Phase 2 Proposed Facility Plan

Davidson County MSW Landfill
Lexington, North Carolina

Prepared For:

Davidson County Integrated Solid Waste Management
220 Davidson County Landfill Road
Lexington, North Carolina 27292

Prepared By:

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DAVIDSON COUNTY MSW LANDFILL

PHASE 2 PROPOSED FACILITY PLAN

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SECTION 1.0
INTRODUCTION

1.1 OVERVIEW

The Davidson County Landfill facility is located off of Roy Lopp Road in Lexington, North Carolina and operates under NC Solid Waste Permit 29-06. The landfill facility includes a ± 32 acre Subtitle D municipal solid waste (MSW) landfill (Phase 1), separate C&D landfill unit, a white goods area, a recycling building, a landfill office, scales and scalehouse, and three closed unlined MSW landfill units.

Disposal Area 2 is the last area approved for the facility under the County's current approved Facility Plan for the Phase 1 unit (Disposal Areas 1 and 3 were previously constructed.) and is currently in operation. Based on current projections, Phase 1 is expected to remain in operation until about 2007. Once Phase 1 has reached capacity, the County will need to either laterally expand the current Phase 1 unit or move operations to a new unit (Phase 2) constructed on County owned property north of the current facility and across a railroad right of way owned by Southern Railway. The potential for the lateral expansion of the current facility is limited due to the lack of remaining useable land. Thus, the purpose of this document is to present conceptual plans for the development of a MSW landfill on the Phase 2 site.

1.2 SITE DESCRIPTION

The Phase 2 site consists of approximately 290 acres located to the north of the current Phase 1 area. Phase 2 is bounded to the north by Old Highway 29, to the east by adjacent properties, to the south by the Southern Railway right of way, and to the west by Rich Fork Creek. There are wetland areas to the north and west along Rich Fork Creek and to the south of the proposed Phase 2 footprint adjacent to the railroad right of way. The topographic relief of the site is approximately 100 feet, ranging from elevation 640 feet to elevation 740 feet. Existing conditions are shown on **Drawing S1**.

The proposed Phase 2 Subtitle D landfill unit will occupy approximately 14.7 acres (lined) (Note that additional lined area is anticipated once site suitability requirements are met for additional portions of the site). At the projected gate rates described in **Section 2.0** (Facility Report), Phase 2 has been designed for approximately 5.9 years of disposal volume. The proposed landfill has been designed to meet current DWM setback and horizontal buffer requirements: 300 feet from property lines, 500 feet from residences or active water wells.

SECTION 2.0
FACILITY REPORT

2.1 OVERVIEW

This section presents a plan for the development of the proposed Phase 2 of the Davidson County MSW Landfill. This report has been prepared in accordance with the requirements of Rule .1619(d)(1), (d)(2), (e)(1), (e)(2), (e)(3), and (e)(5) of the North Carolina Solid Waste Management Regulations.

2.2 FACILITY SERVICES AND WASTE STREAM

2.2.1 Facility Services

Currently, the following activities or services are provided at the Davidson County Landfill facility:

- Scales and scale house facilities
- Administrative offices and maintenance building
- Convenience center
- White goods handling facility
- Tire processing area
- Recycling building
- Household hazardous waste (HHW) center
- Lined municipal solid waste (MSW) landfill - (Phase 1) (NC Permit No. 29-06)
- Construction and demolition debris (C&D) landfill (NC Permit No. 29-06).

The following facilities are proposed for the facility:

- Additional scales and scale house facilities
- Lined MSW landfill - Phase 2.

2.2.2 Types of Waste

The proposed Davidson County MSW Landfill will accept mixed municipal solid waste (MSW) originating from residential, commercial, and industrial sources. Other wastes (i.e. C&D, and yard waste) will be segregated and directed to on-site facilities for disposal as described below.

2.2.3 Disposal Rates and Estimated Variances

Based on the 2002-2003 Solid Waste Management Annual Report information provided by the County, the landfill accepted 93,351 tons of MSW from 7/1/02 to 6/30/03 (average

7,779 tons per month or 301 tons per day based on 310 operating days per year). The population served during this time period was estimated as 151,163 which translates to 0.62 tons/person/year being disposed of at the landfill. Based on the anticipated population figures and increases projected through 2030 from the NC Office of State Planning (NCOSP) and the current per capita disposal rate, **Table 2.1** gives the projected annual and monthly tonnages to be disposed in the Davidson County MSW Landfill. Note that monthly variances shown in the table are based on County records which indicate that the maximum anticipated monthly variance is about plus or minus 20 percent from average. Also note that population figures after 2030 are based on an assumed constant percentage increase from 2030 onward.

2.2.4 Service Area

The landfill will serve Davidson County and additional areas as approved by the County.

2.2.5 Procedures for Waste Segregation

Procedures for waste segregation at the proposed landfill will be similar to existing operations in Phase 1 including requirements for waste screening and contingency plans for managing any identified hazardous and liquid wastes. Please refer to the currently approved facility Operations Manual for more information.

2.2.6 Equipment Requirements

The equipment requirements for operation and maintenance of the proposed Phase 2 are anticipated to be the same as that currently used in Phase 1.

2.3 LANDFILL CAPACITY

2.3.1 Total Operating Capacity and Life Expectancy

Drawing S2 (Site Development Plan - Base Grades) and **Drawing S3** (Site Development Plan - Final Cover Grades), show conceptual subgrade and final cover grades for the maximum development of the Phase 2 site. Subgrade contours were laid out based on the information provided in the report from site investigations performed by Westinghouse Environmental Services and GNRA in 1989 and 2000-2003, respectively. Subgrade contours were laid out to be a minimum of 4 feet above groundwater or bedrock elevations in accordance with State regulations. It is anticipated that some adjustments will be required to these contours once more detailed site investigations are performed for each disposal area.

The top elevation of the final cover grades is at approximately 758 feet. The exterior side slopes for the Phase 2 expansion will be at a 4H to 1V slope to an approximate elevation of 748 feet, then transition at a slope of 8 percent to the top elevations.

The estimated total gross and net operating capacities, life expectancies, and lined areas of Phase 2 are shown in **Table 2.2**. The net capacity for waste and corresponding life expectancy of each disposal area accounts for compacted soil liner, leachate collection media, protective cover, and daily, intermediate, and final cover. (Note that volumes were calculated from base grades (top of subgrade) to top of final cover grades.)

2.3.3 In-Place Ratio of Waste to Soil and Compaction Factor

The capacities obtained above were based on a 10 percent periodic cover ratio and a compaction factor of 1,450 pounds per cubic yard. The assumed periodic cover ratio is indicative of the County's current practices of using a tarp as an alternative to placing 6 inches of daily cover soil. The assumed compaction factor is based on a recent analysis of waste density in Phase 1 and is typical for the use of large compactors for compaction of the waste.

2.4 AVAILABLE SOIL RESOURCES AND REQUIRED SOIL QUANTITIES

2.4.1 Earthwork Quantities

The soils required to construct the proposed landfill will be removed from on-site borrow sources or will be imported from off-site. The soils removed during excavation of the landfill may be used for structural fill, compacted soil liner, and general fill. These excavation (cut) and structural fill (fill) volumes are shown in **Table 2.3**.

2.4.2 Compacted Soil Liner

The low permeability soil required for the compacted soil liner will be on-site soils (An adequate supply of 1 x 10^{-5} cm/sec or less soil is anticipated within the Phase 2 footprint). On the basis of the 1.5 foot thick compacted soil liner required for the landfill, the in-place volume required for each disposal area is shown in **Table 2.4**.

2.4.3 Leachate Collection System (LCS)

The collection media (stone) used in the LCS will be imported from off-site sources. This layer is 12 inches thick on both the landfill base and side slopes. The estimated total in-place volume of this drainage media for each disposal area is shown in **Table 2.5**.

2.4.4 Protective Cover

Overlying the leachate collection system is the protective cover. Davidson County plans to use either 12 inches of additional stone or 20 inches of tire shreds/chips for this layer. The thicker layer of tire shreds/chips used accounts for approximately 40% settlement in this material under planned loads. The required in-place volume of protective cover for each disposal area is shown in **Table 2.6**. Combined with the collection media of the LCR system, there will be a minimum of 24 inches of material between waste and the

geomembrane liner.

2.4.5 Daily and Intermediate Cover

Assuming the previously mentioned periodic cover ratio of 10 percent, the required in-place volume for use as daily and intermediate cover during landfill operations is shown in **Table 2.7**.

2.4.6 Vegetative Soil Layer

On the basis of the 2 foot thick vegetative soil layer required for the landfill final cover, the in-place volume required for each disposal area is shown in **Table 2.8**.

2.4.7 Soil Summary

The above on-site and off-site soil quantities are summarized in **Table 2.9**. Note that, based on the proposed base grades, long-term there is a soil surplus of on-site soil. However, due to compaction factors, waste, other potential uses, etc., this surplus should be minor.

2.5 FACILITY DESIGN CRITERIA

The base liner and final cover systems will be constructed in accordance with Section .1624 (b)(8)(9) of the North Carolina Administrative Code, Title 15A, Chapter 13, Subchapter 13B including the following requirements.

2.5.1 Horizontal Separation Requirements

The horizontal separation requirement between the disposal boundary (edge of waste) and the property lines is a minimum of 300 feet, the minimum buffer between private residences and wells and the disposal boundary is 500 feet, and the minimum buffer between any surface water (stream, river, creek) and the disposal boundary is 50 feet. The proposed design satisfies all buffer requirements.

2.5.2 Vertical Separation Requirements

The post-settlement bottom elevation of the base liner system will meet the minimum requirement of four feet above the seasonal high groundwater table and bedrock.

2.6 CONTAINMENT AND ENVIRONMENTAL CONTROL SYSTEMS

The following is an overview of the proposed containment and environmental control systems. Detailed design of these components will be prepared and submitted later as part of the Permit to Construct application submitted for each disposal area.

2.6.1 Landfill Subgrade and Perimeter Berms

The landfill subgrade elevations have been designed for minimum post-settlement slopes of 2 percent (NCAC .1624(b)(7)). The subgrade elevations will be achieved by excavation or placement of compacted structural fill (embankment). During excavation, a determination of unsuitable soils (i.e. soils which are too soft, wet, or organic) will be made. Where unsuitable soils are found, the soils will be undercut and backfilled with structural fill.

In addition to providing the liner foundation in fill areas, structural fill will be used for berm and roadway construction. Structural fill will consist of on-site soils removed during excavation of the landfill units or imported borrow soils, except that no CH, OL, or OH soils will be allowed.

2.6.2 Base Liner System

The base liner area for Phase 2 is approximately 14.7 acres and is shown on **Drawing S2** (Site Development Plan - Base Grades). The base liner will consist of either a standard composite liner system or an alternative liner system as allowed under North Carolina regulations. The components of this liner system will consist of the following components (bottom-up):

Standard Liner System:

- a 24 inch thick compacted soil liner with a permeability of no more than 1 x 10^{-7} cm/sec.;
- a 60 mil HDPE geomembrane liner; and
- a leachate collection system (LCS).

OR

Alternative Liner System:

- an 18 inch thick compacted soil liner with a permeability of no more than 1 x 10^{-5} cm/sec.;
- geosynthetic clay liner (GCL);
- a 60 mil HDPE geomembrane liner; and
- a LCS.

The compacted soil liner will consist of compacted on-site or imported borrow soils. The compacted soil liner will be placed in 6 inch lifts and compacted to achieve the required permeability and strength requirements.

The GCL will consist of a layer of sodium bentonite bonded between two geotextiles. The GCL will provide a maximum hydrated permeability of 5 x 10^{-9} cm/sec.

The geomembrane component of the liner system will consist of a 60 mil thick High Density Polyethylene (HDPE) synthetic liner. This geomembrane will be installed by a qualified contractor.

For the purposes of this report and the calculations of volumes, an alternative liner has been assumed. A demonstration of the proposed alternative liner system will be made in the Permit to Construct application for the first disposal area.

2.6.3 Leachate Collection System (LCS)

The LCS will be constructed directly above the geomembrane on both the base and side slopes of the landfill. The LCS functions to collect leachate as quickly as is practical and to conduct the fluid out of the landfill via the sump areas. The goal of the LCS is to minimize the hydraulic head acting on the liner, thereby reducing the leak potential.

On both the base and side slopes of the landfill, the LCS will consist of 12 inches of collection media (typically NCDOT No. 78 stone) having a permeability of at least 5 x 10^{-1} cm/sec and a series of perforated collection pipes. Collection pipes within each cell as well as the main headers will have coarse aggregate (typically NCDOT No. 57 stone) placed over and around them and are referred to as "gravel columns". These gravel columns provide a significant amount of storage, provide primary leachate removal capacity, and are designed to be resistant to biological clogging. Since the gravel column aggregate extends through the protective cover and is in direct contact with the waste (no geotextile is placed between the waste and gravel), the long-term clogging potential is significantly reduced. Cleanout ports will be provided, where possible, at the end of leachate collection piping along the perimeter berms to allow periodic hydro-washing of the piping when necessary.

In order to provide protection of the base geomembrane against damage due to the granular leachate collection media, a cushion (Type GT-C) geotextile will be placed between the between the base geomembrane and collection media.

The collection piping of the LCS conducts the leachate to the sump areas for the removal from the landfill by pump and force main to leachate storage tanks. Note that a potential location for leachate storage tanks is shown on **Drawing S2** (Site Development Plan - Base Grades). The actual location and type of storage facility will be finalized as part of the Permit to Construct application for the first disposal area.

2.6.4 Protective Cover

A protective cover layer of stone or tire shreds/chips will be placed over the LCS as was done in the Phase 1 landfill unit.

2.6.5 Stormwater/Leachate Separation System

In order to increase facility operating efficiency by reducing the leachate treatment quantities, stormwater/leachate separation is planned for Phase 2. Leachate is considered to be any precipitation or fluid that comes in direct contact with the waste. This liquid will be collected by the LCS and conveyed to the leachate storage tanks. Precipitation that falls in areas where it does not contact waste, such as within inactive areas, does not have to be treated as leachate. This fraction of the precipitation is treated as stormwater - that is, treated for removal of sediment only.

For disposal areas that have waste placed in them, precipitation is allowed to percolate or run-off into the LCS. For areas that have no waste, the percolation or run off to the sump where a pump conducts the water to a perimeter drainage structure. This runoff does not contact waste or leachate.

2.6.6 Final Cover System

As a minimum, the components of the final cover system (bottom up) will consist of a 6 to 12 inch foundation layer (daily or intermediate cover), 30 mil textured LLDPE geomembrane, drainage geocomposite (pore pressure reduction), and a 24 inch thick vegetative soil layer which includes a 6 inch thick topsoil layer. This system differs from the standard regulatory final cover in that an 18 inch layer of 1 x 10^{-5} cm/sec soil below the geomembrane is removed and the drainage geocomposite is added above the geomembrane. The addition of the drainage geocomposite reduces head on the geomembrane for both reduced infiltration through the geomembrane and increased stability of the overlying soil veneer. A demonstration of this final cover system will be presented as part of the Permit to Construct application for the first disposal area.

2.6.7 Erosion and Sedimentation Control

The erosion and sedimentation control structures provided will be designed and maintained to manage the run-off generated by the 24-hour, 25-year storm event, and conform to the requirements of the Sedimentation Pollution Control Law (15A, NCAC, 4). Note that potential sediment basin locations are shown on **Drawing S2** (Site Development Plan - Base Grades).

2.6.8 Landfill Gas Control

Landfill gas control for Phase 2 will consist of a series of surficial collection trenches placed beneath the final cover and/or vertical/horizontal wells which are connected to passive vents or utility flares or to an active gas extraction system. The selected system will be designed to limit the gas pressures on the final cover geosynthetics.

At sometime during the active life of the proposed landfill, the volume of MSW waste at the facility will exceed 2.75 million tons and will, thus, require a Title V air quality

permit. The timetable for this will be further evaluated in the Permit to Construct application for the first disposal area.

2.6.9 Access and Roadways

The site will be designed to provide all-weather access to active cells as well as cells under intermediate cover. Access ramps into the lined areas will be provided where necessary.

Due to the presence of the railroad between Phase 2 and the current Phase 1 site, a new site access point will be required along Old Highway 29 and some site infrastructure will need to be moved or duplicated. At a minimum, scales and a scalehouse will be required along with the necessary site roads.

2.7 SLOPE STABILITY AND SETTLEMENT

The slope stability of the overall waste mass and perimeter berms, the protective cover veneer, and the final cover veneer, as well as estimates of foundation settlement will be addressed in the Permit to Construct application for each disposal area.

2.8 LEACHATE MANAGEMENT

The general leachate management system includes the collection, storage, treatment (if required), and disposal of the leachate generated. The collection and transmission of leachate to the on-site storage tanks will be as described above. From the storage tanks, the leachate will be pumped into tanker trucks and hauled on a regular basis to a local wastewater treatment plant (WWTP) for disposal. Pretreatment, if required, will be employed on-site to meet the standards for disposal into the WWTP. Alternatively, the County may install a force main if deemed feasible.

2.9 SPECIAL ENGINEERING FEATURES

Special engineering features proposed for Phase 2 include an alternative liner system, wetlands mitigation, and an alternative final cover system.

2.9.1 Alternative Liner

An alternative liner as described above is proposed for use in Phase 2 due to the lack of 1 x 10^{-7} cm/sec soil on-site.

2.9.2 Wetlands Mitigation

Several areas of Phase 2 contain wetlands and may require mitigation. Permitting of these areas, as necessary, will take place through the Army Corps of Engineers and the North Carolina Division of Water Quality.

2.9.3 Alternative Final Cover

An alternative final cover as described in **Section 2.6.6** is proposed for use in Phase 2 to eliminate the compacted soil barrier component.

TABLE 2.1
PROJECTED LANDFILL TONNAGES

Year	Population	Projected Annual MSW Tonnage	Projected Average Monthly MSW Tonnage	Projected Monthly Variance (± 20%)
2004 - 2006 Operations in Phase 1				
2007	160,957	99,793	8,316	6,653 - 9,979
2008	162,916	101,008	8,417	6,734 - 10,101
2009	164,874	102,222	8,519	6,815 - 10,222
2010	166,833	103,436	8,620	6,896 - 10,344
2011	168,783	104,646	8,720	6,976 - 10,465
2012	170,733	105,855	8,821	7,057 - 10,585
2013	172,684	107,064	8,922	7,138 - 10,706
2014	174,634	108,273	9,023	7,218 - 10,827
2015	176,584	109,482	9,124	7,299 - 10,948
2016	178,534	110,691	9,224	7,379 - 11,069
2017	180,484	111,900	9,325	7,460 - 11,190
2018	182,435	113,109	9,426	7,541 - 11,311
2019	184,385	114,319	9,527	7,621 - 11,432
2020	186,335	115,525	9,627	7,702 - 11,553
2021	188,262	116,722	9,727	7,781 - 11,672
2022	190,189	117,917	9,826	7,861 - 11,792
2023	192,115	119,112	9,926	7,941 - 11,911
2024	194,042	120,306	10,026	8,020 - 12,031
2025	195,969	121,501	10,125	8,100 - 12,150
2026	197,896	122,695	10,225	8,180 - 12,270
2027	199,823	123,890	10,324	8,259 - 12,389
2028	201,749	125,085	10,424	8,339 - 12,508
2029	203,676	126,279	10,523	8,419 - 12,628
2030	205,603	127,474	10,623	8,498 - 12,747

TABLE 2.1 (CONTINUED)

Year	Population	Projected Annual MSW Tonnage	Projected Average Monthly MSW Tonnage	Projected Monthly Variance (± 20%)
2031	207,548	128,680	10,723	8,579 - 12,868
2032	209,511	129,897	10,825	8,660 - 12,990
2033	211,493	131,126	10,927	8,742 - 13,113
2034	213,494	132,366	11,031	8,824 - 13,237
2035	215,514	133,619	11,135	8,908 - 13,362
2036	217,553	134,883	11,240	8,992 - 13,488
2037	219,611	136,159	11,347	9,077 - 13,616
2038	221,688	137,447	11,454	9,163 - 13,745
2039	223,785	138,747	11,562	9,250 - 13,875
2040	225,903	140,060	11,672	9,337 - 14,006
2041	228,040	141,385	11,782	9,426 - 14,138
2042	230,197	142,722	11,894	9,515 - 14,272
2043	232,375	144,072	13,006	9,605 - 14,407
2044	234,573	145,435	12,120	9,696 - 14,544
2045	236,792	146,811	12,234	9,787 - 14,681
2046	239,032	148,200	12,350	9,880 - 14,820
2047	241,293	149,602	12,467	9,973 - 14,960
2048	243,576	151,017	12,585	10,068 - 15,102
2049	245,880	152,446	12,704	10,163 - 15,245
2050	248,206	153,888	12,824	10,259 - 15,389
2051	250,554	155,344	12,945	10,356 - 15,534
2052	252,925	156,813	13,068	10,454 - 15,681
2053	255,317	158,297	13,191	10,553 - 15,830
2054	257,733	159,794	13,316	10,653 - 15,979
2055	260,171	161,306	13,442	10,754 - 16,131

TABLE 2.2
TOTAL OPERATING CAPACITY AND LIFE EXPECTANCY

Disposal Area	Area (Acres)	Total Gross Capacity (CY)[1]	Net Capacity (CY/Tons)	Life Expectancy (Years)
1	14.7	1,065,388	841,455 (610,055)	5.9
Total:	14.7	1,065,388	841,455 (610,055)	5.9

Notes:

1. The Total Gross Capacity is calculated from the proposed base grades (top of subgrade) to the top of final cover contours.

TABLE 2.3
GENERAL EARTHWORK QUANTITIES

Disposal Area	Cut (CY)	Fill (CY)
1 (See Note 1)	412,771	172,957
Total:	412,771	172,957

Notes:

1. Quantities include landfill access roads.

TABLE 2.4
COMPACTED SOIL LINER QUANTITIES

Disposal Area	Required Volume (CY)
1	35,574
Total:	35,574

TABLE 2.5
NATURAL DRAINAGE MEDIA QUANTITIES

Disposal Area	Required Volume (CY)
I	23,716
Total:	23,716

TABLE 2.6
PROTECTIVE COVER QUANTITIES

Disposal Area	Required Volume (CY)
1 (See Note 1)	23,716
Total:	23,716

Notes:

1. The quantity shown above is for 12 inches of stone. Should tire shreds/chips be used, a thickness of 20 inches will be required to account for approximately 40% settlement. Thus, approximately 39,527 CY of tire shreds/chips will be required.

TABLE 2.7
DAILY AND INTERMEDIATE COVER QUANTITIES

Disposal Area	Required Volume (CY)
1	93,495
Total:	93,495

TABLE 2.8
VEGETATIVE SOIL LAYER QUANTITIES

Disposal Area	Required Volume (CY)
1	47,432
Total:	47,432

TABLE 2.9
PHASE 2 SOIL SUMMARY

Material	Quantity (CY)
On-Site[1]:	
Excavation	412,771
Structural Fill	(172,957)
Compacted Soil Liner	(35,574)
Daily/Intermediate Cover	(93,495)
Vegetative Soil Layer	(47,432)
On-Site Total[2]:	63,313
Off-Site:	
Collection Media (Stone)	(23,716)
Protective Cover (Stone/Tire Shreds/Chips)	(23,716/39,527)

Notes:

1. On-site material refers to materials available and used within the conceptual Phase 2 footprint only.
2. Soil surplus shown will likely be less due to compaction factors, waste, other possible uses, etc.

Attachment A

Calculations

DAVIDSON COUNTY MSW LANDFILL
PHASE 2 PROPOSED FACILITY PLAN

ATTACHMENT A: CALCULATIONS

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PROJECT Davidson County MSW Landfill - Phase 2

SUBJECT Landfill Life Expectancy

SHEET 1 OF 5
JOB NO. DAVDCO-A
DATE 9/22/04
COMPUTED BY PKS
CHECKED BY

Objective To determine the expected life of landfill Phase 2 given the proposed contours.

Assumptions
1. Density of Waste.
2. Waste to Periodic Cover (i.e. daily and intermediate) Ratio.
3. Waste Generation/Disposal Rates

Analysis AutoCAD was used to generate volumes.

LIFE.WPD

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ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 2.5
JOB #: DAVDCO-A
DATE: 9/22/04
BY: PKS
CHKD BY:

Davidson County MSWLF - Phase 2
Analysis of Life Expectancy - Area 1

Waste Parameters:

Unit Weight (pcy) =	1,450
Unit Weight (tcy) =	0.725
Percentage of Periodic Cover =	10
Area of Waste Footprint (Ac.) =	14.7

Volume Calculations:

Volume From AutoCAD =		1,065,388 cy	(See Attached)

Adjustment For Other Layers:

1.5 feet Liner System =		35,574 cy
2 feet LCS/Pro. Cover =		47,432 cy
2 feet (Avg.) of Final Cover =		47,432 cy
	Sum =	130,438 cy

Volume of Waste and Periodic Cover (cy) =	934,950
Volume of Periodic Cover (cy) =	93,495
Volume of Waste (cy) =	841,455
Volume of Waste (tons) =	610,055

LIFE-REV.WB3

Area 1 Handles 2007 – 2011 → 511,105 Tons

$+ \frac{98,950}{105,855} =$ 93% of 2012

$\approx$ **5.9 Yrs**

3/5

volume report 092204.txt

Site Volume Table: Unadjusted

	Cut yards	Fill yards	Net yards	Method
Site: AREA1				
Stratum: fcvr-airspace	sgrd-081904	fcvr-081904		
	1	1065388	1065387	(F) Composite
Stratum: topo to sbgrd	topo-overall	sgrd-081904		
	412771	172957	239814	(C) Composite

Lined Area = 14.7 Ac.

G.N. Richardson & Associates

ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 4/5
JOB #: DAVDCO-A
DATE: 11/13/03
BY: PKS
CHKD BY:

Davidson County MSWLF
Waste Generation Analysis

Data from NC Office of State Planning Website (10/17/03):

Year	Population	%Increase
2000	147,246	-----
2010	166,833	13.3
2020	186,335	11.7
2030	205,603	10.3

Year	Population	% Increase From Previous	Projected MSW Tonnage	Projected Average Monthly MSW Tonnage	Projected Monthly Variance (Min.)	Projected Monthly Variance (Max.)
2000	147,246	-----	-----	-----	-----	-----
2001	149,205	1.33	-----	-----	-----	-----
2002	151,163	1.31	93,351	7,779	6,223	9,335
2003	153,122	1.30	94,936	7,911	6,329	9,494
2004	155,081	1.28	96,150	8,013	6,410	9,615
2005	157,040	1.26	97,364	8,114	6,491	9,736
2006	158,998	1.25	98,579	8,215	6,572	9,858
2007	160,957	1.23	99,793	8,316	6,653	9,979
2008	162,916	1.22	101,008	8,417	6,734	10,101
2009	164,874	1.20	102,222	8,519	6,815	10,222
2010	166,833	1.19	103,436	8,620	6,896	10,344
2011	168,783	1.17	104,646	8,720	6,976	10,465
2012	170,733	1.16	105,855	8,821	7,057	10,585
2013	172,684	1.14	107,064	8,922	7,138	10,706
2014	174,634	1.13	108,273	9,023	7,218	10,827
2015	176,584	1.12	109,482	9,124	7,299	10,948
2016	178,534	1.10	110,691	9,224	7,379	11,069
2017	180,484	1.09	111,900	9,325	7,460	11,190
2018	182,435	1.08	113,109	9,426	7,541	11,311
2019	184,385	1.07	114,319	9,527	7,621	11,432
2020	186,335	1.06	115,528	9,627	7,702	11,553
2021	188,262	1.03	116,722	9,727	7,781	11,672
2022	190,189	1.02	117,917	9,826	7,861	11,792
2023	192,115	1.01	119,112	9,926	7,941	11,911
2024	194,042	1.00	120,306	10,026	8,020	12,031
2025	195,969	0.99	121,501	10,125	8,100	12,150
2026	197,896	0.98	122,695	10,225	8,180	12,270
2027	199,823	0.97	123,890	10,324	8,259	12,389
2028	201,749	0.96	125,085	10,424	8,339	12,508
2029	203,676	0.96	126,279	10,523	8,419	12,628
2030	205,603	0.95	127,474	10,623	8,498	12,747
2031	207,548	0.95	128,680	10,723	8,579	12,868
2032	209,511	0.95	129,897	10,825	8,660	12,990
2033	211,493	0.95	131,126	10,927	8,742	13,113
2034	213,494	0.95	132,366	11,031	8,824	13,237
2035	215,514	0.95	133,619	11,135	8,908	13,362
2036	217,553	0.95	134,883	11,240	8,992	13,488
2037	219,611	0.95	136,159	11,347	9,077	13,616
2038	221,688	0.95	137,447	11,454	9,163	13,745
2039	223,785	0.95	138,747	11,562	9,250	13,875
2040	225,903	0.95	140,060	11,672	9,337	14,006
2041	228,040	0.95	141,385	11,782	9,426	14,138
2042	230,197	0.95	142,722	11,894	9,515	14,272
2043	232,375	0.95	144,072	12,006	9,605	14,407
2044	234,573	0.95	145,435	12,120	9,696	14,544
2045	236,792	0.95	146,811	12,234	9,787	14,681
2046	239,032	0.95	148,200	12,350	9,880	14,820
2047	241,293	0.95	149,602	12,467	9,973	14,960
2048	243,576	0.95	151,017	12,585	10,068	15,102
2049	245,880	0.95	152,446	12,704	10,163	15,245
2050	248,206	0.95	153,888	12,824	10,259	15,389
2051	250,554	0.95	155,344	12,945	10,356	15,534
2052	252,925	0.95	156,813	13,068	10,454	15,681
2053	255,317	0.95	158,297	13,191	10,553	15,830
2054	257,733	0.95	159,794	13,316	10,653	15,979
2055	260,171	0.95	161,306	13,442	10,754	16,131

Areal

Notes:

1. Population figures and increases from 2000 to 2030 are from the NC Office of State Planning (NCOSP). Figures after 2030 are based on an assumed constant percentage increase from 2030 onward.

2. Projected MSW tonnage is based on the per capita disposal rate of 0.62 tons per person per year to this facility (based on tonnage disposed in FY 2002-2003 (93,351 tons) divided by the 2002 County population).

G.N. Richardson & Associates

ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 5 / 5
JOB #: DAVDCO-A
DATE: 10/22/01
BY: PKS
CHKD BY:

Davidson County MSW Landfill - Phase 2
Anticipated Monthly Disposal Rates and Variances

Fiscal Year	Month	Tonnage	% of Annual Total	Difference from Avg. Month (%)		
1995-96	07/98	9,012	9.4	17.4		
	08/98	9,713	10.2	26.5		
	09/98	9,147	9.6	19.1		
	10/98	8,996	9.4	17.2		
	11/98	8,722	9.1	13.6	FY 1995-96 Total (tons) =	92,137
	12/98	7,258	7.6	-5.5	FY 1995-96 Average Month (tons) =	7,678
	01/99	6,381	6.7	-16.9	Maximum Monthly Difference (%) =	26.5
	02/99	5,976	6.3	-22.2		
	03/99	6,372	6.7	-17.0		
	04/99	6,728	7.0	-12.4		
	05/99	7,269	7.6	-5.3		
	06/99	6,563	6.9	-14.5		
1996-97	07/99	7,094	7.0	-1.6		
	08/99	7,553	7.4	4.7		
	09/99	7,015	6.9	-2.7		
	10/99	7,544	7.4	4.6		
	11/99	6,628	6.5	-8.1	FY 1996-97 Total (tons) =	86,544
	12/99	7,542	7.4	4.6	FY 1996-97 Average Month (tons) =	7,212
	01/00	7,360	7.2	2.0	Maximum Monthly Difference (%) =	-11.2
	02/00	6,404	6.3	-11.2		
	03/00	7,106	7.0	-1.5		
	04/00	7,398	7.3	2.6		
	05/00	7,674	7.5	6.4		
	06/00	7,225	7.1	0.2		
1997-98	07/00	7,041	6.9	6.4		
	08/00	6,678	6.5	0.9		
	09/00	6,523	6.4	-1.4		
	10/00	6,396	6.3	-3.3		
	11/00	5,736	5.6	-13.3	FY 1997-98 Total (tons) =	79,403
	12/00	6,590	6.5	-0.4	FY 1997-98 Average Month (tons) =	6,617
	01/01	6,747	6.6	2.0	Maximum Monthly Difference (%) =	-13.3
	02/01	6,028	5.9	-8.9		
	03/01	6,692	6.6	1.1		
	04/01	6,828	6.7	3.2		
	05/01	6,786	6.7	2.6		
	06/01	7,360	7.2	11.2		
1998-99	07/98	7,599	8.0	-4.5		
	08/98	7,901	8.3	-0.8		
	09/98	7,372	7.7	-7.4		
	10/98	8,617	9.0	8.2		
	11/98	7,583	7.9	-4.7	FY 1998-99 Total (tons) =	95,524
	12/98	8,718	9.1	9.5	FY 1998-99 Average Month (tons) =	7,960
	01/99	7,577	7.9	-4.8	Maximum Monthly Difference (%) =	-12.2
	02/99	6,986	7.3	-12.2		
	03/99	8,197	8.6	3.0		
	04/99	8,012	8.4	0.6		
	05/99	8,224	8.6	3.3		
	06/99	8,739	9.1	9.8		
1999-00	07/99	8,763	8.6	3.2		
	08/99	8,498	8.3	0.1		
	09/99	8,204	8.1	-3.4		
	10/99	8,279	8.1	-2.5		
	11/99	8,266	8.1	-2.6	FY 1999-00 Total (tons) =	101,864
	12/99	8,444	8.3	-0.5	FY 1999-00 Average Month (tons) =	8,489
	01/00	7,303	7.2	-14.0	Maximum Monthly Difference (%) =	-14.0
	02/00	8,460	8.3	-0.3		
	03/00	9,297	9.1	9.5		
	04/00	8,044	7.9	-5.2		
	05/00	9,579	9.4	12.8		
	06/00	8,727	8.6	2.8		
2000-01	07/00	8,160	8.0	-4.0		
	08/00	9,619	9.4	13.2		
	09/00	8,412	8.2	-1.0		
	10/00	8,595	8.4	1.1		
	11/00	8,054	7.9	-5.2	FY 2000-01 Total (tons) =	101,991
	12/00	7,771	7.6	-8.6	FY 2000-01 Average Month (tons) =	8,499
	01/01	8,341	8.2	-1.9	Maximum Monthly Difference (%) =	13.2
	02/01	7,516	7.4	-11.6		
	03/01	8,709	8.5	2.5		
	04/01	8,643	8.5	1.7		
	05/01	9,415	9.2	10.8		
	06/01	8,755	8.6	3.0		

Source: Davidson County Waste Disposal Tonnages.

PROJECT Davidson County MSW Landfill - Phase 2

SUBJECT Earthwork Quantities

SHEET 1 OF 3
JOB NO. DAVIDSON-A
DATE 9/22/04
COMPUTED BY PKS
CHECKED BY

Objective To determine the required volumes of soil and aggregate required for the construction and operation of landfill Phase 2.

Analysis The volumes of each material will be calculated by taking design thicknesses and/or cross sections and multiplying by design areas and/or lengths. Areas and lengths are determined using AutoCAD, a planimeter, and/or direct measurement.

EARTHWORK.WPD

G.N. RICHARDSON & ASSOCIATES
Engineering and Geological Services
14 N. Boylan Avenue, Raleigh, NC 27603
Telephone: (919) 828-0577

G.N. Richardson & Associates

ENGINEERING AND GEOLOGICAL SERVICES

SHEET: 2 /3
JOB #: DAVDCO-A
DATE: 9/22/04
BY: PKS
CHKD BY:

Davidson County MSW Landfill - Phase 2
Earthwork Quantities

Subgrade Cut and Fill Volumes:

Volume of Cut (cy) =	412,771	**(User Input - From AutoCAD - See Attached)**
Volume of Fill (cy) =	172,957	**(User Input - From AutoCAD - See Attached)**

Compacted Soil Liner (CSL) Volume:

Area of CSL (Ac.) =	14.7	**(User Input - From AutoCAD)**
Thickness of CSL (ft) =	1.5	**(User Input)**
Volume of CSL (cy) =	35,574	

Natural Drainage Media (NDM) Volume:

Area of NDM (Ac.) =	14.7	**(User Input - From AutoCAD)**
Thickness of NDM (ft) =	1	**(User Input)**
Volume of NDM (cy) =	23,716	

Protective Cover Volume:

Area of Protective Cover (Ac.) =	14.7	**(User Input - From AutoCAD)**
Thickness of Protective Cover (ft) =	1	**(User Input)**
Volume of Protective Cover (cy) =	23,716	

20" Tire Chips/Shreds:
⇒ 39,527 CY

Daily/Intermediate Cover Volume:

Volume of Daily/Intermediate Cover (cy) =	93,495	**(User Input - From Life Expectancy Calcs.)**

Vegetative Soil Layer (VSL) Volume:

Area of VSL (Ac.) =	14.7	**(User Input - From AutoCAD)**
Thickness of VSL (ft) =	2	**(User Input)**
Volume of VSL (cy) =	47,432	

volume report 092204.txt

Site Volume Table: Unadjusted

	Cut yards	Fill yards	Net yards	Method
Site: AREA1				
Stratum: fcvr-airspace	sgrd-081904	fcvr-081904		
	1	1065388	1065387	(F) Composite
Stratum: topo to sbgrd	topo-overall	sgrd-081904		
	412771	172957	239814	(C) Composite

Lined Area = 14.7 Ac.