98-09

Construction Plan Application For

WILSON COUNTY
WESTSIDE C&D LANDFILL FACILITY
Wilson, North Carolina

Prepared for:
Wilson County
Department of Solid Waste
P.O. Box 1728
Wilson, North Carolina
27894

August 2004
Revised September 2004

PERMIT DOCUMENT

Prepared by:

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NORTH CAROLINA PROFESSIONAL SEAL 20400 ENGINEER GARY W. AHLBERG
9/2/04

APPROVED
DIVISION OF WASTE MANAGEMENT
SOLID WASTE SECTION
DATE 9/21/04 BY DJB

PERMIT TO CONSTRUCT
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Permit/Co ID # 98-09 | Date 8/21/12 | DIN | Doc ID#
Lauren Johnson

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1.0 INTRODUCTION

1.1 PURPOSE

In accordance with the North Carolina Solid Waste Management Rules, codified at 15A NCAC 13B, Wilson County respectfully submits the following Construction Plan application for review and approval by the North Carolina Department of Environment and Natural Resources, Division of Waste Management. The purpose of this application is to provide written plans and engineering drawings for landfill construction, operations, closure and post closure, and monitoring relative to the requirements of a sanitary landfill that receives "construction and demolition waste" as defined in GS 130A-290, and other waste types approved by the Division. The proposed landfill site is identified as the Westside C&D Landfill, including the landfill footprint and regulatory buffer zones.

With respect to Rules .0503 (1) and .0504(1) of the North Carolina Solid Waste Management Rules, the Division issued General Conditions and Site Specific Design Requirements for the Westside C&D Landfill on June 7, 2004. This letter notified Wilson County that after reviewing the Site Plan Application documents (listed therein as 1-4) that the site is considered suitable for the proposed landfill use. Therefore, Wilson County respectfully submits this Construction Plan Application for review by the Division that the engineering and monitoring plans for the Westside C&D Landfill meets the design requirements.

1.2 SUBMITTAL DOCUMENTS

In general, this Construction Plan (CP) application presents all information and data for the proposed landfill according to the requirements of Rule .0504, paragraph 2, conforming to the design requirements in Rule .0503 paragraph 2 and aforementioned site specific design requirements letter. The application was prepared by Gary W. Ahlberg, P.E. (GWA or Design Engineer) in association

with Babb & Associates, P.A. (Babb or Geologist). As described and incorporated herein, Babb & Associates, P.A. conducted the geologic and hydrogeologic investigation, prepared the corresponding geologic report and the Water Quality Monitoring Plan. Herring-Sutton & Associates, P.A. (HSA or Surveyor) provided professional land surveying services for mapping existing conditions, the property survey, and deed registration.

GWA is the primary contact for any correspondence related to the submittal documents. This CP application document includes all reports, drawings and data, titled "Construction Plan Application for Westside C&D Landfill Facility", prepared by Gary W. Ahlberg, P.E. and Babb & Associates, P.A., August 2004.

1.3 DEFINITIONS

In order to enhance the clarity of this document, the following common terms are defined according to the description provided unless otherwise noted in the report. Sections of the report define specific terms that relate to the site application.

a) Airport: public-use airport open to the public without prior permission and without restrictions within the physical capacities of available facilities.
b) Buffer property: 3.76 Acres (50-ft width, recorded on the plat) separating the Westside C&D landfill site from the MSW landfill facility, physically separating the sites, and excluded from the property description of the Westside site.
c) C&D: Construction and demolition "waste" or "debris" is solid waste resulting solely from construction, remodeling, repair, or demolition operations on pavement, buildings, or other structures, but does not include inert debris, land-clearing debris or yard debris.
d) Division: North Carolina Division of Waste Management or Solid Waste Section.

e) 100-year flood: a flood that has a one percent or less chance of recurring in any year or a flood of a magnitude equalled or exceeded once in 100 years on the average over a significantly long period.

f) Floodplain: the lowland and relatively flat areas adjoining inland and coastal waters, including flood-prone areas of offshore islands, which are inundated by the 100-year flood.

g) Footprint: The areal extent of a discrete landfill unit, also described as the disposal area.

h) Inert debris: solid waste which consists solely of material that is virtually inert and that is likely to retain its physical and chemical structure under expected conditions of disposal.

i) Land-clearing debris: solid waste which is generated solely from land-clearing activities.

j) Natural resources: all materials which have useful physical or chemical properties which exist, unused, in nature.

k) Operator: any person, including the owner, who is principally engaged in, and is in charge of the actual operation, supervision, and maintenance of a solid waste management facility and includes the person in charge of a shift or periods of operation during any part of the day.

l) Owner: Wilson County, North Carolina.

m) Rules: North Carolina Solid Waste Management Rules, codified at 15A NCAC 13B.

n) Sanitary landfill: a facility for disposal of solid waste on land in a sanitary manner in accordance with the rules concerning sanitary landfills.

o) Site: The 100-Acre site proposed for the Westside C&D landfill.

p) Engineer: Gary W. Ahlberg, P.E., NC PE No. 20100

q) Geologist: Gary D. Babb, P.G., NC LG No. 488

r) Surveyor: Timothy L. Kennedy, P.L.S., NC L-4245

1.4 SCOPE & APPLICABILITY

This application presents a plan for compliance with the requirements of Rule .0504 (2) and providing the information "required for reviewing a construction plan application for a proposed sanitary landfill." Tables and Figures are provided in the report. References and supporting data and documentation are provided at end of each Section. Permit Issue drawings are attached at the end of the report.

The Facility Plan draws all key elements of the landfill design and provides a summary of the project. Subsequently, separate plans are presented for engineering, operations, closure and post closure and monitoring. Altogether, these plans demonstrate conformance with the Rules for issuance of a Permit to Construct. The complete 10.5 Acre footprint will be constructed within the initial 5-year operating period. After the five years of operation, Wilson County intends to request an estimated additional 5-year extension of the Permit to Operate the Westside C&D Landfill Facility.

2.0 FACILITY PLAN

2.1 FACILITY DESCRIPTION

Drawing F1 provides the Facility Plan for the Westside C&D Landfill Facility. This facility plan delineates areas of the site and identifies general features of the landfill design, construction, operation, monitoring, and closure. In accordance with the site specific design requirements issued by the Division, buffer zones are shown on the plan.

The facility property is 100.00 Acres owned by Wilson County. The proposed waste boundary is 10.5 Acres, and is defined as the landfill footprint. The landfill will receive C&D waste and additional wastes compatible with the facility design. The estimated 5-year disposal capacity is approximately 100,000 tons. The calculated total landfill capacity is 215,000 tons yielding an estimated project life of 10 years.

Prior to operation, a compacted soil layer shall be constructed for the landfill base. The landfill base will be constructed in 3 contiguous cells within the first 5-year operating period. A network of 4 groundwater monitoring wells provide one downgradient well per 3.5 Acres of landfill development. All cover soils will be imported from Wilson County's dedicated landfill borrow sites located to the west of the Westside Facility, identified as the Tucker and Mohesky sites. As documented in the Site Plan, the facility plan is consistent with all zoning and local government approvals.

2.2 WASTE STREAM

The waste stream for the Westside C&D Landfill is identical to the current waste stream for the C&D operation at the Wilson County Landfill. The landfill will receive construction and demolition waste generated within Wilson County, North Carolina. Other waste types categorically approved by the Division for disposal

at C&D landfills, such as pallets, may also be accepted for disposal. Specific approval must be received from the Division for other waste types that Wilson County may want to accept for disposal; typically, this will require a demonstration to the Division that the volume of waste and the waste's chemical characteristics and leaching potential are compatible with the landfill design and monitoring plan.

Consistent with the current C&D operating permit and as noted in the Site Application, Wilson County will accept two specific waste types at the Westside C&D site. The County will continue to receive off-spec tires, split at the factory; the split tires are not scrap tires and will be co-mingled with the C&D waste stream unless the Division determines that it is necessary to segregate disposal in an area of the C&D footprint designated specifically for management of this waste. Tobacco Dust from leaf processing is proposed for disposal with the C&D waste stream; this waste is predominantly soil fines, with leaf stems and tobacco plant material. Acceptance of these wastes may be subject to permit conditions.

The service area for the facility is Wilson County, North Carolina. According to the 2000 census, the population of Wilson County is 73,814. The population of Wilson County is expected to grow at an annual rate of .7% over the next 10 years.

Population, economic trends, and natural disasters have a direct impact on the quantity of waste received at landfill facilities. Based primarily on the historical waste generation rate in the County within a 5-year permitting period, the average annual disposal rate at the Westside C&D Landfill is predicted to be 20,000 tons per year.

2.3 LANDFILL CAPACITY & FACILITY LIFE

Following base construction work, base grades will be verified by a record survey to ensure design compliance. Landfill operations will proceed to construct lifts with perimeter slopes at final grade, intermediate slopes and a top surface. The final grading plan for the landfill's conceptual design provides 433,560 cubic yards of airspace for landfill operation and final cover construction. Approximately 114,500 cubic yards of soil will be used for operational, intermediate and final cover applications.

Quantification of the in-place density and soil:waste ratio for temporary soil cover for the waste is available from capacity evaluations performed on the existing Wilson County C&D landfill facility. Using an in-pace density of 0.66 tons/cubic yard and a 1:8 soil to waste ratio, the average disposal rate of 20,000 tons/year will use approximately 35,300 cubic yards per year of landfill capacity. At these rates, the Westside site will be in operation for approximately 10 years.

2.4 LANDFILL OPERATIONS

In addition to the issues previously discussed in the proposed facility plan, landfill operations will maintain several existing practices for C&D landfill management. Wilson County will continue to operate the scalehouse at the entrance to the Wilson County Landfill Facility. At the scalehouse, the Weighmaster directs specific waste types, such as Land Clearing and Inert Debris, asbestos, and yard waste to specific management areas. Access roads to the Westside site will be improved to all-weather construction and the route will be adequately identified with signs.

The waste screening program shall be maintained for C&D operations. The facility shall only accept those solid wastes which it is permitted to receive. The operator shall monitor loads periodically to identify non-conforming wastes, including municipal solid waste, industrial waste, and hazardous waste. If a suspect load is identified, an inspection will be conducted in an area prepared

near the working face. This staging area will be graded to contain and segregate the wastes if necessary. Together with complete operating plans, details of the waste screening program shall be provided in the construction plan application.

As noted in the design requirements, the landfill will be operated in 5 to 10-foot lifts, progressing evenly across the footprint. At the intermediate height of 10 feet above base grade, the entire 10.5 Acre footprint provides approximately 4 years of capacity. Soils for cover construction are available from the dedicated borrow sites adjacent to the site and owned by Wilson County. Due to the non-putrescible nature of the waste, the working lift shall be typically covered on a weekly basis. The top portion of the lift shall receive a minimum cover of six inches. As sections of the perimeter slopes are completed, the 24-inch final cover VSL shall be placed and compacted.

2.5 MONITORING PLAN

Groundwater monitoring wells will be used to detect potential releases from the C&D landfill into the surficial aquifer. Based on the observed potentiometric and hydrogeologic conditions at the site, the site can be effectively monitored with shallow monitoring wells. Based on the aquifer conductivity testing and laboratory permeability test results, the potential for lateral groundwater flow is several orders of magnitude greater than the vertical potential. The clay lenses stratified in the surficial aquifer limit vertical groundwater movement. To the contrary, the sand layers provide conductive zones for lateral groundwater flow.

Background sampling shall be conducted prior to beginning landfill operations. A detailed Water Quality Monitoring Plan, including sampling protocol and parameters is provided in Section 6.

2.6 FINAL GRADE & CLOSURE

Once a major portion of the landfill perimeter slopes has been completed, a final cover shall be installed on the completed perimeter slope section. A vegetative

soil layer (VSL) is planned for the landfill final cover. The VSL will consist of a minimum 24-inch layer of suitable compacted earth, seeded with native grasses. The final cover will be deployed in phases as the landfill reaches final grade. The top surface of the landfill shall be sloped at a minimum 5% grade, prior to construction of the final cover. Perimeter slopes are planned at a grade of 4 (horizontal):1(vertical).

2.7 GENERAL CONDITIONS

The Westside C&D landfill site is located on land formerly used by Wilson County as a borrow site for the Wilson County Municipal Solid Waste (MSW) Landfill Facility. The site was not included in the original landfill permit, but was incorporated as the "Borrow Area" in an Amendment to Permit #98-01, issued in March 1990. Presently, the MSW landfill has been closed and Wilson County is utilizing remaining capacity of the MSW landfill site for disposal of construction and demolition waste; permitted capacity for C&D will be depleted in 2004.

Wilson County plans to continue operation of the yard waste composting, white goods and tire collection, and convenience center located at the closed MSW Landfill Facility. Over the past several years, Wilson County has acquired two additional properties for current and future borrow soil operations associated with C&D landfill projects. The progression of C&D operations to the Westside site maintains a central location for waste management in Wilson County and minimizes impacts to the County's existing natural resources by developing pre-disturbed lands.

2.8 C&D FACILITY PROPERTY

Figure 1 of this report is a recombination plat of the Wilson County Landfill prepared by the surveyor, defining two tracts for the separate landfill facilities. The plat includes a vicinity map providing the general location of site to the east of the City of Wilson, and accessed via Landfill Road (SR 1503). Tract 2 contains 196.45 Acres and defines the property for the MSW Landfill Facility; this

is provided for reference only in this application. By dedication and maintenance of a 50-foot buffer from the MSW Landfill Facility, the Westside CDLF is separate and apart from the MSW Facility.

Tract 1 contains the 100.00 Acres which delineates the Westside C&D landfill site proposed for this permit, and an additional 3.76 Acre buffer property. The site is in Gardners Township of Wilson County and bisected by the extraterritorial jurisdiction (ETJ) of the City of Wilson, North Carolina. The property boundary presented in site drawings and figures for this report is the 100.00 Acres delineated in the recombination plat by the surveyor.

Wilson County Westside Construction & Demolition Landfill Property

BEGINNING at a point located at the northwesterly corner of Tract 1 on a map entitled "Recombination Plat, Wilson County Landfill" as recorded in Plat Book 32, Page 13 of the Wilson County Registry, thence from said point of BEGINNING running along the northerly line of the aforementioned Tract 1 S 56°44'20"E 2046.65 feet to a point, cornering, thence running along the easterly line of the aforementioned Tract 1 S 44°30'40"W 3290.20 feet to a point on the traverse line of the Buck Branch, cornering, thence running along the traverse line of the Buck Branch the following courses and distances N 27°37'56"W 52.53 feet, N 27°37'56"W 541.38 feet, N 15°46'04"E 450.77 feet, N 42°58'44"E 258.20 feet, N 09°17'36"W 208.83 feet, N 32°42'36"W 402.81 feet, N 19°17'26"W 321.17 feet, N 23°55'24"E 631.57 feet, N 40°45'34"E 454.57 feet, N 29°58'24"E 456.29 feet, N 43°42'14"E 209.68 feet and N 50°15'59"E 5.12 feet to the point of BEGINNING and containing 103.76 acres and being all of Tract 1 on the map entitled "Recombination Plat, Wilson County Landfill" as recorded in Plat Book 32, Page 13 of the Wilson County Registry.

Tract 1 is also subject to a 3.76 acre buffer as shown on the aforementioned map and described as follows BEGINNING at the northeasterly corner of Tract 1 on the map entitled "Recombination Plat, Wilson County Landfill" as recorded in Plat Book 32, Page 13 of the Wilson County Registry and running along the easterly line of the aforementioned Tract 1 S 44°30'40"W 3290.20 feet to a point, cornering, thence leaving said line N 27°37'56"W 52.53 feet, N 44°30'40"E 3264.15 feet and S 56°44'20"E 50.98 to the point of BEGINNING. According to the Solid Waste Permit issued for the Westside Construction and Demolition Landfill Facility, the facility property excludes the 3.76 acre buffer described herein.

NCDENR
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

June 7, 2004

Mr. Steve Clayton, Solid Waste Director
County of Wilson
P.O. Box 1728
Wilson, North Carolina 27893

Re: General Conditions and Site Specific Design Requirements for the Proposed Wilson County/Westside C&D Landfill, Wilson County, North Carolina

Dear Mr. Clayton:

The Solid Waste Section (Section) of the Division of Waste Management, has completed its review of the site study application for the proposed Wilson County/Westside C&D landfill. The proposed site is located northwest of the existing Wilson County landfill accessed from State Road 1503 (S.R. 1503) in Wilson, Wilson County, North Carolina. The site will be accessed from S.R 1503 according to the site plans in the site suitability plan application. Pursuant to Rule .0503(1) and .0504(1), of the North Carolina Administrative Code 15A NCAC 13B, the Division is notifying Wilson County that the site is considered suitable based on the information provide to the Section in documents prepared by Gary W. Ahlberg, P.E. (Ahlberg). The site suitability documents are as follows:

1. Site Application For Wilson County C&D Landfill Facility - Wilson, North Carolina, prepared for Wilson County Department of Solid Waste, application dated December 2003 and received 12 December 2003;

2. Certified Copy of the Solid Waste Permit for the vertical expansion which included the Williamson tract certified 3 April 1990, letter to Jim Barber, Solid Waste Section, from Steve Clayton of Wilson County Department of Solid Waste Management, with permit and land plat attached received 29 January 2004;

3. Addendum No. 1 to Site Application - Westside C&D Landfill Site Wilson County, North Carolina, letter addressed to Ellen Lorscheider, Solid Waste Section received on 16 April 2004 from Ahlberg;

GENERAL CONDITIONS AND SITE-SPECIFIC DESIGN REQUIREMENTS

The Section requires the submittal of a construction plan application for the first five-year development phase, as identified in the conceptual design plan, which is consistent with the requirements of 15A NCAC 13B .0201(e), including, but not limited to, the site specific criteria set forth in this letter.

Buffers

Horizontal buffers shall be as described in the conceptual design and as designated in Rule .0503(2)(f), and shall also include the following buffer criteria:

a) A 100-foot minimum buffer shall be maintained between facility boundaries and borrow areas, unless otherwise approved by the Division;

b) A minimum 50-foot buffer shall be maintained between borrow areas and delineated wetlands;

c) A minimum 50-foot buffer shall be maintained between disposal areas and delineated wetlands;

d) A minimum 50-foot buffer shall be maintained between facility activities and any sites of archeological, historical and/or cultural significance;

e). A minimum 200-foot buffer shall be maintained between the disposal area and the site property lines;

f). A minimum 500-foot buffer to wells (on-site or off-site) and off-site dwellings.

Wilson County may utilize all remaining areas of the site, except buffer areas, for other solid waste management activities (such as yard waste composting or recycling) or for landfill support activities (such as stockpiling of cover material) upon approval by the Section.

Design and Construction Standards

1. The applicant must complete the application for a permit to construct consistent with Rule .0503(2) and .0504(2) and the general site conditions and design requirements of this letter.

3.0 ENGINEERING PLAN

3.1 DESIGN REQUIREMENTS

The engineering design of the landfill is presented in this Section. Drawings C1, C2 and C3 provide the primary plans for landfill construction, operation and closure. Details are illustrated in Drawings D1-D3. The following sections discuss key elements of the engineering design for the Westside landfill.

3.1.1 Topography and Mapping Resources

Topographic mapping (2-foot contour interval) for the site was included in the 1998 project completed by GeoData Corporation, of Zebulon, North Carolina. The 1998 topography is generally representative of current ground conditions. In order to provide updated mapping for landfill construction, HSA surveyed the construction limits for the Westside landfill and mapped one-foot contours in July 2003. Floodplain, zoning, subdivision, and local property boundary (plat) data was provided by Wilson County's Mapping/GIS Department.

Topographic relief on the site is gradually sloping north to south, toward Buck Branch and Toisnot Swamp. The slope increases upgradient of the landfill footprint to the northern property boundary. Ditches were constructed with borrow site operation to convey stormwater to an existing sedimentation basins west and south of the footprint.

3.1.2 Controlled Site Access

Natural topographic and vegetative conditions and control measures limit public access to the site. Wilson County will continue to maintain the gated entrance (at SR 1503) to the existing MSW facility. Access to the Westside site will be controlled via the existing manned scalehouse during operating hours. The main entrance will be closed and locked after operating hours. Access to the western borrow sites is also controlled by locked gates. The west gate is only open when soil hauling from the borrow site is in-progress.

3.1.3 Hydrologic Grade Restoration

During borrow operations at the site, soil was removed along a limited portion of the downgradient cleared limits. These areas are shown on the grading plan as embankment fill, along the western and southern cleared limits. Approximately 1000 linear feet of soil embankment fill will placed to restore hydrologic conditions and establish stormwater control for the landfill perimeter. The proposed typical peak elevation for the embankment fill is 96 msl. While the grade restoration areas are presently above the 100-year floodplain elevation of 88 feet msl, the embankments will enhance site drainage conditions and maintenance access. Soil placement and associated construction activities are planned during the initial year of landfill operations. Plans may be modified as required by field conditions and with approval of the Design Engineer.

3.1.4 Surface Water Protection

The site contains one stream and one intermittent stream. The site's western boundary is established by the center-line run of Buck Branch. Buck Branch is a named stream on the USGS Quadrangle Map for the area. Along the eastern site boundary, an intermittent stream is present in the vegetated area. Both Buck Branch and the intermittent stream feed into Toisnot Swamp. All surface waters in the local area are classified by NC Surface Water Standards as Class C waters. Toisnot Swamp is a major tributary stream and groundwater discharge feature in the area. The Neuse Buffer associated with all streams on-site is delineated on the plan drawings and will not be effected by landfill development. Jurisdictional wetlands are present within the floodplain regions bordering the surface waters on-site. According to a field delineation performed in 1994 and reviewed by the U.S. Army Corps of Engineers, wetlands on-site are contained within the existing woodland areas as generally illustrated on the project drawings. In compliance with Section 404 of the Clean Water Act, these wetland areas will not be disturbed by construction activities on the site.

The 100-year floodplain and floodway delineated on the project drawings was obtained from the Wilson County Planning Department. The floodplain information is based on the recently updated Flood Insurance Rate Map published by FEMA for the local area. The landfill footprint is topographically higher than the 100-year floodplain.

3.1.5 Landfill Base Grade and Foundation Design

Based on a preliminary analysis of existing grade conditions within the footprint, soil fill will be placed and compacted to establish the landfill base grade. The base grade elevation is equal to the bottom elevation of waste. Where necessary, a leveling lift is proposed for initial subgrade construction. Above the leveling lift, an average 2-foot layer of compacted soil will be added to the existing grade within the footprint. The compacted soil layer will be constructed in three 8-inch compacted lifts with soils selected and approved by the engineer for suitability. The base grade elevations are set at least 4.5 feet above the seasonal high water table, including allowances for foundation consolidation and settlement. The base grade shall be completed in 3 cells under the initial permit to construct. Consistent with the Base Grade Plan and the construction requirements herein, site restoration grading was performed for Cell 1 in September 2004. Construction was monitored by the design engineer for quality assurance and documented by the Surveyor. Upon of the permit to construct and inspection by the design engineer, Cell 1 is qualified to begin operation.

An engineering evaluation of slope stability and settlement was performed by G.N. Richardson & Associates, Inc. (GNRA) of Raleigh, North Carolina. The GNRA report is provided in Appendix 3-1. The analysis reports a slope stability safety factor of 2.6 for static conditions represented by the proposed landfill design, which is much greater than the required minimum of 1.5. Consolidation of the clays and sands is calculated at a typical value of 0.5 feet.

According to the seasonal high water table defined by November 19, 2002 water level readings and mapped potentiometric conditions, the base grade elevations will be calculated to establish a 4.5 ft design separation above the groundwater. As detailed in the settlement report by GNRA, a typical settlement of 0.5 feet across the footprint was calculated under a typical load condition. This calculation assumes equal loading of the waste mass at an equivalent fill height of 30 feet across the entire footprint. The fill height over more than 60% of the footprint is less than 30 feet. Considering the peak height is only 20 feet higher, the selection of 30 feet as a typical load condition is greater than the average load. Based on the thickness of the foundation unit, the depth to the unit midpoint, and broad region subject to loading, it is reasonable to expect the stresses to be distributed equally across the footprint. Following the August 2003 geotechnical investigation, GNRA reviewed the additional data to check the results of the settlement analysis. In conclusion, GNRA noted that this calculation was conservatively based on Boring P-106, which exhibited the most compressible subsurface conditions of any of the site borings and is not located under the peak of the landfill. Final review of the August 2003 data indicated that typical settlement of 0.5 feet under the worst case analysis was a valid conclusion for base grade design of the landfill.

3.1.6 Landfill Development

Landfill operations will continue to follow the standard operating procedures used at the existing landfill. Operational lifts are planned at 5-10 foot intervals, and shall not exceed one acre in aerial extent without temporary soil cover. The waste shall be compacted using a compactor or large dozer. Lifts are planned to proceed across the entire completed base grade, and then progress to the next lift elevation. This method of operation will result in even gradual loading of the foundation soils.

3.1.7 Buffer Zones

The landfill footprint is surrounded by adequate land to providing for buffers to property lines, private dwellings, wells, streams and rivers. The planned property line buffer is a minimum of 250 feet. The closest dwelling and well is approximately 1200 feet to the northwest of the footprint. From the top of bank for Buck Branch, the minimum 50-foot buffer for compliance with the Neuse River setback requirements is well within the vegetated buffer property.

No excavation activities are planned on-site for cover soil resources. No land clearing is planned on-site; brush cutting may be required periodically to control vegetation on previously disturbed land.

3.1.8 Stormwater and Sedimentation Control

In addition to the embankments constructed for hydrologic restoration, temporary and permanent drainage controls are planned for landfill development. As a minimum design criteria, permanent structures will be designed to convey run-off from the 10-year, 24-hour storm event. All channels are sized with adequate freeboard for siltation during operation and to convey the 25-year storm.

Current land disturbing and site restoration activities are regulated under an existing Erosion and Sedimentation Control Plan approved by the NC Division of Land Resources. Modifications to the existing Erosion and Sedimentation Control Plan have been submitted to the NC Division of Land Resources for approval. A copy of the E&SC Plan is incorporated in this section. Stormwater will be managed in compliance with the NPDES General Permit for construction activities, under Section 402 of the Clean Water Act. With respect to NPDES wastewater regulations, no point source discharges are planned for facility operations.

3.1.9 Explosive Gas Control

Due to the non-putrescible nature of the waste, no significant quantities of explosive gas are expected to be generated by the facility. In the event that mercaptan odors characteristic of landfill gas are noticeably present, further investigations shall be conducted to determine the source of the gas odor and the need for monitoring or remedial action. The compacted soil layer, shallow unsaturated zone, and adjacent streams and wetlands will significantly limit migration of any gas through the subsurface.

Slope Stability And Settlement Evaluation

Wilson County - Westside C&D Landfill
Wilson, North Carolina

Prepared for:

Gary W. Ahlberg, P.E.
Wilmington, NC

August 2003

G.N. Richardson & Associates, Inc.
Engineering and Geological Services
14 N. Boylan Avenue
Raleigh, North Carolina 27603

Slope Stability And Settlement Evaluation

Wilson County - Westside C&D Landfill
Wilson, North Carolina

Prepared for:

Gary W. Ahlberg, P.E.
Wilmington, NC

GNRA Project No. AHLBERG-3

Pieter K. Scheer, P.E.
Project Engineer

Gregory N. Richardson, Ph.D., P.E.
President

August 2003

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WILSON COUNTY - WESTSIDE C&D LANDFILL
WILSON, NORTH CAROLINA

SLOPE STABILITY AND SETTLEMENT EVALUATION

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WILSON COUNTY - WESTSIDE C&D LANDFILL
WILSON, NORTH CAROLINA

SLOPE STABILITY AND SETTLEMENT EVALUATION

1.0 OVERVIEW

The slope stability of the overall waste mass is addressed in this report in addition to an estimate of foundation settlement. In that the project site lies outside a seismic impact zone ($a_{max} < 0.10$ g according to USGS[1, 2]), seismic slope stability analyses were not required.

2.0 SLOPE STABILITY

Slope stability analyses performed meet 40 CFR 258 requirements as expressed in EPA guidance for MSW landfills, which require that the completed landfill have a minimum static factor of safety against slope failures of 1.5.

The slope stability analysis for the landfill was performed using the computer program STABL5M, a computer program developed by Purdue University. Circular failure surfaces were assumed for the evaluation of the worst case final geometry section shown in **Figure 1** and **Appendix A**. Complete output for this analysis is presented in **Appendix A**. The minimum factor of safety is 2.6 for static conditions, which is much greater than the minimum of 1.5.

A summary of material properties assumed in the slope stability analyses is presented in **Table 1**. Note that the shear strength assumed for the C&D waste in this evaluation was cohesion = 200 psf and phi = 30 degrees, which is conservative for this type of waste. Also, the shear strength assumed for the landfill subgrade was assumed to be low (c = 100 psf; phi = 20 degrees) based on the soft interbedded clays and sands found in Boring P-106.

3.0 FOUNDATION SETTLEMENT

The anticipated total settlement of the foundation of the proposed C&D landfill unit was estimated under the proposed loads. This value does not include subsidence of the waste itself, only settlement of the subgrade soils.

The settlement analysis evaluated both elastic and consolidation settlement using data from Boring P-106 in predicting the total settlement. This boring was determined to represent worst case site conditions (i.e. softest materials based on blow count information) under the proposed C&D landfill unit. The analysis indicates that the total foundation settlement will be typically about 0.5 feet with a maximum of about 1.2 feet under the maximum proposed fill height of 50 feet. Foundation settlement calculations are provided in **Appendix B**.

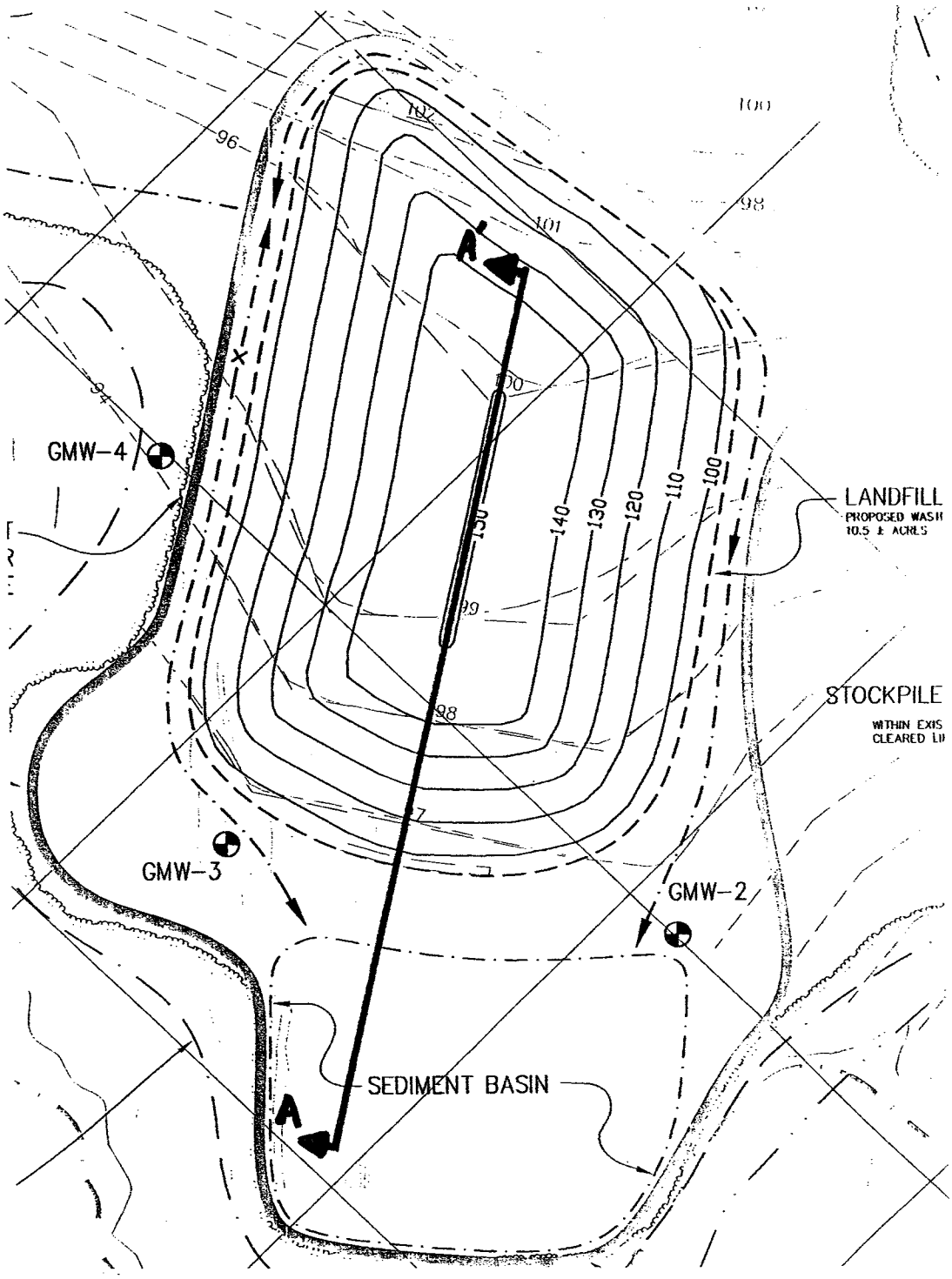
4.0 REFERENCES

1- Frankel, A.D., Peterson, M.D., et. al (2002), "Documentation for the 2002 Update of the National Seismic Hazard Maps," U.S. Geological Survey Open-File Report 02-420.

2- USGS (Oct. 2002), Map - Peak Acceleration (%g) with 2% Probability of Exceedance in 50 Years, U.S. Geological Survey.

TABLE 1: MATERIAL PROPERTIES USED IN SLOPE STABILITY ANALYSES

MATERIAL TYPE	UNIT WEIGHT (pcf)	COHESION, C (psf)	PHI, φ (degrees)
C&D Waste	50	200	30
Compacted Fill	110	500	25
Subgrade	100	100	20
Firm Layer (Depth of 26 Feet at P-106)	110	1,000	30



C:\CAD\GNRA\GNRA-A0002.dwg DATE: FEB 07, 2003 TIME: 10:46 AM

LOCATION OF SLOPE STABILITY

CROSS SECTION

G.N. RICHARDSON & ASSOCIATES, INC.

Engineering and Geological Services

14 N. Boylan Avenue Raleigh, North Carolina
(919)-828-0577 Fax:(919)-828-3899 www.gnra.com

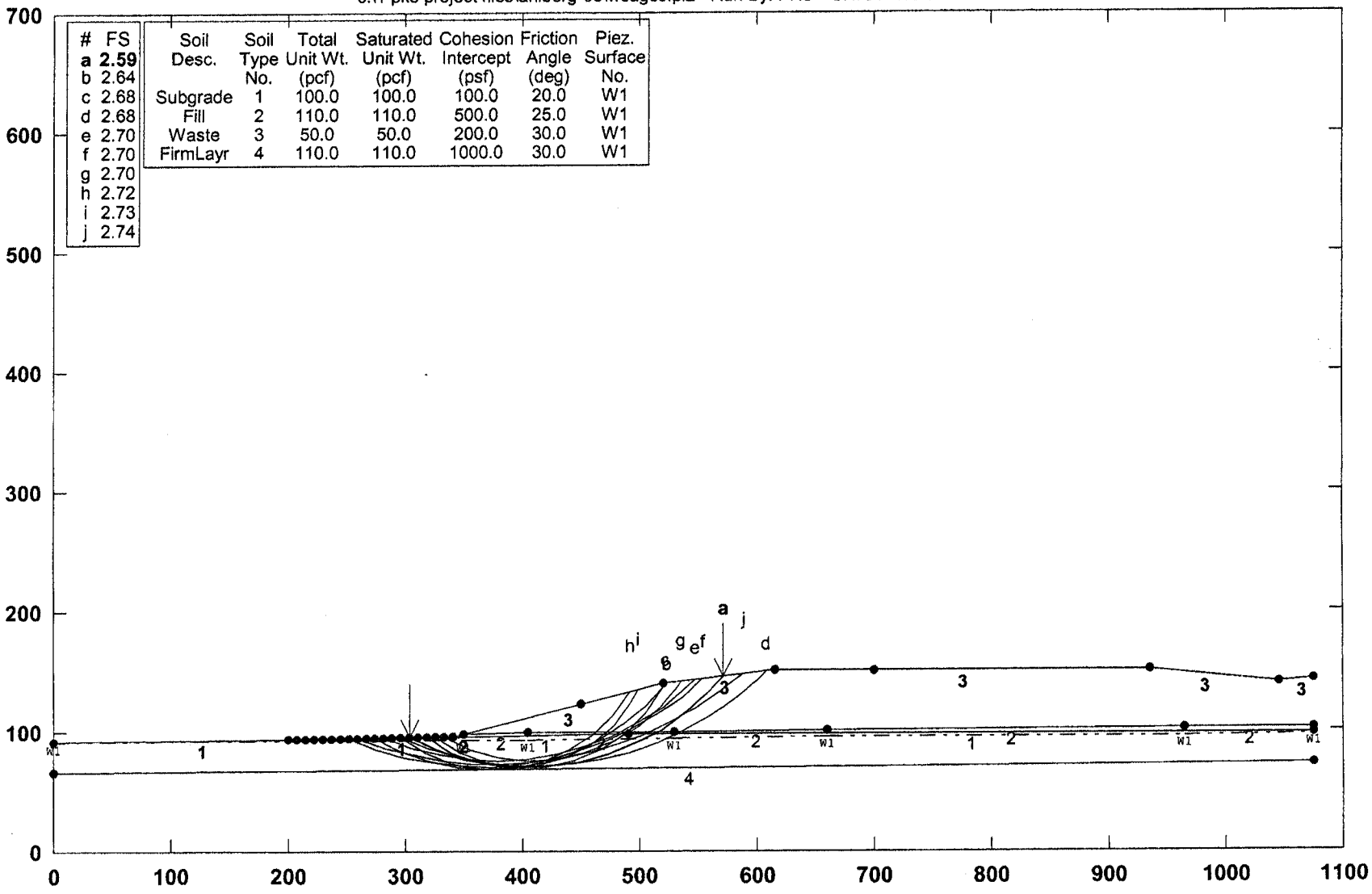
SCALE:	DRAWN BY:	CHECKED BY:	DATE:	PROJECT NO.	FIGURE NO.	FILE NAME
AS SHOWN	OTHERS	P.K.S.	AUG. 2003	AHLBERG-3	1	GNRA-A0005

Appendix A

Slope Stability Analysis

Wilson Co. C&D LF - Sect. A-A Global - Circular - Static

c:\1 pks project files\ahlberg-03\wcagcs.pl2 Run By: PKS - GNRA 7/30/03 02:48PM



#	FS
a	**2.59**
b	2.64
c	2.68
d	2.68
e	2.70
f	2.70
g	2.70
h	2.72
i	2.73
j	2.74

Soil Desc.	Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Piez. Surface No.
Subgrade	1	100.0	100.0	100.0	20.0	W1
Fill	2	110.0	110.0	500.0	25.0	W1
Waste	3	50.0	50.0	200.0	30.0	W1
FirmLayr	4	110.0	110.0	1000.0	30.0	W1

PCSTABL5M/si FSmin=2.59

Safety Factors Are Calculated By The Modified Bishop Method

STED

**** PCSTABL5M ****
by
Purdue University
--Slope Stability Analysis--
Simplified Janbu, Simplified Bishop
or Spencer`s Method of Slices

Run Date: 7/30/03
Time of Run: 02:48PM
Run By: PKS - GNRA
Input Data Filename: C:wcagcs.in
Output Filename: C:wcagcs.OUT
Unit: ENGLISH
Plotted Output Filename: C:wcagcs.PLT
PROBLEM DESCRIPTION Wilson Co. C&D LF - Sect. A-A
Global - Circular - Static

BOUNDARY COORDINATES
8 Top Boundaries
16 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	.00	92.00	245.00	94.00	1
2	245.00	94.00	340.00	96.00	1
3	340.00	96.00	350.00	98.50	2
4	350.00	98.50	520.00	140.00	3
5	520.00	140.00	615.00	150.00	3
6	615.00	150.00	935.00	150.00	3
7	935.00	150.00	1045.00	140.00	3

8	1045.00	140.00	1075.00	143.00	3
9	350.00	98.50	405.00	99.00	2
10	405.00	99.00	530.00	100.00	2
11	530.00	100.00	660.00	101.00	2
12	660.00	101.00	965.00	102.00	2
13	965.00	102.00	1075.00	102.50	2
14	340.00	96.00	490.00	98.00	1
15	490.00	98.00	1075.00	98.00	1
16	.00	66.00	1075.00	72.00	4

ISOTROPIC SOIL PARAMETERS

4 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	100.0	100.0	100.0	20.0	.00	.0	1
2	110.0	110.0	500.0	25.0	.00	.0	1
3	50.0	50.0	200.0	30.0	.00	.0	1
4	110.0	110.0	1000.0	30.0	.00	.0	1

1 PIEZOMETRIC SURFACE(S) HAVE BEEN SPECIFIED

Unit Weight of Water = 62.40

Piezometric Surface No. 1 Specified by 7 Coordinate Points

Point No.	X-Water (ft)	Y-Water (ft)
1	.00	92.00
2	350.00	92.50
3	405.00	93.00
4	530.00	94.00
5	660.00	95.00
6	965.00	96.00
7	1075.00	96.50

A Critical Failure Surface Searching Method, Using A Random Technique For Generating Circular Surfaces, Has Been Specified.

200 Trial Surfaces Have Been Generated.

10 Surfaces Initiate From Each Of 20 Points Equally Spaced Along The Ground Surface Between X = 200.00 ft.
and X = 340.00 ft.

Each Surface Terminates Between X = 450.00 ft.
and X = 700.00 ft.

Unless Further Limitations Were Imposed, The Minimum Elevation At Which A Surface Extends Is Y = 65.00 ft.

25.00 ft. Line Segments Define Each Trial Failure Surface.

Following Are Displayed The Ten Most Critical Of The Trial Failure Surfaces Examined. They Are Ordered - Most Critical First.

* * Safety Factors Are Calculated By The Modified Bishop Method * *

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	303.16	95.22
2	325.91	84.86
3	349.68	77.14
4	374.19	72.16
5	399.09	70.01
6	424.08	70.69
7	448.83	74.21
8	473.03	80.51
9	496.35	89.52
10	518.50	101.11
11	539.18	115.15
12	558.14	131.44
13	571.05	145.37

Circle Center At X = 405.6 ; Y = 289.8 and Radius, 219.9

*** 2.586 ***

Individual data on the 21 slices

Slice	Width	Weight	Water Force Top	Water Force Bot	Tie Force Norm	Tie Force Tan	Earthquake Force Hor	Earthquake Force Ver	Surcharge Load

No.	(ft)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
1	6.1	888.6	.0	.0	.0	.0	.0	.0	.0
2	16.6	11450.1	.0	4343.1	.0	.0	.0	.0	.0
3	14.1	18721.9	.0	9161.2	.0	.0	.0	.0	.0
4	9.7	18030.8	.0	8758.8	.0	.0	.0	.0	.0
5	.3	680.6	.0	309.0	.0	.0	.0	.0	.0
6	24.2	62022.8	.0	27705.1	.0	.0	.0	.0	.0
7	24.9	80383.8	.0	33924.3	.0	.0	.0	.0	.0
8	5.9	20804.5	.0	8439.3	.0	.0	.0	.0	.0
9	19.1	69547.3	.0	26976.5	.0	.0	.0	.0	.0
10	24.8	92018.6	.0	32451.9	.0	.0	.0	.0	.0
11	24.2	85495.0	.0	25099.0	.0	.0	.0	.0	.0
12	17.0	53454.3	.0	11154.6	.0	.0	.0	.0	.0
13	6.3	18063.8	.0	2298.8	.0	.0	.0	.0	.0
14	8.2	21256.4	.0	1212.5	.0	.0	.0	.0	.0
15	8.0	18303.8	.0	.0	.0	.0	.0	.0	.0
16	3.6	7358.9	.0	.0	.0	.0	.0	.0	.0
17	2.3	4544.3	.0	.0	.0	.0	.0	.0	.0
18	1.5	2873.8	.0	.0	.0	.0	.0	.0	.0
19	19.2	31044.3	.0	.0	.0	.0	.0	.0	.0
20	19.0	18695.2	.0	.0	.0	.0	.0	.0	.0
21	12.9	4054.8	.0	.0	.0	.0	.0	.0	.0

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	273.68	94.60
2	296.07	83.47
3	319.69	75.29
4	344.17	70.20
5	369.10	68.28
6	394.06	69.56
7	418.66	74.02
8	442.49	81.59
9	465.15	92.15
10	486.28	105.51
11	505.52	121.47
12	522.57	139.76
13	522.97	140.31

Circle Center At X = 371.6 ; Y = 263.4 and Radius, 195.1

*** 2.639 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	325.26	95.69
2	346.53	82.55
3	369.90	73.66
4	394.53	69.36
5	419.52	69.79
6	443.99	74.94
7	467.03	84.63
8	487.83	98.50
9	505.64	116.05
10	519.80	136.65
11	521.32	140.14

9	491.44	82.51
10	515.11	90.55
11	538.00	100.61
12	559.93	112.62
13	580.73	126.49
14	600.24	142.11
15	607.70	149.23

Circle Center At X = 410.9 ; Y = 358.6 and Radius, 287.6

*** 2.683 ***

Failure Surface Specified By 13 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	281.05	94.76
2	304.61	86.38
3	328.88	80.38
4	353.62	76.83
5	378.60	75.75
6	403.56	77.16
7	428.26	81.05
8	452.44	87.38
9	475.88	96.07
10	498.34	107.06
11	519.59	120.22
12	539.43	135.44
13	547.36	142.88

Circle Center At X = 376.9 ; Y = 326.9 and Radius, 251.1

*** 2.699 ***

Failure Surface Specified By 14 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	251.58	94.14
2	274.90	85.12
3	298.92	78.21
4	323.46	73.45
5	348.33	70.88
6	373.33	70.53
7	398.26	72.39
8	422.93	76.46
9	447.14	82.69
10	470.70	91.05
11	493.43	101.46
12	515.15	113.84
13	535.68	128.10
14	554.26	143.61

Circle Center At X = 364.8 ; Y = 352.2 and Radius, 281.8

*** 2.701 ***

Failure Surface Specified By 11 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	332.63	95.84
2	355.21	85.10
3	379.23	78.18
4	404.06	75.27
5	429.03	76.44
6	453.48	81.65
7	476.75	90.79
8	498.23	103.59
9	517.33	119.71
10	533.55	138.74
11	535.28	141.61

Circle Center At X = 409.4 ; Y = 228.2 and Radius, 153.0

*** 2.701 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	295.79	95.07
2	317.09	81.98

3	340.44	73.05
4	365.04	68.59
5	390.04	68.74
6	414.58	73.51
7	437.82	82.73
8	458.96	96.08
9	477.27	113.10
10	492.10	133.19

Circle Center At X = 376.7 ; Y = 202.9 and Radius, 134.8

*** 2.715 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	317.90	95.53
2	339.02	82.17
3	362.46	73.46
4	387.18	69.77
5	412.14	71.27
6	436.25	77.89
7	458.47	89.35
8	477.84	105.14
9	493.54	124.60
10	498.74	134.81

Circle Center At X = 392.2 ; Y = 189.2 and Radius, 119.6

*** 2.734 ***

Failure Surface Specified By 15 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	258.95	94.29
2	282.62	86.26
3	306.83	80.03
4	331.44	75.62
5	356.31	73.07
6	381.30	72.39
7	406.27	73.59
8	431.08	76.65
9	455.60	81.57
10	479.67	88.31
11	503.17	96.83
12	525.97	107.09
13	547.94	119.03
14	568.95	132.58
15	588.25	147.18

Circle Center At X = 377.8 ; Y = 405.8 and Radius, 333.4

*** 2.735 ***

Appendix B

Foundation Settlement Evaluation

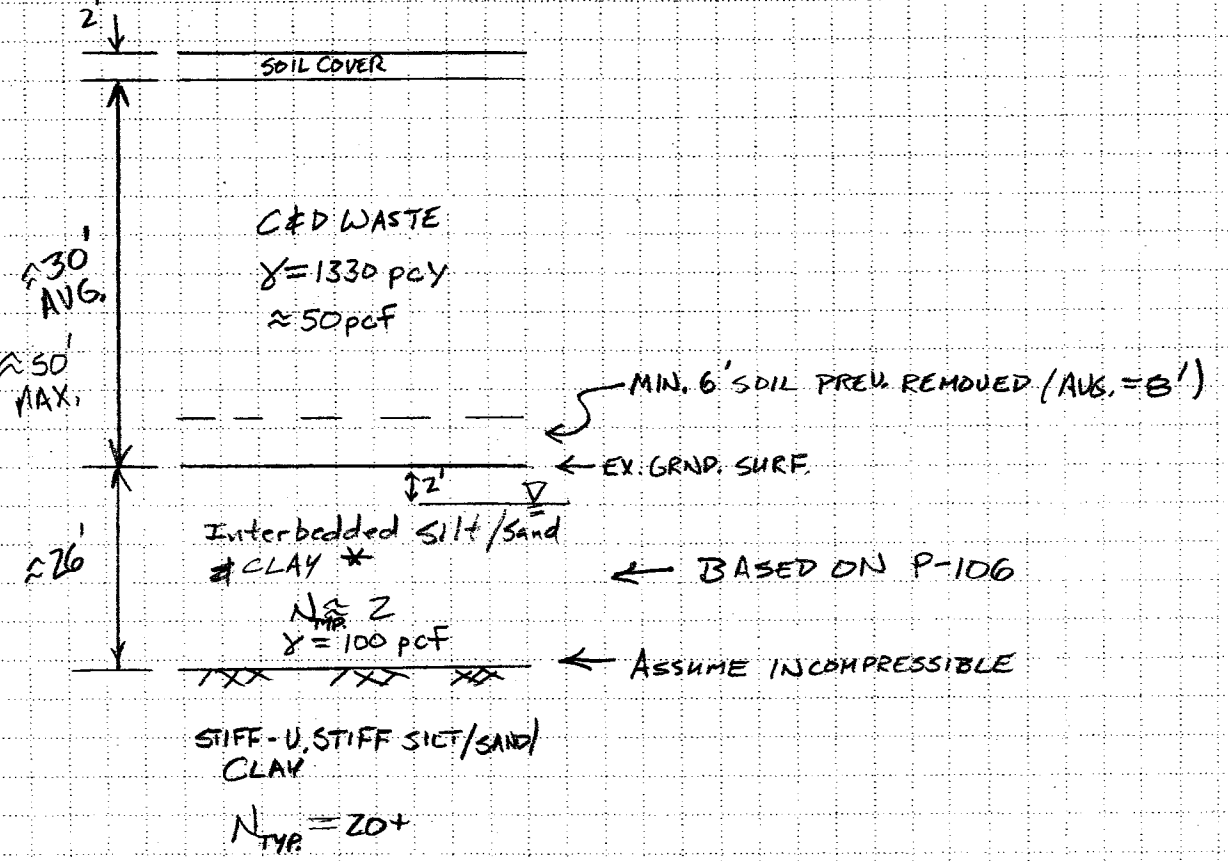
PROJECT Wilson Co, C&DLF
SUBJECT Settlement Analysis

SHEET 1 OF 4
JOB NO. AHLBeeG-3
DATE 7/30/03
COMPUTED BY PKS
CHECKED BY

- Objective: To analyze the settlement potential of the proposed C&DLF unit. Compute both the elastic & consolidation settlements.

- Assumptions:

- Simplified Site Stratigraphy/Loadings:



* Assume 1/2 is Sand - Elastic Settlement
1/2 is Clay - Consol. Settlement
E_s = 150 ksf - V. Soft Clay or V. Loose Sands[1]

[1] Bowles, J.E. (1988), Foundation Analysis & Design, McGraw-Hill, New York, p. 99.

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- Calculate Stress Increase @ Mid Pt. of 50ft Layer:

$\Delta\sigma_v$ @ Ground Surf. = 3' FILL (ASSUMED) + 30' C&D + 2' SOIL COVER

$= 5'(110\,pcf) + 30(50\,pcf) = 2{,}050\ psf$

$$\sigma_{MIDPT} = \frac{\Delta\sigma_v \times B \times L}{(B+z)(L+z)} \qquad z = 13'$$

(B & L: WIDTH & LENGTH OF LF)

$$= \frac{2050 \times 600 \times 900}{(600+13)(900+13)} = 1{,}978\ psf = \Delta\sigma_{v=13'}$$

W/ 50' C&D $\Delta\sigma_v = 3{,}050\ psf$; $\sigma_{MIDPT} = 2{,}943\ psf$

- Calculate Elastic Settlement:

$$\Delta H_E = \frac{PL}{AE}$$

$\frac{P}{A} = \Delta\sigma_{v=B'} = 1{,}978\ psf$

L = Layer Thickness (Assume $\frac{1}{2} \times 26' = 13'$)

$E = 150\ ksf = 150{,}000\ psf$

$$\Delta H_E = \frac{1{,}978\,(13')}{150{,}000} = 0.17' \cong 2''$$

W/ 50' C&D, $\Delta H_E = 0.26' \approx 3''$

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– Calculate Consolidation Settlement:

$$\Delta H_c = RR\, H_o \log \frac{P_p'}{P_o} + CR\, H_o \log \frac{P_o + \Delta P}{P_p}$$

$P_p = 2200$ psf

$P_o = 13' \times 100\ pcf - 11' \times 62.4' \cong 614$ psf

$\Delta P = \Delta T_{V=13'} = 1{,}978$ psf

$H_o = 1/2 \times 26' = 13'$

$RR = .008$ } – CONSOL. TEST DATA – ATTACHED

$CR = .33$

$$\Delta H_c = .008(13) \log \frac{2200}{614} + 0.33(13) \log \frac{614+1978}{2200}$$

$$= .06' + 0.31' = 0.37'$$

w/ 50' C&D, $\Delta H_c = .06 + .90 = 0.96'$

– Total Settlement:

$$\Delta H_{TOTAL} = \Delta H_E + \Delta H_c = .17' + 0.37' = \underline{0.54'} = 6.5''$$

w/ 50' C&D, $\Delta H_{TOTAL} = 0.26' + 0.96' = 1.22'$

∴ MAX Settlement = 1.2'; TYP. Settlement = 0.5'

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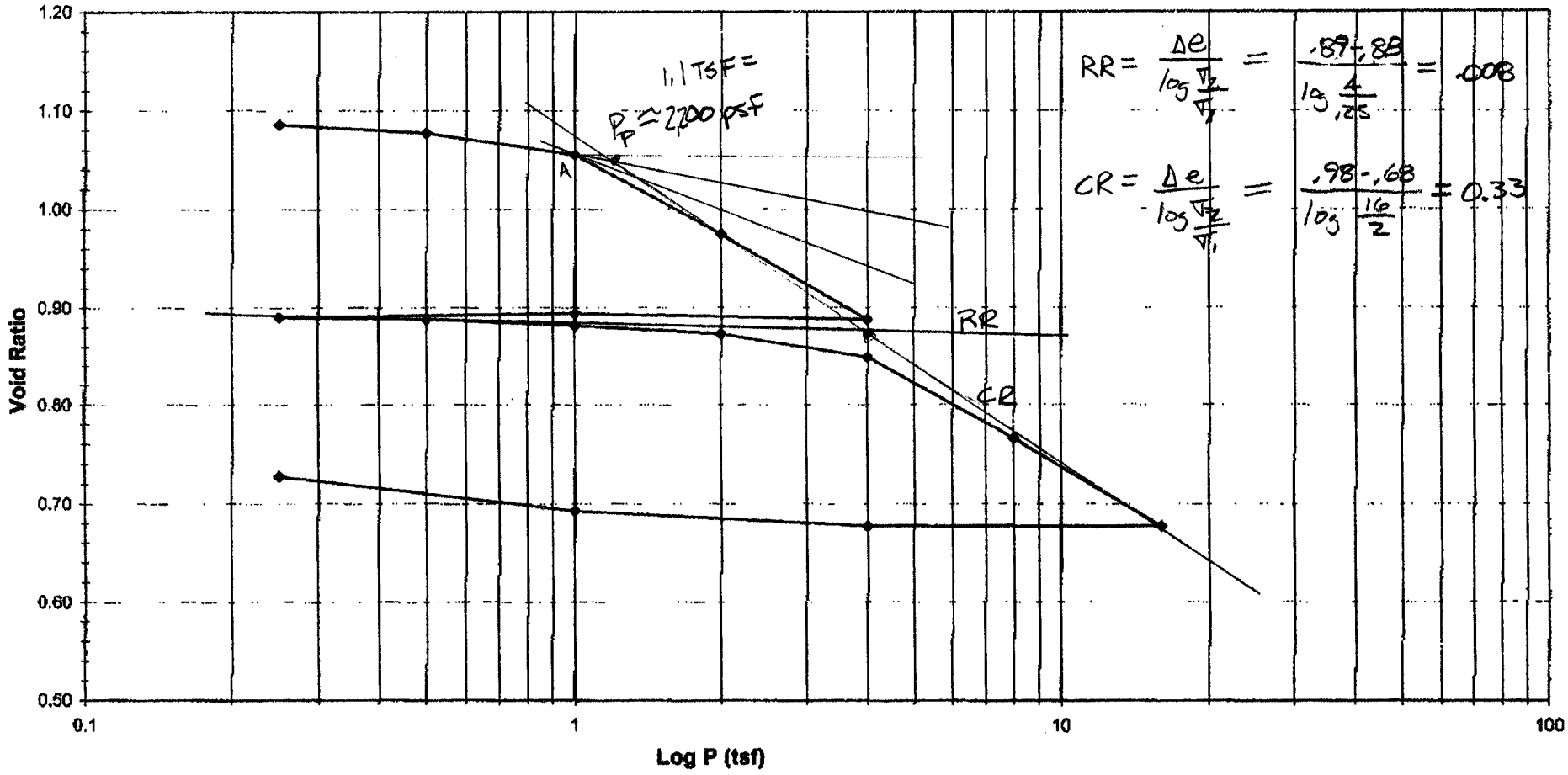
ONE DIMENSIONAL CONSOLIDATION

ASTM D 2[illegible]6 (SOP-S24)

Client	BABB ASSOCIATES	Boring No.	P-106
Client Reference	WESTSIDE CDLF	Depth (ft)	12.0-14.0
Project No.	R02085-01	Sample No.	11-5-02
Lab ID	R02085-01.01	Visual Description	GRAY CLAY & SAND

Sample Conditions: UNDISTURBED, INUNDATED AND DOUBLE DRAINED



4/4

Tested By DAJ *Date* 12/16/02 *Approved By* *Date*

DCN: CT-S24F Date: 11/9/00 Revision: 4

C:\2002 Projects\R02085 Babb\[R02085-01.01 CONSOL...xls]Sheet1

2200 Westinghouse Boulevard • Suite 105 • Raleigh, NC 27604 • Phone (919) 876-0405 • Fax (919) 876-0460

Erosion and Sedimentation Control Plan

WILSON COUNTY
WESTSIDE C&D LANDFILL FACILITY
Wilson, North Carolina

Prepared for:
Wilson County
Department of Solid Waste
P.O. Box 1728
Wilson, North Carolina
27894

September 2004

PERMIT DOCUMENT

Prepared by:

Gary W. Ahlberg, P.E.
Consulting Engineer
Post Office Box 58
Wilmington, North Carolina 28402

EROSION AND SEDIMENTATION CONTROL PLAN
WESTSIDE C&D LANDFILL FACILITY
WILSON COUNTY DEPARTMENT OF SOLID WASTE
WILSON COUNTY, NORTH CAROLINA

1. Purpose

Wilson County currently operates a landfill for the disposal of construction and demolition debris generated in the County. Located east of Wilson, North Carolina, the proposed Westside Construction and Demolition Landfill Facility (CDLF) is adjacent and generally west of the existing landfill facility. The Westside facility property is 100.00 Acres owned by Wilson County and described as Tract 1 in the attached Recombination Plat for the Wilson County Landfill, prepared by Herring Sutton and Associates; a vicinity map is included in the plat. When originally purchased by the County as a dedicated landfill borrow site in 1990, the site contained 127.98 Acres and was described as the Williamson Borrow Site. While the Williamson Borrow Site was depleted in the mid 1990's, Wilson County has continued to use the property for soil stockpiles and other solid waste management activities. Land disturbing activities were originally approved by the NC Division of Land Resources on March 19, 1990; see attached Letter of Approval. The original Erosion and Sedimentation Control Plan includes permanent structures which continue to operate on the site. This plan evaluates existing conditions and the suitability of existing structures, and specifies new temporary and permanent measures to maintain compliance with the Sedimentation Pollution Control Act of 1973. Pursuant to the North Carolina Sedimentation Pollution Control Act, Wilson County is requesting review and approval of this plan by the North Carolina DENR DLR Land Quality Section.

The proposed Westside waste boundary is 10.5 Acres, and is defined as the landfill footprint. Limited to a portion of the originally disturbed borrow area, the construction limits include perimeter channels and access roads for a total disturbed area of 19.4 Acres. A NC DENR permit fee of $1,000.00 is attached for plan review, with the Financial Responsibility and Ownership Form completed by Wilson County. The landfill will receive C&D waste and additional wastes compatible with the facility design. The estimated 5-year disposal capacity is approximately 100,000 tons. The calculated total landfill capacity is 215,000 tons yielding an estimated project life of 10 years. No additional borrow activities are proposed on the Westside site.

Prior to landfill operation, a compacted soil layer shall be constructed for the landfill base. The landfill base will be constructed in 3 contiguous cells within the first 5-year operating period. Previous restoration grading activities have established suitable condition to begin Cell 1 (2 Acres) landfill operations. Using existing grassed swales and temporary ditches, all of Cell 1 drainage is directed to the existing West Sediment Basin for control prior to discharge to Buck Branch. Plan approval is necessary for construction of new permanent channels and restoration of the Main Sediment Basin. All cover soils will be imported from Wilson County's dedicated landfill borrow site located to the west of the Westside Facility, identified as the Tucker Borrow Site and approved by the NC DLR in 1995.

2. Plan Elements

The S&EC Plan for the borrow site includes narrative descriptions, attachments, and drawings including the following elements:

- Vicinity Map
- Site Development/Existing Conditions Drawing
- Site Erosion and Sedimentation Control Drawings
- Detail Drawings for Specified Practices and S&EC Structures
- Design Calculations and Assumptions
- Vegetation Specifications for Temporary and Permanent Stabilization
- Construction Schedule
- Financial/Ownership Form.

3. Site Conditions

3.1. Facility Property

Attached to this report is a recombination plat of the Wilson County Landfill prepared by the surveyor, defining two tracts for the separate landfill facilities. The plat includes a vicinity map providing the general location of site to the east of the City of Wilson, and accessed via Landfill Road (SR 1503). Tract 2 contains 196.45 Acres and defines the property for the MSW Landfill Facility; this is provided for reference only in this application. By dedication and maintenance of a 50-foot buffer from the MSW Landfill Facility, the Westside CDLF is separate and apart from the MSW Facility.

Tract 1 contains the 100.00 Acres which delineates the Westside C&D landfill site proposed for this permit, and an additional 3.76 Acre buffer property. The site is in Gardners Township of Wilson County and bisected by the extraterritorial jurisdiction (ETJ) of the City of Wilson, North Carolina. The property boundary presented in site drawings and figures for this report is the 100.00 Acres delineated in the recombination plat by the surveyor.

The site's western boundary is established by the center-line run of Buck Branch. The adjoining properties on the west and east are owned by Wilson County. To the west, Wilson County recently purchased the 76.43 Ac property identified as the Mohesky Farm. The Mohesky Farm provides potential future off-site borrow resources for Wilson County landfill projects; NC DLR approval is required prior to development. Continuing upstream along Toisnot Swamp from the Mohesky Farm is the Tucker Borrow Site. The Tucker Borrow Site was purchased by Wilson County in 1995 and is the active borrow site for current landfill projects. The only surrounding property not owned by Wilson County is farmland located upslope and generally north of the site.

3.2. Topographic Mapping and GIS Resources

Topographic mapping (2-foot contour interval) for the site was included in the 1998 project completed by GeoData Corporation, of Zebulon, North Carolina. The 1998 topography is generally representative of current ground conditions. In order to provide updated mapping for

landfill construction, HSA surveyed the construction limits for the Westside landfill and mapped one-foot contours in July 2003. Floodplain, zoning, subdivision, and local property boundary (plat) data was provided by Wilson County's Mapping/GIS Department.

Topographic relief on the site is gradually sloping north to south, toward Buck Branch and Toisnot Swamp. The slope increases upgradient of the landfill footprint to the northern property boundary. Ditches were constructed with borrow site operation to convey stormwater to an existing sedimentation basins west and south of the footprint.

3.3. Soils

According to the SCS Soil Survey of Wilson County North Carolina, the mapped soil series include Wagram, Gritney, Altavista, and Tarboro Coastal Plain sediments. Within the construction limits, these soils have been removed by borrow operations and mostly clay soils, or sandy clays are exposed at the surface.

3.4. Wetlands

Jurisdictional wetlands are present within the floodplain regions bordering the surface waters on-site. According to a field delineation performed in 1994 and reviewed by the U.S. Army Corps of Engineers, wetlands on-site are contained within the existing woodland areas shown on the drawings. An approximate wetland boundary is illustrated on the map. These wetland areas will not be disturbed by construction activities on the site. According to the irregular relief within the swamp areas, surface water accumulating in the wetland areas likely form runs which drain to the streams.

3.5. Surface Waters

The site contains one stream and one intermittent stream. The site's western boundary is established by the center-line run of Buck Branch. Buck Branch is a named stream on the USGS Quadrangle Map for the area. Along the eastern site boundary, an intermittent stream is present in the vegetated area. This stream is identified as such on the Local Area Map. Both Buck Branch and the intermittent stream feed into Toisnot Swamp. All surface waters in the local area are classified by NC Surface Water Standards as Class C waters. Toisnot Swamp is a major tributary stream and groundwater discharge feature in the area. This site is subject to the Neuse Buffer requirements, which is illustrated on the drawings.

4. Design Procedures and Goals

The sediment and erosion control plan is designed based on the guidelines and procedures set forth in the North Carolina Erosion and Sediment Control Planning and Design Manual (E&SCP&DM) and "Elements of Urban Stormwater Design" (EOUSD), by H. Rooney Malcom, P.E. Drawing No. 2 – Drainage Plan illustrates the features of the S&EC plan for the site. Design calculations and a construction sequence for S&EC measures are attached to this report.

In accordance with the NC Sedimentation Pollution Control Act, all S&EC structures specified for the borrow site are designed for the 10-year storm event. Ditches and channels are oversized to allow for some sediment accumulation during construction. In general, this plan follows the

guidelines established in the North Carolina Erosion and Sediment Control Planning and Design Manual (E&SCP&DM).

Sedimentation and erosion occurs when cleared areas are allowed to remain disturbed for extended periods of time without a vegetative cover being established. Once vegetation has been established on the disturbed areas, the erosion potential is minimized and temporary sedimentation and erosion control measures may be removed. A seeding plan for disturbed areas is specified for permanent borrow area stabilization.

In general, this plan describes the various types of erosion control measures used on the site and specifies the design of channels, velocity controls, temporary sediment trap and permanent basin structures. Both the temporary and permanent erosion and sedimentation control devices employed in this project use a combination of filtration and settling to remove silt/sediment from stormwater.

All stormwater flow volumes are calculated using the Rational Method based on a 10-year storm event. Runoff coefficients for various ground cover conditions are referenced to Table 8.03a in the E&SCP&DM. Rainfall intensities used in the Rational Method are derived from Table 8.03d E&SCP&DM, using times of concentration calculated with the Kirpich Equation. Drainage areas, slope gradients and distances were determined using computer aided design techniques.

4.1. Phased Development of Landfill

The landfill base will be constructed in three cells over the intial 4 years of operation. Drainage from Cell 1 and the northwest landfill quadrant is controlled by the existing West Sediment Basin. Prior to construction of Cell 2, the Main Basin requires construction of a new access road for restoration and future maintenance. The embankments for the loop access road create the outboard bank for a perimeter channel loop around the landfill. For constructability, these permanent channels (PC) are constructed with a 7-ft base, and depths of 1-2 feet. Final Grade plans include diversion berms to capture drainage from the top landfill surface and route to the perimeter channels via permanent slope drains.

4.2. Permanent Structures

Design calculations are attached for all channels and ditches. Channel lining materials are specified for use according to the manufacturer's properties and recommendations for construction. At locations where temporary downpipes or permanent slope drains and culverts discharge, channel segments are improved with armoured rip rap lining to control flow dynamics. The design utilizes conventional liner materials to stabilize channels. The channels direct run-off to the sediment basins. The design incorporates the two (2) existing basins.

Design for the permanent sediment basins is consistent with E&SCP&DM Section 6.60. The structure provides a volume of 1800 ft3/acre of disturbed area and meets the surface area requirements set forth in E&SCP&DM. E&SCP&DM guidelines for permanent basins include riser/barrel principal spillways and emergency weir-type spillways. The principal spillway must be met with one foot of driving head. The crest of the emergency spillway is set one foot above the invert of the riser and must pass the peak run-off from the 10-year storm event with one foot of freeboard to crest of berm. The riser/barrel and emergency spillways were designed using spreadsheet based on methods provided in EOUSD. The riser/barrel assembly must be

constructed with an anchor displacing a buoyant weight of at least 1.1 times the weight of water displaced by the riser. The riser must also be provided with a method of dewatering the basin.

The existing Area A basin provides storage capacity that greatly exceeds the required 1800 ft3/acre design volume. This impoundment has been in-place for several decades and the surface features are in excellent condition, with well established vegetation. Based on its performance as an existing, functional structure, no spillway modifications are proposed for its use as a sediment basin. Evidently, when the transmission lines were constructed at this location, a rock trench was installed to drain impounded water through the embankment. The constructed swale under the transmission lines acts as an emergency spillway; however no flow condition has been observed where the water level from the impoundment has breached the swale. Superior vegetation is established in the swale and construction activities would compromise the established growth. If conditions prove otherwise, the S&EC plan would be modified to fit the feature with a standard riser/barrel principal spillway and reinforced emergency spillway.

4.3. Temporary Structures

The design utilizes existing grassed swales and temporary diversion ditching to convey stormwater to permanent channels and the control structures. Ditch design is standardized across the site to establish clear operating requirements for soil borrow operations. Ditch depth allows for sedimentation during construction, with a minimum freeboard of 6 inches. These measures are designed to provide temporary erosion control until permanent vegetative cover is established.

5. Maintenance and Sediment Disposal

All sedimentation and erosion control devices will be inspected at regular intervals and immediately following any significant rainfall event. Repairs will then be made as needed and accumulated sediment removed if necessary. All sediments which are removed during cleaning operations will be located in an area which is isolated from storm drainage and stabilized with vegetative cover.

Design allows for at least 6 inches of sediment to accumulate in channels and ditches. If accumulation exceeds 6 inches, sediment must be removed from channel or ditch. For the sediment basins and traps, sediment/silt will be removed prior to one-half of the basin volume becoming filled with sediment. A level gauge shall be set in each basin for monitoring sediment accumulation.

6. Vegetation Plan

Vegetative cover must be established as soon as possible in inactive areas of the landfill. The landfill will be constructed in 5-10 lifts, which establish intermediate elevations. Areas at intermediate grade are covered with 12 inches of soil and seeded for stabilization. At final grade, a final cover is constructed on the perimeter slopes and top landfill surface. The final cover design is a 2-foot soil layer, with a 6-in topsoil surface, vegetated with native grasses. Temporary seeding may be used when cover is required in a season outside the best dates for permanent seeding. Seeding requirements are included in the project details.

Prior to any seeding operation, the soil shall be limed, fertilized, and disked. Soil testing shall be performed to determine the specific nutrient requirements of the soil. Adequate nutrient inputs are critical to establishing good vegetation in exposed subsoils. Incorporating the appropriate amounts of organic matter into the soil by using composted materials can also help to establish a good seed bed. Mulch or compost shall be used to protect permanent seeding applications.

7. GENERAL CONSTRUCTION SCHEDULE

1. Inspect existing West Basin and clean as necessary to limits shown on Drawings.
2. Install TC-2 V ditch and perimeter landfill toe dikes for Cell 1 operation.
3. Evaluate existing swale TC-1 for performance, replace with PC-1 if necessary.
4. Improve main haul road and extend into Cell 1 landfill operation.
5. Construct access roads along west perimeter of Cell 1, PC-1 segments, and RCP1.
6. Extend access roads, PC-1 and PC-2 along west perimeter to access and restore Main Basin ahead of Cell 2 base construction.
7. Restore Main Basin as shown on Drawings.
8. Construct Haul Road and Roadside Ditch as lifts progress.
9. Install access roads and PC-3 along east perimeter to Main Basin.
10. Install temporary downpipes for top landfill surface as lifts progress.
11. Seed intermediate cover areas on landfill.
12. When Phase 1 operations are complete, install partial final cover on competed perimeter slopes.
13. Continue use of temporary measures to convey landfill operational drainage to perimeter channels and basins.
14. When Phase 2 operations are complete, install remaining final cover on perimeter slopes and top landfill surface, including stormwater berms and permanent slope drains.
15. Clean channels and basins, maintain until vegetation is full established through facility post closure plan.

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Westside CDLF
Drainage Areas for Construction

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Drainage areas for stormwater calculations were delineated under final grade conditions, as represented in Drawing C3, Final Grade Plan.

TABLE 1 - DRAINAGE AREAS

Drainage Area ID	Area sq ft	Acreage	Gradient ft/ft	Comments
1	21,640	0.50	0.10	Landfill top surface
2	21,370	0.49	0.10	Landfill top surface
3	35,930	0.82	0.10	Landfill top surface
4	33,160	0.76	0.10	Landfill top surface
5	107,950	2.48	0.25	Landfill perimeter slope
6	204,750	4.70	0.25	Landfill perimeter slope
7	181,640	4.17	0.25	Landfill perimeter slope
8	57,620	1.32	0.25	Landfill perimeter slope
9	213,300	4.90	0.08	Undisturbed area to West Basin
10	450,000	10.33	0.05	Undisturbed area to Main Basin
Cell 1	100,670	2.31	0.01	Initial Landfill Cell 1 footprint area

TABLE 1

SEDIMENT BASIN DESIGN CRITERIA
West Basin

Drainage Area (ft^2)	306,850
Drainage Area (ac) A =	7.04
Disturbed Drainage Area (ft^2) A=	306,850
Disturbed Drainage Area (ac) A=	7.04
Rational Coefficient C = Table 8.03a, E&SCP&DM	0.45
Length of Flow (Overland) (ft)	n/a
Length of Flow (Channel / Ditch) (ft)	n/a
Height Change (Overland) (ft)	n/a
Height Change (Channel / Ditch) (ft)	n/a
Time of Concentration:	
Tc (min) (Overland +Channel / Ditch)	n/a
Tc Used	5
Intensity (in/hr) I = Tables 8.03b - 8.03g, E&SCP&DM	8
Peak Flow:	
Q = C*I*A (cfs)	25.36
Rounded Q (cfs)	**26**
Minimum Volume per Acre (ft^3/ac)	1800
Minimum Volume (ft^3)	**12,680**
Required Surface Area of Basin (ac) A = 0.01 * Q	0.26
Required Surface Area of Basin (ft^2)	**11,326**

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TABLE 2
Analysis of Stage-Storage Function
West Basin

Contour (ft)	Contour Area (sq ft)	Incr Vol (cu ft)	Accum Vol (cu ft)	Stage Z (ft)	ln S	ln Z
88	0	0	0	0		
89	5000	2500	2500	1	7.8240	0.0000
90	6000	5500	8000	2	8.9872	0.6931
91	12000	9000	17000	3	9.7410	1.0986
92	16800	14400	31400	4	10.3546	1.3863
93	18000	17400	48800	5	10.7955	1.6094

Regression Output:

Constant	7.771069	b=	1.85
Std Err of Y Est	0.0674095	Ks =	2232
R Squared	0.997535		
No. of Observations	5		
Degrees of Freedom	3		
X Coefficient(s)	1.8479228		
Std Err of Coef.	0.0530358		

Calibrated Stage Storage Function S = Ks * Z ^ b

Required Storage Volume S = 12680 ft^3

Height of Riser Z = 2.56 ft
Z = (S / Ks) ^1/b

Use 3 ft

Riser Base Invert - Barrel Inlet Elev. = 88 ft

Set Riser Rim (Top) Elev. = 91 ft

Actual Surface Area of Basin S.A.act = 12,000 ft^2
A = (ds/dz) - (b * ks * Z^(b-1))

Required Surface Area of Basin S.A. req = 11,326 ft^2

Conclusions: West Basin with a 3-ft riser, rim elev = 91.0,
has adequate storage and surface area, with the Design Ratios:

Storage DR =	1.34
Surface Area DR =	1.06

TABLE 3

STAGE DISCHARGE FOR RISER/BARREL SPILLWAY WITH EMERGENCY WEIR
RISER/BARREL/SPILLWAY REQUIREMENTS
WEST BASIN

Riser diam.	15 (in)	Principal Spillway Capacity = 0.2 cfs/ac.	
Top of riser elev.	91.00 (ft)	Drainage area = 7.04 ac	
Cw riser	3.33		
Cd riser	0.60	Therefore, capacity at elevation	92 ft.
		must be greater than	1.4 cfs
Barrel diam.	12 (in)	Actual Capacity =	5.9 cfs
Barrel invert elev.	88 (ft)		
Cd barrel	0.60	Emergency spillway must pass 10-yr flow with 1 ft freeboard.	
		Emergency spillway crest Elevation	92 ft.
Weir length (minimum)	20 (ft.)	Top of Berm Elevation =	94 ft.
Weir crest elev.	92.00 (ft.)		
Cw weir	3.00	10-yr storm flow =	26 cfs
		Flow at 93.00 ft. is	60 cfs
Top of berm elev.	94.00 (ft)		

Elevation (ft.)	Stage (ft.)	Riser (weir) (cfs)	Riser (orifice) (cfs)	Barrel (cfs)	Pricipal Spillway (cfs)	Emergency Spillway (cfs)	Total Outflow (cfs)
88.00	0.00	0	0	0	0	0	0
88.25	0.25	0	0	0	0	0	0
88.50	0.50	0	0	1	0	0	0
88.75	0.75	0	0	2	0	0	0
89.00	1.00	0	0	3	0	0	0
89.25	1.25	0	0	3	0	0	0
89.50	1.50	0	0	4	0	0	0
89.75	1.75	0	0	4	0	0	0
90.00	2.00	0	0	5	0	0	0
90.25	2.25	0	0	5	0	0	0
90.50	2.50	0	0	5	0	0	0
90.75	2.75	0	0	6	0	0	0
91.00	3.00	0	0	6	0	0	0
91.25	3.25	2	3	6	2	0	2
91.50	3.50	5	4	7	4	0	4
91.75	3.75	8	5	7	5	0	5
92.00	4.00	13	6	7	6	0	6
92.25	4.25	18	7	7	7	8	14
92.50	4.50	24	7	8	7	21	28
92.75	4.75	30	8	8	8	39	47
93.00	5.00	37	8	8	8	60	68
93.25	5.25	44	9	8	8	84	92
93.50	5.50	52	9	8	8	110	119
93.75	5.75	60	10	9	9	139	148

Riser Anchor Block - Bouyancy Calculations **West Basin**

Uplift Force:

F = Volume Riser X Density of Water

Volume Riser

Diameter = 15 in.
Height = 3 ft.

Volume = 3.68 ft^3

Unit Weight of Water 62.4 lb/ft^3

Uplift Force F = 229.6 lbs.

Safety Factor:

Use Fs = 1.5

Fb = F x Fs

Fb = 344.4 lbs.

Ballast Required:

Unit Weight of Concrete = 150 lb/ft^3

Bouyant Weight of Concrete = Density of Concrete - Density of Water

Bouyant Weight of Concrete = 87.6 lb/ft^3

Volume of Ballast Anchor:

Volume = Fb / Bouyant Weight of Concrete

Volume = 3.932 ft^3
Use Block 3 ft. X 3 ft. X 1 ft. = 9 ft^3
Subtract volume of riser in block = 1.23 ft^3
Net concrete volume = 7.77 ft^3

Fa = 680.90 lbs.
Design Ratio = 2.97

DEWATERING HOLES FOR RISER WEST BASIN

DESIGN: Based on riser diameter and height (maximum head) determine equivalent opening size, Ao (ft^2), to control drainage of the pool. Design hole pattern equivalent to opening size.

$$Ao = \frac{As\ (2h)^{0.5}}{T*Cd*(20{,}428)}$$

where
- Ao = total area of dewatering hole, ft^2
- As = surface area of Basin, ft^2
- h = maximum head of water above hole, ft
- T = detention time to dewater Basin, hr
- Cd = orifice coefficient

BASIN D DATA:

1.0 Riser height = 3 ft

2.0 As = 12000 ft^2

ASSUMPTIONS:

3.0 Equivalent hole is located at mid pt of perfs

4.0 T = 20 hours

5.0 Cd = 0.6

6.0 h = 1

CALCULATE:

7.0 Ao = 0.0692 ft^2

8.0 Perforation Geometry

Hole Diameter = 0.5 inch

Row spacing = 3 inches

determine

N = Number of holes/row

N = 8

9.0 Number of rows, R

R = 6

10.0 Check hole equivalence for perforations

Ao perf = 0.0698 ft^2

deviation 1%

CONCLUSIONS:

Above the 1-ft anchor block, the 2-ft riser segment shall be perforated with 0.5 inch holes:
6 rows, spaced every 3 vertical inches with a 22.5 degree offset between rows;
each row containing 9 holes, equally spaced 45 degrees from riser centerline.
Gravel pack (#57 or #5 washed stone) to cover perforations per detail.
Perforated riser predicted to drain riser stage in 20 hours, when all perforations are open.

TABLE 1

SEDIMENT BASIN DESIGN CRITERIA
Main Basin

Drainage Area (ft^2)	1,020,510
Drainage Area (ac) A =	23.43
Disturbed Drainage Area (ft^2) A=	1,020,510
Disturbed Drainage Area (ac) A=	23.43
Rational Coefficient C = Table 8.03a, E&SCP&DM	0.45
Length of Flow (Overland) (ft)	n/a
Length of Flow (Channel / Ditch) (ft)	n/a
Height Change (Overland) (ft)	n/a
Height Change (Channel / Ditch) (ft)	n/a
Time of Concentration:	
Tc (min) (Overland +Channel / Ditch)	n/a
Tc Used	5
Intensity (in/hr) I = Tables 8.03b - 8.03g, E&SCP&DM	8
Peak Flow:	
Q = C*I*A (cfs)	84.34
Rounded Q (cfs)	**85**
Minimum Volume per Acre (ft^3/ac)	1800
Minimum Volume (ft^3)	**42,170**
Required Surface Area of Basin (ac) A = 0.01 * Q	0.85
Required Surface Area of Basin (ft^2)	**37,026**

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Q

TABLE 2
Analysis of Stage-Storage Function
Main Basin

Contour (ft)	Contour Area (sq ft)	Incr Vol (cu ft)	Accum Vol (cu ft)	Stage Z (ft)	ln S	ln Z
89	0	0	0	0		
90	17500	8750	8750	1	9.0768	0.0000
92	57800	75300	84050	3	11.3392	1.0986
94	70000	127800	211850	5	12.2636	1.6094

Regression Output:

Constant	9.0944366	b=	1.99
Std Err of Y Est	0.0695163	Ks =	9414
R Squared	0.9991011		
No. of Observations	3		
Degrees of Freedom	1		
X Coefficient(s)	1.9926883		
Std Err of Coef.	0.0597698		

Calibrated Stage Storage Function $S = Ks * Z \wedge b$

Required Storage Volume	S =	42170 ft^3
Height of Riser Z = (S / Ks) ^1/b	Z =	2.12 ft
	Use	5 ft
Riser Base Invert - Barrel Inlet	Elev. =	87 ft
Set Riser Rim (Top)	Elev. =	92 ft
Actual Surface Area of Basin A = (ds/dz) - (b * ks * Z^(b-1))	S.A.act =	57,800 ft^2
Required Surface Area of Basin	S.A. req =	37,026 ft^2

Conclusions: Main Basin with a 5-ft riser, rim elev = 92.0 controlling basin surface area, has adequate storage and surface area, with the Design Ratios:

Storage DR =	5.02
Surface Area DR =	1.89

TABLE 3

STAGE DISCHARGE FOR RISER/BARREL SPILLWAY WITH EMERGENCY WEIR
RISER/BARREL/SPILLWAY REQUIREMENTS
MAIN BASIN

Riser diam.	36 (in)	Principal Spillway Capacity = 0.2 cfs/ac.	
Top of riser elev.	92.00 (ft)	Drainage area = 23.43 ac	
Cw riser	3.33		
Cd riser	0.60	Therefore, capacity at elevation	94 ft.
		must be greater than 4.7 cfs	
Barrel diam.	30 (in)	Actual Capacity = 48.1 cfs	
Barrel invert elev.	87 (ft)		
Cd barrel	0.60	Emergency spillway must pass 10-yr flow with 1 ft freeboard.	
		Emergency spillway crest Elevation =	94 ft.
Weir length (minimum)	30 (ft.)	Top of Berm Elevation =	96 ft.
Weir crest elev.	94.00 (ft.)		
Cw weir	3.00	10-yr storm flow =	85 cfs
		Flow at 95.00 ft. is	90 cfs
Top of berm elev.	96.00 (ft)		

Elevation (ft.)	Stage (ft.)	Riser (weir) (cfs)	Riser (orifice) (cfs)	Barrel (cfs)	Pricipal Spillway (cfs)	Emergency Spillway (cfs)	Total Outflow (cfs)
87.00	0.00	0	0	0	0	0	0
87.25	0.25	0	0	1	0	0	0
87.50	0.50	0	0	2	0	0	0
87.75	0.75	0	0	4	0	0	0
88.00	1.00	0	0	7	0	0	0
88.25	1.25	0	0	9	0	0	0
88.50	1.50	0	0	12	0	0	0
88.75	1.75	0	0	16	0	0	0
89.00	2.00	0	0	19	0	0	0
89.25	2.25	0	0	23	0	0	0
89.50	2.50	0	0	26	0	0	0
89.75	2.75	0	0	29	0	0	0
90.00	3.00	0	0	31	0	0	0
90.25	3.25	0	0	33	0	0	0
90.50	3.50	0	0	35	0	0	0
90.75	3.75	0	0	37	0	0	0
91.00	4.00	0	0	39	0	0	0
91.25	4.25	0	0	41	0	0	0
91.50	4.50	0	0	43	0	0	0
91.75	4.75	0	0	44	0	0	0
92.00	5.00	0	0	46	0	0	0
92.25	5.25	4	17	47	4	0	4
92.50	5.50	11	24	49	11	0	11
92.75	5.75	20	29	50	20	0	20
93.00	6.00	31	34	51	31	0	31
93.25	6.25	44	38	53	38	0	38
93.50	6.50	58	42	54	42	0	42
93.75	6.75	73	45	55	45	0	45
94.00	7.00	89	48	57	48	0	48
94.25	7.25	106	51	58	51	11	62
94.50	7.50	124	54	59	54	32	86
94.75	7.75	143	56	60	56	58	115
95.00	8.00	163	59	61	59	90	149

Riser Anchor Block - Bouyancy Calculations **Main Basin**

Uplift Force:

F = Volume Riser X Density of Water

Volume Riser

Diameter = 36 in.
Height = 5 ft.

Volume = 35.33 ft^3

Unit Weight of Water 62.4 lb/ft^3

Uplift Force F = 2204 lbs.

Safety Factor:

Use Fs = 1.5

Fb = F x Fs

Fb = 3306 lbs.

Ballast Required:

Unit Weight of Concrete = 150 lb/ft^3

Bouyant Weight of Concrete = Density of Concrete - Density of Water

Bouyant Weight of Concrete = 87.6 lb/ft^3

Volume of Ballast Anchor:

Volume = Fb / Bouyant Weight of Concrete

Volume =	37.74 ft^3
Use Block 4.5 ft. X 4.5 ft. X 2.5 ft. =	50.6 ft^3
Subtract volume of riser in block =	17.67 ft^3
Net concrete volume =	32.93 ft^3

Fa = 2884.54 lbs.
Design Ratio = 1.31

DEWATERING HOLES FOR RISER **MAIN BASIN**

DESIGN: Based on riser diameter and height (maximum head) determine equivalent opening size, Ao (ft^2), to control drainage of the pool. Design hole pattern equivalent to opening size.

$$Ao = \frac{As\ (2h)^{0.5}}{T*Cd*(20,428)}$$

where
- Ao = total area of dewatering hole, ft^2
- As = surface area of Basin, ft^2
- h = maximum head of water above hole, ft
- T = detention time to dewater Basin, hr
- Cd = orifice coefficient

BASIN D DATA:

1.0 Riser height = 2.5 ft available

2.0 As = 57800 ft^2

ASSUMPTIONS:

3.0 Equivalent hole is located at mid pt of perfs

4.0 T = 72 hours

5.0 Cd = 0.6

6.0 h = 1.25

CALCULATE:

7.0 Ao = 0.1036 ft^2

8.0 Perforation Geometry
Hole Diameter = 0.5 inch
Row spacing = 3 inches

determine
N = Number of holes/row
N = 15

9.0 Number of rows, R
R = 5

10.0 Check hole equivalence for perforations

Ao perf = 0.1044 ft^2
deviation 1%

CONCLUSIONS:
Above the 2.5-ft anchor block, the 2.5-ft riser segment shall be perforated with 0.5 inch holes:
5 rows, spaced every 3 vertical inches with a 11 degree offset between rows;
each row containing 15 holes, equally spaced 22.5 degrees from riser centerline.
Gravel pack (#57 or #5 washed stone) to cover perforations per detail.
Perforated riser predicted to drain riser stage in 72 hours, when all perforations are open.

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Westside CDLF
Drainage Areas for Construction

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Drainage areas for stormwater calculations were delineated under final grade conditions, as represented in Drawing C3, Final Grade Plan.

TABLE 1 - DRAINAGE AREAS

Drainage Area ID	Area sq ft	Acreage	Gradient ft/ft	Comments
1	21,640	0.50	0.10	Landfill top surface
2	21,370	0.49	0.10	Landfill top surface
3	35,930	0.82	0.10	Landfill top surface
4	33,160	0.76	0.10	Landfill top surface
5	107,950	2.48	0.25	Landfill perimeter slope
6	204,750	4.70	0.25	Landfill perimeter slope
7	181,640	4.17	0.25	Landfill perimeter slope
8	57,620	1.32	0.25	Landfill perimeter slope
9	213,300	4.90	0.08	Undisturbed area to West Basin
10	250,000	5.74	0.05	Undisturbed area to Main Basin
Cell 1	100,670	2.31	0.01	Initial Landfill Cell 1 footprint area

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Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: PC-1
Perimeter channel west of landfill, with divided flow along the northwest landfill boundary, confluencing at the access road culvert, taking on undisturbed overland flow south of the haul road, and draining to the west basin

Peak Flow Rate:

Select:

Time of Concentration =	5.00	minutes	conservative selection
Rational Coefficient (C) =	0.35		(to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)
Rainfal Intensity (I) =	8	10-year storm	from Ref1
Contributing Areas:	3+8+9		
Area (A) =	7.04	acres	
Contributing flows (cfs)=	0		
Peak Flow Q (cfs) =	19.7		

Ditch/Channel Parameters: (User Input)

Lining:	Erosion Control Mat	
Channel Slope (ft/ft) =	0.005	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	7	
M =	3	
M(2) =	3	

SLOPE	0.5%			
Normal Depth Calculations:				
			Velocity:	
			V (ft/s) =	2.58
nQ/(1.49s^0.5) =	5.62			
y (ft) =	0.81		**Liner Shear Stress:**	
			T (lb/ft^2) =	0.25
accuracy =	0.10			
f(M,y,B) =	5.62		**Froude Number:**	
			Fr =	0.57
Normal Depth (ft) =	0.81	0.00		

Conclusions:

Use total depth = 1 feet, with 7-foot base width for constructability and adequate freeboard.
Where fill is required use clayey sand, sandy clay, or clay amended to support vegetation.
Line with Excelsior Curlex 2 or equivalent to stabilize grass-lined channel.

See TC-1 existing swale and TC-2 analysis for existing conditions, temporary measures for initial construction.

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: TC-1
Existing grassed swale located west of Landfill Cell 1 draining to west basin. Temporary channel for initial Cell 1 construction. Based on performance, increased landfill elevation above 110 may require construction of PC-1 (projected PC-1 in-service 2005).

Peak Flow Rate:

Select:

Time of Concentration =	5.00	minutes	conservative selection
Rational Coefficient (C) =	0.35	(to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)	
Rainfal Intensity (I) =	8	10-year storm	from Ref1
Contributing Areas:	3+8+9		
Area (A) =	7.04	acres	
Contributing flows (cfs)=	0		
Peak Flow Q (cfs) =	19.7		

Ditch/Channel Parameters: (User Input)

	Lining: Grassed	
Channel Slope (ft/ft) =	0.005	
n =	0.04	For well established vegetation
B (ft) =	0	
M =	50	
M(2) =	50	

SLOPE 0.5%

Normal Depth Calculations:

			Velocity: V (ft/s) =	1.16
nQ/(1.49s^0.5) =	7.49			
y (ft) =	0.58		**Liner Shear Stress:** T (lb/ft^2) =	0.18
accuracy =	0.10			
f(M,y,B) =	7.49		**Froude Number:** Fr =	0.38
Normal Depth (ft) =	0.58	0.00		

Conclusions:

Evaluated under same conditions as PC-1, the existing grassed swale (TC-1) has adequate capacity for initial construction of Cell 1.

Inspect swale and surrounding area following storm events exceeding 2 inches to evaluate performance and need for installation of PC-1.

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: TC-2
Temporary diversion ditch located south and west of Landfill Cell 1 draining to TC-1 and west basin. Temporary channel for initial Cell 1 construction. Start of landfill operations for Cell 2 will remove TC-2 from drainage plan.

Peak Flow Rate:

Select:

Time of Concentration = 5.00 minutes conservative selection

Rational Coefficient (C) = 0.35 (to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)

Rainfal Intensity (I) = 8 10-year storm from Ref1

Contributing Areas: Cell 1

Area (A) = 2.31 acres

Contributing flows (cfs)= 0

Peak Flow Q (cfs) = 6.5

Ditch/Channel Parameters: (User Input)

Lining: Grassed

Channel Slope (ft/ft) =	0.005	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	0	
M =	3	
M(2) =	3	

SLOPE 0.5%

Normal Depth Calculations:

			Velocity:	
			V (ft/s) =	2.14
nQ/(1.49s^0.5) =	1.84			
y (ft) =	1.00		**Liner Shear Stress:**	
			T (lb/ft^2) =	0.31
accuracy =	0.10			
f(M,y,B) =	1.84		**Froude Number:**	
			Fr =	0.53
Normal Depth (ft) =	1.00	0.00		

Conclusions:

TC-2 is a V-ditch with a depth of 1 ft, installed in the landfill base soil layer along the south and southwest limits of Cell 1. This temporary measure serves to divert surface flow from Cell 1 to the existing swale (TC-1) and the west basin. Its useful life is approximately 10 months.

On the southwest alignment, TC-2 is replaced by PC-1, draining north to the access road culvert.

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: PC-2
Perimeter channel west of landfill, beginning south of break to PC-1 (separate flow to west basin), draining south to main basin

Peak Flow Rate:

Select:

Time of Concentration =	5.00	minutes	conservative selection
Rational Coefficient (C) =	0.35	(to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)	
Rainfal Intensity (I) =	8	10-year storm	from Ref1
Contributing Areas:	4+7		
Area (A) =	4.93	acres	
Contributing flows (cfs)=	0		
Peak Flow Q (cfs) =	13.8		

Ditch/Channel Parameters: (User Input)

Lining: Erosion Control Mat

Channel Slope (ft/ft) =	0.005	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	7	
M =	3	
M(2) =	3	

SLOPE	0.5%			
Normal Depth Calculations:				
			Velocity:	
			V (ft/s) =	2.31
nQ/(1.49s^0.5) =	3.93			
y (ft) =	0.66		**Liner Shear Stress:**	
			T (lb/ft^2) =	0.21
accuracy =	0.10			
f(M,y,B) =	3.93		**Froude Number:**	
			Fr =	0.55
Normal Depth (ft) =	0.66	0.00		

Conclusions:

Use total depth = 1 feet, with 7-foot base width for constructability and less maintenance.
Where fill is required use clayey sand, sandy clay, or clay amended to support vegetation.
Line with Excelsior Curlex 2 or equivalent to stabilize grass-lined channel.
Armour 50-foot segments with 6-in riprap / GT-S subgrade, centered on slope drain outlet locations.

Total Depth of 1 feet yileds a capacity design ratio DR=2.1, at V=2.9 fps

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

SHEET:	/
JOB #:	AHLBERG-1
DATE:	8/27/2004
BY:	GWA
CHKD BY:	GWA

Westside CDLF
Normal Depth Analysis

Channel: PC-3
Perimeter channel east of landfill draining south to main basin
Incorporates input from north site area DA10 = 5.74 Ac

Peak Flow Rate:

Select:

Time of Concentration = 5.00 minutes conservative selection

Rational Coefficient (C) = 0.35 (to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)

Rainfal Intensity (I) = 8 10-year storm from Ref1

Contributing Areas: 1+2+5+6+10

Area (A) = 13.91 acres

Contributing flows (cfs)= 0

Peak Flow Q (cfs) = 38.9

Ditch/Channel Parameters: (User Input)

Lining: Erosion Control Mat

Channel Slope (ft/ft) =	0.005	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	7	
M =	3	
M(2) =	3	

SLOPE 0.5%

Normal Depth Calculations:

			Velocity:	
			V (ft/s) =	3.16
nQ/(1.49s^0.5) =	11.09			
y (ft) =	1.17		**Liner Shear Stress:**	
			T (lb/ft^2) =	0.37
accuracy =	0.10			
f(M,y,B) =	11.09		**Froude Number:**	
			Fr =	0.59
Normal Depth (ft) =	1.17	0.00		

Conclusions:

Use total depth = 2 feet, with 7-foot base width for constructability and less maintenance.
Where fill is required use clayey sand, sandy clay, or clay amended to support vegetation.
Line with Excelsior Curlex 2 or equivalent to stabilize grass-lined channel.
Armour 50-foot segments with 6-in riprap / GT-S subgrade, centered on slope drain outlet locations.

Total Depth of 2 feet yileds a capacity design ratio DR=2.5, at V=4 fps

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: SB-1
Stormwater berm placed at the top of the landfill perimeter slope to divert surface drainage to slope drain inlets. Typical construction evaluated for greatest area.

Peak Flow Rate:

Select:

Time of Concentration =	5.00	minutes	conservative selection
Rational Coefficient (C) =	0.35		(to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)
Rainfal Intensity (I) =	8	10-year storm	from Ref1
Contributing Areas:	3		
Area (A) =	0.82	acres	
Contributing flows (cfs)=	0		
Peak Flow Q (cfs) =	2.3		

Ditch/Channel Parameters: (User Input)

Lining: Erosion Control Mat

Channel Slope (ft/ft) =	0.02	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	0	
M =	10	
M(2) =	2	

SLOPE	2.0%			
Normal Depth Calculations:			**Velocity:**	
			V (ft/s) =	2.75
nQ/(1.49s^0.5) =	0.33			
y (ft) =	0.37		**Liner Shear Stress:**	
			T (lb/ft^2) =	0.47
accuracy =	0.10			
f(M,y,B) =	0.33		**Froude Number:**	
			Fr =	1.12
Normal Depth (ft) =	0.37	0.00		

Conclusions:

Use total depth = 1.5 feet to minimize maintenance following completion of final cover project .

Line with one roll width (8-ft) Excelsior Curlex 2 or equivalent to stabilize grass-lined channel.

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Normal Depth Analysis

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

Channel: RS-1
Roadside channel intercepting drainage from top of landfill perimeter slope along the western slope and northern toe.

Peak Flow Rate:

Select:

Time of Concentration =	5.00	minutes	conservative selection
Rational Coefficient (C) =	0.35	(to reconcile the results of the Rational method with the results from the SCS method when examining such a small area)	
Rainfal Intensity (I) =	8	10-year storm	from Ref1
Contributing Areas:	RS1		
Area (A) =	2.48	acres	
Contributing flows (cfs)=	0		
Peak Flow Q (cfs) =	6.9		

Ditch/Channel Parameters: (User Input)

Lining:	Rip Rap	
Channel Slope (ft/ft) =	0.05	
n =	0.03	American Excelsior Manufacturer's Data (conservative estimate)
B (ft) =	0	
M =	4	
M(2) =	2	

SLOPE	5.0%			
Normal Depth Calculations:				
			Velocity:	
			V (ft/s) =	5.31
nQ/(1.49s^0.5) =	0.62			
y (ft) =	0.66		Liner Shear Stress:	
			T (lb/ft^2) =	2.06
accuracy =	0.10			
f(M,y,B) =	0.62		Froude Number:	
			Fr =	1.63
Normal Depth (ft) =	0.66	0.00		

Conclusions:

Use total depth = 1.5 feet to minimize maintenance following completion of final cover project, and provide increased capacity for greater storm intensity.

Velocity and shear stress at full channel run requires rip rap lining with GT-S subgrade.

References:
1. North Carolina Erosion and Sediment Control Planning and Design Manual.
2. Debo, T. and J. Reese, Municipal Storm Water Management, Lewis Publishers, 1995.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Culverts and Slope Drains

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

RCP1 - Access Road crossing to PC-1

	Contributing Channels	Flow (CFS) (CFS)
	TC-2	6.47
	SB-3	2.31
MAX FLOW (Q) (CFS)		**8.78**

Manning's Equation
Q=1.486/n * A * R^2/3 * S^1/2

Slope:		
Vertical Distance		0.2
Horizontal Distance		20
Slope =		0.01
Manning roughness n =		0.014
Calculated Diameter of Pipe (in.)		17.30
Full area		235.2
Diameter Used (in.)		18
% Full		92%
Length of Pipe (FT)		20
Inlet control (orifice)	D1	18 in
	Ke	0.50
	A	1.7671 sf
	V	4.97 fps
Head above center of culvert	h =	0.19 ft

Conclusions:

Install 18" dia. RCP to convey northwest quadrant landfill drainage to PC-1.

Installation follows construction of access road for upstream segments of PC-1.
Use rip rap armour for inlet and outlet protection in PC-1.

Gary W. Ahlberg, P.E.
ENGINEERING AND CONSULTING SERVICES

Westside CDLF
Culverts and Slope Drains

SHEET: /
JOB #: AHLBERG-1
DATE: 8/27/2004
BY: GWA
CHKD BY: GWA

ALL SLOPE DRAINS SD 1-4

		Contributing Channels	Flow (CFS) (CFS)
		SB-3	2.31
MAX FLOW (Q) (CFS)			2.31
Manning's Equation			
Q=1.486/n * A * R^2/3 * S^1/2			
Slope:			
Vertical Distance			30
Horizontal Distance			120
Slope =			0.250
Manning roughness n =			0.01
Calculated Diameter of Pipe (in.)			5.06
Full area			20.1
Diameter Used (in.)			12
% Full			18%
Length of Pipe (FT)			124
Inlet control (orifice)		D1	12 in
		Ke	0.50
		A	0.7854 sf
		V	2.94 fps
Head above center of culvert		h =	0.07 ft

Conclusions:

Install 12" dia. CPE Type S for all permanent slope drain installations.

Installation follows completion of final cover when landfill has reached final grade.
Use rip rap armour for inlet and outlet protection.

Sedimentation and Erosion Control
Wilson Westside CDLF

Designed by: GWA
Checked by: GWA

OUTLET PROTECTION FOR CULVERTS

DESIGN: Calculate specific dimensions for outlet protection energy dissipators at 12" and 18" culverts/slope drains.

DATA: Design includes 12" and 18" culverts/slope drains.

CALCULATE: Dimensions for depth and length of Class B rip rap apron.

where, all units are feet and design minimums

do = culvert diameter
Lo = 4*do = length of apron
D = 1.5*stone diameter (10" max) = depth of rip rap layer
W1 = apron width at flared end or headwall
W2 = apron width at Lo

CULVERT DIAMETER do	LENGTH Lo	DEPTH D	WIDTH 1 W1	WIDTH 2 W2
1	4	1.25	3	7
1.5	6	1.25	4.5	10.5

FINANCIAL RESPONSIBILITY /OWNERSHIP FORM
SEDIMENTATION POLLUTION CONTROL ACT

No person may initiate a land-disturbing activity on one or more acres as covered by the Act before this form and an acceptable erosion and sedimentation control plan have been completed and approved by the Land Quality Section, NC Department of Environment, and Natural Resources. (Please type or print and, if question is not applicable, place N/ A in the blank).

Part A.

1. Project Name Westside Construction & Demolition Landfill
2. Location of land-disturbing activity: Wilson County

   City or Township Gardners Township, and Highway/Street SR 1503, Landfill Road
3. Approximate date land-disturbing activity will be commenced: September 2004
4. Purpose of development (residential, commercial, industrial, etc.): Commercial and Municipal
5. Total acreage disturbed or uncovered (including off-site borrow and waste areas): 19.4 Acres

---

6. Amount of fee enclosed $ 1,000.00
7. Has an erosion and sedimentation control plan been filed? Yes

   Enclosed By Gary W. Ahlberg, PE
8. Person to contact should sediment control issues arise during land-disturbing activity.

   Name Steve Clayton Telephone 252-291-7335`
9. Ower(s) of Record (Use blank page to list additional owners):

   Wilson County
   Name(s)

P.O. Box 1728			113 East Nash Street		
Current Mailing Address			Current Street Address		
Wilson	NC	27894	Wilson	NC	27894
City	State	Zip	City	State	Zip

10. Recorded in Deed Book No. 39 Page No. 13

Part B.

Person(s) or firm(s) who are financially responsible for this land-disturbing activity (Use a blank page to list additional persons or firms):

Name of Person(s) or Firm(s): Wilson County

P.O. Box 1728			113 East Nash Street		
Current Mailing Address			Current Street Address		
Wilson	NC	27894	Wilson	NC	27894
City	State	Zip	City	State	Zip

Telephone 252-291-7335 Telephone 252-291-7335

2. (a) If the Financially Responsible Party is not a resident of North Carolina give name and street address of a North Carolina Agent.

Name

Mailing Address

City State Zip

Telephone

Street Address

City State Zip

Telephone

(b) If the Financially Responsible Party is a Partnership or other person engaging in business under an assumed name, attach a copy of the certificate of assumed name. If the Financially Responsible Party is a Corporation give name and street address of the Registered Agent.

Denise Stinagle
Name of Registered Agent

P.O. Box 1728
Current Mailing Address

Wilson NC 27894
City Mailing Address Zip

Telephone 252-291-7335

113 East Nash Street
Street Address

Wilson NC 27893
City State Zip

Telephone 252-291-7335

The above information is true and correct to the best of my knowledge and belief and was provided by me under oath. (This form must be signed by the financially responsible person if an individual or his attorney-in-fact or if not an individual by an officer, director, partner, or registered agent with authority to execute instruments for the financially responsible person). I agree to provide corrected information should there be any change in the information provided herein.

Denise Stinagle
Type or print name

Denise Stinagle
Signature

Asst County Manager
Title or Authority

8/27/2004
Date

I, Melissa W. Parrish, a Notary Public of the County of Nash State of North Carolina, hereby certify that Denise Stinagle appeared personally before me this day and being duly sworn acknowledged that the above form was executed by him.

Witness my hand and notarial seal, this 27th day of Aug, 19 2004

Seal

Melissa W. Parrish
Notary

My commission expires 12/15/07

ORIGINAL EESC APPROVAL

State of North Carolina
Department of Environment, Health, and Natural Resources
Raleigh Regional Office

James G. Martin, Governor
William W. Cobey, Jr., Secretary

Larry South
Regional Manager

DIVISION OF LAND RESOURCES
March 19, 1990

Wilson County
PO Box 1728
Wilson, NC 27893
ATTN: Garry C. Mercer, County Manager

RE: Letter of Approval
Project Name: Wilson Co. Landfill
Location: Wilson County
Submitted by: Municipal Engineering
Date Received: 2-20, 3-6 & 3-8-90
New Submittal (X) Revised ( )

Dear Mr. Mercer:

This office has reviewed the subject Erosion and Sedimentation Control Plan. We find the plan to be acceptable and hereby issue this letter of approval. If any modifications, performance reservations, or recommendations are applicable, a list is enclosed and is incorporated as a part of this letter of approval. If any modifications are not incorporated into the plan and implemented in the field, the site will be in violation of the Sedimentation Pollution Control Act of 1973 (NCGS 113A-61 (d)).

Please be advised that Title 15, North Carolina Administrative Code, 4B.0017(a) requires that a copy of the approved plan be on file at the job site. Also, please consider this letter as notice in accordance with the requirements of North Carolina General Statute (hereinafter NCGS) 113A-61(d) concerning our right to perform periodic inspections to ensure compliance with the approved plan.

North Carolina's sedimentation pollution control program is performance oriented, requiring protection of the natural resources and adjoining properties. If at any time during this project it is determined that the Erosion and Sedimentation Control Plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (NCGS 113A-51 through 66), this office may require revisions in the plan and its implementation to ensure compliance with the Act.

Please note that this approval is based in part on the accuracy of the information provided on the Financial Responsibility Form you have submitted. You are requested to file an amended form if any changes become necessary. In addition, it would be helpful if you would notify this office of the proposed starting date for the activity at the subject site.

Your cooperation is appreciated and we look forward to working with you on this project. If there are any questions, please do not hesitate to contact this office.

Sincerely,

John L. Holley, Jr., P.E., CPESC
Regional Engineer
Land Quality Section

cc: Mr. Jeffrey L. Bechler
Division of Solid Waste Management

JLH

ATTACHMENT 1

BOOK 1396 PAGE 717

PLAN REVIEW COMMENTS

Project Name: Wilson Co. Landfill
Location: Wilson County

Date Received: 2-20-90, 3-6-90 & 3-8
Reviewed By: Brown/Holland/Holley

New Submittal (X) ~~Revised ( )~~ Approved (X) ~~Disapproved~~ ( )

Reasons for Disapproval ( ) Modifications (X) Performance Reservations ( )

1. Suitable stone dams must be provided below the borrow access roads in the existing ditch during installation of the 60" cmp's. Upon completion of the pipe installation, the stone may be used in the dissipator construction.

2. Work may not begin in the north fill area (including the north borrow access road) until revised plans addressing the encroachment of fill into the existing drainage channel are approved by this office. Silt fences will not be appropriate along the toe of the fill within the channel or at the outlet of diversion ditch #3. Special staging of the fill is suggested to address this issue.

3. All netting in ditches must be over the proposed mulch.

4. The proposed thickness for stone treatments must be adjusted to at least 1.5 times the maximum stone size or 2.25 times the d_{50} size. The minimum thickness for NCDOT Class I rip-rap must be at least 18".

5. The dimensions must be given for the proposed concrete anchors at each riser basin sufficient to ensure the amount of concrete is consistent with the design computations.

Recommendations and/or Comments:

Revised record drawings due by 4-1-90.

BOOK 1396 PAGE 720

FINANCIAL RESPONSIBILITY/OWNERSHIP FORM
SEDIMENTATION POLLUTION CONTROL ACT

No person may initiate any land-disturbing activity covered by the Act before this form has been completed and filed with the appropriate Regional Office of the Land Quality Section, N.C. Department of Natural Resources and Community Development. A map is included showing the various regional office representatives. (Please type or print and, if question is not applicable, place N/A in the blank.)

Part A.

1. Project where land-disturbing activity is to be undertaken Wilson Co. Landfill.

2. Location of land-disturbing activity? County Wilson, City or Township Gardners, and Highway/Street SR 1503.

3. Approximate date land-disturbing activity will be commenced? 1-1-90.

4. Purpose of development (residential, commercial, industrial, etc.)?
Vertical Expansion Borrow Area.

5. Approximate acreage of land to be disturbed or uncovered? 45.

6. Has an erosion and sedimentation control plan been filed?
Yes X No ____

7. Land owner(s) of Record (Use blank page to list additional owners.):

William R. Williamson	
Name	Name
3001 Wolf Trap Road	
Current Mailing Address	Current Mailing Address
Wilson, NC 27893	
City State Zip	City State Zip
N/A	
Telephone Number	Telephone Number

8. Indicate County, Book, and Page where deed or instrument is filed (Use blank page to list additional deeds or instruments):

County Wilson Book 1216 Page 376

County _____ Book _____ Page _____

Part B.

1. Person(s) or firm(s) financially responsible for this land-disturbing activity.

WILSON COUNTY	
Name of Person or Firm	Name of Person or Firm
P. O. Box 1728	
Mailing Address	Mailing Address
Wilson, NC 27893	
City State Zip	City State Zip
(919) 237-6600 Ext. 501	
Telephone	Telephone

2. Registered agent, if any, for the person or firm who is financially responsibe:

Garry C. Mercer	Wilson, NC 27893
Name	City State Zip
P.O. Box 1728	919 237-6600 Ext. 501
Mailing Address	Telephone

3. The above information is true and correct to the best of my knowledge and belief and was provided by me while under oath. (This form must be signed by the financially responsible person if an individual and by an officer, director, partner, attorney-in-fact, or other person with authority to execute instruments for the financially responsible person if not an individual.)

November 29, 1989
Date

Garry C. Mercer
Type or Print Name

County Manager
Title or Authority

x Garry C Mercer
Signature

I, Ruth M. McCormick, a Notary Public of the County of Wilson, State of North Carolina, hereby certify that Garry C.Mercer personally before me this day and under oath acknowledged that the above form was executed by him.

Witness my hand and notarial seal, this 29th day of November, 19 89.

x Ruth M McCormick
Notary

My Commission expires 3-3-93.

4.0 OPERATION PLAN

In Section 2.0 of this document, a general description of landfill capacity, disposal rates, and waste types is provided. This Section provides a detailed plan for operation of the CDLF. While similar to the operation plan for the MSWLF units, the limited waste types present a lesser concern for specific operational practices. Still, some of the MSWLF practices will be continued for C&D operations. All operations shall be in compliance with 15A NCAC 13B Rule .0505.

4.1 PHASES OF OPERATION

Drawing C2 illustrates the three cells of development for the CDLF. In general, the landfill will be constructed in 10-foot lifts, with the intermediate slopes following the current topography. At an annual disposal rate of 20,000 tons/year and a waste:soil ratio = 8:1, the peak intermediate fill elevation will be 122 msl under the initial 5-year operating phase.

4.2 BASE EMBANKMENT

In addition to the base soil layer, construction of the initial landfill lift shall include a perimeter embankment or toe dike. The peak elevation of the toe dike is approximately 5 feet. Waste placement shall be at least 3 feet below the top of the dike to allow for stormwater control during operations and final cover construction at closure.

4.3 ROUTINE OPERATIONS

Following completion of the base lift, routine waste placement and compaction operations shall be practiced. Lift progression shall establish a maximum side slope at 4:1, and the top grade should follow the planned 1-2% surface grade, sloped from the center to the perimeter. The waste shall be adequately compacted with a compactor.

4.4 WASTE ACCEPTANCE

4.4.1 Approved Waste Types

Wastes typically generated by construction and demolition activities shall be managed at the CDLF. Other waste types categorically approved by the Division, such as pallets, will also be accepted for disposal. Specific approval must be received from the Division for other waste types that Wilson County may want to accept for disposal; typically, this will require a demonstration to the Division that the waste type is "Inert Debris". The Inert Debris evaluation may require chemical analysis to document that potential leaching from the material will not exceed 15A NCAC 2L Groundwater Standards.

4.4.2 Waste Screening

In addition to C&D waste, the Wilson County Landfill receives other waste types at the facility entrance. The Weighmaster directs specific waste types, such as Land Clearing and Inert Debris, asbestos, and yard waste to specific management areas. The solid waste management areas are identified with signs. Signs will be posted for routing of C&D waste to the Westside facility.

A waste screening program similar to the current program shall be maintained for C&D operations. The facility shall only accept those solid wastes which it is permitted to receive. The operator shall monitor loads periodically to identify non-conforming wastes, including municipal solid waste, industrial waste, and hazardous waste. If a suspect load is identified, an inspection will be conducted in an area prepared near the working face. This staging area will be graded to contain and segregate the wastes if necessary.

Personnel Training and Preparation

The following facility personnel shall receive Awareness Level Training by a qualified consultant to identify non-conforming wastes: Weighmaster, Compactor Operators, and the Heavy Equipment Supervisor. The Supervisor will lead waste inspections and ensure that the staging area is properly prepared, inspectors are

outfitted with the appropriate Personal Protective Equipment, and records are properly maintained.

Identifying Excluded Wastes

When conducting waste inspections, personnel should look for municipal waste, and industrial containers with hazard labels, liquids, powders and dusts, sludges, bright or unusual colors, and be aware of chemical odors. No liquids will be allowed in the landfill. Suspect wastes will be required to perform the paint filter test. Hazardous waste exhibits the following properties:

1. Ignitability — Flash Point of less than 140 degrees Fahrenheit
2. Corrosivity — pH of less than or equal to 2.0 or greater than or equal to 12.5
3. Reactivity — Explosive, reactive with water or corrosive materials
4. Toxicity — Exhibits Toxic Chemical Leaching Process (TCLP) constituent above regulatory level

Key Personnel

The following names and telephone numbers shall be posted in the Scalehouse:

1. County Emergency Management Supervisor - R.C. Smith 399-2830
2. SWS Regional Waste Management Specialist - Ben Barnes (919) 571-4700

Procedures for Handling Excluded Wastes

If possible the hauler in violation shall be detained at the site and required to remove the non-conforming wastes from the facility. If wastes are identified and off-loaded from the vehicle, the inspector shall notify the County Emergency Management Supervisor for coordinating containment, temporary storage, and disposal. If waste is temporarily stored on-site, the maximum storage period is dictated by the amount of waste present. The SWS shall be notified within 24 hours of the attempted disposal of unauthorized waste. The following definitions exist for hazardous waste management.

1. CONDITIONALLY EXEMPT SMALL QUANTITY GENERATOR: Generates less than 220 pounds of hazardous waste in any calendar month.

2. SMALL QUANTITY GENERATOR: Generates between 220 and 2200 pounds of hazardous waste in a given calendar month.
3. LARGE QUANTITY GENERATOR: Generates greater than 2200 pounds of hazardous waste in any given calendar month, or greater than 2.2 pounds of acutely hazardous waste in a calendar month.

When possible the operator shall remove non-conforming wastes within 30 days. If the maximum storage period exceeds 90 days, the operator must request approval from the DEHNR Hazardous Waste Section.

Containers holding hazardous waste must be maintained in good condition and clearly labeled with the words "HAZARDOUS WASTE". If a container is not in good condition or begins to leak, the contents must be transferred to a good container. Containers must be constructed or lined with materials which will not react with the waste being stored. Containers holding hazardous waste must always be closed during storage. Containers must not be handled in such a manner which may rupture or damage container. Areas where containers are stored must be inspected on a weekly basis. A log of inspections must be maintained at the facility for a three year period.

Recordkeeping

The following records shall be maintained for waste inspections and haulers that are refused entry:

1. Vehicle and Driver Identification
2. Amount and Source of Waste
3. Date and Time of Inspection
4. Observations of Inspection
5. Required Notifications for Confirmed Wastes

4.5 COVER REQUIREMENTS

Due to the non-putrescible nature of the waste, the working lift shall be typically covered on a weekly basis. The top portion of the lift shall receive a minimum

cover of six inches. As the side slopes are completed, an intermediate 12-inch soil cover shall be placed and compacted.

4.6 STORMWATER MANAGEMENT

Management of stormwater and erosion control are integrated concepts for the landfill. Lift progression from upslope to downslope positions simplifies stormwater management for daily operations. Stormwater shall be directed away from the working face of the landfill to the perimeter stormwater berm or a temporary diversion. During operations, multiple temporary downdrains will convey drainage from the intermediate landfill surface to the perimeter channel network. Mulching or temporary seeding shall be utilized as necessary to stabilize the site; areas of the landfill that are not planned to receive additional waste within 120 days shall be stabilized with temporary cover.

4.7 ACCESS CONTROL

The facility is designed to limit access and comply with the following general safety requirements for MSWLFs.

(a) The MSWLF shall be adequately secured by means of gates, chains, berms, fences and other security measures approved by the Division to prevent unauthorized entry.

(b) An attendant shall be on duty at the site at all times while it is open for public use to ensure compliance with operational requirements.

(c) The access road to the site shall be of all-weather construction and maintained in good condition.

(d) Dust control measures shall be implemented when necessary.

(e) Signs providing information on dumping procedures, the hours during which the site is open for public use, the permit number and other pertinent information specified in the permit conditions shall be posted at the site entrance.

(f) Signs shall be posted stating that no hazardous or liquid waste can be received.

(g) *Traffic signs or markers shall be provided as necessary to promote an orderly traffic pattern to and from the discharge area and to maintain efficient operating conditions.*

(h) *The removal of solid waste from a sanitary landfill is prohibited unless the owner or operator approves and the removal is not performed on the working face.*

(i) *Barrels and drums shall not be disposed of unless they are empty and perforated sufficiently to ensure that no liquid or hazardous waste is contained therein, except fiber drums containing asbestos (asbestos area).*

4.8 AIR CRITERIA

The operator has an established relationship with the local Fire Department for controlling accidental fires. Hot loads should be unloaded in an area of the facility with at least 1 foot of soil cover and must be completely cool before transfer to the working face. The weighmaster shall be alert for smoke from disposal vehicles. If a "hot load" is detected, the vehicle shall be directed to a covered portion of the landfill for off-loading. The load shall be monitored and allowed to burn out prior to spreading the waste to cool. The fire department shall be notified to monitor/extinguish the fire.

In addition to contingency plans for accidental fires, the operator shall comply with the following requirements:

(a) *Owners or operators of all landfills must ensure that the units do not violate any applicable requirements developed under a State Implementation Plan (SIP) approved or promulgated by the U.S. EPA Administrator pursuant to Section 110 of the Clean Air Act, as amended.*

(b) *Open burning of solid waste, except for the infrequent burning of land clearing debris generated on site or debris from emergency clean-up operations, is prohibited at all MSWLF units. Any such infrequent burning must be*

approved by the Division.

(c) *Equipment shall be provided to control accidental fires or arrangements shall be made with the local fire protection agency to immediately provide fire-fighting services when needed.*

(d) *Fires that occur require verbal notice to the Division within 24 hours and written notification shall be submitted within 15 days.*

4.9 OPERATING RECORD

The Operating Record for the Wilson Westside CDLF shall be maintained at the Director's Office for the Department of Solid Waste Management. The operator shall continue to maintain records for C&D disposal according to the Rules and North Carolina Laws. A copy of all permit documents will be placed in the Operating Record.

4.10 COVER SOIL INFORMATION

Soil materials for base fill, temporary, intermediate and final cover applications will be obtained from dedicated off-site borrow sources. In 1996, Wilson County purchased the 226 acre Tucker Farm as a soil borrow site for landfill construction projects. Just recently, Wilson County acquired the 76 acre Mohesky Farm joining the Tucker Farm and the Westside site. The Mohesky site was purchased as a supplemental borrow site for landfill construction. Altogether, approximately 50 acres of borrow area are currently undeveloped and provide adequate soil resources for current and proposed landfill projects. An average excavation of 2 feet will provide over 165,000 cubic yards estimated for base construction, operational cover, and final cover. Typical excavation depths at the Tucker Site are in excess of 5 feet.

The Westside site was formerly the borrow site for landfill operations. Beginning in 1998, the Tucker Farm provided soils for intermediate cover, clay liner, and vegetative soil layer construction for closure of the MSWLF units. Presently, the Tucker site continues to supply soils for C&D landfill construction at the facility. Located between the Westside and Tucker sites, soils on the Mohesky Farm are typical of the local area. According to the SCS Soil Survey of Wilson County North Carolina, the mapped soil series include Wagram, Gritney, Altavista, and Tarboro Coastal Plain sediments. Several geotechnical investigations have been conducted on the Tucker site to define soil properties for landfill construction.

5.0 CLOSURE AND POST CLOSURE PLAN

Once a major portion of the landfill perimeter slopes has been completed, a final cover shall be installed on the completed perimeter slope section. A vegetative soil layer (VSL) is planned for the landfill final cover. The VSL will consist of a minimum 24-inch layer of suitable compacted earth, seeded with native grasses. The final cover will be deployed in phases as the landfill reaches final grade. The top surface of the landfill shall be sloped at a minimum 8-10% grade, prior to construction of the final cover. Perimeter slopes are planned at a grade of 4 (horizontal):1(vertical).

Final Cover construction shall be monitored by the project engineer for quality assurance. Closure activities will be documented in a Final Report, submitted to the agency for regulatory records.

Stormwater shall be conveyed off the top surface of the landfill by a series of permanent slope drains. These pipes will discharge into the perimeter channel network, which routes stormwater to sediment basins. Sediment basins, channels, and drain inlets and outlets shall be monitored on an annual basis for cleaning and maintenance.

6.0 WATER QUALITY MONITORING PLAN

This Water Quality Monitoring Plan (WQMP) is designed to address regulatory requirements as set forth in the Rules and to establish the compliance boundary for groundwater quality for the Westside C&D facility. The monitoring plan considers information and data gathered from previous and current studies of the Westside Site, adjacent MSWLF and Tucker Borrow Site and the Wilson County vicinity. Items that are addressed in this WQMP are:

- Regional Geology
- Existing Site Conditions
- Monitoring System Design
- Sampling and Analysis Procedures

Prepared under the supervision of Mr. Gary D. Babb, P.G., the final WQMP is presented in this Section. Based on the data and information provided, the monitoring system has been designed to provide early detection of any release of hazardous constituents to the uppermost aquifer, so as to be protective of the public health and the environment. Design of the monitoring system considers regional geology, data and conclusions from geologic and hydrogeologic investigations of the Westside Site and adjacent properties owned by Wilson County, characteristics of the waste, and the applicable state and federal rules and guidelines published for monitoring of RCRA Subtitle D facilities.

6.1 Regional Geology and Groundwater Use

6.1.1 Regional Geology

The Westside C&D facility is located in the western portion of the Carolina Coastal Plain near the Fall Line. The Fall Line is the province boundary between the Piedmont and the Coastal Plain provinces. It represents a significant change in lithology which in turn reflects a change in stream gradients. Lithology in the Piedmont province is primarily igneous and metamorphic while the Coast Plain province is primarily sedimentary. In general, rivers and streams in the Piedmont Province have higher flow rates with well defined channels while Coastal Plain rivers and streams are meandering with lesser defined channels resulting in swamps and bays. These streams, swamps, and bays are the major discharge point of the uppermost aquifer. Downgradient from the CDLF footprint, Toisnot Swamp and Buck Branch are regional streams that form the property boundary for the Westside site and adjoining Wilson County properties (Mohesky Farm and MSWLF).

The Carolina Coastal Plain is underlain by flat-lying to very gently eastward dipping sedimentary strata which overlay a foundation of crystalline rocks. These sediments were deposited during repeated marine transgressive and regressive cycles due to fluctuations in sea level caused by expansion and recession of glacial ice caps during the Pliocene and early Pleistocene epochs (approximately 2 to 5 million years ago).

Sediments in the area of the Westside C&D facility are classified as being in the Yorktown Formation. Information gathered from the 1985 edition of the Geologic Map of North Carolina and The Geology of the Carolina, published in 1991, sites that sediments of the Yorktown Formation are fossiliferous clay with varying amounts of fine-grained sand, silty sand, sandy silt, silty clay, and bluish gray shell material. These types of deposits are found mainly north of the Neuse River and are commonly concentrated in lenses and vary in vertical and horizontal

dimensions. The topography of the Coastal Plain is characterized by flat to gently undulating relief.

6.1.2 Original Site Conditions

The Westside Site is a depleted borrow site for the Wilson County Landfill. The borrow site operation was completed in the mid 1990's. Prior to excavation the upland portion of the site was agricultural land, bounded by woodlands which still incorporate wetlands adjacent to Buck Branch and the intermittent stream present on-site.

6.1.3 Groundwater Use

The primary use of groundwater in the Coastal Plain region is for agricultural operations and for residential water supply. Expansion of city water and sewer systems will eventually make agriculture operations the primary user of groundwater in this region. Ms. Georgia Boulo, with the Wilson County Environmental Health Department, stated that presently, groundwater usage is 50 percent agriculture and 50 percent residential. She also stated that once planned expansion of the Wilson water and sewer system is complete, residential groundwater usage will likely decrease to approximately 5 percent and agriculture usage will increase to approximately 95 percent. Currently, the City of Wilson is capable of providing water services to residents in the landfill area through a 12 inch water line along SR 1503 - Landfill Road.

6.2 Existing Site Hydrogeological Conditions

The geologic and hydrogeologic investigations for the Westside CDLF were implemented in three phases to progressively define existing site conditions relevant to site suitability, and monitoring and engineering design. All data and evaluation of the hydrogeologic conditions are presented in the Site Plan documents and Addendum No. 1. A summary of the investigations is provided in this section relative to monitoring system design.

As shown in the USGS topographic map for the area, the major groundwater recharge feature for the Westside C&D facility is a topographic high (130± feet mean sea level) located approximately 4,000 feet northeast of the facility. The major groundwater discharge features influencing groundwater flow direction on the site are the Toisnot Swamp and Buck Branch. The existing MSWLF facility is generally located to the east of the proposed CDLF footprint and is separated by a deep drainage canal that intercepts the uppermost aquifer.

In general, the site geology conforms to the regional Coastal Plain characteristics. The depositional environment is influenced by Buck Branch and Toisnot Swamp, were fluvial sediments are mixed with marine sediments in an estuarine setting. Where these streams once flowed into the Atlantic Ocean, a much broader river was likely present. Swift currents during flood conditions may have deposited lenticular beds of sand and other sediments. Incoming tidal currents rework the stream sediments, creating alternating layers of continental and marine sediments.

On the Westside Site, all groundwater level measurements and the modeled potentiometric surfaces through the course of investigation indicate that the general groundwater flow direction from the CDLF footprint to the southwest towards Toisnot Swamp. Based on the analysis of site stratigraphy and comparing aquifer testing results with laboratory clay unit permeability testing, it is clear that the potential for groundwater flow is highest through the water bearing sand layers in the uppermost 15 feet of the aquifer. The marine clays present a confining or semi-confining layer limiting potential vertical groundwater flow. Furthermore, the elevation of the wetlands adjacent to Buck Branch relative to the mapped potentiometric surface indicates an area of extensive groundwater discharge surrounding the stream.

As determined from the soil boring logs, the site stratigraphy is best illustrated in hydrogeologic profiles C and D, presented in Figure 4 of the Site Plan. The local stratigraphy is characterized by relatively thin layers of continental and marine silt, sand, and clay in varying textures and colors. Figure 4 illustrates the uniformities and unconformities associated with the depositional environment. Typically, the color of fluvial sediments are tan, brown, light grey or orange. With the unconformities expected in the depositional environment, the typical profile includes a lean clay overlying poorly graded sands, interbedded with thin clay and clayey sand lenses. The water bearing zone is present in coarse and well graded sand layers, typically beneath surficial clay. Below the fluvial sediments, a marine clay layer is consistently encountered. This marine clay unit is typically dark grey, fat, and laminated with microlenses of fine sand. Below the marine clay, a dark greenish grey silty clayey sand with shell fragments overlies the residual, fully weathered bedrock. As evidence of the site's proximity to the regional fall line, bedrock was encountered approximately 30-35 feet below the disturbed land surface, at an elevation of 60 to 64 feet mean sea level. Dip of the marine sediments mirror the southwest groundwater flow direction.

6.3 Monitoring System Design

Design of the monitoring system for the Westside Site considers the site an regional hydrogeologic conditions with the base design for the landfill unit. The site's adjacent, upgradient position to major stream features in the area (Buck Branch and Toisnot Swamp) provide relative hydrogeologic isolation in a groundwater discharge area. The landfill base design includes construction of a compacted soil layer that will provide for vertical separation from the seasonal high water table and control infiltration from the landfill base. Deeper in the surficial aquifer, the presence of low-permeability clays deposited in horizontal lenses significantly limits vertical groundwater flow potential. Most importantly, the preferential lateral groundwater flow in the unconfined surficial aquifer sands toward a groundwater discharge zone presents hydrogeologic conditions that can be

effectively monitored with shallow groundwater monitoring wells. Due to the extent of wetlands and dense vegetation surrounding Buck Branch, surface water monitoring is not a necessary component of the site's detection monitoring system.

6.3.1 Groundwater Monitoring System

Proposed monitoring well locations are shown on Drawing M1, Groundwater Monitoring Plan. Based on the geology and hydrogeology Section *and* the criteria for establishing the relevant point of compliance, the following detection monitoring stations are recommended for the WQMP.

The Westside WQMP will include a total of four groundwater monitoring wells to establish the relevant point of compliance. The following is a discussion of existing monitor well status, field conditions, and proposed location of the groundwater monitoring system for the proposed Westside C&D facility. The detection monitoring system utilizes one existing well (P-101) and requires installation of three additional downgradient wells. Overall, one upgradient and three downgradient locations provide a monitoring well density of 1 detection station per 3.5 Acres of landfill area. Downgradient well installations are spaced equally across a 125-foot offset (review boundary) to the landfill footprint. Completion intervals shall be within the uppermost 10-15 feet of the seasonal high water table and shall target the tan and orange sand units in the characterized stratigraphy. Ground surface elevations leading to (4W drive path) and surrounding the wells shall be at least 93 feet msl.

TABLE 6-1
PROPOSED MONITORING WELL NETWORK

WELL ID	TD	TOS	BOS	COMMENT	WELL TYPE	MONITORING SCHEDULE
GMW-1	17	7	17	UPGRADIENT	2	SEMI-ANNUAL
GMW-2	15-20	5	15-20	SOIL	2	SEMI-ANNUAL
GMW-3	15-20	5	15-20	SOIL	2	SEMI-ANNUAL
GMW-4	15-20	5	15-20	SOIL	2	SEMI-ANNUAL

Note:
All wells shall be constructed in accordance with 15A NCAC 2C .0108. All new and existing wells were surveyed to a known datum to provide groundwater elevations to determine flow characteristics. Ground surface and top of casing elevations were also surveyed to provide information for potentiometric maps of the uppermost aquifer at the facility. Accuracy requirements for the survey are ±0.01 ft for elevation, and ±0.1 ft for horizontal location.

In accordance with 15A NCAC 2C **.0108,** the wells will be constructed of schedule 40 PVC and installed with wash drilling methods (sands) in accordance with standard monitoring well installation procedures by a NC licensed driller. Split spoon samples will be collected at a minimum of five-foot intervals to document lithology; more frequent sampling may be directed during installation.

6.3.2 Piezometer Abandonment

All existing piezometers within the landfill footprint and as directed by the engineer shall be abandoned in accordance with 15A NCAC 2C. Abandonment may utilize either bentonite or cement grout, or a combination of the two materials. Abandonment shall be documented with standard documentation and included in the pre-operative submittal.

6.3.3 Background Sampling

Prior to beginning landfill operations, one set of background samples shall be collected for the monitoring network. These baseline results will be submitted to the agency according to the plan reporting procedures. Following background sampling, routine detection monitoring

6.4 Sampling and Analysis Procedures

6.4.1 Sampling Equipment and Containers

Disposable Teflon bailers will be utilized for groundwater sample collection. Samplers will wear clean disposable vinyl or latex gloves during the sampling process. Bailing line shall be nylon, Teflon coated wire, or single stranded stainless steel wire. Groundwater sample containers will be obtained from the laboratory prior to sample collection. The laboratory will provide pre-cleaned sample containers with the appropriate preservatives (if any).

6.4.2 Cleaning Procedures

Prior to beginning sampling, field equipment should be deconned in the office laboratory. Documentation of proper cleaning protocol must be provided with disposable bailers. Between wells, field decontamination for field equipment will consist of a five step process: 1) deionized or distilled water rinse, 2) wash with a phosphate free soap/water mixture, 3) deionized or distilled water rinse, 4) isopropyl alcohol rinse or 10% nitric acid or 10% hydrochloric acid rinse, and 5) deionized or distilled water rinse. Clean unused disposable Teflon bailers will be used for monitor well sample collection and will not require decontamination.

6.4.3 Purging Procedures

Prior to the purging of any groundwater monitoring wells the water levels in all wells will be determined. The water levels are to be determined by using an electric water level meter. Any one of several commercial models of water level meters are

acceptable for this purpose. The meter chosen for use will be able to determine the depth to groundwater to at least the nearest 0.01 foot. The water level for each well is to be recorded in the bound field notebook at the time of measurement. During the water level measurement procedure the personnel performing the measurement will wear clean protective gloves (i.e. disposable vinyl or latex gloves). The water level meter will be decontaminated between each well location by a distilled water rinse. The reference point for groundwater level measurements will be the top of the northern side of the inner well casing.

Due to the relatively shallow groundwater level on-site, each groundwater monitoring well will be purged with disposable Teflon bailers. Each well will be purged of approximately three to five well volumes of water or until dry prior to sampling. In order to determine the volume of water to be purged from each well the volume of one well casing volume will need to be determined. This volume is calculated by subtracting the depth to the water table from the total depth of the well to give the volume of standing water in the well casing. Then by using Table 1 (attached) the approximate volume of water in the well casing may be estimated. This volume is then multiplied by three, four or five to give the total purge volume necessary for each well. Once this volume is calculated the well may then be purged. Purging may need to be continued past the 3 to 5 volumes if pH and spec conductance are not initially stabilized.

6.4.4 Groundwater Sample Collection Procedure

Upon completion of the purging procedure and stabilization of field parameters, groundwater samples may be collected. Samples will be collected using disposable Teflon bailers. Separate bailers may be used during the purging and sampling processes. Samples will be poured directly from the bailer into the laboratory supplied containers that they are to be transported to laboratory. Under no circumstances will an intermediate sample container be used, i.e. jar, beaker, etc., and then transferred to the sample container. Water samples will not be filtered.

Groundwater sample containers should be labeled prior to filling. Sample containers have a tendency to "sweat" when filled with groundwater, this makes it difficult to affix a label to the container. The sample label should be covered with a clear tape, which should be wrapped around the sample container. This prevents the label from detaching from the container during sample storage and shipment.

Each sample container should have its own label. The label should indicate at a minimum, the sample location (i.e. GMW-1), date and time of collection, and project site. Other pertinent sample information such as sample location, collector, etc. should be recorded in the field notes.

Samples will be placed in a sample cooler containing ice immediately after collection. After collection, samples are to be transported to the laboratory either in person or by some form of accepted courier service (Federal Express, etc). When practical, samples should be delivered to lab on the collection day.

6.4.5 Field QA/QC Procedures

Each sample will be recorded on a Chain-of-Custody record at the time of collection. A sample Chain-of-Custody form is attached to this plan for reference. The Chain-of-Custody form will contain sample and well identification, signature(s) of the sample collector and others who accept the samples from the collector, date and time of sample collection, requested laboratory analytical parameters, and other pertinent information or special requests etc.

One trip blank per sampling event will be collected and one equipment blank sample will be collected for each day that groundwater monitor wells are sampled. Blank samples will be analyzed for all constituents that are being analyzed in the groundwater and surface water quality samples.

6.4.6 Laboratory QA/QC Procedures

All water samples will be analyzed by a North Carolina certified laboratory for Appendix I VOCs and RCRA metals along with specific conductance, pH, and temperature. The laboratories will be certified for drinking water analysis and for the constituents being analyzed. The following is a list of the analytical parameters to be analyzed for this project. Each parameter has an appropriate EPA method number associated with the parameter. Samples are to be analyzed by the listed method or by an equivalent acceptable method. A copy of the laboratory Quality Assurance/Quality Control measures may be provided on request (100 pages). All analysis shall be in accordance with methods listed in the publication SW-846.

o Inorganic Constituents

Metals	Method	Detection Limit
~~Antimony~~	CLP/SW-846	0.06 mg/L
Arsenic	CLP/SW-846	0.010 mg/L
Barium	CLP/SW-846	0.20 mg/L
~~Beryllium~~	CLP/SW-846	0.005 mg/L
Cadmium	CLP/SW-846	0.005 mg/L
Chromium	CLP/SW-846	0.01 mg/L
~~Cobalt~~	CLP/SW-846	0.05 mg/L
~~Copper~~	CLP/SW-846	0.025 mg/L
Lead	CLP/SW-846	0.003 mg/L
~~Nickel~~	CLP/SW-846	0.04 mg/L
Mercury	CLP/SW-846	0.001 mg/L
Selenium	CLP/SW-846	0.005 mg/L
Silver	CLP/SW-846	0.01 mg/L
~~Thallium~~	CLP/SW-846	0.010 mg/L
~~Vanadium~~	CLP/SW-846	0.05 mg/L
~~Zinc~~	CLP/SW-846	0.02 mg/L

- o Organic Parameters

  Volatile Organic Compounds (EPA Method SW-846 8240 or 8260**)

- o Field Parameters

  Specific Conductance

  pH

  Temperature

* All metals analysis will be preformed by acceptable methodology as described in EPA SW-846

** Specific constituents listed for these methods are not listed here, please refer to the EPA publication SW-846 for the complete list of volatile and semi-volatile parameters listed for the above references methods.

6.5 Field Logbook

The field technician will keep an up-to-date logbook documenting important information pertaining to the technician's field activities. The field logbook will document the following:

- Site Name and Location
- Date and Time of Sampling
- Climatic Conditions During Sampling Event
- Sampling Point/Well Identification Number
- Well Static Water Level
- Height of Water Column in Well
- Purged Water Volume and Well Yield (High or Low)
- Observations on Purging and Sampling Event
- Time of Sample Collection
- Temperature, pH, Turbidity, and Conductivity Readings
- Signature of Field Technician.

6.6 Record Keeping and Reporting

6.6.1 Sampling Reports

Copies of all laboratory analytical data will be forwarded to the DWM within 45 calendar days of the sample collection date. The analytical data submitted will specify the date of sample collection, the sampling point identification and include a map of sampling locations. Should a significant concentration of contaminants be detected in ground and surface water, as defined in North Carolina Solid Waste Rules, Ground Water Quality Standards, or Surface Water Quality Standards, the owner/operator of the landfill shall notify the DWM and will place a notice in the landfill records as to which constituents were detected.

Monitoring data will be compared to compliance standards established by Groundwater Standards 15A NCAC 2L .0202 and 15A NCAC 13B. If a standard is exceeded in any well, additional samples or assessment monitoring will begin following notification of the Division. In response to non-compliance data results, the Division of Solid Waste Management will be notified with a plan of action to further investigate, verify or assess the source of the observed contaminants.

6.7 Well Abandonment/Rehabilitation

Should wells become irreversibly damaged or require rehabilitation, the DWM shall be notified. If monitoring wells and/or piezometers are damaged irreversibly they shall be abandoned according to 15A NCAC 2C .0113, with notification to the Division. The abandonment procedure in unconsolidated materials will consist of over-drilling and/or pulling the well casing and plugging the well with an impermeable, chemically-inert sealant such as neat cement grout and/or bentonite clay (Hole Plug, or 15A NCAC 2L approved materials). For bedrock well completions the abandonment will consist of plugging the interior well riser and screen with an impermeable neat cement grout and/or bentonite cement grout.

6.8 Additional Well Installations

The data will be analyzed to verify the correct placement of wells and determine locations for future monitoring wells, if necessary. Any additional well installations will be carried out in accordance with DWM directives. If the potentiometric maps reveal that the depths, location, or number of wells is insufficient to monitor potential releases of solid waste constituents from the solid waste management area, new well locations and depths will be submitted to the DWM for approval.

All monitoring wells shall be installed under the supervision of a geologist or engineer who is registered in North Carolina and who will certify to the DWM that the installation complies with the North Carolina Regulations. Upon installation of future wells the registered geologist or engineer will submit the documentation for the construction of each well within 30 days after well construction.

TABLE 6-2

CONVERSION OF FEET OF WATER
TO
VOLUME IN GALLONS
FOR A TWO INCH I.D. WELL CASING

FEET OF WATER	1	2	3	4	5	6	7	8	9	10
VOLUME IN GALLONS	0.2	0.4	0.5	0.7	0.9	1.0	1.2	1.4	1.5	1.7
FEET OF WATER	15	20	25	30	35	40	45	50	55	60
VOLUME IN GALLONS	2.5	3.3	4.1	4.9	5.8	6.6	7.4	8.2	9.0	9.8
FEET OF WATER	65	70	75	80	85	90	95	100	105	110
VOLUME IN GALLONS	10.7	11.5	12.3	13.1	13.9	14.7	15.5	16.4	17.2	18.0