PERMIT TO OPERATE RENEWAL APPLICATION (Phases 1 and 2)

PERMIT TO CONSTRUCT APPLICATION (Phase 2B)

C&D Landfill, Inc., CDLF (Phase 2)
Pitt County, North Carolina

Prepared for

February 2014

David Garrett, P.G., P.E.
Engineering and Geology

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Permit to Operate Renewal Application (Phases 1 and 2)
Permit to Construct Application (Phase 2A)

Construction & Demolition Debris Landfill
Pitt County, North Carolina

Prepared for:

C&D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834

To the Attention of:

Mr. Judson Whitehurst
President

This report was prepared by:

G. David Garrett, P.G., P.E.
Project Engineer

NORTH CAROLINA LICENSED SEAL 980 GEOLOGIST DAVID GARRETT

NORTH CAROLINA PROFESSIONAL SEAL 25462 ENGINEER DAVID GARRETT

2-28-2014

February 2014

Signature page of Applicant –

Name of facility C & D Landfill, Inc.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision and that the information provided in this application is true, accurate, and complete to the best of my knowledge.

I understand that North Carolina General Statute 130A-22 provides for administrative penalties of up to fifteen thousand dollars ($15,000.00) per day per each violation of the Solid Waste Management Rules. I further understand that the Solid Waste Management Rules may be revised or amended in the future and that the facility siting and operations of this solid waste management facility will be required to comply with all such revisions or amendments.

Signature | Judson Whitehurst (Print Name) | _____ (Date)

President
Title

C & D Landfill, Inc.
Business or organization name

INTRODUCTION

C&D Landfill, Inc., is a privately owned and operated disposal facility operated in conjunction with EJE Recycling, Inc. The facility is located on US 264 in the Pactolus community in Pitt County (**Figure 1**). Phase 1 commenced operations in 2001. Phase 2 is a non-contiguous expansion within the permitted facility boundary. A Site Suitability evaluation for Phase 2 was prepared in early 2003 under Solid Waste Rule **15A NCAC 13B .0500,** *et seq.* A hydrogeologic review was completed in 2004 by the NC DENR Division of Waste Management; engineering plans were approved and the PTC was issued for Phase 2A in early 2009. The PTO for Phase 1 and Phase 2A was issued in March 2010; however, an earlier PTO renewal had been issued in July 2009 for Phase 1, upon which the 5-year operational permit period was based.

At present, Phase 1 is nearly full and closure alternatives are under consideration; a future closure plan will be prepared. This application requests renewal of the Permit to Operate for Phase 1 and Phase 2A under Rules **15A NCAC 13B .0531** *et seq.* In addition, the facility requests a Permit to Construct for Phase 2B, so that base grades only can be established to allow new recycling activities, described in the Operations Plan; no waste placement will occur in Phase 2B until a Permit to Operate application is approved. The fill depths required to reach final base grades in Phase 2A vary up to four feet. Plans are to gradually place clean soil fill, taking care to avoid unauthorized materials in the fill; the Phase 2B area will be subject to the approved CQA testing criteria.

The original site characterization study for Phase 2 included a sufficient number and depth of borings to provide the information for the **Site Suitability Evaluation** (Part 1) and the **Design Hydrogeologic Study** (Part 2); as such, no additional borings were performed since the 2003 submittal. Ongoing monitoring of Phase 1 since 2000 provides ample historic data for the evaluation of the long-term seasonal high ground water table. Based on the site characterization study, conditions at Phase 2 are similar to those at Phase 1 with respect to ground water depths, flow directions, and absence of down-gradient ground water users. The data indicate an upward vertical gradient beneath much of the site; a partial confining is layer present. Site conditions allow effective monitoring of Phases 1 and 2 as separate CDLF units (**Figure 2**).

OWNER/OPERATOR INFORMATION

C&D Landfill, Inc. / EJE Recycling, Inc.
Mr. Judson Whitehurst, Owner
Mr. Wayne Bell, General Manager
802 Recycling Lane — Tel 252-752-8274
Greenville, North Carolina 27834 — Fax 252-752-9016

SITE LOCATION DATA

Latitude N 35.6052
Longitude E -77.1651

Pitt County Tax Department PIN identification is given on the Pitt County GIS Parcel Map (**Figure 3**) following this text; deed book and page number for plat identification is given on the recombination map (**Appendix 1**).

REVISIONS

Previous documents:		
x	Part 1 Site Suitability Application C&D Landfill, Inc., Phase 2	November 2002 (Revised Sept. 2004)
This document:		
Rev 0	Part 2 Permit to Construct Application C&D Landfill, Inc., Phase 2 (Vol. 1 and 2)	February 2008
Rev 1	Resubmittal of Volumes 1 and 2 in response to 2006 C&D rules	October 2008
Rev 2	Update of Volumes 1 and 2 in response to regulatory Comments	February 12, 2009
Rev 2.1	Update of Volumes 1 and 2 in response to regulatory Comments	March 15, 2009
Rev 2.1	Revised Sections 9 and 11 pertaining to Closure and Post-Closure Costs	March 15, 2009
Rev 3.0	Update Operations Plan to Include Recycling	February 2014

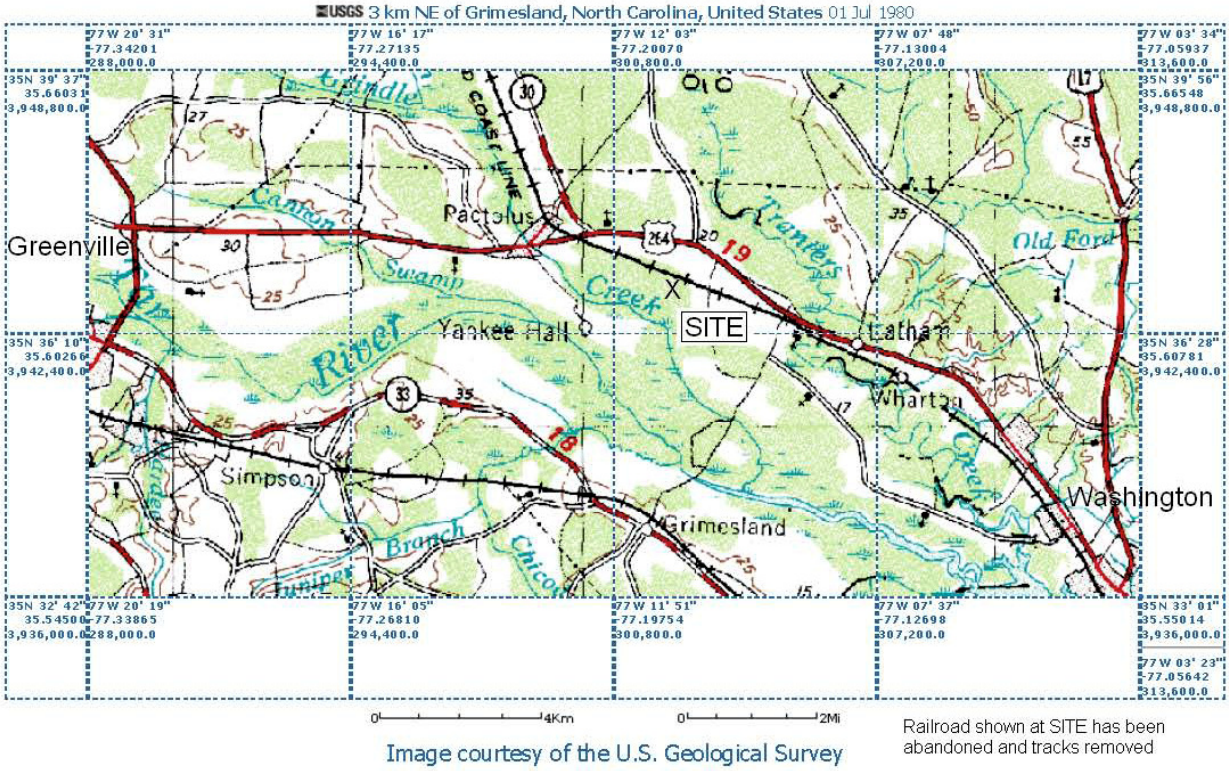


Figure 1 – General Vicinity Map

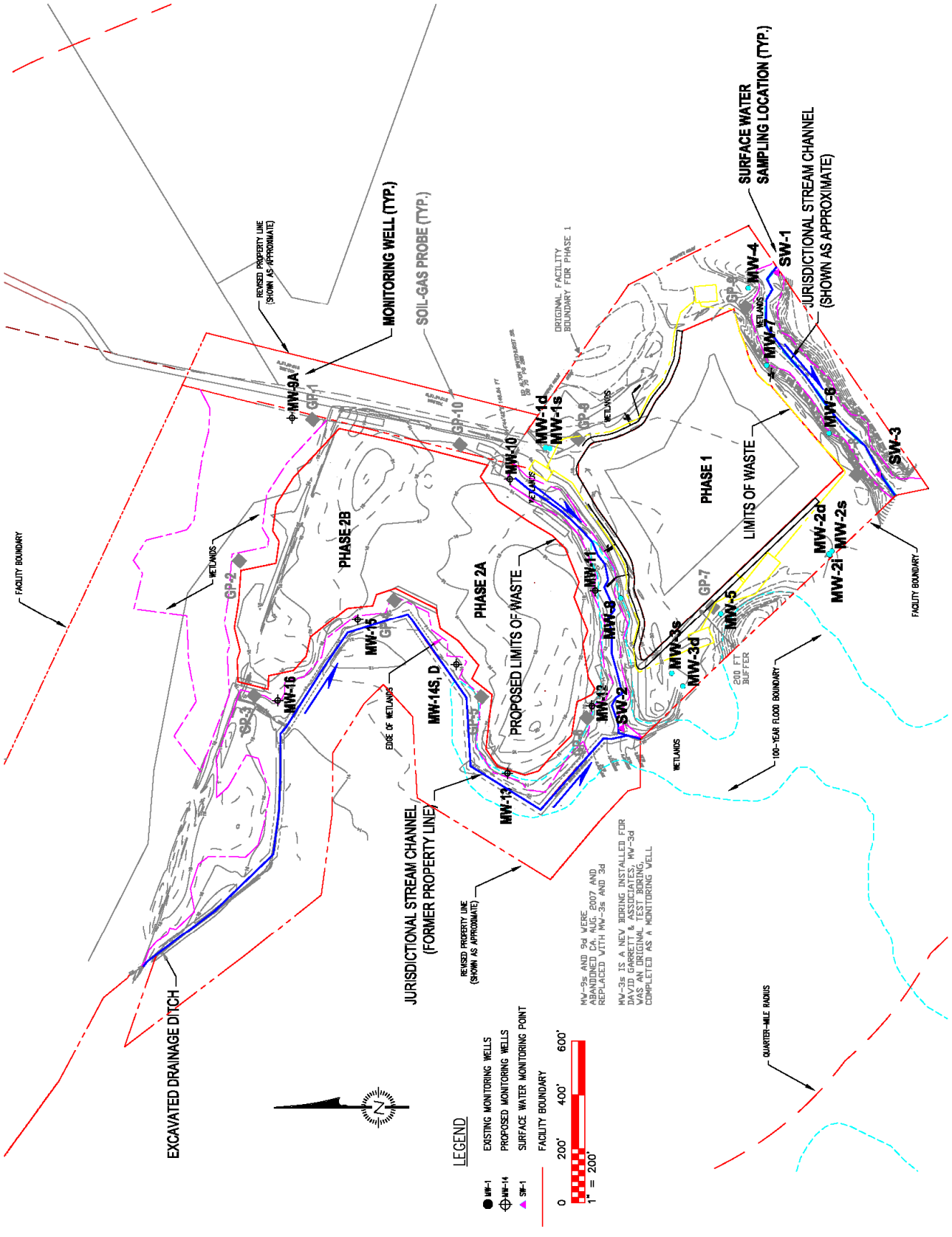
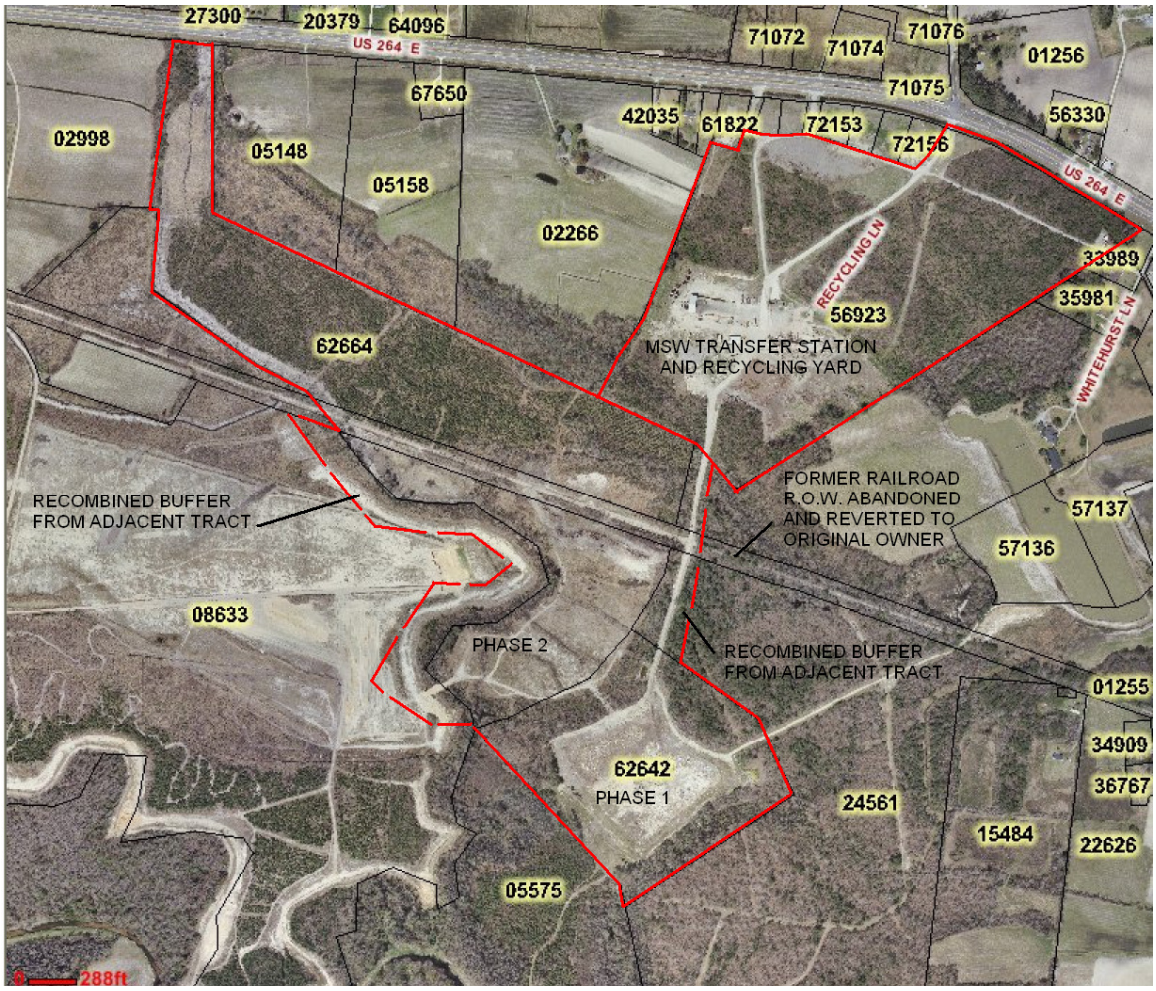


Figure 2 – Facility Layout and Drainage Pattern (in 2009)



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DRAWINGS *Refer to the rolled drawing set that accompanies this report*

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S2 Local Area Map
S3 Local Area Photo and Facility Plan
S4 Site Boundary and Test Boring Locations
E1 Base Grades with Ground Water Contours
E2 Final Cover Contours
E3 Phase 2A Staging

E4 Phase 2B Staging
E3 Top of Confining Unit Map
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1 Local Government Information
2 Airspace & Earthwork Calculations
3 Ground Water and Landfill Gas Monitoring Plan
4 Operation Plan Information
- 4A Facility Plan Maps
- 4B Waste Screening Form
- 4C Hazardous Waste Responders
- 4D Fire Notification Form
- 4E Landfill Gas Monitoring Plan
- 4F Asphalt Shingle Documentation

5 Financial Assurance Documents

1.1 Development History

C&D Landfill, Inc. consists of two non-contiguous disposal areas. Phase 1 encompasses a 15-acre footprint within a 33-acre facility boundary. The facility is owned and operated by C&D Landfill, Inc., in conjunction with the adjacent EJE Recycling, Inc., both of which are family owned business entities that operate from the one location. The landfill serves portions of multiple counties within a 100-mile radius, per the franchise agreement. Phase 1A began operations in 2001; Phase 1B began operations in 2002. Phase 1 has a permitted capacity of 842,000 cubic yards (421,000 tons). The facility is a regional disaster debris disposal site. Phase 2A opened in 2010.

Mixed agricultural, commercial, light industrial and residential properties exist within the community. No significant ground water users or potential sources of contaminants are located in the immediate vicinity, but certain inorganic constituents have been noted at elevated levels in the natural background geochemistry. Public water is available in the vicinity of the site, but no public water supply wells or surface water intakes have been identified near the site. The site suitability studies for Phases 1 and 2 identified no conditions that would limit the ongoing use of the site as a C&D disposal facility.

1.2 Existing Facilities

EJE Recycling operates a material recovery facility and a MSW transfer station north of the CDLF units. An office (doubles as a scale house) and equipment maintenance shop are located near the recycling yard. White goods are stored on a paved pad located between the Transfer Station and the CDLF Phase 1 – these materials are sold for scrap metal and removed periodically by EJE. Tires are generally not accepted at the facility; occasional tires from on-site equipment are disposed off-site, like any other consumer's. The Facility Plan map (**Drawing S3**) identifies the relevant waste management facilities.

1.3 Facility Plan Modification

Phase 2 encompasses a 23-acre footprint within the 123 acres facility boundary. Phase 2 will contain an estimated 1,046,156 cubic yards (523,078 tons) of debris, bringing the total disposed volume (combined with Phase 1) to 1,888,156 cubic yards (944,078 tons). The estimated life of Phase 2 was 15 years at the time of permitting; planned recycling efforts will likely extend this time period. The southern half of the Phase 2 area is built and is the active cell, called Phase 2A. The ideal place to conduct the recycling is at the working face, using Phase 2B as a staging and stockpile area. The Owner/Operator desires to build up base grades to maintain ground water separation. Design information for the PTC for Phase 2B and an updated Operations Plan are included herein.

EXISTING CONDITIONS	**C&D Landfill, Inc. (Permit #74-07)**		
Solid Waste Units Present	MSW Transfer Station, Recycling Facility, CDLF		
Other Activities/Infrastructure	Scales/Office, Alternative Cover Demonstration		
CDLF Unit Footprint Acreage	15 acres		
CDLF Phases/Sub-Phases [1]	**1A**	**1B**	
New Ground Footprint Acreage [1]	8 ac	7 ac	
Final Elevations (Entire Unit) [2]	EL. 124 [5]		
Maximum Waste Thickness [2]	104 feet [5]		
Permitted Side Slope Ratios	3H:1V		
Acreage of Closed Slopes [3]	0		
Facility Boundary Acreage	34.21 acres		
Total Permitted Capacity [2]	842,000 cy		
Permitted Capacity Remaining	0		

PROPOSED CONDITIONS	**Phase 2 is a separate unit from Phase 1**		
Solid Waste Units Present [4]	Unchanged		
Other Activities/Infrastructure [4]	Unchanged		
New CDLF Unit Footprint Acreage [4]	23 acres		
New CDLF Phases/Sub-Phases [1]	**2A**	**2B**	**2C**
New Ground Footprint Acreage [1]	10 ac	13 ac	9 ac [5]
Interim Capacities (Sub-Phases) [2]	313,044 cy	386,045 cy	347,067 cy
Interim Elevations (Sub-Phases)	EL. 50	EL. 50	EL. 106
New CDLF Unit Capacity [2]	1,046,156 cy		
Final Elevations (Entire Unit) [2]	EL. 106		
Maximum Waste Thickness [2]	90 feet		
Permitted Side Slope Ratios [4]	3H:1V		
Acreage of Closed Slopes [3]	0		
Facility Boundary Acreage [4]	160.14 acres		
Total CDLF Footprint Acreage [4]	38 acres		
Total Permitted Capacity [4]	1,888,156 cy		
Permitted Capacity Remaining [4]	1,046,156 cy		

1 Corresponding to 5-year Operating Capacity
2 Includes Final Cap System and Operational Cover
3 Per Applicable Rules at Time of Closure
4 Subject to Approval of this Application
5 Vertical Expansion – not actual ground disturbance

1.4 Regulatory Requirements

Solid Waste Rules **15A NCAC 13B .0531** *et seq.* became effective January 1, 2007. This facility accepted waste prior to January 1, 2007, thus as a requirement of the rule change, an application was submitted in 2009 that met the requirements of Rule .0547, which required existing CDLF units to submit plans for long-term development of the site. That information is presented in the table immediately preceding this section.

The 2009 application included topics required by Rules **.0531** through **.0547**, consisting of a comprehensive facility plan for long-range development (layout, aerial limits and capacity of various waste management units) along with identification of the anticipated waste stream and criteria for waste acceptance and segregation; an Engineering Plan for the initial phase of development; a Construction Quality Assurance (CQA) plan; an Operation Plan that includes amended monitoring programs for environmental and waste acceptance criteria; a Closure and Post-Closure Plan with cost estimates to facilitate a required Financial Assurance demonstration. Most of that information, replicated in this document, remains the same except for the Operation Plan.

For the Permit to Construct application for Phase 2B, Rule **15A NCAC 13B .0537** requires a grading plan that provides a minimum of 4 feet of vertical separation between the base grades and the maximum seasonal high ground water table. Another requirement for the subgrade is specific soil types, e.g., ML, MH, CL, CH, SM and mixed SM-ML classifications, within the upper 24 inches beneath the base grades. Earlier studies demonstrated that subgrade soil types that will be exposed via excavation and those derived elsewhere onsite for compacted fill will meet these requirements.

1.5 Facility Drawings

1.5.1 Facility Layout

Phase 2 is a separate CDLF unit developed in two sub-phases of footprint expansion, with a third sub-phase (vertical expansion). Each sub-phase is expected to provide approximately 5 years of operational capacity, based on current waste stream projections. **Drawings E1** and **E2** respectively depict the base grades and final grades for Phase 2. The footprint provides a minimum buffer of 200 feet to the facility boundary and 50 feet to jurisdictional water bodies, per the rules in effect when the project initiated – this is an "existing" facility relative to the 2007 Solid Waste legislation, hence original setback requirements apply. **Drawings E2B and E2C** show the footprints and interim fill grades for sub-phases 2A and 2B. Final grades for sub-phase 2C are shown on **Drawing E2**.

The Facility Plan (**Drawing S3**) shows the locations of current and future soil borrow areas and future access routes, along with other permitted solid waste units and activities, including infrastructure for the MSW Transfer Station and Recycling Facility – at present, these units are considered a separate facility, permitted independently of the CDLF. The Phase 2B footprint contains no identified floodplains or wetlands, unstable areas or cultural resource areas that affect project development.

1.5.2 Operational Sequence

Phase 2B and associated S&EC measures (shown on **Drawing EC1**) will be developed in the northern half (approximately) of the Phase 2 footprint. This sub-phase will involve only engineered fill up to 4 feet in height for reaching the approved base grading plan (see **Drawing E1**). Similar to Phase 2A, the Phase 2B operational sequence is divided into five contiguous cells, each lasting an estimated one year of duration, which will extend to an interim elevation that approximates 5 years of capacity.

However, new aggressive recycling activities are planned to support LEED construction projects within the region. The Phase 2B footprint will be used for staging and stockpiling materials, this requires base grade construction in the interest of protecting ground water resources. No waste disposal will occur in Phase 2B until a Permit to Operate application, including CQA documentation for the base grades, is approved by the NC DENR Division of Waste Management.

Interim waste slopes will be maintained at 3H:1V, in accordance with Division of Waste Management requirements, while upper surfaces shall be graded to promote positive drainage, ideally at a 5% slope. Operational procedures are described more fully in the Operations Plan (**Sections 5.0 – 7.0**). Exterior slopes will be closed – with simultaneous construction of erosion control benches – in Phase 2 (all sub-phases) as the slopes come to grade. Interim cover will be placed on exterior slopes until a maximum of 10 acres of slope is ready for final closure (refer to the Final Closure Plan, **Section 8.0**).

1.6 Facility Report

1.6.1 Waste Stream

The CDLF is permitted and managed separately from the recycling facility and transfer station. This report pertains specifically to the CDLF operation. Scale-house records verify an average C&D disposal rate of 200 tons per day (at full capacity), operating 250 days per year for approximately 50,000 tons per year (100,000 cubic yards per year). The populations served include all or portions of the counties listed below.

SELECTED COUNTY	2000 Pop[1]	2006 Pop[1]	Pop Growth[2]	% Grow	July 2009[3]	% Grow	July 2019[3]	% Grow	July 2029[3]	% Grow
BEAUFORT	44,958	46,346	1,388	3.1%	47,342	5.3%	49,045	9.1%	50,138	11.5%
BERTIE	19,757	19,355	-402	-2.0%	18,945	-4.1%	18,147	-8.1%	17,149	-13.2%
CHOWAN	14,150	14,664	514	3.6%	15,142	7.0%	15,707	11.0%	16,011	13.2%
CRAVEN	91,523	95,558	4,035	4.4%	98,661	7.8%	104,279	13.9%	108,160	18.2%
EDGECOMBE	55,606	52,644	-2,962	-5.3%	51,563	-7.3%	47,811	-14.0%	43,850	-21.1%
GREENE	18,974	20,833	1,859	9.8%	21,378	12.7%	24,057	26.8%	26,728	40.9%
HALIFAX	57,370	55,606	-1,764	-3.1%	54,707	-4.6%	53,321	-7.1%	51,486	-10.3%
HYDE	5,826	5,511	-315	-5.4%	5,426	-6.9%	5,292	-9.2%	5,090	-12.6%
JONES	10,398	10,318	-80	-0.8%	10,512	1.1%	10,680	2.7%	10,766	3.5%
LENOIR	59,619	58,172	-1,447	-2.4%	58,083	-2.6%	57,053	-4.3%	55,711	-6.6%
MARTIN	25,546	24,396	-1,150	-4.5%	24,112	-5.6%	22,968	-10.1%	21,755	-14.8%
NASH	87,385	92,220	4,835	5.5%	94,871	8.6%	103,245	18.1%	111,136	27.2%
NORTHAMPTON	22,086	21,524	-562	-2.5%	21,544	-2.5%	21,330	-3.4%	21,003	-4.9%
PAMLICO	12,934	13,097	163	1.3%	13,236	2.3%	13,702	5.9%	13,930	7.7%
PITT	133,719	146,403	12,684	9.5%	154,430	15.5%	175,690	31.4%	196,602	47.0%
TYRRELL	4,149	4,240	91	2.2%	4,334	4.5%	4,384	5.7%	4,379	5.5%
WASHINGTON	13,723	13,360	-363	-2.6%	13,243	-3.5%	12,589	-8.3%	11,821	-13.9%
WAYNE	113,329	114,930	1,601	1.4%	116,281	2.6%	121,958	7.6%	127,160	12.2%
WILSON	73,811	77,468	3,657	5.0%	79,574	7.8%	85,835	16.3%	91,905	24.5%
	2000 Pop	**2006 Pop**	**Pop Growth**	**% Grow**	**July 2009**	**% Grow**	**July 2019**	**% Grow**	**July 2029**	**% Grow**
MULTI-COUNTY SERVICE AREA	864,863	886,645	21,782	2.5%	903,384	4.5%	947,093	9.5%	984,780	13.9%
STATE OF NORTH CAROLINA	8,046,813	8,860,341	813,528	10.1%	9,348,744	16.2%	10,744,214	33.5%	12,167,409	51.2%

[1]Source data: 2006 Certified County Population Estimates, North Carolina State Demographics, North Carolina State Data Center, http://demog.state.nc.us/

[2]All growth is relative to 2000 Census Data

[3]Source data: Projected Annual County Population Totals (for years given), North Carolina State Demographics, North Carolina State Data Center, http://demog.state.nc.us/

1.6.2 Landfill Capacity

The volumetric analysis for Phase 2 (see **Appendix 2**) indicates an estimated total capacity of 1,046,156 cubic yards of airspace, including interim and final cover soils. Based on an estimated 50,000 tons of C&D per year with an assumed 3% annual increase in C&D intake, the projected operational life for Phase 2 is between 9 and 15 years. The waste stream and compaction density will vary, thus will the projected operational life.

1.6.3 Special Engineering Features

No seeps, springs, soft ground or other deleterious conditions were identified in the site characterization studies. As such, no special engineering features are required.

2.1 Engineering Report

This section of the report describes the physical aspects of the facility design, with emphasis on waste containment and environmental control systems, based on data discussed in the Design Hydrogeologic Report. The design was prepared by a qualified Professional Engineer, who is licensed to practice in North Carolina and is familiar with the requirements of the North Carolina Division of Waste Management (Division) rules.

The design of CDLF Phase 2A was set to provide approximately 5 years of capacity, in keeping with rules. There is no liner or leachate collection system, since the site meets the rule requirements for soil types present within two feet below planned base grades, and there is at least 4 feet of vertical separation between the waste and seasonal high ground water and/or bedrock, per **Rule .0540 (2)**. The base grades and outer slopes will have maximum slope ratios of 3H:1V, which have been demonstrated to be stable.

2.1.1 Analytical Methods

The facility design incorporates elements that are consistent with Division rules and guidelines, as well as sound engineering practice. Various analyses used in the design of the facility include evaluations of soil conditions, i.e., the consistency of subgrade soils and the availability of suitable soils for constructing stable embankments and other earthen structures (discussed below), and ground water characteristics, i.e., flow directions and seasonal water depth fluctuations identified in the site studies. Soil properties testing used to facilitate these evaluations included grain size analysis, shear strength, consolidation, and compaction characteristics (see **2009 Design Hydro** report). Stability and settlement of foundation soils were considered in setting base grades, as was outer slope stability for the final cover system. Other analyses included a detailed evaluation of S&EC and storm water management systems (see **2009 PTC** application).

2.1.2 Identified Critical Conditions

Based on the nature of the soils within the Phase 2 footprint and the understanding of geologic conditions within the region (and the site), no inherent foundation stability or long-term settlement problems are anticipated. Some considerations that are both generic to landfills and specific to the on-site soils, learned through practical experience with the construction and operation of Phase 1, are discussed below.

- On-site soils are typically sandy, whereas fine grained soils that meet the soil-type requirements for the upper two (2) feet beneath the base grade elevations are available but often difficult to obtain in the region. Required soil types for the upper two (2) feet of base grades include SM, SC, ML, MH, CL, and CH.

- Borrow site selection and a field evaluation of the soils during construction (i.e., the CQA program, see **Section 4**) will be critical to assure the subgrade construction complies with the rule requirements.
- Soil compaction is dependent on both compaction effort (i.e., the right equipment) and working within the correct range of near-optimum moisture (**Section 4.2**).
- Properly compacted embankments are expected to be stable. Outer slope stability (relative to final cover) will also rely on adequate compaction and observation of proper slope ratios, due to the strength considerations.
- Another consideration is significant soil erosivity, which is counteracted with good cover construction practices and vegetative cover. The on-site soils have moderate field capacity and poor nutrient value, which may require additional effort to establish vegetation. These conditions pose operational considerations but require no special design accommodations.

2.1.3 Technical References

Calculations found in **2009 PTC** application are referenced within the various analyses.

2.1.4 Location Restriction Demonstrations

The site was granted a Site Suitability determination in accordance with **15A NCAC 13B .0531** *et seq.* based on work completed in 2003-04, i.e., the site characteristics were determined suitable for a C&D landfill. Relative to **Rule .0536** pertaining to C&D landfills, the site has no disqualifying conditions with respect to zoning, setbacks from residences or potable wells, historic or cultural sites, state or nature preserves, 100-year floodplains, wetlands, water supply watersheds, or endangered species. Documentation pertaining to these criteria is found in the October 2002 **Site Suitability Report**.

2.2 Construction Materials and Practices

Based on the Design Hydrogeologic investigation for Phase 2, on-site construction soils consist of variably silty sand (i.e., Unified Soil Classification System classifications of SM and SM-ML) with silty clay (CL) and clayey silt (ML). These soils meet the requirements for the upper two feet beneath the landfill subgrade referenced in **15A NCAC 13B .0540 (2)**. The soils exhibit adequate compaction characteristics and shear strength (when properly compacted) to build stable embankments and subgrades that will not undergo excessive settlement – subject to the caveats discussed in **Section 5.1.2**. Some selective use of soils and/or field evaluation will be required to place the correct soil types within the upper two (2) beneath the subgrade elevations.

Good construction practices for embankments and subgrades include compaction using steel-wheel rollers, sheep foot rollers, and/or smooth-drum rollers of sufficient weight – not dozers – making a minimum numbers of passes (typically three to five passes) in two perpendicular directions in order to achieve the desired strength properties for stability. Past experience at the site indicates that material selection (i.e., avoiding soils that are excessively wet or exhibit excess organic debris content) and/or blending soils to negate the effects of wet or slick soils will produce satisfactory results. The targeted compaction criterion is 95% of standard Proctor maximum dry density (**ASTM D-698**). Critical embankment and subgrade areas should be tested to ensure proper compaction in accordance with the criteria outlined in the CQA Plan (**Section 4.0**).

2.3 Design Hydrogeologic Report

Refer to **Volume 1** of the 2009 Permit to Construct application for Phase 1.

2.4 Engineering Drawings

Refer to the rolled plan set that accompanies this report. All relevant criteria required by the rules (except as noted) are depicted on the plans.

2.4.1 Existing Conditions

See **Drawings S1 – S5**.

2.4.2 Grading Plan

See **Drawing E1**.

2.4.3 Stormwater Segregation

See **Drawing E1** – while this rule requirement pertains to separation of stormwater runoff from leachate (i.e., a lined landfill), in order to reduce generated leachate volumes, good practices for water management include maintaining slopes with positive drainage (always directed toward approved stormwater control measures), facilitated by an orderly waste placement sequence, shown on this drawing.

2.4.4 Final Cap System

See **Drawing E2A** for final contours, cross-section and details.

2.4.5 Temporary and Permanent S&EC

See **Drawing EC1** for temporary sedimentation and erosion control (S&EC) measures and **Drawing EC2** for permanent measures pertaining to the final cover. A separate S&EC plan has been submitted to the Pitt County Planning Department, which has delegated jurisdiction from the NC DENR Division of Land Quality.

2.4.6 Vertical Separation

See **Drawing E1** for base grades relative to ground water; also see cross section **Drawings X1 – X2**.

2.4.7 Other Features

This rule pertains to liners and leachate collection systems, if proposed (none are).

2.5 Specific Engineering Calculations and Results

Calculations for settlement and slope stability were performed using site specific data. The calculations can be found in **2009 PTC** application, the geotechnical lab data are found in the **2009 Design Hydro** report. The following is brief description of the analyses and results.

2.5.1 Settlement

Settlement is a concern at unlined landfills for maintaining vertical separation between the bottom of the waste (or base liner) and the maximum long-term seasonal high water table. Settlements of the foundation soils result from time-dependent strain, i.e., a change in thickness within the various soil layers due to the vertical stress (weight of the landfill) applied at the surface, accompanied by drainage of the various soil layers. Vertical stresses beneath landfills gradually increase as the waste becomes thicker over long periods of time; strain-induced settlements within sands and/or well drained silts and clays are relatively short-term, thus long-term settlements are not typically a concern unless thick uniform clay deposits are present (which tend to drain slowly) – such is not the case at the subject landfill.

Settlements were calculated using elastic methods adapted from the US Federal Highway Administration (FHWA) for highway embankments. Ostensibly, a landfill is a large flexible embankment with the highest stresses impinging on the foundation soils near the

center. The FHWA settlement calculation is based on the work of Hough (1959) and others, which considers both the material type and overburden depth for determining a "correction factor" for standard penetration test (SPT) values, from which the compressibility and load-induced strain of each soil layer can be evaluated. For sandy soils conventional sampling via Shelby tubes and laboratory consolidation testing is infeasible. For clayey soils, representative Shelby tube samples were acquired and laboratory consolidation tests were performed (see **2009 PTC** application), and the consolidation data were substituted into the calculations for appropriate soil layers.

A spreadsheet facilitates the settlement calculation. Initially, the vertical stress increase resulting from varying embankment heights was calculated using an average unit weight of 1000 pounds per cubic yard (37 pcf) and by applying a depth-related "influence factor" based on elastic stress distribution theory. Next a subsurface stress distribution was developed for original and post-construction (final height) conditions, based on the depth and average unit weight of the soil layers, plus the added vertical stresses. The SPT correction factor was applied to determine the compressibility factor and strain within each sand layer. For the clays, consolidation theory was applied to determine the strain in those layers, which was added to the strain in the sand layers to estimate total settlement under a given load. Time-dependent settlement was not considered due to the well-drained conditions indicated by the subsurface data (see **2009 PTC** application).

Assuming fairly uniform subsurface conditions within the footprint – as confirmed by the test borings – a representative subsurface profile was used to estimate the maximum settlements beneath the landfill (at the center), then successive calculations were made to evaluate areas within the footprint where lower stresses will occur, i.e., beneath side slopes. The variable settlement values were plotted on a footprint map, from which it was confirmed that the base grade design, which provides 5 feet of vertical separation (not the minimum required 4 feet), is sufficient to accommodate the anticipated settlement while maintaining the required minimum vertical separation. Differential settlement within the footprint is not a concern. For this project, the maximum estimated settlement at the center of the landfill is 0.75 feet (see **2009 PTC** application).

2.5.2 Slope Stability

Two primary concerns exist for landfills with respect to slope stability: deep-seated or global stability involving a deep layer in the foundation or along the base of the landfill, which could potentially result in catastrophic slope failure, and veneer stability (sliding of the cover), which can expose the waste but is typically more of a maintenance issue relative to repairs in the event of a failure (veneer stability can also be catastrophic).

Subsurface conditions identified at this site are relatively sandy (high strength soils) with interspersed this clay layers with sand seams that are expected to drain readily under the applied embankment loads – only "effective" stresses (i.e., drained conditions) were considered. The site is not earthquake prone, so liquefaction is not a concern. No extremely soft layers that would pose stability concerns were identified by the SPT testing, but the foundation is expected to undergo a strain-hardening strength increase as settlement occurs, i.e., the foundation soils will become even more stable with time.

2.5.2.1 Deep-seated stability – Limit-equilibrium methods, i.e., the STABL-5M model used for this project, evaluate the balance of forces driving a slide (weight of the porous material and contained water) against the forces resisting a slide (shear strength, expressed as cohesion and friction) along a theoretical failure surface, which can be either a circular surface or a series of intersecting planar surfaces. A "static" analysis considers just the weight of the materials and the shear strength (tie-back loads may be considered for reinforced embankments); a "dynamic" analysis might consider external loads, such as linear loads at the top of the embankment (i.e., traffic forces) or additional horizontal loads to represent earthquakes, expressed as a fraction of the normal gravity field, specific to the region of interest.

In more advanced routines, the mass above the failure surface is divided into many slices, the driving and resisting forces for each of which are calculated and summed up. This "method of slices" expresses the balance of resisting forces and driving forces as a ratio, e.g., 1.5:1, or simply 1.5, which is the "safety factor." Ratios less than unity (safety factor <1) indicate unstable conditions. Typical minimum safety factors for maintaining stable embankment conditions throughout the life of a project are 1.5 for static conditions, 1.2 for seismic conditions.

Shear strength inputs to the STABL-5M model were developed from the drilling and laboratory data. A circular failure surface was used with a Janbu method of slices analysis. A representative soil profile was developed from the drilling data. A side slope ratio of 3H:1V was modeled. The following table shows a summary of the soil strength input values for the representative cross section at the project site.

Soil Layer	Layer Thickness (feet)	Soil Layer Description	Saturated Unit Weight (pcf)	Drained Cohesion (psf)*	Drained Friction Angle (deg)
1	15	Sli. silty-clean sand N = 17	110	0	35

2	25	Silt-Clay N = 3 to 20	125	100	25
3	40	Silty sand N = 100	130	100	35
4	Undefined	Silt-clay N = 10	112	20	15
5	85	Waste	60	20	45

*Apparent cohesion for silty sands and waste is based on retrogression analysis from other projects (past experience). The water table was modeled at a depth of 5 feet below ground surface, i.e., the base of the waste, which reflects seasonal high conditions.

Based on the analysis in the **2009 PTC** application, the minimum safety factor for static conditions is 1.55; the minimum safety factor for seismic conditions (2%g) is 1.41.

2.5.2.2 Veneer Stability – Sliding of the final cover (or veneer failure) is dependent on slope angle, material strength, i.e., the interface friction angle and cohesion within the soils and between the soils and synthetic components (if any), and the degree of saturation. Veneer failure occurs when the pore pressures build up along a critical interface in excess of available shear strength. The severity of failure can range from minor sloughing of small areas (maintenance nuisances) to large-scale slides requiring complete replacement of large sections – this type of failure is expensive to repair, especially when synthetic components are involved. The analysis is typically performed for preliminary design conditions to anticipate (and try to avoid) the large-scale failures.

A worse-case scenario involves little (or no) cohesion, as in a geotextile-geomembrane interface, and complete saturation of the soils overlying that interface. Good engineering practice requires a drainage layer (typically a synthetic geonet) whenever a flexible membrane barrier is used, e.g., an alternative final cover that might be considered. The regulatory minimum cover includes 18 inches of vegetative support soil overlying a compacted soil barrier. Given the soils available in the region, the upper 18 inches could include a high permeability sand layer near the base, but the compacted soil barrier (maximum 1 x 10^{-5} cm/sec permeability) may not be readily available. North Carolina Solid Waste regulations allow alternative final covers, subject to approval by the Solid Waste Section, but specific interface testing will be required to verify future designs.

Even when all natural soil covers are used, drainage is still important relative to veneer stability, so a final cover section should include higher permeability sand layer next to the barrier to prevent the soils above the barrier from becoming saturated. Assuming a regulatory minimum cover soil profile is used, the critical interface for veneer stability exists within a low-cohesion sand layer overlying the compacted soil barrier at full saturation on a 3H:1V slope. A nominal effective cohesion can be assumed in the sand.

A veneer stability analysis adapted from Matasovic (1991) was performed to evaluate four conditions: static unsaturated and saturated conditions (with a required safety factor of 1.5) and seismic unsaturated and saturated conditions (with a safety factor of 1.1). For this site, the static (non-seismic) saturated case is the critical condition for design because of the higher required safety factor. The calculations start with the given slope geometry and saturation state, then for a given safety factor the required friction (with or without cohesion) is back-calculated to provide the desired safety factor (**2009 PTC** application).

The analysis assumed full saturation of the vegetation support layer (upper cover soil is at field capacity) with a 1-year, 60-minute design storm impinging, resulting in a head of just over 12 inches acting on the base of the upper soil layer. Assuming the deeper compacted soil layer is stronger (due to cohesion) a minimum friction angle of 31 degrees is required within the upper soil layer. Select soils available in the region (including the borrow sites on the premises) are capable of providing this minimum friction angle, combined with the required high permeability for drainage. The CQA program for the final closure should verify the available friction angles for the actual cover components (including alternative cover designs, if these are to be used).

2.5.3 Slope Ratios

Both the deep-seated stability analysis (**Section 5.5.2**) and the veneer stability analysis (**Section 5.5.4**) assumed a 3H:1V slope ratio. These analyses demonstrate that stability safety factors meet the minimum acceptable requirement of 1.5 for static (non-seismic) conditions. The use of 3H:1V slope ratios will result in stable slopes, providing that the drainage requirements are accommodated, and assuming proper vegetation maintenance.

2.5.4 Required Soil Volume Calculations

A soil volume analysis performed in part using AutoCAD Digital Terrain Model (DTM) methods is presented in Appendix 2. The following summary is based on a combined area of Phases 2A and 2B, equaling 23 acres. This is also the acreage bonded for the 2009 permit to construct, which included Phases 1 and 2A. This analysis does not

represent an actual earthwork balance. The intent of this calculation is to show the required soil quantities (in approximate terms) – the use of overstated quantities is conservative. Ample soil resources are on-hand in the adjacent soil borrow pit.

Total Airspace (includes 3' final cover thickness)	1,046,156 cy
Final Cover Required (23 ac. x 43,560 x 3' /27 x 1.1 x 1.15)	140,820 cy*
Net Airspace (total minus final cover)	905,636 cy
Intermediate Cover (estimated 15% loss to voids)	135,845 cy**
Base Fill Volume (fill depth varies up to 4 feet)	84,285 cy
Required Soil Balance (from adjacent borrow pit)	**360,950 cy**

*Use a slope factor of 1.1 (increases volume determined from planimetric area) and a 15 percent shrinkage factor from borrow site to field placement (compaction)

**Available cover soil is sand; expect relatively high soil loss into voids

For the next 5-year interval, Phase 2B is not expected to be operated as a disposal unit. A future Permit to Operate will be required, and the Owner/Operator desires to update the soil inventory at that time. The facility sits adjacent to a permitted mine, which is owned by and operated for the benefit of the landfill by the Owner/Operator. The availability of adequate soil resources for building Phase 2B is not in question. Relative to Phase 1, closure activities are expected to commence during the upcoming 5 year period. Thus, in consideration of the pending closure costs for Phase 1, and the deferred construction and operation schedule for Phase 2B, the Owner requests that the current bond amount be kept in place until such time the a PTO is issued for Phase 2B.

3.1 Horizontal Separation

The following regulatory criteria are addressed in project drawings specified below. Refer to the rolled plan set that accompanies this report.

3.1.1 Property Lines

The minimum setback to property lines is 200 feet (**Drawings E1 and E2**).

3.1.2 Residences and Wells

The minimum setback to residences and wells is 500 feet (**Drawings S1 – S3**).

3.1.3 Surface Waters

The minimum setback to surface waters is 50 feet (**Drawings E1 and E2**).

3.1.4 Existing Landfill Units

The minimum setback to Phase 1 C&D landfill is 100 feet (**Drawing S3**). The Phases are separated by a small stream with associated wetlands – essentially these are separate disposal units for monitoring purposes. The planned expansion (Phase 2) is cross-gradient from Phase 1 relative to local and regional ground water flow. Phase 2 is not expected to impact either operations or monitoring of Phase 1, nor vice-versa.

3.2 Vertical Separation

3.2.1 Settlement

Maximum waste thicknesses are approximately 85 feet; the waste density is approximately 0.5 tons/cubic yard. Foundation soils are very medium stiff, normally consolidated silty sand, sandy silt and/or clayey sand and silt (all marine deposits). Settlement calculations (see **2009 PTC** application) indicate maximum post-construction settlements on the order of 0.75 feet (9 inches), or less. Based on the grading plan (**Drawing E1)**, settlements of this magnitude will not decrease the vertical separation to less than 4 feet, nor will strains adversely affect the engineered subgrade. Discussion of the assumptions and procedures behind the calculations is presented in **Section 2.5**.

3.2.2 Soil Consistency

Based on the laboratory data, a majority of the on-site soils generally classify as silty sands (SM), silt (ML) or dual classify as sand-silt (SM-ML). A relatively small fraction of the near surface soils consist of low plasticity silty clay (CL), and there are minor high plasticity silty clay (MH-CH) soil types present. These soil types will be present either in-situ or within compacted subgrades, meeting the requirements of **Rule .0540 (2) (b)** for the upper two feet beneath the subgrade. No modification of the soils, i.e., admixtures, will be required to meet this rule requirement, but reworking to blend the soils to a more uniform consistency and proper compaction may be required to mitigate isolated pockets of highly granular soils. For new base grade fill sections, proper soil selection will be required. The soil types shall be documented in the CQA program.

3.3 Survey Control Benchmarks

A permanent benchmark has been established by Burgess Land Surveying, P.A., of Wilson, NC. The benchmark is tied into the North Carolina State Plan (NCSP) coordinate system. The NCSP coordinates of the benchmark are as follows:

N 596,356.5642
E 1,119,904.2133
El. 955.43

3.4 Site Location Coordinates

The latitude and longitude coordinates of the center of the site are approximately:

N 35.3477,
E -81.9504.

3.5 Landfill Subgrade

3.5.1 Subgrade Inspection Requirement

The Owner/Operator shall have the Phase 2 subgrade inspected by a qualified engineer or geologist upon completion of the excavation, in accordance with **Rule .0534 (b)** and **Rule .0539**. Said inspection is required by the Division to verify that subgrade conditions are consistent with expected conditions based on the Design Hydrogeologic Report.

3.5.2 Division Notification

The Owner/Operator shall notify the Division at least 24 hours in advance of the subgrade inspection.

3.5.3 Vertical Separation Compliance

The subgrade inspection shall verify to the Division that the minimum vertical separation requirements are met and that required subgrade soil types are present.

3.6 Special Engineering Features

This section of the rules generally pertains to liners and leachate collection systems, if any are present (none will be).

3.7 Sedimentation and Erosion Control

The sedimentation and erosion control structures described in the **2009 PTC** application have been designed to accommodate the 25-year, 24-hour storm event, per the North Carolina Sedimentation Pollution Control Law (**15A NCAC 04**). A separate plan has been prepared and submitted to the NC DENR Division of Land Resources, Land Quality Section, and is depicted in the construction plan set (see **Drawings E1 and EC2**). Existing sediment basins shall be cleaned out and upgraded as needed.

4.1 General Provisions

This Construction Quality Assurance (CQA) Plan has been prepared to provide the Owner, Engineer, and CQA Testing Firm – operating as a coordinated team – the means to govern the construction quality and to satisfy landfill certification requirements. The CQA program includes both a quantitative testing program (by a third-party) and qualitative evaluations (by all parties) to assure that the construction meets the desired criteria for long-term performance. Variations in material properties and working conditions may require minor modification of handling and placement techniques throughout the project. Close communication between the various parties is paramount. It is anticipated that the early stages of the construction activities will require more attention by the CQA team, i.e., the Contractor, Engineer, Owner and CQA Testing Firm.

The requirements of the CQA program (construction oversight and testing) apply to the preparation of the base grades, embankments, and engineered subgrade, as well as the final cover installation. All lines, grades, and layer thicknesses shall be confirmed by topographic surveys performed under the supervision of the Engineer of Record or the CQA Testing Firm, and as built drawings of the base grades and final cover shall be made part of the construction records. Once the base grade and final cover construction is completed, the Engineer shall verify that all surfaces are vegetated within 20 days following completion of final grades. The Engineer shall also verify that interior slopes and base grades of new cells are protected until waste is placed.

4.1.1 Definitions

4.1.1.1 Construction Quality Assurance (CQA) – In the context of this CQA Plan, Construction Quality Assurance is defined as a planned and systematic program employed by the Owner to assure conformity of base grade and embankment construction and the final cover system installation with the project drawings and specifications. CQA is provided by the CQA Testing Firm as a representative of the Owner and is independent from the Contractor and all manufacturers. The CQA program is designed to provide confidence that the items or services brought to the job meet contractual and regulatory requirements and that the final cover will perform satisfactorily in service.

4.1.1.2 Construction Quality Control (CQC) – Construction Quality Control refers to actions taken by manufacturers, fabricators, installers, and/or the Contractor to ensure that the materials and the workmanship meet the requirements of the project drawings and the project specifications. The manufacturer's specifications and quality control (QC) requirements are included in this CQA Manual by reference only. A complete

updated version of each manufacturer's QC Plan for any Contractor-supplied components shall be incorporated as part of the Contractor's CQC submittal. The Owner and/or the Engineer shall approve the Contractor's QC submittal prior to initial construction. Contractor submittals may be (but us not required to be) incorporated into the final CQA certification document at the Owner's discretion.

4.1.1.3 CQA Certification Document – The Owner and/or the Engineer will prepare a certification document upon completion of construction, or phases of construction. The Owner will submit these documents to the NC DENR Division of Waste Management Solid Waste Section. The CQA certification report will include relevant testing performed by the CQA Testing Firm, including field testing used to verify preliminary test results and/or design assumptions, records of field observations, and documentation of any modifications to the design and/or testing program. An "as-built" drawing (prepared by/for the Owner), showing competed contours, shall be included. The Certification Document may be completed in increments, i.e., as several documents, as respective portions of the final cover are completed. Section 2 of this report discusses the documentation requirements.

4.1.1.4 Discrepancies Between Documents – The Contractor is instructed to bring discrepancies to the attention of the CQA Testing Firm who shall then notify the Owner for resolution. The Owner has the sole authority to determine resolution of discrepancies existing within the Contract Documents (this may also require the approval of State Solid Waste Regulators). Unless otherwise determined by the Owner, the more stringent requirement shall be the controlling resolution.

4.1.2 Responsibilities and Authorities

The parties to Construction Quality Assurance and Quality Control include the Owner, Engineer, Contractor, CQA Testing Firm (i.e., a qualified Soils Laboratory).

4.1.2.1 Owner – The Owner is C&D Landfill, Inc., who operates and is responsible for the facility. The Owner or his designee is responsible for the project and will serve as liaison between the various parties.

4.1.2.2 Engineer – The Engineer (a.k.a. the "Engineer of Record") is responsible for the engineering design, drawings, and project specifications, regulatory affairs, and communications coordinator for the construction of the base grades, embankments, engineered subgrade, drainage and final cover systems. The Engineer represents the Owner and coordinates communications and meetings as outlined in **Section 4.3**. The Engineer shall also be responsible for proper resolution of all quality issues that arise

during construction and appropriate documentation. The Engineer shall prepare the CQA certification documents, with input from the Owner, the CQA Testing Firm, and the Owner's Surveyor. The Engineer shall be registered in the State of North Carolina.

4.1.2.3 Contractor – The Contractor is responsible for the construction of the subgrade, earthwork, and final cover system. The Contractor is responsible for the overall CQC on the project and coordination of submittals to the Engineer. Additional responsibilities of the Contractor include compliance with 15A NCAC 4, i.e., the North Carolina Sedimentation and Erosion Control rules. In the event that the Owner/Operator serves as his own contractor, including performing the work with facility staff, the same CQA requirements are fully in force.

4.1.2.4 CQA Testing Firm – The CQA Testing Firm (a.k.a. Soils Laboratory) is a representative of the Owner, independent from the Contractor, and is responsible for conducting geotechnical tests on conformance samples of soils and aggregates used in structural fills and the final cover system. Periodic site visits shall be coordinated with the Engineer of Record and the Contractor.

4.1.3 Control vs. Records Testing

4.1.3.1 Control Testing – In the context of this CQA plan, Control Tests are those tests performed on a material prior to its actual use in construction to demonstrate that it can meet the requirements of the project plans and specifications. Control Test data may be used by the Engineer as the basis for approving alternative material sources.

4.1.3.2 Record Testing – Record Tests are those tests performed during or after the actual placement of a material to demonstrate that its in-place properties meet or exceed the requirements of the project drawings and specifications.

4.1.4 Modifications and Amendment

This document was prepared by the Engineer to communicate the basic intentions and expectations regarding the quality of materials and workmanship. Certain articles in this document may be revised with input from all parties, if so warranted based on project specific conditions. No modifications will be made without the Engineer's approval. Some modifications may require approval from the Solid Waste Section, especially those that require a deviation from the approved construction plan, e.g., the use of underdrains for controlling unanticipated ground water and/or blasting to remove unanticipated rock within the design subgrades.

4.1.5 Miscellaneous

4.1.5.1 Units – In this CQA Plan, and throughout the plans and specifications for this project, all properties and dimensions are expressed in standard U.S. units.

4.1.5.2 References – This CQA Plan includes references to the most recent version of the test procedures by the American Society of Testing and Materials (ASTM) on **Table 4D**.

4.2 Inspection, Sampling and Testing

The requirements of the General Earthwork (perimeter embankments and subgrade) and Final Cover Systems (soil barrier, vegetative cover, storm water management devices) differ with respect to continuous or intermittent testing and oversight. The following two sections are devoted to the specific requirements of each work task.

4.2.1 General Earthwork

This section outlines the CQA program for structural fill associated with perimeter embankments, including sedimentation basins, and general grading of the subgrade. Issues to be addressed include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.1.1 Compaction Criteria – All material to be used as compacted embankment shall be compacted to a minimum of 95% of the Standard Proctor Maximum Dry Density **(ASTM D-698)**, or as approved by the Engineer or designated QC/QA personnel. Specifically, field observation of the response of soils beneath equipment and the use of a probe rod and/or a penetrometer are other means of determining the adequacy of compaction. Skilled soil technicians working under the supervision of an engineer may make this determination, subject to concurrence by the engineer. Approval is based on visual evaluation for consistency with project specification and objectives. Such material evaluations may be performed either during material handling, i.e., delivery to or upon receipt at the landfill, or from existing stockpiles and/or the soil borrow site. Borrow soils shall be evaluated by the Engineer and QC/QA personnel prior to placement on the work site. All visual inspection and testing shall be documented for the CQA Report. Where permeability is the key parameter of interest, field and/or lab tests will be used.

4.2.1.2 Testing Criteria – Periodic compaction (moisture-density) testing requirements are imposed on the structural fill, although compaction and testing requirements may not be as stringent as that required for the final cover construction. Initial compaction testing shall be in accordance with the project specifications. The Engineer may recommend

alternative compaction testing requirements based on field performance. Additional qualitative evaluations shall be made by the Contractor Superintendent and the Engineer to satisfy the performance criteria for placement of these materials.

CQA monitoring and testing will not be "full-time" on this project. Rather, the CQA Testing Firm will test completed portions of the work at the Contractor's or Owner's request. The CQA Testing Firm may be called upon to test final cover and/or compacted structural fill at any time, ideally scheduling site visits to optimize his efforts. The Engineer will make an inspection at least monthly, more often as needed (anticipated more often in the initial stages of new construction).

4.2.1.3 Material Evaluation – Each load of soil will be examined either at the source, at the stockpile area, or on the working face prior to placement and compaction. Any unsuitable material, i.e., that which contains excess moisture, insufficient moisture, debris or other deleterious material, will be rejected from the working face and routed to another disposal area consistent with its end use. Materials of a marginal natural, i.e., too dry or too wet, may be stockpiled temporarily near the working face for further evaluation by designated QC/QA personnel. The Contractor may blend such materials with other materials (in the event of dryness) or dry the materials (in the event of excess moisture). Soils designated for the upper 2 feet of subgrade within the cell shall consist of ML, MH, CL, CH, SM and mixed SM-ML classifications – this shall be confirmed with lab testing.

4.2.1.4 Subgrade Approval – Designated QC/QA personnel shall verify that the compacted embankment and/or subgrade are constructed in accordance with the project specifications prior to placing subsequent or overlying materials. These activities include an inspection of the subgrade by a qualified engineer, geologist, or soil technician working under the supervision of an engineer, which will examine and classify the soils within the upper two feet beneath the finished subgrade. This may consist of continual observation during placement with confirmatory sampling and laboratory gradation testing at specified intervals, or there may be an exploratory sampling program at some time near the completion of the subgrade with confirmatory testing at specified intervals. The frequency of visual inspection and testing shall conform to **Table 4A**.

4.2.2 General Earthwork Construction

4.2.2.1 Construction Monitoring – The following criteria apply:

A. Earthwork shall be performed as described in the project specifications. The Construction Superintendent has the responsibility of assuring that only select materials are used in the construction, discussed above.

B. Only materials previously approved by the Engineer or his designee shall be used in construction of the compacted embankment. Unsuitable material will be removed and replaced followed by re-evaluation to the satisfaction of the Engineer and retesting, as may be required.

C. All required field density and moisture content tests shall be completed before the overlying lift of soil is placed – as applicable. The surface preparation (e.g. wetting, drying, scarification, compaction etc.) shall be completed before the Engineer (or his designate) will allow placement of subsequent lifts.

D. The CQA Testing Firm and/or the Engineer shall monitor protection of the earthwork, i.e., from erosion or desiccation during and after construction.

4.2.2.2 Control Tests – The control tests, as shown on **Table 4A**, will be performed by the CQA Testing Firm prior to placement of additional compacted embankment.

4.2.2.3 Record Tests – The record tests, as shown on **Table 4A**, will be performed by the CQA Testing Firm during placement of compacted embankment. The CQA Testing Firm may propose and the Engineer may approve an alternative testing frequency. Alternatively, the Engineer may amend the testing frequency, without further approval from the regulatory agency, based on consistent and satisfactory field performance of the materials and the construction techniques.

4.2.2.4 Record Test Failure – Failed tests shall be noted in the construction report, followed by documentation of mitigation. Soils with failing tests shall be evaluated by the Engineer (or his designee), and the soils shall be scarified and recompacted or undercut and replaced; either way requires retesting. The reworking and retesting shall be repeated until the area meets the specifications or to the satisfaction of the Engineer.

4.2.2.5 Judgment Testing – During construction, the frequency of control and/or record testing may be increased at the discretion of the CQA Testing Firm when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas will be considered when:

- Rollers slip during rolling operation;
- Lift thickness is greater than specified;
- Fill material is at an improper moisture content;
- Fewer than the specified number of roller passes is made;
- Dirt-clogged rollers are used to compact the material;

- Rollers may not have used optimum ballast;
- Fill materials differ substantially from those specified; or
- Degree of compaction is doubtful.

4.2.2.6 Deficiencies – The CQA Testing Firm will immediately determine the extent and nature of all defects and deficiencies and report them to the Owner and Engineer. The CQA Testing Firm shall properly document all defects and deficiencies – this shall be more critical on the final cover construction, although this applies to structural fill, as well. The Contractor will correct defects and deficiencies to the satisfaction of the Owner and Engineer. The CQA Testing Firm shall perform retests on repaired defects.

4.2.3 Final Cover Systems

This section outlines the CQA program for piping, drainage aggregate, geotextiles, compacted soil barrier layer, and the vegetative soil layer of the final cover system, and related erosion and sedimentation control activities. Issues include material approval, subgrade approval, field control and record tests, if any, and resolution of problems.

4.2.3.1 Material Approval – The Engineer and/or the CQA Testing Firm shall verify that the following materials (as applicable) are provided and installed in accordance with the project drawings, specifications, and this CQA Manual. In general, the Contractor shall furnished material specification sheets to the Engineer for review and approval. In certain cases, materials furnished by the Contractor may need to meet the Owner's requirements, in which case the Owner shall approve of the materials with the Engineer's concurrence. The materials approval process may involve the submittals furnished by the Owner, in the event that the Owner decides to furnish certain materials.

A. <u>High Density Polyethylene (HDPE) Pipe</u>
   (1) Receipt of Contractor's submittals on HDPE pipe.
   (2) Review manufacturer's submittals for conformity with project specs.

B. <u>Corrugated Polyethylene (CPE) Pipe</u>
   (1) Receipt of Contractor's submittals on CPE pipe.
   (2) Review manufacturer's submittals for conformity with project specs.

C. <u>Aggregates</u> (Verify for each type of aggregate)
   (1) Receipt of Contractor's submittals on aggregates.
   (2) Review manufacturer's submittals for conformity with project specs.
   (3) Verify aggregates in stockpiles or borrow sources conform to project specifications. Certifications from a quarry will be sufficient.
   (4) Perform material evaluations in accordance with **Table 4B**.

D. Vegetative Soil Layer and Drainage Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Review contractor's submittals on seed specifications.

(3) Perform material evaluations in accordance with **Table 4C**.

E. Compacted Barrier Layer

(1) Review manufacturer's submittals for conformity with project specs.

(2) Conduct material control tests in accordance with **Table 4C**.

F. Erosion and Sedimentation Control

(1) Review Contractor's submittals on erosion and sedimentation control items (including rolled erosion control products and silt fence).

(2) Review of submittals for erosion and sedimentation control items for conformity to the project specifications.

(3) Perform visual examination of materials for signs of age or deterioration.

4.2.3.2 Final Cover Systems Installation – The CQA Testing Firm, in conjunction with the Engineer, shall monitor and document the construction of all final cover system components for compliance with the project specifications. Monitoring for the final cover system includes the following:

- Verify location of all piping;
- Assuring sufficient vertical buffer between field equipment and piping;
- Monitor thickness and moisture-density of the final cover layers and verification that equipment does not damage the compacted barrier layer or other components; and
- Assure proper installation of sedimentation and erosion control measures.

4.2.3.3 Deficiencies – The CQA Testing Firm and/or the Engineer shall immediately determine the extent and nature of all defects and deficiencies and report them to the Owner. The CQA Testing Firm and/or the Engineer shall properly document all defects and deficiencies; the Contractor shall make repairs to the satisfaction of the Engineer. The CQA Testing Firm and/or the Engineer shall document all retests on said repairs.

4.3 CQA Meetings

Effective communication is critical toward all parties' understanding of the objectives of the CQA program and in resolving problems that could compromise the ability to meet those objectives. To that end, occasional meetings are essential to establish adequate channels of communication. The frequency of meetings shall be dictated by site conditions and the effectiveness of communication between the parties.

4.3.1 Project Initiation CQA Meeting

A CQA Meeting shall be held at the site prior to placement of the compacted barrier layer. The Engineer, the Contractor, and representatives of the CQA Testing Firm and of the Owner shall attend the meeting. The purpose of this meeting is to coordinate tasks, anticipate problems that might cause construction difficulties or schedule delays; all involved parties shall become familiar with the CQA Manual. During this meeting, the results of prior compaction test data, if any, shall be reviewed; project specific moisture-density relationships and rules regarding testing, repairs, etc., shall be reviewed, along with all of the activities referenced in the project specifications. The Engineer shall document the meeting and transmit minutes to all parties.

4.3.2 CQA Progress Meetings

Progress meetings shall be held between the Engineer, the Contractor, a representative of the CQA Testing Firm, and representatives from any other involved parties. Meeting frequency will be at least once per month during active construction or more often during critical stages (i.e., initial stages of base grading and/or final cover). These meetings will discuss current progress and upcoming activities. The Engineer shall any problems, decisions, or questions arising at this meeting in his periodic reports. Any matter requiring action, which is raised in this meeting, will be reported to the appropriate parties. The Engineer will document these meetings and minutes will be transmitted to interested parties and to a record file.

4.3.3 Problem or Work Deficiency Meetings

A special meeting will be held when and if a problem or deficiency is present or likely to occur. At a minimum, the Engineer, the Contractor, the CQA Testing Firm, and representatives will attend the meeting from any other involved parties. The purpose of the meeting is to define and resolve the problem or work deficiency as follows:

- Define and discuss the problem or deficiency;
- Review alternative solutions; and
- Implement an action plan to resolve the problem or deficiency.

The Engineer will document these meetings and keep a record file.

4.4 Documentation and Reports

An effective CQA plan depends largely on recognition of which construction activities should be monitored and on assigning responsibilities for the monitoring of each required activity. This is most effectively accomplished and verified by the documentation of quality assurance activities. The CQA Testing Firm will provide documentation to address quality assurance requirements. Monitoring will not be continuous and full-time, although the CQA Testing Firm representative (typically this is a Soil Technician) and the Engineer will make frequent and periodic visits to inspect and/or test the work. Both parties shall keep records of their visits and observations.

The Soils Technician will visit the site periodically (e.g., once per week) to document activities during placement of the structural fill and during final cover construction. Site visits by the CQA Testing Firm shall be coordinated between the Contractor and the CQA Testing Firm. The Engineer will make regular site visits during these critical stages to review the work. The Construction Superintendent or his representative shall be present on-site daily and shall keep a record of the general construction progress, noting any problems or inconsistencies that need to be brought to the Owner's attention.

The CQA Testing Firm will provide the Owner (or his designee) with periodic progress reports including signed descriptive remarks, data sheets, and logs to verify that required CQA activities have been carried out. These reports shall also identify potential quality assurance problems. The CQA Testing Firm will also maintain at the job site a complete file of project drawings, reports, project specifications, the CQA Plan, periodic reports, test results and other pertinent documents. The Owner shall keep these records.

4.4.1 Periodic CQA Reports

The CQA Testing Firm representative's reporting procedures will include preparation of a periodic report that will include the following information, where applicable:

- A unique sheet number for cross referencing and document control;
- Date, project name, location, and other identification;
- Data on weather conditions;
- A Site Plan showing all proposed work areas and test locations;
- Descriptions and locations of ongoing construction;
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented;

- Locations where tests and samples were taken;
- A summary of test results as they become available;
- Calibration or recalibration of test equipment, and actions taken as a result of recalibration;
- Off-site materials received, including quality verification documentation;
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality;
- Summaries of pertinent discussions with the Contractor and/or Engineer;
- The Technician's signature.

The periodic report must be completed by the end of each Technician's visit, prior to leaving the site. This information will keep at the Contractor's office and reviewed periodically by the Owner and Engineer. The CQA Testing Firm on a weekly basis should forward copies of the Periodic CQA Reports to the Engineer. The reports and records shall be kept current throughout the construction.

4.4.2 CQA Progress Reports

The Engineer will prepare a summary progress report each month, or at time intervals established at the pre-construction meeting. As a minimum, this report will include the following information, where applicable:

- Date, project name, location, and other information;
- A summary of work activities during the progress reporting period;
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period;
- A summary of all test results, failures and retests, and
- The signature of the Engineer.

The Engineer's progress reports must summarize the major events that occurred during that week. This report shall include input from the Contractor and the CQA Testing Firm. Critical problems that occur shall be communicated verbally to the Engineer immediately (or as appropriate, depending on the nature of the concern) as well as being included in the Periodic CQA Reports.

4.4.3 CQA Photographic Reporting

Photographs shall be taken by the CQA Testing Firm at regular intervals during the construction process and in all areas deemed critical by the CQA Testing Firm. These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. These records will be presented to the Engineer upon completion of the project. Electronic photographs are preferred, in which case the electronic photos should be forwarded to the Engineer (the CQA Testing Firm shall keep copies, as well). In lieu of photographic documentation, videotaping may be used to record work progress, problems, and mitigation activities. The Engineer may require that a portion of the documentation be recorded by photographic means in conjunction with videotaping.

4.4.4 Documentation of Deficiencies

The Owner and Engineer will be made aware of any significant recurring nonconformance with the project specifications. The Engineer will then determine the cause of the non-conformance and recommend appropriate changes in procedures or specification. When this type of evaluation is made, the results will be documented, and the Owner and Engineer will approve any revision to procedures or specifications.

4.4.5 Design and/or Technical Specification Changes

Design and/or project specification changes may be required during construction. In such cases, the Contractor will notify the Engineer and/or the Owner. The Owner will then notify the appropriate agency, if necessary. Design and/or project specification changes will be made only with the written agreement of the Engineer and the Owner, and will take the form of an addendum to the project specifications. All design changes shall include a detail (if necessary) and state which detail it replaces in the plans.

4.5 Final CQA Report

At the completion of each major construction activity at the landfill unit, or at periodic intervals, the CQA Testing Firm will provide final copies of all required forms, observation logs, field and laboratory testing data sheets, sample location plans, etc., in a certified report. Said report shall include summaries of all the data listed above. The Engineer will provide one or more final reports, pertinent to each portion of completed work, which will certify that the work has been performed in compliance with the plans and project technical specifications, and that the supporting documents provide the necessary information.

The Engineer will provide Record Drawings, prepared with input from the Owner's Surveyor, which will include scale drawings depicting the location of the construction and details pertaining to the extent of construction (e.g., depths, plan dimensions, elevations, soil component thicknesses, etc.). All final surveying shall be performed by a licensed surveyor. The items shown below shall be included in the Final CQA Report(s); some items may not be applicable to all stages of the project.

FINAL CQA REPORT GENERAL OUTLINE (FINAL COVER SYSTEM)

1.0 Introduction
2.0 Project Description
3.0 CQA Program
3.1 Scope of Services
3.2 Personnel
4.0 Earthwork CQA
5.0 Final Cover System CQA
6.0 Summary and Conclusions
7.0 Project Certification

Appendices

A Design Clarifications/Modifications
B Photographic Documentation
C CQA Reporting
C1. CQA Reports
C2. CQA Meeting Minutes
D Earthwork CQA Data
D1. CQA Test Results - Control Tests
D2. CQA Test Results - Record Tests
E Final Cover System CQA Data
E1. Manufacturer's Product Data and QC Certificates
E2. CQA Test Results - Drainage Aggregate
E3. CQA Test Results - Vegetative Soil Layer
E4. CQC Test Results - Pressure Testing of HDPE Piping
F Record Drawings
F1. Subgrade As Built
F2. Vegetative Soil Layer As Built

Each CQA report shall bear the signature and seal of the Engineer (or multiple Engineers as applicable), attesting that the construction was completed in accordance with the CQA plan, the conditions of the permit to construct, the requirements of the North Carolina Solid Waste Rules, and acceptable engineering practice.

4.6 Storage of Records

All handwritten data sheet originals, especially those containing signatures, will be stored in a secure location on site. Other reports may be stored by any standard method, which will allow for easy access. All written documents will become property of the Owner.

4.7 Protection of Finished Surfaces

The Owner/Operator shall be responsible for maintaining the finished surfaces, including exterior slope vegetation and drainage conveyances, along with the interior slopes and subgrades. Ground cover shall be established on all finished surfaces shall to prevent erosion, i.e., seeding of the finished surfaces within 20 days, per NC DENR Division of Land Quality rules, or other measures for preventing erosion (e.g., mulch, rain sheets). If finished surfaces within the waste disposal area will be required to sit completed for more than 30 days following completion, the Engineer shall examine the finished surfaces prior to waste disposal and the Owner shall be responsible for any necessary repairs, e.g., erosion that might affect embankment integrity or vertical separation with a subgrade.

TABLE 4A
CQA TESTING SCHEDULE FOR GENERAL EARTHWORK

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
CONTROL TESTS:		
Consistency Evaluation	ASTM D 2488 (visual)[1]	Each Material
RECORD TESTS:		
Lift Thickness	Direct Measure	Each compacted lift
In-Place Density	ASTM D 2922[2]	20,000 ft^2 per lift
Moisture Content	ASTM D 3017[3]	20,000 ft^2 per lift
Subgrade Consistency within the upper 24 inches[4]	Visual	4 tests per acre
Subgrade Consistency within the upper 24 inches[4]	ASTM D 422 ASTM D 4318	1 test per acre

Notes:

1. To be performed by Contractor Superintendent, Engineer, or CQA Testing Firm. Direct measure shall be facilitated with hand auger borings.
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear testing device. ***Minimum required soil density is 95 percent of the standard proctor maximum dry density, which is dependent on the moisture-density characteristic developed for the specific soil during initial construction; lower density or incorrect moisture results in a failed test and the lift must reworked and retested.***

2a. If "beneficial fill" materials are used to construct embankments or structural fill, the Contractor shall spread large particles evenly and fill all voids with finer soil – this is referred to as "choking off" the voids; density testing shall be suspended at the discretion of the Engineer, but judgment testing shall be applied and the use of these materials and evaluation thereof shall be documented as would any other soil placement activity

3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every 10 nuclear density-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Subgrade evaluation shall be conducted via continuous inspection with the indicated testing frequency, in order to evaluate the full 24 inch depth, of an intrusive investigation (e.g., hand auger borings) may be performed after portions of the subgrade are completed with the indicated testing frequency – all testing locations, testing types and test results shall be recorded on a site map and made part of the construction record

TABLE 4B
CQA TESTING SCHEDULE FOR DRAINAGE AND FINAL COVER SOIL

COMPONENT	PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:			
Coarse Aggregate:	Confirm Gradation	Visual	5,000 CY[1]
Vegetative Soil Layer: (In-Situ Verification)	Visual Classification	ASTM D 2488	1 per acre
	Layer Thickness	Direct measure	Survey[4]

Notes:

1. A quarry certification is acceptable for aggregate from a commercial quarry. If a byproduct is used, i.e., crushed concrete aggregate, the gradation test frequency may be adjusted based on project specific conditions. The Engineer shall approve all materials and alternative test frequencies. ***Materials that do not meet relevant ASTM or ASHTO standard gradation specifications (either may be used at the discretion of the Engineer) shall be rejected.***

TABLE 4C
CQA TESTING SCHEDULE FOR FINAL COVER COMPACTED SOIL BARRIER

PROPERTY	TEST METHOD	MINIMUM TEST FREQUENCY
RECORD TESTS:		
Lift Thickness	Direct measure	Survey[4]
Permeability	ASTM D5084[1]	1 per acre per lift
In-Place Density	ASTM D 2922[2]	4 per acre per lift
Moisture Content	ASTM D 3017[3]	4 per acre per lift

Notes:

1. Optionally use ASTM D6391. ***Maximum allowable soil permeability is 1 x 10^{-5} cm/sec; higher permeability results in a failed test and the lift must reworked and retested.***
2. Optionally use ASTM D 1556, ASTM D 2167, or ASTM D 2937. For every 10 nuclear density tests perform at least 1 density test by ASTM D 1556, ASTM D 2167, or ASTM D 2937 as a verification of the accuracy of the nuclear device. ***Minimum required density is dependent on the moisture-density-permeability characteristic developed for the specific soil during initial construction; lower density or incorrect moisture may result in higher permeability. Permeability criteria shall govern the determination of a passing test.***
3. Optionally use ASTM D 2216, ASTM D 4643, or ASTM D 4959. For every ten nuclear-moisture tests, perform at least 1 moisture test by ASTM D 2216, ASTM D 4643, or ASTM D 4959 as a verification of the accuracy of the nuclear testing device.
4. Topographic graphic survey by licensed surveyor

TABLE 4D
REFERENCE LIST OF TEST METHODS

American Society American Society of Testing and Materials (ASTM):

ASTM C 136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
ASTM D 422	Standard Test Method for Particle Size Analysis of Soils.
ASTM D 698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).
ASTM D 1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
ASTM D 2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
ASTM D 2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
ASTM D 2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure).
ASTM D 2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D 2937	Standard Test Method for Density of Soil in Place by the Drive Cylinder Method.
ASTM D 3017	Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).
ASTM D 4318	Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
ASTM D 4643	Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
ASTM D 4959	Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
ASTM D5084	Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
ASTM D 5993	Standard Test Method for Measuring Mass per Unit of Geosynthetic Clay Liners.
ASTM D6391	Standard Test Method for Field Measurement of Hydraulic Conductivity Limits of Porous Materials Using Two Stages of Infiltration from a Borehole
ASTM D 6768	Standard Test Method for Tensile Strength of Geosynthetic Clay Liners.

5.0 GENERAL FACILITY OPERATIONS PLAN (15A NCAC 13B .0542)

5.1 General Conditions

This Operations Plan was prepared for C&D Landfill, Inc., Phase 2 to provide landfill personnel with an understanding of relevant rules and how the Design Engineer assumed that the facility would be operated. While deviations from the operation plan outlined here may be acceptable, significant changes should be reviewed and approved by the Design Engineer and/or regulatory personnel.

5.1.1 Facility Description

The landfill entrance is located at 802 Recycling Lane, accessed from US 264. The scales and office are located near the front gate, which is the only means of accessing the site by the public. After crossing the scales, incoming loads are directed either to the Recycling Yard or to the working face of the C&D disposal unit (see **Drawing S3**).

5.1.2 Geographic Service Area

The current service area authorized by the Pitt County Commissioners includes a multi-county area (see **Section 3.3**). The facility receives C&D from commercial haulers, contractors, and private individuals. The recycling facility and MSW transfer station receive other wastes, which are segregated from the C&D and managed in separate areas. The operator will be responsible for knowing his customer base and waste stream characteristics, such that the approved service area is observed.

5.1.3 Hours of Operation

The landfill is open to the public from 7 AM to 4 PM on Monday – Friday and 7 AM to 12 PM on Saturday. All current operations for the C&D landfill are within those hours, but future recycling activities (not waste acceptance) may occur outside those hours.

5.1.4 Personnel Training and Certification

NC DENR Division of Waste Management rules require that a certified Operator be present on-site at all times during operations. As many of the facility staff as practical will receive Operations Specialist training from a credible organization, e.g., SWANA. Certificates will be posted prominently in the scale house, and certifications will be kept up-to-date.

5.1.5 Utilities

Electrical power, water, telephone, and restrooms are provided at the scale house.

5.1.6 Equipment Requirements

The Facility will maintain on-site equipment required to perform the necessary landfill activities. Periodic maintenance of all equipment and repair work will be performed at designated maintenance zones outside of the landfill and away from water bodies.

5.1.7 Safety

All aspects of the C&D Landfill, Inc., operation were developed with the health and safety of the landfill's operating staff, customers, and neighbors in mind. The Owner or General Manager of the facility is the designated Site Safety Officer and is responsible for the safe operation of the facility in keeping with Occupational Safety and Health Administration (OSHA) requirements. Regular safety meetings shall be conducted.

Safety equipment to be provided includes (at a minimum) equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Landfill personnel will be encouraged to complete the American Red Cross Basic First Aid Course with CPR. Safety for customers will be promoted by the Operator and his staff knowing where the equipment and customer vehicles are moving at all times. Radio communications between the scale house and the field staff will help keep track of the location and movement of customers.

5.2 Contact Information

5.2.1 Emergencies For fire, police, or medical/accident emergencies dial 911.

5.2.2 C&D Landfill, Inc. / EJE Recycling, Inc.

Mr. Judson Whitehurst, Owner
Mr. Wayne Bell, General Manager
802 Recycling Lane — Tel 252-752-8274
Greenville, North Carolina 27834 — Fax 252-752-9016

5.2.3 North Carolina Department of Environment and Natural Resources

Washington Regional Office
943 Washington Square Mall — Tel. 252/946-6481
Washington, NC 27889 — Fax 252/975-3716

5.3 Permitted Activities

The following is a discussion of the permitted solid waste activities at C&D Landfill, Inc. and EJE Recycling, Inc. These facilities are permitted separately, yet the planned C&D recycling activities at the working face of the CDLF Phase 2A and nearby at Phase 2B, appear to overlap some of the recycling activities conducted adjacent to the transfer station. All currently active permits are renewable on a 5-year cycle. A summary of the permitted activities include:

Activities now conducted under **Permit #74-06T (MSW Transfer Station)**:

- Receipt of MSW for transport (limited sorting and recycling)
- Sorting prohibited materials, e.g., pallets, tires, white goods, electronic equipment
- Removal of C&D materials (these are taken to the CDLF)
- Temporary storage of certain wood waste (poles)
- Sorting of recyclable products, e.g., metals and cardboard

Activities now conducted under **Permit #74-07 (CDLF disposal unit)**:

- Disposal of construction and demolition debris
- Disposal of asbestos wastes in a designated area

All activities and areas are accessible only via a single gate and are secure after hours. Each permitted activity is described in brief detail in **Section 5.4**.

5.4 Proposed Activities

5.4.1 Phase 2B Base Grading

The CDLF consists of two unlined disposal areas that are physically separated by a modified natural drainage feature. Phase 2A is an active disposal area, while Phase 2B has not been constructed. Due to relatively shallow ground water conditions, base grades for both cells required up to 4 feet of structural fill, in part for drainage considerations as much as for vertical separation. The request for the PTC for base grading is in the interest of providing vertical separation to the design high ground water levels.

Construction of Phase 2B will be gradual as space is needed for the C&D recycling activities. Only clean fill dirt will be used for base grade construction with appropriate soil testing (refer to the CQA Plan). Staged construction is not atypical for small CDLF facilities, and precedents exist for the planned on-site C&D recycling activities.

Approved storm water control measures will be installed to protect surface water. No waste disposal will occur in Phase 2B until the construction has been certified and the Solid Waste Section has issued a Permit to Operate.

5.4.2 C&D Recycling

The Owners of the facility intend to recycle C&D from the normal waste stream, and perhaps LCID, for making boiler fuel, mulch, and aggregates, with ancillary recycling of metals. An emerging C&D customer base is LEED construction projects, which encourage high recycling percentages. The Owners of the facility are assisting local contractors in meeting their LEED certification goals by accepting C&D waste and recycling as much of the waste stream as practical.

It is anticipated that all intake C&D, processing activities and finished stockpiles will be kept within the Phase 2B footprint on a temporary basis, i.e., no more than a week, which corresponds to the Solid Waste cover requirements for C&D disposal. Recycling activities will be separated from the disposal area by a minimum distance of 50 feet. Should the Owner opt to recycle LCID, the processing area will be separate from the C&D processing facility. No comingling of the C&D and LCID shall occur until the finished product stage, such as aggregates and processed wood wastes.

This activity will not affect the volume of the landfill, the population served or the service area. Recycling will extend the operational life of the landfill, while supporting the regional recycling effort.

5.5 Facility Drawings

A copy of the approved Facility Plan and construction drawings must be kept on-site at all times. Several sets of drawings submitted to various agencies exist, e.g., local government site plan approval, the mining permit application and solid waste applications; revisions have occurred over time. The Engineer should be consulted to resolve conflicts between drawings. The enclosed drawing shows the transfer station, recycling yard, both phases of the CDLF, and layout for the planned recycling activities in Phase 2B.

Within the CDLF, the Owner/Operator shall note the location of areas that have come to final grade and areas that are closed – the map shall be updated continuously and filed with the **Operating Record** (**Section 5.12**). The locations and depths of approved special wastes (i.e., asbestos) shall be noted on the drawings. Soil stockpiles and in-situ reserves are shown on the site plan.

5.6 Staff Responsibilities

Every staff member shall receive instruction on "preventative maintenance" pertaining to ground water and surface water quality, and how to protect these features, in addition to waste acceptance criteria and operational requirements that pertain to each individual's specific duties. The critical importance of preserving environmental quality and maintaining operational compliance should be a topic for discussion at regular staff meetings, along with issues concerning safety and efficient operation of the facility.

Each worker should understand that the overall compliance of the facility affects not only their position at the facility but the future ability to continue operations beyond the next 5-year permit review. All staff should be vigilant about enforcing the waste acceptance policy and to make sure that all aspects of the operation, from mowing the grass to the daily transfer or disposal of waste, are conducted in an environmentally sound manner.

In accordance with **Rule .0542(j)(2)** a trained operator must be on duty at all times when the facility is open to the public and/or when operations are being conducted. All training should be documented and Operator's certifications shall be kept current.

5.7 Inspections and Maintenance

The Operator is responsible for keeping the operations tidy and compliant with regulations pertaining to site security, proper waste coverage, control of windblown debris, all-weather access, and the condition of slopes (vegetation, stability, erosion).

Daily inspection and potential action items include:

- Collection of trash and windblown debris around the scales and buildings,
- Detection of spills or fluid leakage in heavy equipment traffic areas, i.e., access roads, working face, grinding area, active mine, fueling areas,*
- Make sure access roads are passable and free of obstructions,
- Look for smoke, dust, runoff around the CDLF, stockpiles and buildings,
- Check stockpiles for inappropriate materials (remove as needed).

Weekly inspection and potential action items include:

- Check the security of gates, doors, locks and fences,
- Check operation of electronic surveillance and communication equipment,
- Check fire alarms, extinguishers, smoke detectors, and gas detection devices,
- Inspect soil coverage on inactive disposal areas
- Inspect drainage conveyances for excess erosion or sediment build up

Monthly inspection and potential action items include:

- Check closed slopes for cracking, sloughing, bulging, distressed vegetation,
- Check slopes for obvious signs of erosion, basins for excess sedimentation,**
- Inspect the quality of vegetation on closed slopes

Semi-Annual action items include:

- Mow slopes, shoulders, ditches (all disposal units and grounds),
- Clear paths to monitoring locations (wells and surface sampling stations),
- Inspect/clean sediment basins

Annual action items include:

- Topographic survey of active phase of CDLF,
- Remove and distribute any remaining mulch,
- Remove and distribute any stockpiled finished products,
- Staff training.

*All spills or leaks shall be cleaned up promptly, and if a reportable quantity of material is spilt or leaked, regulatory authorities may need to be notified, e.g., NC DENR Division of Water Quality.

**Slopes, channels, and erosion/sedimentation control measures also shall be checked within a 24-hour period following any rainfall event exceeding one-half inch; damage to slopes or measures shall be promptly repaired.

5.8 Access Control

5.8.1 Physical Restraints – The site is accessible by the single entrance gate. All customers and visitors shall check upon arrival; all incoming waste-hauling vehicles shall cross the scales. The entrance gates will be securely locked during non-operating hours.

5.8.2 Security – Frequent inspections of gates and fences will be performed. Evidence of trespassing, vandalism, or illegal operation will be reported to the Owner.

5.8.3 All-Weather Access – The on-site roads will be paved or otherwise hardened and maintained for all-weather access.

5.8.4 Traffic – The Operator shall direct traffic to a waiting area, if needed, and onto the working face with safe access to an unloading site is available. Once a load is emptied, the delivery vehicle will leave the working face immediately.

5.8.5 Anti-Scavenging Policy – The removal of previously deposited waste by members of the public (or the landfill staff) is strictly prohibited by the Division for safety reasons. The Operator shall enforce this mandate and discourage loitering after a vehicle is unloaded. No persons that are not affiliated with the landfill or having business at the facility (i.e., customers) shall be allowed onto or near the working face.

5.8.6 Signage - A prominent sign containing the information required by the Division shall be placed just inside the main gate. This sign will provide information on operating hours, operating procedures, and acceptable wastes. Additional signage will be provided within the landfill complex to distinctly distinguish access routes. Restricted access areas will be clearly marked and barriers (e.g., traffic cones, barrels, etc.) will be used.

5.8.7 Communications – Visual and radio communications will be maintained between the C&D landfill and the landfill scale house and field operators. The scale house has telephones in case of emergency and for the conduct of day-to-day business. Emergency telephone numbers are displayed in the scale house.

5.9 Fire and Safety

5.9.1 Fire Prevention – Measures shall be taken to prevent fires in the raw materials and finished goods stockpiles in the processing facility. Stockpiles (and the disposal area) shall be inspected daily for signs of smoke or combustion. The piles shall be separated by a minimum distance of 25 feet for access. At a minimum, any accumulated piles of combustible materials shall be limited to 6,000 c.y. in size and turned on a quarterly basis or when dictated by temperature. The piles shall be monitored for dryness and temperature – a temperature probe shall be acquired and kept in the office – maximum allowable temperatures shall be 120 degrees Fahrenheit.

Fire Control – Fires in landfills and stockpiles (especially LCID facilities) have been a regulatory concern of recent times. The possibility of fire within the landfill or a piece of equipment must be anticipated in the daily operation of the landfill. A combination of factory installed fire suppression systems and/or portable fire extinguishers shall be operational on all heavy pieces of equipment at all times. Brush fires of within the waste may be smothered with soil, if combating the fire poses no danger to the staff. The use of water to combat the fire is allowable, but soil is preferable. For larger or more serious fire outbreaks, the local fire department will respond. In the event of any size fire at the facility, the Owner shall contact NC DENR Division Waste Management personnel within 24 hours and complete a **Fire Notification Form** (**Appendix 4C**) within 15 days, which will be placed in the **Operating Record.**

5.9.2 Personal Safety – Safety is a key concern with the operation of this facility. All aspects of operation were planned with the health and safety of the landfill's operating staff, customers, and neighbors in mind. Prior to commencing operations, a member of the management staff will be designated as Site Safety Officer. This individual, together with the Facility's management will modify the site safety and emergency response program as needed to comply with National Solid Waste Management Association and Occupational Safety and Health Administration (OSHA) guidance. Staff safety meetings (minimum one per month) shall be conducted. Safety equipment to be provided includes (at a minimum) equipment rollover protective cabs, seat belts, audible reverse warning devices, hard hats, safety shoes, and first aid kits. Field operators will be encouraged to complete the American Red Cross Basic First Aid Course with CPR.

The working face of a landfill is an inherently dangerous place due to the movement of heavy equipment, steep slopes, obstacles to pedestrian movement and sometimes poor visibility (e.g., backing up equipment). These considerations are also a concern for the sorting and grinding operations, as well as the concern for flying debris that can be ejected from a tub grinder. Safety for customers will be promoted by the Operator and his staff knowing where the equipment and customer vehicles are moving at all times. Radio communications between the scale house and the field staff will help keep track of the location and movement of customers.

The recycling areas (C&D and LCID) shall be located no closer than 50 feet to the working face of the CDLF disposal unit. Signs, fences and/or physical barriers will be used to separate public access areas from the working face of the CDLF and the waste processing areas (sorting, grinding, etc.) – activities that could endanger the public shall not be conducted when non-employees are present. Vehicles transporting waste to the facility and/or the general public shall not have access to the working face. Children under the age of 16 shall not be allowed in the facility. If waste processing and loading is to be conducted after dark, appropriate lighting shall be provided. No unloading, grinding or disposal activities shall be conducted after dark.

5.10 Other Regulatory Requirements

5.10.1 Sedimentation and Erosion Control – All aspects of the facility operation are subject to the requirements of **15A NCAC 4**, the Sedimentation and Erosion Control rules. Runoff measures were designed in accordance with this rule and approved by the NC DENR Division of Land Resources, Land Quality Section, as a condition of the mining permit. Approved S&EC measures shall be installed and maintained throughout the operational life of the facility and into the post-closure period (see **Closure/Post**

Closure Plan, Section 8.0). Measures to curtail erosion include vegetative cover and woody mulch as ground cover. Measures to control sedimentation include stone check dams in surface ditches, sediment traps and basins. All exposed soils, regardless of whether they are inside or outside the disposal area, should be covered within 20 days after any given area is brought to final grade.

5.10.2 Storm Water Management – The transfer station is covered by NC DENR **Storm Water General Permit, *Certification No. NCG130059***. As of August 1, 2013 the storm water permits are administered by the Division of Energy, Mineral, and Land Resources, Land Quality Section (no longer by the Division of Water Quality). Compliance with the provisions of the permit – and the monitoring requirements – is required. A **Storm Water Pollution Prevention Plan** was prepared for the facility, in accordance with the General Permit, which shall be observed and incorporated into the daily operation of the facility. Steps to protect water quality include diverting surface water ("run-on") away from the disposal area, allowing no impounded water inside the disposal area, and avoiding the placement of solid waste into standing water.

The landfill is not required to have a separate storm water certification; however the facility is obligated by law not to discharge pollutants into the waters of the United States (i.e. surface streams and wetlands). Land Quality requirements for protective measures for storm water management are adequate for storm water quality. The measures and slopes should be inspected frequently, at least weekly if rainfall occurs, and following any significant storm event. Maintenance should be performed on small problems before they become big problems. Any conditions the Operator suspects might constitute a discharge should be mitigated immediately, and appropriate agencies and the Engineer should be contacted.

5.11 Miscellaneous Requirements

5.11.1 Minimizing Surface Water Contact – Protection of water quality is a key interest in the operation of this facility. Although C&D wastes are typically inert, there can be chemical residues present in the C&D (e.g., solvents) that can mobilize upon contact with water – i.e., leachate generation – and which can enter the environment via storm water runoff. This tends to be more prevalent when the wastes are processed (sorted and ground) due to increased surface area available to contact the water source and increased exposure to ambient conditions.

Whereas the tipping and processing areas will be uncovered, the C&D processing facility shall not be operated during rain events in order to minimize contact between the waste and surface water, thus minimizing leachate generation. Activities pertaining to the

processing facility should be scheduled to accommodate the weather forecast. During periods of light rain unloading may occur and sorting operations may occur if no runoff is visible, but no grinding shall occur. During heavy rain (with visible runoff) or periods of high wind the incoming (unprocessed) materials shall be stockpiled and covered with tarps (secured against wind) or incorporated into the working face to minimize contact with water. Processed materials (including source-sorted loads) shall be placed in appropriate (covered) containers – i.e., transport trailers or roll-off boxes.

5.11.2 Processing Facility Operation over the CDLF – The Processing Facility (tipping, sorting, loading) activities will move within the C&D footprint to be near the working face of the CDLF unit, albeit a safe distance shall be maintained – minimum of 50 feet – to promote safety of workers and the public (**Section 5.9.2**). At some time it may advantageous to locate the Processing Facility atop an inactive portion of the CDLF unit. When the Processing Facility is to be operated over an inactive portion of the CDLF, a soil pad with a minimum thickness of 2 feet shall be placed beneath the processing facility operational area (including the tipping and grinding areas), in addition to the interim soil cover that might already be present (see **Section 7.4.2**).

The purpose of the supplemental operating soil pad is to protect the underlying wastes – and water quality – against possible spills, leaks and/or the introduction of non-compliant materials (liquids) that might escape detection in the preliminary screening. The soil pad serves as a sorbent layer that can be removed in the case of an incident, minimizing the chance of the incident affecting the ground water or surface water monitoring system, and maintaining adequate coverage for the underlying wastes. The soil pad may be removed at the end of the processing operation and/or prior to placement of final cover and/or additional waste disposal.

5.11.3 Equipment Maintenance – Facility equipment consists of a variety of excavators, loaders, dozers, dump trucks, and specialized equipment, e.g., a tub grinder for LCID and a separate grinder with power screens for aggregates. Most of the equipment is used in the normal course of mining operations. The Owner represents that he has sufficient resources to provide and maintain the needed equipment to operate the facility. A maintenance schedule for the facility equipment is beyond the scope of this Operations Plan. The Operator (or his designee) should develop a routine equipment maintenance program to assure reliable operation and to lessen the likelihood of fluid spills or leaks.

Fuel and lubricants shall be stored under covers and/or with secondary containment systems that are separate from the principle storm water drainage systems at all times.

Care shall be taken when servicing or fueling equipment to prevent spills. Driveways, shop areas and all operations areas where heavy equipment is working shall be inspected daily for signs of spills and leaks. Equipment should be parked overnight and serviced in designated areas with separate berms and/or runoff controls that will not discharge to the facility storm water management systems or into the environment. Care shall be taken not to allow any hazardous substance to enter the surface water or ground water, including (but not limited to) fuel, oil, hydraulic fluid, pesticides, and herbicides.

5.11.4 Utilities – Electrical power, water, telephone, and restrooms will be provided at the scale house. Other sanitary facilities shall be provided for the field staff, as needed. Two-way radios or cell phones shall be provided to the field staff for communication with the scale house. Portable light plants may be required to promote safe operation of the processing facility in the late afternoon or evening.

5.11.5 Vector Control – Steps shall be taken to discourage disease carrying vectors at the landfill (e.g., birds, rodents, dogs, mosquitoes). The C&D wastes should be mostly inert (subject to the waste screening procedures) and not attractive to animals. Care should be taken to avoid pools of standing water in and around the disposal area.

5.11.6 Air Quality Criteria

Dust Control – Measures shall be taken to control dust from the operations. Dusty wastes shall be covered immediately with soil, and water shall be sprinkled on roads and other exposed surfaces (including operational cover and/or the working face, as needed) to control dust. Disposal activities may need to be suspended during high winds

Open Burning – No open burning of any waste shall be allowed.

State Implementation Plan – Compliance with the State Implementation Plan (SIP) for air quality under Section 110 of the Clean Air Act, as required by the 2006 Solid Waste Rules, is demonstrated with the following discussion. Typically, the SIP focuses on industries with air permits and activities that have regulated emissions, which contribute to unhealthy levels of ozone (NOx , SO_4, VOC's), particularly coal combustion plants (electric power) and other "smokestack" industries. Compliance with the spirit of the SIP is demonstrated by the prohibition of combustion of solid waste, the fact that the wastes are generally inert and do not emit sufficient quantities of landfill gas to require active controls (such as flaring), and the current status of the regional attainment.

The facility is not currently located in a designated area of non-attainment for ozone and/or fine particle emissions (e.g., VOC's, NOx), designation based on NCDENR Division of Air Quality (DAQ) web site information.

Based on information presented prior years concerning the possibility of certain areas of the state becoming designated as non-attainment areas for ozone, it does not appear that a non-attainment designation would affect existing facilities – more stringent regulation might be expected on future industrial locations in the region – and the three-year data that lead to this consideration is above the US-EPA's current threshold for attainment. State-wide, ozone monitoring data show general improvement since the implementation of the "clean smokestacks" legislation, and if the next few months show continued improvement, US-EPA may not impose the non-attainment designation.[1] This leads to a conclusion that the facility is not contributing to an existing non-attainment condition in the local area, nor is it likely to in the future.

Nonetheless, proactive steps that can be taken at the facility include dust control measures (see below) to minimize airborne particle emissions, minimizing the idling time on trucks and equipment, keeping mechanized equipment in good operating condition, and the use of low-sulfur fuels, subject to availability. Adherence to the waste acceptance criteria will minimize VOC emissions. Regular application of periodic cover (in accordance with Solid Waste regulations) will reduce the risk of fires and curtail wind-blown debris; the proper use of vegetative cover will further minimize fugitive emissions of dust and particulates.

5.11.7 Litter Control – Appropriate measures will be taken to control trash and windblown debris within and around the facility. The site and entrance will be policed for litter on a regular basis and such materials will be collected and disposed of properly.

5.12 Operating Record

The **Operating Record** shall consist of one or more files, notebooks, or computerized records and associated maps that document the day-to-day facility operations, including the waste intake and sources, transfer records, routine waste placement, cover, and closure activities (for the CDLF), and routine or special maintenance requirements and follow up activities. The following records shall be maintained:

A Daily tonnage records - including source of generation

[1] Tom Mather, Public Information Officer, NC DENR DAQ, personal communication (2-12-09)

B Tonnage and type of recycled materials shipped offsite

C Facility map, tracking the current location of waste placement activities, interim closure and completed final closure activities – including the date and time of placement of cover material;

D Waste inspection records (on designated forms); fire notification forms;

E Quantity, location of disposal, generator, and special handling procedures employed for all special wastes disposed of at the site;

F Generators or haulers that have attempted to dispose of restricted wastes;

G Employee training procedures and records of training completed;

H Ground water quality monitoring information including:

1. Copy of the current **Sampling and Analysis Plan** (**Monitoring Plan**)
2. Monitoring well construction records
3. Sampling reports with statistical analyses
4. Records of inspections, repairs, etc.

I Closure and post-closure information, where applicable, including:

1. Testing
2. Certification
3. Completion records;

J Cost estimates for financial assurance documentation;

K Annual topographic survey of the active disposal phase;

L Records of operational problems or repairs needed at the facility, e.g., slope maintenance, upkeep of SE&C measures, other structures;

M Equipment maintenance records;

N Daily rainfall records (via on-site rain gauge);

O Landfill gas monitoring information:

1. Quarterly methane monitoring records
2. Landfill Gas Monitoring and Control Plan;

P Updated Financial Assurance Documentation;

Q Compliance Audit Records (by the Solid Waste Section) and documentation of follow up measures to ensure compliance;

R Copies of the Operation Plan, Closure and Post Closure Plan, Sediment and Erosion Control Plan, Construction Drawings, Storm Water Pollution Prevention Plan, Storm Water General Permit Certificate of Coverage, and Solid Waste Permit

The Owner or his designee will keep the **Operating Record** up to date. Daily logbooks or computerized files may be used for some items. Records shall be presented upon request to DWM for inspection. A copy of this **Operations Plan** shall be kept at the landfill and will be available for use at all times, along with the **Closure/Post-Closure Plan** and the **Monitoring Plan**.

5.13 Annual Report

The facility shall file an annual report with the NC DENR Division of Waste Management by August 1 of each year, detailing the activities for the preceding July 1 through June 30. Records shall be kept pertaining to the types and amounts of wastes received, as well as the types and amounts of materials reused, recycled, and distributed; material quantities shall be reported annually in tons. An annual survey is required to determine slope, height, and volume consumed (see **Section 7.5**). This survey shall be prepared a licensed surveyor. In addition, the Storm Water General Permit, issued by NC DENR Division of Waste Quality, has an annual sampling and reporting requirement.

5.14 Contingency Plan

5.14.1 Hot Loads Contingency – In the event of a "hot" load attempting to enter the landfill, the scale house staff will turn away all trucks containing waste that is suspected to be hot, unless there is imminent danger to the driver. The vehicle will be isolated away from structures and other traffic and the fire department will be called. The vehicle will not be allowed to unload until the fire is out. If a hot load is detected on the working face, then the load will be treated as a fire condition (see **Section 5.9**), whereas the load will be spread as thin as possible and cover soil will be immediately placed on the waste to extinguish the fire. Other traffic will be redirected to another tipping area (away from the fire), or other waste deliveries may be suspended until the fire is out. The fire will be monitored to ensure it does not spread. If the fire cannot be controlled, the fire department will be notified and the area cleared of non-essential personnel.

5.14.2 Hazardous Waste Contingency – In the event that identifiable hazardous waste or waste of questionable character is detected at the scales or in the landfill, appropriate protective equipment, personnel, and materials will be employed as necessary to protect the staff and public. Hazardous waste identification may be based on (but not limited to) strong odors, fumes or vapors, unusual colors or appearance (e.g., liquids), smoke, flame, or excess dust.

The fire department will be called immediately in the event a hazardous material is detected. An attempt will be made to isolate the wastes in a designated area where runoff is controlled, preferably prior to unloading, and the vicinity will be cleared of personnel until trained emergency personnel (fire or haz-mat) take control of the scene. Staff will act prudently to protect personnel but no attempt will be made to remove the material until trained personnel arrive. A partial listing of regional **Hazardous Waste Responders** and disposal firms is found in **Appendix 4B**.

The Operator will notify the Division (see **Section 5.2.3**) that an attempt was made to dispose of hazardous waste at the landfill. If the vehicle attempting disposal of such waste is known, attempts will be made to prevent that vehicle from leaving the site until it is identified (license tag, truck number driver and/or company information) or, if the vehicle leaves the site, immediate notice will be served on the owner of the vehicle that hazardous waste, for which they have responsibility, has been disposed of at the landfill.

The landfill staff will assist the Division as necessary and appropriate in the removal and disposition of the hazardous waste (acting under qualified supervision) and in the prosecution of responsible parties. If needed, the hazardous waste will be covered with on-site soils, tarps, or other covering until such time when an appropriate method can be implemented to properly handle the waste. The cost of the removal and disposing of the hazardous waste will be charged to the owner of the vehicle involved. Any vehicle owner or operator who knowingly dumps hazardous waste in the landfill may be barred from using the landfill or reported to law enforcement authorities.

Any hazardous waste found at the scales or in the landfill that requires mitigation under this plan shall be documented by staff using the **Waste Screening Form** provided in **Appendix 4B**. Records of information gathered as part of the waste screening programs will be placed in the **Operating Record** and maintained throughout the operational life of the facility.

5.14.3 Severe Weather Contingency – Unusual weather conditions can directly affect the operation of the landfill. In all circumstances, the safety of personnel at the landfill is of primary importance. The Owner/Operator should monitor weather forecasts and be prepared in advance to the extent possible to prevent harm and to minimize disruption to the operation. Some of the commonly anticipated weather conditions and recommended responses are as follows:

5.14.3.1 Ice Storms – Access and personal safety issues are or primary concern. Operations should be suspended until the roads are passable.

5.14.3.2 Heavy Rains – Erosion of slopes and runoff conveyances and access problems are of primary concern, in additional to personal safety. Preventative measures include proper drainage control and maintenance of access roads for all-weather access. Operations should be suspended during heavy rain. After a rain event, inspection and corrective measures should be implemented immediately. No grading of exterior slopes should be undertaken until the soils dry out.

5.14.3.3 Electrical Storms – Personal safety is the primary concern. Operations should be suspended if lightning or thunder is detected. Field personnel should seek refuge in buildings or in rubber-tire vehicles.

5.14.3.4 Windy Conditions – Windblown debris is the concern, typically restricted to paper and plastic litter, but larger objects have been known to blow in extreme circumstances, thus creating a safety hazard. Operations should be suspended and the working face secured if blowing debris becomes a danger.

5.14.3.5 Violent Storms – Major weather events, e.g., hurricane, tornado, or winter storm, could pose any or all of the anticipated hazards. In the event of a warning issued by the National Weather Service, landfill operations should be temporarily suspended until the warning is lifted. The waste should be covered and buildings and equipment should be properly secured. In the event of eminent danger to personnel, safety shall take precedence over all other concerns.

6.0 C&D RECYCLING OPERATIONS PLAN (15A NCAC 13B .0542)

6.1 Overview

This section describes the general waste intake and handling operations for the Processing (Recycling) facility. These protocols shall be followed, regardless of whether the material is brought to the facility by private contractors or the general public.

6.2 Acceptable Wastes

The Facility shall only accept these waste types generated within approved service area:

- **Construction Debris**: Unpainted and untreated wood, plywood, particle board, hardboard, gypsum board, siding, flooring, shingles, etc., from new residential or commercial construction;
- **Demolition Debris**: Concrete, brick, block and asphalt will be accepted; unpainted and untreated wood, roofing, insulation, piping, wallboard, siding, etc., from residential and commercial remodeling, repair, or demolition operations, will be accepted *after the Facility produces certificates of training for the staff* pertaining to the identification and safe handling of hazardous materials (e.g., asbestos, lead paint)
- **Land Clearing and Inert Debris**: Stumps, trees, limbs, brush, other vegetation, concrete, brick, concrete block, clean soils and rock, untreated/unpainted wood, etc.;

6.3 Prohibited Wastes

No municipal solid waste (MSW), hazardous waste as defined by **15A NCAC 13A .0102**, including hazardous waste from conditionally exempt small quantity generators (CESQG waste), or liquid waste will be accepted at this facility. In addition, no tires, batteries, polychlorinated biphenyl (PCB) waste, electronic devices (computer monitors), or mercury switches and fluorescent lamps will be accepted. Animal carcasses will not be accepted. No oils, grease, solvents, or fluids of any kind will be accepted, nor will bagged wastes or any putrescible or household wastes. A partial listing of prohibited wastes is presented on **Table 1** following this section.

6.4 Waste Processing

In order to assure that no prohibited waste enters the Facility, a waste screening program will be implemented (see **Section 6.4.1**). Waste received at the scale house will be inspected by trained personnel. These individuals will be trained to spot indications of suspicious wastes, including: hazardous material placards or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and

"chemical" odors. Screening programs for visual and olfactory characteristics of prohibited wastes will be an ongoing part of the Facility operation.

6.4.1 Waste Receiving and Screening

All incoming vehicles must stop at the scale house located near the entrance of the facility, and visitors are required to sign-in. All waste transportation vehicles shall be uncovered prior to entering the scales to facilitate inspection; all incoming loads shall be weighed and the content of the load assessed. The attendant shall request from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the Facility. Signs informing users of the acceptable and unacceptable types of waste shall be posted near the facility entrance. The attendant shall visually check the vehicle as it crosses the scale. Suspicious loads will be pulled aside for inspection prior to leaving the scale area. Loads with unacceptable materials or wastes generated from outside of the service area will be directed to the nearby Transfer Station.

Once passing the scales, incoming transport vehicles will be routed to the tipping area for unloading, inspection, sorting and appropriate processing, depending on the nature of the load – C&D and LCID materials will go to separate areas (**Sections 6.4.2** and **6.4.3**).

Incoming vehicles shall be selected at random for screening a minimum of three times per week. The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver's responses to interrogation about the load content. Vehicles selected for inspection shall be directed to an isolated area away from the stockpile of materials to be stockpiled, where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify unacceptable wastes shall inspect the waste, using the **Waste Screening Form** (**Appendix 4A**) to document the waste screening activity. After the waste screening inspection of a load, one of the following activities will occur:

- If no unacceptable waste is found, the load will be pushed to the active recycling area and processed with the remainder of the day's intake.
- If unacceptable materials are found, the entire load will be isolated and secured via soil berms or barricades, then loaded into roll-off boxes, or
- Non-hazardous materials will be reloaded onto the delivery vehicle for removal from the facility – the hauler will be escorted to the MSW Transfer Station;
- If hazardous materials are detected, the **Hazardous Waste Contingency Plan** outlined in **Section 5.14** will be followed.

The hauler will be responsible for removing unacceptable waste from the Facility. The rejection of the load shall be noted on the Waste Screening Form, along with the identification of the driver and vehicle. A responsible party to the load generator or hauler shall be notified that the load was rejected. The generator or hauler may be targeted for more frequent waste screening and/or banished from delivering to the facility, depending on the nature of the violation of the waste acceptance policy. State and County authorities may be notified of severe or repeat offenders.

6.4.2 LCID Processing

The Facility may recycle LCID to make mulch, boiler fuel, and aggregates. Future LCID waste intake generally will consist of brush, limbs, tree trunks, stumps, leaves, dirt, inert debris, and other materials defined as LCID by the NC DENR Solid Waste rules. LCID materials will be stockpiled and processed via shredding or grinding within the approved CDLF footprint separate from working face. Some LCID materials may be combined with similar C&D materials post-processing – e.g., wood wastes that can be ground into boiler fuel and inert debris that can be processed into aggregates. LCID materials will not be commingled with other materials prior to processing.

6.4.3 C&D Processing

The Facility may recycle C&D wastes aggregates, boiler fuel, mulch, and beneficial fill. Typically, C&D materials are anticipated to arrive source-sorted, having been transported by an affiliated hauler, but some private hauling will occur. Sorting will take place at least 50 feet from the CDLF working face, with appropriate runoff controls and S&EC measures in place. The sorted materials will be redirected to appropriate stockpiles and/or roll-off boxes and temporarily stored for further processing. Non-recyclable C&D materials will be pushed into the CDLF working face (**Section 7.0**). Co-mingling interim stage processed materials from the C&D and LCID waste streams will NOT be allowed – separate stockpiles or containers will be maintained. All materials will be strictly accounted for, including those in various stages of processing, stockpiled finished goods, on-site beneficial-use materials and/or distribution off-site.

6.4.4 Disposal of Rejected Wastes

All waste loads will be inspected upon arrival, in order to reject inappropriate material before it is unloaded or such that it can be reloaded onto the transport vehicle and sent to an appropriate facility. One or more roll-off boxes will be kept on-site for disposal of any "reject" materials that are found in the waste during material sorting, e.g., small

quantities of garbage (chiefly food containers), plastic packaging, paint cans, insulation, carpet, etc. Such "rejects" will be placed into the roll-off boxes and removed from the processing area to the Transfer Station. The roll-off boxes will be removed on a weekly basis. The number of roll-off boxes required will depend on the market trends; A-1 and affiliated businesses own an ample supply of roll-off boxes

6.4.5 Processing of Finishing Goods

Processing activities shall be limited to grinding, shredding, or chipping land clearing debris, unpainted/untreated wood waste (including pallets and new construction waste), and certain engineered wood products (plywood, particle board), to make boiler fuel or mulch (but not compost). Inert materials will be processed and recycled into aggregates. The operation of the Processing Facility will include the following:

- Processed LCID and sorted C&D (raw materials) will be stockpiled temporarily in the designated adjacent to the working face.
- Woody materials suitable for making mulch and/or boiler fuel (including pallets) will be ground or shredded and stored in over-the-road shipping containers.
- Earthen inert materials (dirt, rocks, concrete debris) suitable for "beneficial fill" and/or for processing into aggregates, will be ground or shredded and stockpiled.
- Metals will be placed in roll-off boxes and kept clean and ready to haul to off-site recycling operations until a full load is reached.

The Owner intends to process incoming material and remove sorted materials from the tipping area to covered bins or stockpiles by the end of each working day. Plans are to move the finished materials off-site or use them in the mine reclamation activities on a quarterly (or more frequent) basis. If the stockpiles of finished products must remain on site for longer periods of time, these materials will be wetted and turned quarterly as needed, to prevent composting and/or fires (see **Section 5.9**).

6.4.6 Maximum Stockpile Size

Maximum volumes of processed and raw materials to be stored in stockpiles at the processing facility (for those materials not stored in roll-off boxes) shall be 6000 cy – this is consistent with Solid Waste Sections rules and guidelines for "notification" stockpiles, e.g., LCID stockpiles. The following table provides guidance for determining the maximum allowable stockpile dimensions to meet this requirement at various heights with 2H:1V maximum side slope ratios. The selection of maximum size of stockpile needs to incorporate the factors of safe operation, storage, and fire prevention.

Height of Pile, ft	Top of Pile Diameter, ft	Bottom of Pile Diameter, ft	Average Cross Section Area, sf	Volume, cy
20	20	100	60	2,093
20	40	80	80	3,721
25	20	120	70	3,562
25	40	140	90	5,887
30	20	140	80	5,582

6.4.7 Maximum Processed Material Storage Volumes

Tentative estimates of maximum stored volumes of various materials such as aggregates, boiler fuel and mulch (described in **Sections 6.4.2** and **6.4.3**) and rejected materials (**Section 6.4.4**) are as follows. These bulky materials will be stockpiled, except the rejects. It should be realized that the finished goods are marketable commodities and will have market value, as well as being relatively easy to move. The facility is located across from a MSW Transfer Station that will be the destination for reject materials (those that cannot be disposed in the on-site landfill). Once the operations are underway, more specific volume determinations can be made – these numbers are tentative estimates.

Aggregate (recycled concrete)	2,000 cy
Boiler Fuel	4,000 cy
Mulch	4,000 cy
Reject Materials (roll-off boxes)	200 cy

6.5 Contingency Plan

Refer to **Section 5.14**

6.6 Annual Reporting

Refer to **Sections 5.12** and **5.13**

Table 6
Prohibited Wastes at the Processing Facility*

- Putrescible wastes (garbage and/or food wastes)
- Demolition Wastes
- Hazardous wastes: Pesticides
  Herbicides
  Used motor oil
  Antifreeze
  Solvents
  Paint thinners
- Hazardous materials as defined by 15A NCAC 13A
- Radioactive materials
- Lead acid batteries
- Regulated medical wastes
- Polychlorinated biphenyls (PCB) wastes
- All sludges except sludge from water treatment plants
- White Goods
- Liquid wastes
- Animal carcasses
- Asbestos wastes
- Yard Wastes
- Tires

*References: 15A NCAC 13B .0103
15A NCAC 13B .1626

7.1 Waste Acceptance Criteria

7.1.1 Permitted Wastes

The C&D Landfill shall only accept (for disposal) the following wastes generated within approved areas of service:

- Construction and Demolition Debris Waste: materials derived from construction, remodeling, repair, or demolition operations on pavement or other structures;
- Land Clearing and Inert Debris Waste: yard waste, stumps, trees, limbs, brush, grass, concrete, brick, concrete block, uncontaminated soils and rock, untreated and unpainted wood, etc.;
- Other Wastes as approved by the NC DENR Solid Waste Section.

7.1.2 Asbestos

A-1 Sandrock may dispose of asbestos within the C&D landfill, or within a special designated area, only if the asbestos has been processed and packaged in accordance with State and Federal (40 CFR 61) regulations. Handling asbestos requires advance arrangements between the hauler and the landfill and special placement techniques (see (**Section 7.3.5**).

7.1.3 Wastewater Treatment Sludge

Sludge of any kind may **not** be disposed in the C&D Landfill, per Division rules. Waste Water Treatment Plant sludge may be used as a soil conditioner to enhance the final cover, upon receipt of permission from the Division, to be applied at agronomic rates.

7.2 Waste Exclusions

No municipal solid waste (MSW), hazardous waste as defined by 15A NCAC 13A .0102, or hazardous waste from conditionally exempt small quantity generators (CESQG waste), sludges or liquid wastes will be accepted. No drums or industrial wastes shall be accepted. No tires, batteries, polychlorinated biphenyl (PCB), electronic devices (computer monitors), medical wastes, radioactive wastes, septage, white goods, yard trash, fluorescent lamps, mercury switches, lead roofing materials, transformers, or CCA treated wood shall be accepted.

No pulverized or shredded C&D wastes may be accepted, except those materials received and inspected in a whole condition and shredded on-site. The Facility will implement a waste-screening program, described in **Section 7.3** below, to control these types of waste. **Solid Waste Rule .0542 (e)** contains further exclusions (see **Table 2**).

7.3 Waste Handling Procedures

In order to assure that prohibited wastes are not entering the landfill facility, screening programs have been implemented at the landfill. Waste received at both the scale house entrance and waste taken to the working face is inspected by trained personnel. These individuals have been trained to spot indications of suspicious wastes, including: hazardous placards or markings, liquids, powders or dusts, sludges, bright or unusual colors, drums or commercial size containers, and "chemical" odors. Screening programs for visual and olfactory characteristics are an ongoing part of the landfill operation.

7.3.1 Waste Receiving and Inspection

All incoming vehicles must stop at the scale house located near the entrance of the facility, and visitors are required to sign-in. All waste transportation vehicles shall be uncovered prior to entering the scales to facilitate inspection; all incoming loads shall be weighed and the content of the load assessed. The scale attendant shall request from the driver of the vehicle a description of the waste it is carrying to ensure that unacceptable waste is not allowed into the landfill.

Signs informing users of the acceptable and unacceptable types of waste shall be posted at the entrance near the scale house. The scales attendant shall visually check the vehicle as it crosses the scale. Any suspicious loads will be pulled aside for a more detailed inspection prior to leaving the scale house area. Loads with unacceptable materials will be required to be covered (with a tarp) and turned away from the facility. Wastes from outside of the service area will be rejected.

Once passing the scales, the vehicles containing C&D wastes are routed to the working face. Vehicles shall be selected for random screening a minimum of three times per week. The selection of vehicles for screening might be based on unfamiliarity with the vehicle/driver or based on the driver's responses to interrogation about the load content. The Operator shall use the **Waste Screening Form** (see **Appendix 4A**) to document the waste screening activities. Completion of three random waste screenings reports shall be placed in the Operations Record.

Selected vehicles shall be directed to an area of intermediate cover adjacent to the working face where the vehicle will be unloaded and the waste shall be carefully spread using suitable equipment. An attendant trained to identify wastes that are unacceptable at the landfill shall inspect the waste discharged at the screening site. If no unacceptable waste is found, the load will be pushed onto the working face.

- If unacceptable wastes that are non-hazardous are found, the load will be reloaded onto the delivery vehicle and directed to the Transfer Station.
- For unacceptable wastes that are hazardous, the Hazardous Waste Contingency Plan outlined in **Section 5.14** will be followed.

The hauler is responsible for removing unacceptable waste from the landfill property. The rejection of the load shall be noted on the **Waste Screening Form**, along with the identification of the driver and vehicle. A responsible party to the load generator or hauler shall be notified that the load was rejected. The generator or hauler may be targeted for more frequent waste screening and/or banished from delivering to the facility, depending on the nature of the violation of the waste acceptance policy. If the violation is repetitive or severe enough, State and/or County authorities may be notified.

7.3.2 Disposal of Rejected Wastes

Attempts will be made to inspect waste as soon as it arrives in order to identify the waste hauler; ideally, the hauler can be stopped from leaving the site and the rejected materials reloaded onto the delivery vehicle. Non-allowed materials that are found in the waste during sorting or placement, i.e., after the delivery vehicle has left the site, shall be taken to the on-site Transfer Station. Small quantities of garbage (chiefly food containers) will inevitably wind up in the C&D waste stream from job sites. These materials may be disposed with the C&D wastes as long as they are non-liquid and non-hazardous. If garbage, “black bags” or any prohibited wastes are detected, the Operator shall be responsible for removing these materials and placing them in the Transfer Station.

7.3.3 C&D Disposal Procedures

Waste transportation vehicles will arrive at the working face at random intervals. There may be a number of vehicles unloading waste at the same time, while other vehicles are waiting. In order to maintain control over the unloading of waste, only a certain number of vehicles will be allowed on the working face at a time. The superintendent and/or equipment operator(s), who will serve as ‘spotters’, will determine the actual number. This procedure will be used in order to minimize the potential of unloading unacceptable waste and to control disposal activity.

Operations at the working face will be conducted in a manner that will promote the efficient movement of vehicles to and from the working face, and to expedite the unloading of waste. At no time during normal business hours will the working face be left unattended. Scale house and field staff shall be in constant communication regarding incoming loads and the movement of vehicles on the site, irrespective of facility vehicles or private vehicles. It is the responsibility of the working face superintendent to know where each vehicle in the facility is located and what they are doing at all times.

Portable signs with directional arrows and barricades will be used to direct traffic to the correct unloading area. The approaches to the working face will be maintained such that two or more vehicles may safely unload side by side. A vehicle turn-around area large enough to enable vehicles to arrive and turn around safely with reasonable speed will be provided adjacent to the unloading area. The vehicles will back to a vacant area near the working face to unload. Upon completion of the unloading operation, the transportation vehicles will immediately leave the working face. Personnel will direct traffic as necessary to expedite safe movement of vehicles.

Waste unloading at the landfill will be controlled to prevent disposal in locations other than those specified by site management. Such control will also be used to confine the working face to a minimum width, yet allow safe and efficient operations. The width and length of the working face will be maintained as small as practical to control windblown waste, preserve aesthetics, and minimize the amount of required periodic cover.

Normally, only one working face will be active on any given day, with all deposited waste in other areas covered by either periodic or final cover, as appropriate. The procedures for placement and compaction of solid waste include: unloading of vehicles, spreading of waste into 2 foot lifts, and compaction on relatively flat slopes (i.e., 5H: IV max.) using a minimum number of three full passes. Depending on the nature of the wastes and long-term volume analysis of in-situ density, the waste placement geometry and compaction procedures may require adjustment to optimize airspace.

7.3.4 Spreading and Compaction

The working face shall be restricted to the smallest possible area; ideally, the maximum working face area with exposed waste shall be one-quarter to one-half acre. Wastes shall be compacted as densely as practical. Appropriate methods shall be employed to reduced wind-blown debris including (but not limited to) the use of wind fences, screens, temporary soil berms, and periodic cover. Any wind-blown debris shall be recovered and placed back in the landfill and covered at the end of each working day.

7.3.5 Special Wastes: Asbestos Management

Any asbestos handling and disposal will follow specific NC DENR regulations with proper shipping manifests and documentation of disposal. Asbestos shall arrive at the site in vehicles that contain only the asbestos waste and only after advance notification by the generator and if accompanied by a proper NC DMV transport manifest. Once the hauler brings the asbestos to the landfill, operations personnel will direct the hauler to the designated asbestos disposal area. Operations personnel will prepare the designated disposal area by leveling a small area using a dozer or loader. Prior to disposal, the landfill operators will stockpile cover soil near the designated asbestos disposal areas. The volume of soil stockpiled will be sufficient to cover the waste and to provide any berms, etc. to maintain temporary separation from other landfill traffic.

Once placed in the prepared area, the asbestos waste will be covered with a minimum of 18 inches of daily cover soil placed in a single lift. The surface of the cover soil will be compacted and graded using a tracked dozer or loader. The landfill compactor will be prohibited from operating over asbestos disposal areas until at least 18 inches of cover are in-place. The landfill staff shall record the location and elevation of the asbestos waste once cover is in-place. Records of the disposal activity shall be entered into the **Operating Record**. Once disposal and recording for asbestos waste is completed, the disposal area may be covered with C&D waste. No further excavation into recorded asbestos disposal areas will be permitted.

7.5.6 Asphalt Shingle Storage for Recycling

The Owner/Operator shall only accept new tear-off asphalt shingles for storage, typically from contractors they know. ***No grinding of shingles shall be conducted at the facility.*** Source-sorted shingles shall be placed into roll off boxes or temporary stockpiles as separate loads. Documentation for the source for each load shall be retained. A detailed plan for documenting the intake and distribution (i.e., to a licensed recycler) of asphalt shingles is found in **Appendix 4D**. Old shingles may contain asbestos and shall not be stored or processed for recycling at this facility. Asphalt shingles arriving without documentation or in mixed loads may be accepted for disposal, but these materials shall not go through the processing line and should be sent to the working face.

Acceptance and storage of documented asphalt shingles for off-site recycling may take place within the current T&P area on top of the CDLF, at least 50 feet away from the working face alongside other recycling activities. ***The facility is only authorized to receive and store asphalt shingles at this time.*** The facility must adhere to NCDENR's

documentation requirements outlined in **Appendix 4D** to maintain operational compliance. Should the facility opt to grind shingles into a recycled byproduct in the future, an additional Solid Waste Processor permit application and an asbestos screening plan will be prepared to supplement this operational.

7.4 Cover Material

7.4.1 Periodic Cover

The working face of the CDLF shall be covered on a weekly basis, or sooner if the area of exposed waste exceeds one-half acre in size. Periodic cover shall consist of a 6 inch layer of earthen material that completely covers the waste to control vectors, fire, odors, and blowing debris. Alternative periodic cover may be considered, subject to a demonstration project with prior approval from the Division. Placement of periodic cover shall be documented on the facility map along with the date of placement – these items shall be filed with the **Operating Record**.

7.4.2 Interim Soil Cover

An interim soil cover (at least 24 inches in thickness) shall be placed on inactive slopes, subject to the following conditions:

- Interior slopes adjacent to future expansion (such as a cell or phase boundary) no later than 30 days following the last waste receipt, providing that further waste disposal will occur within one year of the last waste receipt*
- Exterior slopes that have attained final grade but which are to be left for no more than 20 days without temporary vegetation, until an area of no more than 10 acres is ready to be closed simultaneously.**

*North Carolina Solid Waste Rule 15A NCAC 13B .0543 requires final cover to be placed if the slope shall remain inactive for more than one year

**Typically, it is advantageous to close the final slopes in 2 to 3 acre increments, observing the placement of erosion control benches; 10 acres is the regulatory maximum

Interim cover soils shall be vegetated in accordance with the Seeding Schedule presented in the Facility Drawings. Either temporary or permanent vegetation may be required – and alternate ground cover may be considered – depending on the time duration of inactivity. Placement of interim cover shall be documented on a copy of the facility map – these items shall be filed with the **Operating Record**.

7.4.3 Final Cover

Exterior slopes shall be closed upon reaching final grades in increments throughout the operation of the facility. Placement of final cover shall conform to the design and CQA requirements presented in the **Closure and Post-Closure Plan** (**Section 8.0**) and shall be documented on the facility map. The permitted final cover consists of a minimum of 18 inches of compacted soil cover (maximum 10^{-5} cm/sec permeability requirement), overlain by 18 inches of vegetation support soil. In general, the final soil cover shall be spread in at least three uniform lifts, maximum of 9 inches before compaction, 6 inches after compaction; soils shall be compacted by "tracking" with dozers or other equipment.

North Carolina Solid Waste regulations require a maximum permeability, achieved through proper material selection and compaction criteria, confirmed by the testing program outlined in the **CQA** section of the **Closure and Post-Closure Plan**. All disturbed soils shall be vegetated with a seed mix that is suitable to climatic conditions (see construction plans) within 20 days following completion of the grading, in accordance with the **Sedimentation and Erosion Control Rules, 15A NCAC 4**. All seeded areas should be provided with lime, fertilizer and straw mulch. An emulsified tack may be required to prevent wind damage. Other stabilization treatments, e.g., curled wood matting of synthetic slope stabilization blankets may be employed.
At the operator's discretion, wood mulch may be spread evenly over the final surfaces – at a maximum thickness of 2 inches – to help retain moisture and retard erosion while the vegetation develops. By SWS definition this material is not recognized to provide nutrient value but the partial decomposition of the wood mulch over time does introduce organic content to the soils, which were typically derived from deep within the borrow pit. Typically, the mulch takes about a year to break down and does benefit the effort of establishing vegetation, as long as the mulch is not applied too thick. This allows the operator some flexibility is establishing vegetation at optimum times of the year – the S&EC rules require seeding within 20 days following completion of the grading.

A nurse crop of seasonal vegetation can be sown at the time the slopes are finished and a permanent crop can be sown later, typically requiring manual sowing to prevent damaging the existing vegetation (refer to the **Seeding Schedule** in the **Closure Plan construction drawings**). All protective measures must be maintained until permanent ground cover is established and is sufficient to restrain erosion on the site.

If settlement occurs after the cover is placed, the cover shall be fortified with additional soil. In the case of extreme settlement (unlikely), the old cover can be stripped and the affected area built up with waste prior to replacing the cover. The sedimentation and

erosion control criteria governing the final closure of this facility are performance-based; some trial and error may be required, but the goal is to protect the adjacent water bodies and buffers throughout the operational and post-closure periods.

7.5 Survey for Compliance

7.5.1 Height Monitoring

The landfill staff will monitor landfill top and side slope elevations on a weekly basis or as needed to ensure proper slope ratios, in accordance with the approved grading plan, and to ensure the facility is not over-filled. This shall be accomplished by use of a surveyor's level and a grade rod. When such elevations approach the grades shown on the Final Cover Grading Plan, the final top-of-waste grades will be staked by a licensed surveyor to limit over-placement of waste.

7.5.2 Annual Survey

The working face shall be surveyed on an annual basis to verify slope grades and to track the fill progression. In the event of problems (slope stability, suspected over-filling), more frequent surveys may be required at the request of the Division.

7.6 Contingency Plan

Refer to **Section 5.14**

7.7 Annual Reporting

Refer to Sections **5.12** and **5.13**

Table 7
Prohibited Wastes in the CDLF Unit**

(1) Containers such as tubes, drums, barrels, tanks, cans, and bottles unless they are empty and perforated to ensure no liquid, hazardous or municipal solid waste is contained,

(2) Garbage as defined in G.S. 130A-290(a) (7),

(3) Hazardous waste as defined in G.S. 130A-290(a) (8), to also include hazardous waste from conditionally exempt small quantity generators,

(4) 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),

(5) Liquid wastes,

(6) Medical waste as defined in G.S. 130A-290(a) (18),

(7) Municipal solid waste as defined in G.S. 130A-290(a) (18a),

(8) Polychlorinated biphenyls (PCB) wastes as defined in 40 CFR 761,

(9) Radioactive waste as defined in G.S. 104E-5(14),

(10) Septage as defined in G.S. 130A-290(a) (32),

(11) Sludge as defined in G.S. 130A-290(a) (34),

(12) Special wastes as defined in G.S. 130A-290(a) (40),

(13) White goods as defined in G.S. 130A-290(a) (44), and

(14) Yard trash as defined in G.S. 130A-290(a) (45),

(15) The following wastes cannot be received if separate from C&DLF waste:

- lamps or bulbs, e.g., halogen, incandescent, neon or fluorescent;
- lighting ballast or fixtures;
- thermostats and light switches;
- batteries, e.g., 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.

(16) Waste accepted for disposal in a C&DLF unit must be readily identifiable as C&D waste and must not have been shredded, pulverized, or processed to such an extent that the composition of the original waste cannot be readily ascertained except as specified in Subparagraph (17) of this Paragraph.

(17) C&D waste that has been shredded, pulverized or otherwise processed may be accepted for disposal from a facility that 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 plan and waste acceptance plan must be made available to the Division upon request.

(18) Waste that is generated outside the boundaries of a unit of local government ordinance (i.e., areas not approved by County Commissioners).

**Reference: 15A NCAC 13B .0542

8.1 Summary of Regulatory Requirements

8.1.1 Final Cap

The final cap design for all phases of the CDLF shall conform to the minimum requirements of the Solid Waste Rules, i.e., the compacted soil barrier layer shall exhibit a thickness of 18 inches and a field permeability of not more than 1.0×10^{-5} cm/sec. The overlying vegetative support layer shall be 18 inches thick. **Drawings E2A** show final contours and final cover cross-section and details. **EC2 Drawings EC1 – EC2** show additional cap construction details.

8.1.2 Construction Requirements

Final cap installation shall conform to the approved plans (see accompanying plan set), inclusive of the approved Sedimentation and Erosion Control Plan. The CQA plan must be followed (see **Section 4.0**) and all CQA documentation must be submitted to the Division. Post-settlement surface slopes must not be flatter than 5% (on the upper cap) and not steeper than 25% (on the side slopes). Solid Waste rules require a gas venting system is required for the cap. A passive venting system will be specified, which will consist of a perforated pipe in crushed stone-filled trench – installed just below the final cap soil barrier layer – with a ***tentative minimum vent spacing of three vents per acre.*** **Drawing E2A** shows the gas vent system details.

8.1.3 Alternative Cap Design

Solid Waste **Rule .0543** makes a provision for an alternative cap design, to be used in the event that the permeability requirements for the compacted soil barrier layer cannot be met. Past experience indicates that readily available on-site soils may not meet the required field permeability of not more than 1.0×10^{-5} cm/sec, as supported by the laboratory data for the Design Hydrogeologic Report. Tentative final closure plans have assumed that on-site soils will be used for the compacted barrier layer – alternative cap designs are being researched and will be submitted for Division approval at a future time.

8.1.4 Division Notifications

The Operator shall notify the Division prior to beginning closure of any final closure activities. The Operator shall place documentation in the Operating Record pertaining to the closure, including the CQA requirements and location and date of cover placement.

8.1.5 Required Closure Schedule

The Operator shall close the landfill in increments as various areas are brought to final grade. The final cap shall be placed on such areas subject to the following:

- No later than 30 days following last receipt of waste;
- No late that 30 days following the date that an area of 10 acres or greater is within 15 feet of final grades;
- No later than one year following the most recent receipt of waste if there is remaining capacity.

Final closure activities shall be completed within 180 days following commencement of the closure, unless the Division grants extensions. Upon completion of closure activities for each area (or unit) the Owner shall notify the Division in writing with a certification by the Engineer that the closure has been completed in accordance with the approved closure plan and that said documentation has been placed in the operating record.

8.1.6 Recordation

The Owner shall record on the title deed to the subject property that a CDLF has been operated on the property and file said documentation with the Register of Deeds. Said recordation shall include a notation that the future use of the property is restricted under the provision of the approved closure plan.

8.2 Closure Plan

The following is a tentative closure plan for CDLF Phase 2, based on the prescribed operational sequence and anticipated conditions at the time of closure.

8.2.1 Final Cap Installation

8.2.1.1 Final Elevations – Final elevation of the landfill shall not exceed those depicted on **Drawing E2** when it is closed, subject to approval of this closure plan. The elevations shown include the final cover. A periodic topographic survey shall be performed to verify elevations.

8.2.1.2 Final Slope Ratios – All upper surfaces shall have at least a 5 percent slope, but not greater than a 10 percent slope. The cover shall be graded to promote positive drainage. Side slope ratios shall not exceed 3H:1V. A periodic topographic survey shall be performed to verify slope ratios.

8.2.1.3 Final Cover Section – The terms "final cap" and "final cover" both apply. The final cover will subscribe to the minimum regulatory requirement for C&D landfills:

- An 18-inch thick compacted soil barrier layer (CSB), i.e., the "infiltration layer," with a hydraulic conductivity not exceeding 1 x 10^{-5} cm/sec,

  overlain by

- An 18-inch thick "topsoil" or vegetated surface layer (VSL), i.e., the "erosion layer."

8.2.1.4 Final Cover Installation – All soils shall be graded to provide positive drainage away from the landfill area and compacted to meet applicable permeability requirements. Suitable materials for final cover soil shall meet the requirements defined above. Care shall be taken to exclude rocks and debris that would hinder compaction efforts. The surface will then be seeded in order to establish vegetation.

Test Pad – Whereas the lab data indicate that the required permeability is attainable, the ability to compact the materials in the field to achieve the required strength and permeability values shall be verified with a field trial involving a test pad, to be sampled with drive tubes and laboratory density and/or permeability testing, prior to full-scale construction. The materials, equipment, and testing procedures should be representative of the anticipated actual final cover construction. The test pad may be strategically located such that the test pad may be incorporated into the final cover.

Compacted Barrier – Materials shall be blended to a uniform consistency and placed in three loose lifts no thicker than 9 inches and compacted by tamping, rolling, or other suitable method – the targeted final thickness is 18 inches minimum. A thicker compacted barrier is acceptable. The cover shall be constructed in sufficiently small areas that can be completed in a single day (to avoid desiccation, erosion, or other damage), but large enough to allow ample time for testing without hindering production. The Contractor shall take care not to over-roll the cover such that the underlying waste materials would pump or rut, causing the overlying soil layers to crack – adequate subgrade compaction within the upper 36 inches of waste materials and/or the intermediate cover soil underlying the final cover is critical. All final cover soils shall be thoroughly compacted through the full depth to achieve the required maximum permeability required by Division regulations of 1.0 x 10^{-5} cm/sec, based on site-specific test criteria (see below). Compaction moisture control is essential for achieving adequate strength and permeability.

Vegetated Surface Layer – Materials shall be blended and placed in two loose lifts no thicker than 12 inches and compacted by tamping, rolling, or other suitable method – the targeted final layer thickness is 18 inches minimum per the design criteria. A thicker soil layer is acceptable. A relatively high organic content is also desirable. The incorporation of decayed wood mulch or other organic admixtures (WWTP sludge, with advance permission from the Division) is encouraged to provide nutrient and enhanced field capacity. These surface materials are not subject to a permeability requirement, thus no testing will be specified. Care should be taken to compact the materials sufficiently to promote stability and minimize erosion susceptibility, but not to over-compact the materials such that vegetation would be hindered. Following placement and inspection of the surface layer, seed bed preparation, seeding and mulching should follow immediately. The work should be scheduled to optimize weather conditions, if possible.

Inspection and Testing – Soils for the barrier layer are subject to the testing schedule outlined in the Construction Quality Assurance plan (see **Section 4.0**). The proposed testing program includes a minimum of one permeability test per lift per acre and four nuclear density gauge tests per lift per acre, to verify compaction of the compacted barrier layer. The moisture-density-permeability relationship of the materials has been established by the laboratory testing (discussed elsewhere in this report). The Contractor shall proof roll final cover subgrade materials (i.e., intermediate cover), which consist of essentially the same materials as the compacted barrier layer (without the permeability requirements), to assure that these materials will support the final cover.

8.2.1.5 Final Cover Vegetation – Seedbed preparation, seeding, and mulching shall be performed accordance the specifications provided in the Construction Plans (see **Drawing EC2**), unless approved otherwise (in advance) by the Engineer. In areas to be seeded, fertilizer and lime typically should be distributed uniformly at a rate of 1,000 pounds per acre for fertilizer and 2,000 pounds per acre for lime, and incorporated into the soil to a depth of at least 3 inches by disking and harrowing. The incorporation of the fertilizer and lime may be a part of the cover placement operation specified above. Distribution by means of an approved seed drill or hydro seeder equipped to sow seed and distribute lime and fertilizer at the same time will be acceptable. Please note that the seeding schedule varies by season.

All vegetated surfaces shall be mulched with wheat straw and a bituminous tack. Areas identified as prone to erosion mat be secured with curled-wood excelsior, installed and pinned in accordance with the manufacturer's recommendations. Certain perimeter

channels will require excelsior or turf-reinforcement mat (TRM), as specified in the Channel Schedule. Alternative erosion control products may be substituted with the project engineer's prior consent. All rolled erosion control materials should be installed according to the generalized layout and staking plan found in the Construction Plans or the manufacturer's recommendations.

Irrigation for landfill covers is not a typical procedure, but consideration to temporary irrigation may be considered if dry weather conditions prevail during or after the planting. Care should be taken not to over-irrigate in order to prevent erosion. Collected storm water will be suitable for irrigation water. Maintenance of the final cover vegetation, described in the Post-Closure Plan (see below), is critical to the overall performance of the landfill cover system.

8.2.1.6 Documentation – The Owner shall complete an "as-built" survey to depict final elevations and to document any problems, amendments or deviations from the Construction Plan drawings. Records of all testing, including maps with test locations, shall be prepared by the third-party CQA testing firm. All materials pertaining to the closure shall be placed in the Operational Record for the facility. Whereas the closure will be incremental, special attention shall be given to keeping the closure records separate from the normal operational records.

8.2.2 Maximum Area/Volume Subject to Closure

The largest anticipated area that will require final closure at any one time within the next 5-year period – including all of Phase 2A is 10 acres (stated in the Permit to Construct). Added to that is the 15 acres in Phase 1, bringing the total permitted acreage subject to a final closure bond to 25 acres. Intermediate cover shall be used on areas that have achieved final elevations until the final cover is installed. An annual adjustment of open area is required by the Division for a bond requirement.

8.2.3 Closure Schedule

Refer to the requirements outlined in **Section 8.1.5** (above).

8.2.4 Closure Cost Estimate

The foregoing cost estimate is considered suitable for the **Financial Assurance** requirements (see **Section 9.0**).

TABLE 8A
ESTIMATED FINAL CLOSURE COSTS FOR PHASE 1 (2009 dollars) [1]

VSL (topsoil)[2] – 25 acres	60,500 c.y.	@	$3 / cubic yard [5]	$181,500
CSB (barrier)[2] – 25 acres	70,000 c.y.	@	$6 / cubic yard [5]	$420,000
Establish Vegetation	25 acres	@	$1,300 per acre	$ 32,500
Storm Water Piping [3]	1200 LF	@	$35.00 / LF	$ 42,000
Erosion Control Stone [3]	100 tons	@	$40.00 / ton	$ 4,000
Gas Vents – 25 ac * 3/ac	75 each	@	$100 each	$ 7,500
			Subtotal Construction Costs	$687,500
Testing and Surveying [4]	Estimated 20 percent of subtotal			$137,500
Contingency	Estimated 15 percent of subtotal			$ 103,125
			Total Construction Cost (if contracted out)	**$928,125**

Notes:

1 Intended to represent likely third-party construction costs (hired contractor, not the Owner/Operator), based on knowledge of local construction costs for similar projects – these estimates provided to meet NC DENR Division of Waste Management financial assurance requirements; actual costs may be lower for construction by the Owner/Operator; final closure work will be performed incrementally, spreading out the costs over the life of the project.

2 Includes soil work for regulatory requirements of the 2006 C&D Rules, i.e., a minimum of 18 inches of compacted soil barrier (max. permeability of 1 x 10^{-5} cm/sec) and 18 inches of topsoil (total soil thickness is 36 inches). For the compacted soil barrier, use a shrinkage factor of 15%; costs include surface preparation, soil procurement and transport costs, soil placement and compaction, machine/equipment costs, fuel costs

3 Conservative estimate based on similar project history; includes materials and installation

4 Includes Construction document and bidding, construction administrative fee, CQA field monitoring and lab testing, CQA reporting and certification, final survey for as-built drawings, recordation/notation fee

An adjustment for annual inflation factors will be presented in Section 11.

8.3 Post-Closure Plan

8.3.1 Monitoring and Maintenance

8.3.1.1 Term of Post-Closure Care – The facility shall conduct post-closure care for a minimum of 30 years after final closure of the landfill, unless justification is provided for a reduced post-closure care period. The post-closure care period may be extended by the Division if necessary to protect human health and the environment.

8.3.1.2 Maintenance of Closure Systems – Inspections of the final cover systems and sediment and erosion control (S&EC) measures shall be conducted quarterly. Maintenance will be provided during post-closure care as needed to protect the integrity and effectiveness of the final cover. The cover will be repaired as necessary to correct the effects of settlement, subsidence, erosion, or other events. Refer to the **Post Closure Monitoring and Maintenance Schedule** (below).

8.3.1.3 Landfill Gas Monitoring – Refer to **Section 9.0**.

8.3.1.4 Ground Water Monitoring – Refer to **Section 9.0**.

8.3.1.5 Record Keeping – During the post closure period, maintenance and inspection records, i.e., a **Post Closure Record**, shall be kept as a continuation of the **Operating Record** that was kept during the operational period. The Post Closure Record shall include future inspection and engineering reports, as well as documentation of all routine and non-routine maintenance and/or amendments. The Post Closure Record shall include the ground water and gas monitoring records collected for the facility.

8.3.1.6 Certification of Completion – At the end of the post-closure care period the facility manager shall contact the Division to schedule an inspection. The facility manager shall make the Post Closure Record available for inspection. A certification that the post-closure plan has been completed, signed by a North Carolina registered professional engineer, shall be placed in the operating/post closure record. C&D Landfill, Inc. shall maintain these records indefinitely.

TABLE 8B
POST-CLOSURE MONITORING AND MAINTENANCE SCHEDULE

Activity	Frequency Yrs. 1 - 5	Frequency Yrs. 6-15	Frequency Yrs. 16-30
General - Inspect access gates, locks, fences, signs, site security	Quarterly	Quarterly	Quarterly
Maintain access roads, monitoring well access	As needed	As needed	As needed
Final Cover Systems/Stability - Inspect cap and slope cover for erosion, sloughing, bare spots in vegetation, make corrections as needed (1)	Quarterly	Semi-Annually	Annually
Storm Water/Erosion Control Systems - Inspect drainage swales, pipe drains, and sediment basin for erosion, excess sedimentation (1)	Quarterly	Semi-Annually	Annually
Mow cover vegetation and remove thatch	Semi-Annually	Annually	None (2)
Inspect vegetation cover and remove trees	Annually	Annually	Annually
Landfill Gas Monitoring	Quarterly (3)	Quarterly (3)	Quarterly (3)
Ground Water Monitoring System - Check well head security, visibility	Semi-Annually	Semi-Annually	Semi-Annually
Ground Water Monitoring (4)	Semi-Annually	Semi-Annually	Semi-Annually

Notes:
1. Inspect after every major storm event, i.e., 25-year 24-hour design storm
2. Dependent on vegetation type, periodic mowing may be required
3. The Solid Waste Section may be petitioned for discontinuation of gas monitoring if no detections occur in gas sampling locations or on-site buildings
4. See current Ground Water Sampling and Analysis Plan

8.3.2 Responsible Party Contact

C&D Landfill, Inc.
Mr. Judson Whitehurst, Owner
Mr. Wayne Bell, General Manager
802 Recycling Lane — Tel 252-752-8274
Greenville, North Carolina 27834 — Fax 252-752-9016

8.3.3 Planned Uses of Property

Currently, there is no planned use for the landfill area following closure. The closed facility will be seeded with grass to prevent erosion. Any post-closure use of the property considered in the future will not disturb the integrity of the final cover.

8.3.4 Post-Closure Cost Estimate

The following represents post-closure costs for **Financial Assurance** (see **Section 10.0**).

TABLE 8C
ESTIMATED POST-CLOSURE COSTS FOR PHASE 1 (in 2009 dollars)

Annual Events	Units		Unit Cost	Cost/ Event	Annual Costs
Reseeding/mulching and erosion repair (Assume 5% of 25 ac., once per year)	1.25	ac.	$1,300	$1,625.00	$1,625.00
Mow final cap (twice per year)	25	ac.	$25	$625.00	$1,250.00
Ground Water (semi-annual, 22 wells)*	22	ea.	$350	$7700.00	$15,400.00
Surface Water (semi-annual, 3 locations)*	3	ea.	$350	$1,050.00	$2,100.00
Water quality analysis and reporting	2	ea.	$2,500	$2,500.00	$5,000.00
Landfill Gas Monitoring (quarterly)	4	ea.	$1,500	$1,500.00	$6,000.00
Engineering inspection (annual basis)	1	ea.	$2,500	$2,500.00	$2,500.00
Maintain storm water conveyances	1	ea.	$1,000	$1,000.00	$1,000.00
Maintain access roads, gates, buildings	1	ea.	$500	$500.00	$500.00
	Total Estimated Annual Cost				**$35,375.00**

*Appendix I Detection Monitoring (**Section 10.0**)

An adjustment for annual inflation factors will be presented in Section 11.

9.1 Summary of Regulatory Requirements

Detection phase monitoring for ground water and surface water is required of all C&D landfills. Typical monitoring programs include one or more up gradient background wells and several down gradient (or cross gradient) compliance wells, along with several strategically placed surface water sampling locations (with up gradient and down gradient coverage). Well placement is based on the site's hydraulic and topographic characteristics; compliance wells are located at a regulatory "review boundary" approximately half the distance to the "compliance boundary" – established 50 feet inside the facility boundary, or 150 feet from the waste boundary at a C&D landfill.

Detection phase monitoring for all landfills includes semi-annual sampling and analysis for ensuring compliance with North Carolina ground water standards, i.e., **15A NCAC 2L .0300** (the "2L rules"). The detection phase sampling list includes organic constituents on the Appendix 1 list[2] (i.e., volatiles and semi-volatiles that are analyzed by US-EPA Method 8260 and the eight RCRA metals), key indicator parameters (measured in the field), and – added per a rule change in 2006 – several additional constituents (mercury, manganese, sulfate, iron, alkalinity, and total dissolved solids).

Assuming no detects of ground water constituents that exceed a 2L standard, the term of detection phase monitoring runs for the operational life of the facility plus the post-closure period (minimum of 30 years beyond closure). Should one or more detected constituents exceed a 2L standard, the facility must undergo an expanded assessment monitoring program to determine the source, extent, and rate of contaminant migration, plus an evaluation of potential human receptors and/or other environmental impacts.

9.2 Ground Water Monitoring

The following discusses the rationale behind planned amendments to the detection phase monitoring program for the C&D landfill, reflected in the **Sampling and Analysis Plan** (see **Appendix 3**). The format of the SAP is consistent with that used for numerous Division-accepted landfill monitoring programs.

9.2.1 Monitoring System Requirements

The purpose of the ground water monitoring plan at this site is to provide early detection of a potential release of contaminants that may occur from operations at the landfill into

[2] 40 CFR Part 258

the uppermost aquifer(s). The Design Hydrogeologic studies indicate a radial ground water flow pattern toward the south, southwest, and southeast. This flow pattern reflects surface topography along a gentle ridge, surrounded on three sides by surface streams (i.e., ground water receptors). Based on site topography and hydrogeologic conditions, predominant ground water flow direction to the south (toward Grindle Creek), with loose to medium dense sandy surficial soils serving as the uppermost (unconfined) aquifer (**Unit 1**), which exists above a variably thick, clayey partial confining layer **(Unit 2**). A deeper, regional (confined) aquifer (**Unit 3**) exists beneath the partial confining unit, exhibiting a pronounced upward vertical gradient beneath much of the site.

The placement of wells for the CDLF should focus on the upper sand layer (**Unit 1**), keeping in mind that the regional discharge point (Grindle Creek) is off-site, separated by a distance of several hundred feet. The interstitial land is old-family farm land is not likely to be developed. Regional municipal water is typically supplied to residences and other consumers throughout the area. However, the distance to the off-site ground water discharge point was considered in determining an appropriate monitoring well spacing in the original studies for Phase 1. An advection-dispersion calculation was made to determine a well spacing around the landfill perimeter that would likely intercept a release of contaminants from the landfill.

Applying these principles to the similar geologic conditions at Phase 2, a well spacing of approximately 300 to 400 feet appears appropriate. Please refer to the 2003 Design Hydrogeologic report for a discussion of new well depths and screen intervals and refer to the **Sampling and Analysis Plan** (**Appendix 3**) for detailed discussion of sampling and analysis protocols. A number of wells were installed and activated prior to the opening of Phase 2A, shown on **Drawing MP-1**. Additional wells originally planned for the opening of Phase 2B have not been activated but will be prior to commencing disposal operations in Phase 2B.

9.2.2 Background Water Quality

Low concentrations of metals have been detected at the facility background wells and the baseline sampling of the compliance wells. No concentrations of inorganic constituents were present that affect the ability to monitor the site.

9.2.3 Point of Compliance Water Quality

The 15A NCAC 2L ground water standards are applicable for the compliance boundary, tempered with background water quality data. For constituents that do not have

promulgated 2L standards, the Division will consider the Solid Waste Section Limits for future compliance issues.

9.2.4 Sampling and Analysis Procedures

Industry accepted protocols (consistent with Division guidelines)[3] are discussed in the **Sampling and Analysis Plan** (see **Appendix 3**).

9.2.5 Detection-phase Monitoring Parameters

The sampling parameters consist of the **EPA Appendix I** list, plus additional inorganic constituents required by Solid Waste Section. Well MW-12 in the phase 2 area has been sampled for Appendix II parameters as part of the assessment monitoring of Phase 1.

9.2.6 Sampling Frequency

The detection phase sampling frequency shall be semi-annually.

9.2.7 Water Level Elevations

During each sampling event, water levels shall be measured from the top-of-casing at each monitoring well.

9.2.8 Reporting

Data analysis and reporting, consistent with Division requirements, are described in the **Sampling and Analysis Plan** (see **Appendix 3**).

9.2.9 Source Demonstration

In the event of the detection of a ground water constituent that exceeds a 2L standard, an evaluation may be made in accordance with Division policy to determine the source, e.g., sampling error, laboratory contamination, extenuating circumstances (improper repairs to a well or incidental spill near a well). Typically, such evaluations are accompanied by re-sampling and, if appropriate, correction of conditions that may have led to the detection. If such demonstrations cannot be made, the landfill might be considered as the source.

[3] NC DENR Division of Waste Management Guidance Document, Ground Water Sampling for Construction and Demolition, Closed or Industrial Landfills, http://www.wastenotnc.org/swhome/enviro_monitoring.asp

9.2.10 Monitoring Well Design

Wells shall be (and currently are) designed in accordance with **15A NCAC 2C**.

9.2.11 Monitoring Well Layout

The layout takes advantage of topographic features, the shape of the top of the confining unit (as indication of buried former channels), regional flow conditions and access considerations within the generally hilly terrain.

9.2.12 Alternative Monitoring Systems

None are proposed at this time.

9.2.13 Assessment Monitoring

Requirements of assessment monitoring, if required, are outlined in **Rule .0545**. Phase 1 is currently being monitored under an assessment monitoring plan, under review by the Solid Waste Section. Phase 2 does not appear to contribute to the conditions being monitored; further discussion of the assessment is beyond the scope of this report. The **Sampling and Analysis Plan** presented in **Appendix 3** pertains only to Phase 2.

9.3 Surface Water Monitoring

Surface water monitoring should (and does) focus on the creek and unnamed tributaries shown to be shallow ground water discharge features to the north, west, and south of the Phase 1 footprint. Upstream monitoring on these water bodies, which converge at the site margins, and monitoring of the larger stream at the point it leaves the property will provide excellent monitoring of the surface water. The surface water sampling locations are shown on **Drawing MP1**.

The North Carolina 2L ground water standards will apply. Samples will be analyzed for Appendix I parameters, consistent with the ground water samples. A separate storm water sampling program focuses on turbidity and sediment, with sampling conducted under the purview of the NC DENR Division of Water Quality and in accordance with a NPDES General Storm Water Permit.

9.4 Landfill Gas Monitoring and Control Plan

This section has been replaced with the text in Appendix 4E.

9.5 Adherence to Waste Acceptance Criteria

Monitoring the waste intake is addressed in the **Operations Plan** (**Sections 6.0 and 7.0**) is a sure way to maintain compliance with ground water quality criteria. The plan calls for routine waste screening and record keeping with respect to waste types, sources, and haulers. Maintaining strict adherence to the waste acceptance criteria

9.6 Monitoring Plan Certification

This monitoring plan for the C&D Landfill, Inc., disposal units has been prepared by, or under the responsible charge of, one or more North Carolina Licensed Geologists or Professional Engineers. The individual signature and seal below attests to compliance with this rule requirement.

Signed _____

Printed __G. David Garrett, PG, PE____

Date _____February 28, 2014_____

Not valid unless this document bears the seal of the above-named licensed professional.

Owners/Operators are required to demonstrate financial assurance for closure and post-closure activities. Typically, for local government-owned facilities, said demonstration is based on a local government test. For private facilities, the posting of a performance bond or insurance policy is typically acceptable to the Solid Waste Section.

Cost estimates for closure and post-closure of CDLF Phase 2 are presented in **Sections 8.2.4** and **8.3.4**, respectively. The following is a detailed analysis of the closure and post closure costs for Phases 1 and 2A, based on the analysis prepared in 2009 and updated using annual inflation multipliers furnished by the Solid Waste Section. It should be realized that the bond requirement is for those portions of the landfill that have been issued a Permit to Operate; this application asks only for authorization to place base grades and conduct recycling activities in Phase 2B. Assuming a bond is used, the amount of the financial assurance instrument should be adjusted on an annual basis, consistent with Division policy, as new areas are opened and others are closed. Acceptable financial assurance instruments include performance bonds, insurance policies, cash deposits and irrevocable letters of credit.

SUMMARY OF CLOSURE AND POST-CLOSURE COST

1. Final Closure Construction (see **Table 8A**) $ 928,125
2. Projected Post-Closure Costs (see **Table 8C**)

$35,375 x 30 years = $ 1,061,250

TOTAL CLOSURE/POST-CLOSURE COST $ 1,989,375

Bond Year	**NCDENR Multiplier**	**Closure:**	**Post-Closure:**	**TOTAL**
2009	--------	$928,125 (2009)	$1,061,250 (2009)	$1,989,375
2010	1.016	$942,975	$1,078,230	$2,021,205
2011	1.010	$952,405	$1,089,012	$2,041,417
2012	1.021	$972,405	$1,111,882	$2,084,287
2013	1.018	$989,908 (2013)	$1,131,895 (2013)	$2,121,803

These values shall be updated for the 2014 multiplier in the near future.

The sum of closure and post-closure (Phases 1 and 2) for end of 2013 is $2,121,803

For foregoing values are consistent with calculations furnished in July 2013, per memo from David Garrett memo to Judson Whitehurst, inclusive of the Transfer Station. This amount was accepted by the Solid Waste Section, and Owner/Operator has furnished a performance bond to meet the financial assurance requirement (see **Appendix 5**).

11.0 ENGINEERING CERTIFICATION (15A NCAC 13B .0539)

This engineering plan for C&D Landfill, Phase 2 disposal unit has been prepared by, or under the responsible charge of, a North Carolina Licensed Professional Engineer to meet the requirements of 15A NCAC 13B .0539. The individual signature and seal below attests to compliance with this rule requirement.

Signed _____

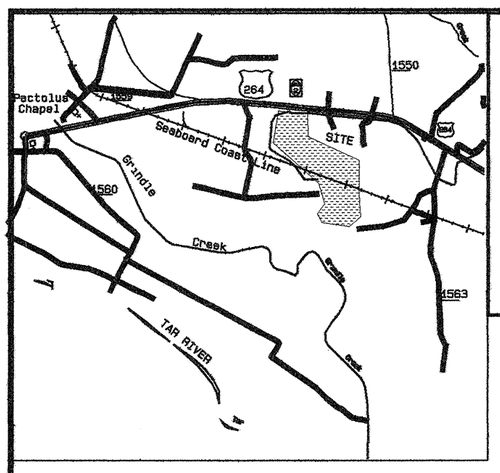
Printed ___G. David Garrett, PG, PE___

Date _____February 28, 2014_____

Not valid unless this document bears the seal of the above-named licensed professional.

Facility Drawings

Appendix 1
Local Government Information



VICINITY MAP
NOT TO SCALE

SOURCE OF TITLE

THIS IS TO CERTIFY THAT THE LAST INSTRUMENT(S) IN THE CHAIN OF TITLES(S) OF THIS PROPERTY AS RECORDED IN THE PITT COUNTY REGISTRY AT GREENVILLLE, NORTH CAROLINA IS:

DEED BOOK	1588	PAGE	108
DEED BOOK	1637	PAGE	314
DEED BOOK	922	PAGE	161
DEED BOOK	P36	PAGE	563

NC REGISTRATION NO. L-3960

LEGEND

EIP = EXISTING IRON PIPE
ERRI = EXISTING RAILROAD IRON
SIP = SET IRON PIPE
EIA = EXISTING IRON AXLE
NTS = NOT TO SCALE
SIR=SET IRON ROD
NPS= NO POINT SET

NOTES

TOTAL AREA BY THE COORDINATE METHOD = 160.14 ACRES.
OR 6,975,922.24 SQFT

REVISIONS

12-19-00	DITCH LOCATION SW CORNER ACREAGE, OWNER
04-29-02	DITCH LOCATION AREA DESIGNATED R2
04-30-02	DITCH LOCATION AREA DESIGNATED R3
06-22-2008	RECOMBINED AREA 14.91 ACRES, WEST ADJOINER
02-01-2009	PHASE 1 AND PHASE 2 RECOMBINED RAILROAD RIGHT OF WAY REMOVED. AREA "A" REMOVED. OWNER.
03-23-2009	RECOMBINE PORTION OF TAX PARCEL #56923 AND TAX PARCEL #24561 WITH TAX PARCEL # 62664
05-08-2009	CHANGE LINEWORK AND RECOMBINED ACREAGE

CERTIFICATION

I, JAMES A. BURGESS II CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE BY ME JABII DEED DESCRIPTIONS RECORDED IN BOOK 1588 PAGE 108 ; RECORDED IN BOOK 1637 PAGE 314 ; MAP BOOK 54 , PAGE 150 ; THAT THE RATIO OF PRECISION AS CALCULATED BY LATITUDES AND DEPARTURES IS 1: 10,000 + ; THAT BOUNDARIES NOT SURVEYED ARE SHOWN AS BROKEN LINES PLOTTED FROM INFORMATION FOUND IN BOOKS REFERENCED HEREON; THAT THIS MAP WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED.

WITNESS MY ORIGINAL SIGNATURE, REGISTRATION NUMBER AND SEAL THIS 8TH DAY OF MAY, 2009 A.D.

SIGNED
PROFESSIONAL LAND SURVEYOR
REGISTRATION NUMBER L-3960

NORTH CAROLINA PROFESSIONAL SEAL L-3960 LAND SURVEYOR JAMES A. BURGESS II

SEE ALSO MAP BY BURGESS LAND SURVEYING P.A. ENTITLED "BOUNDARY SURVEY FOR C & D LANDFILL" REVISED 02-01-09

TRACT A	104.75 ACRES	OR	4,562,799.68SQFT
TRACT B	6.27 ACRES	OR	273,215.50SQFT
TRACT C	34.21 ACRES	OR	1,490,361.47SQFT
TRACT D	14.91 ACRES	OR	649,545.59SQFT
	160.14 ACRES	OR	6,975,922.24SQFT

50.00FT CENTERLINE WEST BOUND LANE
US HWY 264
130.00FT CENTERLINE EAST BOUND LANE
SIP SIP SIP SIP
26.08ft S84°40'12"E
109.13ft S84°40'12"E
103.81ft S84°40'12"E
DITCH

CONTROL CORNER- SIP
NAD 83 STATE PLANE COORDINATES
N 687614.2207 FT
E 2536852.1006 FT

N88°16'50"W
2363.54 FT
2363.29 FT GRID DISTANCE

NOTE: ALL GRID DISTANCES AND COORDINATES CALCULATED USING A COMBINED FACTOR OF 0.99989217.

CONTROL POINT-SIP
NAD 83 STATE PLANE COORDINATES
N 687,543.3091 FT
E 2,539,214.3265 FT

NTS
N83°31'56"W
1994.76 GRID DISTANCE

NCGS MONUMENT
"BEACHAM- 1979"
NAD 83 STATE PLANE COORDINATES
N 687318.60643
E 2541196.39187

NAD 83 GRID

HATTIE CRANDOL
DB Q30 PG 560

MARKED AND PAINTED LINE
N07°53'47"E TOTAL 977.24FT
982.50ft N00°28'39"W
MARKED AND PAINTED LINE

ERRI AT TOP BANK DITCH ON PROPERTY LINE 4.65FT FROM PROPERTY CORNER IN CENTER OF DITCH.
ERRI 49.69ft N86°20'27"W NPS
CENTER OF DITCH IS PROPERTY LINE
N03°27'21"E 477.48ft
NPS
DITCH 727.80ft N53°51'18"W
NO POINTS SET IN CANAL OR DITCH UNLESS STATED OTHERWISE.
CENTERLINE OF CANAL IS PROPERTYLINE
NPS 350.24ft N61°53'21"W DITCH PROPERTY LINE

EIA
921.00ft S65°20'57"E
EIA
667.98ft S63°49'56"E
EIA
937.05 FT S64°49'53"E 1332.05ft
595.00 FT

W.L. CRANDOL HEIRS

JOHN DAVID & EMMA STOKES BREWER
T36 PG 559

E.J.E. RECYCLING DISPOSAL, INC
DB 684 PG 657
TAX PARCEL #56923

40" POPLAR (DEAD) MARKS PROPERTY CORNER
PORTION OF TAX PARCEL #56923
40" POPLAR
S78°01'28"E 200.00ft
SIR

SIR 116.28ft N39°16'20"W
17.03ft N58°34'14"W
55.84ft N29°10'05"W
S70°30'52"E 383.32ft
PROPERTY LINE
N51°06'55"W 24.55ft
N37°06'54"W 44.27ft
574.77ft N37°07'03"W PROPERTY LINE
CANAL
FORMER PROPERTY LINE
600' MINIMUM
SIR
R2
TAX PARCEL #62664
CANAL
FORMER PROPERTY LINE
351.45ft N58°02'30"W
SIR
300.58ft N82°22'30"W PROPERTY LINE
SIR N88°41'40"W 232.49ft
R3
214.78ft N57°38'11"W
SIR
N44°11'16"W 98.30ft
SIR
N46°54'49"E 158.97ft
SIR N86°16'45"E 302.77ft SIR
600' MINIMUM
CANAL
FORMER PROPERTY LINE
N31°51'53"E 579.18ft PROPERTY LINE
SIR
CANAL
FORMER PROPERTY LINE
286.92ft N49°38'56"W
SIR
153.29ft N47°36'26"W
SIR
N15°02'07"W 46.03ft SIR
178.07ft S89°10'00"W ERRI
PROPERTY LINE
1312.08ft N49°39'16"W

TRACT A
PHASE 2
104.75 ACRES
4,562,799.68SQFT
AREA CALCULATED BY COORDINATES

TRACT D AREA
14.91 ACRES OR 649,645.59 SQFT
CALCULATED BY COORDINATES

JUDSON T. WHITEHURST & ED A. WHITEHURST
DB 1637 PG 314 TAX PARCEL# 08633
MB 10 PG 9

RESERVED 30 FT(15 EACH SIDE OF CENTER) EASEMENT FOR MAINTENANCE AND REPAIR OF CANAL THAT LIES SOUTH OF THE RAILROAD RIGHT OF WAY.
(SEE DEED BOOK "A"-32 PAGE 515 & MB 10 PG 9)

FORMER PROPERTY LINE
TRACT B
6.27 ACRES OR 273,215.50 SQFT TO BE RECOMBINED WITH PHASE 2.
SIP
4330.32ft S11°58'35"W
PROPERTY LINE
PORTION OF TAX PARCEL #24561
ED ALTON WHITEHURST SR.
DB 70 PG 268
TAX PARCEL #24561
FORMER PROPERTY LINE
PROPERTY LINE
S65°19'44"E 389.51ft
SIP
PROPERTY LINE
S28°04'49"E 459.80ft
SIP
PROPERTY LINE
S55°34'45"W 1182.37ft
SIP
N11°39'16"W 122.65ft
SIP

Parcel 062642
C & D LANDFILL INC
DB1098 PG 156
Map Book 54-148

TRACT C
PHASE 1
PHASE 1TO BE RECOMBINED WITH PHASE 2
AREA CALCULATED BY COORDINATES
34.21 ACRES
1,490,361.47SQFT

DAVENPORT FARMS INC.
DB 437 PG 457

ED ALTON WHITEHURST SR.
DB 70 PG 268

ED ALTON WHITEHURST SR.
DB 70 PG 268

CERTIFICATE OF PURPOSE OF PLAT

THE FINAL PLAT SHALL CONTAIN ONE OF THE FOLLOWING STATEMENTS, SIGNED AND SEALED BY THE PLAT PREPARER:

___A. THIS SURVEY CREATES A SUBDIVISION OF LAND WITHIN THE AREA OF A COUNTY OR MUNICIPALITY THAT HAS AN ORDINANCE THAT REGULATES PARCELS OF LAND;
___B. THIS SURVEY IS LOCATED IN A PORTION OF A COUNTY OR MUNICIPALITY THAT IS UNREGULATED AS TO AN ORDINANCE THAT REGULATES PARCELS OF LAND;
___C. ANY ONE OF THE FOLLOWING:
___1. THIS SURVEY IS OF AN EXISTING PARCEL OR PARCELS OF LAND AND DOES NOT CREATE A NEW ROAD OR CHANGE AN EXISTING ROAD;
___2. THIS SURVEY IS OF AN EXISTING BUILDING OR OTHER STRUCTURE, OR NATURAL FEATURE, SUCH AS A WATER COURSE;
___3. THIS SURVEY IS A CONTROL SURVEY;
X D. THIS SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXCEPTION TO THE DEFINITION OF SUBDIVISION; OR
___E. THE INFORMATION AVAILABLE TO THE SURVEYOR IS SUCH THAT THE SURVEYOR IS UNABLE TO MAKE A DETERMINATION TO THE BEST OF THE SURVEYOR'S PROFESSIONAL ABILITY AS TO PROVISIONS CONTAINED IN (A) THROUGH (D) ABOVE.

SIGNED: SURVEYOR SEAL
DATE: 5/8/09

I, _____, REVIEW OFFICER OF _____ COUNTY, CERTIFY THAT THE MAP OR PLAT TO WHICH THIS CERTIFICATION IS AFFIXED MEETS ALL STATUTORY REQUIRMENTS FOR RECORDING.

REVIEW OFFICER

DATE

SCALE 1"=300'
0 300 600

PROJECT #09-005R4/09-002/08-006/02-051REV2

REVISED

SHEET 1 OF 1

BOUNDARY SURVEY
FOR
C & D LANDFILL INC.

DATES OF SURVEY: 10/1-11/20/2000
PACTOLUS TOWNSHIP PITT COUNTY NORTH CAROLINA

OWNER: C&D LANDFILL INC.
ADDRESS: 802 Recycling Lane
Greenville, NC 27834

PHONE: 252-752-8274

BURGESS LAND SURVEYING P.A.
PROFESSIONAL LAND SURVEYORS
3931 NC HWY 30, PO Box 172
STOKES, N.C. 27884
(252) 758-4900
e-mail: BURGESSSURVEYS@EMBARQMAIL.com

SURVEYED: JB	APPROVED: JABII
DRAWN: JABII	DATE: 12-1-2000
CHECKED: JABII	SCALE: 1": 300'

PROJECT 09-005
PROJECT 09-002
PROJECT 08-006
PROJECT 02-051
EJE/LEWIS TRACT/EJELEWIS-BOUNDARY/MFR/
EJLEWBOUNDREVmfr

FRANCHISE RENEWAL AMENDMENT #1

For: A Construction and Demolition Landfill

Granted By: Pitt County Board of Commissioners
1717 West Fifth Street
Greenville, North Carolina 27834

Granted To: C & D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 2834
Contact: Judson Whitehurst, President

Original Franchise Date: December 18, 2000

Renewal Franchise Date: February 3, 2003

Amendment #1 Date: August 4, 2008

The following terms of the Franchise are hereby modified:

1. **The service area is changed from an area up to 50 miles in radius from the center of the waste area to an area up to 100 miles in radius from the center of the waste area. This extension of radius will include counties not specified in the Franchise Renewal.**
2. **The applicant is granted the authority to receive up to 300 tons of waste per calendar day rather than the 200 tons of waste per calendar day specified in the Franchise Renewal.**

The Franchise for C & D Landfill, Inc., is hereby amended to reflect the above changes. This Amendment #1 to the Franchise does not change any of the other requirements of the Franchise not directly set out in this Amendment.

CONTRACTOR

C & D LANDFILL, INC.

BY: _____

ATTEST: _____

CORPORATE SEAL

PITT COUNTY

BY: _____
Mark W. Owens, Jr., Chairman
Pitt County Board of Commissioners

ATTEST:

_____
Patricia Staton
Clerk to the Board

COUNTY SEAL

APPROVED
Pitt County Legal Department
Date: 8/28/08
By: _____
Attorney

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act.

_____
Finance Officer

FRANCHISE RENEWAL

FOR: A Construction and Demolition Debris Landfill

GRANTED BY: Pitt County Board of Commissioners
1717 West Fifth Street
Greenville, North Carolina 27834
Contact: Phil Dickerson
Deputy County Manager/Public Services

GRANTED TO: C & D Landfill, Inc.
802 Recycling Lane
Greenville, North Carolina 27834
Contact: Judson Whitehurst, President

TERM OF FRANCHISE: The renewal term of this Franchise shall be one (1) year from the date of granting of the Franchise Renewal. The Franchise may renew and extend for seven (7) subsequent one (1) year terms, contingent upon County Commissioner approval pursuant to G. S. §153A-46. The Board of Commissioners may, at its sole option, require that the Franchisee meet additional terms and conditions in order to secure the renewal of the Franchise at the end of any one year term.

POPULATION AND AREA TO BE SERVED: The Site is located on US264 near the Pitt County/Beaufort County line. It is expected that the site will serve an area up to 50 miles in radius from the center of the waste area. This area will include all or portions of Pitt, Beaufort, Pamlico, Craven, Lenoir, Greene, Jones, Wayne, Wilson, Nash, Edgecombe, Halifax, Northampton, Bertie, Martin, Chowan, Washington, Tyrrell and Hyde Counties.

TYPE, QUANTITY AND SOURCE OF WASTE: Construction of new commercial and residential projects will be the main source of waste. Typical components of the waste stream are gypsum board, lumber, shingles, paper products, plastics and other miscellaneous materials. The most likely average daily rate is 50 tons per day. The Applicant is granted the authority to receive up to 200 tons per calendar day in order to accommodate future growth or other natural disasters such as Hurricane Floyd.

ANTICIPATED LIFE OF SITE: On the next page is a table of calculations of the potential useful life of the site. The useful life is based on the estimated tonnage per year arriving at the facility. It is estimated the proposed facility will have a useful life of approximately 20 years.

Annual Growth	Daily Tonnage		
	50	100	200
0%	25 years	13 years	7 years
2%	21 tears	11 years	6 years
5%	17 years	9 years	5.5 years
10%	13 years	8 years	5 years

DESCRIPTION OF SITE: Beginning at North Carolina Geodetic Survey Monument "BEACHUM-1979" with NAD '83 state plane coordinates NORTHING 209495.130 meters EASTING 774558.210 meters proceed on a magnetic bearing (July 22, 2000) SOUTH 28 degrees 46 minutes 00 seconds WEST 467.22 ft. to an existing iron stake, thence SOUTH 68 degrees 17 minutes 21 seconds WEST 1317.66 ft. to an existing iron pipe, thence SOUTH 24 degrees 28 minutes, 54 seconds, WEST 870.40 ft. to an existing iron pipe, thence SOUTH 19 degrees 17 minutes 19 seconds WEST 620.11 ft. to an existing iron pipe in the center of an abandoned railroad bed, thence SOUTH 22 degrees 50 minutes 42 seconds WEST 700.25 ft. to an existing iron pipe and being the TRUE POINT OF BEGINNING.

Thence from the TRUE POINT OF BEGINNING the following courses and distances:

SOUTH 44 degrees 44 minutes 42 seconds EAST 677.72 ft. to an existing iron pipe, thence SOUTH 15 degrees 30 minutes 38 seconds EAST 495.60 ft. to an existing iron pipe, thence SOUTH 66 degrees 08 minutes 47 seconds WEST 1182.37 ft to an existing iron pipe, a corner with Davenport Farms DEED BOOK K-37 PAGE 457, thence NORTH 01 degrees 05 minutes 14 seconds WEST 122.65 ft. to an existing iron pipe, thence NORTH 33 degrees 05 minutes 14 seconds WEST 1312.98 ft. to an existing railroad iron on the south bank of WOLF PITT BRANCH, thence along the branch NORTH 27 degrees 36 minutes 05 seconds EAST 51.55 ft. (no point set) to the center line intersection of WOLF PITT BRANCH and a CANAL HEADING NORTH, thence along the centerline of the canal NORTH 04 degrees 28 minutes 05 seconds WEST 62.82 ft. (no point set), thence NORTH 19 degrees 30 minutes 45 seconds EAST 26.37 ft. (no point set), thence NORTH 36 degrees 34 minutes 19 seconds WEST 81.04 ft. (no point set), thence NORTH 37 degrees 17 minutes 08 seconds WEST 154.38 ft. to a set iron pipe in the centerline of the canal, thence leaving the canal SOUTH 82 degrees 23 minutes 10 seconds EAST 723.01 ft. (no point set), thence NORTH 54 degrees 18 minutes 09 seconds EAST 414.81 ft. (no point set), thence SOUTH 44 degrees 44 minutes 42 seconds EAST 210.00 ft. (no point set), thence SOUTH 44 degrees 44 minutes 42 seconds EAST 146.84 ft. back to THE TRUE POINT OF BEGINNINGS and having and containing 40.14 acres by the coordinate method.

CONDITIONS: The conditions upon which the Franchise renewal is granted are the following:

1. The franchisee shall cause any public road leading to the landfill to be cleared of debris at least twice per month for a distance of two miles on both sides of the landfill

entrance onto the public road.

2. The franchisee shall require that all trucks transporting debris be adequately covered or secured to prevent the spillage of debris.

3. The franchisee shall pay to the Pitt County Solid Waste Enterprise Fund a certain sum to be set each year in the fee schedules approved by the Board of County Commissioners for every ton of debris taken into the landfill. These funds shall be utilized by the County to insure that the landfill operates in accordance with all Federal, State, and local regulations and the franchise.

4. The franchisee shall comply with all fire prevention regulations and sedimentation and erosion control regulations.

5. The franchisee shall provide dust control measures that will not allow dust to leave his property.

6. The franchisee hereby gives the County the right to seek up to $500 per calendar day in damages, for violation of the franchise agreement.

Beth Ward, Chairman

ATTEST:

Susan J. Banks, CMC
Clerk to the Board

PITT COUNTY NORTH CAROLINA
Agriculture Education Health Care Industry

APPROVED
Pitt County Legal Department
Date: 2/26/03
By: _____
Attorney

"This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control Act."

Finance Officer

FRANCHISE ORDINANCE FOR CONSTRUCTION DEBRIS LANDFILLS COUNTY OF PITT NORTH CAROLINA

WHEREAS, G.S. §153A-136 provides that a county may grant a franchise to one or more persons for the disposal of solid wastes in a county; and,

WHEREAS, G.S. §130A-294 requires any applicant for a sanitary landfill permit, prior to applying for such permit from the State of North Carolina, to obtain from each local government having jurisdiction over any part of the proposed sanitary landfill a franchise for operation of same; and,

WHEREAS, construction debris (C&D) landfills, defined as facilities for the disposal of solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but not including inert debris, land-clearing debris or yard debris, are classified by the North Carolina Department of Environment, Health & Natural Resources as sanitary landfills; and,

WHEREAS, operational issues regarding C&D landfills are controlled by the provisions of the Rules of the North Carolina Department of Environment, Health & Natural Resources; and,

WHEREAS, because of the rapid building and development in Pitt County, there is a continual need for C&D landfills in the County, and;

WHEREAS, G.S. §130A-294 requires that certain information be contained in every franchise granted for a sanitary landfill.

NOW THEREFORE IT BE ORDAINED,

Section 1. For purposes of this ordinance a construction debris (C&D) landfill is defined as a facility for the disposal of solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but not including inert debris, land-clearing debris or yard debris.

Section 2. Every operator of a C&D landfill in Pitt County must obtain a franchise from the Pitt County Board of Commissioners. A franchise shall be issued upon the presentation of the following information to the County:

1. The name and address of the applicant and owner of the proposed site.

2. The trade or other fictitious names, if any, under which the applicant does business, along with a certified copy of and assumed name certificate stating such name or articles or incorporation stating such name.

3. A legal description and a map of the property proposed to be included in the C&D landfill;

4. A statement of the population to be served by the C&D landfill, including a description of the geographic area;

5. A description of the volume and characteristics of the waste stream;

6. A projection of the useful life of the C&D landfill; and

7. Evidence that the site has been approved by the Pitt County Board of Commissioners.

Section 3. Upon issuance, the franchise document shall contain a statement of the population to be served by the C&D landfill, including a description of the geographic area; a description of the volume and characteristics of the waste stream; and, a projection of the useful life of the C&D landfill.

Section 4. The Board of County Commissioners, pursuant to G.S. § 130A-294, may hold a public hearing for the purpose of notifying the public of the intent to issue a franchise for a C&D landfill if the board determines that sufficient public interest exists in the proposed C&D landfill to warrant a public hearing. If the Board, in its sole discretion, determines that a public hearing should be held, the county shall schedule a time and place for said hearing.

A notice of such hearing shall be, at the expense of the applicant, published at least once in a newspaper of general circulation not less than thirty (30) days prior to the date established for the hearing. Notice of the hearing must also be posted on the property, at a place visible to all public roads adjacent to the proposed site. The notice shall be reasonably calculated to inform the public of the location, date, time and purpose of the hearing. The applicant shall provide an affidavit to the County not less than ten (10) days before the date of the hearing that the required notice has been posted.

The conditions upon which a franchise is granted shall be the following:

1. The franchisee shall cause any public road leading to the landfill to be cleared of debris at least twice per month for a distance of two miles on both sides of the landfill entrance onto the public road.

2. The franchisee shall require that all trucks transporting debris be adequately covered or secured to prevent the spillage of debris.

3. The franchisee shall pay to the Pitt County Solid Waste Enterprise Fund a certain sum to be set each year in the fee schedules approved by the Board of County Commissioners for every ton of debris taken into the landfill. These funds shall be utilized by the County to insure that the

landfill operates in accordance with all Federal, State and lc :al regulations and the franchise.

4. The franchisee shall comply with all fire prevention regulat ons and sedimentation and erosion control regulations.

5. The franchisee shall provide dust control measures that will not allow dust to leave his property.

6. The franchisee hereby gives the County the right to seek up to $500 per calendar day in damages, for violation of the franchise agre ment.

This ordinance shall be effective upon enactment and shall apply to all C& D landfills that have been issued a site approval by Pitt County.

Charles P. Gas ons, Chairman

ATTEST:

Susan J. Banks, CMC
Clerk to the Board

Appendix 2
Airspace and Earthwork Calculations

C&D Landfill, Inc.
Pitt County, North Carolina

Phase 2
Note: Volumes taken from AutoCAD DTM

Soils Volume Analysis			
Total Airspace Proposed	1,046,156	Cyds	Total with 3' cover
Final Cover Required	96,700	Cyds	3' feet of cover
Net Airspace	949,456	Cyds	
Intermediate Cover Required	284,837	Cyds	Net Airspace x .30
Total Base Fill Volume	84,285	Cyds	
Soil Balance	465,822	Cyds	Borrow Material Required

Note: Borrow material is available from adjacent sand mining operation.

Appendix 3
Water Quality Monitoring Plan

The following summarizes the current state of Assessment and Detection stage monitoring programs for C&D Landfill, Inc. Phase 1 is in Assessment monitoring, with Appendix II sampling taking place at MW-3s, MW-3A, MW-8, along with the shallow background well, MW-1s. The remaining Phase 1 and Phase 2 wells are in Detection monitoring with Appendix I sampling only, except for MW-12s within Phase 2, where impacts similar to MW-3s and MW-8 have been detected. For the next several sampling events, Appendix II sampling will be conducted at MW-12 (see sampling schedule). While no definite conclusions have been drawn, it appears that the source may be focused on the drainage feature, which splits the distance between MW-8 and MW-12. The contaminants detected thus far are not typical of materials found in C&D wastes. Activities conducted prior to the start of the landfill are suspected.

The following documents, developed at different times, are included in this compilation:

- Ground Water Assessment Work Plan, dated June 22, 2009
- Sampling schedule for Fall 2013 through Spring 2005, dated November 14, 2013
- Table 1a Monitoring Well and Ground Water Data for Phase 1, from November 2013 sampling report
- Table 1b Monitoring Well and Ground Water Data for Phase 2, from November 2013 sampling report
- Figure 1 Type 3 Monitoring Well Schematic, from June 2009 Work Plan
- Figure 1 Type 3 Monitoring Well Schematic, from June 2009 Work Plan
- Figure 2 Type 2 Monitoring Well Schematic, from June 2009 Work Plan
- Attachment 1 Monitoring Locations Map, from November 2013 sampling report
- Attachment 2 Solid Waste Section Guidelines for Goundwater, Soil, and Surface Water Sampling

David Garrett & Associates
Engineering and Geology

June 22, 2009

Ms. Jackie Drummond
NC Division of Waste Management
Solid Waste Section
Mail Service Center 1646
Raleigh, NC 27699-1646

RE: Ground Water Assessment Work Plan – Revised
C&D Landfill, Inc. (Pitt County, NC)
ND Solid Waste Permit #74-07

Dear Ms. Drummond:

Thank you for meeting with me and Donna Wilson on June 9, 2009 to discuss the upcoming Assessment Monitoring program for the referenced facility, and your comments provided on June 18, 2009, which this revision addresses. This document formalizes our discussion and presents a brief summary of known conditions associated with the facility and a work plan for an assessment monitoring program, consistent with your expectations following our meeting. During that meeting you asked for several items, including a copy of the November 2008 monitoring report (in progress) and an Environmental Monitoring Form for the May 2008 sampling event. These documents will be transmitted in the near future under separate cover. You asked about the stream and wetlands classifications (see Background Information).

Subsequent to our meeting, I received verbal information from the May 2009 sampling event (report is in progress), which suggests that the number and concentration of constituents of concern may be decreasing. However, the regulations are specific regarding the initial course of action for the assessment. Thus, I propose an independent sampling event for Appendix II constituents at existing wells MW-3s and MW-8 (which had previously shown a slight impact), plus the installation and sampling of one new well at the property line (down gradient of the apparent impact) and three of the Phase 2 wells (upgradient of the apparent impact). Then we will review the data with the SWS to determine the next course of action.

Summary of Objectives

C&D Landfill, Inc. is entering a ground water assessment monitoring program as a requirement of North Carolina Solid Waste regulations. Assessment monitoring is a self-implementing sampling program triggered by one or more constituents, those normally monitored in the detection-stage monitoring program, that exceed North Carolina ground water protection standards (15A NCAC 2L). Detection of a handful of key constituents on the US-EPA Appendix I sampling list – common at unlined landfills – at concentrations just slightly above the 2L standards, has occurred at a small number of wells.

5105 Harbour Towne Drive • Raleigh • North Carolina • 27604
919-418-4375 (Mobile) • 919-231-1818 (Office fax) • E-mail: david@davidgarrettpe.com

The values that exceed the 2L standards have persisted for a couple of years, but (at present) both the number of constituents and the concentrations appear to be decreasing. Per the regulations, initial assessment activities shall consist of installing one or more new monitoring wells at the compliance boundary (property line) and sampling this well and a subset of the other wells for the US-EPA Appendix II sampling list for an indeterminate time. Depending on the results, amendments to the routine detection-stage monitoring program may be required.

Background Information

C&D Landfill, Inc., is an unlined construction and demolition debris landfill (CDLF) that is regulated under 15A NCAC 13B .0537 *et seq*. The regulations impose strict material acceptance requirements, and the facility has been operated in compliance based on periodic inspection by the regulatory agency. Phase 1 of the CDLF covers approximately 15 acres and opened in 2001, following site characterization studies performed ca. 2000 that identified the ground water flow conditions.

Subsurface conditions within the upper 70 feet consist of two relatively sandy aquifers (fluvial and shallow marine sediments) separated by a partial confining layer (deep marine silt-clay associated with the Yorktown Formation) – the deeper sandy layer is underlain by another confining layer. An upward hydraulic gradient exists beneath much of the site due to mild artesian pressure within the deeper aquifer. Ground water is shallow (typically within 5 feet beneath the surface) and is directed to the south, toward large receiving streams (Grindle Creek and/or the Tar River).

The downgradient area (between the facility and the streams) is mostly within the 100-year floodplain and contains extensive wetlands. There are no ground water users located down-gradient of the facility (i.e., between the landfill and the ground water discharge features), and no down-gradient development potential exists. No constituents exceeding the 2L standards have been detected in the deeper aquifer. The wetlands classifications (based on attached NWI data) are PSS and PFO, with modifiers indicating needle and deciduous vegetation, saturated and/or seasonally flooding, and partially drained/ditched.

Grindle Creek (based on NC DENR BIMS data) has a class C-NSW stream designation (fresh water, supportive of aquatic life and recreation, nutrient sensitive). Past uses of the site include agriculture and recreational hunting – both potential sources of some of the contaminants observed in excess of the 2L standards. The initial waste material brought to the facility was Hurricane Floyd flood damaged demolition debris, which was collected under emergency management conditions – materials that are not normally admitted to a CDLF under the Solid Waste regulations may have been introduced. Ground water monitoring did indicate certain inorganic background constituents – not the focus of this assessment – which are exacerbated by turbidity. The organic constituents were only recently detected.

Ground Water Monitoring Network

Currently, there are twelve (12) monitoring wells in place for Phase 1, eight (8) of which monitor the uppermost aquifer within depths of approximately 15 to 25 feet – these are sampled on a semi-annual basis in accordance with the regulations – and four (4) deeper wells that are sampled less frequently. The

background wells for Phase 1 are MW-1s and MW-1d. Planned future monitoring of Phase 2 (under permit review) includes nine (9) additional wells with one deep well (MW-14A) and another upgradient background well (MW-9A). For the initial stages of the assessment monitoring, plans are to install and sample one supplemental well at the property line (MW-3A), located down-gradient the wells historically showing the highest concentrations of Appendix I constituents (MW-8 and MW-3s), in accordance with the Solid Waste regulations, and three (3) of the proposed Phase 2 wells (MW-10, MW-11, and MW-12).

Background sampling for Phase 2 is required prior issuance of the Permit to Operate – although this is a separate issue from the Assessment Monitoring for Phase 1 – sampling the three Phase 2 wells as part of the Assessment will assist in determining the contaminant source. There are three stream sampling locations to monitor the discharge of the uppermost aquifer to the on-site water bodies. The well network and regional topographic conditions are shown on the accompanying drawings (**Sheets 1 through 5**).

Detection Stage Monitoring

Semi-annual sampling is conducted in May and November of each year. The sampling and analysis is performed by a local laboratory (Environment-1) in accordance with North Carolina regulations and industry protocols. The data are reviewed and reported by professional geologists. A data base has been established from which trends can be observed. The following is a summary of the constituents that exceed the 2L standards, prepared subsequent to the November 2008 sampling event but prior to the issuance of the report for the May 2009 sampling event. Preliminary results for the May 2009 sampling event were communicated by telephone for the preparation of this work plan. The full data set is summarized on the attached **Table 1**.

MW-3s:

- Benzene and 1,2-Dichloroethane have been detected **above** the 2L standards and have exhibited an upward trend in concentration since November 2007. Vinyl chloride has been detected **above** the 2L standard twice since November 2007, most recently in November 2008.
- Cis-1,2-Dichloroethene, ethylbenzene, methylene chloride and toluene have been consistently detected since November 2007 at levels **below** the 2L standards. Cis-1,2-Dichloroethene and toluene have exhibited an upward trend in concentrations.

MW-8:

- Benzene, cis-1,2-Dichloroethene and methylene chloride have been consistently detected since November 2007 at concentrations **below** the 2L standards.

MW-1s and MW-2s:

- Cis-1,2-Dichloroethene was detected in the samples collected from MW-1s and MW-2s for the first time in November 2008 at concentrations **below** the 2L standard.

Based on new information for the May 2009 sampling event, communicated by the lab via telephone – not available for a meeting with SWS on June 9, 2009 – only benzene was detected at MW-3s slightly above the 2L standard (the concentration was 1.5 µg/l, whereas the 2L standard is 1.0 µg/l).

Discussion of the Data

1,2-Dichloroethane (1,2-DCA) is a common chemical intermediate used in the production of vinyl chloride, which is the main precursor for the production of PVC. It is also used as an industrial solvent and was formerly used as an anti-knock agent in leaded gasoline (chlorinated equivalent of ethylene dibromide (EDB)). 1,2-DCA is relatively recalcitrant in the environment and can persist for many years once released to groundwater.

Cis-1,2-Dicloroethene (DCE) and vinyl chloride are environmental breakdown products of trichloroethene (TCE), which is a common industrial solvent and degreasing agent. TCE is also an environmental breakdown product of tetrachloroethene (PCE), a common industrial solvent frequently used in dry cleaning.

Methylene chloride (MC) is a common industrial solvent that is widely used as a paint stripping and degreasing agent. It is also a common laboratory contaminant introduced during preparation of samples for analysis. MC is a direct environmental breakdown product of chloroform, which is widely used as an industrial solvent and as a chemical intermediate in the production of other organic chemicals, and it is found in building materials.

Benzene, ethylbenzene, and toluene are three (of the four) chief constituents of gasoline.

Based on the above, it is likely that a contaminant source exists hydraulically upgradient of the location of MW-3s. Further, based on the mix of contaminants reported in groundwater, the source materials likely include 1,2-DCA and TCE (possibly chloroform or MC), the latter being a parent compound of the environmental breakdown products found at MW-3s and MW-8.

None of the foregoing constituents (or concentrations) indicates gross contamination or a chronic, worsening condition. In fact, the most recent data suggest a "slug" of contaminants may have been released at an unknown time and the apparent impact may be improving on its own. Concentrations of some constituents come and go, perhaps tied to seasonal water level fluctuation – there may be a tendency for the light constituents (relative to water) to reside in the partly saturated capillary space above the water table (vadose zone), only to be released during time of low water levels – petroleum products are known to exhibit such tendencies. Water levels have fluctuated in recent years due to the prolonged drought, and dilution factors associated with quantities of ground water movement come into play.

Barring any significant future changes in the data, nothing in the data appear to affect the future ability to monitor the site, nor does the data necessarily reflect on the operation of the facility.

Other Issues to Consider

Source location – It appears that the constituents detected in the ground water have been introduced to the aquifer somehow; the constituents in question are not naturally occurring compounds or believed to derive from the normal decomposition of C&D wastes. So far, the apparent ground water impacts are limited to the west side of the Phase 1 footprint, although it has not been determined if the landfill operation is responsible for the impact. The uppermost aquifer, monitored by the shallow wells, is showing a potential impact, but not the deeper well which monitors a lower aquifer, separated from the upper by a confining unit. The data trends do not clearly indicate if the impact is due to a short-term (or one-time) release or a chronic condition. Based on the new information (May 2009) the impact may be abating on its own.

Past uses of the site – The history of the site – as well as adjacent properties – are fairly well understood, some of which could potentially lead to a contaminant being introduced to the ground water at Phase 1 (gasoline components, probably not the organic solvents). These uses include former agricultural activities and dismantling of flood damaged mobile homes in the Phase 1 area, along with the MSW transfer station and material processing area located upgradient (north) of Phase 2 – albeit these off-site facilities quite a distance away and located across wetlands features (these are not suspected facilities). The landfill began as a repository for Hurricane Floyd food-damage debris some of this material that was brought in under emergency management conditions may have contained components that would normally be excluded from a C&D landfill. The normal operation of the C&D landfill after the initial waste placement has been compliant with the regulatory requirements for waste acceptance.

Extent of impact – The intent of the assessment monitoring program is to determine the horizontal and vertical extent of the impact (if one exists), and to determine if there is any risk to the public. At a minimum, one new well is typically required (per the regulations) to check for compliance boundary (property line) violations. The assessment monitoring program also seeks to establish a baseline data base of the Appendix II list of constituents, upon which trends can be established by comparing the results of future sampling events, followed by future adjustments to the long-term monitoring program and any corrective that might be appropriate. Temporal trends are important, as well, whereas the data may indicate a temporary problem or chronic conditions, which would be treated in different ways.

Corrective action – The next logical step after assessment monitoring is consideration of corrective measures. It is premature to discuss corrective measures at this time, but one typical response to a ground water impact is to acquire more property for buffer purposes, followed by natural attenuation and continued monitoring. Other potential corrective measures that might be considered are various forms remediation, e.g., extraction and treatment, in-situ treatment (bacterial injection), and/or cut-off walls. All these measures are very dependent on the nature, concentration and ultimate fate of the contaminants.

Assessment Monitoring Work Plan

1. Prepare an Assessment Monitoring Plan (this document) and review it with NC DENR-SWS officials – this document formalizes the discussion from the June 9, 2009 and follow up reviews.

2. Install one (1) downgradient well at the property line (MW-3A) and three (3) wells in the Phase 2 monitoring network (MW-10, MW-11, MW-12) during mid-July 2009. In accordance with Rule .0545(b)(1)(B), slug testing will be performed to determine the hydraulic conductivity. The other wells for Phase 2 may be installed during this time. All new wells will be surveyed.

3. Sample these four wells plus MW-3s and MW-8 (total of six wells) for the full Appendix II list by late-July 2009 – this will be an independent sampling event relative to Phase 1, i.e., the sampling event will be out-of-sequence with the routine semi-annual sampling schedule.

4. Prepare a summary report by mid-August 2009, including a detailed evaluation of site geology and potential ground water receptors, along with the results of the independent sampling event. It should be noted that much of the data needed for the hydrogeology portion of the assessment has been completed as part of the earlier permitting studies.

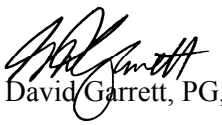
5. Review the summary report with NC DENR-SWS officials to determine which wells and which, if any, Appendix II parameters might be appropriate for sampling during the next semi-annual sampling event (November 2009) – the subset of Appendix II parameters will be added to the normal Appendix I parameter list for the next four consecutive semi-annual samples.

6. Assessment of Corrective Measures will follow. Depending on the baseline data, future adjustments to the long-term sampling program may be appropriate – or the sampling might revert back to the Appendix I list.

In accordance with Rule .0545(a)(2) and (3), the approved work plan for the Assessment Monitoring program and subsequent data will be placed in the facility operating record and, in the event that an off-site migration is detected, local government officials and adjacent property owners will be notified.

Please contact me if you have any questions or concerns. I propose to implement the assessment in accordance with the schedule outlined in the following document, same as discussed in our meeting, which involves installing and sampling the new wells within the next six weeks. I will review the data with you when it becomes available, then we can discuss the next course of action.

Cordially yours,



G. David Garrett, PG, PE

cc: Judson Whitehurst, Wayne Bell – C&D Landfill, Inc.
Donna Wilson – NC DENR-DWM, SWS

EJE Recycling, Inc. / C&D Landfill, Inc. Sampling List

Prepared 11-14-2013

Phase No.	Well No.	Fall 2013	Spring 2014	Fall 2014	Spring 2015	Fall 2015
1	MW-1s	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**
1	MW-1d	--	--	--	Appendix I	--
1	MW-2s	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
1	MW-2d	--	--	--	Appendix I	--
1	MW-3s	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**
1	MW-3A	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**
1	MW-3d	--	--	--	Appendix I	--
1	MW-4	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
1	MW-5	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
1	MW-6	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
1	MW-7	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
1	MW-8	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**
2	MW-9A	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
2	MW-10	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
2	MW-11	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
2	MW-12s	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**	Appendix I + detected Appx II	**Full Appendix II**
2	MW-13	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
2	MW-14s	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
2	MW-14d	--	--	--	Appendix I	--
	SW-1	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
	SW-2	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
	SW-3	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I
	SW-4	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I

Deep wells last sampled in May 2013 schedule biannually

Table 1
Monitoring Well and Groundwater Data
Water Quality Monitoring
November 26, 2013
C&D Landfill, Inc. Phase 1
Greenville, Pitt County, North Carolina
Permit # 74-07

Well Identity	Depth to Groundwater (Feet BTOC)	Elevation Top of PVC Well Casing (Feet MSL)	Groundwater Elevation (Feet MSL)	Field Parameters			
				Temp. C°	pH	S.C. umhos/cm	Turbidity (ntu)
MW-1s	8.91	20.91	12.00	16.0	6.1	751	7.72
MW-1d	NM	21.14	#VALUE!	NM	NM	NM	NM
MW-2s	11.51	21.44	9.93	18.0	6.5	1,570	5.41
MW-2d	NM	21.80	#VALUE!	NM	NM	NM	NM
MW-3s	12.80	23.02	10.22	20.0	6.4	1,493	3.53
MW-3d	NM	22.83	#VALUE!	NM	NM	NM	NM
MW-3A	12.01	21.93	9.92	16.0	6.4	1,601	4.74
MW-4	6.86	18.42	11.56	16.0	6.1	338	19.7
MW-5*	NM	17.90	#VALUE!	NM	NM	NM	NM
MW-6	9.90	20.03	10.13	17.0	6.4	673	7.28
MW-7	7.83	19.40	11.57	17.0	6.7	1,604	7.08
MW-8	10.25	21.21	10.96	18.0	5.0	1,976	11.7

Notes: BGS = Below Ground Surface
*MW-5 was reported as having sustained damage

NM = Not Measured
S.C. = Specific Conductance
ntu = Nephelometric Turbidity Units

Table 1
Monitoring Well and Groundwater Data
Water Quality Monitoring
November 26, 2013
Phase 2 - C&D Landfill, Inc.
Greenville, Pitt County, North Carolina
Permit # 74-07

Well Identity	Depth to Groundwater (Feet BTOC)	Elevation Top of PVC Well Casing (Feet MSL)	Groundwater Elevation (Feet MSL)	Field Parameters			
				Temp. C°	pH	S.C. umhos/cm	Turbidity (ntu)
MW-9A	6.47	20.58	14.11	17.0	7.1	361	97.4
MW-10	4.40	16.61	12.21	17.0	5.6	1006	2.56
MW-11	3.97	14.49	10.52	16.0	6.5	698	7.16
MW-12s	5.92	16.18	10.26	17.0	6.3	1501	2.39
MW-13	10.44	20.69	10.25	18.0	5.6	163	6.63
MW-14s	6.11	16.60	10.49	18.0	5.7	1223	7.06
MW-14d	NM	17.45	#VALUE!	NM	NM	NM	NM

Notes: BGS = Below Ground Surface

NM = Not Measured
S.C. = Specific Conductance
ntu = Nephelometric Turbidity Units

Figure 1 – Type 3 Monitoring Well Construction Schematic (Lower Aquifer)

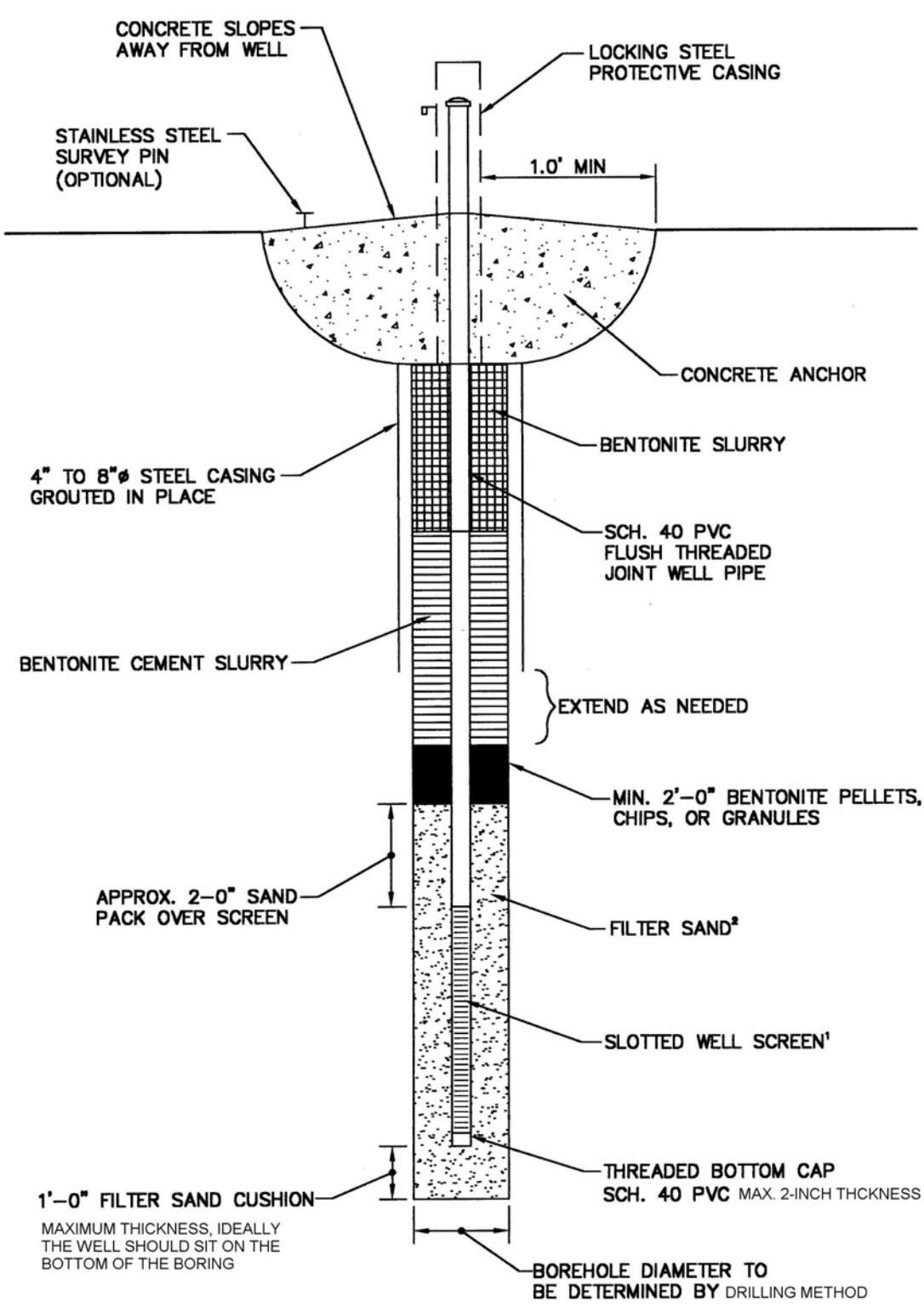
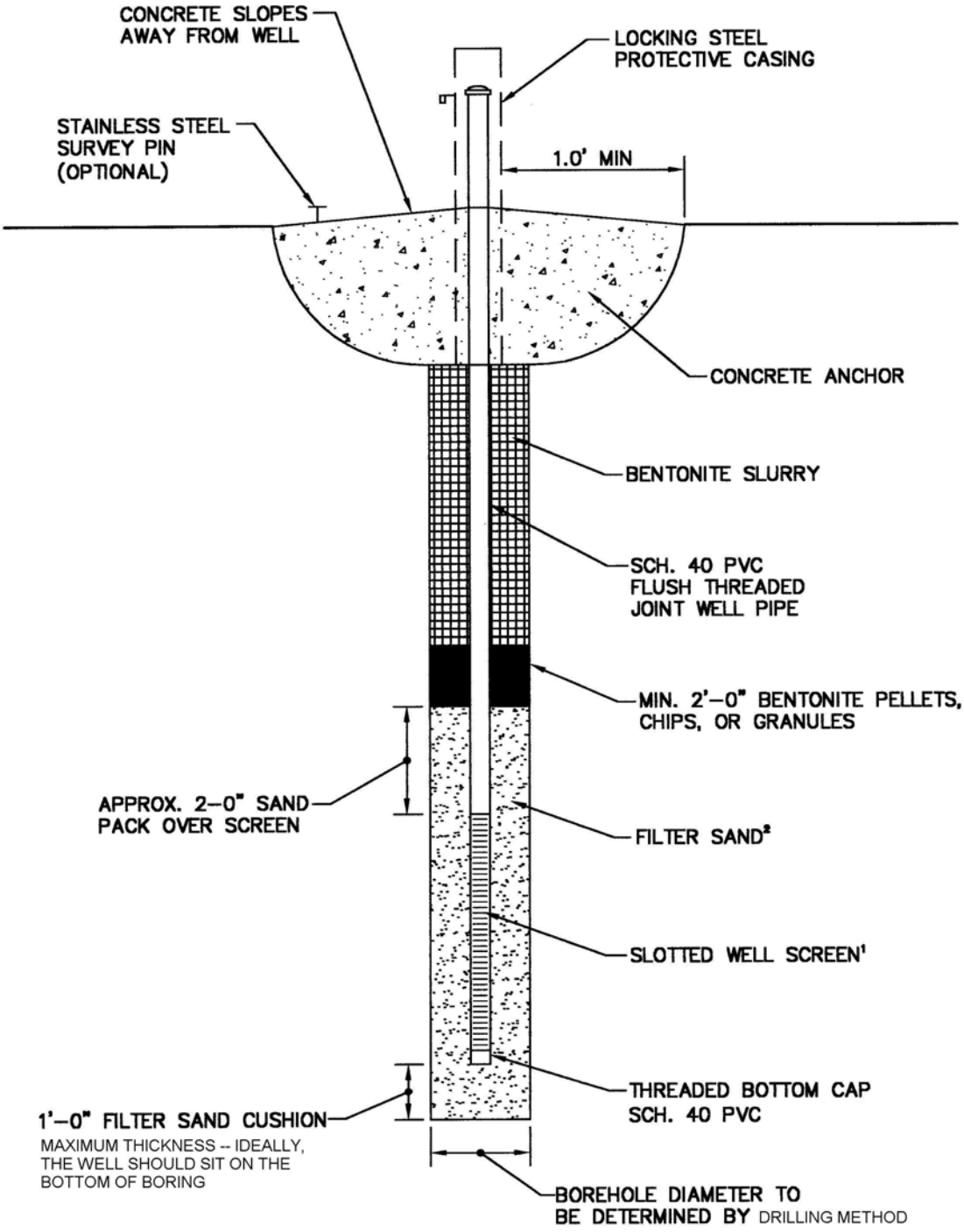


Figure 2 – Type 2 Monitoring Well Construction Schematic (Upper Aquifer)



Attachment 1

Drawing MP-1 Monitoring Locations

DATE	NO.	REVISION
3-8-2011	1	CORRECTED GAS PROBE ENUMERATION
6-18-09	0	ISSUED FOR REGULATORY REVIEW

CONCRETE PROCESSING

EJE RECYCLING, INC.

LCID PROCESSING

CLEAN WOOD PROCESSING

EXCAVATED DRAINGE DITCH

WETLANDS

GP-2

B-20

GP-3

SW-4

MW-16 FUTURE

GWE 14

QUARTER-MILE RADIUS

RECOMBINED PROPERTY LINE (SHOWN HERE AS APPROXIMATE)

GP-1

MW-9A

GWE 14.11

MW-15 FUTURE

PHASE 2B

GWE 13

MONITORING WELL (TYP.)

SEDIMENT BASIN (HOLDS WATER)

GP-4

SEDIMENT BASIN (HOLDS WATER)

SOIL-GAS PROBE (TYP.)

GWE 10.45

MW-14S

SEDIMENT BASIN (HOLDS WATER)

MW-14D

GP-5

GP-11

PHASE FOOTPRINT (TOE OF WASTE)

GWE 12

MW-13

GWE 10.25

PHASE 2A

MW-10

GWE 12.21

WETLANDS

MW-1D

MW-1S

GWE 12.00

GP-10

SEDIMENT BASIN (HOLDS WATER)

MW-12S

GWE 10.26

ROAD

MW-11

GWE 10.52

GP-6

SW-2

MW-8

GWE 10.96

PHASE 1

WETLANDS

GROUND WATER ELEVATION CONTOUR ON DATE OF SAMPLING EVENT (TYP)

500 FEET

RECOMBINED PROPERTY LINE (SHOWN AS APPROXIMATE)

QUARTER-MILE RADIUS

MW-3S

GWE 10.22

SEDIMENT BASIN (HOLDS WATER)

SEDIMENT BASIN (HOLDS WATER)

SURFACE WATER SAMPLING LOCATION (TYP.)

MW-3D

MW-3A

GWE 9.92

GP-7

GWE 11

MW-4

GWE 11.56

MW-7

GWE 11.57

SW-1

SEDIMENT BASIN (HOLDS WATER)

GWE 10

FLAT GRADES OUTSIDE TOE (DITCHES HOLD WATER)

100-YEAR FLOOD BOUNDARY

MW-2D

MW-2I

MW-2S

GWE 9.93

MW-6

GWE 10.13

GP-8

STREAM CHANNEL (UNNAMED TRIBUTARY)

SW-3

ORIGINAL FACILITY BOUNDARY

REFERENCE NOTES:

1. SITE TOPOGRAPHY AND FACILITY DESIGN BY JOHN TUCKER, PE
2. HYDROGEOLOGIC INVESTIGATION BY DAVID GARRETT, PG, PE
3. ORIGINAL SITE CHARACTERIZATION STUDIES PERFORMED IN 2000 FOR PHASE 1 AND 2002 FOR PHASE 2
4. PHASE 1 OPENED IN 2001, PHASE 2 PLANNED TO OPEN IN 2009 (PENDING APPROVAL OF PERMIT TO CONSTRUCT)
5. FACILITY IS OWNED AND OPERATED BY C&D LANDFILL, INC. (JUDSON WHITEHURST, PRESIDENT)

LEGEND

- MW-1 EXISTING MONITORING WELLS
- MW-14 PROPOSED MONITORING WELLS
- SW-1 SURFACE WATER MONITORING POINT
- FACILITY BOUNDARY

0 150' 300' 450'

1" = 150'

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919-418-4375 (mobile)
919-231-1818 (Office and Fax)

SEAL

NORTH CAROLINA REGISTERED GEOLOGIST DAVID G. GARRETT 6-18-09

PROJECT TITLE: C&D LANDFILL, INC. GROUND WATER MONITORING PITT COUNTY, NC PERMIT #74-07

DRAWING TITLE: POTENTIOMETRIC CONTOURS FOR PHASES 1 AND 2 OBSERVED NOV 26, 2013

DESIGNED BY: G.D.G.	DRAWN BY: G.D.G.
CHECKED BY: G.D.G.	PROJECT NO.: CDLF-3
SCALE: AS SHOWN	DATE: JUNE 2009
FILE NAME: C&D LANDFILL ASSESSMENT	
SHEET NO.: 1	DRAWING NO.: MP1

Attachment 2

Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling

North Carolina Department of
Environment and Natural Resources
Division of Waste Management
Solid Waste Section

Solid Waste Section
Guidelines for Groundwater, Soil, and Surface Water Sampling

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION

General Sampling Procedures

The following guidance is provided to insure a consistent sampling approach so that sample collection activities at solid waste management facilities provide reliable data. Sampling must begin with an evaluation of facility information, historical environmental data and site geologic and hydrogeologic conditions. General sampling procedures are described in this document.

Planning

Begin sampling activities with planning and coordination. The party contracting with the laboratory is responsible for effectively communicating reporting requirements and evaluating data reliability as it relates to specific monitoring activities.

Sample Collection

Contamination Prevention

a.) Take special effort to prevent cross contamination or environmental contamination when collecting samples.
    1. If possible, collect samples from the least contaminated sampling location (or background sampling location, if applicable) to the most contaminated sampling location.
    2. Collect the ambient or background samples first, and store them in separate ice chests or separate shipping containers within the same ice chest (e.g. untreated plastic bags).
    3. Collect samples in flowing water at designated locations from upstream to downstream.

b.) Do not store or ship highly contaminated samples (concentrated wastes, free product, etc.) or samples suspect of containing high concentrations of contaminants in the same ice chest or shipping containers with other environmental samples.
    1. Isolate these sample containers by sealing them in separate, untreated plastic bags immediately after collecting, preserving, labeling, etc.
    2. Use a clean, untreated plastic bag to line the ice chest or shipping container.

c.) All 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 with a portion of the sample water before taking the actual sample. Sample containers do not need to be rinsed. In the case of petroleum hydrocarbons, oil and grease, or containers with pre-measured preservatives, the sample containers cannot be rinsed.

d.) Place all fuel-powered equipment away from, and downwind of, any site activities (e.g., purging, sampling, decontamination).
    1. If field conditions preclude such placement (i.e., the wind is from the upstream direction in a boat), place the fuel source(s) as far away as possible from the sampling activities and describe the conditions in the field notes.
    2. 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.
    3. Dispense all fuels downwind. Dispose of gloves well away from the sampling activities.

<u>Filling Out Sample Labels</u>

Fill out label, adhere to vial and collect sample. Print legibly with indelible ink. At a minimum, the label or tag should identify the sample with the following information:

1. Sample location and/or well number
2. Sample identification number
3. Date and time of collection
4. Analysis required/requested
5. Sampler's initials
6. Preservative(s) used, if any [i.e., HCl, $Na_2S_2O_3$, NO_3, ice, etc.]
7. Any other pertinent information for sample identification

<u>Sample Collection Order</u>

Unless field conditions justify other sampling regimens, collect samples in the following order:

1. Volatile Organics and Volatile Inorganics
2. Extractable Organics, Petroleum Hydrocarbons, Aggregate Organics and Oil and Grease
3. Total Metals
4. Inorganic Nonmetallics, Physical and Aggregate Properties, and Biologicals
5. Microbiological

NOTE: *If the pump used to collect groundwater samples cannot be used to collect volatile or extractable organics then collect all other parameters and withdraw the pump and tubing. Then collect the volatile and extractable organics.*

Health and Safety

Implement all local, state, and federal requirements relating to health and safety. Follow all local, state and federal requirements pertaining to the storage and disposal of any hazardous or investigation derived wastes.

a.) The Solid Waste Section recommends wearing protective gloves when conducting all sampling activities.

1. Gloves serve to protect the sample collector from potential exposure to sample constituents, minimize accidental contamination of samples by the collector, and preserve accurate tare weights on preweighed sample containers.
2. Do not let gloves come into contact with the sample or with the interior or lip of the sample container. Use clean, new, unpowdered and disposable gloves. Various types of gloves may be used as long as the construction materials do not contaminate the sample or if internal safety protocols require greater protection.
3. Note that certain materials that may potentially be present in concentrated effluent can pass through certain glove types and be absorbed in the skin. Many vendor catalogs provide information about the permeability of different gloves and the circumstances under which the glove material might be applicable. The powder in powdered gloves can contribute significant contamination. Powdered gloves are not recommended unless it can be demonstrated that the powder does not interfere with the sample analysis.
4. 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.

b.) Properly manage all investigation derived waste (IDW).

5. To prevent contamination into previously uncontaminated areas, properly manage all IDW. 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.
6. 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 orpurged well water is contaminated with hazardous waste, contact the DWM Hazardous Waste Section (919-508-8400) for disposal options. Maintain all containers holding IDW in good condition. Periodically inspect the containers for damage and ensure that all required labeling (DOT, RCRA, etc.) are clearly visible.

Sample Storage and Transport

Store samples for transport carefully. Pack samples to prevent from breaking and to maintain a temperature of approximately 4 degrees Celsius (°C), adding ice if necessary. Transport samples to a North Carolina-certified laboratory as soon as possible. Avoid unnecessary handling of sample containers. Avoid heating (room temperature or above, including exposure to sunlight) or freezing of the sample containers. Reduce the time between sample collection and delivery to a laboratory whenever possible and be sure that the analytical holding times of your samples can be met by the laboratory.

a.) A complete chain-of-custody (COC) form must be maintained to document all transfers and receipts of the samples. Be sure that the sample containers are labeled with the sample location and/or well number, sample identification, the date and time of collection, the analysis to be performed, the preservative added (if any), the sampler's initials, and any other pertinent information for sample identification. The labels should contain a unique identifier (i.e., unique well numbers) that can be traced to the COC form. The details of sample collection must be documented on the COC. The COC must include the following:

1. Description of each sample (including QA/QC samples) and the number of containers (sample location and identification)
2. Signature of the sampler
3. Date and time of sample collection
4. Analytical method to be performed
5. Sample type (i.e., water or soil)
6. Regulatory agency (i.e., NCDENR/DWM – SW Section)
7. Signatures of all persons relinquishing and receiving custody of the samples
8. Dates and times of custody transfers

b.) Pack samples so that they are segregated by site, sampling location or by sample analysis type. When COC samples are involved, segregate samples in coolers by site. If samples from multiple sites will fit in one cooler, they may be packed in the same cooler with the associated field sheets and a single COC form for all. Coolers should not exceed a maximum weight of 50 lbs. Use additional coolers as necessary. All sample containers should be placed in plastic bags (segregated by analysis and location) and completely surrounded by ice.

1. Prepare and place trip blanks in an ice filled cooler before leaving for the field.
2. Segregate samples by analysis and place in sealable plastic bags.
3. Pack samples carefully in the cooler placing ice around the samples.
4. Review the COC. The COC form must accompany the samples to the laboratory. The trip blank(s) must also be recorded on the COC form.
5. Place completed COC form in a waterproof bag, sealed and taped under the lid of the cooler.
6. Secure shipping containers with strapping tape to avoid accidental opening.
7. For COC samples, a tamper-proof seal may also be placed over the cooler lid or over a bag or container containing the samples inside the shipping cooler.

8. "COC" or "EMERG" should be written in indelible ink on the cooler seal to alert sample receipt technicians to priority or special handling samples.
9. The date and sample handler's signature must also be written on the COC seal.
10. Deliver the samples to the laboratory or ship by commercial courier.
    NOTE*: If transport time to the laboratory is not long enough to allow samples to be cooled to 4° C, a temperature reading of the sample source must be documented as the field temperature on the COC form. A downward trend in temperature will be adequate even if cooling to 4° C is not achieved. The field temperature should always be documented if there is any question as to whether samples will have time to cool to 4° C during shipment. Thermometers must be calibrated annually against an NIST traceable thermometer and documentation must be retained.*

Appendix A - Decontamination of Field Equipment

Decontamination of personnel, sampling equipment, and containers - before and after sampling - must be used to ensure collection of representative samples and to prevent the potential spread of contamination. Decontamination of personnel prevents ingestion and absorption of contaminants. It must be done with a soap and water wash and deionized or distilled water rinse. Certified pre-cleaned sampling equipment and containers may also be used.

All previously used sampling equipment must be properly decontaminated before sampling and between sampling locations. This prevents the introduction of contamination into uncontaminated samples and avoids cross-contamination of samples. Cross-contamination can be a significant problem when attempting to characterize extremely low concentrations of organic compounds or when working with soils that are highly contaminated.

Clean, solvent-resistant gloves and appropriate protective equipment must be worn by persons decontaminating tools and equipment.

Cleaning Reagents

Recommendations for the types and grades of various cleaning supplies are outlined below. The recommended reagent types or grades were selected to ensure that the cleaned equipment is free from any detectable contamination.

a.) Detergents: Use Liqui-Nox (or a non-phosphate equivalent) or Alconox (or equivalent). Liqui-Nox (or equivalent) is recommended by EPA, although Alconox (or equivalent) may be substituted if the sampling equipment will not be used to collect phosphorus or phosphorus containing compounds.

b.) Solvents: Use pesticide grade isopropanol as the rinse solvent in routine equipment cleaning procedures. This grade of alcohol must be purchased from a laboratory supply vendor. Rubbing alcohol or other commonly available sources of isopropanol **are not acceptable**. Other solvents, such as acetone or methanol, may be used as the final rinse solvent if they are pesticide grade. However, methanol is more toxic to the environment and acetone may be an analyte of interest for volatile organics.

1. **Do not** use acetone if volatile organics are of interest
2. Containerize all methanol wastes (including rinses) and dispose as a hazardous waste.

Pre-clean equipment that is heavily contaminated with organic analytes. Use reagent grade acetone and hexane or other suitable solvents. Use pesticide grade methylene chloride when cleaning sample containers. Store all solvents away from potential sources of contamination.

c.) Analyte-Free Water Sources: Analyte-free water is water in which all analytes of interest and all interferences are below method detection limits. Maintain documentation (such as results from equipment blanks) to demonstrate the reliability and purity of analyte-free water source(s). The source of the water must meet the requirements of the analytical method and must be free from the analytes of interest. In general, the following water types are associated with specific analyte groups:

1. *Milli-Q (or equivalent polished water)*: suitable for all analyses.

2. *Organic-free*: suitable for volatile and extractable organics.
3. *Deionized water*: may not be suitable for volatile and extractable organics.
4. *Distilled water*: not suitable for volatile and extractable organics, metals or ultratrace metals.

Use analyte-free water for blank preparation and the final decontamination water rinse. In order to minimize long-term storage and potential leaching problems, obtain or purchase analyte-free water just prior to the sampling event. If obtained from a source (such as a laboratory), fill the transport containers and use the contents for a single sampling event. Empty the transport container(s) at the end of the sampling event. Discard any analyte-free water that is transferred to a dispensing container (such as a wash bottle or pump sprayer) at the end of each sampling day.

d.) Acids:

1. *Reagent Grade Nitric Acid*: 10 - 15% (one volume concentrated nitric acid and five volumes deionized water). Use for the acid rinse unless nitrogen components (e.g., nitrate, nitrite, etc.) are to be sampled. If sampling for ultra-trace levels of metals, use an ultra-pure grade acid.
2. *Reagent Grade Hydrochloric Acid*: 10% hydrochloric acid (one volume concentrated hydrochloric and three volumes deionized water). Use when nitrogen components are to be sampled.
3. If samples for both metals and the nitrogen-containing components are collected with the equipment, use the hydrochloric acid rinse, or thoroughly rinse with hydrochloric acid after a nitric acid rinse. If sampling for ultra trace levels of metals, use an ultra-pure grade acid.
4. Freshly prepared acid solutions may be recycled during the sampling event or cleaning process. Dispose of any unused acids according to local ordinances.

Reagent Storage Containers

The contents of all containers must be clearly marked.

a.) Detergents:

1. Store in the original container or in a HDPE or PP container.

b.) Solvents:

1. Store solvents to be used for cleaning or decontamination in the original container until use in the field. If transferred to another container for field use, use either a glass or Teflon container.
2. Use dispensing containers constructed of glass, Teflon or stainless steel. Note: If stainless steel sprayers are used, any gaskets that contact the solvents must be constructed of inert materials.

c.) Analyte-Free Water:

1. Transport in containers appropriate for the type of water stored. If the water is commercially purchased (e.g., grocery store), use the original containers when transporting the water to the field. Containers made of glass, Teflon, polypropylene or HDPE are acceptable.
2. Use glass or Teflon to transport organic-free sources of water on-site. Polypropylene or HDPE may be used, but are not recommended.

3. Dispense water from containers made of glass, Teflon, HDPE or polypropylene.
4. Do not store water in transport containers for more than three days before beginning a sampling event.
5. If working on a project that has oversight from EPA Region 4, use glass containers for the transport and storage of all water.
6. Store and dispense acids using containers made of glass, Teflon or plastic.

General Requirements

a.) Prior to use, clean/decontaminate all sampling equipment (pumps, tubing, lanyards, split spoons, etc.) that will be exposed to the sample.

b.) Before installing, clean (or obtain as certified pre-cleaned) all equipment that is dedicated to a single sampling point and remains in contact with the sample medium (e.g., permanently installed groundwater pump). If you use certified pre-cleaned equipment no cleaning is necessary.
    1. Clean this equipment any time it is removed for maintenance or repair.
    2. Replace dedicated tubing if discolored or damaged.

c.) Clean all equipment in a designated area having a controlled environment (house, laboratory, or base of field operations) and transport it to the field, pre-cleaned and ready to use, unless otherwise justified.

d.) Rinse all equipment with water after use, even if it is to be field-cleaned for other sites. Rinse equipment used at contaminated sites or used to collect in-process (e.g., untreated or partially treated wastewater) samples immediately with water.

e.) Whenever possible, transport sufficient clean equipment to the field so that an entire sampling event can be conducted without the need for cleaning equipment in the field.

f.) Segregate equipment that is only used once (i.e., not cleaned in the field) from clean equipment and return to the in-house cleaning facility to be cleaned in a controlled environment.

g.) Protect decontaminated field equipment from environmental contamination by securely wrapping and sealing with one of the following:
    1. Aluminum foil (commercial grade is acceptable)
    2. Untreated butcher paper
    3. Clean, untreated, disposable plastic bags. Plastic bags may be used for all analyte groups except volatile and extractable organics. Plastic bags may be used for volatile and extractable organics, if the equipment is first wrapped in foil or butcher paper, or if the equipment is completely dry.

Cleaning Sample Collection Equipment

a.) <u>On-Site/In-Field Cleaning</u> – Cleaning equipment on-site is not recommended because environmental conditions cannot be controlled and wastes (solvents and acids) must be containerized for proper disposal.
    1. Ambient temperature water may be substituted in the hot, sudsy water bath and hot water rinses.

NOTE: Properly dispose of all solvents and acids.

2. Rinse all equipment with water after use, even if it is to be field-cleaned for other sites.
3. Immediately rinse equipment used at contaminated sites or used to collect in-process (e.g., untreated or partially treated wastewater) samples with water.

b.) Heavily Contaminated Equipment - In order to avoid contaminating other samples, isolate heavily contaminated equipment from other equipment and thoroughly decontaminate the equipment before further use. Equipment is considered heavily contaminated if it:

1. Has been used to collect samples from a source known to contain significantly higher levels than background.
2. Has been used to collect free product.
3. Has been used to collect industrial products (e.g., pesticides or solvents) or their byproducts.

NOTE: *Cleaning heavily contaminated equipment in the field is not recommended.*

c.) On-Site Procedures:

1. Protect all other equipment, personnel and samples from exposure by isolating the equipment immediately after use.
2. At a minimum, place the equipment in a tightly sealed, untreated, plastic bag.
3. Do not store or ship the contaminated equipment next to clean, decontaminated equipment, unused sample containers, or filled sample containers.
4. Transport the equipment back to the base of operations for thorough decontamination.
5. If cleaning must occur in the field, document the effectiveness of the procedure, collect and analyze blanks on the cleaned equipment.

d.) Cleaning Procedures:

1. If organic contamination cannot be readily removed with scrubbing and a detergent solution, pre-rinse equipment by thoroughly rinsing or soaking the equipment in acetone.
2. Use hexane only if preceded and followed by acetone.
3. In extreme cases, it may be necessary to steam clean the field equipment before proceeding with routine cleaning procedures.
4. After the solvent rinses (and/or steam cleaning), use the appropriate cleaning procedure. Scrub, rather than soak, all equipment with sudsy water. If high levels of metals are suspected and the equipment cannot be cleaned without acid rinsing, soak the equipment in the appropriate acid. Since stainless steel equipment should not be exposed to acid rinses, do not use stainless steel equipment when heavy metal contamination is suspected or present.
5. If the field equipment cannot be cleaned utilizing these procedures, discard unless further cleaning with stronger solvents and/or oxidizing solutions is effective as evidenced by visual observation and blanks.
6. Clearly mark or disable all discarded equipment to discourage use.

e.) General Cleaning - Follow these procedures when cleaning equipment under controlled conditions. Check manufacturer's instructions for cleaning restrictions and/or recommendations.

1. *Procedure for Teflon, stainless steel and glass sampling equipment*: This procedure must be used when sampling for ALL analyte groups. (Extractable organics, metals, nutrients, etc. or if a single decontamination protocol is desired to clean all Teflon, stainless steel and glass equipment.) Rinse equipment with hot tap water. Soak equipment in a hot, sudsy water solution (Liqui-Nox or equivalent). If necessary, use a brush to remove particulate matter or surface film. Rinse thoroughly with hot tap water. If samples for trace metals or inorganic analytes will be collected with the equipment that is not stainless steel, thoroughly rinse (wet all surfaces) with the appropriate acid solution. Rinse thoroughly with analyte-free water. Make sure that all equipment surfaces are thoroughly flushed with water. If samples for volatile or extractable organics will be collected, rinse with isopropanol. Wet equipment surfaces thoroughly with free-flowing solvent. Rinse thoroughly with analyte-free water. Allow to air dry. Wrap and seal as soon as the equipment has air-dried. If isopropanol is used, the equipment may be air-dried without the final analyte-free water rinse; however, the equipment must be completely dry before wrapping or use. Wrap clean sampling equipment according to the procedure described above.
2. *General Cleaning Procedure for Plastic Sampling Equipment*: Rinse equipment with hot tap water. Soak equipment in a hot, sudsy water solution (Liqui-Nox or equivalent). If necessary, use a brush to remove particulate matter or surface film. Rinse thoroughly with hot tap water. Thoroughly rinse (wet all surfaces) with the appropriate acid solution. Check manufacturer's instructions for cleaning restrictions and/or recommendations. Rinse thoroughly with analyte-free water. Be sure that all equipment surfaces are thoroughly flushed. Allow to air dry as long as possible. Wrap clean sampling equipment according to the procedure described above.

Appendix B - Collecting Soil Samples

Soil samples are collected for a variety of purposes. A methodical sampling approach must be used to assure that sample collection activities provide reliable data. Sampling must begin with an evaluation of background information, historical data and site conditions.

Soil Field Screening Procedures

Field screening is the use of portable devices capable of detecting petroleum contaminants on a real-time basis or by a rapid field analytical technique. Field screening should be used to help assess locations where contamination is most likely to be present.

When possible, field-screening samples should be collected directly from the excavation or from the excavation equipment's bucket. If field screening is conducted only from the equipment's bucket, then a minimum of one field screening sample should be collected from each 10 cubic yards of excavated soil. If instruments or other observations indicate contamination, soil should be separated into stockpiles based on apparent degrees of contamination. At a minimum, soil suspected of contamination must be segregated from soil observed to be free of contamination.

a.) Field screening devices – Many field screen instruments are available for detecting contaminants in the field on a rapid or real-time basis. Acceptable field screening instruments must be suitable for the contaminant being screened. The procdedure for field screening using photoionization detectors (PIDs) and flame ionization detectors (FIDs) is described below. If other instruments are used, a description of the instrument or method and its intended use must be provided to the Solid Waste Section. Whichever field screening method is chosen, its accuracy must be verified throughout the sampling process. Use appropriate standards that match the use intended for the data. Unless the Solid Waste Section indicates otherwise, wherever field screening is recommended in this document, instrumental or analytical methods of detection must be used, not olfactory or visual screening methods.

b.) Headspace analytical screening procedure for filed screening (semi-quantitative field screening) - The most commonly used field instruments for Solid Waste Section site assessments are FIDs and PIDs. When using FIDs and PIDs, use the following headspace screening procedure to obtain and analyze field-screening samples:

1. Partially fill (one-third to one-half) a clean jar or clean ziplock bag with the sample to be analyzed. The total capacity of the jar or bag may not be less than eight ounces (app. 250 ml), but the container should not be so large as to allow vapor diffusion and stratification effects to significantly affect the sample.
2. If the sample is collected from a spilt-spoon, it must be transferred to the jar or bag for headspace analysis immediately after opening the split-spoon. If the sample is collected from an excavation or soil pile, it must be collected from freshly uncovered soil.

3. If a jar is used, it must be quickly covered with clean aluminum foil or a jar lid; screw tops or thick rubber bands must be used to tightly seal the jar. If a zip lock bag is used, it must be quickly sealed shut.
4. Headspace vapors must be allowed to develop in the container for at least 10 minutes but no longer than one hour. Containers must be shaken or agitated for 15 seconds at the beginning and the end of the headspace development period to assist volatilization. Temperatures of the headspace must be warmed to at least 5° C (approximately 40° F) with instruments calibrated for the temperature used.
5. After headspace development, the instrument sampling probe must be inserted to a point about one-half the headspace depth. The container opening must be minimized and care must be taken to avoid the uptake of water droplets and soil particulates.
6. After probe insertion, the highest meter reading must be taken and recorded. This will normally occur between two and five seconds after probe insertion. If erratic meter response occurs at high organic vapor concentrations or conditions of elevated headspace moisture, a note to that effect must accompany the headspace data.
7. All field screening results must be documented in the field record or log book.

Soil Sample Collection Procedures for Laboratory Samples

The number and type of laboratory samples collected depends on the purpose of the sampling activity. Samples analyzed with field screening devices may not be substituted for required laboratory samples.

a.) General Sample Collection - When collecting samples from potentially contaminated soil, care should be taken to reduce contact with skin or other parts of the body. Disposable gloves should be worn by the sample collector and should be changed between samples to avoid cross-contamination. Soil samples should be collected in a manner that causes the least disturbance to the internal structure of the sample and reduces its exposure to heat, sunlight and open air. Likewise, care should be taken to keep the samples from being contaminated by other materials or other samples collected at the site. When sampling is to occur over an extended period of time, it is necessary to insure that the samples are collected in a comparable manner. All samples must be collected with disposable or clean tools that have been decontaminated. Disposable gloves must be worn and changed between sample collections. Sample containers must be filled quickly. Soil samples must be placed in containers in the order of volatility, for example, volatile organic aromatic samples must be taken first, organics next, then heavier range organics, and finally soil classification samples. Containers must be quickly and adequately sealed, and rims must be cleaned before tightening lids. Tape may be used only if known not to affect sample analysis. Sample containers must be clearly labeled. Containers must immediately be preserved according to procedures in this Section. Unless specified

otherwise, at a minimum, the samples must be immediately cooled to 4 ± 2°C and this temperature must be maintained throughout delivery to the laboratory.

b.) Surface Soil Sampling - Surface soil is generally classified as soil between the ground surface and 6-12 inches below ground surface. Remove leaves, grass and surface debris from the area to be sampled. Select an appropriate, pre-cleaned sampling device and collect the sample. Transfer the sample to the appropriate sample container. Clean the outside of the sample container to remove excess soil. Label the sample container, place on wet ice to preserve at 4°C, and complete the field notes.

c.) Subsurface Soil Sampling – The interval begins at approximately 12 inches below ground surface. Collect samples for volatile organic analyses. For other analyses, select an appropriate, pre-cleaned sampling device and collect the sample. Transfer the sample to the appropriate sample container. Clean the outside of the sample container to remove excess soil. Label the sample container, place on wet ice to preserve at 4°C, and complete field notes.

d.) Equipment for Reaching the Appropriate Soil Sampling Depth - Samples may be collected using a hollow stem soil auger, direct push, Shelby tube, split-spoon sampler, or core barrel. These sampling devices may be used as long as an effort is made to reduce the loss of contaminants through volatilization. In these situations, obtain a sufficient volume of so the samples can be collected without volatilization and disturbance to the internal structure of the samples. Samples should be collected from cores of the soil. Non-disposable sampling equipment must be decontaminated between each sample location. **NOTE:** *If a confining layer has been breached during sampling, grout the hole to land.*

e.) Equipment to Collect Soil Samples - Equipment and materials that may be used to collect soil samples include disposable plastic syringes and other "industry-standard" equipment and materials that are contaminant-free. Non-disposable sampling equipment must be decontaminated between each sample location.

Appendix C - Collecting Groundwater Samples

Groundwater samples are collected to identify, investigate, assess and monitor the concentration of dissolved contaminant constituents. To properly assess groundwater contamination, first install sampling points (monitoring wells, etc.) to collect groundwater samples and then perform specific laboratory analyses. All monitoring wells should be constructed in accordance with 15A NCAC 2C .0100 and sampled as outlined in this section. Groundwater monitoring is conducted using one of two methods:

1. Portable Monitoring: Monitoring that is conducted using sampling equipment that is discarded between sampling locations. Equipment used to collect a groundwater sample from a well such as bailers, tubing, gloves, and etc. are disposed of after sample collection. A new set of sampling equipment is used to collect a groundwater sample at the next monitor well.

2. Dedicated Monitoring: Monitoring that utilizes permanently affixed down-well and well head components that are capped after initial set-up. Most dedicated monitoring systems are comprised of an in-well submersible bladder pump, with air supply and sample discharge tubing, and an above-ground driver/controller for regulation of flow rates and volumes. The pump and all tubing housed within the well should be composed of Teflon or stainless steel components. This includes seals inside the pump, the pump body, and fittings used to connect tubing to the pump. Because ground water will not be in contact with incompatible constituents and because the well is sealed from the surface, virtually no contamination is possible from intrinsic sources during sampling and between sampling intervals. All dedicated monitoring systems must be approved by the Solid Waste Section before installation.

Groundwater samples may be collected from a number of different configurations. Each configuration is associated with a unique set of sampling equipment requirements and techniques:

1. Wells without Plumbing: These wells require equipment to be brought to the well to purge and sample unless dedicated equipment is placed in the well.

2. Wells with In-Place Plumbing: Wells with in-place plumbing do not require equipment to be brought to the well to purge and sample. In-place plumbing is generally considered permanent equipment routinely used for purposes other than purging and sampling, such as for water supply.

3. Air Strippers or Remedial Systems: These types of systems are installed as remediation devices.

Groundwater Sample Preparation

The type of sample containers used depends on the type of analysis performed. First, determine the type(s) of contaminants expected and the proper analytical method(s). Be sure to consult your selected laboratory for its specific needs and requirements prior to sampling.

Next, prepare the storage and transport containers (ice chest, etc.) before taking any samples so that each sample can be placed in a chilled environment immediately after collection.

Use groundwater purging and sampling equipment constructed of only non-reactive, non-leachable materials that are compatible with the environment and the selected analytes. In selecting groundwater purging and sampling equipment, give consideration to the depth of the well, the depth to groundwater, the volume of water to be evacuated, the sampling and purging technique, and the analytes of interest. Additional supplies, such as reagents and preservatives, may be necessary.

All sampling equipment (bailers, tubing, containers, etc.) must be selected based on its chemical compatibility with the source being sampled (e.g., water supply well, monitoring well) and the contaminants potentially present.

a.) Pumps - All pumps or pump tubing must be lowered and retrieved from the well slowly and carefully to minimize disturbance to the formation water. This is especially critical at the air/water interface.

1. *Above-Ground Pumps*
    - Variable Speed Peristaltic Pump: Use a variable speed peristaltic pump to purge groundwater from wells when the static water level in the well is no greater than 20- 25 feet below land surface (BLS). If the water levels are deeper than 18-20 feet BLS, the pumping velocity will decrease. A variable speed peristaltic pump can be used for normal purging and sampling, and sampling low permeability aquifers or formations. Most analyte groups can be sampled with a peristaltic pump if the tubing and pump configurations are appropriate.
    - Variable Speed Centrifugal Pump: A variable speed centrifugal pump can be used to purge groundwater from 2-inch and larger internal diameter wells. **Do not use** this type of pump to collect groundwater samples. When purging is complete, do not allow the water that remains in the tubing to fall back into the well. Install a check valve at the end of the purge tubing.
2. *Submersible Pumps*
    - Variable Speed Electric Submersible Pump: A variable speed submersible pump can be used to purge and sample groundwater from 2-inch and larger internal diameter wells. A variable speed submersible pump can be used for normal purging and sampling, and sampling low permeability aquifers or formations. The pump housing, fittings, check valves and associated hardware must be constructed of stainless steel. All other materials must be

compatible with the analytes of interest. Install a check valve at the output side of the pump to prevent backflow. If purging **and** sampling for organics, the entire length of the delivery tube must be Teflon, polyethylene or polypropylene (PP) tubing; the electrical cord must be sealed in Teflon, polyethylene or PP and any cabling must be sealed in Teflon, polyethylene or PP, or be constructed of stainless steel; and all interior components that contact the sample water (impeller, seals, gaskets, etc.) must be constructed of stainless steel or Teflon.

3. *Variable Speed Bladder Pump*: A variable speed, positive displacement, bladder pump can be used to purge and sample groundwater from 3/4-inch and larger internal diameter wells.
    - A variable speed bladder pump can be used for normal purging and sampling, and sampling low permeability aquifers or formations.
    - The bladder pump system is composed of the pump, the compressed air tubing, the water discharge tubing, the controller and a compressor, or a compressed gas supply.
    - The pump consists of a bladder and an exterior casing or pump body that surrounds the bladder and two (2) check valves. These parts can be composed of various materials, usually combinations of polyvinyl chloride (PVC), Teflon, polyethylene, PP and stainless steel. Other materials must be compatible with the analytes of interest.
    - If purging and sampling for organics, the pump body must be constructed of stainless steel. The valves and bladder must be Teflon, polyethylene or PP; the entire length of the delivery tube must be Teflon, polyethylene or PP; and any cabling must be sealed in Teflon, polyethylene or PP, or be constructed of stainless steel.
    - Permanently installed pumps may have a PVC pump body as long as the pump remains in contact with the water in the well.

b.) <u>Bailers</u>

1. *Purging*: Bailers must be used with caution because improper bailing can cause changes in the chemistry of the water due to aeration and loosening particulate matter in the space around the well screen. Use a bailer if there is non-aqueous phase liquid (free product) in the well or if non-aqueous phase liquid is suspected to be in the well.
2. *Sampling*: Bailers must be used with caution.
3. *Construction and Type*: Bailers must be constructed of materials compatible with the analytes of interest. Stainless steel, Teflon, rigid medical grade PVC, polyethylene and PP bailers may be used to sample all analytes. Use disposable bailers when sampling grossly contaminated sample sources. NCDENR recommends using dual check valve bailers when collecting samples. Use bailers with a controlled flow bottom to collect volatile organic samples.

4. *Contamination Prevention*: Keep the bailer wrapped (foil, butcher paper, etc.) until just before use. Use protective gloves to handle the bailer once it is removed from its wrapping. Handle the bailer by the lanyard to minimize contact with the bailer surface.

c.) Lanyards

1. Lanyards must be made of non-reactive, non-leachable material. They may be cotton twine, nylon, stainless steel, or may be coated with Teflon, polyethylene or PP.
2. Discard cotton twine, nylon, and non-stainless steel braided lanyards after sampling each monitoring well.
3. Decontaminate stainless steel, coated Teflon, polyethylene and PP lanyards between monitoring wells. They do not need to be decontaminated between purging and sampling operations.

Water Level and Purge Volume Determination

The amount of water that must be purged from a well is determined by the volume of water and/or field parameter stabilization.

a.) General Equipment Considerations - Selection of appropriate purging equipment depends on the analytes of interest, the well diameter, transmissivity of the aquifer, the depth to groundwater, and other site conditions.

1. Use of a pump to purge the well is recommended unless no other equipment can be used or there is non-aqueous phase liquid in the well, or non-aqueous phase liquid is suspected to be in the well.
2. Bailers must be used with caution because improper bailing:
    - Introduces atmospheric oxygen, which may precipitate metals (i.e., iron) or cause other changes in the chemistry of the water in the sample (i.e., pH).
    - Agitates groundwater, which may bias volatile and semi-volatile organic analyses due to volatilization.
    - Agitates the water in the aquifer and resuspends fine particulate matter.
    - Surges the well, loosening particulate matter in the annular space around the well screen.
    - May introduce dirt into the water column if the sides of the casing wall are scraped.

NOTE: *It is critical for bailers to be slowly and gently immersed into the top of the water column, particularly during the final stages of purging. This minimizes turbidity and disturbance of volatile organic constituents.*

b.) Initial Inspection

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. It is recommended that you place a protective covering around the well head. Replace the covering if it becomes soiled or ripped.

4. Inspect the well lock and determine whether the cap fits tightly. Replace the cap if necessary.

c.) Water Level Measurements - Use an electronic probe or chalked tape to determine the water level. Decontaminate all equipment before use. Measure the depth to groundwater from the top of the well casing to the nearest 0.01 foot. Always measure from the same reference point or survey mark on the well casing. Record the measurement.

1. *Electronic Probe*: Decontaminate all equipment before use. Follow the manufacturer's instructions for use. Record the measurement.
2. *Chalked Line Method*: Decontaminate all equipment before use. Lower chalked tape into the well until the lower end is in the water. This is usually determined by the sound of the weight hitting the water. Record the length of the tape relative to the reference point. Remove the tape and note the length of the wetted portion. Record the length. Determine the depth to water by subtracting the length of the wetted portion from the total length. Record the result.

d.) Water Column Determination - To determine the length of the water column, subtract the depth to the top of the water column from the total well depth (or gauged well depth if silting has occurred). The total well depth depends on the well construction. If gauged well depth is used due to silting, report total well depth also. Some wells may be drilled in areas of sinkhole, karst formations or rock leaving an open borehole. Attempt to find the total borehole depth in cases where there is an open borehole below the cased portion.

e.) Well Water Volume - Calculate the total volume of water, in gallons, in the well using the following equation:

$$V = (0.041)d \times d \times h$$

Where:

V = volume in gallons
d = well diameter in inches
h = height of the water column in feet

The total volume of water in the well may also be determined with the following equation by using a casing volume per foot factor (Gallons per Foot of Water) for the appropriate diameter well:

$$V = [\text{Gallons per Foot of Water}] \times h$$

Where:

V = volume in gallons
h = height of the water column in feet

Record all measurements and calculations in the field records.

f.) Purging Equipment Volume - Calculate the total volume of the pump, associated tubing and flow cell (if used), using the following equation:

$$V = p + ((0.041)d \times d \times l) + fc$$

Where:

V = volume in gallons
p = volume of pump in gallons
d = tubing diameter in inches
l = length of tubing in feet

fc = volume of flow cell in gallons

g.) If the groundwater elevation data are to be used to construct groundwater elevation contour maps, all water level measurements must be taken within the same 24 hour time interval when collecting samples from multiple wells on a site, unless a shorter time period is required. If the site is tidally influenced, complete the water level measurements within the time frame of an incoming or outgoing tide.

Well Purging Techniques

The selection of the purging technique and equipment is dependent on the hydrogeologic properties of the aquifer, especially depth to groundwater and hydraulic conductivity.

a.) Measuring the Purge Volume - The volume of water that is removed during purging must be recorded. Therefore, you must measure the volume during the purging operation.

1. Collect the water in a graduated container and multiply the number of times the container was emptied by the volume of the container, OR
2. Estimate the volume based on pumping rate. This technique may be used only if the pumping rate is constant. Determine the pumping rate by measuring the amount of water that is pumped for a fixed period of time, or use a flow meter.
    - Calculate the amount of water that is discharged per minute: D = Measured Amount/Total Time In Minutes
    - Calculate the time needed to purge one (1) well volume or one (1) purging equipment volume: Time = V/D
      Where: V = well volume or purging equipment volume
      D = discharge rate
    - Make new measurements each time the pumping rate is changed.
3. Use a totalizing flow meter.
    - Record the reading on the totalizer prior to purging.
    - Record the reading on the totalizer at the end of purging.
    - To obtain the volume purged, subtract the reading on the totalizer prior to purging from the reading on the totalizer at the end of purging.
    - Record the times that purging begins and ends in the field records.

b.) Purging Measurement Frequency - When purging a well that has the well screen fully submerged and the pump or intake tubing is placed within the well casing above the well screen or open hole, purge a minimum of one (1) well volume prior to collecting measurements of the field parameters. Allow at least one quarter (1/4) well volume to purge between subsequent measurements. When purging a well that has the pump or intake tubing placed within a fully submerged well screen or open hole, purge until the water level has stabilized (well recovery rate equals the purge rate), then purge a minimum of one (1) volume of the pump, associated tubing and flow cell (if used) prior to collecting measurements of the field parameters. Take measurements of the field parameters no sooner than two (2) to three (3) minutes apart. Purge at least

three (3) volumes of the pump, associated tubing and flow cell, if used, prior to collecting a sample. When purging a well that has a partially submerged well screen, purge a minimum of one (1) well volume prior to collecting measurements of the field parameters. Take measurements of the field parameters no sooner than two (2) to three (3) minutes apart.

c.) Purging Completion - Wells must be adequately purged prior to sample collection to ensure representation of the aquifer formation water, rather than stagnant well water. This may be achieved by purging three volumes from the well or by satisfying any one of the following three purge completion criteria:

1.) Three (3) consecutive measurements in which the three (3) parameters listed below are within the stated limits, dissolved oxygen is no greater than 20 percent of saturation at the field measured temperature, and turbidity is no greater than 20 Nephelometric Turbidity Units (NTUs).

- Temperature: + 0.2° C
- pH: + 0.2 Standard Units
- Specific Conductance: + 5.0% of reading

Document and report the following, as applicable. The last four items only need to be submitted once:

- Purging rate.
- Drawdown in the well, if any.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

2.) If it is impossible to get dissolved oxygen at or below 20 percent of saturation at the field measured temperature or turbidity at or below 20 NTUs, then three (3) consecutive measurements of temperature, pH, specific conductance and the parameter(s) dissolved oxygen and/or turbidity that do not meet the requirements above must be within the limits below. The measurements are:

- Temperature: + 0.2° C
- pH: + 0.2 Standard Units
- Specific Conductance: + 5.0% of reading
- Dissolved Oxygen: + 0.2 mg/L or 10%, whichever is greater
- Turbidity: + 5 NTUs or 10%, whichever is greater

Additionally, document and report the following, as applicable, except that the last four(4) items only need to be submitted once:

- Purging rate.
- Drawdown in the well, if any.
- A description of conditions at the site that may cause the dissolved oxygen to be high and/or dissolved oxygen measurements made within the screened or open hole portion of the well with a downhole dissolved oxygen probe.

- A description of conditions at the site that may cause the turbidity to be high and any procedures that will be used to minimize turbidity in the future.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

3.) If after five (5) well volumes, three (3) consecutive measurements of the field parameters temperature, pH, specific conductance, dissolved oxygen, and turbidity are not within the limits stated above, check the instrument condition and calibration, purging flow rate and all tubing connections to determine if they might be affecting the ability to achieve stable measurements. It is at the discretion of the consultant/contractor whether or not to collect a sample or to continue purging. Further, the report in which the data are submitted must include the following, as applicable. The last four (4) items only need to be submitted once.

- Purging rate.
- Drawdown in the well, if any.
- A description of conditions at the site that may cause the Dissolved Oxygen to be high and/or Dissolved Oxygen measurements made within the screened or open hole portion of the well with a downhole dissolved oxygen probe.
- A description of conditions at the site that may cause the turbidity to be high and any procedures that will be used to minimize turbidity in the future.
- A description of the process and the data used to design the well.
- The equipment and procedure used to install the well.
- The well development procedure.
- Pertinent lithologic or hydrogeologic information.

If wells have previously and consistently purged dry, and the current depth to groundwater indicates that the well will purge dry during the current sampling event, minimize the amount of water removed from the well by using the same pump to purge and collect the sample:

- Place the pump or tubing intake within the well screened interval.
- Use very small diameter Teflon, polyethylene or PP tubing and the smallest possible pump chamber volume. This will minimize the total volume of water pumped from the well and reduce drawdown.
- Select tubing that is thick enough to minimize oxygen transfer through the tubing walls while pumping.

- Pump at the lowest possible rate (100 mL/minute or less) to reduce drawdown to a minimum.
- Purge at least two (2) volumes of the pumping system (pump, tubing and flow cell, if used).
- Measure pH, specific conductance, temperature, dissolved oxygen and turbidity, then begin to collect the samples.

Collect samples immediately after purging is complete. The time period between completing the purge and sampling cannot 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 "dry" wells.

d.) Lanyards

1. Securely fasten lanyards, if used, to any downhole equipment (bailers, pumps, etc.).
2. Use bailer lanyards in such a way that they do not touch the ground surface.

Wells Without Plumbing

a.) Tubing/Pump Placement

1. If attempting to minimize the volume of purge water, position the intake hose or pump at the midpoint of the screened or open hole interval.
2. If monitoring well conditions do not allow minimizing of the purge water volume, position the pump or intake hose near the top of the water column. This will ensure that all stagnant water in the casing is removed.
3. If the well screen or borehole is partially submerged, and the pump will be used for both purging and sampling, position the pump midway between the measured water level and the bottom of the screen. Otherwise, position the pump or intake hose near the top of the water column.

b.) Non-dedicated (portable) pumps

1. *Variable Speed Peristaltic Pump*
   - Wear sampling gloves to position the decontaminated pump and tubing.
   - Attach a short section of tubing to the discharge side of the pump and into a graduated container.
   - Attach one end of a length of new or precleaned tubing to the pump head flexible hose.
   - Place the tubing as described in one of the options listed above.
   - Change gloves before beginning to purge.
   - Measure the depth to groundwater at frequent intervals.
   - Record these measurements.
   - Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.

- If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.
- If the water table continues to drop during pumping, lower the tubing at the approximate rate of drawdown so that water is removed from the top of the water column.
- Record the purging rate each time the rate changes.
- Measure the purge volume.
- Record this measurement.
- Decontaminate the pump and tubing between wells (see Appendix C) or if precleaned tubing is used for each well, only the pump.

2. *Variable Speed Centrifugal Pump*
    - Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
    - Wear sampling gloves to position the decontaminated pump and tubing.
    - Place the decontaminated suction hose so that water is always pumped from the top of the water column.
    - Change gloves before beginning to purge.
    - Equip the suction hose with a foot valve to prevent purge water from re-entering the well.
    - Measure the depth to groundwater at frequent intervals.
    - Record these measurements.
    - To minimize drawdown, adjust the purging rate so that it is equivalent to the well recovery rate.
    - If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.
    - If the water table continues to drop during pumping, lower the tubing at the approximate rate of drawdown so that the water is removed from the top of the water column.
    - Record the purging rate each time the rate changes.
    - Measure the purge volume.
    - Record this measurement.
    - Decontaminate the pump and tubing between wells or if precleaned tubing is used for each well, only the pump.
3. *Variable Speed Electric Submersible Pump*
    - Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
    - Wear sampling gloves to position the decontaminated pump and tubing.
    - Carefully position the decontaminated pump.

- Change gloves before beginning to purge.
- Measure the depth to groundwater at frequent intervals.
- Record these measurements.
- To minimize drawdown, adjust the purging rate so that it is equivalent to the well recovery rate.
- If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.
- If the water table continues to drop during pumping, lower the tubing or pump at the approximate rate of drawdown so that water is removed from the top of the water column.
- Record the purging rate each time the rate changes.
- Measure the purge volume.
- Record this measurement.
- Decontaminate the pump and tubing between wells or only the pump if precleaned tubing is used for each well.

4. *Variable Speed Bladder Pump*
    - Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
    - Wear sampling gloves to position the decontaminated pump and tubing.
    - Attach the tubing and carefully position the pump.
    - Change gloves before beginning purging.
    - Measure the depth to groundwater at frequent intervals.
    - Record these measurements.
    - To minimize drawdown, adjust the purging rate so that it is equivalent to the well recovery rate.
    - If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdrawal rate with the recharge rate.
    - If the water table continues to drop during pumping, lower the tubing or pump at the approximate rate of drawdown so that water is removed from the top of the water column.
    - Record the purging rate each time the rate changes.
    - Measure the purge volume.
    - Record this measurement.
    - Decontaminate the pump and tubing between wells or if precleaned tubing is used for each well, only the pump.

c.) <u>Dedicated Portable Pumps</u>

1. *Variable Speed Electric Submersible Pump*
    - Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
    - Wear sampling gloves.

- Measure the depth to groundwater at frequent intervals.
- Record these measurements.
- Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.
- If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdraw with the recharge rate.
- Record the purging rate each time the rate changes.
- Measure the purge volume.
- Record this measurement.

2. *Variable Speed Bladder Pump*
    - Position fuel powered equipment downwind and at least 10 feet from the well head. Make sure that the exhaust faces downwind.
    - Wear sampling gloves.
    - Measure the depth to groundwater at frequent intervals.
    - Record these measurements.
    - Adjust the purging rate so that it is equivalent to the well recovery rate to minimize drawdown.
    - If the purging rate exceeds the well recovery rate, reduce the pumping rate to balance the withdraw with the recharge rate.
    - Record the purging rate each time the rate changes.
    - Measure the purge volume.
    - Record this measurement.
3. *Bailers* - Using bailers for purging is not recommended unless care is taken to use proper bailing technique, or if free product is present in the well or suspected to be in the well.
    - Minimize handling the bailer as much as possible.
    - Wear sampling gloves.
    - Remove the bailer from its protective wrapping just before use.
    - Attach a lanyard of appropriate material.
    - Use the lanyard to move and position the bailer.
    - Lower and retrieve the bailer slowly and smoothly.
    - Lower the bailer carefully into the well to a depth approximately a foot above the water column.
    - When the bailer is in position, lower the bailer into the water column at a rate of 2 cm/sec until the desired depth is reached.
    - Do not lower the top of the bailer more than one (1) foot below the top of the water table so that water is removed from the top of the water column.
    - Allow time for the bailer to fill with aquifer water as it descends into the water column.

- Carefully raise the bailer. Retrieve the bailer at the same rate of 2 cm/sec until the bottom of the bailer has cleared to top of the water column.
- Measure the purge volume.
- Record the volume of the bailer.
- Continue to carefully lower and retrieve the bailer as described above until the purging is considered complete, based on either the removal of 3 well volumes.
- Remove at least one (1) well volume before collecting measurements of the field parameters. Take each subsequent set of measurements after removing at least one quarter (1/4) well volume between measurements.

Groundwater Sampling Techniques

a.) Purge wells.

b.) Replace protective covering around the well if it is soiled or torn after completing purging operations.

c.) Equipment Considerations

1. The following pumps are approved to collect volatile organic samples:
    - Stainless steel and Teflon variable speed submersible pumps
    - Stainless steel and Teflon or polyethylene variable speed bladder pumps
    - Permanently installed PVC bodied pumps (As long as the pump remains in contact with the water in the well at all times)
2. Collect sample from the sampling device and store in sample container. Do not use intermediate containers.
3. To avoid contamination or loss of analytes from the sample, handle sampling equipment as little as possible and minimize equipment exposure to the sample.
4. To reduce chances of cross-contamination, use dedicated equipment whenever possible. "Dedicated" is defined as equipment that is to be used solely for one location for the life of that equipment (e.g., permanently mounted pump). Purchase dedicated equipment with the most sensitive analyte of interest in mind.
    - Clean or make sure dedicated pumps are clean before installation. They do not need to be cleaned prior to each use, but must be cleaned if they are withdrawn for repair or servicing.
    - Clean or make sure any permanently mounted tubing is clean before installation.
    - Change or clean tubing when the pump is withdrawn for servicing.
    - Clean any replaceable or temporary parts.

- Collect equipment blanks on dedicated pumping systems when the tubing is cleaned or replaced.
- Clean or make sure dedicated bailers are clean before placing them into the well.
- Collect an equipment blank on dedicated bailers before introducing them into the water column.
- Suspend dedicated bailers above the water column if they are stored in the well.

Sampling Wells Without Plumbing

a.) Sampling with Pumps – The following pumps may be used to sample for organics:

- Peristaltic pumps
- Stainless steel, Teflon or polyethylene bladder pumps
- Variable speed stainless steel and Tefloṇ submersible pumps

1. *Peristaltic Pump*

- Volatile Organics: One of three methods may be used.
  - Remove the drop tubing from the inlet side of the pump; submerge the drop tubing into the water column; prevent the water in the tubing from flowing back into the well; remove the drop tubing from the well; carefully allow the groundwater to drain into the sample vials; avoid turbulence; do not aerate the sample; repeat steps until enough vials are filled. OR
  - Use the pump to fill the drop tubing; quickly remove the tubing from the pump; prevent the water in the tubing from flowing back into the well; remove the drop tubing from the well; carefully allow the groundwater to drain into the sample vials; avoid turbulence; do not aerate the sample; repeat steps until enough vials are filled. OR
  - Use the pump to fill the drop tubing; withdraw the tubing from the well; reverse the flow on the peristaltic pumps to deliver the sample into the vials at a slow, steady rate; repeat steps until enough vials are filled.
- Extractable Organics: If delivery tubing is not polyethylene or PP, or is not Teflon lined, use pump and vacuum trap method. Connect the outflow tubing from the container to the influent side of the peristaltic pump. Turn pump on and reduce flow until smooth and even. Discard a

small portion of the sample to allow for air space. Preserve (if required), label, and complete field notes.

- Inorganic samples: These samples may be collected from the effluent tubing. If samples are collected from the pump, decontaminate all tubing (including the tubing in the head) or change it between wells. Preserve (if required), label, and complete field notes.

2. *Variable Speed Bladder Pump*
    - If sampling for organics, the pump body must be constructed of stainless steel and the valves and bladder must be Teflon. All tubing must be Teflon, polyethylene, or PP and any cabling must be sealed in Teflon, polyethylene or PP, or made of stainless steel.
    - After purging to a smooth even flow, reduce the flow rate.
    - When sampling for volatile organic compounds, reduce the flow rate to 100-200mL/minute, if possible.
3. *Variable Speed Submersible Pump*
    - The housing must be stainless steel.
    - If sampling for organics, the internal impellers, seals and gaskets must be constructed of stainless steel, Teflon, polyethylene or PP. The delivery tubing must be Teflon, polyethylene or PP; the electrical cord must be sealed in Teflon; any cabling must be sealed in Teflon or constructed of stainless steel.
    - After purging to a smooth even flow, reduce the flow rate.
    - When sampling for volatile organic compounds, reduce the flow rate to 100-200mL/minute, if possible.

b.) Sampling with Bailers - A high degree of skill and coordination are necessary to collect representative samples with a bailer.

1. *General Considerations*
    - Minimize handling of bailer as much as possible.
    - Wear sampling gloves.
    - Remove bailer from protective wrapping just before use.
    - Attach a lanyard of appropriate material.
    - Use the lanyard to move and position the bailers.
    - Do not allow bailer or lanyard to touch the ground.
    - If bailer is certified precleaned, no rinsing is necessary.
    - If both a pump and a bailer are to be used to collect samples, rinse the exterior and interior of the bailer with sample water from the pump before removing the pump.
    - If the purge pump is not appropriate for collecting samples (e.g., non-inert components), rinse the bailer by collecting a single bailer of the groundwater to be sampled.
    - Discard the water appropriately.

- Do not rinse the bailer if Oil and Grease samples are to be collected.

2. *Bailing Technique*
    - Collect all samples that are required to be collected with a pump before collecting samples with the bailer.
    - Raise and lower the bailer gently to minimize stirring up particulate matter in the well and the water column, which can increase sample turbidity.
    - Lower the bailer carefully into the well to a depth approximately a foot above the water column. When the bailer is in position, lower the bailer into the water column at a rate of 2 cm/sec until the desired depth is reached.
    - Do not lower the top of the bailer more than one foot below the top of the water table, so that water is removed from the top of the water column.
    - Allow time for the bailer to fill with aquifer water as it descends into the water column.
    - Do not allow the bailer to touch the bottom of the well or particulate matter will be incorporated into the sample. Carefully raise the bailer. Retrieve the bailer at the same rate of 2 cm/sec until the bottom of the bailer has cleared to top of the water column.
    - Lower the bailer to approximately the same depth each time.
    - Collect the sample. Install a device to control the flow from the bottom of the bailer and discard the first few inches of water. Fill the appropriate sample containers by allowing the sample to slowly flow down the side of the container. Discard the last few inches of water in the bailer.
    - Repeat steps for additional samples.
    - As a final step measure the DO, pH, temperature, turbidity and specific conductance after the final sample has been collected. Record all measurements and note the time that sampling was completed.

c.) <u>Sampling Low Permeability Aquifers or Wells that have Purged Dry</u>

1. Collect the sample(s) after the well has been purged. Minimize the amount of water removed from the well by using the same pump to purge and collect the sample. If the well has purged dry, collect samples as soon as sufficient sample water is available.
2. Measure the five field parameters temperature, pH, specific conductance, dissolved oxygen and turbidity at the time of sample collection.
3. Advise the analytical laboratory and the client that the usual amount of sample for analysis may not be available.

Appendix D - Collecting Samples from Wells with Plumbing in Place

In-place plumbing is generally considered permanent equipment routinely used for purposes other than purging and sampling, such as for water supply.

a.) Air Strippers or Remedial Systems - These types of systems are installed as remediation devices. Collect influent and effluent samples from air stripping units as described below.

1. Remove any tubing from the sampling port and flush for one to two minutes.
2. Remove all hoses, aerators and filters (if possible).
3. Open the spigot and purge sufficient volume to flush the spigot and lines and until the purging completion criteria have been met.
4. Reduce the flow rate to approximately 500 mL/minute (a 1/8" stream) or approximately 0.1 gal/minute before collecting samples.
5. Follow procedures for collecting samples from water supply wells as outlined below.

b.) Water Supply Wells – Water supply wells with in-place plumbing do not require equipment to be brought to the well to purge and sample. Water supply wells at UST facilities must be sampled for volatile organic compounds (VOCs) and semivolatile compounds (SVOCs).

1. *Procedures for Sampling Water Supply Wells*
    - Label sample containers prior to sample collection.
    - Prepare the storage and transport containers (ice chest, etc.) before taking any samples so each collected sample can be placed in a chilled environment immediately after collection.
    - You must choose the tap closest to the well, preferably at the wellhead. The tap must be before any holding or pressurization tank, water softener, ion exchange, disinfection process or before the water line enters the residence, office or building. If no tap fits the above conditions, a new tap that does must be installed.
    - The well pump must not be lubricated with oil, as that may contaminate the samples.
    - The sampling tap must be protected from exterior contamination associated with being too close to a sink bottom or to the ground. If the tap is too close to the ground for direct collection into the appropriate container, it is acceptable to use a smaller (clean) container to transfer the sample to a larger container.
    - Leaking taps that allow water to discharge from around the valve stem handle and down the outside of the faucet, or taps in which water tends to run up on the outside of the lip, are to be avoided as sampling locations.

- Disconnect any hoses, filters, or aerators attached to the tap before sampling.
- Do not sample from a tap close to a gas pump. The gas fumes could contaminate the sample.

2. *Collecting Volatile Organic Samples*
    - Equipment Needed: VOC sample vials [40 milliliters, glass, may contain 3 to 4 drops of hydrochloric acid (HCl) as preservative]; Disposable gloves and protective goggles; Ice chest/cooler; Ice; Packing materials (sealable plastic bags, bubble wrap, etc.); and Lab forms.
    - Sampling Procedure: Run water from the well for at least 15 minutes. If the well is deep, run water longer (purging three well volumes is best). If tap or spigot is located directly before a holding tank, open a tap after the holding tank to prevent any backflow into the tap where you will take your sample. This will ensure that the water you collect is "fresh" from the well and not from the holding tank. After running the water for at least 15 minutes, reduce the flow of water. The flow should be reduced to a trickle but not so slow that it begins to drip. A smooth flow of water will make collection easier and more accurate. Remove the cap of a VOC vial and hold the vial under the stream of water to fill it. Be careful not to spill any acid that is in the vial. For best results use a low flow of water and angle the vial slightly so that the water runs down the inside of the vial. This will help keep the sample from being agitated, aerated or splashed out of the vial. It will also increase the accuracy of the sample. As the vial fills and is almost full, turn the vial until it is straight up and down so the water won't spill out. Fill the vial until the water is just about to spill over the lip of the vial. The surface of the water sample should become mounded. It is a good idea not to overfill the vial, especially if an acid preservative is present in the vial. Carefully replace and screw the cap onto the vial. Some water may overflow as the cap is put on. After the cap is secure, turn the vial upside down and gently tap the vial to see if any bubbles are present. If bubbles are present in the vial, remove the cap, add more water and check again to see if bubbles are present. Repeat as necessary. After two samples without bubbles have been collected, the samples should be labeled and prepared for shipment. Store samples at 4° C.

3. *Collecting Extractable Organic and/or Metals Samples*

- Equipment Needed: SVOC sample bottle [1 liter, amber glass] and/or Metals sample bottle [0.5 liter, polyethylene or glass, 5 milliliters of nitric acid (HNO3) preservative]; Disposable gloves and protective goggles; Ice Chest/Cooler; Ice; Packing materials (sealable plastic bags, bubble wrap, etc.); and Lab forms.
- Sampling Procedure: Run water from the well for at least 15 minutes. If the well is deep, run the water longer (purging three well volumes is best). If tap or spigot is located directly before a holding tank, open a tap after the holding tank to prevent any backflow into the tap where you will take your sample. This will ensure that the water you collect is "fresh" from the well and not from the holding tank. After running the water for at least 15 minutes, reduce the flow. Low water flow makes collection easier and more accurate. Remove the cap of a SVOC or metals bottle and hold it under the stream of water to fill it. The bottle does not have to be completely filled (i.e., you can leave an inch or so of headspace in the bottle). After filling, screw on the cap, label the bottle and prepare for shipment. Store samples at 4° C.

Appendix E - Collecting Surface Water Samples

The following topics include 1.) acceptable equipment selection and equipment construction materials and 2.) standard grab, depth-specific and depth-composited surface water sampling techniques.

Facilities which contain or border small rivers, streams or branches should include surface water sampling as part of the monitoring program for each sampling event. A simple procedure for selecting surface water monitoring sites is to locate a point on a stream where drainage leaves the site. This provides detection of contamination through, and possibly downstream of, site via discharge of surface waters. The sampling points selected should be downstream from any waste areas. An upstream sample should be obtained in order to determine water quality upstream of the influence of the site.

a.) General Cautions
    1. When using watercraft take samples near the bow away and upwind from any gasoline outboard engine. Orient watercraft so that bow is positioned in the upstream direction.
    2. When wading, collect samples upstream from the body. Avoid disturbing sediments in the immediate area of sample collection.
    3. Collect water samples prior to taking sediment samples when obtaining both from the same area (site).
    4. Unless dictated by permit, program or order, sampling at or near man-made structures (e.g., dams, weirs or bridges) may not provide representative data because of unnatural flow patterns.
    5. Collect surface water samples from downstream towards upstream.

b.) Equipment and Supplies - Select equipment based on the analytes of interest, specific use, and availability.

c.) Surface Water Sampling Techniques - Adhere to all general protocols applicable to aqueous sampling when following the surface water sampling procedures addressed below.
    1. *Manual Sampling*: Use manual sampling for collecting grab samples for immediate in-situ field analyses. Use manual sampling in lieu of automatic equipment over extended periods of time for composite sampling, especially when it is necessary to observe and/or note unusual conditions.
        - Surface Grab Samples - Do not use sample containers containing premeasured amounts of preservatives to collect grab samples. If the sample matrix is homogeneous, then the grab method is a simple and effective technique for collection purposes. If homogeneity is not apparent, based on flow or vertical variations (and should never be assumed), then use other collection protocols. Where practical, use the actual sample container submitted to the laboratory for collecting samples to be analyzed for oil and grease, volatile organic compounds (VOCs), and microbiological samples. This procedure eliminates the possibility of contaminating the sample with an intermediate collection container. The use of

unpreserved sample containers as direct grab samplers is encouraged since the same container can be submitted for laboratory analysis after appropriate preservation. This procedure reduces sample handling and eliminates potential contamination from other sources (e.g., additional sampling equipment, environment, etc.).

1. Grab directly into sample container.
2. Slowly submerge the container, opening neck first, into the water.
3. Invert the bottle so the neck is upright and pointing towards the direction of water flow (if applicable). Allow water to run slowly into the container until filled.
4. Return the filled container quickly to the surface.
5. Pour out a few mL of sample away from and downstream of the sampling location. This procedure allows for the addition of preservatives and sample expansion. Do not use this step for volatile organics or other analytes where headspace is not allowed in the sample container.
6. Add preservatives, securely cap container, label, and complete field notes. If sample containers are attached to a pole via a clamp, submerge the container and follow steps 3 – 5 but omit steps 1 and 2.

- Sampling with an Intermediate Vessel or Container: If the sample cannot be collected directly into the sample container to be submitted to the laboratory, or if the laboratory provides prepreserved sample containers, use an unpreserved sample container or an intermediate vessel (e.g., beakers, buckets or dippers) to obtain the sample. These vessels must be constructed appropriately, including any poles or extension arms used to access the sample location.
    1. Rinse the intermediate vessel with ample amounts of site water prior to collecting the first sample.
    2. Collect the sample as outlined above using the intermediate vessel.
    3. Use pole mounted containers of appropriate construction to sample at distances away from shore, boat, etc. Follow the protocols above to collect samples.
- Peristaltic Pump and Tubing: The most portable pump for this technique is a 12 volt peristaltic pump. Use appropriately precleaned, silastic tubing in the pump head and attach polyethylene, Tygon, etc. tubing to the pump. This technique is not acceptable for Oil and Grease, EPH, VPH or VOCs. Extractable organics can be collected through the pump if flexible interior-wall Teflon, polyethylene or PP tubing is used in the pump head or if used with the organic trap setup.

1. Lower appropriately precleaned tubing to a depth of 6 – 12 inches below water surface, where possible.
2. Pump 3 – 5 tube volumes through the system to acclimate the tubing before collecting the first sample.
3. Fill individual sample bottles via the discharge tubing. Be careful not to remove the inlet tubing from the water.
4. Add preservatives, securely cap container, label, and complete field notes.

- Mid-Depth Grab Samples: Mid-depth samples or samples taken at a specific depth can approximate the conditions throughout the entire water column. The equipment that may be used for this type of sampling consists of the following depth-specific sampling devices: Kemmerer, Niskin, Van Dorn type, etc. You may also use pumps with tubing or double check-valve bailers. Certain construction material details may preclude its use for certain analytes. Many Kemmerer samplers are constructed of plastic and rubber that preclude their use for all volatile and extractable organic sampling. Some newer devices are constructed of stainless steel or are all Teflon or Teflon-coated. These are acceptable for all analyte groups without restriction.
    1. Measure the water column to determine maximum depth and sampling depth prior to lowering the sampling device.
    2. Mark the line attached to the sampler with depth increments so that the sampling depth can be accurately recorded.
    3. Lower the sampler slowly to the appropriate sampling depth, taking care not to disturb the sediments.
    4. At the desired depth, send the messenger weight down to trip the closure mechanism.
    5. Retrieve the sampler slowly.
    6. Rinse the sampling device with ample amounts of site water prior to collecting the first sample. Discard rinsate away from and downstream of the sampling location.
    7. Fill the individual sample bottles via the discharge tube.
- Double Check-Valve Bailers: Collect samples using double check-valve bailers if the data requirements do not necessitate a sample from a strictly discrete interval of the water column. Bailers with an upper and lower check-valve can be lowered through the water column. Water will continually be displaced through the bailer until the desired depth is reached, at which point the bailer is retrieved. Sampling with this type of bailer must follow the same protocols outlined above, except that a messenger weight is not applicable. Although not designed specifically for this kind of sampling, a bailer is acceptable when a mid-depth sample is required

1. As the bailer is dropped through the water column, water is displaced through the body of the bailer. The degree of displacement depends upon the check-valve ball movement to allow water to flow freely through the bailer body.
2. Slowly lower the bailer to the appropriate depth. Upon retrieval, the two check valves seat, preventing water from escaping or entering the bailer.
3. Rinse the sampling device with ample amounts of site water prior to collecting the first sample.
4. Fill the individual sample bottles via the discharge tube. Sample bottles must be handled as described above.

- Peristaltic Pump and Tubing: The most portable pump for this technique is a 12 volt peristaltic pump. Use appropriately precleaned, silastic tubing in the pump head and attach HDPE, Tygon, etc. tubing to the pump. This technique is not acceptable for Oil and Grease, EPH, VPH or VOCs. Extractable organics can be collected through the pump if flexible interior-wall Teflon, polyethylene or PP tubing is used in the pump head, or if used with an organic trap setup.
    1. Measure the water column to determine the maximum depth and the sampling depth.
    2. Tubing will need to be tied to a stiff pole or be weighted down so the tubing placement will be secure. Do not use a lead weight. Any dense, non-contaminating, non-interfering material will work (brick, stainless steel weight, etc.). Tie the weight with a lanyard (braided or monofilament nylon, etc.) so that it is located below the inlet of the tubing.
    3. Turn the pump on and allow several tubing volumes of water to be discharged before collecting the first sample.
    4. Fill the individual sample bottles via the discharge tube. Sample bottles must be handled as described above.

Attachment 3

New Guidelines for the Submittal of Environmental Monitoring Data,
Solid Waste Section Memorandum, October 27, 2006

North Carolina Department of Environment and Natural Resources
Dexter R. Matthews, Director Division of Waste Management Michael F. Easley, Governor
William G. Ross Jr., Secretary

October 27, 2006

To: SW Director/County Manager/Consultant/Laboratory

From: NC DENR-DWM, Solid Waste Section

Re: New Guidelines for Electronic Submittal of Environmental Monitoring Data

The Solid Waste Section receives and reviews a wide variety of environmental monitoring data from permitted solid waste management facilities, including the results from groundwater and surface water analyses, leachate samples, methane gas readings, potentiometric measurements, and corrective action data. We are in the process of developing a database to capture the large volume of data submitted by facilities.

To maintain the integrity of the database, it is critical that facilities, consultants, and laboratories work with the Solid Waste Section to ensure that environmental samples are collected and analyzed properly with the resulting data transferred to the Solid Waste Section in an accurate manner.

In order to better serve the public and to expedite our review process, the Solid Waste Section is requesting specific formatting for environmental monitoring data submittals for all solid waste management facilities.

Effective, December 1, 2006, please submit a Solid Waste Environmental Monitoring Data Form in addition to your environmental monitoring data report. This form will be sent in lieu of your current cover letter to the Solid Waste Section. The Solid Waste Environmental Monitoring Data Form must be filled out completely, signed, and stamped with a Board Certified North Carolina Geologist License Seal.

The solid waste environmental monitoring data form will include the following:

1. Contact Information
2. Facility Name
3. Facility Permit Number
4. Facility Address
5. Monitoring Event Date (MM/DD/YYYY)
6. Water Quality Status: Monitoring, Detection Monitoring, or Assessment Monitoring
7. Type of Data Submitted: Groundwater Monitoring Wells, Groundwater Potable Wells, Leachate, Methane Gas, or Corrective Action Data
8. Notification of Exceedance of Groundwater, Surface Water, or Methane Gas (in table form)
9. Signature
10. North Carolina Geologist Seal

1646 Mail Service Center, Raleigh, North Carolina 27699-1646
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Most of these criteria are already being included or can be added with little effort. The Solid Waste Environmental Monitoring Data Form can be downloaded from our website: http://www.wastenotnc.org/swhome/enviro_monitoring.asp.

The Solid Waste Section is also requesting a new format for monitoring wells, potable wells, surface water sampling locations, and methane probes. This format is essential in the development and maintenance of the database. The Solid Waste Section is requesting that each sampling location at all North Carolina solid waste management facilities have its own unique identification number. We are simply asking for the permit number to be placed directly in front of the sampling location number (example: 9901-MW1 = Permit Number 99-01 and Monitoring Well MW-1). No changes will need to be made to the well tags, etc. This unique identification system will enable us to accurately report data not only to NCDENR, but to the public as well. We understand that this new identification system will take some time to implement, but we feel that this will be beneficial to everyone involved in the long term.

Additionally, effective December 1, 2006, the Practical Quantitation Limits (PQLs) established in 1994 will change. The Solid Waste Section is requiring that all solid waste management facilities use the new Solid Waste Reporting Limits (SWRL) for all groundwater analyses by a North Carolina Certified Laboratory. Laboratories must also report any detection of a constituent even it is detected below the new SWRL (e.g., J values where the constituent was detected above the detection limit, but below the quantitation limit).

PQLs are technology-based analytical levels that are considered achievable using the referenced analytical method. The PQL is considered the lowest concentration of a contaminant that the lab can accurately detect and quantify. PQLs provided consistency and available numbers that were achievable by the given analytical method. However, PQLs are not health-based, and analytical instruments have improved over the years resulting in lower achievable PQLs for many of the constituents. As a result, the Solid Waste Section has established the SWRLs as the new reporting limits eliminating the use of the PQLs.

We would also like to take this opportunity to encourage electronic submittal of the reports. This option is intended to save resources for both the public and private sectors. The Solid Waste Section will accept the entire report including narrative text, figures, tables, and maps on CD-ROM. The CD-ROM submittal shall contain a CD-ROM case and both CD-ROM and the case shall be labeled with the site name, site address, permit number, and the monitoring event date (MM/DD/YYYY). The files may be a .pdf, .txt, .csv, .xls, or .doc type. Also, analytical lab data should be reported in an .xls file. We have a template for analytical lab data available on the web at the address listed above.

If you have any questions or concerns, please call (919) 508-8400. Thank you for your anticipated cooperation in this matter.

Attachment 4

Environmental Monitoring Data Form

DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) Doc/Event #:

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it 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).

Instructions:

- **Prepare one form for each individually monitored unit.**
- **Please type or print legibly.**
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- In accordance with NC General Statutes Chapter 89C and 89E and NC Solid Waste Management Rules 15A NCAC 13B, be sure to affix a seal to the bottom of this page, when applicable.
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Solid Waste Monitoring Data Submittal Information

Name of entity submitting data (laboratory, consultant, facility owner):

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: _____ Phone: _____

E-mail: _____

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)

Environmental Status: (Check all that apply)

☐ Initial/Background Monitoring ☐ Detection Monitoring ☐ Assessment Monitoring ☐ Corrective Action

Type of data submitted: (Check all that apply)

☐ Groundwater monitoring data from monitoring wells
☐ Groundwater monitoring data from private water supply wells
☐ Leachate monitoring data
☐ Surface water monitoring data
☐ Methane gas monitoring data
☐ Corrective action data (specify) _____
☐ Other(specify)

Notification attached?

☐ No. No groundwater or surface water standards were exceeded.
☐ Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
☐ Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

Facility Representative Name (Print) Title (Area Code) Telephone Number

Signature Date

Affix NC Licensed/ Professional Geologist/Engineer Seal here:

Revised 01/2007

Attachment 5

February 2007 Addendum to the October 2006 Memorandum

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

February 23, 2007

MEMORANDUM

To: Solid Waste Directors, Landfill Operators, North Carolina Certified Laboratories, and Consultants

From: North Carolina Division of Waste Management, Solid Waste Section

Re: Addendum to October 27, 2006, North Carolina Solid Waste Section Memorandum Regarding New Guidelines for Electronic Submittal of Environmental Data.

The purpose of this addendum memorandum is to provide further clarification to the October 27, 2006, North Carolina Solid Waste Section memo titled, "New Guidelines for Electronic Submittal of Environmental Data."

The updated guidelines is in large part due to questions and concerns from laboratories, consultants, and the regulated community regarding the detection of constituents in groundwater at levels below the previous practical quantitation limits (PQLs). The North Carolina Solid Waste Section solicited feedback from the regulated community, and, in conjunction with the regulated community, developed new limits. The primary purpose of these changes was to improve the protection of public health and the environment. The North Carolina Solid Waste Section is concerned about analytical data at these low levels because the earliest possible detection of toxic or potentially carcinogenic chemicals in the environment is paramount in the North Carolina Solid Waste Section's mission to protect human health and the environment. Low level analytical data are critical for making the correct choices when designing site remediation strategies, alerting the public to health threats, and protecting the environment from toxic contaminants. The revised limits were updated based on readily available laboratory analytical methodology and current health-based groundwater protection standards.

Definitions

Many definitions relating to detection limits and quantitation limits are used in the literature and by government agencies, and commonly accepted procedures for calculating these limits exist. Except for the Solid Waste Section Limit and the North Carolina 2L Standards, the definitions listed below are referenced from the Environmental Protection Agency (EPA). The definitions are also an attempt to clarify the meaning of these terms as used by the North Carolina Solid Waste Section.

Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.

Method Reporting Limit or Method Quantitation Limit (MRL or MQL) is the minimum concentration of a target analyte that can be accurately determined by the referenced method.

Practical Quantitation Limit (PQL) is a quantitation limit that represents a practical and routinely achievable quantitation limit with a high degree of certainty (>99.9% confidence) in the results. Per EPA Publication Number SW-846, the PQL is the lowest concentration that can be reliably measured within specified limits of precision and accuracy for a specific laboratory analytical method during routine laboratory operating conditions in accordance with "Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. The PQL appears in older NCDENR literature; however, it is no longer being used by the North Carolina Solid Waste Section.

Solid Waste Section Limit (SWSL) is the lowest amount of analyte in a sample that can be quantitatively determined with suitable precision and accuracy. The SWSL is the concentration below which reported analytical results must be qualified as estimated. *The SWSL is the updated version of the PQL that appears in older North Carolina Solid Waste Section literature. The SWSL is the limit established by the laboratory survey conducted by the North Carolina Solid Waste Section. The nomenclature of the SWRL described in the October 27, 2006, memorandum has changed to the SWSL.*

North Carolina 2L Standards (2L) are water quality standards for the protection of groundwaters of North Carolina as specified in 15A NCAC 2L .0200, Classifications and Water Quality Standards Applicable to the Groundwaters of North Carolina.

Method Detection Limits (MDLs)

Clarification of detection limits referenced in the October 27, 2006, memorandum needed to be addressed because of concerns raised by the regulated community. The North Carolina Solid Waste Section is now requiring laboratories to report to the method detection limit.

Method detection limits are statistically determined values that define the concentration at which measurements of a substance by a specific analytical protocol can be distinguished from measurements of a blank (background noise). Method detection limits are matrix-specific and require a well defined analytical method. In the course of routine operations, laboratories generally report the highest method detection limit for all the instruments used for a specific method.

In many instances, the North Carolina Solid Waste Section gathers data from many sources prior to evaluating the data or making a compliance decision. Standardization in data reporting significantly enhances the ability to interpret and review data because the reporting formats are comparable. Reporting a method detection limit alerts data users of the known uncertainties and limitations associated with using the data. Data users must understand these limitations in order to minimize the risk of making poor environmental decisions. Censoring data below unspecified or non-statistical reporting limits severely biases data sets and restricts their usefulness.

Solid Waste Section Limits (SWSLs)

Due to comments from the regulated community, the North Carolina Solid Waste Section has changed the nomenclature of the new limits referenced on Page 2 of the October 27, 2006, memorandum, from the North Carolina Solid Waste Reporting Limits (SWRL) to the Solid Waste Section Limits (SWSL). Data must be reported to the laboratory specific method detection limits and must be quantifiable at or below the SWSL. The SWSLs must be used for both groundwater and surface water data reported to the North Carolina Solid Waste Section. The PQLs will no longer be used.

The North Carolina Solid Waste Section has considered further feedback from laboratories and the regulated community and has made some additional changes to the values of the SWSLs. These changes may be viewed on our webpage:
http://www.wastenotnc.org/sw/swenvmonitoringlist.asp

Analytical Data Reporting Requirements

The strategy for implementing the new analytical data reporting requirements involves reporting the actual laboratory method detection limit with all analytical laboratory results along with the following requirements:

1) Any analyte detected at a concentration greater than the MDL but less than the SWSL is known to be present, but the uncertainty in the value is higher than a value reported above the SWSL. As a result, the actual concentration is estimated. The estimated concentration is reported along with a qualifier ("J" flag) to alert data users that the result is between the MDL and the SWSL. Any analytical data below quantifiable levels should be examined closely to evaluate whether the analytical data should be included in any statistical analysis. A statistician should make this determination. If an analyte is detected below the North Carolina 2L Standards, even if it is a quantifiable concentration, compliance action may not be taken unless it is statistically significant increase over background.

These analytical results may require additional confirmation.

2) Any analyte detected at a concentration greater than the SWSL is present, and the quantitated value can be reported with a high degree of confidence. These analytes are reported without estimated qualification. The laboratory's MDL and SWSL must be included in the analytical laboratory report. Any reported concentration of an organic or inorganic constituent at or above the North Carolina 2L Standards will be used for compliance purposes, unless the inorganic constituent is not statistically significant). Exceedance of the North Carolina 2L Standards or a statistically significant increase over background concentrations define when a violation has occurred. Any reported concentration of an organic or inorganic constituent at or above the SWSL that is not above an North Carolina 2L Standard will be used as a tool to assess the integrity of the landfill system and predict the possibility that a constituent concentration may exceed the North Carolina 2L Standards in the future.

These analytical results may be used for compliance without further confirmation.

Failure to comply with the requirements described in the October 27, 2006, memorandum and this addendum to the October 27, 2006, memorandum will constitute a violation of 15A NCAC 13B .0601, .0602, or .1632(b), and the analytical data will be returned and deemed unacceptable. Submittal of unacceptable data may lead to enforcement action.

Electronic Data Deliverable (EDD) Submittal

The North Carolina Solid Waste Section would also like to take this opportunity to encourage electronic submittal of the reports in addition to the analytical laboratory data. This option is intended to save resources for both the public and private sectors.

The North Carolina Solid Waste Section will accept the entire report including narrative text, figures, tables, and maps on CD-ROM. Please separate the figures and tables from the report when saving in order to keep the

size of the files smaller. The CD-ROM submittal shall contain a CD-ROM case and both CD-ROM and the case shall be labeled with the site name, site address, permit number, and the monitoring event date (MM/DD/YYYY). The reporting files may be submitted as a .pdf, .txt, .csv, .xls,. or .doc type.

Also, analytical lab data and field data should be reported in .xls files. The North Carolina Solid Waste Section has a template for analytical lab data and field data. This template is available on our webpage: http://www.wastenotnc.org/swhome/enviro_monitoring.asp. Methane monitoring data may also be submitted electronically in this format.

Pursuant to the October 27, 2006, memorandum, please remember to submit a Solid Waste Section Environmental Monitoring Reporting Form in addition to your 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. Otherwise, any representative that the facility owner chooses may sign and submit the form. Also, if the concentration of methane generated by the facility exceeds 100% of the lower explosive limits (LEL) at the property boundary or exceeds 25% of the LEL in facility structures (excluding gas control or recovery system components), include the exceedance(s) on the North Carolina Solid Waste Section Environmental Monitoring Reporting Form.

If you have any questions or concerns, please feel free to contact Jaclynne Drummond (919-508-8500) or Ervin Lane (919-508-8520).

Thank you for your continued cooperation with this matter.

Attachment 6

October 2007 Memorandum

North Carolina Department of Environment and Natural Resources

Dexter R. Matthews, Director | Division of Waste Management | Michael F. Easley, Governor
William G. Ross Jr., Secretary

October 16, 2007

MEMORANDUM

To: Solid Waste Directors, Landfill Operators, North Carolina Certified Laboratories, and Consultants

From: North Carolina Division of Waste Management, Solid Waste Section

Re: Environmental Monitoring Data for North Carolina Solid Waste Management Facilities

The purpose of this memorandum is to provide a reiteration of the use of the Solid Waste Section Limits (SWSLs), provide new information on the Groundwater Protection Standards, and provide a reminder of formats for environmental monitoring data submittals.

The updated guidelines are in large part due to questions and concerns from laboratories, consultants, and the regulated community regarding the detection of constituents in groundwater at levels below the previous Practical Quantitation Limits (PQLs). The North Carolina Solid Waste Section solicited feedback from the regulated community, and, in conjunction with the regulated community, developed new limits. The primary purpose of these changes was to improve the protection of public health and the environment.

Data must be reported to the laboratory specific method detection limits and must be quantifiable at or below the SWSLs. The SWSLs must be used for both groundwater and surface water data reported to the North Carolina Solid Waste Section. The PQLs will no longer be used.

In June 2007, we received new information regarding changes to the Groundwater Protection Standards. If a North Carolina 2L Groundwater Standard does not exist, then a designated Groundwater Protection Standard is used pursuant to 15A NCAC 13B .1634. Toxicologists with the North Carolina Department of Health and Human Services calculated these new Groundwater Protection Standards. Questions regarding how the standards were calculated can be directed to the North Carolina Department of Health and Human Services.

We have reviewed the new results from the North Carolina Department of Public Health and have updated our webpage accordingly. The list of Groundwater Protection Standards, North Carolina 2L Standards and SWSLs are subject to change and will be reviewed every year or sooner if new scientific and toxicological data become available. Please review our website periodically for any changes to the 2L NC Standards, Groundwater Protection Standards, or SWSLs. Specific updates will be noted on our website.

http://www.wastenotnc.org/sw/swenvmonitoringlist.asp

In addition, the following should be included with environmental monitoring data submittals:

1. Environmental Monitoring Data Form as a cover sheet:
http://www.wastenotnc.org/swhome/EnvMonitoring/NCEnvMonRptForm.pdf
2. Copy of original laboratory results.
3. Table of detections and discussion of 2L exceedances.
4. Electronic files on CD or sent by email. These files should include the written report as a Portable Document Format (PDF) file and the laboratory data as an excel file following the format of the updated Electronic Data Deliverable (EDD) template on our website:
http://www.wastenotnc.org/swhome/enviro_monitoring.asp

If you have any questions or concerns, please feel free to contact Donald Herndon (919-508-8502), Ervin Lane (919-508-8520) or Jaclynne Drummond (919-508-8500).

Thank you for your continued cooperation with these matters.

PHASE I (MW-1d)

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 / 16.00		SAND: Medium dense buff-white, slightly silty, moist		
4 / 14.00	3 4 5	SAND: Loose, green-gray, silty and clayey, wet	SM	
8 / 10.00	2 1 1	SILT: Medium stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	SM	
12 / 6.00			ML-CL	
14 / 4.00	3 4 6			
16 / 2.00				
18 / 0.00				
20 / -2.00	4 4 6	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
22 / -4.00				
24 / -6.00	4 5 7		CL	Bentonite-Cement Grout
26 / -8.00				
28 / -10.00				
30 / -12.00	3 3 7		CL	
32 / -14.00				
34 / -16.00	6 22 18	SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 36 to 38 feet, very hard below 45 feet	SM	Bentonite Seal
36 / -18.00				

David Garrett, P.G., P.E.

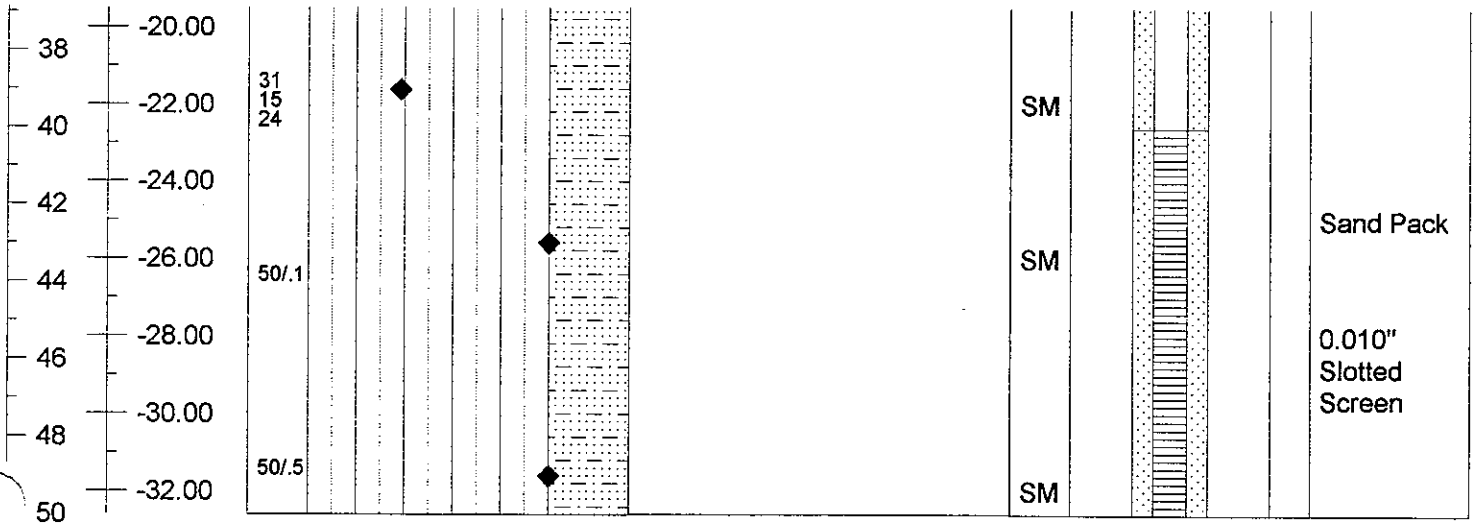
Engineering and Geology

Test Boring No. B-1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**		Total Depth **50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

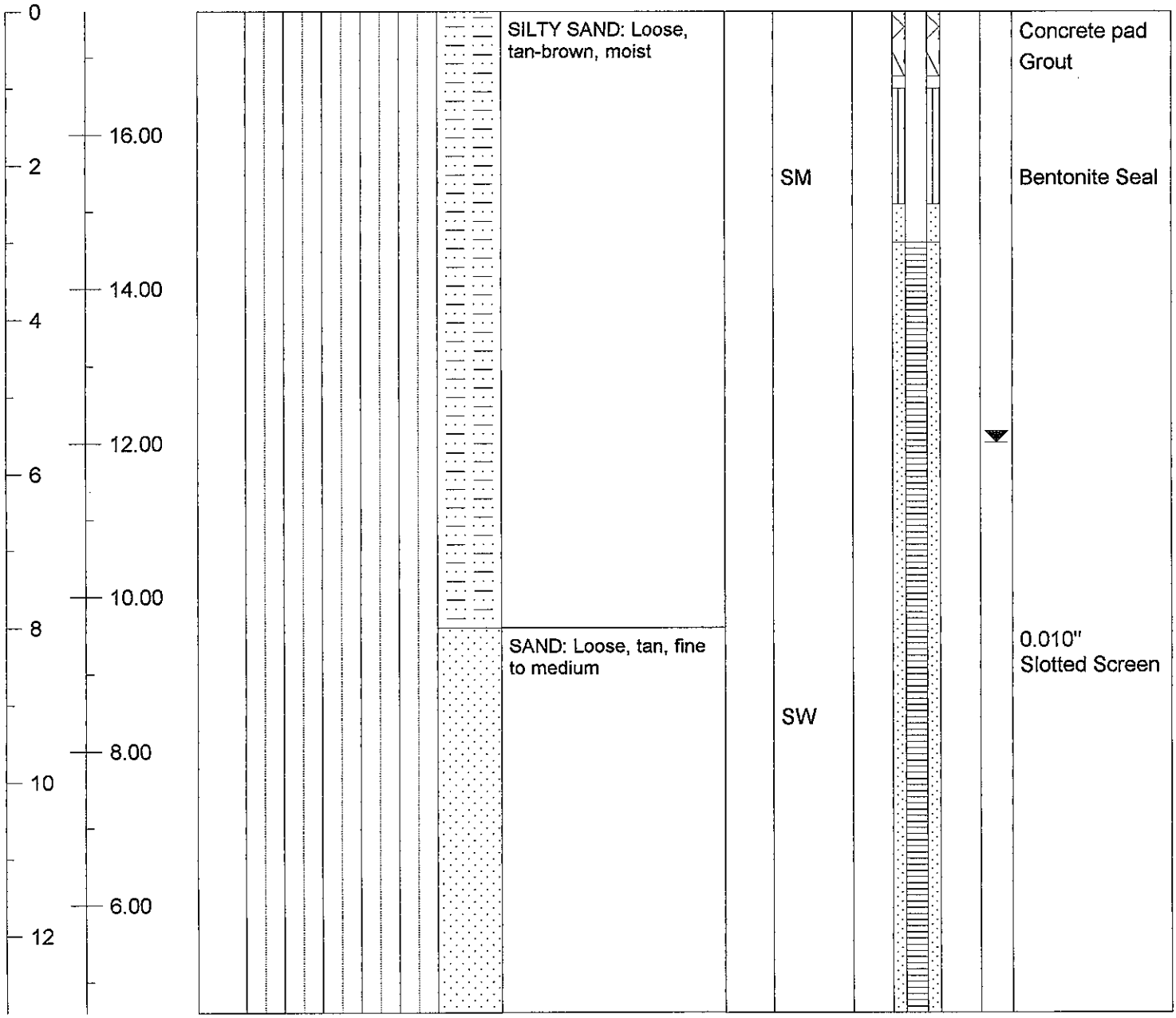
Engineering and Geology

Boring No. MW-1s

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.59**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/02/01**	Date Ended	**05/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.59**
Comments	**Locking cover with 3.32' stickup**		Total Depth **13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



(MW-2d

David Garrett, P.G., P.E.

Engineering and Geology

Test Boring No. B-2d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol		Piezometer Constuction Data
0 / 16.00		SAND: Loose, tan-yellow, variably silty sand		
4 / 14.00	16 8 9	CLAY: Medium stiff, tan-orange, very sandy, silty, slightly plastic, moist, crumbly	CL & SM	
8 / 10.00	5 8 8	SAND: Medium dense, tan, subangular, f - c well graded (boring collapsed at 13.6 feet when casing pulled, redrilled, with 4-1/4" hollow stem auger)	SP-SM	Bentonite-Cement Grout
14 / 4.00	3 3 4	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic	CL-ML	
18 / 0.00	2 2 3		CL-ML	
24 / -6.00	2 2 4	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
30 / -12.00	2 2 3		CL	
34 / -16.00	1 6 8	SILT: Stiff, gray-green, fine sandy, clayey, interlayered with sand	SM	Bentonite Seal
36 / -18.00				

David Garrett, P.G., P.E.

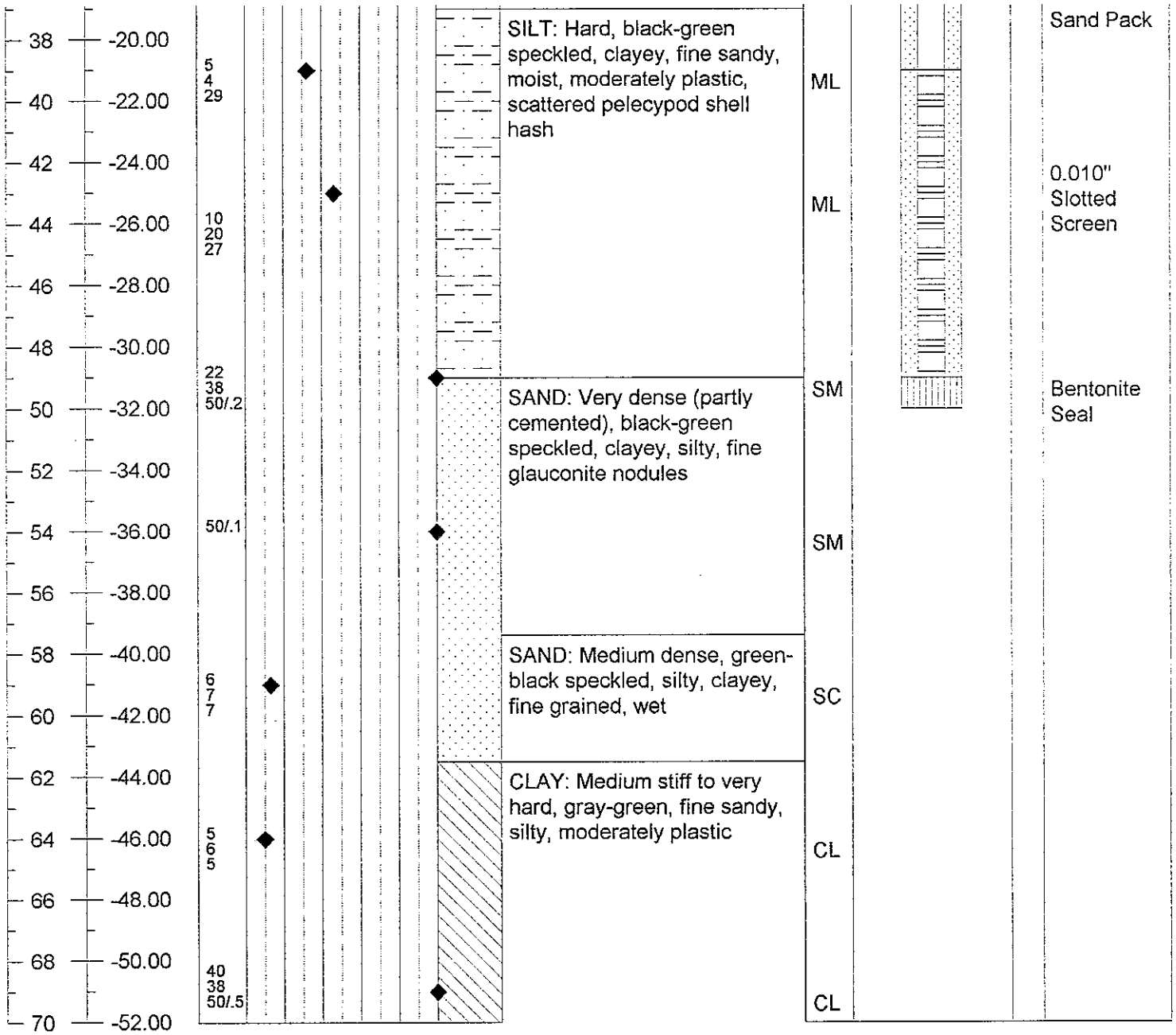
Engineering and Geology

Test Boring No. B-2d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

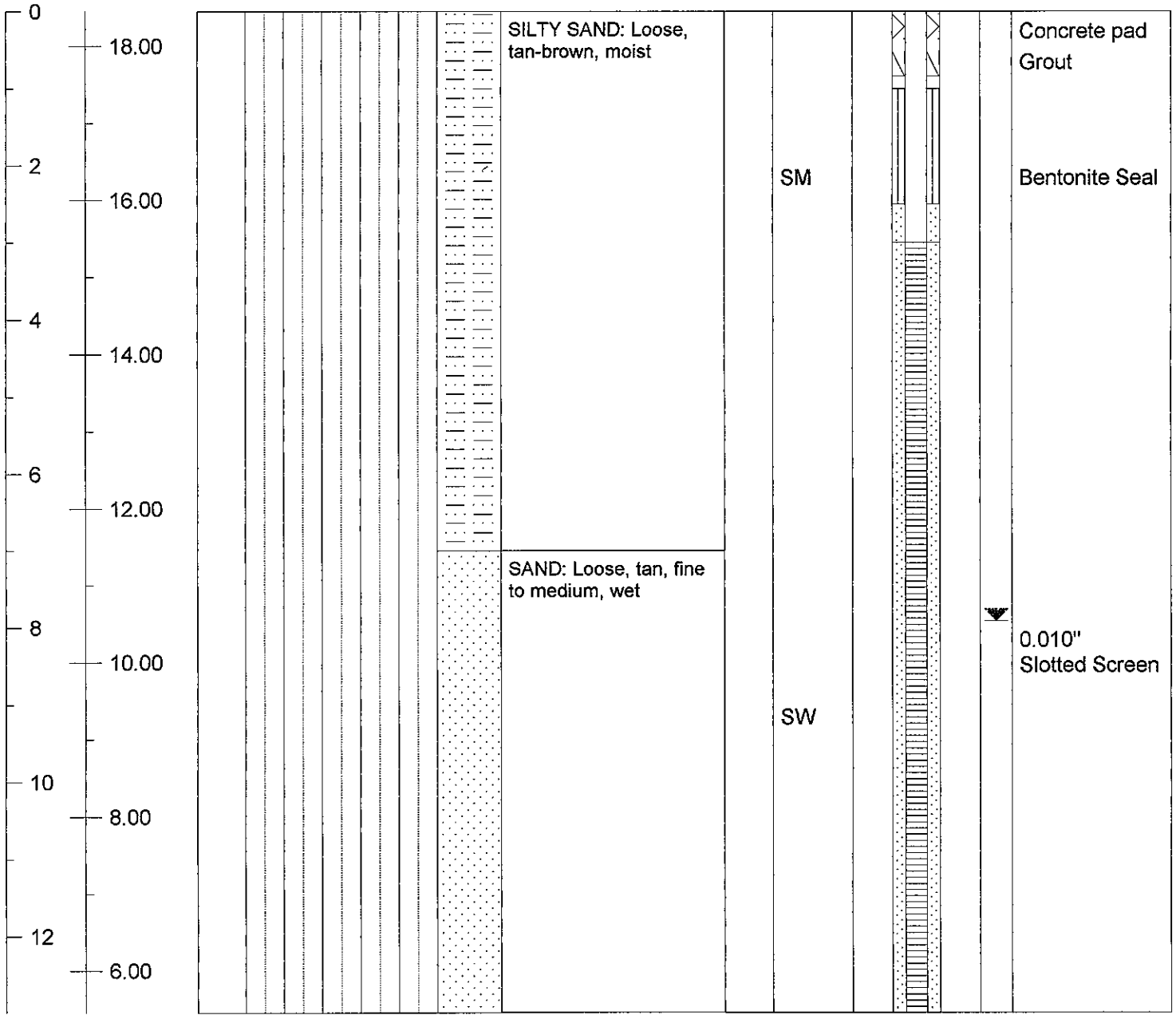
Boring No. MW-2s

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**18.45**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.91**
Comments	**Locking cover with 2.99' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



(MW-3d)

David Garrett, P.G., P.E.

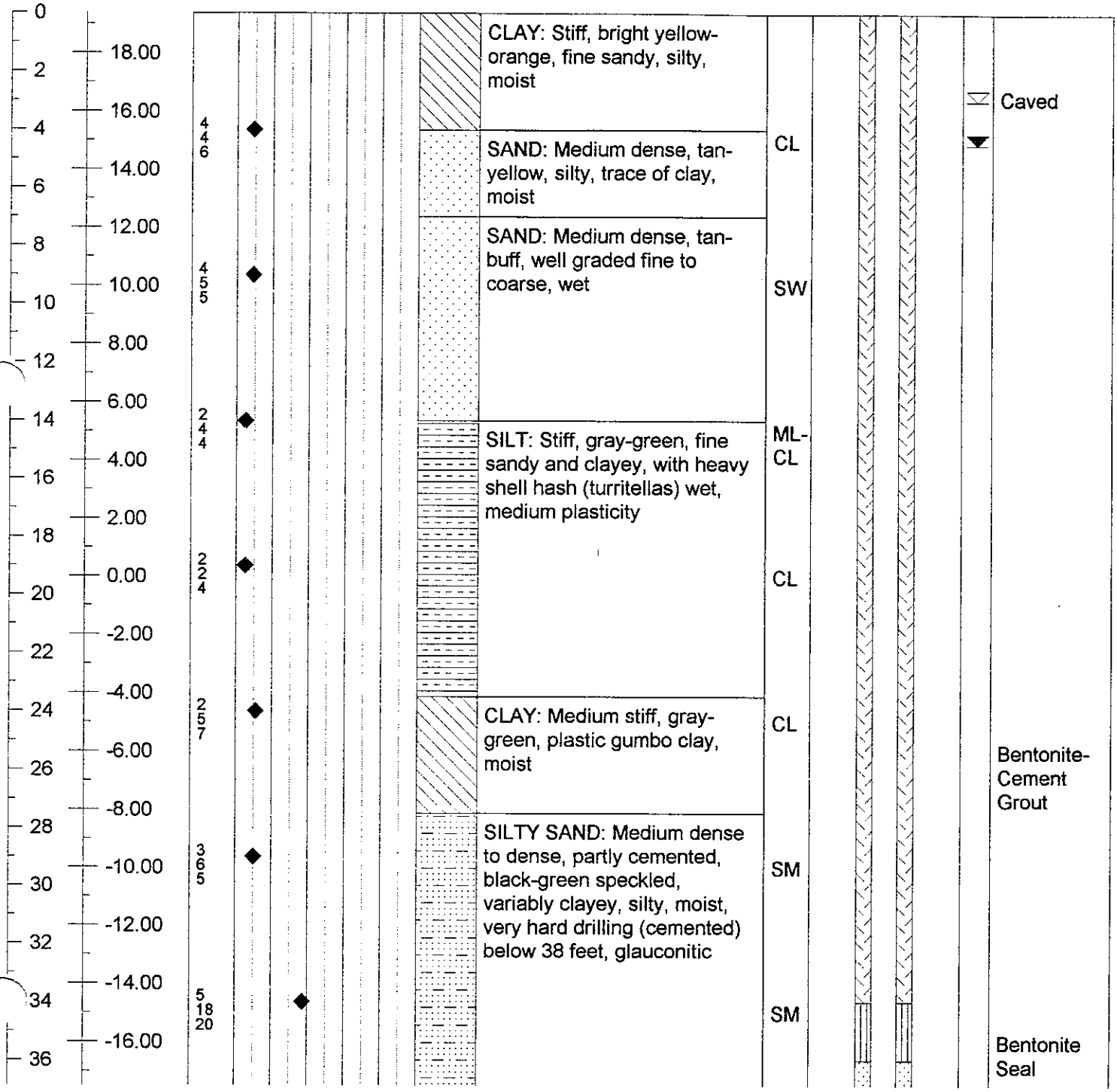
Engineering and Geology

Test Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



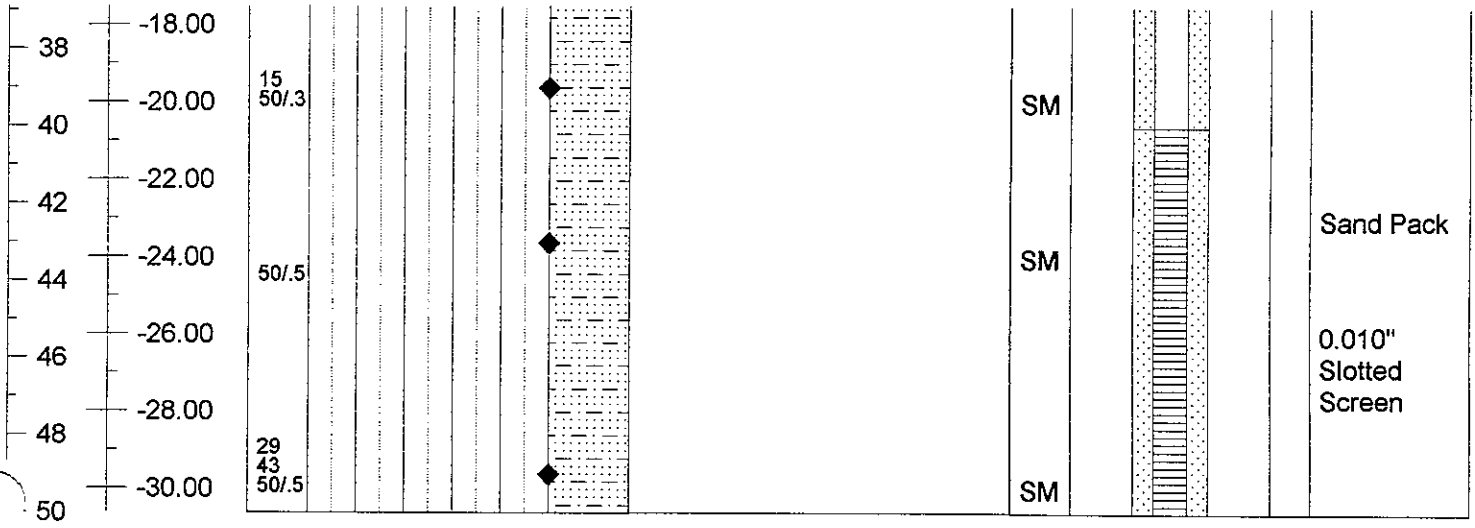
David Garrett, P.G., P.E.
Engineering and Geology

Test Boring No. B-3

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0 caved**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**		Total Depth **50.0**	Date of Observation	**10/16/00**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

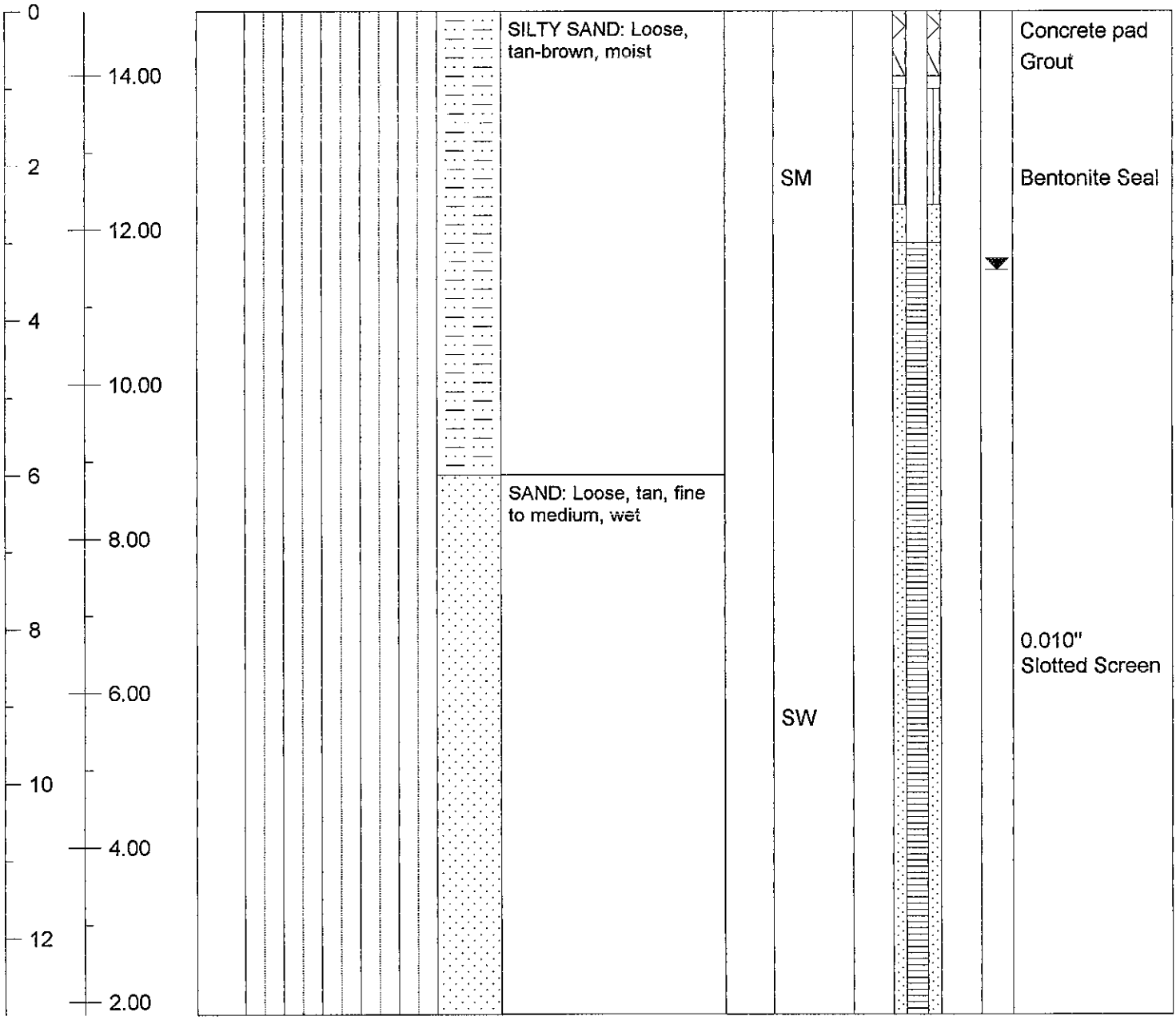
Boring No. MW-4

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**14.83**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.35**
Comments	**Locking cover with 3.59' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

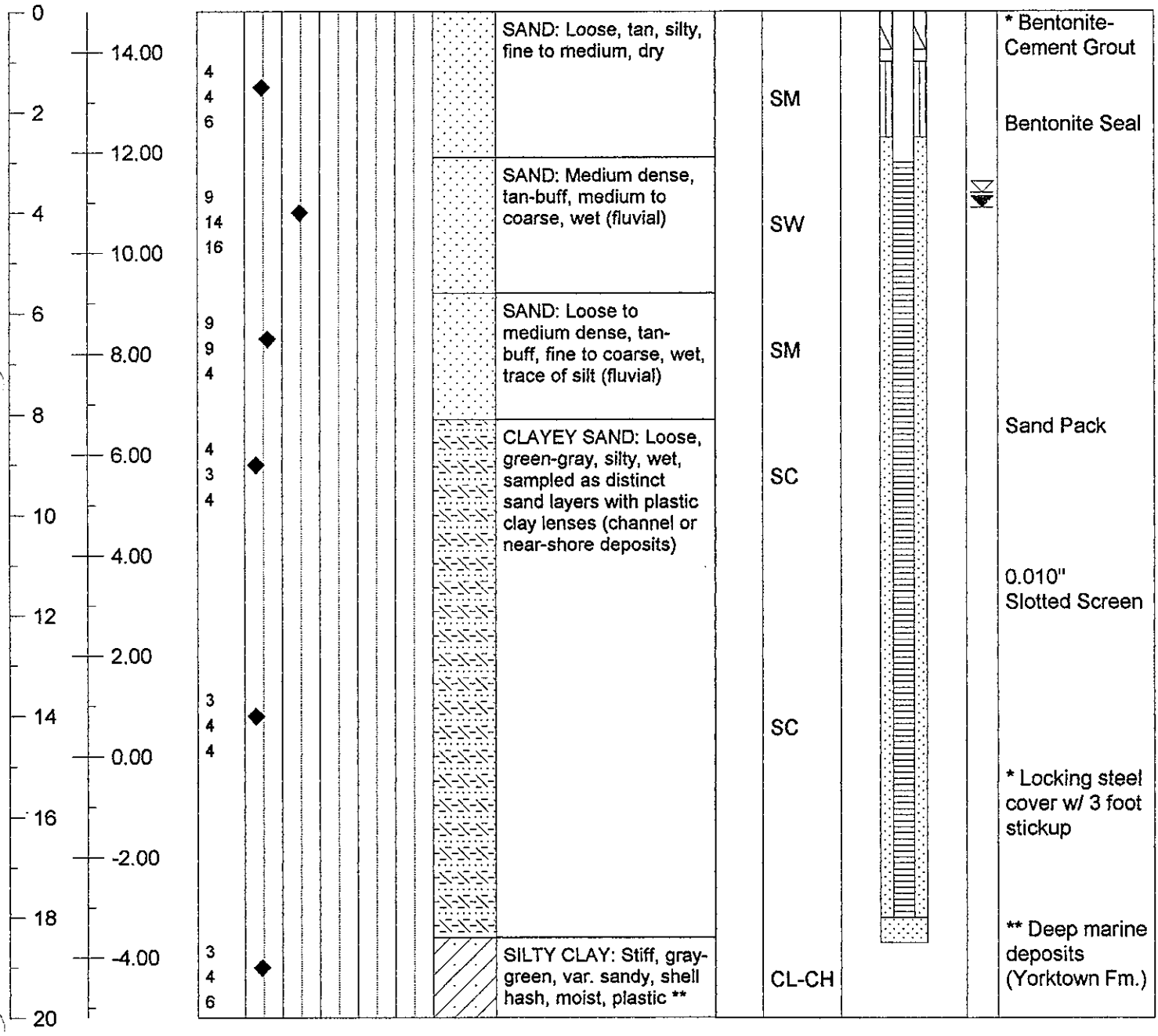
Boring No. MW-5

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**14.80**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.6**
Date Started	**11/19/02**	Date Ended	**11/19/02**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**3.9**
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

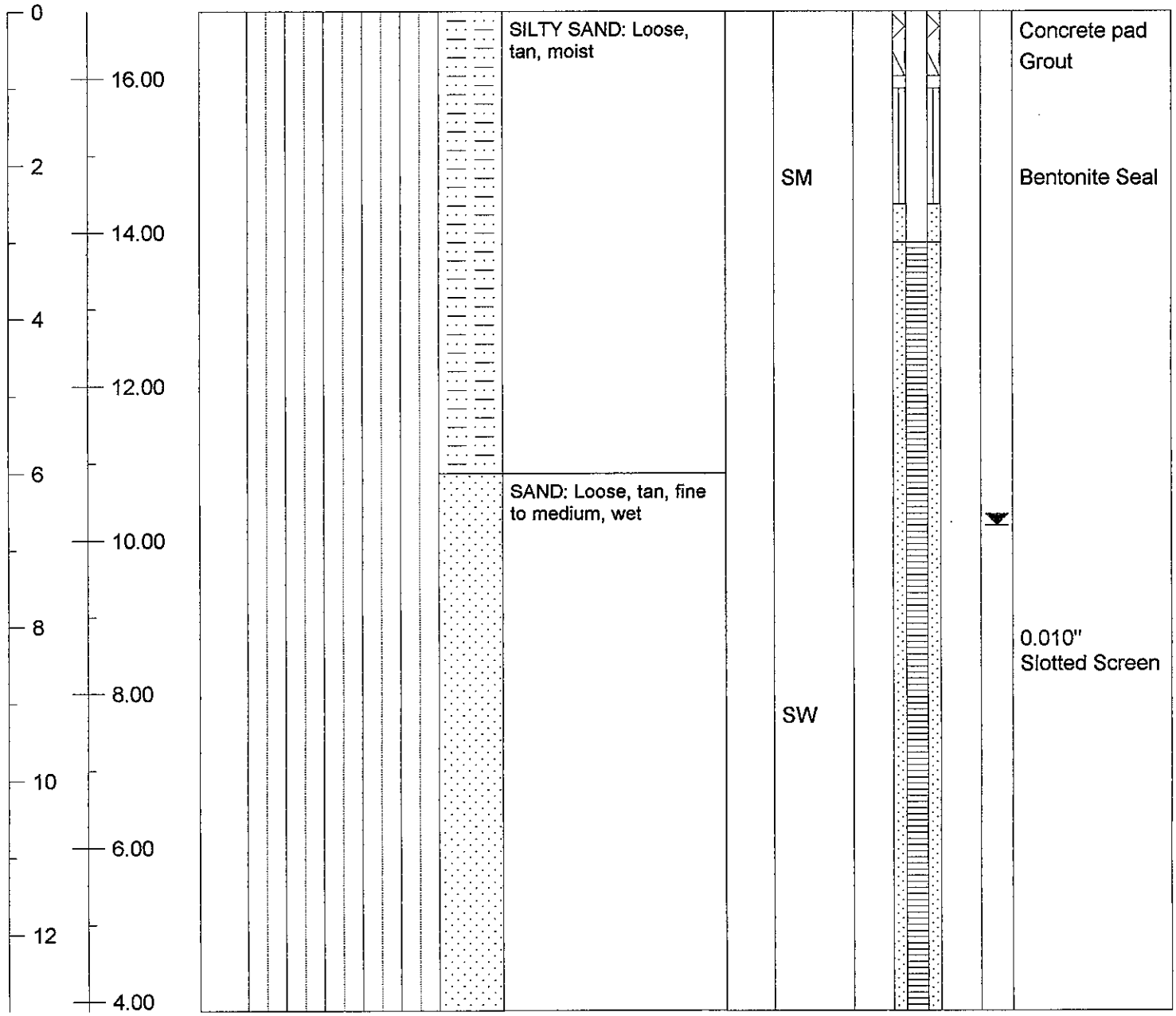
Engineering and Geology

Boring No. MW-6

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.87**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**6.68**
Comments	**Locking cover with 3.16' stickup**		Total Depth **13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

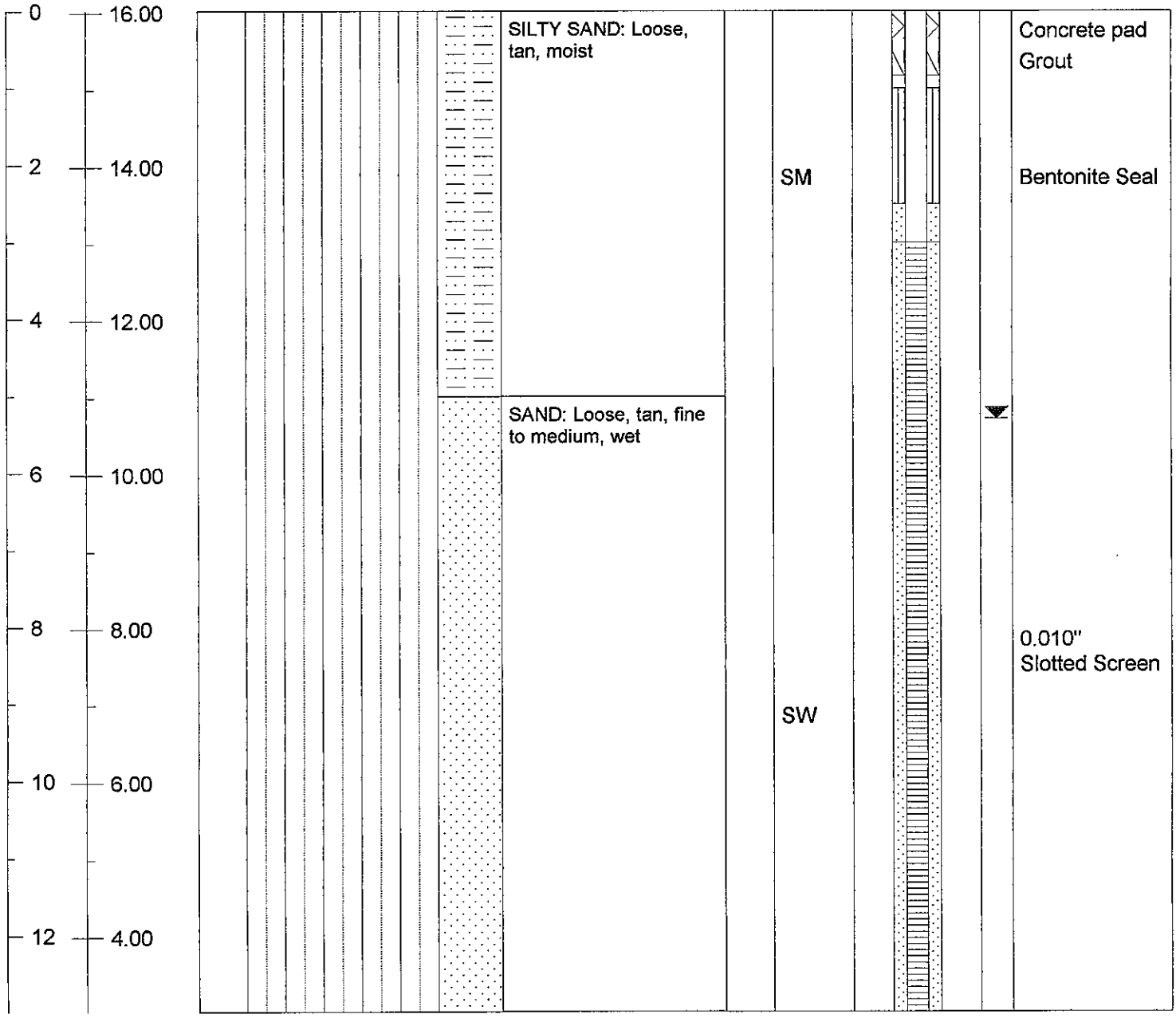
Boring No. MW-7

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Collar Elevation	**16.03**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**5.29**
Comments	**Locking cover with 3.37' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

Engineering and Geology

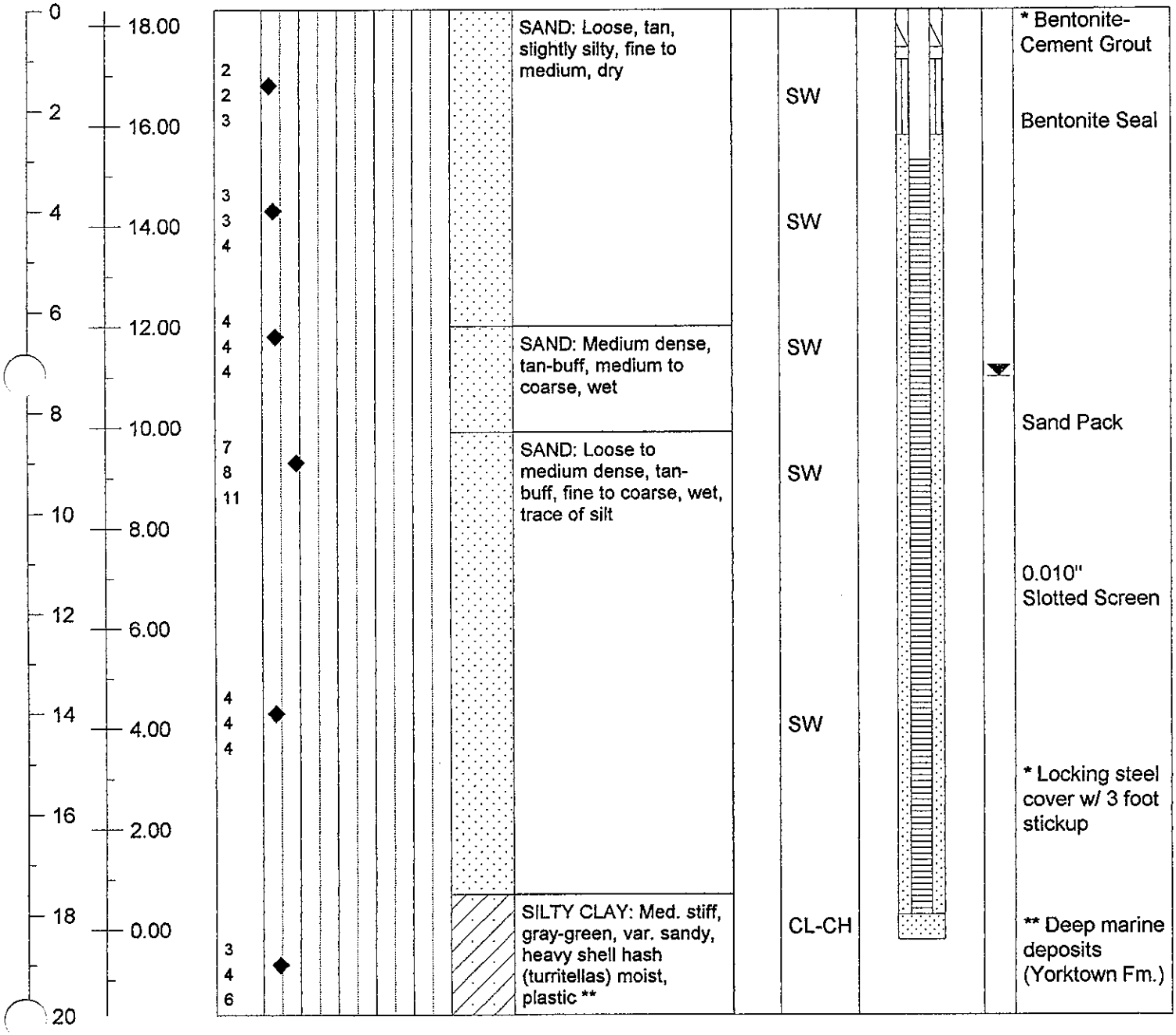
Boring No. MW-8

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**18.30**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**7.3**
Date Started	**11/18/02**	Date Ended	**11/18/02**	Water Level, 24 Hr.	**7.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**7.3**
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.

Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E.

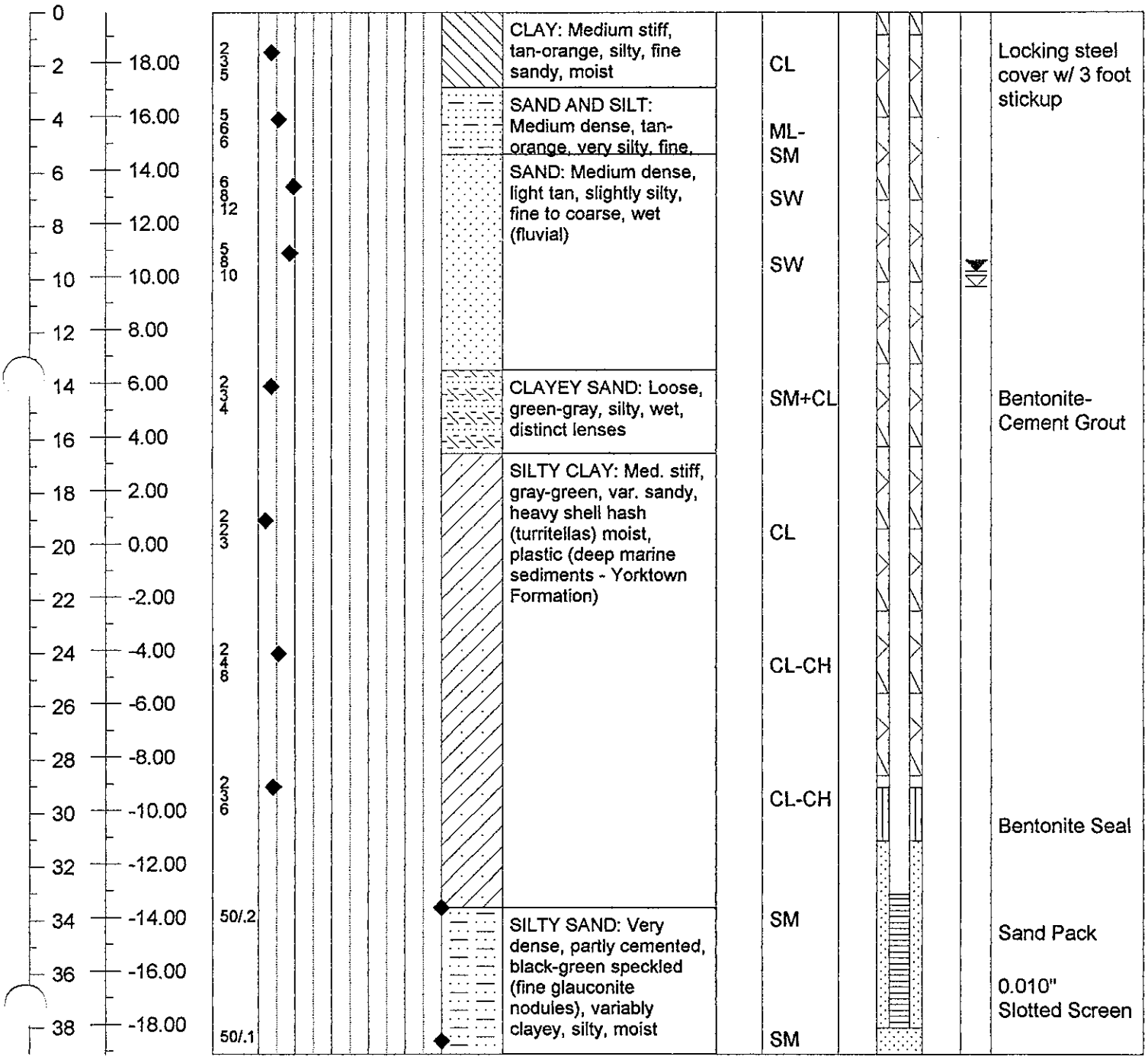
Engineering and Geology

Boring No. MW-9d

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**19.88**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**10.3**
Date Started	**11/14/02**	Date Ended	**11/14/02**	Water Level, 24 Hr.	**10.2**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**9.7**
Comments	**Wooded area, cool sunny weather**	Total Depth	**39.0**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.



David Garrett, P.G., P.E.

Engineering and Geology

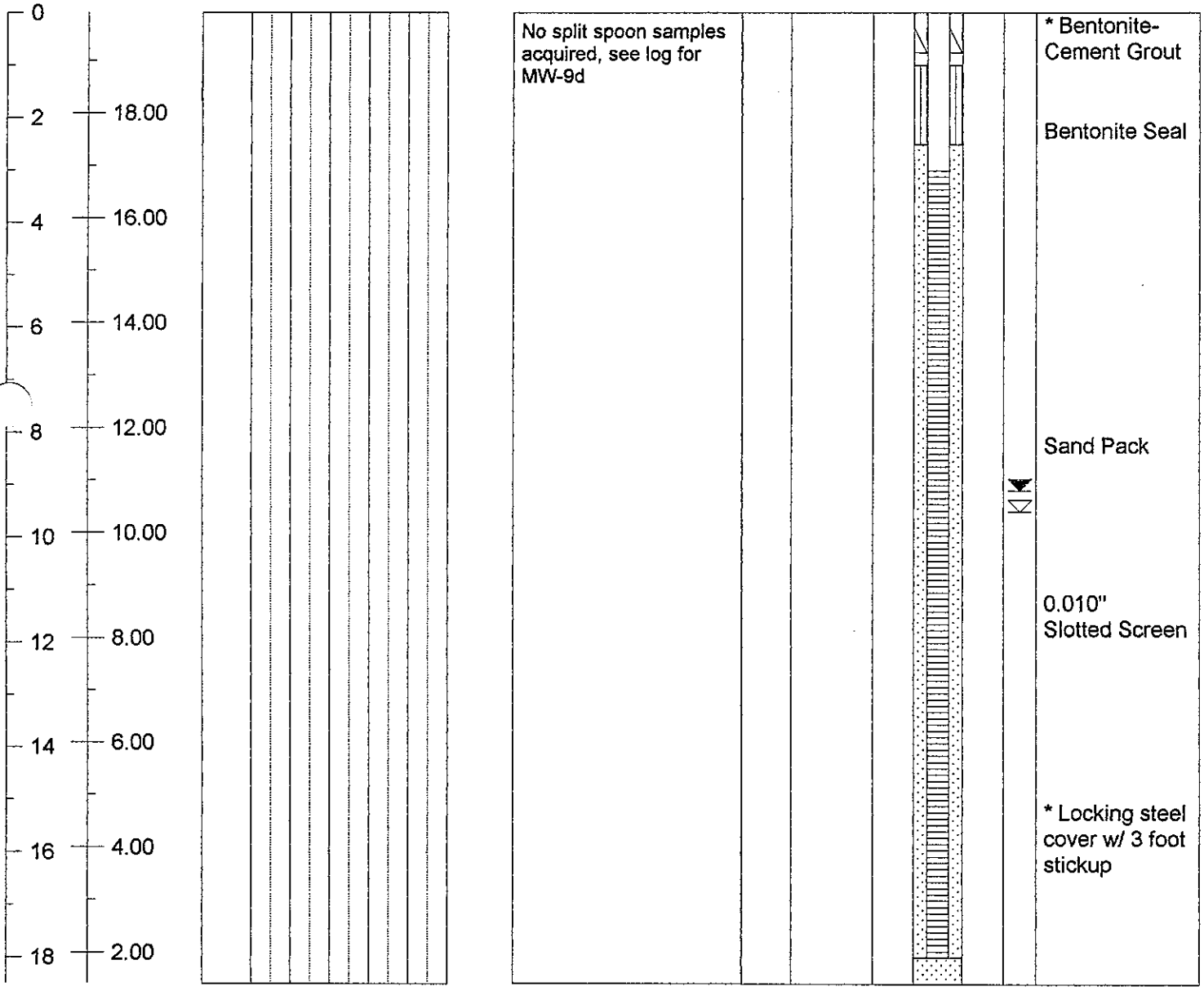
Boring No. MW-9s

Page 1 of 1

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**19.91**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**9.5**
Date Started	**11/19/02**	Date Ended	**11/19/02**	Water Level, 24 Hr.	**9.3**
Drilling Firm	**Bore & Core, Inc.**	Logged by	**David Garrett**	Stabilized Level	**9.1**
Comments	**Wooded area, cool sunny weather**	Total Depth	**18.5**	Date of Observation	**11/27/02**

All depths are given in feet and referenced b.g.s.

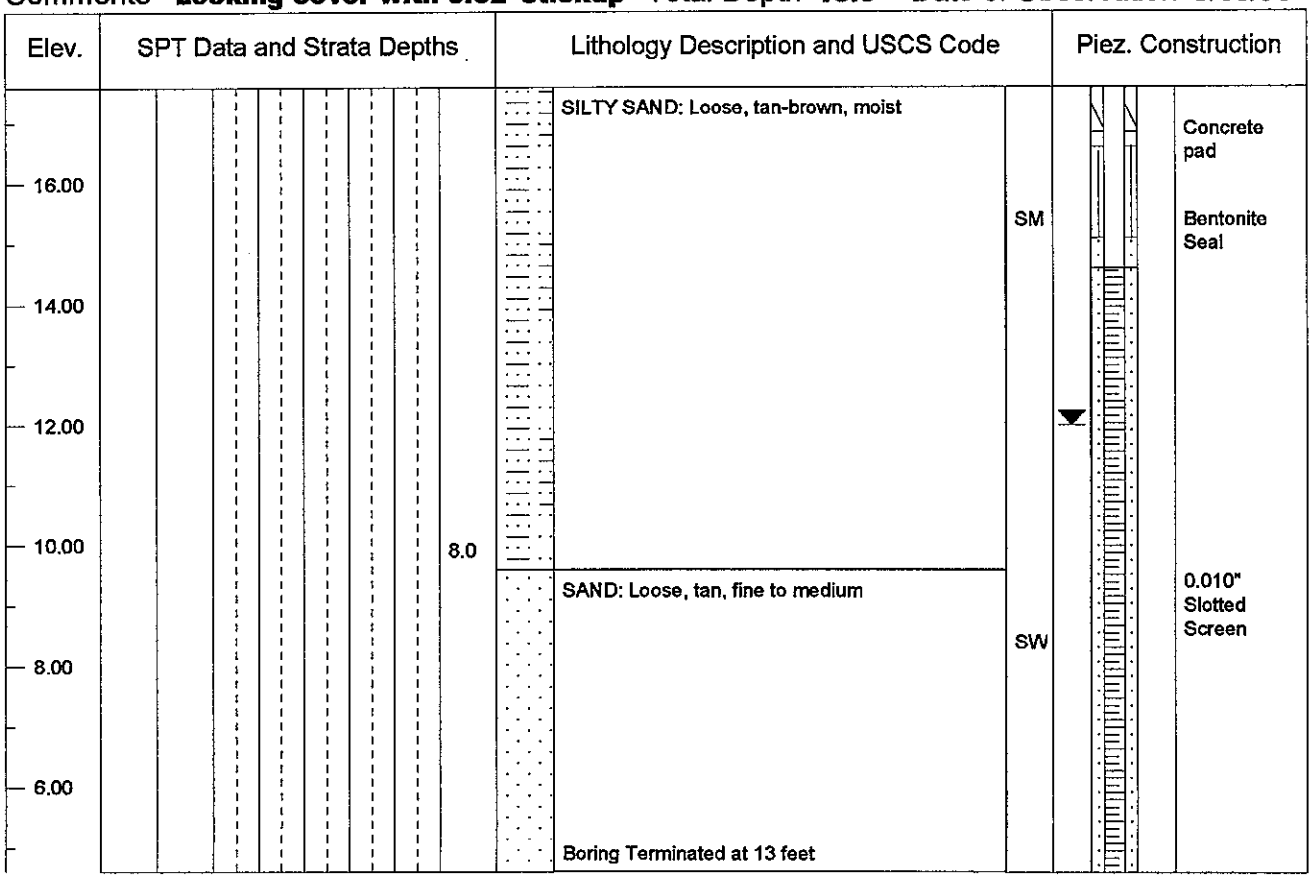
Depth and Elev.	SPT Value and Plot	Soil Description, OVA and USCS Symbol	Piezometer Constuction Data



David Garrett, P.G., P.E. — *Boring No. MW-1s*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

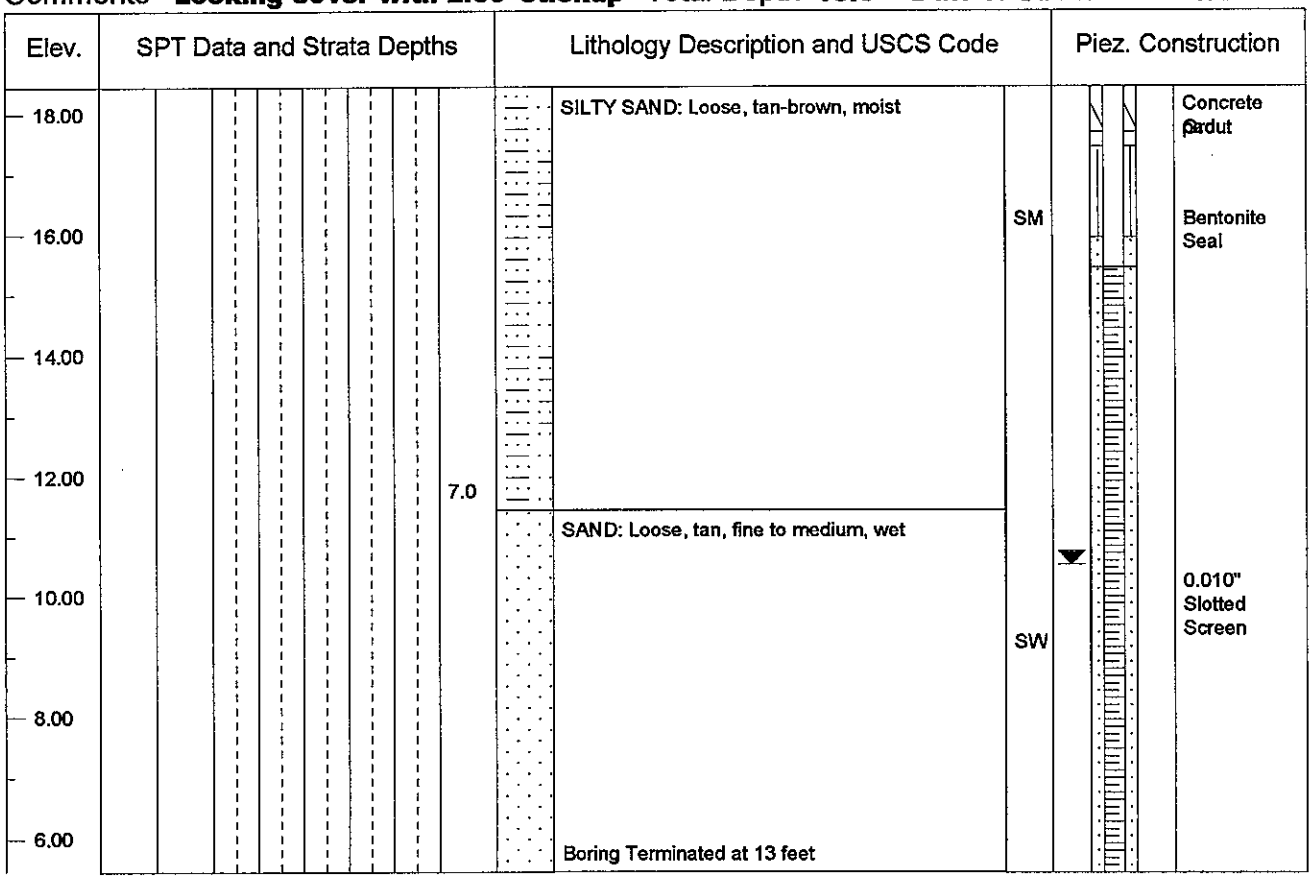
Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.59**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/02/01**	Date Ended	**05/02/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**5.59**
Comments	**Locking cover with 3.32' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**



David Garrett, P.G., P.E. — *Boring No. MW-2s*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**18.45**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.91**
Comments	**Locking cover with 2.99' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**



David Garrett, P.G., P.E. — *Boring No. MW-3s*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

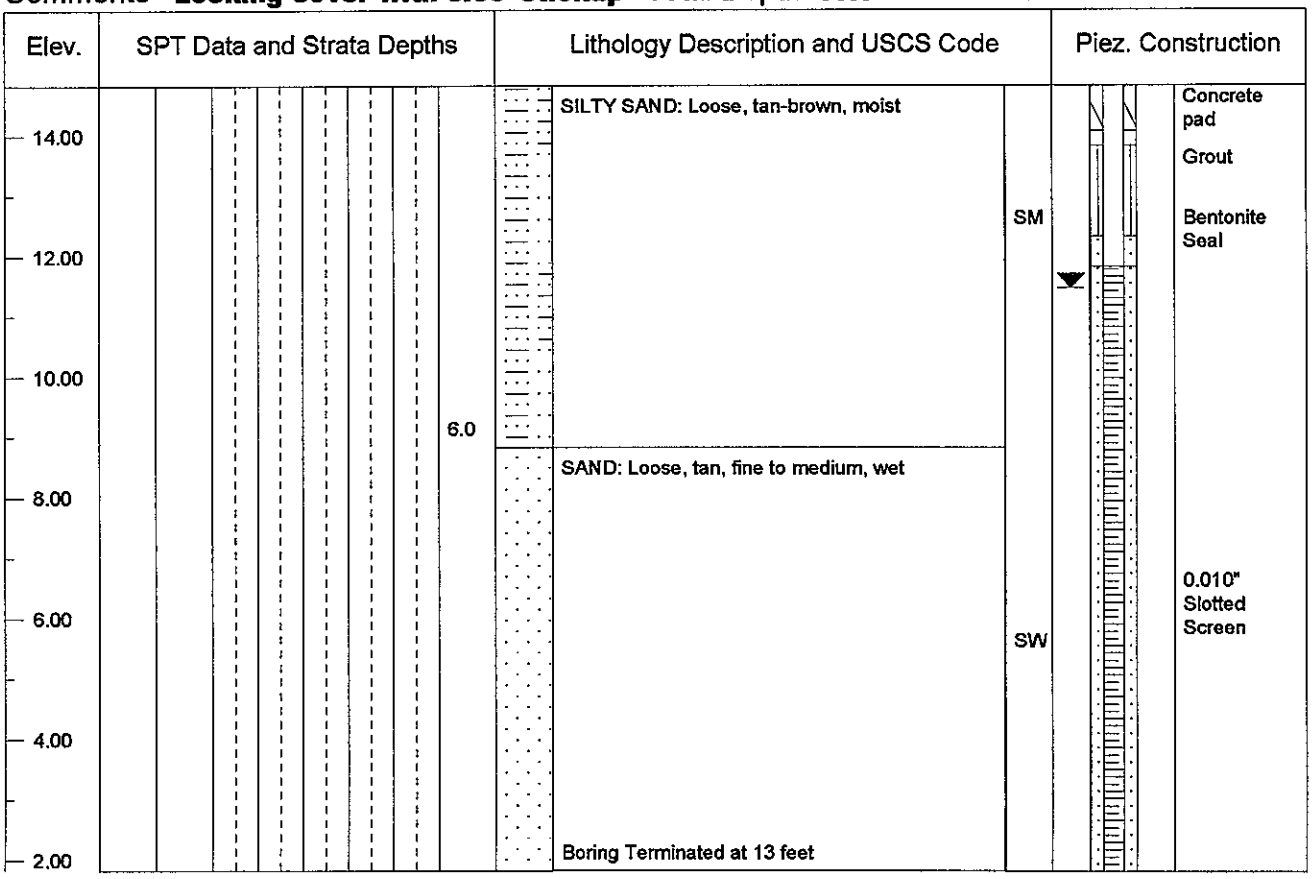
Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.9** ▽
Date Started	**8/6/07**	Date Ended	**8/6/07**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**Aaron Hill**	Stabilized Level	**NA** ▼
Comments	**Replaces former MW-9s**		Total Depth **20.0**	Date of Observation	**NA**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
18.00	1.0	12 16 21	SILTY CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist (1.2) SILTY SAND: Med. dense, brown w/ orange mottle, fine-medium texture (3.3)	ML-CL	Bentonite-Cement Grout
16.00	3.5	14 11 11	SAND: Tan, silty, fine texture, moist (7.1)	SM-ML	Bentonite Seal
14.00	6.0	7 11 11		SM	Sand Pack
12.00	8.5	4 4 4	SAND: Medium dense, tan-gray, well graded fine to medium texture, wet (12.9)	SW-SM	0.010" Slotted Screen
8.00					
6.00	13.5	2 3 3	CLAYEY SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	SM	
4.00					
2.00					
0.00	18.5	4 5 5	Boring Terminated at 20 feet	CL-ML	

David Garrett, P.G., P.E. — *Boring No. MW-4*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**14.83**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**3.35**
Comments	**Locking cover with 3.59' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**



David Garrett, P.G., P.E. — *Boring No. MW-5*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**14.80**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.6** ▽
Date Started	**11/19/02**	Date Ended	**11/19/02**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**3.9** ▼
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**11/27/02**

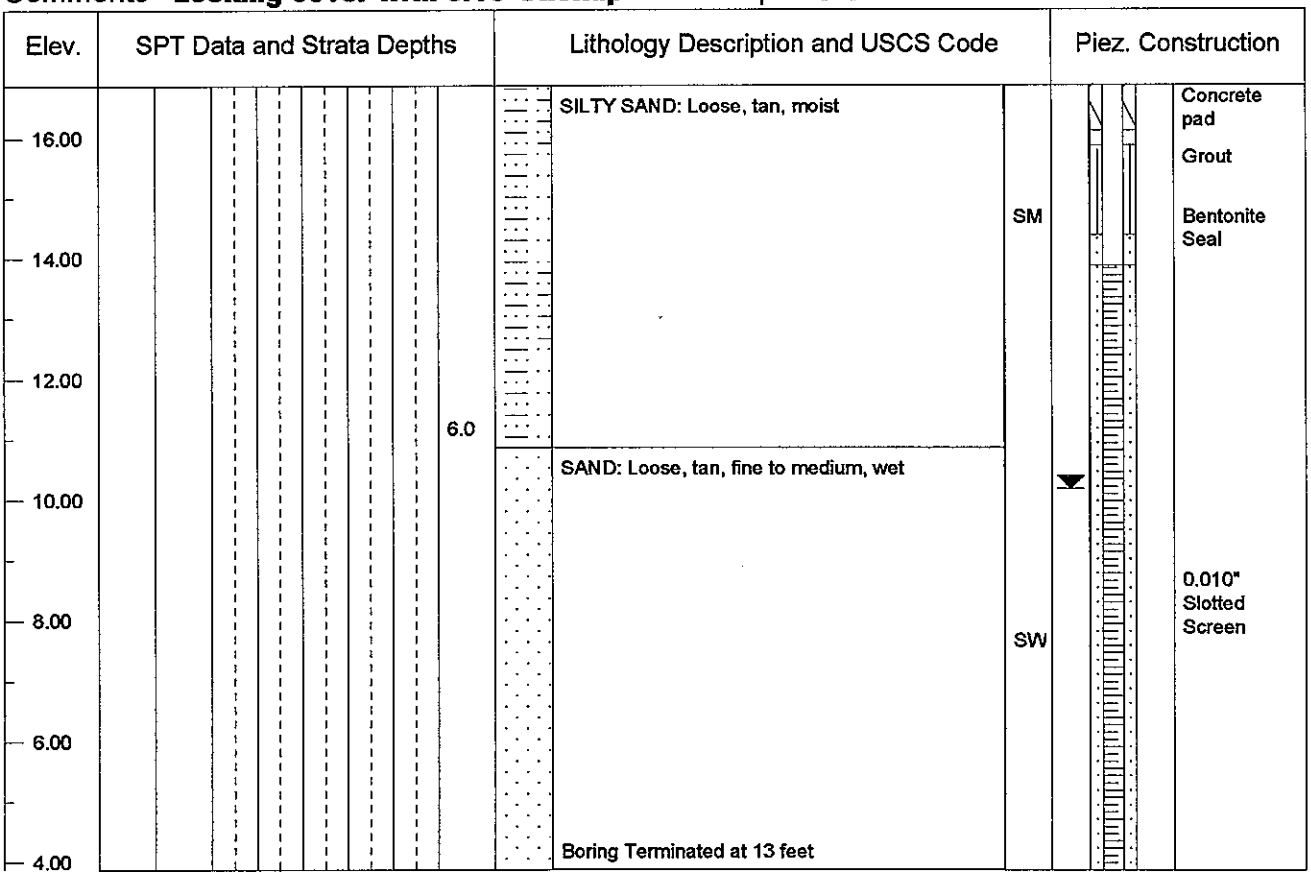
Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
14.00	1.0	4 4 6	SAND: Loose, tan, silty, fine to medium, dry	SM	* Bentonite-Cement Grout
12.00	3.5	9 14 16	SAND: Medium dense, tan-buff, medium to coarse, wet (fluvial)	SW	Bentonite Seal
10.00	6.0	9 9 4	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt (fluvial)	SM	
8.00	8.5	4 3 4	CLAYEY SAND: Loose, green-gray, silty, wet, sampled as distinct sand layers with plastic clay lenses (channel or near-shore deposits)	SC	Sand Pack
6.00	13.5	3 4 4		SC	0.010" Slotted Screen
4.00	18.5	3 4 6	SILTY CLAY: Stiff, gray-green, var. sandy, shell hash, moist, plastic ** Boring Terminated at 20 feet	CL-CH	* Locking steel cover w/ 3 foot stickup ** Deep marine deposits (Yorktown Fm.)
2.00					
0.00					
-2.00					
-4.00					

2.9 — 5.6 — 8.1 — 18.4

David Garrett, P.G., P.E. — *Boring No. MW-6*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**16.87**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**6.68**
Comments	**Locking cover with 3.16' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**



David Garrett, P.G., P.E.

Engineering and Geology

Boring No. MW-7

Depths in feet, referenced b.g.s.

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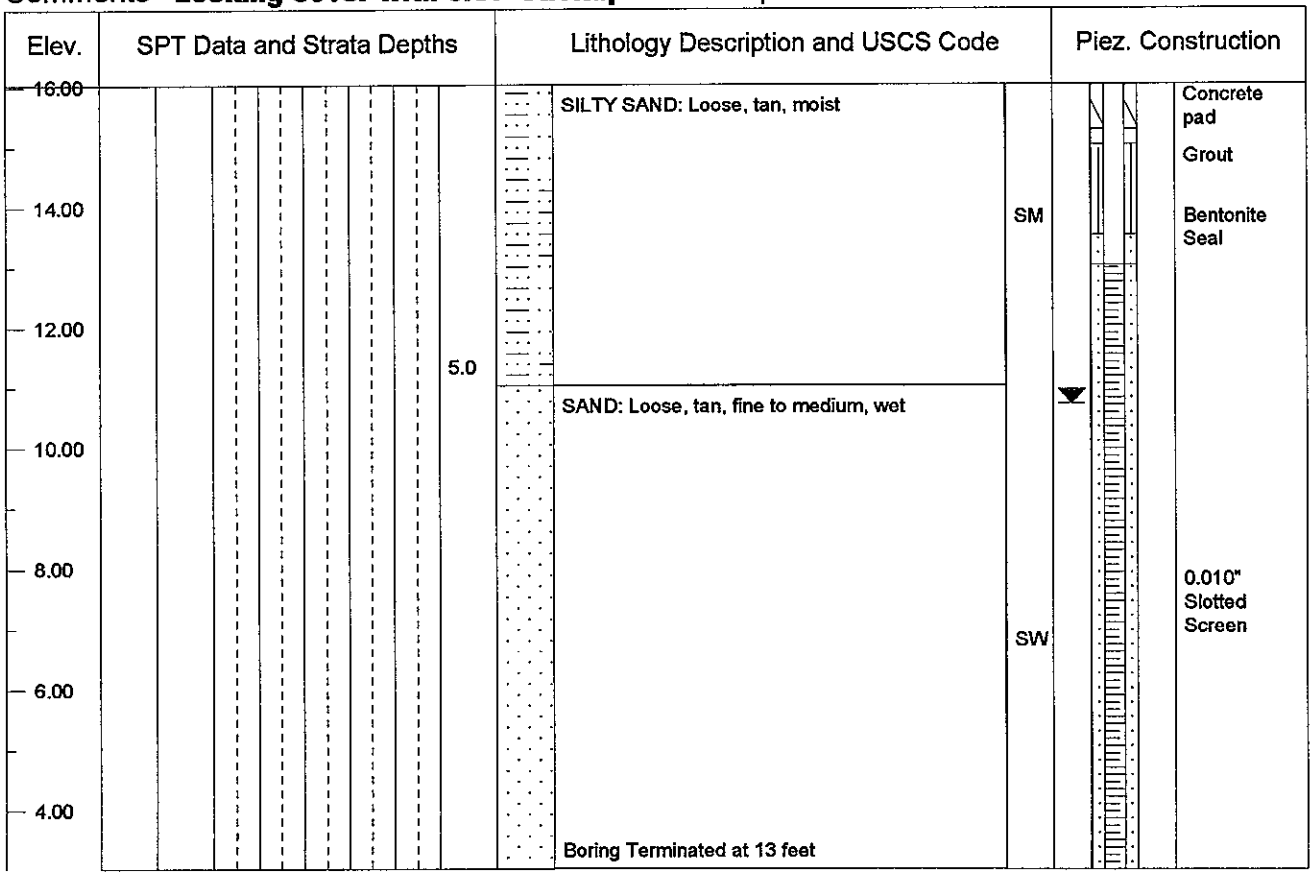
Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**16.03**
Equipment	**CME 75**	Drilling Method	**4-1/4" ID HSA**	Water Level, TOB	**NA**
Date Started	**05/03/01**	Date Ended	**05/03/01**	Water Level, 24 Hr.	**NA**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**5.29**
Comments	**Locking cover with 3.37' stickup**	Total Depth	**13.0**	Date of Observation	**5/16/01**



David Garrett, P.G., P.E. — *Boring No. MW-8*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **1**

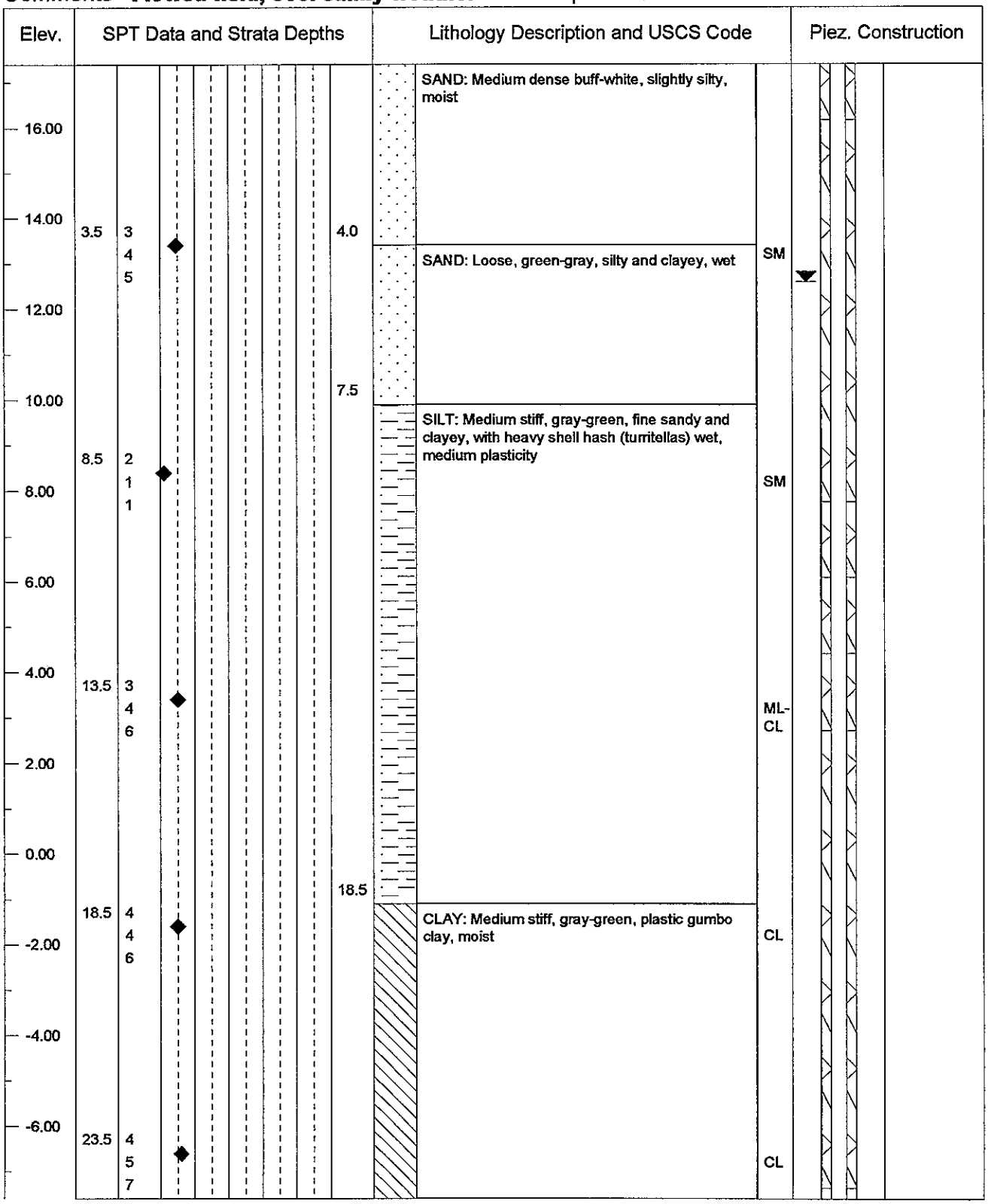
Client and Project	**C&D Landfill, Inc. (Phase 1)**			Ground Elevation	**18.30**
Equipment	**Mobile B-53 ATV**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**7.3**
Date Started	**11/18/02**	Date Ended	**11/18/02**	Water Level, 24 Hr.	**7.3**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.3**
Comments	**Wooded area, cool sunny weather**	Total Depth	**20.0**	Date of Observation	**11/27/02**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
18.00					* Bentonite-Cement Grout
	1.0	2 2 3	SAND: Loose, tan, slightly silty, fine to medium, dry	SW	
16.00					Bentonite Seal
	3.5	3 3 4		SW	
14.00					
			6.3		
12.00	6.0	4 4 4	SAND: Medium dense, tan-buff, medium to coarse, wet	SW	
			8.4		
10.00	8.5	7 8 11	SAND: Loose to medium dense, tan-buff, fine to coarse, wet, trace of silt	SW	Sand Pack
8.00					0.010" Slotted Screen
6.00					
	13.5	4 4 4		SW	
4.00					
2.00					* Locking steel cover w/ 3 foot stickup
			17.6		
0.00	18.5	3 4 6	SILTY CLAY: Med. stiff, gray-green, var. sandy, heavy shell hash (turritellas) moist, plastic ** Boring Terminated at 20 feet	CL-CH	** Deep marine deposits (Yorktown Fm.)

David Garrett, P.G., P.E. — *Boring No. MW-1d*

Engineering and Geology — *Depths in feet, referenced b.g.s.* — *Page* **1** *of* **2**

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**



David Garrett, P.G., P.E.
Engineering and Geology

Depths in feet, referenced b.g.s.

Boring No. MW-1d
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Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.40**
Equipment	**CME 750**	Drilling Method	**3-1/4" Hollow Auger**	Water Level, TOB	**NA**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.8**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.8**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-8.00			CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		GROUTED ANNULUS
-10.00					
	28.5	3			
		3		CL	
-12.00		7			
-14.00			31.5		
			SILTY SAND: Dense, partly cemented, black-green speckled, variably clayey, silty, moist, hard layer at 36 to 38 feet, very hard below 45 feet		
-16.00	33.5	6			
		22		SM	Bentonite Seal
		18			
-18.00					
-20.00					
	38.5	31			
		15		SM	
-22.00		24			
-24.00					Sand Pack
				SM	
-26.00	43.5	50/.1			
-28.00					0.010" Slotted Screen
-30.00					
	48.5	50/.5			
				SM	
-32.00			Boring Terminated at 50 feet		

David Garrett, P.G., P.E.
Engineering and Geology

Depths in feet, referenced b.g.s.

Boring No. MW-2d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6** ⧖
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9** ▼
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
16.00			SAND: Loose, tan-yellow, variably silty sand		
	3.5	16			
14.00		8	CLAY: Medium stiff, tan-orange, very sandy, silty, slightly plastic, moist, crumbly	CL & SM	
		9			
12.00					⧖
					▼
10.00			SAND: Medium dense, tan, subangular, f - c well graded (boring collapsed at 13.6 feet when casing pulled, redrilled with 4-1/4" hollow stem auger)		Bentonite-Cement Grout
	8.5	5			
		8		SP-SM	
		8			
8.00					
6.00					
4.00	13.5	3	CLAYEY SILT: Medium stiff, gray-green, fine sandy, with heavy shell hash (whole turritellas), moist, moderately plastic		
		3		CL-ML	
		4			
2.00					
0.00					
	18.5	2			
		2		CL-ML	
		3			
-2.00					
-4.00					
-6.00	23.5	2	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		
		2		CL	
		4			

3.5
7.5
12.5
22.5

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6**
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9**
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-8.00			CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	
-10.00	28.5	2 2 3			
-12.00					
-14.00					
			33.5		
-16.00	33.5	1 6 8	SILT: Stiff, gray-green, fine sandy, clayey, interlayered with sand	SM	Bentonite Seal
-18.00					
			37.0		Sand Pack
-20.00			SILT: Hard, black-green speckled, clayey, fine sandy, moist, moderately plastic, scattered pelecypod shell hash		
	38.5	5 4 29		ML	
-22.00					
-24.00					0.010" Slotted Screen
				ML	
	43.5	10 20 27			
-26.00					
-28.00					
-30.00					
	48.5	22 38 50/.2			
			49.0		
			SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM	Bentonite Seal
-32.00					

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**17.97**
Equipment	**CME 750**	Drilling Method	**3-7/8" rotary-mud**	Water Level, TOB	**6.6** ▽
Date Started	**10/9/00**	Date Ended	**10/11/00**	Water Level, 24 Hr.	**7.9**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**7.9** ▼
Comments	**Plowed field, cool sunny weather**	Total Depth	**70.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-34.00			SAND: Very dense (partly cemented), black-green speckled, clayey, silty, fine glauconite nodules	SM	
-36.00	53.5	50/.1			
-38.00					
			57.4		
-40.00			SAND: Medium dense, green-black speckled, silty, clayey, fine grained, wet	SC	
	58.5	6			
		7			
-42.00		7			Boring collapsed below 50 feet
			61.5		
-44.00			CLAY: Medium stiff to very hard, gray-green, fine sandy, silty, moderately plastic	CL	
	63.5	5			
-46.00		6			
		5			
-48.00					
-50.00					
	68.5	40			
		38			
		50/.5	Boring Terminated at 70 feet	CL	
-52.00					

David Garrett, P.G., P.E.
Engineering and Geology

Depths in feet, referenced b.g.s.

Boring No. MW-3d

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0** ▽
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.5** ▼
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

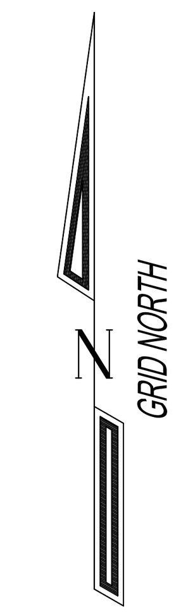
Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
18.00			CLAY: Stiff, bright yellow-orange, fine sandy, silty, moist		Caved
16.00	3.5	4 4 6			
				CL	
14.00			SAND: Medium dense, tan-yellow, silty, trace of clay, moist		
			4.0		
12.00					
			7.0		
			SAND: Medium dense, tan-buff, well graded fine to coarse, wet		
	8.5	4 5 5			
10.00				SW	
8.00					
6.00					
	13.5	2 4 4			
			14.0		
			SILT: Stiff, gray-green, fine sandy and clayey, with heavy shell hash (turritellas) wet, medium plasticity	ML-CL	
4.00					
2.00					
	18.5	2 2 4			
0.00				CL	
-2.00					
			23.5		
-4.00	23.5	2 5 7	CLAY: Medium stiff, gray-green, plastic gumbo clay, moist	CL	

Client and Project	**C&D Landfill, Inc. (Pitt County)**			Ground Elevation	**19.37**
Equipment	**CME 750**	Drilling Method	**4-1/4" Hollow Auger**	Water Level, TOB	**3.0**
Date Started	**10/12/00**	Date Ended	**10/13/00**	Water Level, 24 Hr.	**4.5**
Drilling Firm	**Bore & Core**	Logged by	**David Garrett**	Stabilized Level	**4.5**
Comments	**Plowed field, cool sunny weather**	Total Depth	**50.0**	Date of Observation	**10/16/00**

Elev.	SPT Data and Strata Depths		Lithology Description and USCS Code		Piez. Construction
-6.00			CLAY: Medium stiff, gray-green, plastic gumbo clay, moist		Bentonite-Cement Grout
-8.00		27.5			
	28.5	3	SILTY SAND: Medium dense to dense, partly cemented, black-green speckled, variably clayey, silty, moist, very hard drilling (cemented) below 38 feet, glauconitic		
-10.00		6		SM	
		5			
-12.00					
-14.00	33.5	5			
		18		SM	
		20			
-16.00					Bentonite Seal
-18.00					
	38.5	15			
-20.00		50/.3		SM	
-22.00					
					Sand Pack
-24.00	43.5	50/.5		SM	
-26.00					0.010" Slotted Screen
-28.00					
	48.5	29			
		43		SM	
-30.00		50/.5	Boring Terminated at 50 feet		

Appendix 4
Operation Plan Information

Appendix 4A
Facility Plan Maps



NOTE:

IMAGE TAKEN FROM AERIAL PHOTOGRAPH OBTAINED FROM THE NORTH CAROLINA FLOOD MAPPING PROGRAM, CIRCA 2000

FIELD VERIFIED BY DAVID GARRETT, P.G., P.E. - 12/12/2000
UPDATED BY JOHN A.K. TUCKER, P.E. - 05/15/2003

LEGEND

- EXIST GROUND — 18
- SEASONAL HIGH GROUND WATER — 18
- PROPSED GRADE — 18
- DIVERSION BERM (DIRECTION OF FLOW) — <<<
- SILT FENCE
- WETLANDS
- FLOOD ZONE

GENERAL NOTES:

1. Boundary, topographic and wetland information take from maps prepared by James A. Burgess, PLS, P.O. Box 881, Greenville, NC 27834, 252-758-4900

2. All work shall be in accordance with applicable Federal, State and Local regulations.

3. Contractor shall at all times maintain adequate safety measures , activities, and barricades, for the protection of all persons on or about the site.
ALL CONSTRUCTION OPERATIONS SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THE APPLICABLE REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH DIVISION OF THE NC DEPARTMENT OF LABOR.

Contractor shall be responsible for the design of adequate shoring and bracing in all trenches and excavations that are a part of the construction operations of this project. Contractor shall be responsible for installation and maintenance of adequate shoring and bracing, and the protection of all persons and property on or about the site.

February 18, 2008

John A. K. Tucker, P.E.
Consulting Engineer
P.O. Box 297 Fuquay-Varina, North Carolina 27526
(919) 567-0483 fax (919) 567-3611
Email: johnak@johntuckerpe.com

C & D LANDFILL, INC.
802 Recycling Lane
Greenville, NC 27834

C&D LANDFILL - PHASE 2

PERMIT TO CONSTRUCT

LOCAL AREA PHOTO & FACILITY PLAN

2.	REVISED PER DSW COMMENTS	02-18-09
1.	REVISED PER DSW COMMENTS	10-28-08

REVISIONS

S 3

Appendix 4B
Waste Screening Form

WASTE SCREENING FORM

Facility I.D. _____
Permit No. _____

Day / Date: _____ Time Weighed in: _____
Truck Owner: _____ Driver Name: _____
Truck Type: _____ Vehicle ID/Tag No: _____
Weight: _____ Tare: _____

Waste Generator / Source: _____

Inspection Location: _____

Reason Load Inspected: Random Inspection _____ Staff Initials _____
Detained at Scales _____ Staff Initials _____
Detained by Field Staff _____ Staff Initials _____

Description of Load: _____

_____

Approved Waste Determination Form Present? (Check one) Yes_____ No _____ N/A____

Load Accepted (signature) _____ Date _____

Load Not Accepted (signature) _____ Date _____

Reason Load Not Accepted (complete below only if load not accepted) _____

Description of Suspicious Contents: Color _____ Haz. Waste Markings _____
Texture _____ Odor/Fumes_____
Drums Present _____ Other _____
(describe)_____
Est. Cu. Yds. Present in Load _____
Est. Tons Present in Load _____

Identified Hazardous Materials Present:_____

County Emergency Management Authority Contacted? Yes_____ No _____

Generator Authority Contacted? _____

Hauler Notified (check if waste not accepted)? ____ Phone _____ Time Contacted _____

Final Disposition of Load _____

Signed _____ Date _____
Solid Waste Director

Attach related correspondence to this form. File completed form in Operating Record.

Appendix 4C
Hazardous Waste Responders

HAZARDOUS WASTE CONTACTS

The following contacts were originally found on NC DENR Division of Waste Management's web site in early 2007; since then, local phone numbers have been updated based on internet research. Facility management should verify the availability of these contacts before an emergency. The reference listing of these organizations here is not an endorsement by either the Division or the preparer of this document, nor are any affiliations in existence or implied. For more information refer to the respective URL's.

EMERGENCY RESPONSE

Clean Harbours www.cleanharbors.com	Reidsville, NC	336-342-6107
GARCO, Inc. www.egarco.com	Asheboro, NC	336-683-0911
Safety-Kleen (a.k.a. Clean Harbours)	Reidsville, NC	336-669-5562
Zebra Environmental Services www.zebraenviro.com	High Point, NC	336-841-5276

TRANSPORTERS

ECOFLO www.ecoflo.com	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Zebra Environmental Services	High Point, NC	336-841-5276

USED OIL AND ANTIFREEZE

3RC Resource Recovery	Winston-Salem, NC	336-784-4300
Carolina Environmental Associates	Burlington, NC	336-299-0058
Environmental Recycling Alternatives	High Point, NC	336-905-7231

FLUORESCENT HANDLERS

3RC Resource Recovery	Winston-Salem, NC	336-784-4300
Carolina Environmental Associates	Burlington, NC	336-299-0058
ECOFLO	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Safety-Kleen	Reidsville, NC	800-334-5953

PCB DISPOSAL

ECOFLO	Greensboro, NC	336-855-7925
GARCO, Inc.	Asheboro, NC	336-683-0911
Zebra Environmental Services	High Point, NC	336-841-5276

Appendix 4D
Fire Notification Form

FIRE OCCURRENCE NOTIFICATION

NC DENR Division of Waste Management
Solid Waste Section

The Solid Waste Rules [15A NCAC 13B, Section 1626(5)(d) and Section .0505(10)(c)] require verbal notification within 24 hours and submission of a written notification within 15 days of the occurrence. The completion of this form shall satisfy that requirement. *(If additional space is needed, use back of this form)*

NAME OF FACILITY: _____ PERMIT #_____

DATE AND TIME OF FIRE _____/_____/_____ @ _____: ____ AM / PM (circle one)

HOW WAS THE FIRE REPORTED AND BY WHOM _____

_____

LIST ACTIONS TAKEN_____

_____

_____

_____

WHAT WAS THE CAUSE OF THE FIRE_____

_____

_____

_____

DESCRIBE AREA, TYPE, AND AMOUNT OF WASTE INVOLVED _____

_____

_____

WHAT COULD HAVE BEEN DONE TO PREVENT THIS FIRE_____

_____

_____

_____

CURRENT STATUS OF FIRE _____

_____

_____

DESCRIBE PLAN OF ACTIONS TO PREVENT FUTURE INCIDENTS: _____

_____

_____

_____

_____

NAME_____TITLE_____DATE_____

THIS SECTION TO BE COMPLETED BY SOLID WASTE SECTION REGIONAL STAFF

DATE RECEIVED_____

List any factors not listed that might have contributed to the fire or that might prevent occurrence of future fires:

_____

_____

FOLLOW-UP REQUIRED:

☐ NO ☐ PHONE CALL ☐ SUBMITTAL ☐ MEETING ☐ RETURN VISIT BY:_____ (DATE)

ACTIONS TAKEN OR REQUIRED:

Revised 6/29/01

Appendix 4E
Landfill Gas Monitoring Plan

Landfill Gas Monitoring Plan for
C&D Landfill, Inc., #74-07 (Pitt County)

1.0 Introduction

The following plan has been prepared as a standalone document in accordance with current NCDENR Solid Waste Section (SWS) guidance. The monitoring locations, methods, and thresholds for action have not changed, but the 2010 guidance document requires that attention be given specifically to well construction, equipment calibration, sampling procedures, and data keeping, in a plan that is organized in a standardized format. Landfill staff and monitoring personnel should view the SWS document "Landfill Gas Monitoring Guidance," November 2010, online at

http://portal.ncdenr.org/c/document_library/get_file?uuid=da699f7e-8c13-4249-9012-16af8aefdc7b&groupId=38361.

1.1 Background Information

Monitoring of landfill gas (LFG) is required at C&D landfills by Solid Waste Rule 15A NCAC 13B .0544. Landfill gas is a by-product from the decomposition of organic waste in a sanitary landfill, including certain C&D wastes. Landfill gas typically comprises about 50 percent methane, which can be explosive under certain conditions, as well as carbon dioxide, nitrogen, water, and small amounts of hydrogen sulfide. LFG has been known to promote the migration of contaminants into ground water. The Solid Waste Rules typically focus on the explosive properties from a public safety standpoint. Landfill gas migrates in soil above the ground water table and is restricted laterally by streams. Highly porous soils that tend to occur near the soil-rock interface within the Piedmont are considered to be a good pathway for gas migration.

Past experience suggests that up-gradient areas should be targeted for monitoring, especially if porous soils are present. In addition, this zone typically is an aquifer, thus fluctuations in the water table will affect the gas migration pattern or rate, as does surface saturation, frozen soils, and variation in barometric pressure. The Guidance suggests that the ideal time to sample for subsurface gas is during times of low barometric pressure. Pipelines and other utility trenches can serve as pathways for gas migration, with the potential to convey gas for considerable distances. Open landfills are not as likely to experience subsurface gas migration, but once a low permeability cover is installed, lateral migration into adjacent soils may be more likely if gas is present.

1.2 Current Site Conditions

The subject landfill is situated on two rather flat knolls separated by a drainage feature. The topography of the site slopes gently from US Highway 264 at approximately El. 20, to the disposal sites at approximately El. 16 to 18; then continues southward but more abruptly into drainage features that lead to Grindle Creek at approximately El. 4 to 6. The drainage features tend to be sluggish and marshy. The two disposal units are unlined and are situated above grade with minimal base grade earthwork. Lateral separation to the streams is 50 feet minimum; the disposal area is isolated by the drainage features.

Onsite soils are highly porous sand and silt mixtures extending to depths below the water table, typically underlain by a lower permeability silt-clay that serves as a partial confining layer. Ground water contours mimic the topography, with depths of 4 to 6 feet below the surface in the upper elevations, 2 feet or less within the lower elevations. The soil conditions and site geometry provide little opportunity for landfill gas to migrate either vertically or horizontally beyond the facility buffers. No structures exist within the facility buffers that would accumulate gas. No utility trenches are present.

1.3 Regulatory Requirements

Thresholds that trigger responsive action are methane levels of 100 percent of the lower explosive limit (about 5 percent by volume) in soil-gas or air at the facility boundary; 25 percent of the LEL within onsite structures, not limited to just buildings but inclusive of drainage structures and utility vaults; zero in off-site structures. The contingency plan (**Section 5**) contains a summary of action required if a regulatory threshold is exceeded.

2.0 LFG Monitoring

2.1 Locations and Logistics

LFG monitoring for this facility consists of sampling soil-gas adjacent to the landfill footprint via eleven (11) bar-hole punch test locations, labeled GP-1 through GP-11, spaced approximately 500 foot apart (see **Drawing MP1**). The monitored locations reflect the emphasis on the east side of Phase 1 and the north side of Phase 2, the directions in which distant structures are located outside the facility boundary. The bar-hole punch test has been prescribed and approved for other CDLF facilities; whereas the waste is typically non-putrescible, hence no significant methane migration is anticipated.

Bar-hole punch tests are warranted at this stage because no gas migration has been detected, thus there is no data to guide the locations of permanent monitoring wells or gas probes. The waste is comprised of mostly inert materials with paper, wood, and other potentially combustible materials – the same kind of materials that can degrade slowly to form landfill gas – so it is conceivable that at some time in the future, the Solid Waste Section may require permanent gas monitoring wells. In the event that subsurface methane is detected, additional sampling shall be performed delineate a migration pattern, and then permanent LFG monitoring wells may be installed.

In anticipation of this requirement, this plan has been prepared with procedures for both bar-hole punch tests and sampling of future monitoring wells. A SWS-endorsed well construction schematic is provided, which includes sealed construction and a specialized port at the top to facilitate sampling. Presumably, the monitoring wells would be located near the same locations as currently monitored with the bar-hole punch test, for the same reasoning described above. This plan will be amended in the future to include data tables for the monitoring wells, if required. Data recording protocols will remain the same.

The Solid Waste Rules require quarterly monitoring. Landfill gas monitoring will be performed during the active life of the landfill, estimated at 20 years, and throughout the post-closure care period, 30 years unless future data warrant a schedule revision, which will be subject to approval by the SWS.

2.2 Structures and Ambient Sampling

Within the offices and any future buildings on-site, atmospheric sampling for methane shall be conducted. Methane is heavier than air and tends to accumulate in the lower zones with restricted circulations, i.e., crawlspaces, closets, and corners of rooms near the floor, cracks in walls, floor slabs, or foundations, crawlspace vents, drainage pipes, and utility vaults (excluding sanitary sewer manholes). Methane detection in and around the structures, though unlikely, would signify a problem such that the site manager should be notified – immediate action may be required – refer to the Contingency Plan (**Section 5**).

Ambient monitoring overlaps the building foundations and includes a "walk-around" at the toe of covered (vegetated) slopes to survey for gas that may be seeping through the cover. A key to potential side slope seepage includes stained soil, wetness with visible bubbling, or distressed (or absent) vegetation. Any detection of methane in the ambient monitoring should be noted on a site map and a special notation recorded in the monitoring report. Follow up sampling or close attention in future sampling events might be warranted. The site manager should be alerted to any ambient gas detection.

2.3 Sampling Schedule

Quarterly methane monitoring will be conducted at all subsurface gas detection locations and in all occupied structures located on the landfill property. In addition, enclosed structures, such as manholes, utility vaults, and buried drainage pipes should be checked for gas prior to servicing, in addition to the routine monitoring. The passive gas vents for the final cover, when installed, are not required to be monitored.

Monitoring times are also important when conducting landfill gas monitoring. Proper landfill gas monitoring should include sampling during times when landfill gas is most likely to migrate. LFG monitoring should be conducted when the barometric pressure is low and soils are saturated. During the winter season when snow cover is just beginning to melt or when the ground is frozen or ice covered, landfill gas monitoring should be conducted when the barometric pressure is low.

3.0 LFG Sampling Program

3.1 Equipment and Calibration

Monitoring will be performed with a specialized landfill gas monitoring instrument that meets the requirements of the SWS document, **Landfill Gas Monitoring Guidance**, with respect to detecting methane, oxygen, carbon dioxide, and hydrogen sulfide. Calibration shall occur prior to instrument use and according to the manufacturer's specifications. Should this element of the program change, this plan will be amended accordingly.

3.2 LFG Sampling Procedures

The following procedure is recommended for conducting landfill gas monitoring well sampling and/or bar-hole punch testing *(shown in italics)*. The sampling equipment shall consist of a good-quality gas meter capable of detecting methane (LEL) and oxygen levels – most modern meters include carbon monoxide or carbon dioxide, depending on the meter and hydrogen sulfide readings. In deference to professionals who have conducted LFG sampling for years, these procedures are guidelines; no changes to the current sampling program are warranted.

Step 1 – Calibrate the instrument according to the manufacturer's specifications. In addition, prepare the instrument for monitoring by allowing it to properly warm up as directed by the manufacturer. Make sure the static pressure shows a reading of zero on the instrument prior to taking the first sample.

Step 2 – Purge sample tube for at least one minute prior to taking reading. Connect the instrument tubing to the landfill gas monitoring well cap fitted with a stopcock valve or quick connect coupling.

Step 2 Alternate *– Drive the bar into the ground to a depth of 3 feet at the sampling location using a hammer or backhoe bucket. Heavy gauge rebar is ideal for this task. The bar-hole needs to be near-vertical and free of obstructions. Drilling a hole with a modified concrete drill (an extension is required to reach the desired depth) has been demonstrated to expedite the making of a boring with less smearing of the side walls.*

Step 3 – Open the valve and record the initial reading and then the stabilized reading. A stable reading is one that does not vary more than 0.5 percent by volume on the instrument's scale.

Step 3 Alternate *– Cover the hole upon extraction of the drill to retain any gas present. Without completely lifting the cover, gently insert the sampling tube beneath the cover and obtain an initial reading. Allow time for a stabilized reading as described above.*

Step 4 – Record the stabilized reading including the oxygen concentration and barometric pressure. A proper reading should have two percent oxygen by volume or less. Higher oxygen levels may indicate that air is being drawn into the system, giving a false reading.

Step 5 – Turn the stopcock valve to the off position and disconnect the tubing.

Step 5 Alternate *– Backfill the hole with cuttings or native soil; tamp the backfill with a rod or equipment handle.*

Step 6 – Proceed to the next landfill gas monitoring well and repeat Steps 2 – 5.

4.0 Record Keeping and Reporting

The sampling technician shall record the date, time, location, sampling personnel, calibration data, gas pump rate, barometric pressure (from local weather reports), ambient temperature, general weather conditions at the time of sampling, initial and stabilized concentrations of methane (see the **Landfill Gas Monitoring Data Form**) following this text). These monitoring records shall be maintained in the landfill operating record. Should methane be detected at any sampling location, the facility manager should be notified and, depending on the concentrations, a report to the Solid Waste Section might be warranted. In any event a qualified engineer should be consulted.

5.0 Contingency Plan

Solid Waste Rule .0544 (d) (3) requires the following responses in the event that methane concentrations are detected that exceed the foregoing methane concentration limits:

(A) Immediately take all steps necessary to ensure protection of human health and notify the Division – at a minimum, occupied structures should be evacuated and ventilated until the methane concentrations subside; close monitoring of structures shall be implemented; for facility boundary violations, further evaluation is warranted, subject to notification and approval by the Division.

(B) Within seven days of detection, document the methane or explosive gas levels in the operating record with a description of steps taken to protect human health.

(C) 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.

(D) Based on the need for an extension demonstrated by the operator, the Division may establish alternative schedules for demonstrating compliance with the limits.

(E) "Lower explosive limit" means the lowest percent by volume of a mixture of explosive gases in air that will propagate a flame at 25^{o} C at atmospheric pressure.

Beyond the regulatory mandated response outlined above, a close evaluation of the monitoring program is warranted in the event that methane is detected above the threshold values. Should this occur, an investigation to determine the direction and extent of the migration, involving additional bar-hole-punch tests, shall be performed under the supervision of a qualified professional geologist or engineer. Once a migration pattern is established, the data shall be used to establish locations for permanent monitoring wells. The frequency of monitoring or the field or structures may require adjustment.

The data and proposed plan modifications should be reviewed with SWS staff. Other action may be required, e.g., some type of remedial activity, but those tasks cannot be anticipated at this time. Let it suffice to say that all steps to prevent the offsite migration of dangerous levels of methane shall be taken. However, based on the nature of the wastes and site conditions, which are generally unfavorable to the occurrence and migration of explosive gas, the likelihood that any sort of assessment or remedial action will be required is quite low.

On the other hand, landfill gas can contain components that, while not explosive, could impact ground water quality. Should any LFG be detected, consideration should be given to what, if any, effects might be visible in the ground water data.

6.0 Professional Certification

The certification statement below must be signed and sealed by a North Carolina Professional Geologist or Professional Engineer and submitted with the Landfill Gas Monitoring Plan.

> The landfill gas monitoring plan for this facility has been prepared by a qualified geologist or engineer who is licensed to practice in the State of North Carolina. The plan has been prepared based on first-hand knowledge of site conditions and familiarity with North Carolina regulations and industry standard protocol. This certification is made in accordance with North Carolina Solid Waste Regulations, indicating this Landfill Gas Monitoring Plan should provide reasonably early detection of an occurrence of landfill gas migration, so as to protect public health and the environment. No other warranties, expressed or implied, are made.

Signed _____

Printed ___G. David Garrett, PG, PE_____

Date _____February 28, 2014_____

Not valid unless this document bears the seal of the above mentioned licensed professional.

If wells are installed in the future, the well locations shall be shown on a topographic map that is signed and sealed by a registered surveyor.

DATE: _______________

BOUNDARY PROBE MONITORING LOG

Project Name: __________________________ **Project Number:** _________________________

Site Contact: ___________________________ **Technician(s):** ___________________________

Starting Temperature: __________________ **End Temperature:** ______________________

Starting Barometric Pressure: ____________ **End Barometric Pressure:** ________________

Monitoring Equipment: ____

Probe No.	% Methane (CH_4)	% Carbon Dioxide (CO_2)	% Oxygen (O_2)	% Balance Gas	Static Pressure (inches of water)	Comments

Completed by: ___________________________________

Appendix 4F
Asphalt Shingle Documentation

General Operation Plan
For Tear-off Asphalt Shingle Sorting
At a Permitted Solid Waste Facility

EJE Recycling, Inc.,
And
C&D Landfill, Inc.

Permit #74-07

Prepared for

Judson Whitehurst, President
EJE Recycling, Inc.
802 Recycling Lane
Greenville, NC 27834

Prepared by

G. David Garrett, PG, PE
5105 Harbour Towne Drive
Raleigh, NC 27604

February 28, 2014

Site specific information

a. The maximum amount of shingles to be stockpiled at any time is 40 cubic yards, or the equivalent of one roll-off box.

b. The service area for shingle receipt must be consistent with the landfill service area.

c. The Owner/Operator must keep contact information for the contracting shingle recycling company with the records of incoming and outgoing shingles. Any changes must be reflected in the records.

d. **No grinding of asphalt shingles shall be conducted at the T&P unit.**

The Owner/operator shall refer to the following generic plan, provided by the Solid Waste Section, which includes acceptance criteria for recycling and documentation for the sources of incoming loads (example form).

I. Introduction

This operation plan describes how tear-off asphalt shingles will be collected, sorted, stored, and managed at this facility in order to provide a material that can be used into asphalt production. Our facility uses best practices for acceptance and sorting to remove the tear-off shingles from the waste stream and divert the "clean" shingles to other facilities.

II. Waste Acceptance

Asphalt roofing shingles contain asphalt cement, mineral aggregate, and mineral filler which are raw materials used in asphalt production. Asbestos was used in shingle manufacture until the mid-1970's and in other roofing materials such as roof felt, roof putty, surface coating, and mastic until the mid 1980s.

Our facility provides roofers with a list of acceptable and unacceptable items for tear-off shingle recycling and requires source separation at the job site by the roofer. Materials from flat and built-up roofing system are disposed rather accepted for recycling due the higher use of asbestos roofing materials in those systems. Roofers are instructed to separate tear-off shingles into either a dedicated trailer or to layer their waste when loading so that the shingles can be easily separated from the unacceptable debris. Our list of acceptable and unacceptable material is shown in Attachment 1.

The shingle suppliers are also required to complete a supplier certification form. The handling and disposal of asbestos during demolition and renovation is regulated under the National Emissions Standards for Hazardous Air Pollution (NESHAP). NESHAP-regulated facilities are required to submit a notification of demolition and renovation prior to starting work. The notification includes an inspection by a North Carolina accredited asbestos inspector or roofing supervisor and analysis for asbestos. The supplier of shingles from a NESHAP-regulated facility must present documentation that the shingles do not contain greater than 1% asbestos. The documentation is a letter from the accredited asbestos inspector or roofing supervisor that sampled the shingles and the analytical test results. A copy is of the documentation is kept with the supplier certification form. Shingles from a NESHAP-regulated facility that do not have the required documentation or that are documented to contain greater than 1% asbestos are disposed.

Shingles from single family homes or residential buildings containing four or fewer dwelling units are generally not regulated under NESHAP. Only the source of shingles it required for these shingles.

Our supplier certification form is shown in Attachment 2. These practices help ensure that only recyclable tear-off shingles are sent for asphalt production while reducing sorting at our facility.

III. Flow and Management of Tear-off Shingles

Loads are visually inspected when entering the facility to determine whether the shingles have been separated or if it is a mixed load. The roofer is asked to complete a supplier certification form. Mixed loads, shingles from a NESHAP-regulated facility that contain greater than 1 percent asbestos, and shingles from a NESHAP-regulated facility without the proper documentation are directed to the

[landfill or transfer station tipping floor] for disposal. Loads that were source-separated into dedicated containers are sent directly to the sorting area and unloaded. Loads that were separated into layers usually have the asphalt shingle on the bottom and other material on the top. These loads are first directed to the *[landfill or transfer station tipping floor]* to remove the non-shingle roofing waste and then to the sorting area for unloading the shingles. Figure 1 shows the location of the sorting area on the site plan and Figure 1 shows the unloading, sorting, and storage areas. Shingles are not unloaded into an area with standing water and sorted and unsorted materials are kept separate.

Source-separation by the roofer eliminates most of the unacceptable materials that cannot be used in tear-off shingle recycling. The unloaded tear-off shingles are examined for unacceptable materials and any unacceptable materials are removed. The remaining sorted shingles are accumulated *[in the designated area or in a roll off box or in a container]* until there is a sufficient amount to transport to a facility that will grind and use or sell the ground shingles for asphalt production. *[A copy of the supplier certification form accompanies each sorted load to the receiving facility.]* At least 75% of the tear-off shingles that are sorted leave the facility during the same year.

IV. Recording Keeping

Records are kept of shingle waste entering the facility, sorted shingles leaving the facility for recycling, and waste that is disposed or sent for disposal. These records are kept for use in the facility's monthly and annual reports. Supplier certification forms and any supporting documents are also kept.

V. [Additional Operations/Requirements]

[Please check with the facility that will receive the sorted shingles to determine if there are additional requirements. Those requirements and any other site specific operations may be included here. Asbestos sampling and testing is required prior to grinding shingles. The testing frequency and protocols are set by NCDENR-DAQ and NCDOT. The current frequency current testing requirement is to sample each 100 tons of shingles (September 2011).

TEAR-OFF ASPHALT SHINGLE RECYCLING

List of Acceptable and Unacceptable Materials

"YES"

Include these items:

- Shingles
- Felt attached to shingles

"NO"

Do <u>NOT</u> include these items:

- Wood
- Metal flashings, gutters, etc.
- Nails (best effort)
- Rolls of sheets of felt paper
- Plastic wrap, buckets
- Paper waste
- No garbage, trash, or other waste materials
- Built-up asphalt roofing
- Asbestos-containing materials
- Shingles containing mastics

Attachment 2

A-1 Sandrock, Inc.
CDLF and Recyling Facility

SHINGLE SUPPLIER CERTIFICATION FORM

Supplier of Whole Tear-off Asphalt Shingles

Supplier Name: _____

Address: _____

Contact Name: _____

Phone: _____

We the undersigned certify that (check appropriate boxes):

☐ The tear-off shingles are from a NESHAP regulated facility and documentation stating that the shingles do not contain >1% asbestos is attached. (Documentation is a letter from the North Carolina accredited asbestos inspector or roofing supervisor that collected the samples with the analytical results attached.)

☐ The tear-off shingles are from a single family home or residential building having four or fewer dwelling units that is not regulated under NESHAP.

Tear-off shingles were removed from the following addresses:

_____

_____

_____

(Please attach additional sheets as needed to record each building address.)

_____ _____

Shingle Supplier (signature) Date

Appendix 5
Financial Assurance Calculations

David Garrett & Associates

Engineering and Geology

July 11, 2013

TO: Judson Whitehurst, Wayne Bell

CC: Sheila Smith

RE: Revised Update of Financial Assurance Bond Requirements
EJE Recycling, Inc. Transfer Station (Permit #74-06T)
C&D Landfill, Inc. Phases 1 and 2A CDLF (Permit #74-07)
Pitt County, North Carolina

Greetings, All:

This summary of the financial assurance bond requirements was prepared in response to a letter from the NCDENR Solid Waste Section, dated June 6, 2013, requesting an update of the bond amounts and standby trust account information. The bond amounts are subject to an annual inflation adjustment, as required by NCDENR, thus the forms referenced in the NCDENR letter should also be updated annually, i.e., with each annual bond renewal.

I have performed the required calculations (below) and initiated completion of the forms. I could not ascertain an annual inflation factor multiplier for 2010 – and the numbers furnished by the Section do not exactly match published CPI values – so I used an arbitrary average of the three values provided by the Section for the subsequent years. I started with the last approved bond amounts from earlier permitting.

Per my discussion with Wayne and Sheila on July 10, it appears that we had submitted revised (lower) bond numbers for both the transfer station and the CDLF in October 2009 and April 2010, which are included in this revised calculation. Also please note that since the form requires closure costs to be reported separately from post-closure, I have made this distinction.

Bond Year	NCDENR Multiplier	**Transfer Station:**	**CDLF Closure:**	**CDLF Post-Closure:**
2009	--------		$928,125 (2009)	$1,061,250 (2009)
2010	1.016	$13,000 (2010)	$942,975	$1,078,230
2011	1.010	$13,130	$952,405	$1,089,012
2012	1.021	$13,406	$972,405	$1,111,882
2013	1.018	**$13,647 (2013)**	**$989,908 (2013)**	**$1,131,895 (2013)**

The sum of CDLF closure and post-closure for 2013 is **$2,121,803.**

Please find attached the annual financial assurance update forms, provided in electronic format, which includes the current bond amounts shown above. Sheila has been working to set up a separate standby trust account for the transfer station, for which the account information need to be added to the forms. Please keep in mind that the financial assurance bond calculations do not reflect the anticipated actual costs, rather these are estimates of costs that would be incurred by a third-party contractor, acting on behalf of NCDENR, should the bond be invoked.

Please contact me if you have any questions or comments.

5105 Harbour Towne Drive •Raleigh • North Carolina • 27604
919-418-4375 (Mobile) • E-mail: david@davidgarrettpe.com

North Carolina Department of Environment and Natural Resources
Division of Waste Management

Pat McCrory
Governor

Dexter R. Matthews
Director

John E. Skvarla, III
Secretary

June 6, 2013

CERTIFIED MAIL NO. 7010 3090 0001 4226 0539
RETURN RECIEPT REQUESTED

Mr. Judson T. Whitehurst, President
C&D Landfill, Inc.
802 Recycling Lane
Greenville, NC 27834

Re: Annual Renewal Reminder of Financial Assurance Mechanisms, C&D Landfill, Inc., Permit No. 7407-CDLF-2009, Construction and Demolition Debris Landfill

Dear Mr. Whitehurst,

This letter is to inform C&D Landfill, Inc. of the annual renewal of Financial Assurance for permit number 7407-CDLF-2009 which was due to the Division of Waste Management, Solid Waste Section (Section) by the anniversary date of the original Permit to Operate, **March 31**. The Section requests C&D Landfill, Inc. update their Performance Bond and Standby Trust associated with permit number 7407-CDLF-2009 and submit the documents to my attention at the address below within ***30 days***. The Section only has documentation for Financial Assurance Mechanisms associated with 2010. Please address the following items regarding the associated Financial Assurance Mechanisms.

1. Update C&D Landfill, Inc.'s two Performance Bond with the inflation factor multipliers for 2011(1.01), 2012 (1.021) and 2013 (1.018).
2. Update C&D Landfill, Inc.'s. Standby Trust with the two revised Performance Bond amounts in **Schedule A** as per the template under ***Mechanisms for all other Solid Waste Management Facilities:*** *Trust Fund (also used for Standby Trust Agreement)* at the Section's website http://portal.ncdenr.org/web/wm/sw/financialassurance. .
3. Include the Performance Bond reference number in **Schedule B** as described in the Standby Trust template, "*Trust Property: This Fund shall consist of funds drawn from (insert type of mechanism)(ex. Letter of credit No. _____ dated XX/XX/XXXX issued by (bank)) at such time said funds are directly deposited into the Trust account.*"
4. Include the Standby Trust Account information and Bank information in **Schedule B** as requested as per the Standby Trust Template.

Financial Assurance mechanism templates, inflation factor multipliers, and additional information can be found on the Section's website at http://portal.ncdenr.org/web/wm/sw/financialassurance. In the meantime, should you have any questions or concerns please feel free to contact me at 919.707.8287 or sarah.rice@ncdenr.gov. You may also contact Donna Wilson at 919.707.8255 to discuss any permitting questions.

Sincerely,

Sarah M. Rice

Sarah M. Rice
Compliance Officer
Solid Waste Section

ec: Michael Scott, DWM/SWS
Ben Barnes, DWM/SWS
Ed Mussler, DWM/SWS
Donna Wilson, DWM/SWS