normal billing date and will reimburse the Owner for costs incurred upon reviewing stored materials.

1.4 CHANGE PROCEDURES

A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or subcontractors of changes to the Work.

B. The CQA Consultant will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time.

C. The CQA Consultant may issue a Notice of Change including a detailed description of proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change, and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate within three days.

D. Contractor may propose changes by submitting a request for change to Engineer, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. Document requested substitutions in accordance with **Section 01600**.

E. Work Directive Change: CQA Consultant may issue directive instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.

1.5 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the CQA Consultant and/or Owner, it is not practical to remove and replace the Work, the CQA Consultant will direct appropriate remedy or adjust payment.

C. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.

D. Authority of CQA Consultant and/or Owner to assess defects and identify payment adjustments is final.

E. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from transporting vehicle.
4. Products placed beyond lines and levels of required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling, and disposing of rejected products.

1.6 UNIT PRICES

A. Unit Quantities

1. Measurement methods delineated in individual specification sections complement criteria of this section. In event of conflict, requirements of individual specification section govern.
2. Take measurements and compute quantities. CQA Consultant will review measurements and quantities.
3. Quantities and measurements indicated in Bid Form and/or Contract Documents are for contract purposes only. Quantities and measurements supplied or placed in the Work shall determine payment. Final payment for Work governed by unit prices will be made on basis of actual measurements and quantities accepted by CQA Consultant multiplied by unit sum/price for Work incorporated in or made necessary by the Work.
   a. When actual Work requires more or fewer quantities than those quantities indicated, provide required quantities at unit prices contracted.
   b. When actual Work requires 30 percent or greater change in quantity than those quantities indicated, Owner or Contractor may claim for Contract Price adjustment.

B. Unit Prices
1. Payment Includes: Full compensation for required labor, products, tools, equipment, plant and facilities, transportation, services and incidentals; erection, application or installation of item of the Work; overhead and profit.
2. Specific Item Unit Pricing is delineated in the individual specification sections.
3. Mobilization
   a. Basis of Measurement: By lump sum.
   b. Basis of Payment: Includes mobilization for the project.
4. Surveying
   a. Basis of Measurement: By lump sum.
   b. Basis of Payment: Includes surveying to the locations and grades according to the plans and providing record drawings, and any incidentals in completing the contract.

1.7 ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work.

END OF SECTION

SECTION 01300
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project Meetings.
2. Submittal procedures.
3. Construction progress schedules.
4. Health & Safety Professional.
5. Administrative Submittals

1.2 PROJECT MEETINGS

A. A pre-construction conference will be scheduled as soon as practicable after the award of the contract. The Contractor shall attend the conference along with anticipated major subcontractors. During this conference, the Contractor shall submit a list of anticipated subcontractors and major material suppliers, a detailed construction schedule, and a statement of anticipated monthly progress payments showing the percent of progress each month. The Contractor shall also provide at least two local telephone numbers that may be used to contact the Contractor or his authorized representative in the event of an emergency after normal business hours. The Contractor shall also have his prospective job Superintendent attend the pre-construction conference.

B. The Contractor shall attend all weekly progress meetings for the purpose of informing the Owner and the CQA Consultant regarding the status of the project. A person authorized to act on behalf of the Subcontractor(s) shall be present. Each representative shall be thoroughly familiar with the status of the project and shall be prepared to discuss and act upon any situations that may arise. The time, date, and location of these meetings will be established during the pre-construction conference. The Contractor shall provide an updated job progress schedule at each weekly meeting.

1.3 SUBMITTAL PROCEDURES

A. Transmit each submittal with CQA Consultant accepted form.

B. Sequentially number transmittal forms. Mark revised submittals with original number and sequential alphabetic suffix.

C. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.

D. Apply Contractor’s stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with requirements of the Work and Contract Documents.

E. Identify variations from Contract Documents and product or system limitations, which may be detrimental to successful performance of completed Work.

F. When revised for resubmission, identify changes made since previous submission.

G. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

A. The project schedule shall be developed using commercially available project scheduling software such as Microsoft Project, Primavera P3 Project Planner 3.0, or Suretrak 3.0.

B. The Contractor shall ensure schedule compatibility with Owner's integrated site schedule including but not limited to Activity Codes, Calendars, etc. Approved schedule templates are available from Owner upon request.

C. Submit initial schedules within 10 days after date of Notice to Proceed. After review, resubmit required revised data within 10 days.

D. Submit revised Progress Schedules with each Application for Payment.

E. Distribute copies of reviewed schedules to Project site file, subcontractors, suppliers, and other concerned parties.

F. In addition to the schedule updates described above Contractors shall report to the Owner immediately upon becoming aware of any circumstances which might result in deviation from the approved Project Milestone Schedule. Should the project fall behind schedule to the extent that completion of Work within the Contract Time appears doubtful, Contractor shall take corrective action to get back on schedule at no change in target price. In addition to informing the Owner and taking prompt corrective action, the Contractor shall develop and submit to the Owner a schedule Recovery Plan which identifies changes in approach, schedule sequence logic, work schedule, etc. required to meet the contract Substantial Completion. A Recovery Plan shall be developed by the Contractor by the next schedule update.

1.5 CASH FLOW SCHEDULE

A. The Contractor shall submit a cash flow schedule with the construction progress schedule. The cash flow schedule shall define on a monthly basis the estimated progress payment amount for the project duration.

B. Submit revised cash flow schedules with each Application for Payment

1.6 HEALTH & SAFETY PROFESSIONAL

A. The Contractor shall be responsible for providing a full-time Health & Safety Professional that shall be on-site during construction activities.

B. The Contractor shall provide a resume of the full-time Health & Safety Professional.

1.7 ADMINISTRATIVE SUBMITTALS: The Contractor shall submit the following within 21 days after date of Notice to Proceed. After review, resubmit required revised data within 7 days.

A. Material Handling Plan;

B. Project Work Plan;

C. List of subcontractors;

D. Employee training matrix;

E. List of non-English speaking personnel;

F. List of all chemical products that will be stored/used;

G. MSDS sheets for all chemical products;

H. List of fuel driven equipment; and

I. Contractor and subcontractor time and materials unit rates.

END OF SECTION

SECTION 01400
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Tolerances.
2. Surveying.
3. References.
4. Mock-Up Requirements.
5. Testing and observation requirements.

1.2 QUALITY CONTROL AND CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' and/or supplier's instructions, including each step in sequence.

C. When manufacturers' and/or supplier's instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify field measurements are as indicated on Construction Drawings or as instructed by manufacturer.

G. Materials stored off the site shall be stored in a bonded warehouse and shall be clearly marked as being for this project.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.4 SURVEYING

A. All field layouts shall be performed by or under the supervision of a licensed Professional Land Surveyor registered in the state where the Work is to be conducted. The Contractor shall establish and maintain a minimum of two permanent benchmarks. Horizontal and vertical locations of the benchmarks shall be recorded on the Record Drawings.

B. The Contractor will be responsible for all surveying necessary for construction including Record Drawings. A 50' X 50' grid pattern or as otherwise approved by the CQA Consultant, of ground surface elevations in the construction area shall be surveyed and reference points installed by the Contractor prior to excavation and prior to placement of the soil materials. The Record finished grades and Record Drawings shall be determined and provided by he Contractor's licensed surveyor.

C. Record Drawings for liner system construction shall include at a minimum:
1. Subgrade;
2. Low permeability soil liner;
3. Erosion and vegetative cover;
4. Perimeter berms, roads, and stormwater management features; and
5. Landfill gas wells.

D. The thickness of the soil layers (low permeability soil liner, erosion and vegetative layer) shall be determined by non-destructive survey methods by comparison of topographic survey and spot elevations of the top of subject layer to the bottom of the subject layer. All anchor trenches, berms, toes, crests and breaks-in-slope shall be surveyed, field referenced and located on Record Drawings.

1.5 REFERENCES

A. For products or workmanship specified by association, trades, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable code.

B. Obtain copies of standards where required by product specifications sections.

C. When specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Contractual relationships, duties, and responsibilities of parties in Contract, nor those of Engineer or CQA Consultant shall be altered from Contract Documents by mention or inference otherwise in reference documents.

1.6 MOCK-UP REQUIREMENTS

A. Tests will be performed under provisions identified in respective product specification sections.

1.7 TESTING AND OBSERVATION REQUIREMENTS

A. Testing and observation services for the purpose of conducting tests shall be performed by the CQA Consultant as required by the project Construction Quality Assurance (CQA) Plan. All costs of testing shall be paid by the Owner except for those called out in the CQA documents to be the contractor's responsibility.

B. Testing, observations and source quality control may occur on or off project site. Perform off-site testing as required by CQA Consultant or Owner.

C. CQA Reports will be submitted by the CQA Consultant to the State Regulatory Solid Waste Section/Department indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

D. Contractor shall cooperate with CQA Consultant; furnish samples of materials, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. The Contractor shall give ample advance notice to the CQA Consultant prior to expected time for operations requiring testing services and/or before covering up items that require inspection.
   2. The Contractor shall make arrangements with CQA Consultant and pay for additional samples and tests required for Contractor's use.

E. Testing and employment of testing agency or laboratory shall not relieve Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

F. Re-testing or observation required because of non-conformance to specified requirements shall be performed by same CQA Consultant. Payment for re-testing will be charged to Contractor by deducting testing charges from Contract Sum/Price.

G. CQA Consultant Responsibilities:
   1. Provide qualified personnel at site. Cooperate with Owner, Engineer, and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials with requirements of Contract Documents.
   4. Promptly notify Owner and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests required by Engineer.
   6. Attend preconstruction meetings and progress meetings.

PART 2 PRODUCTS

Not used.

PART 3 EXECUTION

3.1 EXAMINATION

A. Contractor shall verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Contractor shall verify existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Contractor shall examine and verify specific conditions described in individual specification sections.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

END OF SECTION

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Temporary Utilities:
   a. Temporary electricity.
   b. Telephone and facsimile service.
   c. Temporary water service.
   d. Temporary sanitary facilities.
2. Construction Facilities:
   a. Field offices and sheds.
   b. Vehicular access.
   c. Parking.
   d. Progress cleaning and waste removal.
3. Temporary Controls:
   a. Barriers.
   b. Water control.
   c. Dust control.
   d. Erosion and sediment control.
   e. Pollution control.
4. Site Security.
5. Removal of utilities, facilities, and controls.

1.2 TEMPORARY UTILITIES

A. Temporary Electricity
1. Electricity shall be provided on a temporary basis by connection to existing public utility or by other means acceptable to the Owner. The Contractor shall be responsible for all cost incurred in providing temporary electrical service.

B. Telephone and Facsimile Service
1. Provide, maintain, and pay for telephone service for verbal communication and facsimile transmittals to support field office at time of project mobilization.

C. Temporary Water Service
1. Water shall be provided from the local municipality or county water system or by other means acceptable to the Owner on a temporary basis and paid for by Contractor.

D. Temporary Sanitary Facilities
1. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.
2. Sanitary arrangements shall include water closet facilities acceptable to the local Health Department and shall be kept in a sanitary condition at all times. These facilities shall be available to all workers on the job.

1.3 CONSTRUCTION FACILITIES

A. Field Offices and Sheds

1. Temporary structures shall include a temporary field office, complete with lights, telephone, air conditioning, and heat. A portion of this office shall be partitioned off, of sufficient size, for the use of the Owner, CQA Consultant and their representatives.
2. Do not use permanent facilities for field offices or for storage.
3. Removal: At completion of Work, remove buildings, foundations, utility services, and debris. Restore areas to satisfaction of Owner.

B. Vehicular Access
1. Location as indicated on Drawings approved by Engineer and/or Owner.
2. Use designated existing on-site roads for construction traffic or as directed by CQA Consultant and/or Owner.

C. Parking
1. Arrange for and/or provide temporary parking areas to accommodate construction personnel.
2. Locate as approved by Owner.
3. When site space is not adequate, provide additional off-site parking.
4. Tracked vehicles not allowed on existing on-site streets and driveways.
5. Do not allow vehicle parking on existing pavement without approval by Owner.
6. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
7. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original or specified condition.
8. Mud from Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

D. Progress Cleaning and Waste Removal
1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
2. Provide a dumpster and regular garbage services on-site.
3. On-site burial of waste, debris, and rubbish shall not be permitted.

1.4 TEMPORARY CONTROLS

A. Barriers
1. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Water Control
1. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
2. Provide water barriers as required to protect site from soil erosion according to project's Erosion and Sedimentation Control Plan.

C. Dust Control
1. Execute Work by methods to minimize raising dust from construction operations.
2. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

D. Erosion and Sediment Control
1. Follow project's Erosion and Sedimentation Control Plan. Also see **Section 02374** and **Section 02924**.
2. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

3. Minimize surface area of bare soil exposed at one time.
4. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow across disturbed areas.
5. Construct fill and waste areas by selective placement to avoid erosive surface.
6. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

E. Pollution Control
1. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
2. Comply with pollution and environmental control requirements.
3. Comply with Owner's pollution control program.
4. Establish a clear boundary at the existing ash basin drainage features. Material disposal in the active ash basin is not permitted.

1.5 SITE SECURITY:

A. The Contractor is responsible for securing the work area, equipment, and materials. Owner will not be responsible for vandalism, damage, or theft of equipment and materials on the job site.

1.6 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

END OF SECTION

SECTION 01600
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Products.
2. Product delivery requirements.
3. Product storage and handling requirements.
4. Product options.
5. Product substitution procedures.

1.2 PRODUCTS

A. Furnish products of qualified manufacturers suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise.

1.3 PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle products in accordance with manufacturer's instructions and Specifications. When manufacturers' and/or suppliers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.

C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect products in accordance with manufacturers' instructions. When manufacturers' and/or suppliers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

B. Store with seals and labels intact and legible.

C. Store sensitive products in weather-tight enclosures in an environment favorable to product.

D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

E. Materials stored off the site shall be stored in a bonded warehouse and shall be clearly marked as being for this project. When requesting payment for the materials stored, the Contractor shall submit with his request a Certificate of Insurance showing proof of coverage for the materials. Payment will be made for up to 90% of invoice amount only for stored materials. No payment will be made for anticipated overhead and profit. Requests or payments for materials stored shall be accompanied by the Supplier's invoices, or other indications of the value of the stored materials, satisfactory to the Owner.

F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

G. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

1.5 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers with Provision for Substitutions: Submit request for substitution for any manufacturer not named in accordance with the following article.

1.6 PRODUCT SUBSTITUTION PROCEDURES

A. Substitutions may be considered when a product becomes unavailable through no fault of Contractor.

B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

C. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

E. A request constitutes a representation that Contractor:
1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner and/or Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.

F. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to Contract Documents.

G. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Shop Drawings, Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
3. Engineer will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

SECTION 01700
EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Closeout procedures.
2. Final cleaning.
3. Starting of systems.
4. Testing, adjusting, and balancing.
5. Protecting installed construction.
6. Project record documents.
7. Manual for materials and finishes.
8. Manual for equipment and systems.
9. Product warranties and product bonds.

1.2 CLOSEOUT PROCEDURES

A. Certificate of Substantial Completion will not be issued until Owner has been provided with written certification that Contract Documents have been reviewed, work has been observed, and that work is in accordance with Contract Documents and ready for Owner and CQA Consultant's review.

B. Final Application for Payment shall be accompanied by the following documents:
1. Record Drawings (reproducible).
2. Guarantees of all materials and workmanship.
3. Contractor's Affidavit, Release and Waiver of Claims.
4. Consent of Surety (if applicable).
5. Final State/County Sales/Use Tax Statement (if applicable).
6. Complete list of all Subcontractors and areas of work performed.
7. Proof of Compliance with Building Standards.
8. MWBE Documentation of Final Contract Payments (if applicable).

1.3 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean site; sweep paved areas, rake and clean landscaped surfaces.

C. With Owner's permission, may dispose of waste and surplus materials, and rubbish on-site in Owner designated location. Otherwise remove these items from the site. In addition, remove construction facilities from site.

1.4 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify CQA Consultant and Owner five (5) days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.

1.5 TESTING, ADJUSTING AND BALANCING

A. Testing and CQA reports will be prepared by the CQA Consultant indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

1.6 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Prohibit traffic on landscaped areas.

1.7 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

G. Submit documents to CQA Consultant.

1.8 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. CQA Consultant will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations.

D. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

E. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

F. Additional Requirements: As specified in individual product specification sections.

1.9 MANUAL FOR EQUIPMENT AND SYSTEMS

A. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

B. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

C. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

D. Include servicing and lubrication schedule, and list of lubricants required.

E. Include manufacturer's printed operation and maintenance instructions.

F. Include sequence of operation by controls manufacturer.

G. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

H. Include control diagrams by controls manufacturer as installed.

I. Include Contractor's coordination drawings, with color coded piping diagrams as installed.

J. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

K. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

L. Include test and balancing reports as specified in **Section 01400**.

M. Additional Requirements: As specified in individual product specification sections.

1.10 PRODUCT WARRANTIES AND PRODUCT BONDS

A. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

B. Verify documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Submit prior to final Application for Payment.

END OF SECTION

DIVISION 2 - SITE CONSTRUCTION

SECTION 02060
AGGREGATE

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Aggregate materials for fill, drainage, and grading purposes.

B. Related Sections:
1. **Section 02374** – Erosion Control Devices
2. **Section 02611** – Landfill Gas Wells.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Coarse Aggregate:
1. Basis of Measurement: A1, A2, & A3 by the **in place cubic yard** or as otherwise indicated in other Sections of these Specifications. Installation quantities shall not include quantities placed beyond the lines and grades shown on the Drawings.
2. Basis of Payment:
   a. Includes supplying aggregate materials, hauling, stockpiling, and placement.
   b. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

1.3 REFERENCES

A. American Association of State Highway and Transportation Officials:
1. AASHTO T11 – Standard Method of Test for Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing.
2. AASHTO T27 – Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates.
3. AASHTO T180 – Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop.

B. ASTM International:
1. ASTM C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregate.
2. ASTM D421 – Standard Practice for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.
3. ASTM D422 – Standard Test Method for Particle Size Analysis of Soils.
4. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)).
5. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
6. ASTM D1557 – Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 10 lb Rammer and 18 inch Drop.
7. ASTM D2167 – Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
8. ASTM D3017 – Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

9. ASTM D4253 – Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
10. ASTM D4254 – Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
11. ASTM D6938 – Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

C. North Carolina Department of Transportation (NCDOT) Standard specifications for Roads and Structures.

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Materials Source: Submit name of imported materials suppliers and description of material.

C. Manufacturer's/Supplier's Certificate: Certify materials meet or exceed specified requirements.

D. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant.

1.5 QUALITY ASSURANCE

A. Furnish each aggregate material type from single source throughout the Work.

B. Perform Work in accordance with NCDOT Standard Specifications for Roads and Structures or as otherwise specified.

PART 2 PRODUCTS

2.1 COARSE AGGREGATE MATERIALS

A. Coarse Aggregate Type A1 – Roadways: Conforming to ABC Stone NCDOT standards. Coarse Aggregate Type A1 used for roadway subgrades shall conform to Section 1010 of NCDOT Standard Specifications of Type A aggregate base course.

B. Coarse Aggregate Type A2 – Drainage Aggregate: Subangular, subrounded, rounded, or well rounded particle shaped conforming to No. 57 Stone NCDOT Standard Specifications Sections 1005 and 1006. Coarse Aggregate Type A2 shall be used for gas well construction and erosion control device construction and shall conform to the specifications in this section.

C. Coarse Aggregate Type A3: Conforming to Class B Riprap NCDOT Standard Specifications Section 1042. Coarse Aggregate Type A3 used for erosion control device construction and shall conform to the specifications in this section.

2.2 SOURCE QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation services.

B. Aggregate Material – Testing and Analysis: Perform in accordance with ASTM C136, ASTM D421, ASTM D422, ASTM D4253, ASTM D4254, AASHTO T11, and/or AASHTO T27.

C. When tests indicate materials do not meet specified requirements, change material or material source and retest.

D. Furnish materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.1 STOCKPILING

A. Stockpile materials on site at locations designated by CQA Consultant.

B. Stockpile in sufficient quantities to meet Project schedule and requirements.

C. Separate differing materials with dividers or stockpile apart to prevent mixing.

D. Direct surface water away from stockpile site so as to prevent erosion or deterioration of materials.

E. Stockpile materials on impervious material and cover to prevent erosion and leaching, until disposed of.

3.2 STOCKPILE CLEANUP

A. Remove stockpile, leave area in clean and neat condition. Grade site surface to prevent free standing surface water.

3.3 EXAMINATION

A. Verify substrate has been observed, gradients and elevations are correct, and is dry.

B. Perform proofrolling of roadway or slab subgrades with a pneumatic tired vehicle with a minimum loaded weight of 20 tons under the observation of the CQA Consultant or his representative to help identify subgrade areas that require repair. Proofrolling shall be conducted at the discretion of the CQA Consultant or his representative. Any soft, saturated, or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

3.4 PREPARATION

A. Correct irregularities in subgrade gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place fill on soft, muddy, or frozen surfaces.

C. Repair subgrade areas identified by the CQA Consultant or his representative prior to placing aggregate or structural fill.

3.5 AGGREGATE PLACEMENT

A. Spread aggregate over prepared subgrade to a total compacted thickness as specified on Drawings.

B. Place aggregate in layer thicknesses according to NCDOT Standard Specifications **Section 520** and compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

3.6 TOLERANCES

A. **Section 01400** – Quality Requirements: Tolerances.

B. Scheduled Compacted Thickness: Within ¼ inch.

C. Variation From Design Elevation: Within ½ inch.

3.7 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation requirements.

B. Compaction testing will be performed in accordance with ASTM D1556, ASTM D1557, ASTM D698, AASHTO T180, ASTM D2167, ASTM D3017, and/or ASTM D6938.

C. If tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

D. Frequency of Tests: Minimum of 2,500 square feet, one correction test per compacted lift.

E. Stone Pavement Surface
1. Compact placed aggregate materials to achieve compaction of 100 percent.

END OF SECTION

SECTION 02320
STRUCTURAL FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural fill defined as compacted fill for perimeter berms, surface water control systems, roadways, area fill not within the landfill cells, or other systems not intended to function as a migration barrier.
2. Erosion layer defined as compacted fill placed for cover system construction.
3. Vegetative soil layer defined as fill placed for cover system construction.

B. Related Sections:
1. **Section 02321** – Low Permeability Barrier.
2. **Section 02374** – Erosion Control Devices.
3. **Section 02611** – Landfill Gas Wells.
4. **Section 03480** – Pre-Cast Concrete Structures.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fill Type S1, Structural Fill and Erosion Layer:
1. Basis of Measurement: By the cubic yard filled. The quantity of structural fill and erosion layer will be based upon the in-place volume between the prepared subgrade and the structurally filled surface as determined by surveys after completion of the placement of the structural fill. A grid pattern, as approved by the CQA Consultant, of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The CQA Consultant shall check the record finished grades and determine the backfilled volume based on survey data provided by the Earthwork Contractor.
2. Basis of Payment: By the cubic yard placed times the unit price for fill placement.
   a. Includes excavating, screening to particle size requirements, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
   b. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant. If a dispute exists relative to payment quantities, the Earthwork Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

B. Fill Type S2, Vegetative Soil Layer:
1. Basis of Measurement: By the cubic yard filled. The quantity of vegetative soil layer will be based upon the in-place volume between the prepared subgrade and the filled surface as determined by surveys after completion of the placement of the vegetative soil layer. A grid pattern, as approved by the CQA Consultant, of ground surface elevations in the area shall be surveyed and reference points installed by the Earthwork Contractor prior to structural backfill placement and prior to placement of any overlying material. The CQA Consultant shall check the record finished grades and determine the backfilled volume based on survey data provided by the Earthwork Contractor.
2. Basis of Payment: By the cubic yard placed times the unit price for fill placement.

a. Includes excavating, screening to particle size requirements, hauling, scraping, stockpiling, dust control, scarifying substrate surface, moisture conditioning, placing where required, compacting, maintenance, and removing accumulated water during construction.
b. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.

1.3 REFERENCES

A. ASTM D422 – Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).

B. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

C. ASTM D1556 – Standard Test Method for Density of Soil In Place by the Sand-Cone Method.

D. ASTM D2216 – Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.

E. ASTM D2487 – Standard Practices for Classification of Soil for Engineering Purposes (Unified Soil Classification System)

F. ASTM D2937 – Standard Test Method for Density of Soil in place by the Drive-Cylinder Method.

G. ASTM D4318 – Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

H. ASTM D6938 – Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Samples: Submit, in air-tight containers, 50 lb sample of each type of excavated material to testing laboratory to determine suitability for use as structural fill material.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Fill Type S1, Structural Fill:
1. Structural fill is defined as compacted fill for perimeter berms, surface water control systems, roadways, or other systems not intended to function as a migration barrier.
2. Natural soil material from designated on-site borrow areas and/or stockpiles.
3. Structural fill and erosion soil layer shall be classified as SP, SM, SW, SC, SW-SM, SW-SC, SP-SM, ML, or CL soils according to the Unified Soil Classification System (ASTM D2487).

4. Relatively free of topsoil, organic material, roots, stumps, brush, rocks larger than 3 inches, subsoil, debris, vegetation, and other foreign matter.
5. Structural fill located within 1-foot of geosynthetics components shall have a maximum particle size of 2 inches. The material shall be screened by the Earthwork Contractor, if necessary, to remove particle sizes greater than 2 inches in diameter. No more than 5 percent of the material should be retained on the No. 4 sieve.
6. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 4 inches in diameter with no more than 15% retained on the No. 4 sieve.

B. Fill Type S2, Erosion Layer:
1. Erosion layer is defined as compacted fill placed over the low permeability soil layer for cover system construction or to otherwise support vegetation establishment in areas not within the landfill cells.
2. Excavated and reused materials from designated on-site or off-site borrow areas and/or stockpiles and/or approved soil from trenching operations.
3. Vegetative soil layer shall be classified as SM, SC, SW-SM, SW-SC, SP-SM, ML, or CL soils according to the Unified Soil Classification System (ASTM D2487).
4. Relatively free of roots, stumps, brush, rocks larger than 3 inches, debris, and other foreign matter.
5. Topsoil material shall have nutrient content and pH capable of supporting vegetation.
6. Shall have a minimum organic content of 3 percent by weight.
7. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil that is free of clods greater than 2 inches in diameter with no more than 15 percent retained on the No. 4 sieve.

PART 3 EXECUTION

3.1 EXAMINATION

A. **Section 01300** – Administrative Requirements: Coordination and project conditions

B. The CQA Consultant will assist the Earthwork Contractor in the determination of structural fill and non-select material during excavation operations. The Earthwork Contractor will be responsible for excavating, transporting, stockpiling, placing, and compacting all materials as needed.

3.2 PREPARATION

A. Prepare and compact subgrade to density requirements for subsequent backfill materials.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Type S1 fill and compact to density equal to or greater than requirements for subsequent fill material.

C. Scarify subgrade surface to depth of 6 inches.

D. Proofroll subgrade with a pneumatic tired vehicle with a minimum weight of 20 tons to identify subgrade areas that require repair; fill and compact to density equal to or greater than requirements for subsequent fill material. Any soft, saturated, or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

3.3 BACKFILLING

A. Backfill areas to contours and elevations as shown on Drawings with unfrozen materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Fill Type S1: Place and compact material in loose lifts not exceeding 8 inches or 6 inches compacted thickness. Manually compacted fill near pipes and other structures will be placed in loose lifts not exceeding 4 to 6 inches in thickness.

D. Fill type S1 over geosynthetic materials will be compacted by tracking with a low ground pressure bulldozer or other approved equipment with a ground pressure of less than 5 psi.

E. Fill Type S2: Scarify subgrade, place material in one lift and track in with backhoe or other equipment approved by CQA Consultant.

F. Fill Type S1, backfill for drop inlets, and culverts:
   1. Backfill of the drop inlets and culverts shall be placed and compacted in 6 inch thick loose lifts around the drop inlets and up to 2 feet above the culverts.
   2. Compaction shall be performed by hand tampers or small hand operated compactors.

G. Employ placement method that does not disturb or damage other work.

H. Backfill against supported structures. Do not backfill against unsupported structures.

I. Backfill simultaneously on each side of unsupported structures until supports are in place.

J. Protect backfill from desiccation, crusting, or cracking.

K. Make gradual grade changes. Blend slope into level areas.

L. Remove surplus backfill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.

M. Leave fill material stockpile areas free of excess fill materials.

3.4 TOLERANCES

A. **Section 01400** – Quality Requirements: Tolerances.

B. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

3.5 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation services.

B. Laboratory Testing
   1. Perform laboratory material tests in accordance with ASTM D422, ASTM D698, ASTM D2216, and ASTM D4318.
   2. Test at a frequency of:
      a. 10,000 cubic yards of type S1 placed;
      b. When materials using for structural fill change; and/or

c. When directed by the CQA Consultant.

3. Sample size shall be 50-lb.

3.6 In Place Compaction and Natural Moisture Content Tests

1. Perform in place compaction tests in accordance with ASTM D1556, ASTM D2937, or ASTM D6938.
2. Perform in place natural moisture content test in accordance with ASTM D2216.
3. Frequency of compaction/natural moisture content tests:
   a. Cover system fills, area fills outside landfill cells, surface water control systems, or other systems not intended to function as a migration barrier, in-place density and moisture: Each lift at a minimum frequency of 1 per acre per lift.
   b. Perimeter berms and roadways: Each lift at a minimum frequency of 1 per 5,000 sq. ft.
4. Landfill and Embankments:
   a. Type S1 fill shall be compacted to minimum 95 percent of its Standard Proctor (ASTM D 698) maximum dry density.
   b. Testing of the first compacted lift shall be limited to the top 6 inches of the lift thickness.
   c. Fill Type S2 should be placed in one continuous loose lift and tracked in by backhoe or other equipment approved by CQA Consultant.
   d. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by CQA Consultant.
5. Drop Inlets, and Culverts:
   a. Compaction shall be at a minimum 95 percent of the Standard Proctor maximum dry density.
   b. Compacted moisture content shall be within 3 percent of optimum moisture content for all fill placed, or as otherwise approved by CQA Consultant.

B. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.7 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Protecting finished work.

B. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02321
BACKFILL – LOW PERMEABILITY BARRIER

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Sections:
   1. Site filling for constructing low permeability barrier.
   2. Consolidation and compaction as scheduled.

B. Related Sections:
   1. **Section 02320** – Structural Fill.
   2. **Section 02611** – Landfill Gas Wells.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Fill Type S3, Low Permeability Barrier:
   1. Basis of Measurement: By the cubic yard filled.
      a. The quantity of low permeability barrier fill will be based upon the volume between the subgrade surface and top of low permeability barrier (after overbuild removal) as determined by surveys after completion of the placement of the low permeability barrier.
      b. A grid pattern as approved by the CQA Consultant of ground surface elevations in the cell area shall be surveyed and reference points installed by the Contractor before and after placement of low permeability barrier. The grid pattern shall be conducted at the same points for each layer and shall include points at the top and bottom of slopes with a minimum of one point on the slope in between. The CQA Consultant shall verify the record finished grades and volume of the low permeability barrier based on survey data provided by the Contractor.
      c. Quantities shall not include overbuild or replacement volumes of defective areas resulting from erosion or insufficient density and/or permeability test results.
   2. Basis of Payment:
      a. Includes excavation, screening to particle size requirement, hauling, scraping, stockpiling, scarifying substrate surface, placing where required, compacting, maintenance, and removing accumulated water during construction.
      b. Payment for low permeability barrier will be based on the in-place volume filled times the unit price for low permeability barrier.
      c. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant. If a dispute exists relative to payment quantities, the Contractor, at his expense, will uncover any buried or covered material for re-evaluation.
      d. The entire low permeability barrier must meet or exceed the specified thickness, density and permeability requirements prior to payment.

1.3 REFERENCES

A. ASTM D421 – Standard Practices for Dry Preparation of Soil Samples for Particle-Size Analysis and Determination of Soil Constants.

B. ASTM D422 – Standard test Method for Particle-Size Analysis of Soils (Grain Size with Hydrometer).

C. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using

Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor Test).

D. ASTM D1556 – Standard Test Method for Density and Unit Weight of Soil In-Place by the Sand-Cone Method.

E. ASTM D2216 – Standard Test Method for Natural Moisture Content.

F. ASTM D2487 – Standard Practices for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

G. ASTM D2937 – Standard Test Method for Density of Soil in place by the Drive-Cylinder Method Test.

H. ASTM D4318 – Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

I. ASTM D5084 – Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Remolded and Undisturbed Permeability).

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Samples: Submit, in air-tight containers, 50 lb. per sample of each type of excavated material to testing laboratory to determine suitability for use as low permeability barrier fill material.

C. Upon completion of the low permeability barrier submit survey results to CQA Consultant for review and approval documenting the thickness of the low permeability barrier.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Standard Fill Type S3, Low Permeability Barrier:

1. Excavated and reused material from designated on-site borrow area and/or stockpile and/or off-site borrow area approved by the Owner and CQA Consultant.
2. Low permeability barrier material shall be classified as SC, CL, CH, ML, or MH soils according to the Unified Soil Classification System (ASTM D2487).
3. Relatively free of waste, gypsum, ferrous material, topsoil, roots, stumps, brush, rocks larger than 1 inch, subsoil, debris, vegetation, calcareous concretions or nodules, and other foreign matter.
4. Fill material shall have a maximum particle size of 1 inch. The low permeability barrier material shall be raked or sieved by the Contractor, if necessary, to remove all particles greater than 1 inch in diameter. No more than 5 percent of the low permeability barrier fill material should be retained on the No. 4 sieve.
5. All material clods will be broken down with tillers and/or discs to provide a homogeneous soil (prior to compaction) that is free of clay clods greater than 2 inches in diameter.
6. Borrow area(s) shall be final graded to slopes as shown on the Drawings.
7. Material with a minimum Liquid Limit of 30 and Plasticity Index of 10 or as subsequently specified by the CQA Consultant based on laboratory testing (ASTM D4318).
8. Material shall have a maximum permeability of $1x10^{-5}$ cm/sec.

PART 3 EXECUTION

3.1 EXAMINATION

A. **Section 01300** – Administrative Requirements: Coordination and project conditions.

B. The CQA Consultant will assist the Contractor in the determination of low permeability barrier material and non-select material during excavation operations. The Contractor will be responsible for excavating, screening, transporting, stockpiling, placing, and compacting all materials as needed.

C. Continuous and repeated visual observation of the materials will be performed by the Contractor to ensure proper material is being used.

D. CQA Consultant will make frequent observations of the low permeability barrier placement operations and materials, and will consult with the site personnel on suitable liner fill and locations of such. Low permeability barrier fill proposed shall be observed by the CQA Consultant prior to actual use.

3.2 PREPARATION

A. Prepare existing subgrade.

B. Test Pad Construction:
1. A test pad 35 ft x 100 ft in area shall be constructed inside or outside the landfill footprint using the same construction methods, equipment, and material to be used for the low permeability barrier.
2. The completed construction of the test pad must precede the beginning of placement of the low permeability barrier.
3. Compaction and soil moisture content shall be in accordance with **Part 3.3** of this Section.
4. Low permeability barrier material shall be placed in three or more compacted lifts of 6-inch thick maximum thickness for a total thickness of 18 inches.
5. A minimum of six undisturbed samples will be obtained in the test pad by the CQA Consultant or his representative at a frequency of two samples per lift. The following laboratory tests will be performed on the undisturbed or remolded samples to document the soil's characteristics and to verify that the material, construction methods, and equipment can achieve required permeability per **Part 2.1A.8** of this Section:
   a. Atterberg Limits Test (ASTM D4318) at frequency of 1 tests per lift
   b. Grain Size with Hydrometer (ASTM D422) at frequency of 1 test per lift.
   c. Remolded Permeability (ASTM D5084) at frequency of 1 test per lift.
   d. Undisturbed Permeability (ASTM D5084) at frequency of 1 test per lift.
   e. Standard Proctor Test (ASTM D698) at frequency of 1 test per lift.
6. Field moisture and field density tests will also be performed by the CQA Consultant or his representative during soil placing and compaction to document the conditions obtained by the construction method, equipment, and material to correlate with the required permeability for the low permeability barrier test pad.
   a. Field Density Test (ASTM D2937) at frequency of 3 tests per lift.
   b. Natural Moisture Content Test (ASTM D2216) at frequency of 3 tests per lift.
7. The Contractor shall allow sufficient time for construction and testing of the test pad prior to placement of the low permeability barrier.
8. If the initial test pad does not meet the permeability requirements, a second test pad shall be constructed prior to placement of the low permeability barrier.
9. Based on the material classification, density, moisture, and permeability testing performed on the test pad, the CQA Consultant will determine the specified range of acceptable densities and moisture contents required to achieve the required permeability.

10. If the low permeability barrier material differs in classification, plasticity or gradation to the material used in the test pad, the CQA Consultant will require construction of another test pad with additional laboratory classification and permeability testing prior to the materials use to evaluate the its suitability as a low permeability barrier material.

C. Prior to low permeability barrier placement, the prepared subgrade shall be proofrolled with a pneumatic tired vehicle with a minimum weight of 20 tons at the approval of the CQA Consultant. Proofrolling shall be conducted at the discretion of the CQA Consultant or his representative. Any soft, saturated, or yielding areas exhibited by pumping and/or rutting will require removal and replacement with the appropriate compacted soil.

3.3 FILLING

A. Place fill to contours and elevations as shown on Drawings with unfrozen materials.

B. The low permeability barrier shall be a minimum of 18 inches thick. Thickness of the low permeability barrier on the side slopes shall be measured perpendicular to the slope.

C. Low permeability barrier shall have a compacted lift thickness of 6 in. ± 1 in. Thinner lifts are permissible to achieve design grade.

D. Lift thickness may be sampled upon completion (but prior to subsequent lift placement) by hand augering through the lift and measuring the thickness. The resulting penetration shall be promptly backfilled by the Contractor with a hand tamped clayey soil mixture of one part bentonite and three parts low permeability barrier material.

E. Samples of the in-place low permeability barrier material shall be tested and evaluated in accordance with provisions of the CQA Plan and **Part 3.5** of this Section prior to final acceptance of the low permeability barrier. All compaction or permeability test locations shall be filled with a mixture of one part bentonite and three parts low permeability barrier material.

F. Equipment or truck traffic shall not be permitted on previous fill lifts during the period between scarifying and compaction of a new fill lift unless approved by the CQA Consultant.

G. After the lift to be compacted is conditioned, representative samples will be taken by the CQA Consultant or his representative and tested for moisture content prior to any compactive efforts. If the moisture content is within the range specified in **Part 3.5D** of this Section, compaction may begin. If the moisture content is outside of this range, the low permeability barrier fill shall be wetted or dried and reworked accordingly. The low permeability barrier fill should be sprinkled or sprayed with water, utilizing equipment creating a uniform application and dozed, wind-rowed, and/or disc-plowed to uniformly increase the moisture content of the low permeability barrier if the material moisture content is too low. The low permeability barrier fill shall be dozed, wind-rowed, and/or disc-plowed to help air dry the soil if the moisture content is too high.

H. Each lift shall be thoroughly compacted and satisfy the moisture and density criteria established from the test pad results. Field testing shall be completed according to **Part 3.5D** of this Section before a subsequent lift is placed.

I. Compaction of lifts shall be as follows:
1. Compaction of lifts shall be performed with an appropriately heavy, properly ballasted, deep penetrating foot compactor and shall be subject to approval of the CQA Consultant.
2. Dozer equipment shall not be used for primary compaction efforts.
3. A minimum number of passes will be required on each lift as determined by the test pad. A pass is defined as one trip of the compacting equipment over the lift and back to the starting point by a single drum roller or one trip across the lift surface from one side to the

other if the compacting equipment has front and back compacting rollers. This requirement is to allow thorough remolding of the soil by kneading action.

4. The daily work area shall extend a distance so as to maintain moist and uniform soil conditions (facilitate bonding) and continuous operations. Desiccation, crusting, or cracking of the lift surface shall be avoided as much as possible. Each lift shall be protected, at all times after placement, from desiccation and crusting.
5. If desiccation, crusting, or cracking of the lift surface occurs before placement of the next lift, this area shall be scarified to a sufficient depth to mix with moist materials, or sprinkled with water and then scarified at the direction of the CQA Consultant.
6. The surface of the underlying lift shall be scarified prior to compaction of each subsequent lift (i.e.: Lift 2 to Lift 3, etc.) to facilitate bonding of the lifts.
7. The transition between the bottom and side slopes shall be accomplished by compacting parallel (bottom to top) to the slope.
8. Soil moisture and dry density requirements:
   a. To determine the moisture content and dry density requirements of the compacted soil are being satisfied, field and laboratory tests shall be performed at the frequencies specified in **Part 3.5C and D** of this Section.
   b. Compacted moisture content shall be between 2 and 5 percent wet of optimum moisture content, as determined by density testing, or as determined by the results of the low permeability barrier test pad.
   c. The low permeability barrier shall be compacted to a minimum dry density of 95 percent (or as determined by the results of the low permeability barrier test pad) of the maximum dry density determined from the standard Proctor test (ASTM D-698). Where densities less than the specified density are measured, the low permeability barrier shall be recompacted and/or removed and reworked to meet density criteria.

J. Low permeability barrier fill shall not be placed or compacted during sustained periods with air temperatures below 32°F. Low permeability barrier fill may be placed and compacted during periods of early morning and early evening freezing temperatures with warming trends above 45°F during the day. No fill shall be placed on frozen subgrade. If the low permeability barrier or structural fill freezes or ices, the fill section shall be, allowed to thaw, rescarified, and recompacted, at the discretion of the CQA Consultant. Low permeability barrier or structural fill material shall not be placed on frozen or icy subgrade soils.

K. During construction, finished lifts or sections shall be sprinkled with water, as needed, to avoid excessive cracking or at least twice daily.

L. At the end of each construction day's activities, completed lifts or sections shall be sealed by rolling with rubber tired or smooth drum rollers and sprinkled with water, as needed, to avoid excessive cracking.

M. After completion of a segment of low permeability barrier, but before installation of the overlying materials, the surface shall be surveyed by the Contractor to ensure the specified thickness (minimum of 18 inches).

N. The surface of the low permeability barrier shall be smooth drum rolled and maintained free of rocks, organics, voids, and sharp edges.

O. The record thickness shall be determined by survey methods (non-destructive) as described in **Part 1.2A** of this Section.

P. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

Q. Bench the existing upstream and downstream slopes during fill placement to promote bonding of existing and new fill materials.

R. Employ placement methods that do not disturb or damage other work.

S. Make gradual grade changes. Blend slope into level areas.

T. Remove surplus fill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.

U. Leave fill material stockpile areas free of excess fill materials.

V. Repair eroded areas.

3.4 TOLERANCES

A. **Section 01400** – Quality Requirements: Tolerances.

B. Top Surface: Plus 0.1 feet from required elevations shown on Drawings.

3.5 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation services.

B. Perform the following laboratory classification and/or index material tests :
1. Tests to perform:
   a. Standard Proctor Test (ASTM D698).
   b. Atterberg Limits (ASTM D4318).
   c. Grain Size with Hydrometer (ASTM D421 and ASTM D422).
2. Frequency to perform tests:
   a. Once per every 3,000 cubic yards obtained from stockpile or borrow area;
   b. When there is an apparent change in the material type; and/or
   c. As directed by CQA Consultant or CQA Consultant's representative.

C. Low permeability barrier material must achieve required permeability per **Part 2.1A.8** of this Section in accordance with laboratory testing (ASTM D5084).
1. Bulk samples will be taken by the CQA Consultant at intervals of 1 sample per 3,000 cubic yards of material to be placed from the stockpile/borrow area(s). Samples will be transported to a soils laboratory for permeability testing.
   a. The samples will be compacted to at least 95 percent of standard Proctor at moisture contents similar to field conditions and/or as subsequently specified based on laboratory testing results (ASTM D2216)
   b. Remolded Permeability Tests (ASTM D5084) shall be run with a maximum hydraulic gradient of 15 and a maximum confining pressure of 10 psi.
2. Undisturbed Permeability Tests (ASTM D5084) will be performed as directed by CQA Consultant or CQA Consultant's representative. Areas that are not consistent in density, moisture content, or classification with previously approved low permeability barrier material will require additional undisturbed permeability testing of the in-place low permeability barrier material prior to final acceptance.
3. The CQA Consultant may request an in-situ permeability test be performed on the in-place low permeability barrier material if the material being placed is not consistent with the material previously tested and approved for construction.

D. Perform in-place compaction tests in accordance with the following:

1. Density Tests (ASTM D2937) at frequency of once per every other 100 foot by 100 foot grid per lift. The low permeability barrier shall be compacted to a minimum dry density of 95 percent (or as determined by the results of the low permeability barrier test pad) of the maximum dry density determined from the standard Proctor test (ASTM D698).
2. Natural Moisture Content Tests (ASTM D2216) at frequency of at every density location and at least once per every 800 cubic yards placed. Compacted moisture content shall be between 2 and 5 percent wet of optimum moisture content or as determined by the results of the low permeability barrier test pad.

E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.6 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Protecting finished work.

B. The low permeability barrier shall be overbuilt a thickness of 3 inches or covered with a sacrificial 10 mil plastic sheeting where required to protect the finished surface from erosion, desiccation, or other damage.
1. If the overbuild option is selected for protecting the liner, upon removal of the overbuild, the surface of the low permeability barrier will be re-rolled with a smooth drum roller to achieve the surface condition specified in Part 3.3L of this Section.
2. If excessive desiccation cracking becomes evident, as determined by the CQA Consultant, the surface will require rewetting and rerolling prior to placement of overlying materials. If excessive desiccation cracking remains evident after rerolling, the surface shall be scarified on the top 3-inches and reworked as specified in Part 3.3 of this Section.

C. Reshape and re-compact fills subjected to vehicular traffic.

END OF SECTION

SECTION 02374
EROSION CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Grass-Lined/Diversion Channel.
2. Riprap Energy Dissipater (Outlet Protection Apron).
3. Wattles.
4. Sediment Basin.
5. Sediment Trap.
6. Silt Fencing.
7. Silt Fence Outlets.
8. Slope Diversion Berm (Tack On Bench).
9. Matting.
10. Grassing.

B. Related Sections:
1. **Section 02060** – Aggregate.
2. **Section 02320** – Structural Fill.
3. **Section 02674** – Nonwoven Geotextile.
4. **Section 02924** – Seeding and Soil Supplements.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Grass-Lined/Diversion Channel:
1. Basis of Measurement: By linear foot.
2. Basis of Payment: Unit Price per linear foot or each.
   a. Based on linear foot of channel times the unit price for the channel.
   b. Includes excavating, windrowing, compacting, installing erosion control matting and seeding and mulching for grass-lined channels as indicated on Drawings. Refer to **Section 02924** for information on soil supplements for grassing.
   c. Requested payment quantities will be submitted by the Contractor with final approval by the CQA Consultant. If a dispute exists relative to payment quantities, the Contractor at his expense will uncover any buried or covered material for re-evaluation.

B. Riprap Energy Dissipator (Outlet Protection Apron):
1. Basis of Measurement: Each unit placed.
2. Basis of Payment: Unit Price for each unit placed.
   a. Includes labor and materials for cleaning, excavating, backfilling, placing embankment, placing geotextile fabric, placing riprap/aggregate, and required grouting as indicated on Drawings.

C. Wattles:
1. Basis of Measurement: Each unit placed.
2. Basis of Payment: Unit Price for each unit placed.
   a. Includes furnishing, installing, and maintaining the wattles as may be required to obtain the specified results.

D. Sediment Basin:
1. Basis of Measurement: By each unit.

2. Basis of Payment: Unit Price for each unit placed.
   a. Includes clearing, excavating, piping, placing riser footing, constructing embankment and trench and rock basin, seeding, mulching, and any other accessories needed as indicated on Drawings.
   b. Includes maintenance of the sediment basin, which includes removal, hauling, and disposal of sediment and other debris in system.

E. Sediment Trap:
   1. Basis of Measurement: By each unit.
   2. Basis of Payment: Unit Price for each unit placed.
      a. Includes clearing, constructing embankment and rock outlet, seeding, mulching, and any other accessories needed as indicated on Drawings.
      b. Includes maintenance of the sediment trap, which includes removal, hauling and disposal of sediment and other debris in system, and maintenance of stone outlet structure and emergency spillway.

F. Silt Fencing:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Unit Price for each linear foot placed.
      a. Includes furnishing and maintaining the silt fencing as may be required to obtain the specified results, and maintaining a stone stockpile on site for maintenance purposes.

G. Silt Fence Outlets:
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Unit Price for each linear foot placed.
      a. Includes furnishing and maintaining the silt fence outlet as may be required to obtain the specified results and maintaining a stone stockpile on site for maintenance purposes.

H. Slope Diversion Berm (Tack On Bench):
   1. Basis of Measurement: By the linear foot.
   2. Basis of Payment: Unit Price for each linear foot placed.
      a. Includes furnishing and maintaining the tack on bench as may be required to obtain the specified results.

I. Matting:
   1. Basis of Measurement: By the square foot.
   2. Basis of Payment: Unit Price for each square foot placed.
      a. Includes furnishing and maintaining the erosion control matting, including in grass lined ditches, and where shown on the Drawings.

J. Grassing:
   1. Basis of Measurement: By the Acre.
   2. Basis of Payment: Unit Price for each acre seeded.

1.3 REFERENCES

A. ASTM International:
   1. ASTM D698 – Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

B. NCDOT Standard Specifications for Roads and Structures.

C. American Welding Society (AWS) D1.1 Structural Welding Code.

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Requirements for submittals.

B. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Project record documents.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with requirements of these Project Specifications.

B. Perform Work in accordance with NCDOT standards.

1.7 PRE-INSTALLATION MEETINGS

A. **Section 01300** – Administrative Requirements: Project meetings.

B. Convene minimum one week prior to commencing work of this Section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. **Section 01600** – Product Requirements: Environmental conditions affecting products on site.

B. Do not place grout when air temperature is below freezing.

C. Do not place concrete when base surface temperature is less than 40°F or surface is wet or frozen.

PART 2 PRODUCTS

2.1 RIPRAP AND GEOTEXTILE MATERIALS

A. Riprap: As specified in **Section 02060**. Furnish in accordance with NCDOT Standard Specifications Section 1042.

B. Geotextile Fabric: Non-biodegradable, non-woven geotextile, 8 oz/sy, UV stabilized filter fabric as specified in **Section 02674**.

2.2 AGGREGATE AND SOIL MATERIALS

A. Coarse Aggregate: Type A1 and A2 as specified in **Section 02060**.

B. Soil Backfill: Soil Type S1 as specified in **Section 02320**. Subsoil with no rocks over 6 inches in diameter, frozen earth or foreign matter.

2.3 SILT FENCING

A. As specified on Drawings.

2.4 WATTLES

A. As specified on Drawings.

2.5 PLANTING MATERIALS

A. Seeding and Soil Supplements: As specified in **Section 02924**.

B. Mulch: As specified in **Section 02924**.

2.6 ACCESSORIES

A. Joint Sealers: Furnish in accordance with NCDOT standards and as indicated on Drawings.

B. Joint Filler: Furnish in accordance with NCDOT standards and as indicated on Drawings.

C. Grout: Furnish in accordance with NCDOT standards and as indicated on Drawings.

D. Steel Plate Anti-Vortex Device: Furnish in accordance with NCDOT standards and as indicated on Drawings.

E. Welding Material: Furnish in accordance with NCDOT and/or AWS D1.1 standards and as indicated on Drawings.

2.7 SOURCE QUALITY CONTROL (AND TESTS)

A. **Section 01400** – Quality Requirements: Testing and observation requirements.

B. Perform tests on cement, aggregates, and mixes to ensure conformance with specified requirements.

C. Test samples in accordance with ACI 301.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify compacted subgrade or granular base is acceptable and ready to support devices and imposed loads.

B. Verify gradients and elevations of base or foundation for other work are correct.

3.2 GRASS LINED/DIVERSION CHANNELS

A. Windrow excavated material on low side of channel.

B. Compact subgrade soils to a minimum of 95 percent of the maximum dry density as determined by ASTM D698.

C. On entire channel area, apply soil supplements and sow seed as specified in **Section 02924**.

D. Mulch seeded areas with hay as specified in **Section 02924** according to Drawings.

E. Install erosion control matting as specified on Drawings.

3.3 RIPRAP ENERGY DISSIPATOR (OUTLET PROTECTION APRON)

A. Excavate to depth of rock lining or nominal placement thickness as indicated on Drawings. Remove loose, unsuitable material below bottom of rock lining, and then replace with suitable material. Thoroughly compact and finish entire foundation area to firm, even surface.

B. Lay and overlay geotextile fabric over substrate. Lay fabric parallel to flow from upstream to downstream. Overlap edges upstream over downstream and upslope over downslope. Provide a minimum overlap of 2 feet. Offset adjacent roll ends a minimum of 5 feet when lapped. Cover fabric as soon as possible and in no case leave fabric exposed more than 4 weeks.

C. Carefully place riprap/aggregate on geotextile fabric to produce an even distribution of pieces, with minimum of voids and without tearing geotextile. Place as indicated on Drawings.

D. Unless indicated otherwise, place full course thickness of riprap/aggregate in one operation to prevent segregation and to avoid displacement of underlying material. Arrange individual rocks for uniform distribution. Place evenly and carefully to minimize voids.
   1. Saturate riprap/aggregate with water and let all standing water drain. Fill voids between pieces with grout, were shown on Drawings, for at least top 6 inches. Sweep surface with stiff broom to remove excess grout.

3.4 WATTLES

A. Proper site preparation is essential to ensure complete contact of the wattle (fiber roll) with the soil.

B. Remove all rocks, clods, vegetation, or other obstructions so that the installed wattles will have direct contact with the soil.

C. A small trench 2-3 inches (8-10 cm) in depth should be excavated on the slope contour and perpendicular to water flow. Soil from the excavation should be placed down-slope next to the trench.

D. Install the wattles in the trench, insuring that no gaps exist between the soil and the bottom of the wattle. The ends of adjacent wattles should be tightly abutted so that no opening exists for water or sediment to pass through. Alternately, wattles may be lapped, 6-inch minimum to prevent sediment passing through the field joint.

E. Wooden stakes should be used to fasten the wattles to the soil. When conditions warrant, a straight metal bar can be used to drive a hole through the Wattle and into the soil.

F. Wooden stakes should be placed 6-inches from the wattle end angled towards the adjacent wattle and spaced at 4 feet leaving less than 1-2 inches of stake exposed above the wattle. Alternately, stakes may be placed on each side of the Wattle tying across with a natural fiber twine or staking in a crossing manner ensuring direct soil contact at all times.

G. Terminal ends of wattles shall be dog legged up slope to help ensure containment and prevent channeling of sedimentation.

H. Backfill the upslope length of the wattle with the excavated soil and compact.

I. Care shall be taken during installation so as to avoid damage occurring to the wattle as a result of the installation process. Should the wattle be damaged during installation, a wooden stake shall be placed either side of the damaged area terminating the log segment.

J. Field monitoring shall be performed to verify that the placement does not damage the wattle.

K. Any wattle damaged during placement or operations shall be replaced as recommended by the CQA Consultant or his representative, at the Contractor's expense.

3.5 SEDIMENTATION BASIN

A. Clear and grub excavation/fill areas as specified in **Section 02230**. Obtain borrow excavation material for formation of embankment.

B. Excavate emergency spillway in natural ground and stabilize as indicated on Drawings.

C. On entire sedimentation basin area, apply soil supplements and sow seed as specified in **Section 02924**.

D. Mulch seeded areas with hay as specified in **Section 02924**.

3.6 SEDIMENT TRAP

A. Clear and grub excavation/fill areas. Obtain borrow excavation for formation of embankment.

B. Construct stone outlet as shown on the Drawings.

C. Construct emergency spillway in residual soil.

3.7 SILT FENCING

A. Install as specified on Drawings.

3.8 SILT FENCE OUTLETS

A. Install as specified on Drawings.

3.9 SLOPE DIVERSION BERM (TACK ON BENCH)

A. Install as specified on Drawings.

3.10 MATTING

A. Install in grass lined ditches and where specified on the Drawings.

3.11 SITE STABILIZATION

A. Incorporate erosion control devices indicated on Drawings into the Project at the earliest practicable time.

B. Construct, stabilize, and activate erosion controls before site disturbance within tributary areas of those controls.

C. Stockpile and waste pile heights shall not exceed heights indicated on the drawings. Slope stockpile sides at 2 horizontal to 1 vertical (2H:1V) or flatter or as otherwise indicated on the Drawings.

D. Stabilize any disturbed area of affected erosion control devices on which activity has ceased and which will remain exposed for more than 20 days.
   1. During non-germinating periods, apply mulch at recommended rates.
   2. Stabilize disturbed areas which are not at finished grade and which will be disturbed within one year in accordance with **Section 02924** and as specified on Drawings for temporary seeding.
   3. Stabilize disturbed areas which are either at finished grade or will not be disturbed within one year in accordance with **Section 02924** permanent seeding specifications.

E. Stabilize diversion channels and stockpiles immediately.

3.12 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements and **Section 1700** – Execution Requirements: Testing, adjusting, and balancing.

B. Inspect erosion control devices on a weekly basis and after each runoff event. Make necessary repairs to ensure erosion and sediment controls are in good working order.

C. Compaction Testing: As specified in **Section 02320**.

D. When tests indicate work does not meet specified requirements, remove work, replace and retest.

3.13 CLEANING

A. **Section 01700** – Execution Requirements: Final cleaning.

B. When sediment accumulation in sedimentation structures has reached a point one-half depth of sediment structure or device, remove and dispose of sediment.

C. Do not damage structure or device during cleaning operations.

D. Do not permit sediment to erode into construction or site areas or natural waterways.

E. Clean channels when depth of sediment reaches approximately one half channel depth.

F. Do not damage channel or channel lining material during cleaning operations.

3.14 PROTECTION

A. **Section 01700** – Execution Requirements: Protecting installed construction.

3.15 SCHEDULES

A. As indicated on Drawings.

END OF SECTION

SECTION 02500
HDPE AND PVC PIPING AND MISCELLANEOUS ITEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Materials, placement, and installation of perforated and solid High Density Polyethylene (HDPE) and Poly Vinyl Chloride (PVC) pipe, pipe fittings, and valves for landfill gas control system.
2. Flushing/cleaning and hydrostatic pressure testing on the installed fluid conveyance system (including piping, fittings, valves, etc).

B. Related Sections:
1. **Section 02611** – Landfill Gas Wells.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings
1. Basis of Payment: Basis of Payment: Not applicable. HDPE and PVC pipe payment included in other sections.

1.3 REFERENCES

A. American Society for Testing and Materials:
1. ASTM D638 – Standard Test Method for Tensile Properties of Plastics.
2. ASTM D695 – Standard Test Method for Compressive Properties of Rigid Plastics.
3. ASTM D696 – Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
4. ASTM D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact.
5. ASTM D790 – Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
6. ASTM D1238 – Standard Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer.
7. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable.
8. ASTM D1505 – Standard Test Method for Density of Plastics by the Density Gradient Technique.
9. ASTM D1603 – Standard Test Method for Carbon Black in Olefin Plastics.
10. ASTM D1693 – Standard Test Method for Environmental Stress Cracking of Ethylene Plastics.
11. ASTM D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
12. ASTM D1785 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
13. ASTM D2240 – Standard Test Method for Rubber Property - Durometer Hardness.
14. ASTM D2321 – Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
15. ASTM D2467 – Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
16. ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings.

17. ASTM D2564 – Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
18. ASTM D2657 – Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings.
19. ASTM D2774 – Practice for Underground Installation of Thermoplastic Pressure Piping.
20. ASTM D 2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe materials.
21. ASTM D2855 – Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
22. ASTM D3261 – Standard Specification for Butt Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
23. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.
24. ASTM F405 – Standard Specification for Corrugated Polyethylene (PE) Pipe and Fittings.
25. ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.
26. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.
27. ASTM F1473 – Standard Test Method for Notch Tensile Test to Measure the Resistance to Slow Crack Growth of Polyethylene Pipes and Resins.

B. American National Standard Institute (ANSI)
1. ANSI B 31.8 – Code for Pressure Piping, Appendix N.

C. Plastics Pipe Institute (PPI):
1. PPI T-31/9-79 – Technical Report.
2. PPI TR4 – Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compound.

1.4 QUALITY ASSURANCE

A. Provide only pipe and fittings conforming to the requirements or the referenced ASTM standards, ANSI standards, or PPI standards.

B. Utilize only factory trained and certified welders, equipment, and installers.

C. Follow all ASTM practices and standards in the manufacture and fabrication of piping and fittings.

D. Follow manufacturer's written instructions for handling, storage, and installation.

1.5 QUALITY CONTROL

A. Provide permanent markings on piping, clearly showing ASTM conformance, size and SDR, pressure rating, cell classification number, and the manufacturer's name.

B. Provide certification of all welders and installers.

C. Certify compliance with ASTM practices and standards during manufacture and fabrication.

D. Remove from site any pipe and fittings damaged during shipment, construction, or rejected during testing and/or inspection. Replace with acceptable products without additional expense to Owner.

1.6 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. HDPE Pipe
1. Shop Drawings: Submit shop drawings for HDPE Pipe. Indicate piece numbers and locations.
2. Product Data: The Contractor or Supplier shall submit a complete description of and data indicating pipe material used, and pipe accessories and fittings proposed for use to the CQA Consultant for approval at least two weeks prior to installation. Pipe data shall conform to the standards found in **Part 2.1** and **Part 2.2** of this Section.
3. Shop drawings for fabricated fittings shall be submitted to the Engineer at least two weeks prior to fabrication for approval.
4. Manufacturer's Certificates:
   a. Certification of the analysis for the HDPE resin.
   b. Certify products meet or exceed specified requirements specified in **Part 2.1** and **Part 2.2** of this Section.
   c. Certifications must be submitted to CQA Consultant for approval at least two weeks prior to installation.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

1.7 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Closeout Procedures.

B. Project Record Documents: Record location and elevations of landfill gas control system.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.8 QUALITY ASSURANCE

A. The pipe, outlet structure, and/or fitting manufacturer’s production facilities shall be open for observation by the owner or his designated agents with a reasonable advanced notice.

B. During observation, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe, manholes, sumps, and/or fittings to standards required by this Specification.

C. Pipe which has been tested by the manufacturer and falls outside of the appropriate limits set forth in Table 02500-A found in **Part 2.1** of this Section will be cause for rejection.

D. The Owner or the CQA Consultant may request certified lab data to verify the physical properties of materials not meeting the requirements of this specification.

1.9 PRE-INSTALLATION MEETINGS

A. Convene meeting a minimum of one week prior to commencing work pertaining to this Section.

1.10 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated on the Drawings.

1.11 DELIVERY, STORAGE, AND HANDLING

A. **Section 01600** – Product Requirements: Product Delivery Requirements; Product Storage and Handling Requirements.

B. Packaging, handling, and shipment shall be in accordance with the manufacturer's standards, instructions, and recommendations.

C. Transportation to Site:
1. The manufacturer shall package the pipe, fittings, structures, and/or other miscellaneous HDPE items in a manner designed to deliver it or them to the project neatly, intact, and without physical damage.
2. The transportation carrier shall use appropriate methods and intermittent checks to ensure the materials are properly supported, stacked, and restrained during transport such that it is not nicked, gouged, or physically damaged.

D. Storage:
1. Pipe, structures, and other miscellaneous HDPE or PVC items shall be stored on clean, level ground to prevent undue scratching or gouging and as needed to protect them from being covered with excessive dirt, water, moisture, and mechanical abrasion.
2. The handling of pipe, structures, and other miscellaneous HDPE or PVC items shall be done in such a manner that there is no damage. Nylon slings are often used.
3. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations.
4. Store gaskets for mechanical and push-on joints in cool, dry location out of direct sunlight and not in contact with petroleum products.

E. Care shall be taken to minimize the amount of soil collected inside the pipe, structures, and other miscellaneous HDPE or PVC items while handling and installing.

F. The pipe, structures, and other miscellaneous HDPE or PVC items shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment, and care shall be exercised during installation not to damage the pipes and fittings.

G. Any pipe section, structure, fitting, joint or other miscellaneous HDPE or PVC items that become broken, cracked, crushed, cut, scratched, gouged or otherwise rendered unsuitable, as determined by the CQA Consultant, shall be removed and replaced by the Contractor. Scratches greater than 6 inches in length and gouges exhibiting a depth in excess of 8 percent of the wall thickness of the pipe shall be cause for rejection of pipe or fittings to the extent designated by the CQA Consultant.

H. Fused Pipe Segment Handling:
1. Fused segments of pipe shall be handled so as to avoid damage to the pipe.
2. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred.
3. Spreader bars are recommended when lifting long fused sections.
4. Pipe shall be fused in lengths not to exceed that which can be moved and placed easily and safely, causing no damage to the fused pipe or welds.

1.12 COORDINATION

A. Coordinate the Work with construction of other elements of active landfill gas collection system and with construction of the soil cover system.

PART 2 PRODUCTS

2.1 HIGH DENSITY POLYETHYLENE (HDPE) PIPING AND FITTINGS

A. Base Resin (HDPE Material)

1. HDPE material used for the manufacture of HDPE pipe and fittings under this specification shall be produced from approved pipe material base resin that is high density, high molecular weight polyethylene (HDPE) pipe grade resin with the nominal physical properties:
   a. Equivalent to Type III, Category 5, Class C, Grade PE 3408 in accordance with ASTM D1248.
   b. Equivalent to cell classification PE345464C in accordance with ASTM D3350.
   c. As outlined in Table 02500-A below.
2. The material shall be listed by PPI (Plastics Pipe Institute, a division of the Society of the Plastics Industry) in PPI TR-4 with a 73ºF hydrostatic design basis of 1,600 psi and a 140ºF hydrostatic design basis of 800 psi. The PPI listing shall be in the name of the pipe manufacturer and shall be based on ASTM D 2837 testing.
3. The resin shall contain not less than 97% of the base polymer and not less than 2% carbon black as defined in ASTM D1248, Class C to impart maximum weather resistance.
4. The pipe material shall contain no more than 3% carbon black, anti-oxidants, and heat stabilizers combined, and no other additives, fillers or extenders.
5. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same raw material, including both the base resin and the co-extruded resin.

B. Physical Appearance

1. All pipes shall have good appearance qualities.
2. The pipe shall be homogeneous throughout and the surfaces shall be smooth and uniform with no visible defects.
3. The pipes shall be free of visible cracks, holes, voids, nicks, cuts, gouges, scratches, blisters, gels, undispersed ingredients, any signs of contamination by foreign inclusions, or other defects that may affect the wall integrity or the pipe's serviceability.
4. Holes for perforated HDPE pipes shall be cleanly cut, identical in geometry, and evenly spaced.

C. Physical Properties

1. Pipe and fitting dimensions, workmanship, standard dimension ratio (SDR) and corresponding pressure rating shall be in accordance with the requirements of ASTM F714.
2. HDPE piping shall have an SDR of 26 unless otherwise specified on the Drawings.
3. Pipe supplied under this Specification shall have a nominal OD indicated on the Drawings unless otherwise specified.
4. The chemical and corrosion resistance of the PE pipe and all fittings shall be in keeping with typical properties of high quality polyethylene products currently available through commercial sources.
5. All mechanical fasteners or fittings shall be stainless steel.
6. At a minimum, the pipe material shall meet the properties presented in Table 02500-A below:

TABLE 02500-A
REQUIRED PIPE AND BASE RESIN PHYSICAL PROPERTIES

Property	Test Method	Unit	Nominal Value
Material Designation	PPI-TR4		PE 3408
Cell Classification	ASTM D3350		345464C
Material Classification	ASTM D1248		Type III, Category 5, Class C
Density	ASTM D1505		≥0.945 g/cm^3
Melt Index	ASTM D1238 (Condition E)	g/10min	<0.1
Carbon Black Content/Color; UV Stabilizer	ASTM D1603	% range	2 to 3
Flexural Modulus	ASTM D790 2% Secant	psi	>125,000
Tensile Strength @ Ultimate	ASTM D638	psi	3,200
Tensile Strength @Yield	ASTM D638 (Type IV, 2 ipm) [1]	psi	>3,000
Elongation @ Yield	ASTM D638 (Type IV, 2 ipm) [1]	%	>8
Ultimate Elongation @ Break	ASTM D638	%	>750
Modulus of Elasticity	ASTM D638 (Type IV, 2 ipm) [1]	psi	>100,000
Environmental Stress Crack Resistance (ESCR)	ASTM D1693 F_o, Condition C	hrs	>5,000
Hardness	ASTM D2240	Shore "D"	>60
Compressive Strength at Yield	ASTM D695	psi	>1,600
Slow Crack Resistance (SCG) (PENT test)	ASTM F1473	hours	>100
Hydrostatic Design Basis @ 73.4°F (23°C) 140°F (60°C)	ASTM D2837	psi	>1,600 >800
Low Temperature Brittleness	ASTM D746	°F(°C)	< - 180 (-117)
Linear Thermal Expansion Coefficient	ASTM D696	in/in/°F	9 x 10^{-5}

Note:
1. Dumb-bell tested at a rate of strain of 2 inches/minute (ipm)

D. Pipe Fittings
1. All fittings specified on the Drawings, or otherwise, needed to make pipe connections (ex: 90º elbow) shall be in accordance with ASTM D2513 and ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification.
2. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor.
3. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself as specified in **Parts 2.1A**, **2.1B**, and **2.1C** of this Section. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

4. Molded socket fittings shall not be used.
5. Pre-fabricated fittings:
   a. Shall not be permitted unless molded fittings are not available from the pipe Manufacturer, and only after obtaining specific approval from the Engineer.
   b. Shall be made using pipe segments meeting all base resin, physical, and property requirements presented in **Parts 2.1A**, **2.1B**, and **2.1C** of this Section.
   c. All pipe segments in a pre-fabricated fitting shall be pressure rated to exceed by 20% the highest pipe pressure rating to which they are intended to be connected.

2.2 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. All PVC pipe and pipe fittings shall be Schedule 80 PVC conforming to ASTM D 1784, ASTM D 1785 (for pipe), and ASTM D 2467 (for fittings). Perforated pipe shall be slotted in accordance with the Drawings.

B. PVC pipe and pipe fittings shall be manufactured from a compound which meets the requirements of Type 1, Grade 1, Polyvinyl Chloride PVC 1120, Class 12454-B, as outlined in ASTM D 1784. A Type 1, Grade 1 compound is characterized as having the highest requirements for mechanical properties and chemical resistance.
   1. Compound from which pipe is produced shall have a design stress rating of 2000 psi at 73 degrees F, listed by the Plastic Piping Institute.
   2. Materials from which pipe and pipe fittings are manufactured shall have been tested and approved by NSF International.
   3. Pipe shall conform to the requirements of ASTM D 2241. Pipe shall be homogenous throughout and shall be free from cracks, holes, foreign inclusions, and other defects.

C. PVC Pipe Storage:
   1. PVC pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be 6 feet. For storage over 5 days, a location shall be chosen out of direct sunlight, or the piping and fittings shall be covered.

D. PVC Flanges
   1. Flanges shall be Schedule 80 PVC and shall be plate type, ANSI Class 150 pounds.
   2. The bolts, studs, nuts, and washers for the flanges shall be galvanized steel conforming to ASTM A-325. All studs and bolts shall be coated, just prior to installation, with an anti-seize compound as manufactured by Kopr-Kote, or equal.
   3. Flange gaskets shall be full-face Neoprene.

E. Flexible PVC Pipe
   1. Flexible PVC pipe shall be as manufactured by Kanaflex Corporation, Compton, California (310-637-1616), Series 101-PS, or approved equal.
   2. Fasteners for flexible PVC pipe shall be Kanaflex 101-PS power lock clamps, or approved equal.

PART 3 EXECUTION

3.1 HDPE PIPE INSTALLATION

A. Verify landfill gas control system location is ready to receive work and excavations, dimensions, and elevations are as indicated on the Drawings.

B. HDPE Joints
   1. The method of joining for high density polyethylene pipe shall be the heat butt fusion method of high density polyethylene pipe per ASTM D2657 and shall be performed in strict accordance with the pipe manufacturer's recommendations, subject to the CQA

Consultant's approval. The heat fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer.

2. All joints shall be made by trained technicians qualified by the Manufacturer and using equipment and controlled procedures approved by the Manufacturer.
3. All pipe joints shall be stronger than the pipe itself under both tension and hydrostatic loading conditions.
4. The joints shall be leak-tight, homogeneous and uniform throughout.
5. Properly executed electrofusion fittings may be used. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications or fabrications where shear or structural strength is important, as determined by the CQA Consultant. Mechanical joint adapters, flanges, unions, grooved-couplers, transition fittings, and some mechanical couplings may be used to mechanically connect HDPE pipe. Refer to the manufacturer's recommendations.

C. Perforated Pipes
1. The HDPE pipe sections shall be perforated as shown on the Drawings.
2. Perforations shall be cleanly cut, identical in geometry, and evenly spaced.

D. Bedding And Cover Materials
1. Bedding: Fill Type as specified in **Section 02060** and as shown on the Drawings.
2. Cover: Fill Type as specified in **Section 02320** and as shown on the Drawings.

E. Identification
1. The following shall be continuously indent printed on the pipe, or spaced at intervals not exceeding 5 feet:
   a. Name and/or trademark of the pipe manufacturer.
   b. Pipe series designation.
   c. Nominal pipe size.
   d. Standard dimension ratio (SDR).
   e. The letters PE followed by the polyethylene grade per ASTM D1248, followed by the Hydrostatic Design basis in 100's of psi (e.g., PE 3408).
   f. Manufacturing Standard Reference (e.g., ASTM F714-1).
   g. A production code from which the date and place of manufacture can be determined.

F. Pipe and Outlet Structures
1. Excavate, as necessary, to accommodate installation of landfill gas control system.
2. Place bedding material at trench bottom, level materials in continuous layer not exceeding 8 inches (if applicable).
3. Maintain optimum moisture content of bedding material to attain required compaction density.
4. Install pipe, fittings, and accessories in accordance with the Drawings, these Specifications, and the Manufacturer's recommendations.
5. Route piping in straight line.
6. Pipe shall be fused in lengths not to exceed that which can be moved and placed easily and safely, causing no damage to the fused pipe or welds.
7. Care shall be taken not to drop the pipe while moving it, and to avoid excess stress or strain during installation.
8. Pipe installation and, if required, placement of backfill around pipes shall be performed when the pipe is in a contracted state, i.e., during the cool of the morning, at night, or during periods of over-cast skies.
9. Install bedding at sides of pipe as shown on the Drawings.
10. Immediately after placement, the pipe shall be thoroughly and completely embedded and supported.

11. Refer to **Section 02320** for backfilling and compacting requirements. Do not displace or damage pipe when compacting.
12. HDPE pipe shall be joined using butt fusion. All butt fusion welds shall be made as described in ASTM D 2657. Electrofusion welding can be used for making pipe welds. Hot air and extrusion welding are not permitted for pipe joining.
13. Clean and test landfill gas transfer line and condensate transfer line systems using pipe flushing/cleaning procedures and hydrostatic pressure testing on the installed fluid conveyance system including piping, fittings, valves, etc. outlined in Table 02500-A).

G. Miscellaneous HDPE Items
1. Install in accordance with the Drawings and the Manufacturer's recommendations.

H. Pipe Connections:
1. General pipe sections shall be butt-fusion welded according to the Manufacturer's recommendations and shall be performed by a Manufacturer's authorized, trained fusion technician.
2. Pipe ends to be butt-fusion welded shall be clean and dry at the time of welding. No welding shall occur during precipitation or excessive moisture
3. The Contractor shall grind burrs or other potentially damaging areas in the welds prior to placement of the pipe.
4. Specified bolted pipe connections shall be made as specified on the Contract Drawings using stainless steel hardware and neoprene gaskets.
5. Polyethylene stub ends and flanges must be at the ambient temperature of the surrounding soil at the time they are bolted tight to prevent relaxation of the flange bolts and loosening of the joint due to thermal contraction of the polyethylene.
6. Properly executed electrofusion fittings may be used.
7. Perforated HDPE Pipe shall be placed during construction as shown on the Contract Drawings.

I. Cleaning:
1. All HDPE Pipe shall be cleaned of any accumulation of silt, debris, or foreign matter of any kind and shall be kept clear of such accumulation until final acceptance of the work.
2. Final Flushing: The Contractor shall flush all leachate collection piping accessible by cleanout ports with potable water at or near the completion of the work. Any sediment remaining at collection points (sumps, manholes, etc.) shall be removed and disposed of as directed by the Engineer.

3.2 PVC PIPE INSTALLATION

A. PVC pipe installation shall conform to these specifications, the manufacturer's recommendations, and as outlined in ASTM D 2774.

B. Joining of PVC Pipe
1. Joining of pipe shall be in accordance with ASTM D 2855.
2. Preparation:
   a. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used. All burrs, chips, etc. shall be removed from pipe interior and exterior. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting. All pipe cuts shall be square, perpendicular to the center line of pipe. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement does not get wiped off during insertion into the fitting socket.
3. Solvent Welding:

a. A coating of primer as recommended by pipe supplier shall be applied to the entire interior surface of the fitting socket and to an equivalent area on the exterior of the pipe prior to applying solvent cement. The solvent cement shall comply with the requirements of ASTM D 2564 and shall be applied in strict accordance with manufacturer's specifications. Pipe shall not be primed or solvent welded when it is raining, when atmospheric temperature is below 40 degrees F, or above 90 degrees F.

4. Curing:
   a. After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint setting time, use 1 hour for ambient temperatures of 60 to 90 degrees F, or 2 hours when ambient temperature is 40 to 60 degrees F.
5. Alignment:
   a. Pipe and pipe fittings shall be selected so that there will be as small a linear deviation as possible at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.
6. Flexible PVC Pipe Connections:
   a. Connections to HDPE or PVC pipe shall be made with clamps following manufacturers' recommendations and step by step procedures.
7. Flanged Connections:
   a. Flanged connections for PE pipe shall be made with two PE flange adapters with ductile iron back-up rings for bolting.
8. Pipe Supports:
   a. All piping and valves shall be supported so as to prevent stress being transmitted between sections and connected equipment and appurtenances.
   b. Release of any joint shall result in no transverse piping movement and shall allow easy removal and replacement of any piping component.

3.3 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements and **Section 01700** – Execution Requirements.

B. The CQA Consultant or his representative will undertake observations to determine compliance of the materials and work with this Specification.

C. Quality control by the CQA Consultant will include observation:
   1. The HDPE and PVC pipe and fittings for correct size, SDR rating workmanship, and fabrication.
   2. Damage during installation.
   3. The installation, alignment and welding of all pipe, and fittings.
   4. Pipe flushing/cleaning and hydrostatic pressure testing procedures and results on the installed fluid conveyance system including piping, fittings, valves, etc).

D. Contractor shall request observation by CQA Consultant prior to and immediately after placing bedding.

E. Compaction Testing: In accordance with **Section 02320**.

F. When tests indicate Work does not meet specified requirements, remove work, replace and retest.

G. HDPE and PVC pipes and other miscellaneous items shall be subject to rejection on account of failure to conform to these Specifications. In addition, individual sections of these items may be rejected because of any of following reasons:

1. Any pipe section, fitting, joint, or outlet structure that becomes broken, cracked, crushed, cut, scratched, gouged or otherwise rendered unsuitable, as determined by the CQA Consultant, shall be removed and replaced by the Contractor.
2. Scratches greater than 6 inches in length and gouges exhibiting a depth in excess of 8 percent of the wall thickness of the pipe, fitting, or outlet structure shall be cause for rejection of a pipe section, fitting, or outlet structure to the extent designated by the CQA Consultant.

H. HDPE Pipe Testing

1. All solid piping where factory or field joints have been performed require pressure testing except as noted below.
    a. Any unjointed section of pipe showing visual signs of damage or that is of questionable quality may be required to be pressure tested as directed by the CQA Engineer.
    b. Cleanout risers within the containment areas do not require pressure testing.
2. Pressure testing shall be conducted by the Contractor in a manner approved by the Engineer. Such testing shall be observed by the CQA Engineer.
3. The leachate discharge lines shall be tested as follows:
    a. All gravity piping shall be tested using low-pressure air in accordance with ASTM F 1417.
    b. All force main piping shall be tested using hydrostatic pressure in accordance with ASTM F 2164. The pressures used in testing must not exceed the working pressure of the lowest rated component in the system (i.e. valves, meters, flanges, unions, etc.). The Manufacturer's recommendation for pressure testing may also be acceptable as an alternative if approved in advance by the Engineer. Pressure testing of short sections of leachate discharge line or leachate discharge line to be placed in confined or inaccessible areas may be pressure tested by the Contractor prior to installation when approved by the Engineer. Temporary fittings, etc. required to plug section ends shall be provided by the Contractor at no expense to the Owner. Any leachate discharge line that does not meet the pressure test criteria shall be repaired and retested at the Contractor's expense. No leachate discharge line shall be approved until successful pressure testing is completed.

I. PVC Pipe Testing

1. All PVC pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The Contractor shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.
2. Like sizes of polyethylene piping shall be butt welded together into testing segments not to exceed 1,000 feet without the Engineer’s approval. Segments shall be connected to a testing apparatus on one end and fitted with caps on all openings.
3. The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.
4. Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.
5. The test pressure shall be a minimum of 5 psig (138.5 inches, w.c.) and the
6. Contractor shall use a digital gauge.
7. Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. (See Section 3.10 for test failures). The Engineer shall sign off on the test form to indicate test compliance.

8. The Engineer shall be notified at least 24 hours prior to commencement of the testing procedure and shall be present during the test.
9. All equipment for this testing procedure shall be furnished by the Contractor. This shall consist of a portable air compressor, generator, air hoses, and polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge 0 to 100 degrees C: a Schraeder tire valve to facilitate pressurization with an air compressor hose; a ball valve to release pipe pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gasses over a range of 0 to 100 PSI.

J. TEST FAILURE
1. The following steps shall be performed when a pipe segment fails the one percent - one-hour test described in Section 3.9 F above.
   a. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.
   b. All blocked risers and capped ends shall be inspected for leaks.
   c. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.
2. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.
3. After all leaks are repaired, a retest shall be performed in accordance with Section 3.6 D.

3.4 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Protecting installed construction.

B. Protect pipe, aggregate cover, and outlet structures from damage or displacement.

C. Care shall be exercised during construction not to damage the pipes and fittings.

END OF SECTION

SECTION 02610
PIPE CULVERTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. HDPE corrugated, smooth interior stormwater pipe.
2. Joints and accessories.

B. Related Sections
1. **Section 02320** – Structural Fill.
2. **Section 03480** – Pre-Cast Concrete Structures.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe Culvert:
1. Basis of Measurement: By the linear foot invert length of pipe and diameter for each type of pipe.
2. Basis of Payment: By the linear foot placed times the unit price for culvert placement.
   a. Includes excavating (trenching), hand trimming excavation, removing soft subsoil, compacting; installing pipe, fittings and accessories, and backfilling.

1.3 REFERENCES

A. American Society for Testing and Materials:
1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
2. ASTM F405 – Standard Specification for Corrugated Polyethylene Pipe and Fittings.
3. ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Requirements for submittals.

B. Product Data: Submit data on pipe, fittings, and accessories.

C. Manufacturer's Installation Instructions: Submit special procedures required to install Products specified.

1.5 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Closeout procedures

B. Project Record Documents:
1. Accurately record actual locations of pipe runs, connections, and invert elevations.

C. Operation and Maintenance Data: Procedures for submittals.

1.6 PRE-INSTALLATION MEETING

A. **Section 01300** – Administrative Requirements: Pre-installation meeting.

PART 2 PRODUCTS

2.1 HDPE Corrugated Stormwater Pipe.

A. Stormwater pipe shall be HDPE corrugated, smooth interior pipe as manufactured by ADS (N-18) or Engineer approved alternate, meeting the requirements of ASTM F405 and ASTM F667 or as otherwise shown on the Drawings.

PART 3 EXECUTION

3.1 LINES AND GRADES

A. Grades:
1. Lay pipes to lines and grades indicated on Drawings.
2. Maintain grade alignment of pipe using string line parallel with grade line and vertically above centerline of pipe.
   a. Establish string line on level batter boards at intervals of not more than 25 feet.
   b. Install batter boards spanning trench, rigidly anchored to posts driven into ground on both sides of trench.
   c. Set three adjacent batter boards before laying pipe to verify grades and line.
   d. Determine elevation and position of string line from elevation and position of offset points or stakes located along pipe route.
   e. Do not locate pipe using side lines for line or grade.
3. As an alternative method, use laser-beam instrument with qualified operator to establish lines and grades.

B. Location of Pipe Lines:
1. Location and approximate depths of proposed pipe lines are shown on Drawings.
2. CQA Consultant or Owner reserves right to make changes in lines, grades, and depths of pipe lines and structures when changes are required for Project conditions.

3.2 PREPARATION

A. Call Local Utility Line Information service and the Owner not less than three working days before performing Work. Coordinate with and hire a private utility location firm, as needed.
1. Underground utilities must be located and marked within and surrounding construction areas.

B. Identify required lines, levels, contours, and datum locations.

C. Protect bench marks and existing structures from excavating equipment and vehicular traffic.

D. Maintain and protect above and below grade utilities indicated to remain.

3.3 TRENCHING

A. Implement temporary dewatering measures to reduce softening of exposed subgrade soils as excavation advances, until foundation construction is complete, and until fill placement is a minimum of 3-feet above the groundwater level.

B. Do not advance open trench more than 100 feet ahead of installed pipe.

C. Cut trenches sufficiently wide to enable installation and allow inspection. Remove water or materials that interfere with Work.

D. Excavate bottom of trenches maximum 16 inches wider than outside diameter of pipe or structure.

E. Excavate trenches to depth indicated on Drawings. Provide uniform and continuous bearing and support for bedding material and pipe.

F. Do not disturb subgrade soils within a 45 degree zone of influence with depth of foundations, if applicable.

G. When Project conditions permit, slope side walls of excavation starting 2 feet above top of pipe. When side walls can not be sloped, provide sheeting or shoring to protect excavation as specified in this Section.

H. When subsurface materials at bottom of trench are loose or soft, excavate to greater depth as directed by CQA Consultant until suitable material is encountered. Backfill according to **Part 3.5** of this Section.

I. Cut out soft areas of subgrade not capable of compaction in place. Backfill with Fill Type S1 and compact to density equal to or greater than requirements for subsequent backfill material.

J. Hand trim excavation. Remove loose matter.

K. Correct over excavated areas with compacted backfill as specified for authorized excavation or replace with lean concrete as directed by CQA Consultant.

L. Stockpile excavated material in area designated on site and remove excess material not being used from site unless authorized by Owner to dispose of on-site in an Owner designated location.

3.4 SHEETING AND SHORING

A. Comply with all OSHA, State, and local trench safety requirements.

B. Sheet, shore, and/or brace excavations to prevent danger to persons, structures, and adjacent properties and to prevent caving, erosion, and loss of surrounding subsoil.

C. Support trenches more than 5 feet deep excavated through unstable, loose, or soft material. Provide sheeting, shoring, bracing, or other protection to maintain stability of excavation.

D. Design sheeting and shoring to be removed at completion of excavation work.

E. Repair damage caused by failure of the sheeting, shoring, or bracing and for settlement of filled excavations or adjacent soil.

F. Repair damage to pipe bedding work from settlement, water or earth pressure or other causes resulting from inadequate sheeting, shoring, or bracing.

3.5 BACKFILLING

A. Backfill trenches to contours and elevations with unfrozen fill materials.

B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

C. Fill Type S1 – Structural Fill: Place and compact material in equal continuous layers not exceeding 6 inches compacted depth. Refer to **Section 02320**.

D. Employ placement method that does not disturb or damage utilities in trench.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Do not leave more than 50 feet of trench open at end of working day. Protect open trench to prevent danger to the public.

G. Remove and replace trench subgrade soils softened or saturated as a result of exposure to weather or inadequate temporary dewatering measures.

H. Remove surplus fill materials from site unless authorized by Owner to dispose of on-site in an Owner designated location.

I. Protect open trench to prevent danger to the Owner or public.

3.6 TOLERANCES

A. **Section 01400** – Quality Requirements: Tolerances.

B. Top Surface of General Backfilling: Plus or minus 1/2 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation services.

B. Perform laboratory material tests in accordance with AASHTO T180, ASTM D698, and/or ASTM D1557.

C. Perform in place compaction tests in accordance with the following:
1. Density Tests: ASTM D1556, ASTM D2937, ASTM D6938.
2. Moisture Tests: ASTM D2216, ASTM D3017.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, compact, and retest.

E. Frequency of Tests: One test per compacted lift per 50 linear feet of trench.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. **Section 01700** – Execution Requirements: Protecting Installed Construction.

B. Reshape and re-compact fills subjected to vehicular traffic during construction.

C. Vehicular traffic shall be limited to areas which have been protected by at least 24 inches of cover material above the liner. Vehicles shall be prohibited from performing tight turning radii and rapid braking on the cover material.

3.9 SCHEDULE

A. Trenches with Piping:

1. Cover pipe and bedding with Fill Type S1 in loose 8 inch lifts, compacted uniformly to a minimum of 95 percent of its Standard Proctor maximum dry density (AASHTO T180, ASTM D698, ASTM D1557).

END OF SECTION

SECTION 02611
LANDFILL GAS WELLS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Horizontal Landfill gas wells.
2. Vertical Landfill Gas Wells.

B. Related Sections
1. **Section 02060** – Aggregate.
2. **Section 02320** – Structural Fill.
3. **Section 02321** – Backfill – Low Permeability Barrier.
4. **Section 02500** – HDPE and PVC Piping and Miscellaneous Items.
5. **Section 02674** – Nonwoven Geotextile.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Landfill Gas Wells:
1. Basis of Measurement: By each unit installed.
2. Basis of Payment: By each unit installed times the unit price for each unit.
   a. Includes excavating, placing non-woven geotextile filter, drainage aggregate, installation of perforated and solid pipe and fittings and insect screen, geocomposite drainage layer, and backfilling.

1.3 REFERENCES

A. American Society for Testing and Materials:
1. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity Flow Applications.
2. ASTM F405 – Standard Specification for Corrugated Polyethylene Pipe and Fittings.
3. ASTM F667 – Standard Specification for Large Diameter Corrugated Polyethylene Pipe and Fittings.
4. ASTM D3231 – Standard Specification for HDPE pipe.

B. NCDOT Standard Specifications for Roads and Structures (latest edition).

1.4 QUALITY ASSURANCE

A. Quality Assurance during installation of LFG Wells will be provided by the Owner as described in the accompanying Project CQA Manual.

1.5 SITE CONDITIONS

A. Obstructions and saturated conditions are sometimes encountered when drilling in a landfill, many of which can be drilled through. The Contractor is expected to make reasonable efforts to drill through obstructions and saturated conditions and will be paid for offset re-drilling and boring

abandonment only if prior written approval is obtained from the Owner. The Contractor will be paid for abandonment of abandoned hole and for well installation at the new location.

1.6 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Requirements for submittals.

B. Product Data: See **Sections 02060**, **02500**, and **02674** for respective sections on drainage aggregate, HDPE pipe and fittings, and nonwoven geotextile.

C. The Contractor shall furnish copies of the delivery tickets or other approved receipts to the Engineer as evidence for materials received that will be incorporated into construction.

1.7 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Closeout procedures.

B. Project Record Documents:
1. Accurately record actual locations and elevations of landfill gas wells.

1.8 PRE-INSTALLATION MEETING

A. **Section 01300** – Administrative Requirements: Pre-installation meeting.

PART 2 PRODUCTS

2.1 Horizontal Landfill Gas Wells.

A. Product Data: See **Sections 02060**, **02500**, and **02674** for respective sections on drainage aggregate, HDPE pipe and fittings, and nonwoven geotextile.

2.2 Vertical Landfill Gas Wells.

A. Solid/Perforated/Slotted Pipe

1. All pipe and fittings shall be SDR 11 HDPE. Alternately, rigid PVC Schedule 80 pipe and fittings may be used, if approved in advance by the Engineer.

2. Perforations in HDPE or PVC well piping shall be 2 inch diameter holes, spaced at 90 degrees around the circumference of the pipe and 6 inches on center. Stagger adjacent rows of perforations evenly along the pipe. Alternatively, slots in HDPE or PVC well piping shall be 6 to 8 inches long by 1 inch wide, spaced at 90 degrees around the circumference of the pipe and 12 inches center to center. Stagger adjacent rows of slots evenly along the pipe. Perforated HDPE or PVC piping may be used if approved in advance by the Engineer.

3. Bentonite: Coarse-ground, pelletized bentonite from an approved source is to be mixed thoroughly with potable water at a ratio of 5 gallons of water to every 50 lbs. of bentonite.

4. Stone Backfill: Stone backfill for Landfill Gas Wells shall be No. 4 stone (1.5 inch nom.), or approved equal.

5. Soil Backfill: Soil backfill shall be on-site soils as approved by the Engineer.

PART 3 EXECUTION

3.1 EXAMINATION

A. **Section 01400** – Quality Requirements: Examination.

B. Coordinate landfill gas well installation with other portions of the work. All landfill gas wells shall be constructed at the locations and according to the details shown on the Contract Drawings. Care shall be taken to ensure that these locations are not in areas which are prone to pond water. The Engineer shall be notified prior to drilling Landfill Gas Wells, such that he may observe the installation.

3.2 EXCAVATION HORIZONTAL LANDFILL GAS WELLS

A. Excavate area for landfill gas well to the dimensions shown in the Details and in a location where shown on the Drawings. Remove large stones or other hard matter which could damage geotextile installation.

B. Perform temporary dewatering as necessary to keep bearing soils from softening.

3.3 DRILLING VERTICAL LANDFILL GAS WELLS

A. Landfill Gas Wells are to be 36 inch diameter, drilled to the depth shown on the Contract Drawings. The Contractor must use dry drilling equipment; wet rotary drilling equipment may not be used. All borings shall be made with bucket type augers.

B. The boring depths shown on the Contract Drawings are estimated and may be adjusted in the field by the Engineer. One reason limiting depth might be as follows:

1. If water is encountered in a boring, the Contractor may be directed to drill beyond the point at which it was encountered. If wet conditions remain, the boring may be terminated and the length of perforated pipe adjusted by the Engineer, or the well may be relocated. If wet conditions cease (e.g. due to trapped water layer), then drilling will continue to the design depth.

2. If the engineer believes the well borehole may penetrate the protective cover or bottom liner.

C. As soon as drilling is completed, a safety screen shall be placed over the top of the bore. This screen shall stay in place until backfilling is within 4 feet of the surface. Safety screen size should be large enough to accommodate all backfill materials and any tools used during backfill yet not large enough for any human to accidentally fall through.

3.4 HORIZONTAL LANDFILL GAS WELL INSTALLATION

A. Place base layer of drainage aggregate (NCDOT NO. 57 Washed Stone) in bottom of excavation.

B. Construct HDPE landfill gas well pipe and install. Installation of HDPE pipe shall be in accordance with ASTM D2321, the manufacturer's recommendations, and as described elsewhere in these specifications.

C. Backfill excavation with drainage aggregate. Ensure that perforated portion of pipe is entirely within the drainage aggregate portion of the landfill gas well system.

D. Install a fabric donut on top of drainage aggregate.

E. Backfill with 1 foot of structural fill.

F. Install 2-foot thick bentonite pellet plug hydrated with clean water adequate for hydration.

G. Backfill remainder of hole with structural fill.

H. Install low permeability barrier and erosion layer soil backfill. Refer to **Section 02321** and **02320** for respective sections on low permeability barrier and erosion layer soil backfill.

3.5 VERTICAL LANDFILL GAS WELL INSTALLATION

A. The bore for the well shall be straight and the well pipe shall be installed in the center of the bore hole. The Contractor will take all tension off of the pipe by mechanical means and center the pipe in the middle of the borehole before starting to backfill.

B. HDPE well pipe will be welded joint or if approved by the Engineer, PVC shall be flush threaded, and or lag bolted using stainless steel hardware.

C. Backfilling of the well shall commence immediately after well drilling is completed and the well piping has been installed in the borehole. Backfill materials shall be installed as indicated on the Contract Drawings and as approved by the Engineer.

1. Stone backfill shall be poured or scooped through the screen at a rate that will not endanger the integrity of the well casing.

2. The well seal will be formed by evenly distributing two 50 lb. bags of bentonite material around the annulus of the well and then adding 10 gallons of fresh water in a manner that will allow for a thorough saturation of the bentonite material. This process will be continued until a minimum plug thickness of 3 feet has been achieved.

3. Soil backfill shall be used above the bentonite seal up to the existing top of intermediate cover elevation.

D. Abandonment of Boreholes:

1. Borings which have been advanced into the waste and which have been required to be abandoned by the Engineer shall be backfilled up to the top of existing intermediate cover elevations with on-site soils. Final cover materials will be installed above this elevation.

E. Disposal of Waste:

1. C&D Waste from well drilling operations shall be disposed of within the active C&D landfill area as directed by the Owner and Engineer.

2. MSW waste from well drilling operations shall be disposed of in the active MSW Transfer Station as directed by the Owner and Engineer.

3.6 ERECTION TOLERANCES

A. Maximum offset of landfill gas well from indicated alignment: 1 foot.

3.7 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation requirements.

B. Request observation prior to placing backfill around pipe.

C. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. **Section 01700** – Execution Requirements: Protecting installed construction.

B. Protect landfill gas wells from damage or displacement during backfilling operations and subsequent earthwork operations.

END OF SECTION

SECTION 02674
NONWOVEN GEOTEXTILES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Nonwoven geotextile for:
   a. Active landfill gas collection system.
   b. Erosion control devices.

B. Related Sections:
1. Section 02374 – Erosion Control Devices.
2. Section 02611 – Landfill Gas Wells.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Geotextile
1. Basis of Payment: Not applicable, included in other sections of the specifications.

1.3 REFERENCES:

A. Construction Quality Assurance (CQA) Plan

B. American Society for Testing and Materials (ASTM) standards
1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D3786 – Standard Test Method for Hydraulic Burst Strength of Knitted Goods and Non-woven Fabrics (Diaphragm Bursting Strength Tester Method).
3. ASTM D4354 – Practice for Sampling of Geosynthetics for Testing.
4. ASTM D4355 – Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus).
5. ASTM D4491 – Standard Test Method for Water Permeability of Geotextiles by Permittivity.
6. ASTM D4751 – Standard Test Method for Determining Apparent Opening Size of a Geotextile.
7. ASTM D4533 – Test Method for Trapezoidal Tearing Strength of Geotextiles.
8. ASTM D4632 – Test Method for Grab Breaking Load and Elongation of Geotextiles.
9. ASTM D4759 – Practice for Determining the Specification Conformance of Geosynthetics.
10. ASTM D4833 – Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products.
11. ASTM D4873 – Guide for Identification, Storage, and Handling of Geotextiles.
12. ASTM D5261 – Test Method for Measuring Mass per Unit Area of Geotextiles.
13. ASTM D5321 – Standard Test Method for Determining the Coefficient of Soil and Geosynthetic or Geosynthetic and Geosynthetic Friction by the Direct Shear Method.

1.4 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Manufacturer's Product Information

1. A written certificate from the Geotextile Manufacturer stating that the resin and/or materials supplied are in compliance with this Specification:
   a. The manufacturer's certificate shall state that the finished geotextile meets MARV requirements of the specification as evaluated under the manufacturer's quality control program and that these values are guaranteed by the geotextile manufacturer.
   b. The information supplied shall be in the form of a factory quality control certificate for each roll and shall include the following:
      1) Lot, batch, or roll numbers and identification.
      2) Length and width of each roll.
      3) Date each roll was manufactured.
      4) Sampling procedures.
      5) Results of quality control tests that are to include those presented in Table 02674-A found in this Section and description of test methods used. The results of these tests must meet the minimum required physical properties for geotextile specified in Table 02674-B found in this Section.
   c. A person having legal authority to bind the manufacturer shall attest to the certificate.

C. The Installer shall submit details of his/her proposed sewing (e.g., type of seam; number of stitches per inch; number of stitching rows; etc) and typical samples of the seam for approval by the CQA Consultant at least two weeks prior to installation.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance with these Specifications.

B. The Manufacturer shall sample and test the geotextile material, at minimum frequencies specified in Table 02674-A found in this Section.

C. Any geotextile sample that does not comply with this Section shall result in rejection of the roll from which the sample was obtained. The Contractor shall replace any rejected rolls at no additional cost to Owner.

D. If a geotextile sample fails to meet the quality control requirements of this Section, the Contractor shall require that the Geotextile Manufacturer sample and test each roll manufactured in the same lot or batch, or at the same time, as the failing roll. Sampling and testing of rolls shall continue until a pattern of acceptable test results is established.

E. General manufacturing procedures shall be performed in accordance with the manufacturer's internal quality control guide and/or documents.

F. The Manufacturer shall be a well-established firm with more than two years experience in the manufacture of geotextiles.

G. The Installer shall be trained and qualified to install geotextiles.

H. The CQA Consultant shall examine the geotextile rolls upon delivery to the site and report any deviations from project specifications to the contractor.

I. The need for conformance testing shall be determined by the CQA Consultant for rolls delivered to the site.

1. For this purpose, the CQA Consultant shall take a sample three feet (along roll length) by roll width according to ASTM Practice D4354. The sample shall be properly marked, wrapped, and sent to an independent laboratory for conformance testing.
2. The pass or fail of the conformance test results shall be determined according to ASTM Practice D4759.

1.6 DAILY PRE-INSTALLATION MEETINGS

A. At the beginning of each work day the Earthwork Contractor's Superintendent, the Geosynthetic Contractor's Superintendent, and the CQAO will meet to discuss the upcoming work plan for all parties to ensure cooperation, communication, and understanding.

1.7 DELIVERY, STORAGE AND HANDLING

A. **Section 01600** – Product Requirements: Product delivery requirements and Product storage and handling requirements.

B. Geotextile labeling, shipment, and storage shall follow ASTM D 4873.

C. Product labels shall clearly show:
1. Manufacturer or supplier name.
2. Product identification.
3. Lot or batch number.
4. Roll number.
5. Roll dimensions (length and width).

D. If any special handling is required, it shall be so marked on the geotextile itself; e.g., "This Side Up" or "This Side Against Soil to be Retained".

E. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

F. Each geotextile roll shall be wrapped with a material that will protect the geotextile, including the ends of the roll, from damage due to shipment, water, ultraviolet sunlight, mud, dust, puncture, and other damaging deleterious conditions. The protective wrapping shall be maintained during periods of shipment and storage.

G. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from the following: site construction damage, precipitation, extended ultraviolet radiation including sunlight, chemicals that are strong acids or strong bases, flames including welding sparks, temperatures in excess of 160°F (71°C), and any other environmental condition that may damage the property values of the geotextile.

H. Transport and handle geotextile with equipment designed to protect it from damage. Equipment used to unload, stack or transport geotextile shall not damage protective wrap or geonet layers.

I. Upon delivery at the job site, the contractor shall ensure that the geotextile rolls are handled and stored in accordance with the manufacturer's instructions as to prevent damage.

J. The geotextile rolls shall not be stacked more than three rolls high or as otherwise recommended by the Manufacturer.

K. Do not use materials damaged during storage or handling. If the geotextile is not packaged and a roll is damaged during shipment, it shall be rejected.

L. If only the outermost surface of the roll is affected, it may be peeled back, cut, and wasted if approved by the CQA Consultant (i.e., it shall be treated as if it were the protective packaging for the remainder of the roll).

M. The geotextile shall be relatively free of holes or any sign of contamination by foreign matter. The CQA Consultant may reject all or portions of units (or rolls) of the geotextile if in his opinion significant quantities of production flaws are observed.

N. Responsibility
1. Contractor
a. The Contractor shall provide the services of a Geotextile Manufacturer, and Installer, who shall meet the following qualifications. The Contractor shall, however, accept and retain full responsibility for all materials and installation and shall be held responsible for any defects in the completed system.
b. Unloading of geotextile from delivery vehicle.
c. The contractor shall be liable for all damages to the geotextile materials incurred during and after unloading them at the site.
2. Manufacturer of Geotextiles
a. The Geotextile Manufacturer shall be responsible for the production and delivery of geotextile rolls.
b. The Manufacturer shall submit to the CQA Consultant:
1) Those items listed in Part 1.4 of this Section.
2) Production capacity available and projected delivery dates for this project.
3. Installer (may be same as Contractor)
a. The Installer shall be responsible for field handling, storing, deploying, seaming, or connecting, temporary restraining (against wind), anchoring, and other site aspects of the geotextiles.

O. The Installer shall take any necessary precautions to prevent damage to other portions of the Work during placement of the geotextile.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. **Section 01700** – Execution Requirements: Requirements for warranties.

B. Furnish 1 year manufacturer's warranty from date of installation for repair or replacement of geotextiles that fail in materials and workmanship or that deteriorates under conditions of normal weather. Warranty does not include deterioration or failure of geotextile due to exposure to harmful chemicals, gases or vapors, abnormal and severe weather phenomena, fire, earthquakes, floods, vandalism, or abuse by persons, animals, or equipment.

PART 2 PRODUCTS

2.1 GEOTEXTILE

A. Nonwoven geotextile shall be that which is specified on the Drawings. Unless otherwise noted on the Drawings, geotextile suppliers shall furnish materials whose Minimum Average Roll Values meet or exceed the criteria specified in Table 02674-B found in this Section. The Manufacturer shall provide test results for these procedures, as well as a certification that the material properties meet or exceed the specified values.
   1. Minimum Average Roll Value (MARV) shall be based on Manufacturer's data and shall be calculated as the mean value of the property of interest plus or minus two standard deviations, as appropriate.
   2. Where material properties vary among the machine and cross-machine directions, the MARV shall apply to the direction providing the lowest value (when a minimum is specified) or the highest value (when a maximum value is specified).

B. The geotextiles provided by the supplier shall be stock products.

C. The geotextile shall be:
   1. Nonwoven, needlepunched, continuous filament polyester material; or
   2. Nonwoven, needlepunched, continuous filament polypropylene material; or
   3. Nonwoven, needlepunched, polypropylene staple or continuous fiber material.

D. The geotextile shall be manufactured from first quality virgin polymer.

E. The supplier shall not furnish products specifically manufactured to meet the specifications of this project unless authorized by the Owner and Engineer.

F. In addition to the property values listed in Table 02674-B, the geotextiles shall:
   1. Retain its structure during handling, placement, and long-term service.
   2. Be capable of withstanding outdoor exposure for a minimum of 30 days with no measurable deterioration.

G. The Contractor shall be required to submit samples of the proposed geocomposite within one week of award of contract.

TABLE 02674-A
GEOTEXTILE REQUIRED PHYSICAL PRE-SHIPPING TESTING

PROPERTY	TEST METHOD	MINIMUM FREQUENCY
Mass Per Unit Area	ASTM D5261	Every 100,000 ft^2
Grab Tensile Strength	ASTM D4632	Every 100,000 ft^2
Grab Tensile Elongation	ASTM D4632	Every 100,000 ft^2
Trapezoid Tear Strength	ASTM D4533	Every 100,000 ft^2
Mullen Burst Strength	ASTM D3786	Every 100,000 ft^2
Puncture Strength	ASTM D4833	Every 100,000 ft^2
Apparent Opening Size (AOS)	ASTM D4751	1 per production lot (filter geotextiles only)
Permeability	ASTM D4491	1 per production lot (filter geotextiles only)
UV Resistance(3)	ASTM D4355	1 per production lot

TABLE 02674-B
GEOTEXTILE REQUIRED PHYSICAL AND HYDRAULIC PROPERTIES

PROPERTIES AND REQUIREMENTS(1,2)	UNITS	SPECIFIED VALUES 6 oz.	SPECIFIED VALUES 8 oz.	SPECIFIED VALUES 10 oz.	SPECIFIED VALUES 12 oz.	TEST METHOD
Type	---	Nonwoven	Nonwoven	Nonwoven	Nonwoven	---
Mass Per Unit Area	oz/yd^2	6.0	8.0	10.0	12.0	ASTM D5261
Grab Tensile Strength	lb	160	200	230	300	ASTM D4632
Grab Tensile Elongation	%	50	50	50	50	ASTM D4632
Trapezoid Tear Strength	lb	65	80	95	115	ASTM D4533
Mullen Burst Strength	lb/in^2	310	380	520	550	ASTM D3786
Puncture Strength	lb	85	110	120	140	ASTM D4833
Apparent Opening Size (AOS)	US Sieve/ mm	70/0.212	80/0.18	100/0.15	100/0.15	ASTM D4751
Permeability	cm/sec	0.25	0.3	0.3	0.3	ASTM D4491
UV Resistance(3)	% strength retained	70	70	70	70	ASTM D4355

Notes:
(1) All values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the values in this table) except for UV resistance, which is a minimum value.
(2) Polymer composition of 95 % polypropylene or polyester by weight
(3) Evaluation to be on 2.0 inch strip tensile specimen after 500 hours of exposure.

2.2 ACCESSORIES

A. Sewing materials: Types recommended by manufacturer for sewing seams in geotextile.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to implementing any geotextile work, the Geosynthetic Installer shall carefully inspect the subgrade and verify that all work is complete to the point where the installation of the geotextile may properly commence without adverse impact.

B. If the Contractor has any concerns regarding the installed work, the CQA Consultant and/or Owner shall be notified in writing within 48-hours of his site inspection. Failure to inform the CQA Consultant and/or Owner in writing or installation of the geotextile will be construed as Contractor's acceptance of all prior related work.

C. Any geotextile that does not comply with Table 02674-B of this Section shall be rejected and replaced with new material in accordance with the Specifications, at no additional cost to Owner.

3.2 PREPARATION

A. Prior to implementing any of the work described in this Section, the Installer shall become thoroughly familiar with all portions of the work within this Section or related work, as necessary for successful completion of the Work.

3.3 INSTALLATION

A. The Installer shall handle all geotextile in such a manner as to ensure they are not damaged in any way.

B. The Installer shall take any necessary precautions to prevent damage to underlying layers during placement of the geotextile.

C. In the presence of wind, all geotextiles shall be weighted by sandbags or approved equivalent. Such anchors shall be installed during placement and shall remain in place until replaced with cover material.

D. After unwrapping the geotextile from its opaque cover, the geotextile shall not be left exposed for a period in excess of 20 days unless a longer exposure period is approved by the CQA Consultant based on a formal demonstration from the Contractor that the geotextile is stabilized against U.V. degradation for the proposed period of exposure.

E. The Contractor shall take care not to entrap stones, excessive dust, or moisture in the geotextile during placement.

F. Nonwoven geotextile shall be continuously sewn at their seams. Geotextiles shall be overlapped a minimum of 6 inches, or as otherwise specified in the Specifications.

3.4 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation requirements.

B. The Contractor shall be aware of the activities outlined in the CQA Plan and shall account for these CQA activities in the installation schedule.

C. The need for conformance testing shall be determined by the CQA Consultant.

D. The finished geotextile shall have good appearance qualities. It shall be free from such defects that would affect the specific properties of the geotextile, or its proper functioning.

E. Defects and Repairs:
   1. Any holes or tears in the geotextile shall be repaired with a patch made from the same geotextile. The patch shall be sewn in place with a minimum of 12 inches overlap in all directions.
   2. Care shall be taken to remove any soil or other material, which may have penetrated the torn geotextile.

F. Before initial placement of protective cover, compacted soil cover, or other overlying materials, inspect underlying system seams and repaired areas to ensure tight, continuously seamed installation. Repair damaged system and re-inspect repaired work.

3.5 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Requirements for protecting finished Work.

B. The Installer and Contractor shall use all means necessary to protect all prior work and all materials and completed work of other Sections.

C. In applying fill material, no equipment can drive directly across the geotextile. The specified fill material shall be placed and spread utilizing vehicles with a low ground pressure.

D. The geotextile shall be covered as soon as possible after installation and approval. The geotextile shall not be exposed to precipitation prior to being installed and shall not be exposed to direct sun light for more than 20 days after installation.

E. Placement of Overlying Material:
   1. Placement of the overlying material shall proceed immediately following placement and inspection of the geotextile
   2. The overlying material shall be placed on the geotextile in such a manner that ensures that:
      a. The geotextile and underlying lining materials are not damaged.
      b. Minimal slippage occurs between the geotextile and underlying layers.
      c. Wrinkling of geosynthetics does not occur.

F. In the event of damage, the Installer shall immediately make all repairs and replacements necessary at the expense of the responsible party, to the approval of the CQA Consultant.

G. Protect installed geotextile according to manufacturer's instructions. Repair or replace areas of damaged by scuffing, punctures, traffic, rough subgrade, or other unacceptable conditions.

H. The contractor shall not use heavy equipment to traffic above the geotextile without approved protection.

END OF SECTION

SECTION 02924
SEEDING AND SOIL SUPPLEMENTS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:
1. Preparation of subsoil.
2. Placing topsoil as needed.
3. Seeding.
4. Hydroseeding.
5. Mulching.
6. Fertilizing.
7. Maintenance.

B. Related Sections:
1. **Section 02374** – Erosion Control Devices.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Seeding:
1. Basis of Measurement: By the acre.
2. Basis of Payment: By the acre seeded times the unit price for seeding.
   a. Includes all labor, equipment, and materials required to establish a permanent grass cover on all graded surfaces including, but not limited to preparation of subsoil, soil amendments, installation of erosion control matting, fertilizing, and seeding.
   b. Includes maintaining grass cover until acceptance by the CQA Consultant.
   c. Includes any maintenance and protection required to control erosion on embankment fill surfaces prior to beginning permanent grassing operations.

1.3 REFERENCES

A. The State of North Carolina Erosion and Sediment Control Planning and Design Manual.

1.4 DEFINITIONS

A. Weeds: Vegetative species other than specified species to be established in given area.

1.5 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Product Data: Submit data for seed mix, fertilizer, mulch, and other accessories.

C. Soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs or a similar soil and nutrient testing laboratory.

1.6 CLOSEOUT SUBMITTLAS

A. **Section 01700** – Execution Requirements: Project record documents.

B. Operation and Maintenance Data: Include maintenance instructions, cutting method and maximum grass height; types, application frequency, and recommended coverage of fertilizer.

1.7 QUALITY ASSURANCE

A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.

B. Perform Work in accordance with North Carolina Erosion and Sedimentation Control Planning and Design Manual.

1.8 DELIVERY, STORAGE, AND HANDLING

A. **Section 01600** – Product Requirements: Product storage and handling requirements.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 MAINTENANCE SERVICE

A. **Section 01700** – Execution Requirements: Manual for materials and finishes.

B. Maintain seeded areas immediately after placement until grass is well established and exhibits vigorous growing condition for three cuttings.

PART 2 PRODUCTS

2.1 SEED MIXTURE

A. Temporary Seed Mixture: As specified on Drawings.

B. Permanent Seed Mixture: As specified on Drawings.

C. Seed Mixture shall be in accordance with the latest edition of the North Carolina Erosion and Sediment Control Planning and Design Manual.

2.2 SOIL MATERIALS

A. Topsoil: Excavated from site and free of weeds.

2.3 ACCESSORIES

A. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, dry, and as described in the North Carolina Erosion and Sediment Control Planning and Design Manual.

B. Fertilizer: Commercial grade; recommended for grass; of proportion necessary to eliminate deficiencies of topsoil as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated on Drawings.

C. Lime: Pelletized agricultural lime is recommended for grass; of proportion necessary to adjust pH of soil to acceptable levels as described in the North Carolina Erosion and Sediment Control Planning and Design Manual and as indicated on the Drawings.

D. Water: Clean, fresh and free of substances or matter capable of inhibiting vigorous growth of grass.

E. Erosion Fabric: Erosion control matting, as specified on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify prepared soil base is ready to receive the Work of this Section.

3.2 PREPARATION OF SUBSOIL

A. Prepare sub-soil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.

B. Remove foreign materials, weeds and undesirable plants and their roots. Remove contaminated sub-soil.

3.3 FERTILIZING

A. Perform chemical soil tests to determine soil nutrient and amendment requirements to promote grass growth.

B. Apply lime and fertilizer in accordance with Soil test results and fertilizer and soil amendment recommendations from the North Carolina Department of Agriculture and Consumer Affairs.

C. Apply after smooth raking of topsoil.

D. Do not apply fertilizer at same time or with same machine used to apply seed.

E. Mix fertilizer thoroughly into upper 2 inches of soil.

F. Lightly water soil to aid dissipation of fertilizer. Irrigate top level of soil uniformly.

3.4 SEEDING

A. Apply seed at rate as indicated on Drawings evenly in two intersecting directions and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Rake in lightly.

B. Do not seed areas in excess of that which can be mulched on same day.

C. Planting Season: As indicated on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual.

D. Do not sow immediately following rain, when ground is too dry, or when winds are over 12 mph.

E. Immediately following seeding, apply mulch to thickness as specified on Drawings and in accordance with the North Carolina Erosion and Sediment Control Planning and Design Manual. Maintain clear of shrubs and trees.

F. Apply water with fine spray immediately after each area has been mulched. Saturate to 2 **inches** of soil.

3.5 HYDROSEEDING

A. Apply fertilizer, mulch and seeded slurry with hydraulic seeder at rate of 2,000 lbs per acres evenly in one pass.

B. After application, apply water with fine spray immediately after each area has been hydroseeded. Saturate to 4 inches of soil and maintain moisture levels two to four inches.

3.6 SEED PROTECTION

A. Cover seeded slopes where grade is 3 horizontal to 1 vertical (3H:1V) or greater with erosion fabric as specified on the Drawings. Roll fabric onto slopes without stretching or pulling.

B. Lay fabric smoothly on surface, bury top end of each section in 6-inch deep excavated topsoil trench. Overlap edges and ends of adjacent rolls minimum 12 inches. Backfill trench and rake smooth, level with adjacent soil.

C. Secure outside edges and overlaps at 36 inch intervals with stakes or as recommended by the Manufacturer.

D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.

E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches.

3.7 MAINTENANCE

A. Mow grass at regular intervals to maintain at maximum height of 3 inches. Do not cut more than 1/3 of grass blade at each mowing. Perform first mowing when seedlings are 40 percent higher than desired height.

B. Neatly trim edges and hand clip where necessary.

C. Immediately remove clippings after mowing and trimming. Do not let clippings lay in clumps.

D. Water to prevent grass and soil from drying out.

E. Control growth of weeds. Apply herbicides. Remedy damage resulting from improper use of herbicides.

F. Immediately reseed areas showing bare spots.

G. Repair washouts or gullies.

H. Protect seeded areas with warning signs during maintenance period.

3.8 SCHEDULE

A. As indicated on Drawings.

END OF SECTION

DIVISION 3 – CONCRETE

SECTION 03480
PRE-CAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Stormwater drop inlets.

B. Related Sections:
1. **Section 02320** – Structural Fill.
2. **Section 02610** – Pipe Culverts.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Stormwater Drop Inlets:
1. Basis of Measurement: By each unit.
2. Basis of Payment: By each unit times the unit price for each structure.
   a. Includes excavating, concrete sections, cover frames and covers, sealing pipe outlets to depth indicated and backfilling.

1.3 REFERENCES

A. American Concrete Institute
1. ACI 318 – Building Code Requirements for Reinforced Concrete.

B. ASTM International
1. ASTM C443 – Joints.
2. ASTM C913 – Standard Specification for Pre-cast Concrete Water and Wastewater Structures.

C. NCDOT Standard Specifications for Roads and Structures (latest edition)

1.4 DESIGN REQUIREMENTS

A. Design Criteria:
1. Honeycombed or retempered concrete is not permitted.
2. Equivalent strength: Based on structural design of reinforced concrete as outlined in ACI 318, Design for H20 Loading.
3. Design of Lifting Devices for Pre-cast Structures: In accordance with ASTM C 913.
4. Design of Joints for Pre-cast Structures: In accordance with ASTM C443.

1.5 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Submittal procedures.

B. Shop Drawing: Indicate structure locations, elevations, piping, sizes, and elevations of penetrations.

C. Product Data: Submit covers, component construction, features, configuration, and dimensions.

D. Manufacturer's Certificates: Submit Statement of Compliance, supporting data from Materials Suppliers attesting that pre-cast concrete structures provided meet or exceed ASTM Standards and Specification requirements.

1.6 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Closeout procedures.

B. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components, and connections.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with North Carolina and Local Municipality standards.

1.8 DELIVERY, STORAGE AND HANDLING

A. **Section 01600** – Product Requirements: Product delivery requirements; Product storage and handling requirements.

B. Comply with Pre-cast Concrete Manufacturer's instructions for unloading, storing, and moving pre-cast structures.

C. Store pre-cast concrete structures to prevent damage to Owner's property or other public or private property. Repair property damaged from materials storage.

D. Mark each pre-cast structure by indentation or waterproof paint showing date of manufacture, Manufacturer, and identifying symbols and numbers shown on Drawings to indicate its intended use.

1.9 ENVIRONMENTAL REQUIREMENTS

A. **Section 01600** – Product Requirements: Product storage and handling requirements.

B. Conduct operations not to interfere with, interrupt, damage, destroy, or endanger integrity of surface or subsurface structures or utilities, and landscape in immediate or adjacent areas.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Configuration shall be as shown on Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. **Section 01300** – Administrative Requirements: Verification of existing conditions before starting work.

B. Verify connections, sizes, locations and inverts are as indicated on Drawings.

C. Verify items provided by other sections of Work are properly sized and located.

D. Verify excavations for the structures are correct.

3.2 PREPARATION

A. Coordinate placement of connecting pipes required by other Sections of Work as described in these Specifications.

B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.

C. Inspect pre-cast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

D. Remove and replace soft or saturated foundation soils prior to installation as recommended by the CQA Consultant or his representative.

3.3 INSTALLATION

A. Excavation and Backfill:
1. Excavate for pre-cast concrete structures in location and to depth shown. Provide clearance around sidewalls of structure for construction operations.
2. When groundwater is encountered, prevent accumulation of water in excavations. Place pre-cast concrete structures in dry trench.
3. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor structure to avoid flotation.

B. Lift pre-cast structures at lifting points designated by Manufacturer.

C. When lowering pre-cast concrete structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.

D. Set cover frames and covers level without tipping, to correct elevations.

E. Coordinate with other Sections of Work as described in these Specifications to provide correct size, shape, and location.

3.4 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements: Testing and observation requirements and **Section 01700** – Execution Requirements: Testing, adjusting, and balancing.

B. Request observation by CQA Consultant prior to placing structures or aggregate cover over piping.

C. Compaction Testing: In accordance with **Section 02320**.

D. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.5 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Protecting installed construction.

END OF SECTION

DIVISION 15 - MECHANICAL

SECTION 15050
PVC PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 DESCRIPTION

A. CONTRACTOR shall supply all materials, equipment, and labor needed to install complete and make ready for use all pipe, pipe fittings, and valves as specified herein and as indicated on the Drawings for the LFG control system.

B. Related Sections:
1. **Section 02611** – Landfill Gas Wells.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Pipe and Fittings
1. Basis of Payment: Basis of Payment: Not applicable. PVC pipe payment included in other sections.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM D1248 – Specification for Polyethylene Plastics Molding and Extrusion Materials.
2. ASTM D1784 – Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
3. ASTM D1785 – Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
4. ASTM D2321 – Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.
5. ASTM D2467 – Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
6. ASTM D2513 – Specification for Thermoplastic Gas Pressure Pipe Tubing and Fittings.
7. ASTM D2564 – Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
8. ASTM D2774 – Practice for Underground Installation of Thermoplastic Pressure Piping.
9. ASTM D2855 – Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
10. ASTM D3350 – Specification for Polyethylene Plastics Pipe and Fittings Materials.

B. American National Standard Institute (ANSI)
1. ANSI B 31.8 – Code for Pressure Piping, Appendix N.

C. Plastics Pipe Institute (PPI):
1. PPI T-31/9-79 – Technical Report.

1.4 QUALITY ASSURANCE

A. Provide only pipe and fittings conforming to the requirements or the referenced ASTM standards, ANSI standards, or PPI standards.

B. Utilize only factory trained and certified welders, equipment, and installers.

C. Follow all ASTM practices and standards in the manufacture and fabrication of piping and fittings.

D. Follow manufacturer's written instructions for handling, storage, and installation.

1.5 QUALITY CONTROL

A. Provide permanent markings on piping, clearly showing ASTM conformance, size and SDR, pressure rating, cell classification number, and the manufacturer's name.

B. Provide certification of all welders and installers.

C. Certify compliance with ASTM practices and standards during manufacture and fabrication.

D. Remove from site any pipe and fittings damaged during shipment, construction, or rejected during testing and/or inspection. Replace with acceptable products without additional expense to Owner.

1.6 SUBMITTALS

A. Within fifteen (15) calendar days of receiving the Owner's Notice To Proceed, the Contractor shall prepare and submit to the Engineer, for review and approval, two (2) copies of certificates of compliance on materials furnished and manufacturer's brochures containing complete information and instructions pertaining to the storage, handling, installation, inspection, maintenance, and repair of each type of pipe and pipe fitting furnished.

1.7 CLOSEOUT SUBMITTALS

A. **Section 01700** – Execution Requirements: Closeout Procedures.

B. Project Record Documents: Record location and elevations of active landfill gas collection system.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.8 PRE-INSTALLATION MEETINGS

A. Convene meeting a minimum of one week prior to commencing work pertaining to this Section.

1.9 FIELD MEASUREMENTS

A. Verify field measurements and elevations are as indicated on the Drawings.

1.10 DELIVERY, STORAGE, AND HANDLING

A. **Section 01600** – Product Requirements: Product Delivery Requirements; Product Storage and Handling Requirements.

B. Packaging, handling, and shipment shall be in accordance with the manufacturer's standards, instructions, and recommendations.

C. Transportation to Site:
1. The manufacturer shall package the pipe, fittings, structures, and/or other miscellaneous PVC items in a manner designed to deliver it or them to the project neatly, intact, and without physical damage.

2. The transportation carrier shall use appropriate methods and intermittent checks to ensure the materials are properly supported, stacked, and restrained during transport such that it is not nicked, gouged, or physically damaged.

D. Storage:
1. Pipe, structures, and other miscellaneous PVC items shall be stored on clean, level ground to prevent undue scratching or gouging and as needed to protect them from being covered with excessive dirt, water, moisture, and mechanical abrasion.
2. The handling of pipe, structures, and other miscellaneous PVC items shall be done in such a manner that there is no damage. Nylon slings are often used.
3. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations.
4. Store gaskets for mechanical and push-on joints in cool, dry location out of direct sunlight and not in contact with petroleum products.

E. Care shall be taken to minimize the amount of soil collected inside the pipe, structures, and other miscellaneous PVC items while handling and installing.

F. The pipe, structures, and other miscellaneous PVC items shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment, and care shall be exercised during installation not to damage the pipes and fittings.

G. Any pipe section, structure, fitting, joint or other miscellaneous PVC items that become broken, cracked, crushed, cut, scratched, gouged or otherwise rendered unsuitable, as determined by the CQA Consultant, shall be removed and replaced by the Contractor. Scratches greater than 6 inches in length and gouges exhibiting a depth in excess of 8 percent of the wall thickness of the pipe shall be cause for rejection of pipe or fittings to the extent designated by the CQA Consultant.

H. Fused Pipe Segment Handling:
1. Fused segments of pipe shall be handled so as to avoid damage to the pipe.
2. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred.
3. Spreader bars are recommended when lifting long fused sections.
4. Pipe shall be fused in lengths not to exceed that which can be moved and placed easily and safely, causing no damage to the fused pipe or welds.

1.11 COORDINATION

A. Coordinate the Work with construction of other elements of active landfill gas collection system and with construction of the soil cover system.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. All PVC pipe and pipe fittings shall be Schedule 80 PVC conforming to ASTM D 1784, ASTM D 1785 (for pipe), and ASTM D 2467 (for fittings). Perforated pipe shall be slotted in accordance with the Drawings.

B. PVC pipe and pipe fittings shall be manufactured from a compound which meets the requirements of Type 1, Grade 1, Polyvinyl Chloride PVC 1120, Class 12454-B, as outlined in ASTM D 1784. A Type 1, Grade 1 compound is characterized as having the highest requirements for mechanical properties and chemical resistance.

1. Compound from which pipe is produced shall have a design stress rating of 2000 psi at 73 degrees F, listed by the Plastic Piping Institute.
2. Materials from which pipe and pipe fittings are manufactured shall have been tested and approved by NSF International.
3. Pipe shall conform to the requirements of ASTM D 2241. Pipe shall be homogenous throughout and shall be free from cracks, holes, foreign inclusions, and other defects.

C. PVC Pipe Storage:
1. PVC pipe shall be stored or stacked so as to prevent damage by marring, crushing, or piercing. Maximum stacking height shall be 6 feet. For storage over 5 days, a location shall be chosen out of direct sunlight, or the piping and fittings shall be covered.

2.2 PVC FLANGES

A. Flanges shall be Schedule 80 PVC and shall be plate type, ANSI Class 150 pounds.

B. The bolts, studs, nuts, and washers for the flanges shall be galvanized steel conforming to ASTM A-325. All studs and bolts shall be coated, just prior to installation, with an anti-seize compound as manufactured by Kopr-Kote, or equal.

C. Flange gaskets shall be full-face Neoprene.

2.3 FLEXIBLE PVC PIPE

A. Flexible PVC pipe shall be as manufactured by Kanaflex Corporation, Compton, California (310-637-1616), Series 101-PS, or approved equal.

B. Fasteners for flexible PVC pipe shall be Kanaflex 101-PS power lock clamps, or approved equal.

PART 3 EXECUTION

3.1 PVC PIPE INSTALLATION

A. PVC pipe installation shall conform to these specifications, the manufacturer's recommendations, and as outlined in ASTM D 2774.

3.2 JOINING OF PVC PIPE

A. Joining of pipe shall be in accordance with ASTM D 2855.

B. Preparation:
1. All pipe shall be inspected for cuts, scratches, or other damage prior to installation. Pipe with imperfections shall not be used. All burrs, chips, etc. shall be removed from pipe interior and exterior. All loose dirt and moisture shall be wiped from the interior and exterior of the pipe end and the interior of the fitting. All pipe cuts shall be square, perpendicular to the center line of pipe. Pipe ends shall be beveled prior to applying primer and solvent cement so that the cement does not get wiped off during insertion into the fitting socket.

C. Solvent Welding:
1. A coating of primer as recommended by pipe supplier shall be applied to the entire interior surface of the fitting socket and to an equivalent area on the exterior of the pipe prior to applying solvent cement. The solvent cement shall comply with the requirements of ASTM D 2564 and shall be applied in strict accordance with manufacturer's

specifications. Pipe shall not be primed or solvent welded when it is raining, when atmospheric temperature is below 40 degrees F, or above 90 degrees F.

D. Curing:
1. After solvent welding, the pipe shall remain undisturbed until cement has thoroughly set. As a guideline for joint setting time, use 1 hour for ambient temperatures of 60 to 90 degrees F, or 2 hours when ambient temperature is 40 to 60 degrees F.

E. Alignment:
1. Pipe and pipe fittings shall be selected so that there will be as small a linear deviation as possible at the joints, and so that inverts present a smooth surface. Pipe and fittings which do not fit together to form a tight fitting will be rejected.

3.3 FLEXIBLE PVC PIPE CONNECTIONS

A. Connections to HDPE or PVC pipe shall be made with clamps following manufacturers' recommendations and step by step procedures.

3.4 FLANGED CONNECTIONS

A. Flanged connections for PE pipe shall be made with two PE flange adapters with ductile iron back-up rings for bolting.

3.5 PIPE SUPPORTS

A. All piping and valves shall be supported so as to prevent stress being transmitted between sections and connected equipment and appurtenances.

B. Release of any joint shall result in no transverse piping movement and shall allow easy removal and replacement of any piping component.

3.6 FIELD QUALITY CONTROL

A. **Section 01400** – Quality Requirements and **Section 01700** – Execution Requirements.

B. The CQA Consultant or his representative will undertake observations to determine compliance of the materials and work with this Specification.

C. Quality control by the CQA Consultant will include observation:
1. The PVC pipe and fittings for correct size, SDR rating workmanship, and fabrication.
2. Damage during installation.
3. The installation, alignment and welding of all pipe, and fittings.
4. Pipe flushing/cleaning and hydrostatic pressure testing procedures and results on the installed fluid conveyance system including piping, fittings, valves, etc).

D. SEGMENT TESTING
1. All PVC pipes shall be subjected to an air test as described herein to detect any leaks in the piping. Testing shall be performed below grade (inside the trench). The Contractor shall be responsible for locating, uncovering (if previously backfilled), and repairing any leaks detected during testing.
2. Like sizes of polyethylene piping shall be butt welded together into testing segments not to exceed 1,000 feet without the Engineer's approval. Segments shall be connected to a testing apparatus on one end and fitted with caps on all openings.

3. The segment to be tested shall be allowed time to reach constant and/or ambient temperature before initiating the test.
4. Tests shall be performed during periods when the pipe segments will be out of direct sunlight when possible; i.e., early morning, late evening, or cloudy days. This will reduce the pressure changes that will occur due to temperature fluctuations.
5. The test pressure shall be a minimum of 5 psig (138.5 inches, w.c.) and the
6. Contractor shall use a digital gauge.
7. Pressure drop during the test shall not exceed one percent of the testing gauge pressure over a period of one hour. This pressure drop shall be corrected for temperature changes before determining pass or failure. (See Section 3.10 for test failures). The Engineer shall sign off on the test form to indicate test compliance.
8. The Engineer shall be notified at least 24 hours prior to commencement of the testing procedure and shall be present during the test.
9. All equipment for this testing procedure shall be furnished by the Contractor. This shall consist of a portable air compressor, generator, air hoses, and polyethylene flange adapter with a blind flange. Tapped and threaded into the blind flange will be a temperature gauge 0 to 100 degrees C: a Schraeder tire valve to facilitate pressurization with an air compressor hose; a ball valve to release pipe pressure upon completion of the test; and a pressure measuring device. The pressure measuring device shall be a digital manometer capable of measuring positive or differential pressures of air and other non-corrosive gasses over a range of 0 to 100 PSI.

E. TEST FAILURE

1. The following steps shall be performed when a pipe segment fails the one percent - one-hour test described in Section 3.9 F above.
   a. The pipe and all fusions shall be inspected for cracks, pinholes, or perforations.
   b. All blocked risers and capped ends shall be inspected for leaks.
   c. Leaks shall be located and/or verified by applying a soapy water solution and observing soap bubble formation.
2. All pipe and fused joint leaks shall be repaired by cutting out the leaking area and re-fusing the pipe.
3. After all leaks are repaired, a retest shall be performed in accordance with Section 3.6 D.

3.7 PROTECTION OF FINISHED WORK

A. **Section 01700** – Execution Requirements: Protecting installed construction.

B. Protect pipe, aggregate cover, and outlet structures from damage or displacement.

C. Care shall be exercised during construction not to damage the pipes and fittings.

END OF SECTION

SECTION 15052
LANDFILL GAS SYSTEM VALVES

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Landfill gas system valves.

B. Related Sections:
1. **Section 02500** – High Density Polyethylene (HDPE) Piping and Miscellaneous Items.
2. **Section 02611** – Landfill Gas Wells.

1.2 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Landfill Gas System Valves:
1. Basis of Measurement: By each unit installed.
2. Basis of Payment: By each unit installed times the unit price for each unit.
   a. Includes accessories or appurtenances which are required for the proper completion of the work.

1.3 SUBMITTALS

A. **Section 01300** – Administrative Requirements: Requirements for submittals.

B. Product Data: The Contractor or Supplier shall submit a complete description of and data indicating valves used, and valve accessories and fittings proposed for use to the CQA Consultant for approval at least two weeks prior to installation.

C. Manufacturer's certificates of compliance on materials furnished and catalog cuts. Certifications and catalog cuts must be submitted to CQA Consultant for approval at least two weeks prior to installation.

D. Manufacturer's Information: Provide the procedures required for the storage, handling, installation, inspection, maintenance, operation, and repair of each type of valve furnished. Manufacturer information must be submitted to CQA Consultant for approval at least two weeks prior to installation.

PART 2 PRODUCTS

2.1 GENERAL

A. All valves shall be installed complete with all necessary operators, actuators, handwheels, chain wheels, extension stems, floor stands, worm and gear operators, operating nuts, chains, wrenches, and other accessories or appurtenances which are required for the proper completion of the work. Operators, actuators, and other accessories shall be sized and furnished by the valve supplier and factory mounted.

B. Valves shall be suitable for the intended service. Renewable parts including discs, packing, and seats shall be of types recommended by the valve manufacturer for intended service, but not of a lower quality than specified herein.

C. Valves and operators shall be suitable for the exposure they are subject to: buried, interior or exterior, as applicable. Valves shall have all safety features required by OSHA.

D. Unless otherwise shown, valves shall be the same size as the adjoining pipe.

2.2 BUTTERFLY VALVES

A. Header isolation valves shall be butterfly bubble-tight, wafer design, with a PVC body, BUNA-N seat, stainless steel stem, and compatible with a flat face flange, as manufactured by Asahi/America or equal. Stem extensions shall be stainless steel in an epoxy coated steel outer housing with a gear box assembly mounted on top and equipped with a removable manual operating wheel. Monitoring ports at the butterfly valves shall be quick connects mounted on SCH 80 PVC risers as shown on the Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. **Section 01400** – Quality Requirements: Examination.

B. Coordinate landfill gas system valve installation with other portions of the work.

3.2 INSTALLATION

A. Valves shall be installed in accordance with the manufacturer's recommendations and as shown on the Drawings; care shall be taken to avoid stripping bolts when tightening. All bolts, nuts, and washers to be zinc-coated steel. Contractor to use washers with bolts and nuts on both sides of all flanges and valves.

B. Flanged butterfly valves may require spacers between the flange adapters and the valve body in order to allow full travel of the internal disk. If spacers are necessary for any butterfly valve, the Contractor shall install valve spacers, subject to the approval by the Engineer.

C. All buried valves to be wrapped in a 5-mil plastic sheeting and duct taped to seal out water, dirt, and debris.

END OF SECTION

APPENDIX VIII-E

Additional Laboratory Soil Test Results

Permeability Summary Table
Edgecombe County Landfill
Edgecombe County, NC
S&ME Project Number: 1054-07-241A

Boring	**Location**	**Permeability, k (cm/s)**
TP-3	Borrow Area 2	6.50E-07
TP-6 and TP-7	Borrow Area 1	1.20E-06
TP-8 and TP-10	Borrow Area 1	3.51E-06

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall (Method 'C')

S&ME

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #: 1054-07-241A — Test Date(s): 6/19 - 6/25/09

Project Name: Edgecombe County Landfill — Report Date: 06/25/09

Client Name:

Client Address:

Boring #: Near TP-3 | Sample #: S-1 | Depth/Elevation: Stockpile | Sample Date: 09/13/06

Location: East Borrow Near TP-3 | Offset: N/A | Sample Description: (Visual) Tan Sandy Silty CLAY

Liquid Limit: ND | Specific Gravity: 2.669 | Sample Type: undisturbed | Sampled By: S&ME, Inc.

Plastic Limit: ND | Plasticity Index: ND | Percent Passing #200: ND | Maximum Particle Size: #4

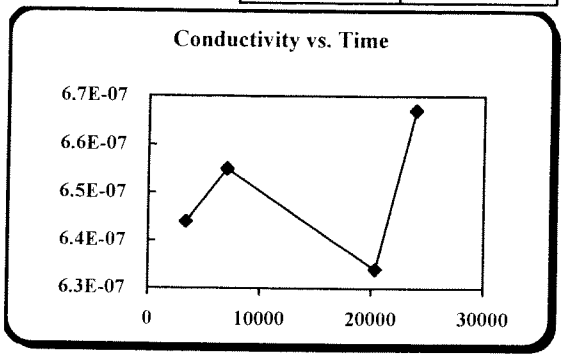
Initial Sample Conditions				Final Sample Conditions			
Height (cm):	9.639	Wet Unit Weight (lbs/ft^3):	124.7	Height (cm):	9.639	Dry Unit Weight (lbs/ft^3):	105.2
Diameter (cm):	7.351	Dry Unit Weight (lbs/ft^3):	105.2	Diameter (cm):	7.351	Percent Saturation:	98.0
Area (cm^2):	42.44	Percent Saturation:	84.7	Area (cm^2)	42.44	Void Ratio:	0.5831
Volume (cm^3):	409.08	Void Ratio:	0.5831	Volume (cm^3)	409.08	Porosity:	0.3683
Wet weight (grams):	816.9	Porosity:	0.3683	Wet weight (grams)	837.0	Measured ***B*** coefficient: 0.96	
Dry Weight (grams):	689.4	**Station Corrections (cm)**		Dry Weight (grams)	689.4	MDD (pcf): 110.5	Opt. (%): 16.5
Percent Moisture:	18.5	Influent: -2.962	Effluent: -2.962	Percent Moisture:	21.4		

Testing Station	Burette Areas (cm^2):				Effective Consolidation Stress (psi):	3.0	Permeant Liquid Used:	Deaired Demineralized water
3	Influent:	0.720	Influent:	0.720	Cell Pressure (psi):	73.0	Influent Pressure (psi):	70.0	Effluent Pressure (psi)	70.0

Start Date	Start Time	End Date	End Time	Time (seconds)	Temperature (°C) Initial	Final	Avg.	Corr. Factor	Initial INF.	Initial EFF.	Final INF.	Final EFF.	h_1 (cm)	h_2 (cm)	Gradient	K-Value (cm/sec) Uncorrected	Corrected
06/24/09	5:58:00 AM	06/24/09	6:54:00 AM	3360	21.8	21.8	21.8	0.958	0.9	48.6	1.5	47.9	47.70	46.40	4.9	6.72E-07	6.44E-07
06/24/09	6:54:00 AM	06/24/09	7:55:00 AM	3660	21.8	21.8	21.8	0.958	1.5	47.9	2.2	47.2	46.40	45.00	4.7	6.84E-07	6.55E-07
06/24/09	7:55:00 AM	06/24/09	11:37:00 AM	13320	21.8	21.8	21.8	0.958	2.2	47.2	4.6	45.0	45.00	40.40	4.4	6.62E-07	6.34E-07
06/24/09	11:37:00 AM	06/24/09	12:36:00 PM	3540	21.8	21.8	21.8	0.958	4.6	45.0	5.2	44.4	40.40	39.20	4.1	6.96E-07	6.67E-07
															Averages:	**6.79E-07**	**6.50E-07**

Remarks: ND= Not Determined. Test specimen compacted to 95% +2% wet of its optimum moisture.

References: ASTM D 854: Specific Gravity of Soils; ASTM D 422: Particle Size Analysis of Soils
ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 2216: Laboratory Determination of Water Content of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plasticity Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)



Mal Krajan — *Technical Responsibility*

Signature

Laboratory Manager — *Position*

6/29/09 — *Date*

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Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall (Method 'C')

S&ME

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #: 1054-07-241A — Test Date(s): 6/19 - 6/25/09

Project Name: Edgecombe County Landfill — Report Date: 06/25/09

Client Name:

Client Address:

Boring #: TP-6 & 7 | Sample #: S-2 | Depth/Elevation: 0.5 - 3' | Sample Date: 09/13/06

Location: Site-Borehole | Offset: N/A | Sample Description: Tan-Brown Sandy Silty CLAY

Liquid Limit: ND | Specific Gravity: 2.665 | Sample Type: undisturbed | Sampled By: S&ME, Inc.

Plastic Limit: ND | Plasticity Index: ND | Percent Passing #200: ND | Maximum Particle Size: #4

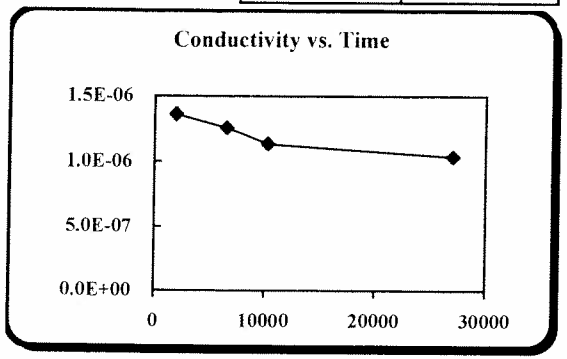
Initial Sample Conditions				Final Sample Conditions			
Height (cm):	9.639	Wet Unit Weight (lbs/ft^3):	124.8	Height (cm):	9.639	Dry Unit Weight (lbs/ft^3):	106.4
Diameter (cm):	7.341	Dry Unit Weight (lbs/ft^3):	106.4	Diameter (cm):	7.341	Percent Saturation:	96.0
Area (cm^2):	42.33	Percent Saturation:	81.8	Area (cm^2)	42.33	Void Ratio:	0.5636
Volume (cm^3):	408.02	Void Ratio:	0.5636	Volume (cm^3)	408.02	Porosity:	0.3605
Wet weight (grams):	815.2	Porosity:	0.3605	Wet weight (grams)	836.1	Measured ***B*** coefficient: 0.97	
Dry Weight (grams):	695.0	**Station Corrections (cm)**		Dry Weight (grams)	695.0	MDD (pcf): 112.2	Opt. (%): 15.3
Percent Moisture:	17.3	Influent: -2.962	Effluent: -2.962	Percent Moisture:	20.3		

Testing Station	Burette Areas (cm^2):				Effective Consolidation Stress (psi):	3.0	Permeant Liquid Used:	Deaired Demineralized water
3	Influent:	0.720	Influent:	0.720	Cell Pressure (psi):	73.0	Influent Pressure (psi): 70.0	Effluent Pressure (psi) 70.0

Start Date	Start Time	End Date	End Time	Time (seconds)	Temperature (°C) Initial	Final	Avg.	Corr. Factor	Initial INF.	Initial EFF.	Final INF.	Final EFF.	h_1 (cm)	h_2 (cm)	Gradient	K-Value (cm/sec) Uncorrected	Corrected
06/24/09	5:04:00 AM	06/24/09	5:36:00 AM	1920	21.8	21.8	21.8	0.958	0.6	49.5	1.3	48.6	48.90	47.30	5.0	1.42E-06	1.36E-06
06/24/09	5:36:00 AM	06/24/09	6:53:00 AM	4620	21.8	21.8	21.8	0.958	1.3	48.6	3.0	46.9	47.30	43.90	4.7	1.32E-06	1.26E-06
06/24/09	6:53:00 AM	06/24/09	7:55:00 AM	3720	21.8	21.8	21.8	0.958	3.0	46.9	4.1	45.7	43.90	41.60	4.4	1.19E-06	1.14E-06
06/24/09	7:55:00 AM	06/24/09	12:35:00 PM	16800	21.8	21.8	21.8	0.958	4.1	45.7	8.1	41.4	41.60	33.30	3.9	1.09E-06	1.04E-06
															Averages:	**1.26E-06**	**1.20E-06**

Remarks: ND= Not Determined. Test specimen compacted to 95% +2% wet of optimum moisture.

References: ASTM D 854: Specific Gravity of Soils; ASTM D 422: Particle Size Analysis of Soils
ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 2216: Laboratory Determination of Water Content of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plasticity Index of Soils
ASTM D 2487: Classification of Soils for Engineering Purposes (Unified Soil Classification System)



Mal Krajan — *Technical Responsibility*

Signature

Laboratory Manager — *Position*

6/29/09 — *Date*

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Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall (Method 'C')

S&ME

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

Project #: 1054-07-241A

Project Name: Edgecombe County Landfill — Test Date(s): 6/19 - 6/25/09

Client Name: — Report Date: 06/25/09

Client Address:

Boring #: TP-8 & 10 — Sample #: S-3 — Depth/Elevation: 5 - 8 ft. — Sample Date: 9/13 - 10/12/06

Location: Site-Borehole — Offset: N/A — Sample Description: Brown Silty Clayey SAND

Liquid Limit: ND — Specific Gravity: 2.653 — Sample Type: undisturbed — Sampled By: S&ME, Inc.

Plastic Limit: ND — Plasticity Index: ND — Percent Passing #200: ND — Maximum Particle Size: #4

Initial Sample Conditions				Final Sample Conditions			
Height (cm):	9.642	Wet Unit Weight (lbs/ft^3):	124.5	Height (cm):	9.642	Dry Unit Weight (lbs/ft^3):	105.7
Diameter (cm):	7.343	Dry Unit Weight (lbs/ft^3):	105.7	Diameter (cm):	7.343	Percent Saturation:	95.5
Area (cm^2):	42.35	Percent Saturation:	83.4	Area (cm^2)	42.35	Void Ratio:	0.5665
Volume (cm^3):	408.34	Void Ratio:	0.5665	Volume (cm^3)	408.34	Porosity:	0.3616
Wet weight (grams):	814.3	Porosity:	0.3616	Wet weight (grams)	832.2	Measured ***B*** coefficient: 0.96	
Dry Weight (grams):	691.3	**Station Corrections (cm)**		Dry Weight (grams)	691.3		
Percent Moisture:	17.8	Influent: -2.190	Effluent: -2.825	Percent Moisture:	20.4	MDD (pcf): 110.8	Opt. (%): 15.8

Testing Station	Burette Areas (cm^2):				Effective Consolidation Stress (psi):	3.0	Permeant Liquid Used:	Deaired Demineralized water
2	Influent:	0.720	Influent:	0.720	Cell Pressure (psi):	73.0	Influent Pressure (psi):	70.0	Effluent Pressure (psi)	70.0

Start Date	Start Time	End Date	End Time	Time (seconds)	Temperature (°C) Initial	Final	Avg.	Corr. Factor	Initial INF.	Initial EFF.	Final INF.	Final EFF.	h_1 (cm)	h_2 (cm)	Gradient	K-Value (cm/sec) Uncorrected	Corrected
06/24/09	5:04:00 AM	06/24/09	6:36:00 AM	5520	21.8	21.8	21.8	0.958	14.0	48.6	18.0	44.8	35.24	27.44	3.3	3.71E-06	3.55E-06
06/24/09	6:36:00 AM	06/24/09	10:00:00 AM	12240	21.8	21.8	21.8	0.958	18.0	44.8	24.4	39.2	27.44	15.44	2.2	3.85E-06	3.69E-06
06/24/09	10:00:00 AM	06/24/09	12:00:00 PM	7200	21.8	21.5	21.7	0.960	24.4	39.2	26.4	37.2	15.44	11.44	1.4	3.41E-06	3.27E-06
06/24/09	12:00:00 PM	06/24/09	1:28:00 PM	5280	21.5	21.5	21.5	0.965	26.4	37.2	27.6	36.0	11.44	9.04	1.1	3.66E-06	3.53E-06
															Averages:	**3.66E-06**	**3.51E-06**

Remarks: ND= Not Determined. Test specimen compacted to 95% +2% wet of its optimum moisture.

References: ASTM D 854: Specific Gravity of Soils — ASTM D 422: Particle Size Analysis of Soils
ASTM D 5084: Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 2216: Laboratory Determination of Water Content of Soils
ASTM D 4318: Liquid Limit, Plastic Limit, & Plasticity Index of Soils
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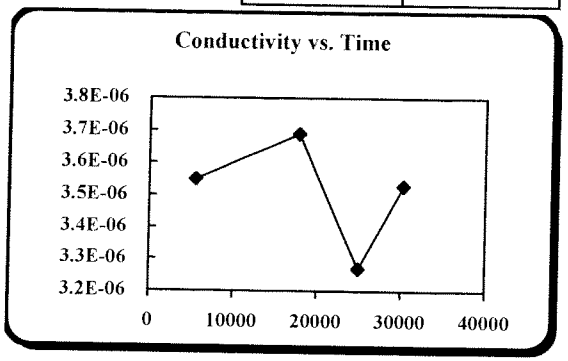

Mal Krajan — *Technical Responsibility*

Signature

Laboratory Manager — *Position*

6/29/09 — *Date*

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APPENDIX IX-E

Waste Volume Calculation

JOB NAME Edgecombe County C&D Landfill
COMPUTED BY KSO
SUBJECT Waste Volume Calculations
CHECKED BY

OBJECTIVE:

Determine the maximum inventory of municipal solid waste (MSW) and construction and demolition (C&D) waste for the Southern Landfill.

METHOD:

The amount of MSW in the Southern Landfill is found by taking the United States Environmental Protection Agency (USEPA) Landfill Methane Outreach Program (LMOP) tonnage from 1973 through June 2007, subtract out the known volume of C&D waste placed, determine the average volume of waste placed per year, and multiply by the number of years the Southern Landfill was open. The maximum amount of C&D waste in the Southern Landfill is found by taking the known volume of C&D that has been placed and adding it to the remaining airspace.

CALCULATION:

Total MSW

As documented on their landfill database, the total LMOP tonnage of waste placed at the facility from 1973 through June 2007 is 1,870,499 tons. This includes the Northern Old Landfill and the Southern Landfill. The Northern Old Landfill is a pre-Subtitle D landfill which received MSW from 1973 to 1979. The Southern Landfill is also a pre-Subtitle D landfill which received MSW from 1980 to 1997. The C&D landfill is operated on top of the Southern Landfill which began receiving C&D waste in 1998. The C&D landfill has received 245,429 tons across its scales from 1998 through June 2007. The total amount of MSW received at the facility is calculated as follows:

1,870,499 tons MSW and C&D waste – 245,429 tons C&D waste = 1,625,070 tons MSW (Northern Old and Southern Landfills)

MSW was received at the site from 1973 to 1997 (24 years). The average amount of MSW received per year is calculated as follows:

1,625,070 tons MSW ÷24 years = 67,712 tons MSW / year

The Southern Landfill received MSW from 1980 to 1997 (18 years). The amount of MSW in the Southern Landfill is calculated as follows:

67,712 tons MSW / year x 18 years = ***1,218,816 tons MSW (Southern Landfill)***

Total C&D Waste

The C&D landfill has received 349,814 tons of C&D waste from January 1998 through October 26, 2008. This volume includes 265,830 tons reported from facility waste disposal records and 83,984 tons of Hurricane Floyd debris calculated from truck counts. Compared to the proposed final grading shown on **Drawing 3** of the Operations Plan, the calculated total volume of the C&D landfill is 1.7 million cubic yards (cy). A total of, 605,500 cy of has been placed as of October 26, 2008 and the remaining gross airspace (waste, operational soil cover, and soil cap system) was approximately 1,094,500 cy. The following table shows the annual C&D waste received at the site for the last 5 years and the volume of airspace used as determined by comparing annual surveys.

Table 1: Airspace Used Over Last 5 Years

YEAR	AIRSPACE USED (tons)	CALCULATED DENSITY (tons/cy)	AIRSPACE USED (cy)
2009	13,377	0.440	30,403
2010	10,065	0.197	20,252
2011	14,854	0.540	27,507
2012	15,930	0.522	30,517
2013	10,601	0.524	20,232
Total	64,827	--	128,911
Average	12,966	0.505	25,782

For the period including 2009 to 2013, a total of 64,827 tons or 128,911cy was placed in the landfill. As of 2013, a total of 734,411 cy of C&D waste has been placed in the landfill and the remaining gross capacity of the landfill is 965,589 cy.

The total cap thickness is 3 feet parallel to the slope. The volume of soil required for the cap was calculated from the plan view area of the cap and multiplying by the cap thickness adjusted for the slope. Using AutoCAD Civil 3D 2008 software, the area of the final cap at a 4 horizontal to 1 vertical slope (4H:1V) is 1,514,500 square feet (sf). The volume of soil required for the cap on the 4H:1V slopes is calculated as follows:

1,514,500 sf x 3 ft x 1.031 ÷ 27 cy/cf = 173,500 cy (Soil Volume for 4H:1V Slope Area)

Using AutoCAD Civil 3D 2008 software, the area of the final cap at a 10 percent slope is approximately 341,600 sf. The volume of soil required for the cap on the 10 percent slopes is calculated as follows:

341,600 sf x 3 ft x 1.005 ÷ 27 cy/cf = 38,200 cy (Soil Volume for 10% Slope Area)

The total volume of soil required to construct the cap is calculated as follows:

173,500 cy + 38,200 cy = ***211,700 cy Total Soil Required to Construct Cap)***

The historical waste density at the site is 0.55 tons/cy. The remaining net airspace (C&D waste and cover) of the landfill in tons is calculated as follows:

(1,094,500 cy - 211,700 cy) x 0.55 tons/cy = ~485,600 tons (Remaining Net Airspace)

The proposed total amount of C&D waste in the Southern Landfill is calculated as follows:

349,814 tons C&D waste (existing) + 485,600 tons C&D waste (proposed) = ***~835,414 tons C&D Waste***

JOB NAME Edgecombe County C&D Landfill

COMPUTED BY KSO

SUBJECT Waste Volume Calculations

CHECKED BY

DISCUSSION:

The maximum inventory of MSW in the Southern Landfill is 1,218,816 tons and the maximum proposed inventory of C&D waste for the Southern Landfill is ~835,414 tons.

REFERENCE:

United States Environmental Protection Agency (USEPA) Landfill Methane Outreach Program (LMOP) Landfill Database.

APPENDIX X-E

Slope Stability Analysis

S&ME

PROJECT NO. 1054-07-241A

SHEET NO. 1 / 5

DATE 07/01/09

JOB NAME Edgecombe County Landfill

COMPUTED BY CHR

SUBJECT Cover Veneer Slope Stability (Static and Pseudo-static)

CHECKED BY KB

COMPUTATIONS BY: Signature _____ Date 7.1.09

Name Cedric Ruhl, E.I.

Title Staff Professional

ASSUMPTIONS AND PROCEDURES CHECKED BY: Signature _____ Date 7/2/09

Name Kenneth Daly, P.E.

Title Senior Project Engineer

COMPUTATIONS CHECKED BY: Signature _____ Date 7/2/09

Name Kyle Baucom, E.I.

Title Staff Professional

REVIEWED BY: Signature _____ Date 7-1-09

Name Jason Reeves, P.E.

Title Senior Project Engineer

REVIEW NOTES / COMMENTS:

OBJECTIVE:

Evaluate the static and pseudo-static slope stability of the cover system veneer. The proposed final cover system layers will be, from bottom to top, 1) waste fill; 1a) possible interim cover; 2) 18 inches of low-permeability cover soil; and 3) 18 inches of vegetative cover.

METHOD:

Cover veneer slope stability was evaluated assuming infinite slope conditions. This method assumes a slope of infinite length whereby driving and resisting forces occur only along or parallel to an interface (i.e., slip plane). This method is considered to be conservative because any added stability which may be provided by toe buttressing is ignored.

CALCULATIONS:

1. Define safety factors for veneer stability.

Assuming an infinite slope, the factor of safety for an interface can be calculated as outlined by Matasovic (1991) and shown below:

$$FS = \frac{c/(\gamma \cdot z \cdot \cos^2 \beta) + \tan \Phi \, [1 - \gamma_w (z - d_w)/(\gamma \cdot z)] - k_s \cdot \tan \beta \cdot \tan \Phi}{k_s + \tan \beta} \qquad \text{(Equation 1)}$$

Where:

FS = factor of safety;

c = cohesion (psf);

γ = unit weight of slope material(s) (pcf);

z = depth to the assumed failure surface (ft);

β = slope angle (degrees);

Φ = friction angle of cover soil (degrees);

γ_w = unit weight of water (pcf);

d_w = depth to the water table (assumed parallel to the slope) (ft); and

k_s = peak average horizontal acceleration as a fraction of gravity.

For this calculation, the following assumptions were made:

- Target safety factor (FS) of 1.5 for static conditions and 1.0 for pseudo-static conditions as shown in References 2 and 3;
- Overlying materials consist of three feet (z) of soil cover with a moist unit weight of 120 pcf (γ), a friction angle of 28 degrees (Φ), and no cohesion (c) as shown in the companion calculation "Global Slope Stability Calculation";
- Even though no geosynthetics will be installed to impede infiltration through the low-permeability soil cover, it was assumed that water infiltrating the cover soil is conveyed immediately below the three feet (d_w) of soil cover;
- The slope angle is 4(H):1(V), or 14.04 degrees (β); and
- The unit weight of water is 62.4 pcf (γ_w).

2. Calculate the veneer stability safety factor for the static condition.

Given the assumptions listed above and assuming a peak average horizontal acceleration of 0, equation 1 can be re-written as shown below:

$$FS = \frac{\tan\Phi\,[1 - \gamma_w(z - d_w)/(\gamma \cdot z)]}{\tan\beta} \qquad \text{(Equation 2)}$$

The veneer stability safety factor for static the condition is then calculated as follows:

$$FS = \frac{\tan(28)[1 - 62.4(3 - 3)/(120 \cdot 3)]}{\tan(14.04)} = 2.13$$

The safety factor is greater than 1.5, therefore the veneer stability requirements are met for the static condition.

3. Calculate the veneer stability safety factor for the pseudo-static condition.

Assuming that 1 foot of seismic deformations are acceptable, the seismic coefficient, k_s, is equal to ½ a_{max} as stated in Reference 3. For a peak crest acceleration (a_{max}) of 0.36g as developed in the Slope Stability calculation, $k_s = 0.18$ and equation 1 can be re-written as shown below:

$$FS = \frac{\tan\Phi[1 - \gamma_w(z - d_w)/(\gamma \cdot z)] - k_s \cdot \tan\beta \cdot \tan\Phi}{k_s + \tan\beta} \qquad \text{(Equation 3)}$$

The safety factor for pseudo-static stability is then calculated as follows:

$$FS = \frac{\tan\Phi[1 - \gamma_w(z - d_w)/(\gamma \cdot z)] - k_s \cdot \tan\beta \cdot \tan\Phi}{k_s + \tan\beta} = \frac{\tan(28)[1 - 62.4(3 - 3)/(120 \cdot 3)] - 0.18 \cdot \tan(14.04) \cdot \tan(28)}{0.18 + \tan(14.04)}$$

FS = 1.18

The safety factor is greater than 1.0 and it is assumed that seismic deformations less than one foot are acceptable, therefore the requirements for pseudostatic veneer stability are met.

DISCUSSION:

Based on the analysis results summarized above, the proposed veneer cover system satisfies the static condition design criteria factor of safety of 1.5 and the pseudostatic design criteria factor of safety of 1.0. During the pseudostatic analysis, it was assumed that seismic deformations up to one foot were acceptable.

We believe these analyses are generally conservative in that the infinite slope approach does not account for toe buttressing or passive toe soil conditions, cohesion, and other factors which may increase the stability.

REFERENCE:

1. Matasovic, Neven. "Selection of Method for Seismic Slope Stability Analysis". Proceedings: Second International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, March 11-15, 1991, St. Louis, Missouri, Paper No. 7.20.

2. FHWA. "Design Guidance: Geotechnical Earthquake Engineering for Highways". Geotechnical Engineering Circular No. 3. May, 1997.

3. USEPA, "*RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*", Office of Research and Development, EPA/600/R-95/051, April 1995.

REFERENCE 1

Matasovic, Neven (1991) "Selection of Method for Seismic Slope Stability Analysis". Proceedings: Second International Conference on Recent Advances in Geotechnical Earthquake Engineering and Soil Dynamics, March 11-15, 1991, St. Louis, Missouri, Paper No. 7.20.

- the magnitude of acceleration is constant in the soil mass above the sliding surface, i.e. free field acceleration is applied at the bottom of the slice
- there is no pore pressure increase in the soil mass during shaking.

The influences of the vertical acceleration component and the pore pressure increase during shaking (flysch is partially saturated cohesive material) are neglected because it is believed they are small in this particular case.

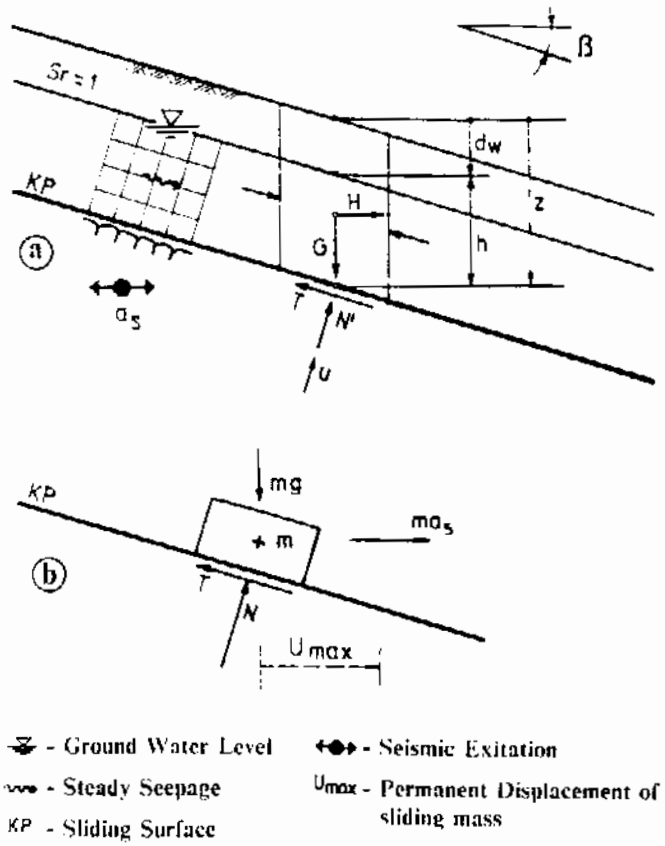


Fig. 2 Model of an infinite slope

Based on the above assumptions, the principles of limit equilibrium and the notation introduced in Figure 2, the following expression for the factor of safety, F_s, has been derived (Matasovic, 1989):

$$F_s = \frac{c/(\gamma z \cos^2 ß) + \tan \Phi [1 - \gamma_w (z - d_w)/(\gamma z)] - k_s \tan ß \tan \Phi}{k_s + \tan ß} \qquad (1)$$

where γ, γ_w, c and Φ are the unit weight of slope material, the unit weight of water, cohesion and the angle of internal friction respectively.

Equation (1) defines the factor of safety for a general case of infinite slope stability. A similar expression, but for stability of cohesionless materials with pore pressure increase due to seismic loading, has been used by Hadj-Hamou and Kavazanjian (1985).

It should be noted that the value of factor of safety calculated by Equation (1) diminishes with depth in cohesive ($c \neq 0$, $\varphi \neq 0$) materials. Also, since the equation has been set for a case of limit equilibrium when $F_s = 1$, it is assumed that slope will generally resist seismic loading and will be stable if $F_s > 1.0$.

Analysis by sliding block method

The sliding block method (Newmark, 1965) has been universally applied in dam engineering. Basic elements of slope stability analysis by this method are shown on an idealized model of an infinite slope in Figure 2b. According to D' Alembert's principle, under seismic excitation of the base a_s, the reaction of the sliding weight G would be the pseudo-static inertial force $m\, a_s = k\, G$. The limiting value of that inertial force, i.e. the limiting value of the acceleration because the mass is constant, which leads mass to the state of the limit equilibrium, depends on the shear resistance of material on a sliding surface. This acceleration is called critical acceleration, a_{sc} and can be expressed as $a_{sc} = k_c\, g$, where g is the acceleration of gravity and k_c is the factor of proportionality called *coefficient of critical acceleration*. According to the premises of this method, if the critical acceleration is exceeded, a sliding of the mass will occur. After each increment of shaking with acceleration greater than a_{sc} and associated down slope sliding, the mass will stop in a new position with respect to its original location. At the end of shaking such increments of dislocation will amount to a final and maximum permanent displacement of the sliding mass, u_{max}.

To estimate u_{max}, it is necessary, as a first step, to determine a_{sc} expressed by the product $k_c\, g$. The coefficient k_c can be determined iteratively by varying the amount of horizontal force until it reaches the value that gives the $F_s = 1$. However, for the model of infinite slope the coefficient of critical acceleration can be expressed explicitly by inserting $F_s = 1$ in Equation (1) and rearranging the variables:

$$k_c = \frac{c / (\gamma z \cos^2 ß) + \tan \Phi [1 - \gamma_w (z - d_w)/(\gamma z)] - \tan ß}{1 + \tan ß \tan \Phi} \qquad (2)$$

For a case without steady state seepage in the slope (if we insert $d_w = z$), Equation (2) becomes the expression for k_c used by Chang et Al. (1984).

After the critical acceleration has been determined, permanent displacements can be estimated by using various close form solutions available (e.g., Ambraseys and Menu, 1988), or by treating the appropriate accelerogram using the Makdisi and Seed (1978) procedure based on Newmark's (1965) approach.

The main practical problem related to the application of sliding block method in analysis of natural slopes is how to define the allowable permanent displacement. The limits on calculated values could be related to functionality of structures on the slope or to the stability of the slope itself after the earthquake. For example, if an earthquake has caused cracking of the slope, water percolation in earthquake opened cracks can significantly change the static stability. One of a very few tentative criteria set for natural slopes is the one established by the State of Alaska's Geotechnical Evaluation Criteria Committee, given in Table 1 (based on 1964 Great Alaskan Earthquake, quoted in Idriss, 1985).

TABLE 1. Orientational stability criteria for the sliding block seismic stability analysis of natural slopes

Failure Category (State of Alaska Criteria)	Amount of Corresponding Perm. Lat. Displacement
I Catastrophic Ground Failure	300 cm
II Major Ground Adjustment	90 cm
III Moderate Ground Adjustment	30 cm
IV Minor Ground Adjustment	15 cm
V Little or no Ground Adjustment	< 3 cm

REFERENCE 2

FHWA. "Design Guidance: Geotechnical Earthquake Engineering for Highways". Geotechnical Engineering Circular No. 3. May, 1997.

calculating the permanent seismic deformation of a slope or embankment, is termed the *Newmark method* (Newmark, 1965).

In a Newmark analysis, relative displacement is usually assumed to accumulate in only one direction, the downslope direction. Using this assumption, the yield acceleration in the other (upslope) direction is implicitly assumed to be larger than the peak acceleration of the failure mass being analyzed. Furthermore, vertical accelerations are typically ignored in a Newmark analysis.

For practical purposes, the seismic coefficient - factor of safety and permanent seismic deformation approaches may be combined into a unified seismic slope stability and deformation analysis, as discussed in section 7.4.

7.2 SEISMIC COEFFICIENT-FACTOR OF SAFETY ANALYSES

7.2.1 General

The traditional pseudo-static limit equilibrium method of seismic stability analysis is illustrated in figure 50. Simplifications made in using the pseudo-static approach to evaluate seismic slope stability include replacing the cyclic earthquake motion with a constant horizontal acceleration equal to $k_s \cdot g$, where k_s is the seismic coefficient, and g is acceleration of gravity, and assuming that this steady acceleration induces an inertia force $k_s W$ through the center of gravity of the potential failure mass, where W is the weight of the potential failure mass.

In the seismic coefficient-factor of safety approach to pseudo-static stability analyses, the engineer attempts to select a seismic coefficient and allowable factor of safety such that the cumulative permanent deformation in the design earthquake is small enough to be acceptable. The seismic coefficient is always less than the peak average acceleration of the failure mass and the factor of safety is typically between 1.0 and 1.2. The reason the seismic coefficient is always less than the peak average acceleration is as follows: Earthquakes produce ground motions that in turn induce inertia forces of an alternating nature in slopes or embankments. The alternating inertia forces are of short duration and change direction many times. Therefore, even though the factor of safety during a cycle of earthquake loading may fall below one, it will usually remain below one for only a very brief period of time, until the load reverses. During the interval when the factor of safety is below one, permanent displacement will accumulate. However, only limited displacements will occur during the interval because of its short duration. Therefore, even though the seismic coefficient is less than the peak average acceleration of the failure mass, the cumulative deformation that occurs over the entire earthquake will be small provided the seismic coefficient and factor of safety are selected appropriately.

To perform pseudo-static slope stability analyses, estimates of the unit weight and the dynamic shear strength parameters of the various soils in the slope cross section are needed. Such data can be obtained directly through laboratory or in situ tests, from data in the literature, or evaluated indirectly through back analyses of representative case histories. The reader is referred to chapter 5 of this document for details on evaluation of the shear strength of soils subjected to seismic loading.

REFERENCE 3

USEPA, "*RCRA Subtitle D (258) Seismic Design Guidance for Municipal Solid Waste Landfill Facilities*", Office of Research and Development, EPA/600/R-95/051, April 1995.

Figure 6.5 shows the results of Newmark seismic deformation analyses performed by Hynes and Franklin (1984) using 387 strong motion records and 6 artificial accelerograms. Based upon this data and their experience with seismic response analyses of slopes and embankments, Hynes and Franklin (1984) concluded that slopes and embankments with a yield acceleration equal to half the peak ground acceleration would experience permanent seismic deformations of less than one meter (3 ft) in any earthquake, even for embankments where amplification of acceleration by a factor of three occurs. In the absence of amplification, or if amplification is taken into account in determining the peak acceleration, the Hynes and Franklin data suggest that deformations will remain less than 0.3 m (1 ft) for yield accelerations less than or equal to one-half the peak acceleration. Therefore, based upon the work of Hynes and Franklin, it appears that the maximum value of k_s may be determined as $k_s = 0.5 \cdot a_{max}/g$ to limit permanent seismic deformations to less than 0.3 m (1 ft), where a_{max} is peak horizontal acceleration at the ground surface for analyses of the liner system and at the top of the landfill for analyses of the cover system. a_{max} can be estimated either using the simplified methods presented in Section 4 of this guidance document or from the results of a seismic response analysis.

Step 3: Perform the pseudo-static stability analysis. If the minimum factor of safety, FS_{min}, exceeds 1.0 and 0.3 m (1 ft) of deformation is acceptable, the seismic stability analysis is completed.

Step 4: If the pseudo-static factor of safety is less than 1.0 or the acceptable deformation is less than 0.3 m (1 ft), perform a Newmark deformation analysis. This is done with the following three steps:

1) Calculate the yield acceleration, k_y. The yield acceleration is usually calculated in pseudo-static analyses using a trial and error procedure in which the seismic coefficient is varied until $FS_{min} = 1.0$ is obtained. The lowest yield acceleration for all possible failure surfaces passing through the liner, cover, and/or waste mass should be evaluated.

2) Calculate the permanent seismic deformation. The permanent seismic deformation may be calculated using either simplified design charts (e.g., Hynes and Franklin, 1984; Makdisi and Seed, 1978) or a formal time-history analysis in which the excursions of the average acceleration time history above the yield acceleration are double integrated.

S&ME

PROJECT NO. 1054-07-241A

SHEET NO. 1 / 9

DATE 07/14/09

JOB NAME Edgecombe County Landfill

COMPUTED BY CHR

SUBJECT Global Slope Stability Calculation

CHECKED BY KB

COMPUTATIONS BY:

Signature Cedric Ruhl

Date 7-14-09

Name Cedric Ruhl, E.I.

Title Staff Professional

ASSUMPTIONS AND PROCEDURES CHECKED BY:

Signature

Date 7-14-09

Name Jason Reeves, P.E.

Title Senior Project Engineer

COMPUTATIONS CHECKED BY:

Signature

Date 7-15-09

Name Kyle Baucom, E.I.

Title Staff Professional

REVIEWED BY:

Signature

Date 7-14-09

Name Jason Reeves, P.E.

Title Senior Project Engineer

REVIEW NOTES / COMMENTS:

OBJECTIVE:

Evaluate the global slope stability of the C&D expansion at the Edgecombe County landfill.

METHOD:

Evaluate the slope stability of one representative cross-section (B-B') for the construction-static, the post-construction-static, and the post-construction pseudo-static cases. Geostudio's SLOPE/W computer program was used to evaluate slope stability by Spencer's Method.

CALCULATIONS:

1. Define Design Criterion

The target factor of safety of 1.3 for Construction-Static (i.e. interim condition), 1.5 for Post-Construction-Static i.e. long-term condition), and 1.1 for Post-Construction Pseudo-Static were obtained from USACE (2003) documents as summarized in Reference 1.

2. Define Slope Stability Analysis Cross-Sections

Three slope stability analysis cross-sections (A-A', B-B', and C-C') were generated where subsurface conditions are expected to be most critical, assumed to coincide with where the fill height is greatest. Cross-section B-B' was chosen for slope stability analysis. Cross-section locations are shown in Figure 1. The existing and proposed landfill cross-sections used during slope stability analysis are shown in Figure 2.

In general, the slope stability cross-sections reflect conditions following final build-out and capping of the proposed construction and demolition waste (C&D) landfill as shown in Figure 2. Based on hand auger borings performed under S&ME (2007), soil test borings performed under S&ME (2009), monitoring wells installed under S&ME (1994, 1999, 2002, 2004, 2007, 2008), and test pits performed under S&ME (2007), native coastal plain soils were assumed to consist of a silty sand material. Information from the test pit logs near the slope stability cross-sections have been included in this calculation (Reference 2). Subsurface water levels estimated from groundwater information collected in January of 2005.

3. Define Material Parameters

The generalized slope stability cross-sections consist of 3 material types: proposed C&D waste fill, existing MSW waste fill, and native coastal plain silty sand. The unit weight and effective strength properties were estimated for each material based on previous laboratory testing, published information, and our experience. The soil types modeled are expected to behave in a free-draining behavior; therefore effective strength properties were used during the analyses.

3.1 Evaluate Unit Weight

Laboratory Standard Proctor maximum dry density and optimum moisture content test results from testing performed by S&ME (Reference 3) were used to estimate the unit weight of the native coastal plain sandy silt. The laboratory test results are presented in Reference 3 and are summarized in Table 1 below:

TABLE 1: UNIT WEIGHT LABORATORY RESULTS

Material	Sample	Dry Unit Weight {γ_d} (pcf)	Moisture Content {w_{moist}} (%)	Moist Unit Weight {$\gamma_{100\%}$} (pcf)	Moist In-Situ Unit Weight {$\gamma_{95\%}$} (pcf)
Silty Sand	CA-TP-1, 5'-6'	113	15.5%	130.5	124.0
	CA-TP-2, 0'-2'	110.2	16.1%	127.9	121.5
	CA-TP-2, 4'-5'	96.7	24.2%	120.1	114.1
	CA-TP-3, 0'-2'	90.4	29.1%	116.7	110.9
	CA-TP-3, 6'-8'	88.1	28.8%	113.5	107.8
	AVERAGE	**99.7**	**22.7%**	**121.7**	**115.7**

For the purposes of this analysis, the C&D waste was assumed to have similar strength properties as the MSW waste. Qian et. al. present a range of unit weights of solid waste, as presented in Reference 4. Based on the above testing, S&ME's experience, and published values, the moist unit weights listed in Table 2 were used in the stability analyses.

TABLE 2: SLOPE STABILITY UNIT WEIGHTS	
Material	**Moist Unit Weight {γ_{moist}} (pcf)**
Native Coastal Plain Silty Sand	115
MSW Waste	65
C&D Waste	90

3.2 Evaluate Strength Parameters for C&D and MSW Waste

For the purposes of this analysis, the C&D waste was assumed to have the same properties as the MSW waste. The MSW and C&D wastes were also assumed to have a permeability high enough to prevent an increase in pore water pressure due to loading. Qian et. al. (2002) present a bilinear shear strength relationship of solid waste modified from Kavazanjian et. al. (1995), as presented in Reference 4 and summarized in Table 3 below:

TABLE 3: EFFECTIVE STRENGTH OF C&D AND MSW WASTE		
Range of Normal Stress (psf)	**Effective Cohesion {c'} (psf)**	**Effective Friction Angle {ϕ'} (degrees)**
0 - 500	500	0
500+	0	33

3.3 Evaluate Strength Parameters for Native Coastal Plain Silty Sand

The native coastal plain silty sand material is expected to be relatively free-draining, such that there is no excess pore water pressure developed during an increase in vertical stress. The effective strength parameters of the silty sand were estimated in part from values published by NAVFAC and presented in Reference 5. Based on these published values and S&ME's experience, the effective strength parameters for the silty sand were estimated as presented in Table 4 below:

TABLE 4: EFFECTIVE STRENGTH OF SILTY SAND		
Material	Effective Cohesion {c'} (psf)	Effective Friction Angle {ϕ'} (degrees)
Native Coastal Plain Silty Sand	0	30

During a seismic event, the materials may experience a decrease in shear strength. Assuming a strength loss of 20%, the cohesion goes from 500 psf to 400 psf and the friction angle may be estimated as follows:

$$\tan^{-1}(\phi_{seismic}) = \frac{\tan(\phi_{static})}{1.2}$$

The strength parameters used for the pseudostatic analysis are summarized in Table 5 below:

TABLE 5: PSEUDOSTATIC STRENGTH PARAMTERS			
Material	Range of Normal Stress (psf)	Effective Cohesion {c'} (psf)	Effective Friction Angle {ϕ'} (degrees)
Native Coastal Plain Silty Sand	all	0	25.7
MSW Waste	0 - 500	400	0
MSW Waste	500+	0	28.4
C&D Waste	0 - 500	400	0
C&D Waste	500+	0	28.4

4. Estimate the Seismic Coefficient for Pseudo-Static Analyses

For a pseudo-static analysis, the forces due to seismic loading are represented by a seismic coefficient, generally in units of percent of gravity. The seismic coefficient is generally defined at several locations including bedrock, the ground surface, the crest of the embankment, and at depths of interest along the embankment.

4.1 Estimate the seismic coefficient at bedrock

The seismic coefficient at bedrock with a 2 percent probability of exceedance in 50 years was estimated using 2008 USGS interactive mapping software as shown in Reference 6. The seismic coefficient at bedrock was estimated to be 5.784 percent of gravity, or 0.06g.

4.2 Estimate the seismic coefficient at the ground surface

The seismic coefficient at the ground surface was estimated using software developed by USGS (Reference 7). Assuming a seismic site class of "D", the software was used to estimate the propagation or attenuation of seismic motion from the bedrock to the ground surface, as shown in Reference 7. The seismic coefficient at the ground surface was estimated to be 0.10g.

4.3 Estimate the seismic coefficient at the top of the embankment

The seismic coefficient at the top of the embankment was estimated using a relationship described by the Federal Highway Administration, as shown in Reference 8. The seismic coefficient at the crest of the embankment was estimated to be 0.36g. This seismic coefficient will be used in the Veneer Stability calculation.

4.4 Estimate the seismic coefficient at depths of interest along the embankment

The seismic coefficient at depths of interest along the embankment was estimated using a relationship described by Makdisi and Seed (1977) as shown in Reference 9. The relationship between depth of interest from the top of the embankment (y) and the total height of the embankment (h) versus seismic coefficient is summarized in Table 6 below:

TABLE 6: SEISMIC COEFFICIENT AT DEPTHS OF INTEREST (REFERENCE 9)			
y/h	k_{max}/u_{max}	Seismic Coefficient at Top of Embankment $\{u_{max}\}$ (%g)	Seismic Coefficient at Depth of Interest $\{k_{max}\}$ (%g)
1	0.35	0.36	0.13
0.9	0.37	0.36	0.13
0.8	0.41	0.36	0.15
0.7	0.48	0.36	0.17
0.6	0.52	0.36	0.19
0.5	0.60	0.36	0.22
0.4	0.70	0.36	0.25
0.3	0.79	0.36	0.28
0.2	0.88	0.36	0.32
0.1	0.93	0.36	0.33
0	1.00	0.36	0.36

During pseudo-static analyses, the depth of interest was assumed to be at the bottom of the failure mass.

RESULTS:

Landfill cross-section B-B' was analyzed for long-term static conditions and long-term pseudostatic conditions, assuming slip surfaces in both the right-to-left and left-to-right directions. For the pseudostatic condition, the bottom of the slip surface was below the total depth of the embankment. From Table 5, y/h was assumed to be 1, and a seismic coefficient of 0.13 was used during pseudostatic analyses. End of construction conditions, i.e. undrained strength conditions, were not modeled because the soil materials were assumed to be free-draining and landfill construction is assumed to occur at a gradual rate. The results of the slope stability analyses are summarized in Table 7 below, and presented in Reference 10. A representative printout of program inputs is also provided in Reference 10.

TABLE 7: SLOPE STABILITY ANALYSIS RESULTS						
Slope Stability Analysis	**Section**	**Soil Strength Condition**	**Description**	**Safety Factor**	**Minimum Safety Factor**	**Check**
1	B-B'	Effective Stress	Static Condition, Right to Left	**2.97**	**1.5**	**OK**
2	B-B'	Effective Stress	Static Condition, Left to Right	**2.55**	**1.5**	**OK**
3	B-B'	Reduced Effective Stress	Pseudostatic Condition, Right to Left	**1.36**	**1.1**	**OK**
4	B-B'	Reduced Effective Stress	Pseudostatic Condition, Left to Right	**1.24**	**1.1**	**OK**

CONCLUSIONS AND RECOMMENDATIONS:

The Edgecombe County C&D landfill expansion achieves slope stability factors greater than the selected minimum safety factors for the conditions modeled. It is recommended that consolidated undrained triaxial tests be performed on the native coastal plain soils before construction to evaluate consistency with the shear strengths assumed in this calculation.

REFERENCES:

1. USACE, "Engineering and Design – Slope Stability," EM 1110-2-1902, October 31, 2003.

2. Test Pit Logs, S&ME Project No. 1040-01-545B, June 2007.

3. Laboratory Test Result Summary, S&ME Project No. 1054-07-241A.

4. Qian, Xuede et. al. "Geotechnical Aspects of Landfill Design and Construction," Prentice Hall, 2002.

5. U.S. Naval Facilities Engineering Command, "Foundations and Earth Structures," Design Manual 7.02, September 1, 1986.

6. United States Geological Survey, "National Seismic Hazard Maps," May 13, 2008.

7. United States Geological Survey, "Earthquake Ground Motion Parameters version 5.0.9," October 6, 2008.

8. Federal Highway Administration, "Geotechnical Engineering Circular No. 3: Design Guidance: Geotechnical Earthquake Engineering for Highways: Volume 1 – Design Principles," May, 1997.

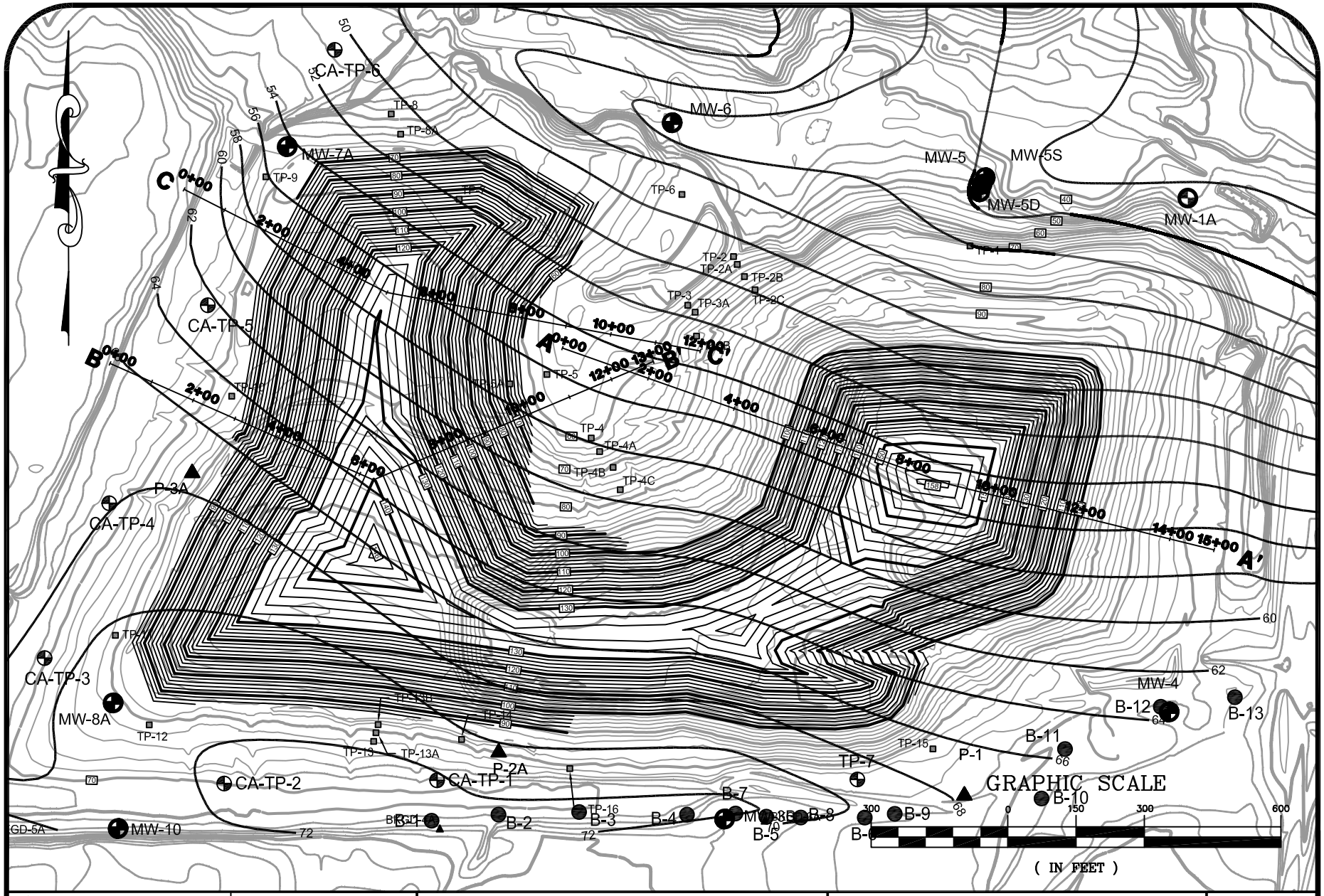
9. Makdisi, F. and H. Bolton Seed. "A Simplified Procedure for Estimating Earthquake-Induced Deformations in Dams and Embankments," August 1977.

10. GEO-Slope International, "SLOPE/W, Geostudio 2007 Version 7.01," Calgary, Alberta, Canada.

FIGURES

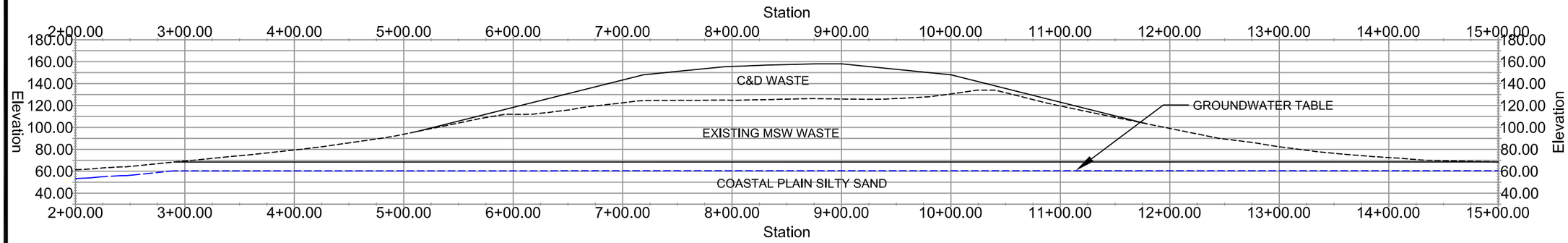
Figure 1: Slope Stability Section Locations

Figure 2: Slope Stability Cross-Sections

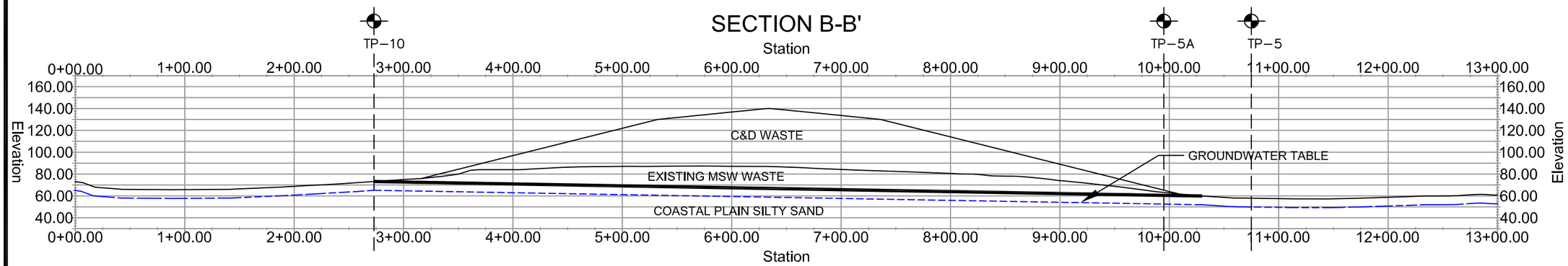


SCALE: 1" = 300'	DATE: 07/14/09	S&ME WWW.SMEINC.COM	9751 SOUTHERN PINE BLVD. CHARLOTTE, N.C. 28273 (704)523-4726	SLOPE STABILITY SECTION LOCATIONS EDGECOMBE COUNTY LANDFILL EDGECOMBE COUNTY, NC	FIGURE NO. 1
PROJECT NO. 1054-07-241A	DRAWN BY: CHR				
ENGINEERING LICENSE NO: F-0176	CHECKED BY:				

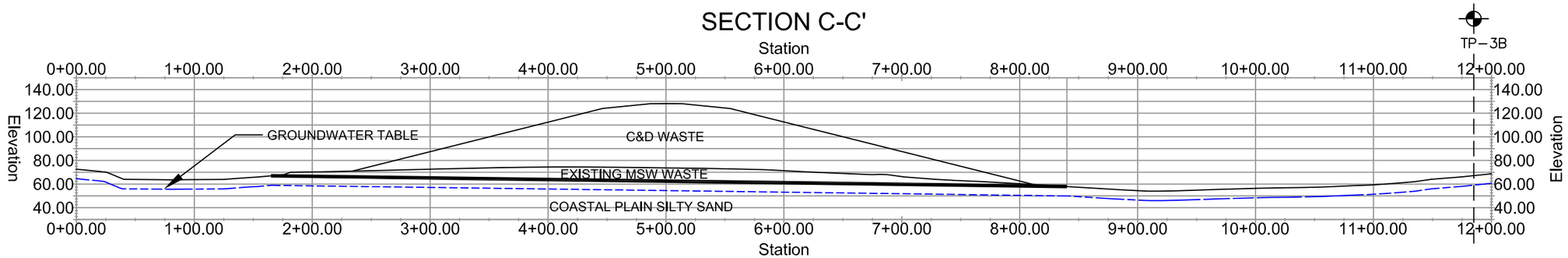
SECTION A-A'



SECTION B-B'



SECTION C-C'



DATE: 07/14/09
DRAWN BY: CHR
CHECKED BY:
SCALE: 1" = 100'
PROJECT NO. 1054-07-241A
ENGINEERING LICENSE NO:

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(704)523-4726
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SLOPE STABILITY CROSS-SECTIONS

EDGECOMBE COUNTY LANDFILL
EDGECOMBE COUNTY, NC

FIGURE NO.
2

REFERENCE 1

USACE, "Engineering and Design – Slope Stability," EM 1110-2-1902, October 31, 2003.

Table 3-1
Minimum Required Factors of Safety: New Earth and Rock-Fill Dams

Analysis Condition[1]	Required Minimum Factor of Safety	Slope
End-of-Construction (including staged construction)[2]	1.3	Upstream and Downstream
Long-term (Steady seepage, maximum storage pool, spillway crest or top of gates)	1.5	Downstream
Maximum surcharge pool[3]	1.4	Downstream
Rapid drawdown	1.1-1.3[4,5]	Upstream

[1] For earthquake loading, see ER 1110-2-1806 for guidance. An Engineer Circular, "Dynamic Analysis of Embankment Dams," is still in preparation.

[2] For embankments over 50 feet high on soft foundations and for embankments that will be subjected to pool loading during construction, a higher minimum end-of-construction factor of safety may be appropriate.

[3] Pool thrust from maximum surcharge level. Pore pressures are usually taken as those developed under steady-state seepage at maximum storage pool. However, for pervious foundations with no positive cutoff steady-state seepage may develop under maximum surcharge pool.

[4] Factor of safety (FS) to be used with improved method of analysis described in Appendix G.

[5] FS = 1.1 applies to drawdown from maximum surcharge pool; FS = 1.3 applies to drawdown from maximum storage pool.

For dams used in pump storage schemes or similar applications where rapid drawdown is a routine operating condition, higher factors of safety, e.g., 1.4-1.5, are appropriate. If consequences of an upstream failure are great, such as blockage of the outlet works resulting in a potential catastrophic failure, higher factors of safety should be considered.

(1) During construction of embankments, materials should be examined to ensure that they are consistent with the materials on which the design was based. Records of compaction, moisture, and density for fill materials should be compared with the compaction conditions on which the undrained shear strengths used in stability analyses were based.

(2) Particular attention should be given to determining if field compaction moisture contents of cohesive materials are significantly higher or dry unit weights are significantly lower than values on which design strengths were based. If so, undrained (UU, Q) shear strengths may be lower than the values used for design, and end-of-construction stability should be reevaluated. Undisturbed samples of cohesive materials should be taken during construction and unconsolidated-undrained (UU, Q) tests should be performed to verify end-of-construction stability.

d. Pore water pressure. Seepage analyses (flow nets or numerical analyses) should be performed to estimate pore water pressures for use in long-term stability computations. During operation of the reservoir, especially during initial filling and as each new record pool is experienced, an appropriate monitoring and evaluation program must be carried out. This is imperative to identify unexpected seepage conditions, abnormally high piezometric levels, and unexpected deformations or rates of deformations. As the reservoir is brought up and as higher pools are experienced, trends of piezometric levels versus reservoir stage can be used to project piezometric levels for maximum storage and maximum surcharge pool levels. This allows comparison of anticipated actual performance to the piezometric levels assumed during original design studies and analysis. These projections provide a firm basis to assess the stability of the downstream slope of the dam for future maximum loading conditions. If this process indicates that pore water pressures will be higher than those used in design stability analyses, additional analyses should be performed to verify long-term stability.

e. Loads on slopes. Loads imposed on slopes, such as those resulting from structures, vehicles, stored materials, etc. should be accounted for in stability analyses.

REFERENCE 2

Test Pit Logs, S&ME Project No. 1040-01-545B, June 2007.

LOG OF BORING NO. TP-3B

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	66.769
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	9.5
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW
DRILLING CONTRACTOR:			
DRILLING METHOD:	BACKHOE		
DATE DRILLED:	6/25/2007		

This log is part of the report prepared for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presentated is a simplification of actual conditions encountered.

SAMPLE NUMBER	PID (ppm)	FID (ppm)	ELEVATION (feet)	DEPTH (feet)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
			66.77	0.0			Light brown silty SAND	
							WASTE - trash bags, clothing, cotton belt, household trash	
							Light brown silty SAND	
							WASTE - hit cable coils, stop pit at 9.5 ft. bgs	
			61.77	5.0				

NOTES:

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LOG OF BORING TP-3B

LOG OF BORING NO. TP-5

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	57.500
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	10
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW
DRILLING CONTRACTOR:			
DRILLING METHOD:	BACKHOE		
DATE DRILLED:	6/26/2007		

This log is part of the report prepared for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presentated is a simplification of actual conditions encountered.

SAMPLE NUMBER	PID (ppm)	FID (ppm)	ELEVATION (feet)	DEPTH (feet)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
			57.50	0.0			Tan silty SAND	
							Gray brown mottled silty SAND	
			52.50	5.0			Brown fill SAND, Water at 6 feet	
							Light gray clayey SILT	
			47.50	10.0			Gray silty CLAY, test pit terminated at 10 ft. bgs	

NOTES:

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LOG OF BORING TP-5

LOG OF BORING NO. TP-5A

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	63.275
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	8
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW
DRILLING CONTRACTOR:			
DRILLING METHOD:	BACKHOE		
DATE DRILLED:	6/26/2007		

This log is part of the report prepared for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presentated is a simplification of actual conditions encountered.

SAMPLE NUMBER	PID (ppm)	FID (ppm)	ELEVATION (feet)	DEPTH (feet)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
			63.28	0.0			**Light brown tan silty SAND**	
							Brown with gray silty CLAY, plastic present, bottles	
			58.28	5.0			**WASTE, Water and Methane, test pit terminated in waste at 8 ft. due to water**	

NOTES:

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LOG OF BORING TP-5A

LOG OF BORING NO. TP-10

PROJECT:	Edgecombe County Landfill	APPROXIMATE ELEVATION:	72.685
PROJECT NO:	1040-01-545B	BORING DEPTH (FT.):	4.5
PROJECT LOCATION:	Tarboro, NC	LOGGED BY:	DW
DRILLING CONTRACTOR:			
DRILLING METHOD:	BACKHOE		
DATE DRILLED:	6/27/2007		

This log is part of the report prepared for the named project and should be read together with that report for complete interpretation. This summary applies only at the location of this boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presentated is a simplification of actual conditions encountered.

SAMPLE NUMBER	PID (ppm)	FID (ppm)	ELEVATION (feet)	DEPTH (feet)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
			72.69	0.0			Light tan silty SAND	
							Red brown silty SAND	
							Light gray SAND	
							WASTE, fabric, burlap, plastic bottles, black. Test Pit terminated at 4.5 ft bgs	

NOTES:

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LOG OF BORING TP-10

REFERENCE 3

Laboratory Test Result Summary, S&ME Project No. 1054-07-241A.

Edgecombe County Landfill
Edgecombe County, NC
S&ME Project Number: 1054-07-241A

Boring	Depth (feet)	USCS	Natural Moisture Content (%)	GRAIN SIZE ANALYSIS					ATTERBERG LIMITS			STANDARD PROCTOR		Permeability, k (cm/s)
				Coarse Sand (%)	Medium Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Optimum Moisture (%)	Maximum Dry Density (pcf)	
CA-TP-1	0 - 2	(SP-SC)	15.7	0	39	50	10.2		-	-	-	-	-	-
CA-TP-1	5 - 6	(CL)	35.0	0	5	45	28.8	21.5	-	-	-	15.5	113.0	2.29E-06
CA-TP-2	0 - 2	CL	25.2	0	3	40	26.4	30.5	34	15	19	16.1	110.2	1.01E-06
CA-TP-2	2 - 4	(SM)	22.0	2	17	62	17.7		-	-	-	-	-	-
CA-TP-2	4 - 5	CL	47.1	0	4	23	58.0	14.5	34	21	13	24.2	96.7	6.41E-07
CA-TP-3	0 - 2	(ML)	39.3	0	4	33	36.0	27.0	-	-	-	29.1	90.4	7.22E-07
CA-TP-3	6 - 8	CL	65.1	0	0	9	57.1	33.5	47	25	22	28.8	88.1	4.60E-07
CA-TP-6	5 - 7	(ML)	65.4	0	1	5	41.4	53.0	-	-	-	-	-	-
CA-TP-6	7 - 9	(SM)	35.5	0	26	35	19.5	20.0	-	-	-	-	-	-
B-1 / S-2	8.5 - 10	(SC)	31.4	0	2.3	69	28.6		31	19	12			
B-1 / S-3	13.5 - 15	(CH)	58.5	0.1	1.8	19.8	78.3		93	28	65			
B-3 / S-4	6 - 7.5	(SC)	42.8	0	0.2	50.6	49.1		46	16	30			
B-5 / S-5	11 - 12.5	(SC)	28.0	0	0.6	65.6	33.7		37	17	20			
B-8 / S-6	16 - 17.5	(SC)	31.9	0	0.7	74	25.5		29	17	12			
B-8 / S-7	18.5 - 20	(SC)	37.9	0.7	3.3	49.2	46.2		47	20	27			
B-9 / S-8	3.5 - 5	(SC)	31.2	0.5	3.8	54.2	41.4		44	17	27			
B-12 / S-9	6 - 7.5	(SC)	31.2	0.5	12.8	57.8	28.8		30	14	16			
B-12 / S-10	11 - 12	(CH)	62.3	0	0.4	8.2	91.4		87	24	63			
B-13 / S-11	22.5 - 24	(SC)	30.8	5.3	20.9	36.3	29.2		54	19	35			
CATP 1A S-1	1 - 1.5	(CH)	25.4	0.1	1.4	32.1	66.4		53	17	36			
B-1	8.5-10.0	x		x	x	x	x	x	x	x	x			
	13.5-15.0	x		x	x	x	x	x	x	x	x			
B-3	6-7.5	x		x	x	x	x	x	x	x	x			
	8.5-10	x		x	x	x	x	x	x	x	x			
B-5	1-2.5	x		x	x	x	x	x	x	x	x			
	11-12.5	x		x	x	x	x	x	x	x	x			
	16-17.5	x		x	x	x	x	x	x	x	x			
B-8	16-17.5	x		x	x	x	x	x	x	x	x			
	18.5-20	x		x	x	x	x	x	x	x	x			
	21-22.5	x		x	x	x	x	x	x	x	x			
B-9	3.5-5	x		x	x	x	x	x	x	x	x			
B-10	3.5-5	x		x	x	x	x	x	x	x	x			
	8.5-10	x		x	x	x	x	x	x	x	x			
B-12	6-7.5	x		x	x	x	x	x	x	x	x			
	11-12.5	x		x	x	x	x	x	x	x	x			
B-13	22.5-24	x		x	x	x	x	x	x	x	x			

(CL) = Visual USCS Classification
CL = USCS Classification

REFERENCE 4

Qian, Xuede et. al. "Geotechnical Aspects of Landfill Design and Construction," Prentice Hall, 2002.

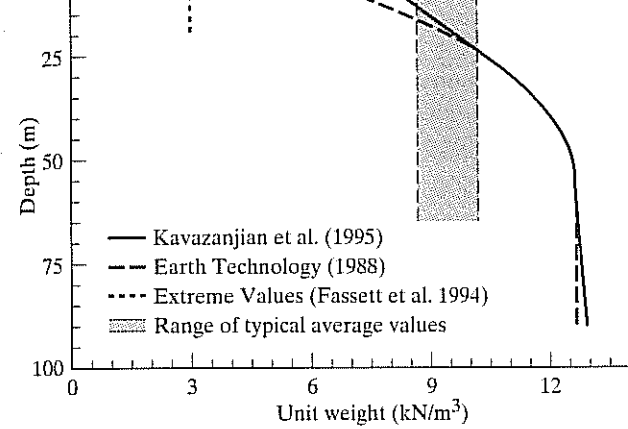
(1994) the least reliable values are those computed by indirect methods (e.g. values based on incoming weights and in-place volume estimates).

A summary of average unit weights of municipal solid waste is shown in Table 6.3. The unit weight values presented in Table 6.3 range from 20 to 84 lb/ft^3 (3.1 to 13.2 kN/m^3). The wide range is likely caused by the diversity of material in the waste stream, the variable amount of daily cover, and varying moisture content and compaction efforts. More information about the unit weight of solid waste can be found in Table 6.5.

The initial in-place unit weight will increase immediately when compressed by the application of overburden pressure from subsequent waste placement. The in-place unit weight may also increase with further compression that occurs over time. Earth Technology (1988) reported the results of field and laboratory studies of unit weight performed at the Puente Hills landfill near Los Angeles. They developed an interpreted profile of unit weight versus depth for that landfill. The interpreted profile was derived from measurements of unit weight of drive samples recovered for laboratory testing and down-hole geophysical gamma-gamma logging. The interpreted unit weight profile shown in Figure 6.1, varied from 21 lb/ft^3 (3.3 kN/m^3) at the surface to 81.4 lb/ft^3 (12.8 kN/m^3) at depths greater than 200 ft (60 m). Based on reported initial in-place waste densities for modern landfills and the waste compressibility values reported by Fassett et al. (1994), Kavazanjian et al. (1995) developed a profile to show the relationship between the unit weight of the waste and landfill depth. In the absence of site specific information, this profile can be used to estimate the unit weight of the municipal solid waste in engineering analysis for modern municipal solid waste landfills (Kavazanjian et al., 1995).

TABLE 6.3 Average Unit Weight of Municipal Solid Waste (Sharma et al., 1990)

Source	Waste Placement Conditions	Unit Weight	
		lb/ft^3	kN/m^3
Sowers (1968)	Sanitary Refuse: Depending on compaction effort	30 to 60	4.7 to 9.4
NAVFAC (1983)	Sanitary Landfill		
	(a) Not Shredded		
	• Poor compaction	20	3.1
	• Good compaction	40	6.3
	• Best compaction	60	9.4
	(b) Shredded	55	8.6
NSWMA (1985)	Municipal Refuse		
	• In a landfill	44 to 49	6.9 to 7.7
	• After degradation and settlement	63 to 70	9.9 to 11
Landva and Clark (1986)	Refuse Landfill (Refuse to soil cover ratio varied from about 2:1 to 10:1)	57 to 84	9 to 13.2
EMCON Associates (1989)	For 6:1 refuse to daily cover soil	46	7.2



Zornberg et al. (1999) conducted direct field m
wave analysis (SASW) surveys to characterize the uni
MSW landfill located in southern California. The v
direct field measurements ranged approximately fro
to 15 kN/m^3) at a depth of between 26 ft and 164 ft (
surface.

Based on the compaction equipment used in m
paction ratio of loose waste to compacted waste usu
average unit weight of compacted solid waste is usual
for modern solid waste landfills.

6.3 MOISTURE CONTENT OF MUNICIPAL SOLID WASTE

Two types of moisture content are used in landfill d
content is defined as the percent by weight of wate
weight of the waste. This dry gravimetric moisture co
in geotechnical engineering analyses, is written as

$$w_d = (W_w/W_s) \times 10$$

where w_d = dry gravimetric moisture content, %;
W_w = weight of water; and
W_s = dry weight of solid waste.

In some references, moisture content is defined
wastes (i.e., w_w), written as

$$w_w = [W_w/(W_s + W_w)] \times$$

where w_w = wet gravimetric moisture content, %;
W_w = weight of water; and
W_s = dry weight of solid waste.

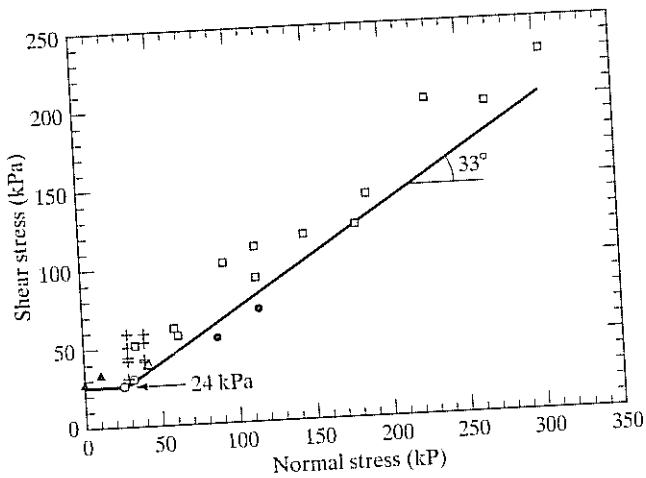


FIGURE 6.8 Shear Strength of Municipal Solid Waste from Different Locations (modified from Kavazanjian et al., 1995). Used with permission of ASCE.

The strength of municipal solid waste appears to increase with increasing normal stress (confining pressure), in much the same way as a soil. On the other hand, its high organic and "fiber" content immediately after placement make it behave more like a fibrous peat than a mineral soil (Landva and La Rochelle, 1983). The fiber content of municipal solid waste will remain relatively constant, but the putresible organic content will decrease with time. Therefore, some changes in geotechnical properties must be expected. Also, municipal solid waste can be extremely heterogeneous, so that a sample taken at one location may not be indicative of the "average" properties (Howland and Landva, 1992).

The date of waste placement may also be a factor as well. Consider, for example the increased use of plastics for packaging in the 1960's. Landva and Clark (1990) note that the friction angle between plastic bags is approximately 9 degrees (Figure 6.6). While plastics in the waste stream do not appear to reduce the average bulk strength of municipal solid waste to 9 degrees, Landva and Clark (1990) measured a friction angle of 24 degrees for a shredded refuse with a high plastic content (Figure 6.5).

Municipal solid waste placed in the 1990's again may behave differently than municipal solid waste of previous eras. Permitted landfill air space has become increasingly valuable and, therefore increased compactive effort is seen as a way to place more waste into the same space. Also, stricter enforcement of daily soil cover requirements will tend to increase the average density of the landfill mass. It is unknown whether the effect of increased density of the layered waste and daily cover on stability will be offset by a corresponding increase in strength. Increased recycling also will have an uncertain effect on waste composition and strength. Conversely, the use of alternative daily cover materials (ADCMs), in place of the customary 6 inches (1 mm) of soil, would greatly decrease the overall unit weight. Pohland and Gray (1993) present the following categories of ADCMs, all of which have the effect of decreasing the overall unit weight of MSW:

(i) Polymer foams,

(ii) Slurry sprays (paper or woodchip based),

REFERENCE 5

U.S. Naval Facilities Engineering Command, "Foundations and Earth Structures," Design Manual 7.02, September 1, 1986.

TABLE 1
Typical Properties of Compacted Soils

Group Symbol	Soil Type	Range of Maximum Dry Unit Weight, pcf	Range of Optimum Moisture, Percent	Typical Value of Compression		Typical Strength Characteristics				Typical Coefficient of Permeability ft./min.	Range of CBR Values	Range of Subgrade Modulus k lbs/cu in.
				At 1.4 tsf (20 psi)	At 3.6 tsf (50 psi)	Cohesion (as compacted) psf	Cohesion (saturated) psf	ϕ (Effective Stress Envelope Degrees)	Tan ϕ			
				Percent of Original Height								
GW	Well graded clean gravels, gravel-sand mixtures.	125 - 135	11 - 8	0.3	0.6	0	0	>38	>0.79	5×10^{-2}	40 - 80	300 - 500
GP	Poorly graded clean gravels, gravel-sand mix	115 - 125	14 - 11	0.4	0.9	0	0	>37	>0.74	10^{-1}	30 - 60	250 - 400
GM	Silty gravels, poorly graded gravel-sand-silt.	120 - 135	12 - 8	0.5	1.1	.....	.....	>34	>0.67	$>10^{-6}$	20 - 60	100 - 400
GC	Clayey gravels, poorly graded gravel-sand-clay.	115 - 130	14 - 9	0.7	1.6	.....	.....	>31	>0.60	$>10^{-7}$	20 - 40	100 - 300
SW	Well graded clean sands, gravelly sands.	110 - 130	16 - 9	0.6	1.2	0	0	38	0.79	$>10^{-3}$	20 - 40	200 - 300
SP	Poorly graded clean sands, sand-gravel mix.	100 - 320	21 - 12	0.8	1.4	0	0	37	0.74	$>10^{-3}$	10 - 40	200 - 300
SM	Silty sands, poorly graded sand-silt mix.	110 - 125	16 - 11	0.8	1.6	1050	420	34	0.67	$5 \times >10^{-5}$	10 - 40	100 - 300
SM-SC	Sand-silt clay mix with slightly plastic fines.	110 - 130	15 - 11	0.8	1.4	1050	300	33	0.66	$2 \times >10^{-6}$	5 - 30	100 - 300
SC	Clayey sands, poorly graded sand-clay-mix.	105 - 125	19 - 11	1.1	2.2	1550	230	31	0.60	$5 \times >10^{-7}$	5 - 20	100 - 300
ML	Inorganic silts and clayey silts.	95 - 120	24 - 12	0.9	1.7	1400	190	32	0.62	$>10^{-5}$	15 or less	100 - 200
ML-CL	Mixture of inorganic silt and clay.	100 - 120	22 - 12	1.0	2.2	1350	460	32	0.62	$5 \times >10^{-7}$	.....	
CL	Inorganic clays of low to medium plasticity.	95 - 120	24 - 12	1.3	2.5	1800	270	28	0.54	$>10^{-7}$	15 or less	50 - 200
OL	Organic silts and silt-clays, low plasticity.	80 - 100	33 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	50 - 100
MH	Inorganic clayey silts, elastic silts.	70 - 95	40 - 24	2.0	3.8	1500	420	25	0.47	$5 \times >10^{-7}$	10 or less	50 - 100
CH	Inorganic clays of high plasticity	75 - 105	36 - 19	2.6	3.9	2150	230	19	0.35	$>10^{-7}$	15 or less	50 - 150
OH	Organic clays and silty clays	65 - 100	45 - 21	.....	.....	.....	.....	.....	.....	.....	5 or less	25 - 100

Notes:

1. All properties are for condition of "Standard Proctor" maximum density, except values of k and CBR which are for "modified Proctor" maximum density.
2. Typical strength characteristics are for effective strength envelopes and are obtained from USBR data.
3. Compression values are for vertical loading with complete lateral confinement.
4. (>) indicates that typical property is greater than the value shown.
   (..) indicates insufficient data available for an estimate.

REFERENCE 6

United States Geological Survey, "National Seismic Hazard Maps," May 13, 2008.

USGS National Seismic Hazard Maps - 2008

Select Map: Peak Horizontal Acceleration (%g) with 2% Probability of Exceedance in 50 Years

Tools:

navigate

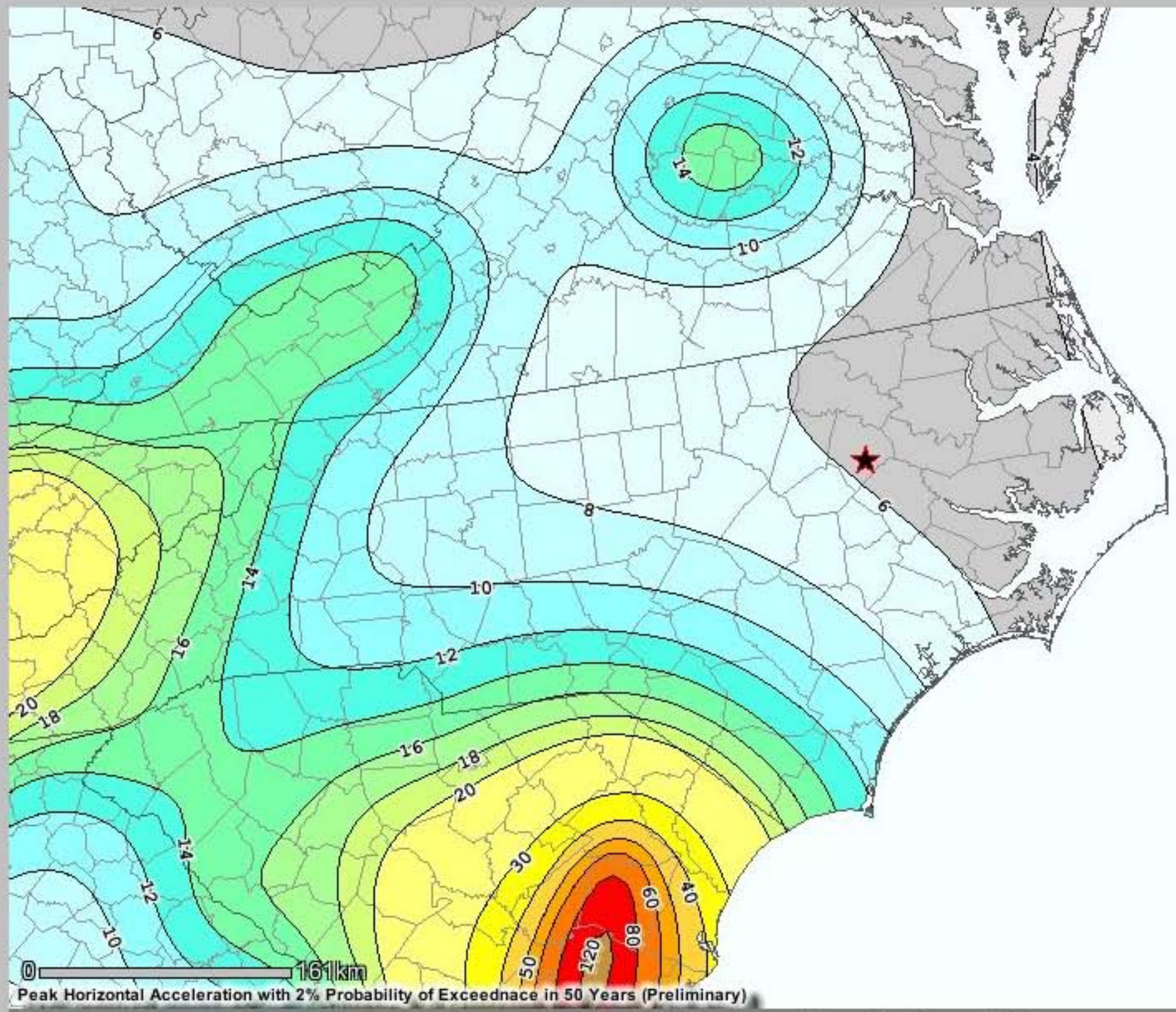
information

select features

distance

maps/data

hazard values



Refresh Map

Layers

Visible Active

- %g contour labels
- %g contours
- States
- Counties
- %g intervals

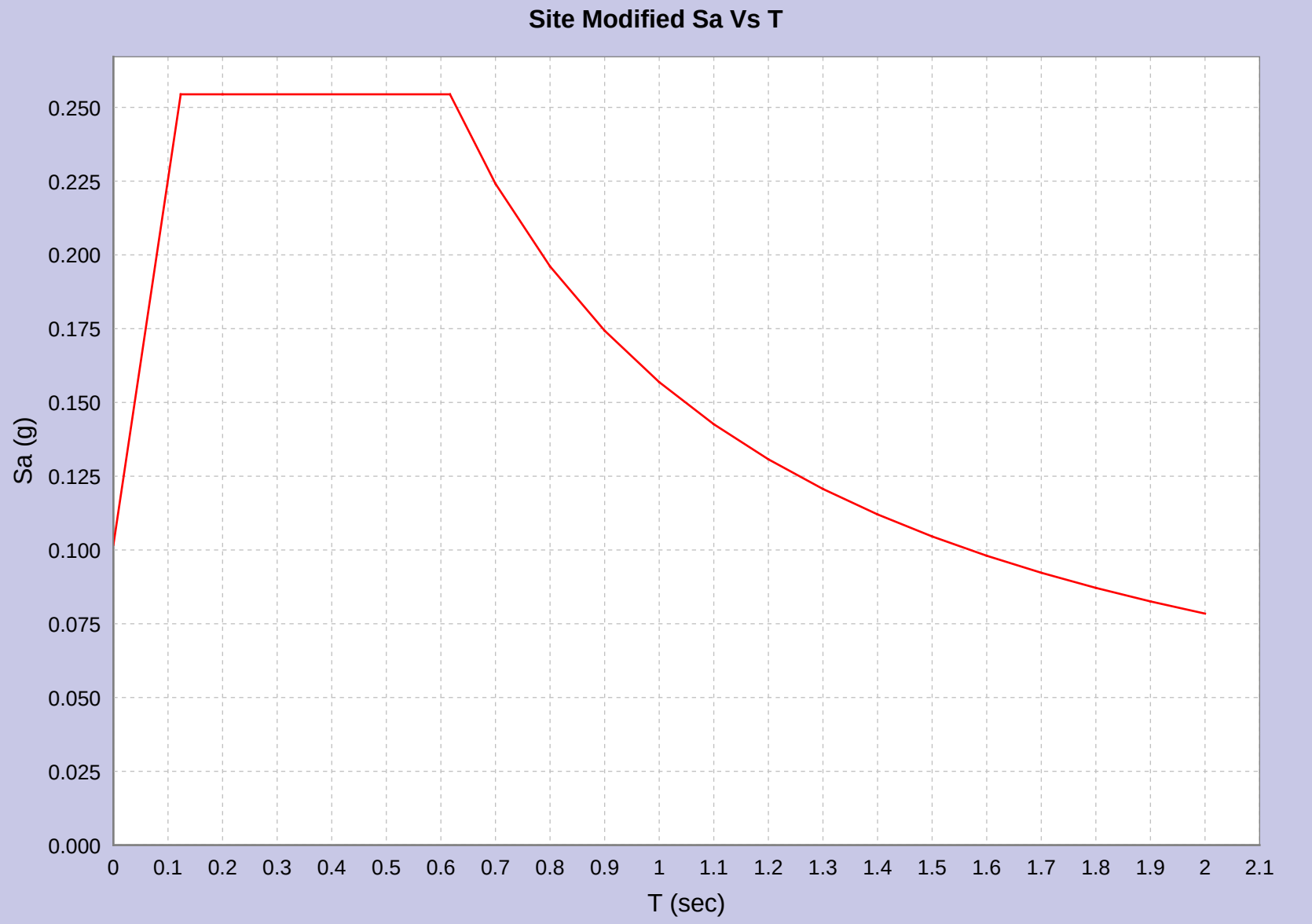
Enter latitude and longitude or click on map.

Latitude: 35.8395 North Longitude: -77.5572 West

Get hazard by Lat / Lon

REFERENCE 7

United States Geological Survey, "Earthquake Ground Motion Parameters version 5.0.9," October 6, 2008.


Site Modified Sa Vs T
Sa (g)
0.250
0.225
0.200
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9
2
2.1
T (sec)

DATASET #1

Site Modified Sa Vs T

5% Damping

Conterminous 48 States

2003 NEHRP Seismic Design Provisions

Lat : 35.8395

Lon : -77.5572

Site Class D

Fa = 1.6 Fv = 2.4

X-Axis: T (sec)
Y-Axis: Sa (g)
Number of Data Sets: 1

DATASET #1

Name: Site Modified Sa Vs T
Num Points: 18
Info: 5% Damping
Conterminous 48 States
2003 NEHRP Seismic Design Provisions
Lat : 35.8395
Lon : -77.5572
Site Class D
Fa = 1.6 Fv = 2.4

X, Y Data:

0.0	0.10177017
0.12332367	0.25442544
0.2	0.25442544
0.61661834	0.25442544
0.7	0.22411914
0.8	0.19610424
0.9	0.17431489
1.0	0.15688339
1.1	0.14262126
1.2	0.13073616
1.3	0.120679535
1.4	0.11205957
1.5	0.10458893
1.6	0.09805212
1.7	0.09228435
1.8	0.08715744
1.9	0.08257021
2.0	0.078441694

REFERENCE 8

Federal Highway Administration, "Geotechnical Engineering Circular No. 3: Design Guidance: Geotechnical Earthquake Engineering for Highways: Volume 1 – Design Principles," May, 1997.

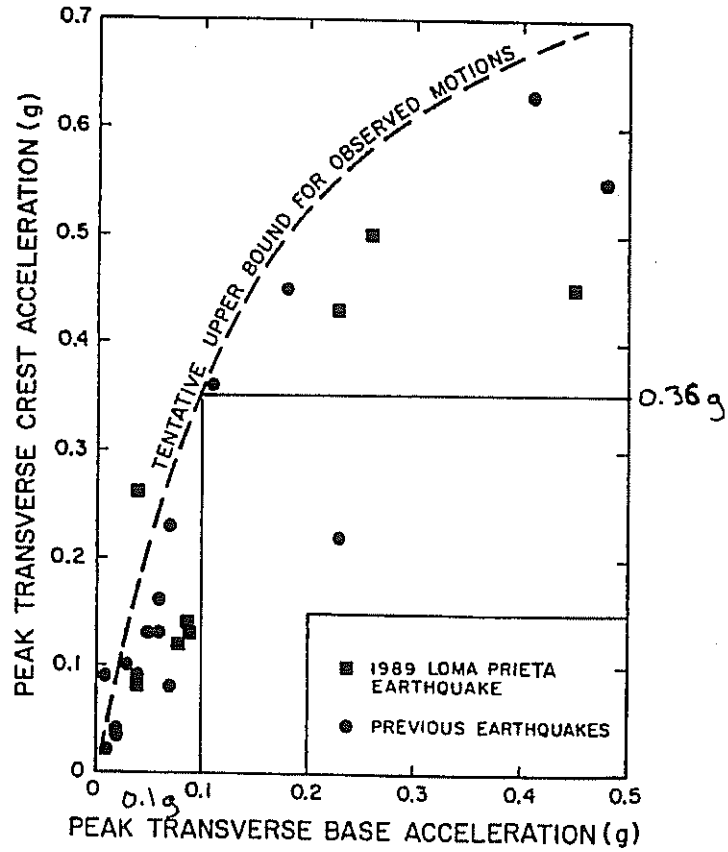


Figure 47. Comparisons of peak base and crest accelerations recorded at earth dams (Harder, 1991).

The free-field soft soil site amplification curve presented in figure 46 and the embankment response observational data presented in figure 47 may be used in a simplified three- or four-step site response analysis procedure to account for the influence of local soil conditions and earthen embankments on the peak ground acceleration at a project site. The three- or four-step procedure is as follows:

Step 1: *Classify the site.* Using table 3 (Borcherdt; 1994), classify the site as a Special Study, soft, medium stiff, stiff, or rock on the basis of the average shear wave velocity for the top 30 meters of soil.

Step 2: *Estimate the hypothetical free-field bedrock acceleration at the site.* Using one of the methods discussed in chapter 3, estimate the free-field peak ground acceleration at a hypothetical bedrock outcrop at the project site.

REFERENCE 9

Makdisi, F. and H. Bolton Seed. "A Simplified Procedure for Estimating Earthquake-Induced Deformations in Dams and Embankments," August 1977.

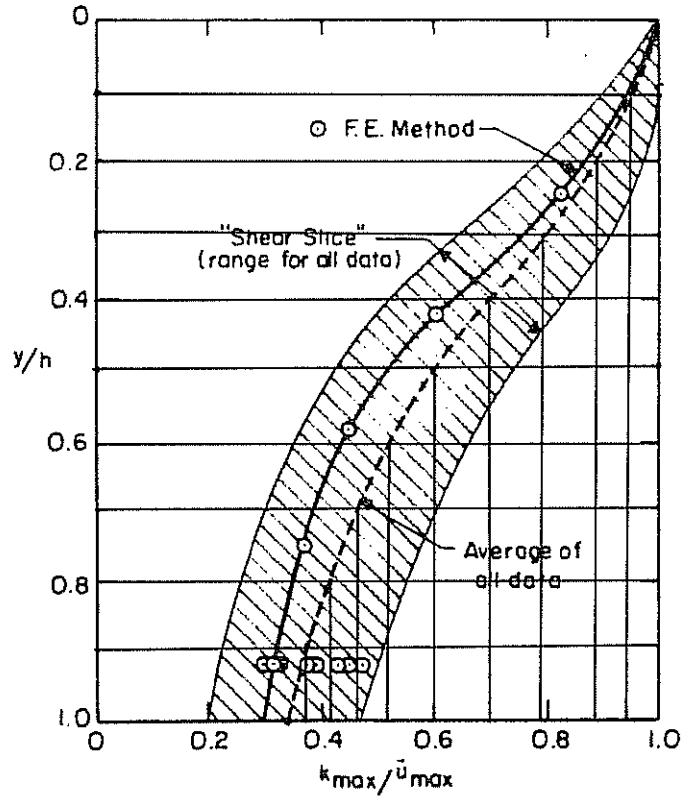


FIG. 9 VARIATION OF "MAXIMUM ACCELERATION RATIO" WITH DEPTH OF SLIDING MASS

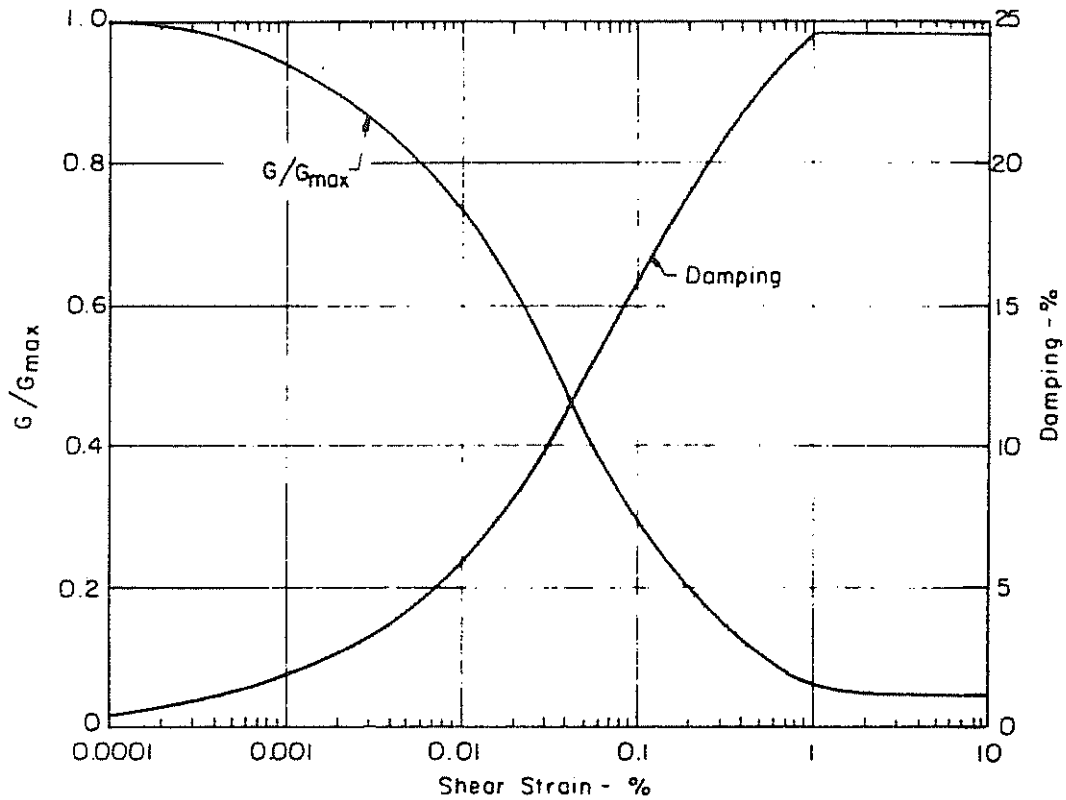
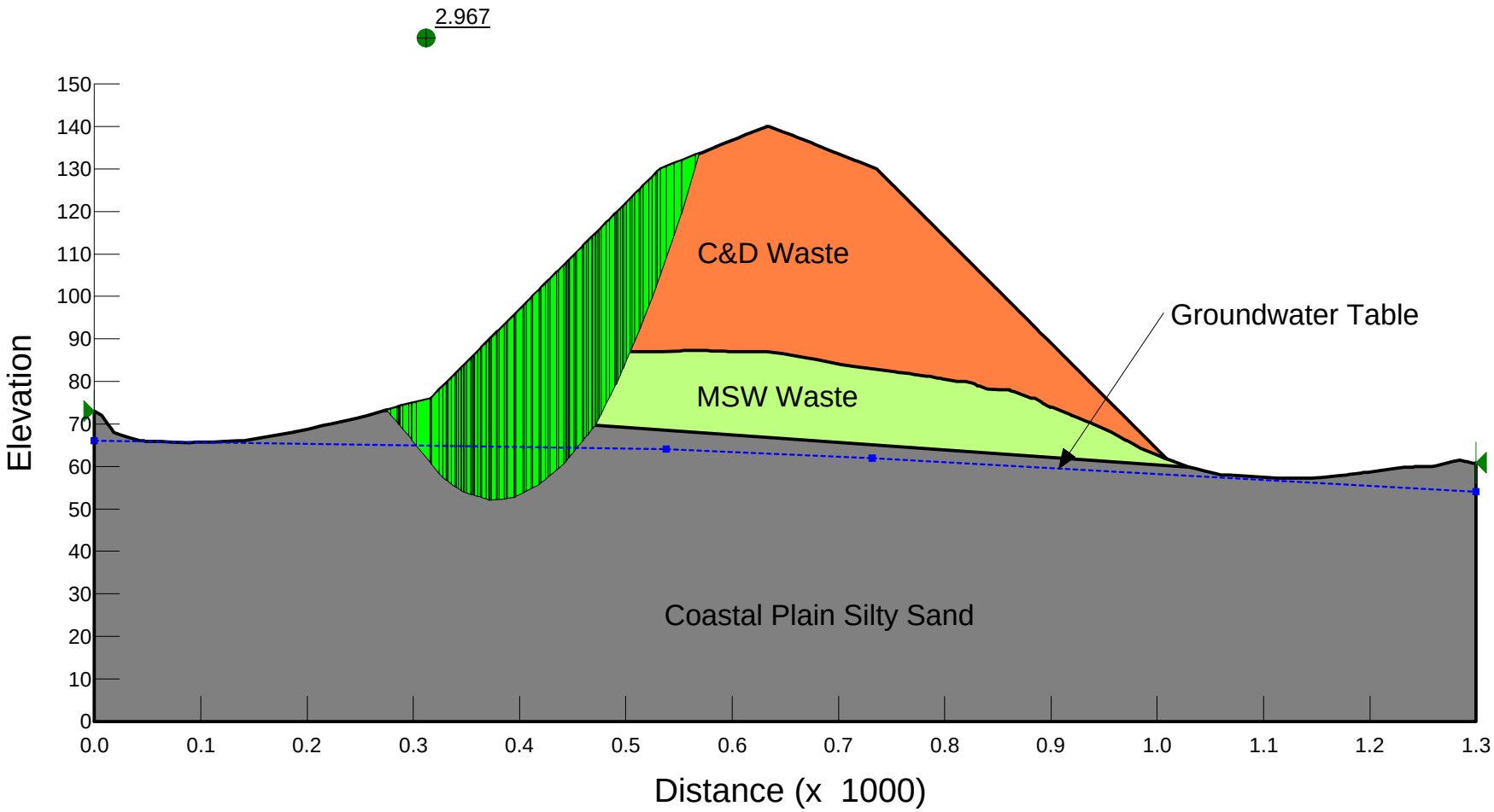


FIG. 10 SHEAR MODULUS AND DAMPING CHARACTERISTICS USED IN RESPONSE COMPUTATIONS

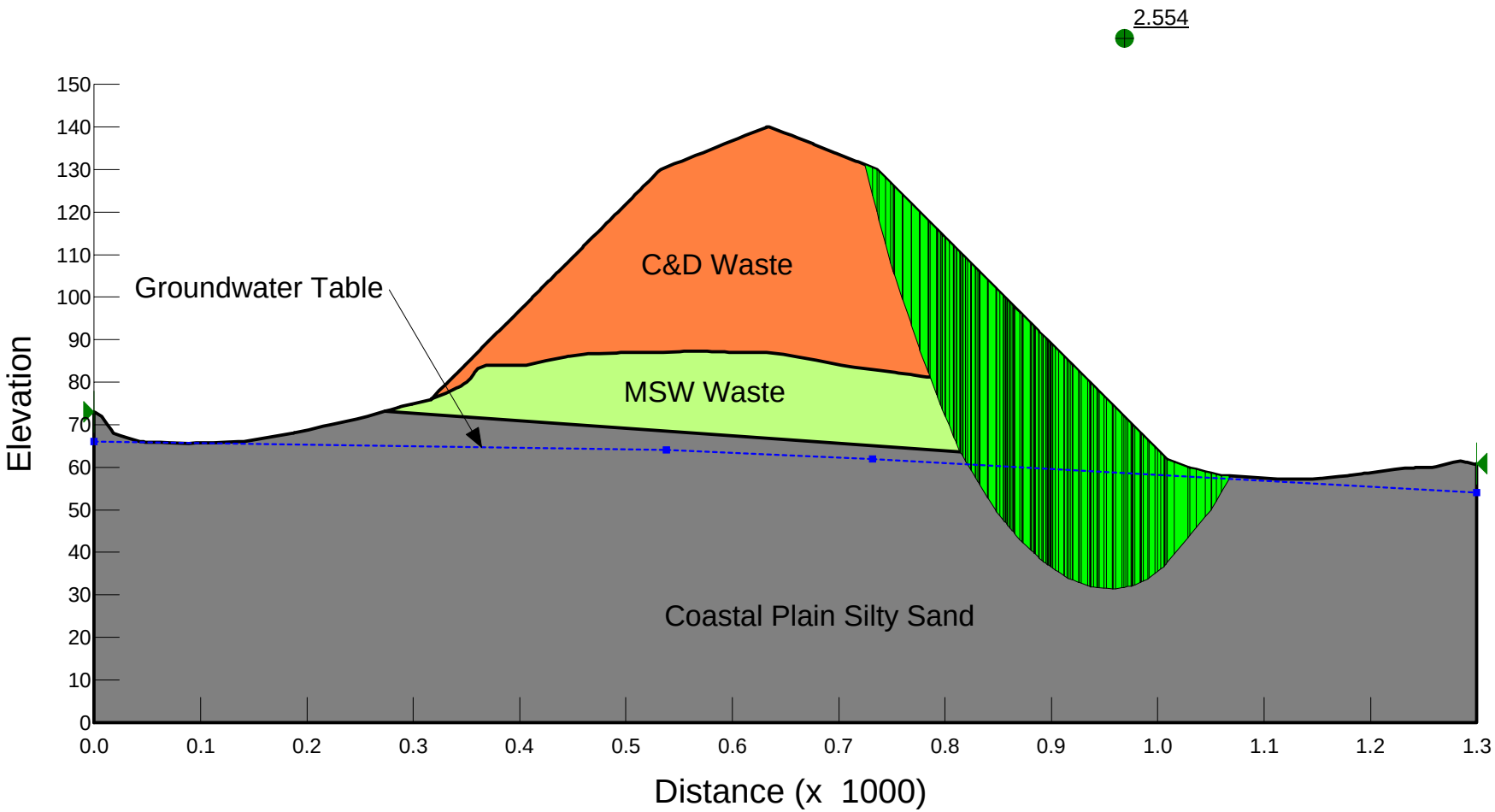
REFERENCE 10

GEO-Slope International, "SLOPE/W, Geostudio 2007 Version 7.01," Calgary, Alberta, Canada.

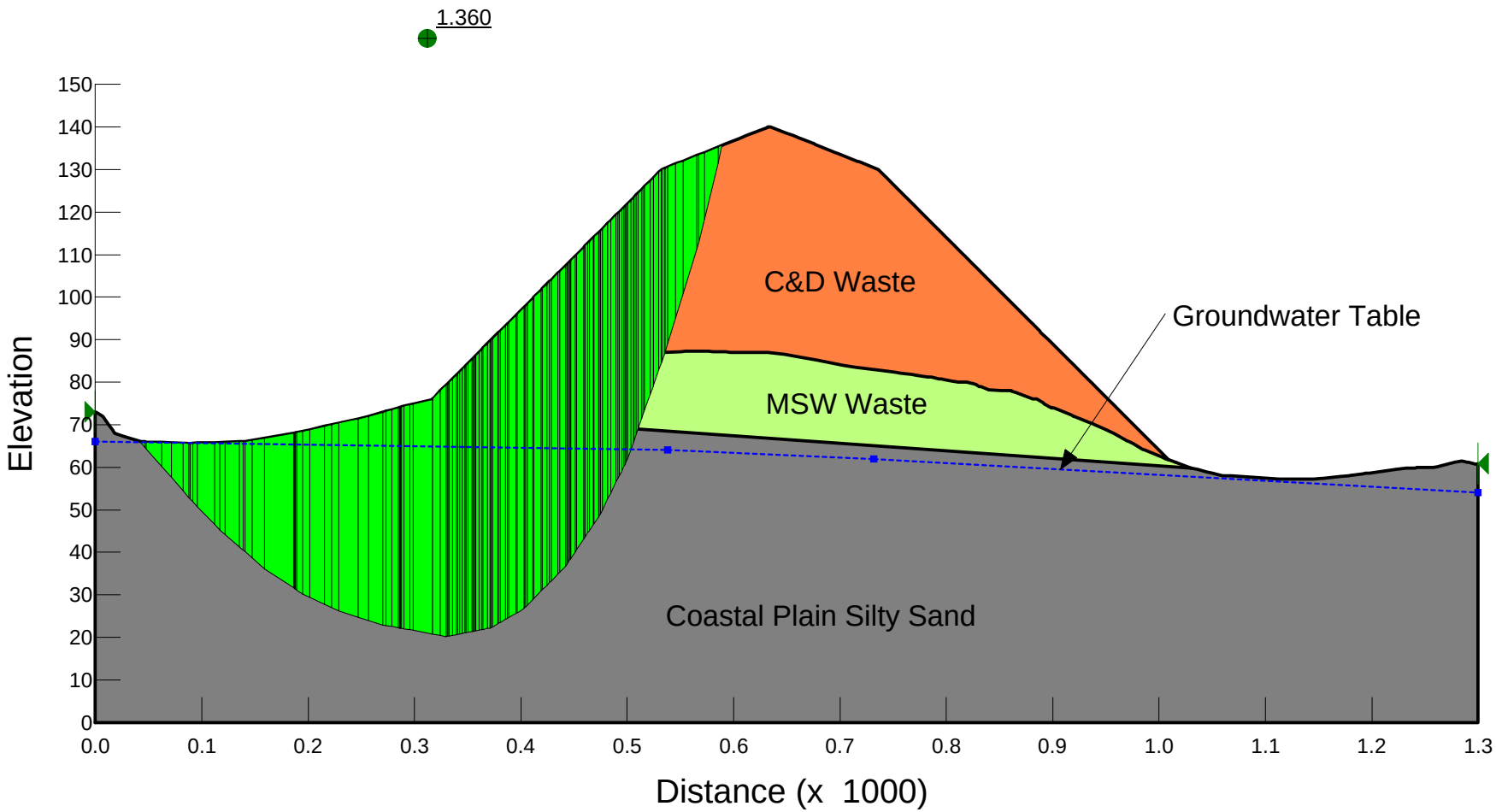
Slope Stability Analysis 1
Description: Section B-B' Static
Direction of movement: Right to Left
Name: C&D Waste Model: Bilinear Unit Weight: 90 pcf Cohesion: 500 psf Phi 1: 0 ° Phi 2: 33 ° Piezometric Line: 1
Name: MSW Waste Model: Bilinear Unit Weight: 65 pcf Cohesion: 500 psf Phi 1: 0 ° Phi 2: 33 ° Piezometric Line: 1
Name: Coastal Plain Silty Sand Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 ° Piezometric Line: 1
Horz Seismic Load: 0



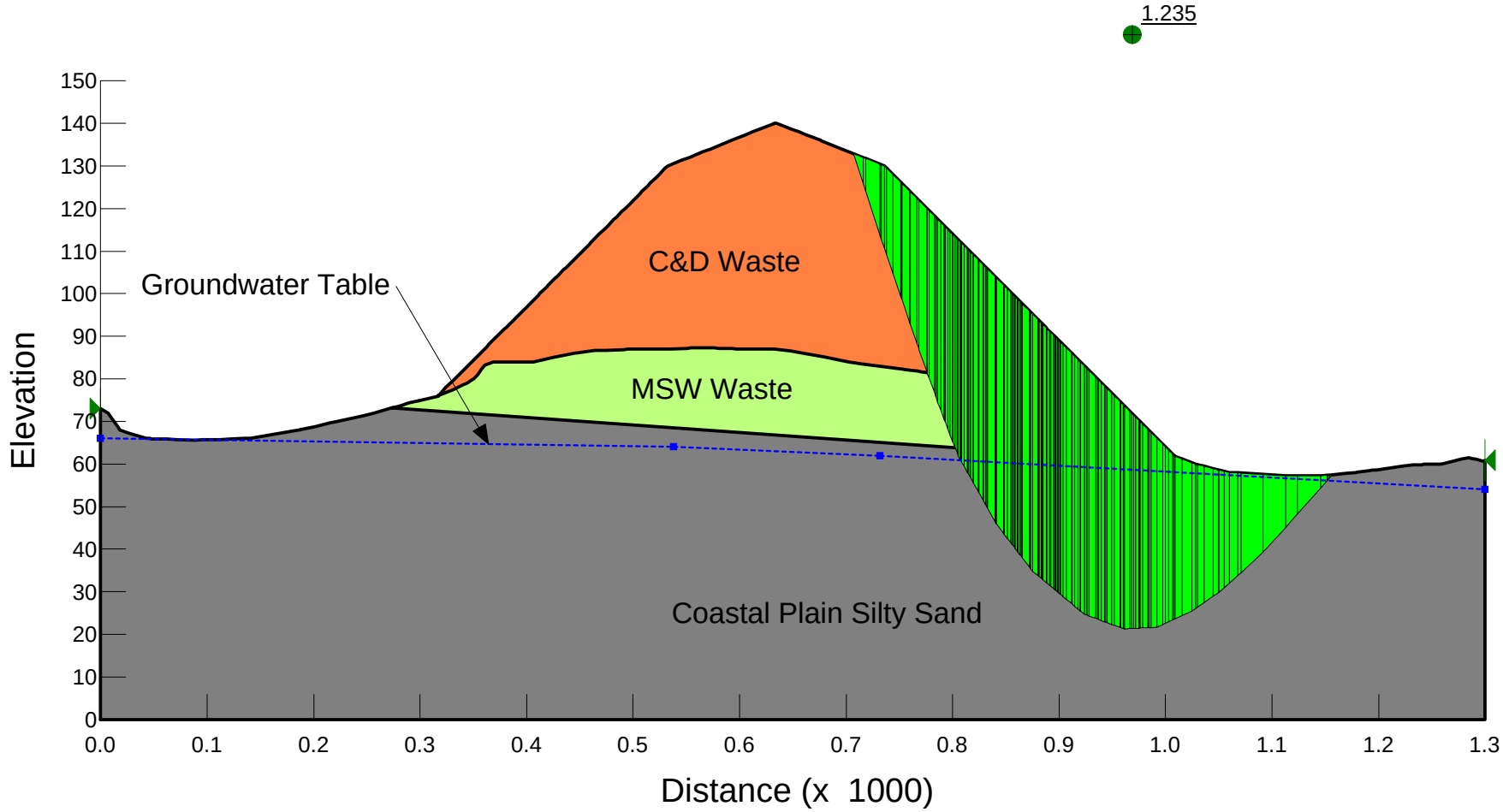
Slope Stability Analysis 2
Description: Section B-B' Static
Direction of movement: Left to Right
Name: C&D Waste Model: Bilinear Unit Weight: 90 pcf Cohesion: 500 psf Phi 1: 0 ° Phi 2: 33 ° Piezometric Line: 1
Name: MSW Waste Model: Bilinear Unit Weight: 65 pcf Cohesion: 500 psf Phi 1: 0 ° Phi 2: 33 ° Piezometric Line: 1
Name: Coastal Plain Silty Sand Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 30 ° Piezometric Line: 1
Horz Seismic Load: 0



Slope Stability Analysis 3
Description: Section B-B' Pseudostatic
Direction of movement: Right to Left
Name: C&D Waste Model: Bilinear Unit Weight: 90 pcf Cohesion: 400 psf Phi 1: 0 ° Phi 2: 28.4 ° Piezometric Line: 1
Name: MSW Waste Model: Bilinear Unit Weight: 65 pcf Cohesion: 400 psf Phi 1: 0 ° Phi 2: 28.4 ° Piezometric Line: 1
Name: Coastal Plain Silty Sand Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 25.7 ° Piezometric Line: 1
Horz Seismic Load: 0.13



Slope Stability Analysis 4
Description: Section B-B' Pseudostatic
Direction of movement: Left to Right
Name: C&D Waste Model: Bilinear Unit Weight: 90 pcf Cohesion: 400 psf Phi 1: 0 ° Phi 2: 28.4 ° Piezometric Line: 1
Name: MSW Waste Model: Bilinear Unit Weight: 65 pcf Cohesion: 400 psf Phi 1: 0 ° Phi 2: 28.4 ° Piezometric Line: 1
Name: Coastal Plain Silty Sand Model: Mohr-Coulomb Unit Weight: 115 pcf Cohesion: 0 psf Phi: 25.7 ° Piezometric Line: 1
Horz Seismic Load: 0.13



SLOPE/W Analysis

Report generated using GeoStudio 2007, version 7.11. Copyright © 1991-2008 GEO-SLOPE International Ltd.

File Information

Created By: Cedric Ruhl
Revision Number: 39
Last Edited By: Cedric Ruhl
Date: 7/14/2009
Time: 3:03:37 PM
File Name: 4 BBPSL2R.gsz
Directory: S:\1054\1054-07-241A Edgecombe County Slope Stability\Global Slope Stability\SLOPEW\B-B\
Last Solved Date: 7/14/2009
Last Solved Time: 3:04:20 PM

Project Settings

Length(L) Units: feet
Time(t) Units: Seconds
Force(F) Units: lbf
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D

Analysis Settings

SLOPE/W Analysis

Description: Section B-B' Pseudostatic
Kind: SLOPE/W
Method: Spencer
Settings
- Apply Phreatic Correction: No
- PWP Conditions Source: Piezometric Line
- Use Staged Rapid Drawdown: No

SlipSurface
- Direction of movement: Left to Right
- Allow Passive Mode: No
- Slip Surface Option: Auto-Search
- Critical slip surfaces saved: 1
- Optimize Critical Slip Surface Location: Yes
- Tension Crack
  - Tension Crack Option: (none)

FOS Distribution
- FOS Calculation Option: Constant

Advanced
- Number of Slices: 30
- Optimization Tolerance: 0.01
- Minimum Slip Surface Depth: 0.1 ft

Optimization Maximum Iterations: 2000
Optimization Convergence Tolerance: 1e-007
Starting Optimization Points: 8
Ending Optimization Points: 16
Complete Passes per Insertion: 1

Materials

C&D Waste

Model: Bilinear
Unit Weight: 90 pcf
Cohesion: 400 psf
Phi 1: 0 °
Phi 2: 28.4 °
Bilinear Normal: 500 psf
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

MSW Waste

Model: Bilinear
Unit Weight: 65 pcf
Cohesion: 400 psf
Phi 1: 0 °
Phi 2: 28.4 °
Bilinear Normal: 500 psf
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Coastal Plain Silty Sand

Model: Mohr-Coulomb
Unit Weight: 115 pcf
Cohesion: 0 psf
Phi: 25.7 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Limits

Left Coordinate: (0, 73.058968) ft
Right Coordinate: (1300, 60.853656) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
	0	66
	538	64
	732	62
	1300	54

Seismic Loads

Horz Seismic Load: 0.13
Ignore seismic load in strength: No

Regions

	Material	Points	Area (ft²)
Region 1	C&D Waste	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282	19777.069
Region 2	MSW Waste	283,284,285,286,287,288,289,290,291,292,293,294,139,138,137,136,135,134,133,132,131,130,129,128,127,126,125,124,123,122,121,120,119,118,117,116,115,114,113,112,111,110,109,108,107,106,105,104,103,102,101,100,99,98,97,96,95,94,93,92,91,90,89,88,87,86,85,84,83,82,81,80,79,78,77,76,75,74,73,72,71,70,69,68,67,66,65,64,63,62,61,60,59,58,57,56,55,54,53,52,51,50,49,48,47,46,45,44,43,42,41,40,39,38,37,36,35,34,33,32,31,30,29,28,27,26,25,24,23,22,21,20,19,18,17,16,15,14,13,12,11,10,9,8,7,6,5,4,3,2,1,295,296	10318.727
Region 3	Coastal Plain Silty Sand	297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,284,283,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371	84740.99

Points

	X (ft)	Y (ft)
Point 1	1008.9238	61.769058
Point 2	1006.6023	62
Point 3	1002.992	62.368571
Point 4	986.63894	64
Point 5	984.79293	64.205014
Point 6	978.39533	65.098397
Point 7	975.41809	65.515156
Point 8	972.01518	66
Point 9	969.98988	66.263326
Point 10	956.98418	68
Point 11	949.50481	68.915301
Point 12	939.8212	70
Point 13	937.14273	70.290606
Point 14	933.66914	70.619006
Point 15	926.17966	71.355902
Point 16	920.26178	71.983819
Point 17	919.85752	72
Point 18	917.84011	72.299614
Point 19	911.4865	72.912233
Point 20	901.27909	73.936616
Point 21	900.85079	73.939716
Point 22	899.64957	73.972871
Point 23	899.0712	74
Point 24	898.74517	74.026719
Point 25	898.17523	74.040957
Point 26	896.70035	74.286235
Point 27	894.6698	74.593906
Point 28	892.36387	74.924766
Point 29	891.03244	75.13109
Point 30	884.74865	76
Point 31	884.2311	76.008134
Point 32	883.84217	76.011747
Point 33	882.86278	76.035147
Point 34	881.48889	76.058747
Point 35	873.55341	76.873785
Point 36	865.77073	77.64792
Point 37	863.11794	77.754411

Point 38	861.44528	77.962914
Point 39	861.33347	77.968127
Point 40	860.65902	78
Point 41	858.98165	78.014138
Point 42	858.18398	78.015623
Point 43	857.90074	78.021243
Point 44	854.40064	78.038225
Point 45	854.30222	78.037262
Point 46	851.59768	78.095239
Point 47	840.78061	78.190403
Point 48	840.13333	78.181001
Point 49	832.56133	78.92519
Point 50	830.79221	79.016306
Point 51	829.09649	79.255595
Point 52	828.45166	79.335382
Point 53	824.78462	79.640274
Point 54	824.25756	79.717002
Point 55	819.43258	79.990343
Point 56	819.39021	79.995837
Point 57	819.1943	80
Point 58	814.40947	80.011587
Point 59	814.25165	80.011293
Point 60	813.97422	80.013275
Point 61	810.75221	80.018168
Point 62	810.58614	80.017463
Point 63	808.30971	80.150997
Point 64	807.8284	80.181329
Point 65	803.83154	80.390924
Point 66	797.73364	80.665021
Point 67	795.71608	80.74826
Point 68	793.11696	80.825303
Point 69	786.16578	81.218469
Point 70	782.55531	81.291775
Point 71	777.98576	81.406366
Point 72	770.35735	81.66328
Point 73	767.41726	81.774364
Point 74	761.85337	82
Point 75	756.17989	82.160775
Point 76	753.35335	82.265642
Point 77	738.96058	82.741229

Point 78	714.96061	83.547917
Point 79	710.27474	83.708282
Point 80	702.55113	84
Point 81	678.99283	85.190026
Point 82	671.73942	85.516768
Point 83	661.46825	86
Point 84	647.75301	86.482007
Point 85	632.38936	86.968224
Point 86	628.40672	86.992838
Point 87	596.73092	87.067247
Point 88	592.46331	87.129438
Point 89	582.96994	87.185952
Point 90	580.29449	87.230318
Point 91	576.0456	87.304878
Point 92	574.69431	87.318399
Point 93	573.3913	87.329712
Point 94	571.59545	87.343016
Point 95	569.85989	87.352219
Point 96	567.74067	87.353127
Point 97	565.11195	87.342518
Point 98	561.97559	87.32709
Point 99	557.84599	87.269949
Point 100	554.27907	87.248799
Point 101	550.76925	87.222663
Point 102	534.82906	87.057926
Point 103	531.88247	87.053702
Point 104	524.66072	86.993004
Point 105	515.68496	86.983219
Point 106	506.34159	87.033674
Point 107	496.96296	86.949097
Point 108	494.61092	86.960717
Point 109	491.09489	86.922022
Point 110	474.59352	86.74175
Point 111	468.93598	86.710825
Point 112	468.43924	86.708148
Point 113	464.53665	86.633422
Point 114	460.11154	86.535183
Point 115	446.89867	86.12127
Point 116	446.57378	86.115773
Point 117	446.27505	86.111502

Point 118	445.76807	86.107026
Point 119	442.99322	86
Point 120	424.29393	84.978431
Point 121	406.26002	84
Point 122	385.41765	84
Point 123	378.1795	84
Point 124	373.07467	84
Point 125	371.77927	84
Point 126	368.48766	84
Point 127	360.48877	83.268403
Point 128	357.48336	82.242364
Point 129	356.6752	82
Point 130	353.68217	80.979141
Point 131	350.26982	80
Point 132	347.48799	79.54589
Point 133	344.71956	79.168774
Point 134	342.39306	78.851771
Point 135	340.5503	78.616684
Point 136	335.77207	78
Point 137	330.92617	77.459438
Point 138	317.09115	76
Point 139	316.70565	75.976004
Point 140	324.38936	78
Point 141	331.17687	79.696877
Point 142	332.38936	80
Point 143	339.13911	81.687437
Point 144	340.38936	82
Point 145	347.11313	83.680943
Point 146	348.38936	84
Point 147	355.09417	85.676203
Point 148	356.38936	86
Point 149	363.07972	87.67259
Point 150	364.38936	88
Point 151	371.06834	89.669745
Point 152	372.38936	90
Point 153	379.05914	91.667447
Point 154	380.38936	92
Point 155	387.05156	93.665551
Point 156	388.38936	94
Point 157	395.0452	95.663961

Point 158	396.38936	96
Point 159	403.03979	97.662608
Point 160	404.38936	98
Point 161	411.03513	99.661444
Point 162	412.38936	100
Point 163	419.03108	101.66043
Point 164	420.38936	102
Point 165	427.02752	103.65954
Point 166	428.38936	104
Point 167	435.02436	105.65875
Point 168	436.38936	106
Point 169	443.02155	107.65805
Point 170	444.38936	108
Point 171	451.01903	109.65742
Point 172	452.38936	110
Point 173	459.01676	111.65685
Point 174	460.38936	112
Point 175	462.95025	112.64022
Point 176	468.38936	114
Point 177	473.65788	115.31713
Point 178	476.38936	116
Point 179	481.65356	117.31605
Point 180	484.38936	118
Point 181	489.64959	119.31506
Point 182	492.38936	120
Point 183	497.64593	121.31414
Point 184	500.38936	122
Point 185	505.64254	123.3133
Point 186	508.38936	124
Point 187	513.6394	125.31251
Point 188	516.38936	126
Point 189	521.63648	127.31178
Point 190	524.38936	128
Point 191	529.63376	129.3111
Point 192	532.38936	130
Point 193	545.27027	131.28809
Point 194	552.38936	132
Point 195	565.27291	133.28836
Point 196	572.38936	134
Point 197	585.27519	135.28858

Point 198	592.38936	136
Point 199	605.27717	137.28878
Point 200	612.38936	138
Point 201	631.64869	139.92593
Point 202	632.38936	140
Point 203	633.42254	140.07073
Point 204	634.59397	140
Point 205	648.33677	138.6986
Point 206	655.65965	138.0042
Point 207	655.71403	138
Point 208	661.10642	137.48936
Point 209	676	136
Point 210	676.65837	135.93416
Point 211	696	134
Point 212	697.56297	133.8437
Point 213	716	132
Point 214	718.49195	131.7508
Point 215	736	130
Point 216	738.13611	129.46597
Point 217	744	128
Point 218	751.3902	126.15245
Point 219	752	126
Point 220	752.36365	125.90909
Point 221	760	124
Point 222	760.38831	123.90292
Point 223	768	122
Point 224	768.41355	121.89661
Point 225	776	120
Point 226	776.43937	119.89016
Point 227	784	118
Point 228	784.4658	117.88355
Point 229	792	116
Point 230	792.49286	115.87679
Point 231	800	114
Point 232	800.52057	113.86986
Point 233	808	112
Point 234	808.54895	111.86276
Point 235	816	110
Point 236	816.57804	109.85549
Point 237	824	108

Point 238	824.60785	107.84804
Point 239	832	106
Point 240	832.63842	105.84039
Point 241	840	104
Point 242	840.66978	103.83256
Point 243	848	102
Point 244	848.70195	101.82451
Point 245	856	100
Point 246	856.73496	99.816259
Point 247	864	98
Point 248	864.76886	97.807785
Point 249	872	96
Point 250	872.80367	95.799082
Point 251	880	94
Point 252	880.83944	93.79014
Point 253	888	92
Point 254	888.8762	91.780949
Point 255	896	90
Point 256	896.914	89.7715
Point 257	904	88
Point 258	906.7377	87.315574
Point 259	912	86
Point 260	914.76791	85.308023
Point 261	920	84
Point 262	925.67318	82.581706
Point 263	928	82
Point 264	933.93791	80.515522
Point 265	936	80
Point 266	942.83748	78.290631
Point 267	944	78
Point 268	945.20613	77.698468
Point 269	952	76
Point 270	957.72535	74.568663
Point 271	960	74
Point 272	966.18125	72.454689
Point 273	968	72
Point 274	974.60225	70.349438
Point 275	976	70
Point 276	983.31821	68.170448
Point 277	984	68

Point 278	984.71263	67.821844
Point 279	992	66
Point 280	997.31276	64.671809
Point 281	1000	64
Point 282	1007.5913	62.102173
Point 283	1030.0024	59.876693
Point 284	273	73.127361
Point 285	278.8106	73.534535
Point 286	284.62504	74
Point 287	285.82129	74.089179
Point 288	286.32075	74.100333
Point 289	286.47745	74.106998
Point 290	286.65767	74.115389
Point 291	287.64794	74.175481
Point 292	290.24517	74.335985
Point 293	295.31786	74.632239
Point 294	298.65805	74.852601
Point 295	1015.436	61.121224
Point 296	1028.0613	60
Point 297	0	0
Point 298	0	73.058968
Point 299	0.7023087	72.949813
Point 300	7.2677781	72
Point 301	9.7203894	71.071345
Point 302	12.615718	70
Point 303	15.949633	68.760774
Point 304	17.874863	68
Point 305	24.647235	67.390813
Point 306	32.628699	66.802704
Point 307	42.866671	66
Point 308	46.256804	65.972812
Point 309	47.425077	65.962459
Point 310	62.391581	65.834826
Point 311	71.152594	65.773118
Point 312	89.248662	65.643787
Point 313	95.902464	65.686107
Point 314	112.13794	65.799264
Point 315	122.11037	65.873492
Point 316	135.39115	65.970606
Point 317	138.82254	65.983582

Point 318	140.57902	66
Point 319	147.44753	66.289372
Point 320	185.94946	68
Point 321	186.98901	68.058111
Point 322	187.27691	68.06762
Point 323	187.54842	68.079701
Point 324	187.9455	68.098893
Point 325	189.40808	68.180368
Point 326	201.49105	68.821848
Point 327	215.52406	69.62513
Point 328	222.07286	70
Point 329	246.77921	71.420268
Point 330	256.91189	72
Point 331	1036.1144	59.488431
Point 332	1044.6505	58.96059
Point 333	1049.9299	58.641797
Point 334	1054.9729	58.348271
Point 335	1059.8943	58
Point 336	1068.0364	57.943682
Point 337	1112.5828	57.304846
Point 338	1145.3504	57.197547
Point 339	1153.1169	57.40786
Point 340	1154.0072	57.392729
Point 341	1170.2146	57.792705
Point 342	1178.419	58
Point 343	1181.0422	58.094492
Point 344	1181.4993	58.108181
Point 345	1191.8368	58.482491
Point 346	1194.3432	58.545413
Point 347	1197.6331	58.613619
Point 348	1222.5424	59.476194
Point 349	1232.5239	59.860851
Point 350	1235.3481	59.866706
Point 351	1235.4281	59.867503
Point 352	1236.1725	59.8793
Point 353	1240.5743	59.889948
Point 354	1240.8596	59.892141
Point 355	1240.9656	59.892083
Point 356	1242.4046	59.909951
Point 357	1244.9919	59.924273

Point 358	1250.9338	59.970294
Point 359	1253.3032	59.978446
Point 360	1257.7158	60
Point 361	1258.1908	60.017956
Point 362	1261.4687	60.085556
Point 363	1278.3026	61.235666
Point 364	1284.423	61.432286
Point 365	1286.9785	61.391996
Point 366	1289.2742	61.226407
Point 367	1290.8051	61.144501
Point 368	1297.7043	60.737277
Point 369	1298.8419	60.76241
Point 370	1300	60.853656
Point 371	1300	0

Critical Slip Surfaces

	Number	FOS	Center (ft)	Radius (ft)	Entry (ft)	Exit (ft)
1	Optimized	1.235	(986.168, 450.264)	200.8517	(706.832, 132.917)	(1156.41, 57.452)
2	664	1.247	(986.168, 450.264)	428.812	(696.659, 133.934)	(1158.26, 57.4976)

Slices of Slip Surface: **Optimized**

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	Optimized	711.41595	129.4109	-4193.182	89.013496	0	400
2	Optimized	717.246	124.95205	-3918.7436	365.70478	0	400
3	Optimized	725.246	118.8335	-3542.069	709.5193	383.63565	129.65
4	Optimized	732.65095	113.17005	-3193.5619	1009.1612	545.6514	129.65
5	Optimized	734.65095	111.6808	-3102.4088	1106.4501	598.25535	129.65
6	Optimized	737.06805	109.9045	-2993.6912	1191.4031	644.18925	129.65
7	Optimized	741.06805	106.9649	-2813.7725	1311.257	708.99403	129.65
8	Optimized	747.6951	102.0947	-2515.6978	1509.833	816.36366	129.65
9	Optimized	751.6951	99.15513	-2335.7558	1629.7169	881.18464	129.65
10	Optimized	752.1818	98.79744	-2313.8382	1644.2832	889.06059	129.65
11	Optimized	756.1818	95.857855	-2133.9738	1764.1188	953.85548	129.65
12	Optimized	760.19415	92.909205	-1953.5128	1884.3692	1018.8746	129.65
13	Optimized	763.4123	90.544215	-1808.8129	1980.8207	1071.0257	129.65
14	Optimized	767.21815	87.7707	-1639.0204	2128.0243	1150.6185	129.65
15	Optimized	768.20675	87.07372	-1596.4298	2156.1891	1165.8471	129.65
16	Optimized	772.20675	84.253765	-1424.0152	2270.4737	1227.6405	129.65

17	Optimized	776.0792	81.523745	-1257.0195	2381.015	1287.41	129.65
18	Optimized	776.2989	81.36887	-1247.5489	2385.6377	1289.9095	129.65
19	Optimized	777.2126	80.72473	-1208.1598	2401.0452	1298.2403	129.65
20	Optimized	780.27055	78.56889	-1076.3281	2452.1759	1325.8865	129.65
21	Optimized	783.27765	76.448905	-946.70312	2502.3648	1353.0236	129.65
22	Optimized	784.2329	75.77547	-905.48765	2518.2751	1361.6263	129.65
23	Optimized	785.3158	75.012045	-858.81294	2536.2458	1371.343	129.65
24	Optimized	787.41205	73.53421	-768.44707	2571.863	1390.6011	129.65
25	Optimized	790.32915	71.578055	-648.93455	2706.2412	1463.2591	129.65
26	Optimized	792.24645	70.341575	-573.45877	2734.889	1478.749	129.65
27	Optimized	792.80495	69.981405	-551.48141	2743.3355	1483.316	129.65
28	Optimized	794.41655	68.94206	-488.04588	2766.8651	1496.0384	129.65
29	Optimized	796.72485	67.45338	-397.17638	2800.545	1514.249	129.65
30	Optimized	798.8668	66.072	-312.86143	2832.1501	1531.3379	129.65
31	Optimized	800.2603	65.17334	-258.01056	2852.7748	1542.4896	129.65
32	Optimized	801.4067	64.434015	-212.88279	2869.7187	1551.6511	129.65
33	Optimized	803.06215	63.366375	-147.71839	2978.9993	1433.6955	0
34	Optimized	804.67945	62.323345	-84.05431	3040.3656	1463.2291	0
35	Optimized	806.46715	61.35721	-25.337029	3437.1287	1654.1784	0
36	Optimized	807.61765	60.8439	5.6822281	3464.6728	1664.6998	0
37	Optimized	807.9142	60.71159	13.677496	3472.1927	1664.4709	0
38	Optimized	808.15485	60.604215	20.166419	3478.1788	1664.229	0
39	Optimized	808.42935	60.48175	27.566897	3485.2464	1664.0688	0
40	Optimized	809.56755	59.973915	58.253689	3514.0042	1663.1404	0
41	Optimized	810.66915	59.482405	87.958897	3541.7823	1662.2129	0
42	Optimized	812.3632	58.72658	133.6334	3582.604	1659.8774	0
43	Optimized	814.11295	57.94591	180.80699	3624.7639	1657.4645	0
44	Optimized	814.3306	57.84881	186.67426	3630.1952	1657.2547	0
45	Optimized	815.20475	57.45878	210.24782	3651.2888	1656.0612	0
46	Optimized	816.289	56.975005	239.47631	3677.4574	1654.5886	0
47	Optimized	817.88615	56.262405	282.54145	3716.0707	1652.446	0
48	Optimized	819.29225	55.635055	320.45163	3750.0769	1650.5672	0
49	Optimized	821.6951	54.56298	385.2369	3810.7668	1648.5962	0
50	Optimized	824.1288	53.47715	450.86427	3872.1993	1646.5774	0
51	Optimized	824.43275	53.341545	459.04805	3880.0614	1646.4226	0
52	Optimized	826.5298	52.405905	515.58124	3934.8677	1645.5915	0
53	Optimized	828.7741	51.40456	576.10763	3992.9149	1644.3983	0
54	Optimized	829.94435	50.88242	607.64361	4024.2993	1644.3253	0
55	Optimized	831.3961	50.23469	646.79961	4062.3549	1643.7958	0
56	Optimized	832.28065	49.84003	670.64359	4084.6753	1643.0625	0

57	Optimized	832.59985	49.69761	679.24917	4092.6702	1642.7686	0
58	Optimized	836.3192	48.038155	779.5372	4189.769	1641.2337	0
59	Optimized	840.06665	46.366155	880.6086	4287.4961	1639.6242	0
60	Optimized	840.40155	46.21674	889.60244	4295.5658	1639.1795	0
61	Optimized	840.7252	46.072345	898.35482	4303.3363	1638.7069	0
62	Optimized	840.8909	45.998405	902.77858	4307.54	1638.601	0
63	Optimized	844.5006	44.813305	973.57507	4630.8622	1760.1334	0
64	Optimized	848.35095	43.5635	1048.1823	4679.5304	1747.6498	0
65	Optimized	850.1498	42.97961	1083.0471	4702.3025	1741.83	0
66	Optimized	852.99915	42.054725	1138.2392	4738.5066	1732.6917	0
67	Optimized	855.2003	41.34024	1180.9057	4766.6794	1725.7163	0
68	Optimized	856.3675	40.96139	1203.4999	4781.3354	1721.8959	0
69	Optimized	857.31785	40.652905	1221.8813	4793.2894	1718.8027	0
70	Optimized	858.04235	40.41773	1235.9526	4802.434	1716.4316	0
71	Optimized	858.58285	40.2423	1246.4164	4809.1903	1714.6473	0
72	Optimized	859.82035	39.84061	1270.4159	4824.7905	1710.605	0
73	Optimized	860.99625	39.45892	1293.1947	4839.9612	1706.9434	0
74	Optimized	861.3894	39.331315	1300.8358	4845.1902	1705.7826	0
75	Optimized	862.2816	39.0417	1318.1104	4858.6415	1703.9425	0
76	Optimized	863.55895	38.627075	1342.8435	4877.1756	1700.9592	0
77	Optimized	864.38445	38.359135	1358.8163	4888.1018	1698.5304	0
78	Optimized	865.2698	38.07175	1376.0157	4899.9792	1695.9691	0
79	Optimized	868.88535	36.898155	1446.0518	4952.0461	1687.3211	0
80	Optimized	872.40185	35.75673	1514.1692	5003.4807	1679.2922	0
81	Optimized	873.17855	35.50462	1529.2209	5014.8146	1677.5029	0
82	Optimized	874.51115	35.072055	1555.037	5034.4927	1674.5489	0
83	Optimized	877.73445	34.288995	1601.0825	5364.885	1811.3958	0
84	Optimized	880.4197	33.72934	1633.626	5371.91	1799.1146	0
85	Optimized	881.16415	33.574185	1642.7398	5373.9509	1795.7106	0
86	Optimized	882.17585	33.363335	1654.9607	5375.2377	1790.4484	0
87	Optimized	883.3525	33.1181	1669.1789	5376.0775	1784.0098	0
88	Optimized	884.03665	32.97551	1677.5073	5376.4808	1780.1957	0
89	Optimized	884.48985	32.88105	1683.0084	5376.7366	1777.6713	0
90	Optimized	886.3743	32.4883	1705.8496	5382.6622	1769.5304	0
91	Optimized	888.4381	32.05817	1730.8915	5389.6511	1760.8421	0
92	Optimized	889.9543	31.74216	1749.2707	5395.049	1754.5946	0
93	Optimized	891.69815	31.378715	1770.3891	5401.2382	1747.4097	0
94	Optimized	893.51685	30.999675	1792.46	5407.8196	1739.9551	0
95	Optimized	895.3349	30.62076	1814.494	5414.5591	1732.5943	0
96	Optimized	896.35015	30.40916	1826.814	5418.3787	1728.5034	0

97	Optimized	896.80715	30.313915	1832.378	5420.1548	1726.6804	0
98	Optimized	897.5446	30.16022	1841.3027	5423.2349	1723.8676	0
99	Optimized	898.4602	29.969395	1852.4928	5426.0776	1719.8502	0
100	Optimized	898.9082	29.876025	1857.8299	5426.6901	1717.5764	0
101	Optimized	899.3604	29.78178	1863.4046	5427.3838	1715.2274	0
102	Optimized	900.2502	29.59633	1874.1188	5428.3106	1710.517	0
103	Optimized	901.06495	29.42652	1884.0082	5428.9864	1706.0828	0
104	Optimized	902.63955	29.098345	1903.089	5432.5143	1698.5977	0
105	Optimized	905.36885	28.52951	1936.1838	5439.5945	1686.0777	0
106	Optimized	909.1121	27.749355	1981.5751	5449.1616	1668.8366	0
107	Optimized	911.74325	27.200975	2013.4081	5455.8956	1656.7573	0
108	Optimized	913.38395	26.85902	2033.3984	5460.169	1649.1934	0
109	Optimized	916.304	26.250435	2068.7882	5467.441	1635.6612	0
110	Optimized	918.8488	25.720055	2099.6612	5474.6766	1624.2852	0
111	Optimized	919.92875	25.494975	2112.7632	5478.6869	1619.9097	0
112	Optimized	920.1309	25.45285	2115.1809	5479.0514	1618.9216	0
113	Optimized	921.8871	25.086825	2136.5099	5483.5743	1610.8333	0
114	Optimized	924.5928	24.648745	2161.433	5821.4584	1761.4512	0
115	Optimized	925.92645	24.52613	2167.8433	5807.1304	1751.4706	0
116	Optimized	927.08985	24.419165	2173.6074	5794.7912	1742.7581	0
117	Optimized	930.96895	24.0625	2192.3683	5752.3464	1713.3018	0
118	Optimized	934.96895	23.694725	2211.8665	5708.9461	1683.0308	0
119	Optimized	936.57135	23.547395	2219.6912	5691.6187	1670.9259	0
120	Optimized	938.48195	23.371725	2228.93	5671.1253	1656.6167	0
121	Optimized	941.32935	23.109925	2242.7519	5641.132	1635.5299	0
122	Optimized	943.41875	22.917815	2252.9012	5619.3615	1620.1679	0
123	Optimized	944.60305	22.808925	2258.6411	5606.9319	1611.4235	0
124	Optimized	947.35545	22.55586	2272.046	5578.188	1591.1387	0
125	Optimized	950.7524	22.24353	2288.5293	5542.9311	1566.2378	0
126	Optimized	954.4921	21.89969	2306.8009	5504.6751	1539.0329	0
127	Optimized	957.35475	21.636485	2320.5849	5475.5164	1518.366	0
128	Optimized	958.86265	21.49784	2327.9434	5460.4404	1507.569	0
129	Optimized	960.6349	21.3349	2336.5626	5442.856	1494.9581	0
130	Optimized	963.7255	21.308585	2335.5529	5702.2752	1620.294	0
131	Optimized	967.0906	21.35251	2329.8019	5624.2475	1585.5096	0
132	Optimized	968.99495	21.37737	2326.5782	5579.7677	1565.6544	0
133	Optimized	971.00255	21.40358	2323.1599	5533.0258	1544.8042	0
134	Optimized	973.3087	21.433685	2319.2607	5479.4785	1520.9101	0
135	Optimized	975.01015	21.455895	2316.4339	5440.188	1503.3613	0
136	Optimized	975.70905	21.46502	2315.2742	5424.072	1496.1633	0

137	Optimized	977.19765	21.484455	2312.6824	5389.6215	1480.8308	0
138	Optimized	980.85675	21.53222	2306.3785	5304.9751	1443.1271	0
139	Optimized	983.6591	21.5688	2301.6816	5240.3075	1414.2651	0
140	Optimized	984.3563	21.577905	2300.5911	5224.1771	1407.0269	0
141	Optimized	985.67575	21.59513	2298.3357	5192.888	1393.0539	0
142	Optimized	989.31945	21.642695	2292.0765	5105.0879	1353.811	0
143	Optimized	992.0611	21.678485	2287.5213	5038.6994	1324.0526	0
144	Optimized	994.7175	21.98016	2266.2749	5247.9133	1434.9657	0
145	Optimized	998.6564	22.43681	2234.3715	5094.5666	1376.519	0
146	Optimized	1001.496	22.76601	2211.3561	4983.735	1334.2559	0
147	Optimized	1004.797	23.14872	2184.564	4855.4121	1285.3924	0
148	Optimized	1007.0965	23.41533	2165.9155	4766.0184	1251.345	0
149	Optimized	1008.2575	23.549895	2156.5008	4720.7888	1234.1085	0
150	Optimized	1012.18	24.00462	2124.6786	4620.1731	1201.0004	0
151	Optimized	1020.1255	24.925775	2060.2076	4441.7533	1146.1606	0
152	Optimized	1026.438	25.752885	2003.0496	4447.6138	1176.4893	0
153	Optimized	1029.0315	26.205815	1972.5063	4370.4402	1154.0477	0
154	Optimized	1033.058	26.908965	1925.0389	4246.8833	1117.4283	0
155	Optimized	1040.3825	28.187945	1838.8382	4018.2319	1048.8714	0
156	Optimized	1047.064	29.354635	1760.1776	3810.738	986.86808	0
157	Optimized	1049.7035	29.82512	1728.4836	3829.6972	1011.2458	0
158	Optimized	1052.4515	30.420525	1688.919	3727.7226	981.2099	0
159	Optimized	1057.4335	31.49995	1617.1952	3538.5826	924.70132	0
160	Optimized	1063.965	32.91509	1523.1134	3323.0256	866.23923	0
161	Optimized	1069.535	34.12182	1442.954	3157.4012	825.10774	0
162	Optimized	1081.117	36.873815	1261.0663	2816.0777	748.37645	0
163	Optimized	1101.8915	42.226745	908.74276	2104.0557	575.26527	0
164	Optimized	1118.233	46.69848	615.36951	1467.5555	410.12943	0
165	Optimized	1134.6165	51.282935	314.89636	839.75949	252.59957	0
166	Optimized	1148.4745	55.20573	57.934394	309.14255	120.89832	0
167	Optimized	1152.358	56.304945	-14.069934	170.47875	82.045883	0
168	Optimized	1153.562	56.645745	-36.394413	118.84331	57.195423	0
169	Optimized	1155.209	57.111895	-66.92853	48.896222	23.532162	0

Slices of Slip Surface: 664

	Slip Surface	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
1	664	697.11085	133.5215	-4440.5216	-134.03499	0	400
2	664	706.7815	125.18615	-3926.5951	389.46337	0	400

3	664	717.246	116.2602	-3376.3826	892.32522	482.47844	129.65
4	664	725.246	110.0767	-2995.6332	1238.8553	669.84656	129.65
5	664	734	103.44225	-2587.7872	1623.8678	878.02205	129.65
6	664	737.06805	101.22585	-2452.1428	1745.216	943.63477	129.65
7	664	741.06805	98.421145	-2280.5802	1875.6226	1014.1454	129.65
8	664	747.6951	93.905955	-2004.7709	2087.3143	1128.6066	129.65
9	664	751.6951	91.2341	-1841.4975	2214.1357	1197.1787	129.65
10	664	752.1818	90.916585	-1822.1283	2229.2093	1205.329	129.65
11	664	756.1818	88.371705	-1666.8991	2349.5961	1270.4219	129.65
12	664	760.19415	85.824835	-1511.4557	2471.6357	1336.4084	129.65
13	664	763.60435	83.75151	-1385.0859	2570.5749	1389.9046	129.65
14	664	767.11885	81.62125	-1255.2293	2670.2593	1443.8038	129.65
15	664	767.70865	81.27143	-1233.9209	2681.0115	1449.6175	129.65
16	664	768.20675	80.976885	-1215.9756	2690.0899	1454.5262	129.65
17	664	769.38545	80.285375	-1173.8669	2711.3546	1466.024	129.65
18	664	773.1787	78.101265	-1040.9037	2777.876	1501.992	129.65
19	664	776.2197	76.363265	-935.13604	2830.9492	1530.6885	129.65
20	664	777.2126	75.808445	-901.36537	2847.8109	1539.8056	129.65
21	664	780.27055	74.1263	-799.09763	2898.0438	1566.9665	129.65
22	664	783.27765	72.487675	-699.51349	2947.0307	1593.4535	129.65
23	664	784.2329	71.97541	-668.37977	2962.0752	1601.5881	129.65
24	664	785.3158	71.400475	-633.44033	2979.0094	1610.7444	129.65
25	664	789.0829	69.44019	-514.42988	3038.1108	1642.7004	129.65
26	664	792.24645	67.80557	-415.20913	3088.1903	1669.7783	129.65
27	664	792.80495	67.52297	-398.06662	3096.6934	1674.3759	129.65
28	664	794.41655	66.71562	-349.12584	3120.3488	1687.1663	129.65
29	664	796.72485	65.569145	-279.59864	3153.8442	1705.2772	129.65
30	664	798.8668	64.522145	-216.15093	3184.6112	1721.9129	129.65
31	664	800.07455	63.935995	-180.63643	3201.8508	1731.2343	129.65
32	664	800.33485	63.81077	-173.04968	3250.6718	1564.4427	0
33	664	802.17605	62.93507	-120.02295	3308.6449	1592.3433	0
34	664	805.116	61.55039	-36.20331	3401.0646	1636.8218	0
35	664	807.11445	60.62403	19.844649	3464.2225	1657.6671	0
36	664	807.9142	60.256735	42.060508	3490.0607	1659.4104	0
37	664	808.15485	60.14686	48.705447	3497.8859	1659.9785	0
38	664	808.42935	60.02172	56.272161	3506.6537	1660.5565	0
39	664	809.56755	59.50689	87.400177	3542.8406	1662.9912	0
40	664	810.66915	59.009295	117.47842	3577.7568	1665.3195	0
41	664	812.3632	58.25778	162.88565	3628.3192	1667.8005	0
42	664	814.11295	57.482745	209.7116	3680.5757	1670.4141	0

43	664	814.3306	57.387465	215.46669	3687.1132	1670.7906	0
44	664	815.20475	57.00722	238.4206	3712.6152	1672.017	0
45	664	816.289	56.53679	266.8261	3744.1113	1673.5043	0
46	664	817.88615	55.853955	308.03186	3789.8417	1675.6819	0
47	664	819.29225	55.254435	344.20532	3829.7226	1677.4662	0
48	664	821.6951	54.25577	404.40263	3898.3805	1681.538	0
49	664	824.1288	53.24593	465.29518	3967.8061	1685.6447	0
50	664	824.43275	53.12204	472.75955	3976.7219	1686.3432	0
51	664	826.5298	52.279805	523.45819	4035.7397	1690.347	0
52	664	828.7741	51.38168	577.52745	4098.3027	1694.4347	0
53	664	829.94435	50.922775	605.15427	4131.2941	1697.0165	0
54	664	831.3961	50.35737	639.14329	4170.8974	1699.7185	0
55	664	832.28065	50.015745	659.67626	4193.813	1700.8651	0
56	664	832.59985	49.89305	667.06509	4201.9906	1701.2447	0
57	664	836.3192	48.5054	750.37938	4297.3369	1707.0354	0
58	664	840.06665	47.10838	834.24178	4393.6781	1713.041	0
59	664	840.40155	46.98727	841.5281	4401.3592	1713.231	0
60	664	844.3349	45.6057	924.28124	4486.5484	1714.4034	0
61	664	848.35095	44.20196	1008.3431	4573.4683	1715.7789	0
62	664	850.1498	43.59857	1044.4037	4609.9173	1715.9658	0
63	664	852.99915	42.656425	1100.7022	4666.7169	1716.207	0
64	664	855.2003	41.942055	1143.3566	4709.2907	1716.1682	0
65	664	856.3675	41.56885	1165.5981	4731.0439	1715.9332	0
66	664	857.31785	41.26851	1183.5472	4748.5065	1715.699	0
67	664	858.04235	41.04054	1197.0812	4761.8422	1715.6036	0
68	664	858.58285	40.8719	1207.1627	4771.4404	1715.371	0
69	664	859.82035	40.48901	1229.9413	4793.2902	1714.924	0
70	664	860.99625	40.1275	1251.477	4814.1801	1714.6132	0
71	664	861.3894	40.007575	1258.5785	4821.3277	1714.6354	0
72	664	862.2816	39.73819	1274.6327	4838.682	1715.2611	0
73	664	863.55895	39.35421	1297.4678	4862.6523	1715.8075	0
74	664	864.38445	39.108745	1312.0435	4876.9209	1715.6597	0
75	664	865.2698	38.847675	1327.5747	4892.0023	1715.4431	0
76	664	868.88535	37.81481	1388.8516	4954.1291	1715.8522	0
77	664	872.40185	36.818575	1447.9138	5014.7317	1716.5935	0
78	664	873.17855	36.60561	1460.4953	5027.2638	1716.5698	0
79	664	876.7767	35.652785	1516.8302	5082.6487	1716.1125	0
80	664	880.4197	34.695545	1573.3218	5138.1171	1715.6201	0
81	664	881.16415	34.50673	1584.5544	5148.8315	1715.3707	0
82	664	882.17585	34.253	1599.4549	5161.5978	1714.3436	0

83	664	883.3525	33.96034	1616.6508	5175.5824	1712.7981	0
84	664	884.03665	33.79171	1626.5853	5183.6373	1711.8935	0
85	664	884.48985	33.68086	1633.0911	5188.6649	1711.1821	0
86	664	886.3743	33.22869	1659.6643	5213.9512	1710.5628	0
87	664	888.4381	32.737135	1688.5497	5241.6715	1710.0021	0
88	664	889.9543	32.38636	1709.0765	5261.0956	1709.4714	0
89	664	891.69815	31.987775	1732.4241	5283.2818	1708.9124	0
90	664	893.51685	31.58228	1756.0975	5305.4688	1708.1971	0
91	664	895.3349	31.182985	1779.464	5326.8571	1707.245	0
92	664	896.35015	30.96382	1792.2841	5338.5968	1706.725	0
93	664	896.80715	30.866045	1797.928	5343.6572	1706.4442	0
94	664	897.5446	30.710075	1806.9812	5352.1337	1706.1666	0
95	664	898.4602	30.517325	1818.2883	5361.6061	1705.2837	0
96	664	898.9082	30.4239	1823.6598	5365.1539	1704.406	0
97	664	899.3604	30.33024	1829.1556	5369.1125	1703.6662	0
98	664	900.2502	30.14763	1839.6827	5375.9091	1701.8708	0
99	664	901.06495	29.98144	1849.3685	5381.787	1700.0382	0
100	664	902.63955	29.6679	1867.561	5394.6474	1697.4721	0
101	664	905.36885	29.13509	1898.4172	5417.1309	1693.4425	0
102	664	909.1121	28.438725	1938.5683	5443.5359	1686.827	0
103	664	911.74325	27.95974	1966.1968	5461.1251	1681.9954	0
104	664	913.38395	27.676125	1982.403	5470.2203	1678.5731	0
105	664	916.304	27.184105	2010.5318	5485.2539	1672.2708	0
106	664	918.8488	26.770105	2034.1296	5498.0049	1667.0506	0
107	664	919.92875	26.59862	2043.849	5503.3104	1664.9263	0
108	664	922.8366	26.163895	2068.4847	5512.2982	1657.3955	0
109	664	925.92645	25.704375	2094.4075	5521.6197	1649.4058	0
110	664	927.08985	25.54184	2103.5232	5523.7887	1646.0626	0
111	664	930.96895	25.029845	2132.0263	5527.4694	1634.1164	0
112	664	934.96895	24.52046	2160.3375	5529.2776	1621.3614	0
113	664	936.57135	24.32994	2170.8065	5528.1942	1615.8016	0
114	664	938.48195	24.11355	2182.6331	5526.1513	1609.1266	0
115	664	941.32935	23.805125	2199.3758	5521.7669	1598.9589	0
116	664	943.41875	23.58832	2211.0764	5517.5483	1591.2975	0
117	664	944.60305	23.47135	2217.3004	5514.4516	1586.8117	0
118	664	947.35545	23.21728	2230.771	5505.0505	1575.8043	0
119	664	950.7524	22.918545	2246.4366	5492.1771	1562.0694	0
120	664	954.4921	22.63056	2261.1804	5473.1732	1545.8277	0
121	664	957.35475	22.42101	2271.6638	5457.5124	1533.2454	0
122	664	958.86265	22.323485	2276.4206	5447.773	1526.2688	0

123	664	963.0906	22.08435	2287.6423	5417.0969	1506.1048	0
124	664	967.0906	21.87728	2297.0443	5385.2749	1486.2651	0
125	664	968.99495	21.796905	2300.4055	5367.8806	1476.2761	0
126	664	971.00255	21.721195	2303.3511	5347.9551	1465.2689	0
127	664	973.3087	21.646555	2305.9748	5324.0956	1452.5235	0
128	664	975.01015	21.59713	2307.5148	5306.1078	1443.1253	0
129	664	975.70905	21.57941	2308.0825	5298.368	1439.1272	0
130	664	977.19765	21.547255	2308.7422	5280.798	1430.3539	0
131	664	980.85675	21.49171	2309.0387	5234.9449	1408.1436	0
132	664	983.6591	21.459225	2308.5854	5198.1306	1390.6442	0
133	664	984.3563	21.455725	2308.204	5188.5124	1386.1989	0
134	664	985.67575	21.453115	2307.1995	5168.8766	1377.2322	0
135	664	989.31945	21.471715	2302.8418	5109.302	1350.6581	0
136	664	994.6564	21.544015	2293.6483	5015.0504	1309.7224	0
137	664	998.6564	21.63576	2284.3894	4939.0394	1277.5968	0
138	664	1001.496	21.72842	2276.0826	4880.9702	1253.6477	0
139	664	1004.797	21.86043	2264.9445	4810.264	1224.9796	0
140	664	1007.0965	21.963095	2256.494	4759.1987	1204.4704	0
141	664	1008.2575	22.021625	2251.8556	4732.3818	1193.7967	0
142	664	1012.18	22.25388	2233.9859	4687.0021	1180.557	0
143	664	1021.7485	22.977435	2180.3615	4585.6027	1157.5644	0
144	664	1029.0315	23.600605	2135.0823	4501.7518	1139.0011	0
145	664	1033.058	24.034315	2104.4298	4442.2334	1125.1089	0
146	664	1040.3825	24.91452	2043.0815	4317.1877	1094.4534	0
147	664	1047.2905	25.83867	1979.4362	4186.2882	1062.0862	0
148	664	1052.4515	26.613325	1926.4986	4077.708	1035.3072	0
149	664	1057.4335	27.422565	1871.6209	3960.0382	1005.0873	0
150	664	1063.965	28.58839	1793.1086	3821.0148	975.9653	0
151	664	1075.4605	30.9204	1637.4978	3566.5308	928.38088	0
152	664	1090.3095	34.36038	1409.7913	3162.5578	843.54955	0
153	664	1105.1585	38.36422	1146.9355	2662.4663	729.37576	0
154	664	1120.775	43.218	830.29968	2032.5189	578.58904	0
155	664	1137.1585	49.00959	454.51715	1242.703	379.32821	0
156	664	1149.2335	53.68892	151.91509	583.71263	207.81012	0
157	664	1153.562	55.474405	36.697214	334.62448	143.38271	0
158	664	1154.453	55.853415	12.264456	277.89944	127.84149	0
159	664	1156.5775	56.770635	-46.83842	126.19259	60.732391	0

SECTION F

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