FACILITY PLAN

MACON COUNTY MSW LANDFILL
MACON COUNTY, NORTH CAROLINA

MARK D. CATHEY, P.E.

McGill ASSOCIATES

Engineering • Planning • Finance
Asheville, North Carolina

December 2003

03305

FACILITY PLAN
Macon County MSW Landfill

This Facility Plan has been prepared as required under Rule .1617 and in accordance with Rule .1619, of the North Carolina Solid Waste Management Rules (15A NCAC 13B).

The Macon County Municipal Solid Waste (MSW) Landfill, permit no. 57-03, is located approximately one mile north of Franklin, North Carolina on Lakeside Drive. The landfill facility is generally bordered by Lake Emory/Little Tennessee River to the North and the West, Emory Lake Road and U.S. 23/441 to the East, and the city of Franklin to the South. The landfill entrance is off Lakeside Drive. The landfill property consists of 196.42 acres. The landfill has been in operation since May 1992. Westinghouse Environmental performed the original site suitability study dated January 1990.

Since the time of the original issuance of the permit, Macon County has purchased 2 additional tracts of land that adjoined the landfill property. The additional tracts allowed for the expansion of Phase 2.

The total facility waste area includes approximately 45.5 acres of waste area consisting of a closed waste area (cell 1) of 6 acres, an existing waste area (Phase 2 Cell 1) and two additional stages of development totaling 26.8 acres. The current waste area (Phase 2 Cell 1) has 12.7 acres of waste area that connects to the existing cell 1. The waste area is divided into four (4) subcells to better control stormwater and leachate generation.

1.0 Waste Stream

Macon County currently classifies their waste stream as industrial, commercial, municipal, or residential. Non-hazardous industrial sludge and sanitary sewage treatment sludge are currently accepted. The Macon County MSW Landfill prohibits regulated hazardous waste, and hazardous liquid wastes.

The service area for the Macon County MSW Landfill will include businesses and municipalities located within Macon County. Waste from other counties will not be accepted at the facility. The waste disposed of at the Macon County MSW Landfill can be classified into two sectors, residential and non-residential. The residential waste compromises approximately 63% of the total waste stream while the non-residential waste compromises approximately 37% of the total waste stream. These percentages were calculated using previous scale records. The Macon County MSW Landfill receives approximately 950 tons of wastewater sludge annually from the Town of Franklin Wastewater Treatment Facility.

The total waste stream for the current landfill is approximately 2,261 tons per month. This waste stream could vary as much as 10 percent based on past occurrences of fluctuations. This disposal rate was calculated by averaging the existing rate with a projected increase rate of 2.5% per year. The Macon County disposal rate for FY 2002-

03 and FY 2007-08 is approximately 25,482 tons and 28,830 tons per year, respectively. These rates translate to approximately 2,261 tons per month over the next five years. The operating hours for the landfill are Monday through Friday 7:30 a.m. to 4:30 p.m. The landfill is closed for Christmas, Thanksgiving and any Federal Holiday that is on Tuesday through Thursday (4 days in 2003). These hours of operation translate to 256 days of operation with a daily waste disposal rate of 106 tons per day.

The Macon County Solid Waste Management Department (MCSWMD) currently operates a baling facility at the Macon County MSW Landfill, which began operating in late 1997. The majority of the solid waste received at the Landfill is processed at the baling facility prior to being disposed of in the landfill. MCSWMD also operates a composting facility at the landfill. The composting facility consists of a 50' by 100' concrete pad in which waste materials are composted using a windrow method. The finished product is used as soil amendment at the Landfill and given to the public. A recycling center is also operated by MCSWMD to process and bale all recyclable materials before shipment to vendors for final processing. MCSWMD operates a yard waste facility to process untreated wood waste from land clearing. The mulch produced from the yard waste facility is used as an Alternative Daily Cover for the MSW and as bulking material in the composting facility. Extra material is made available to the public. The construction and demolition waste is transferred to the Wilson Gap Road C/D Landfill in Highlands.

Macon County uses the following equipment to operate and maintain the Landfill: one compactor, one wheel loader, one track loader, two dozers, one skid steer, two flatbed trucks, and two dump trucks. This equipment should be sufficient for operating the landfill under its current waste stream.

2.0 Landfill Capacity and Soil Resources

The Phase II Cell 1 landfill has an approximate gross fill capacity (top of the stone drainage layer on top of the composite liner system to the top of the cap) of 989,949 cubic yards. This total gross fill capacity is broken up into subcell 1 gross fill capacity of 92,800 CY, subcell 2 gross fill capacity of 222,300 CY, subcell 3 gross fill capacity of 157,233 CY, subcell 4 gross fill capacity of 390,536 CY, and the final filling of Phase 2 gross fill capacity of 127,080 CY. Based on an assumed waste to soil ration of 6:1, this results in the following available waste capacities: subcell 1 - 76,645 CY; subcell 2 - 185,150 CY; subcell 3 - 127,303 CY; subcell 4 - 304,046 CY; and the final filling of Phase 2, Cell 1 - 96,065 CY. The total Phase II estimated life expectancy is 13.7 years. Based on the amount of waste received through June 2003, the remaining net waste airspace is 578,887 CY. Since February 1999 when Phase II, Cell 1 started operation, 176,334 tons of waste has been received. From February 1999 until June 2003, 341,858 CY of airspace has been used. This equates to a waste density of 0.471 tons/CY or 942.31 lbs/CY. The waste density is not the actual in-place density of the fill, but rather a ratio of how much volume of airspace is being taken up by a pound of waste. In order to get the actual in-place density, the actual volume and tonnage of soil cover material that has been placed in

the landfill would be needed. Thus, there is an estimated 9.3 years of landfill life remaining.

The geometry of the Phase II Cell 1 dictated that the entire phase be constructed at one time. The base grading plan is shown on sheet 3. The filling operation was divided into four (4) subcells and one (1) final filling operation. The first phase of filling is the filling of subcells 1 through subcells 4. The filling operations are shown on sheets 8 through 12 of the Permit Drawings.

The remaining landfill area will be developed in two additional cells. Cell 3 is approximately 22 acres and provides approximately 15.8 years of life. The filling will begin in the western end of the cell and progress to the eastern end. The progressive filling will utilize three (3) subcells to better control storm water. Each subcell will provide approximately 5.3 years of life.

Cell 4 is a very small cell covering only 4.8 acres. Cell 4 will be filled from the western end and move to the East. The total life of cell 4 is approximately 0.9 years.

The following is a breakdown of the construction, airspace, and closure quantities. Gross air space is defined as area available from the top of the stone drainage layer on top of the composite liner system to the top of the cap. Net air space is the area available from the top of the stone drainage layer on top of the composite liner system to the bottom of the cap. Available waste volume is defined as the net air space minus operational cover. This gives the true volume available for incoming waste. Operational cover is the area used for daily cover (either six inches of dirt or an approved Alternative Daily Cover).

Phase II Construction: (from existing grade to base grade)

Excavation	370,000 CY
Structural Fill (in-place)	250,000 CY
15% Compaction	37,500 CY
Total Fill Required	287,500 CY
Stockpiled Material	82,500 CY

Phase II Operation:

Assumptions:
6:1 waste to soil ratio
942.31 lbs/CY compaction density
27,128 waste tons/year (2,261 tons/month)

Subcell 1	
Gross Airspace	92,800 CY
Final Cover	3,380 CY
Net Airspace	89,420 CY
Operational Cover	12,775 CY
Available Waste Volume	76,645 CY
Total Waste	36,100 Tons
Subcell 2	
Gross Airspace	222,300 CY
Final Cover	6,292 CY
Net Airspace	216,008 CY
Operational Cover	30,858 CY
Available Waste Volume	185,150 CY
Total Waste	87,206 Tons
Subcell 3	
Gross Airspace	157,233 CY
Final Cover	8,772
Net Airspace	148,521 CY
Operational Cover	21,218 CY
Available Waste Volume	127,303 CY
Total Waste	59,931 Tons
Subcell 4	
Gross Airspace	390,536 CY
Final Cover	35,816 CY
Net Airspace	354,720 CY
Operational Cover	50,674 CY
Available Waste Volume	304,046 CY
Total Waste	143,206 Tons
Final Grading	
Gross Airspace	127,080 CY
Final Cover	15,004 CY
Net Airspace	112,076 CY
Operational Cover	16,011 CY
Available Waste Volume	96,065 CY
Total Waste	45,247 Tons

Closure: (includes closure of Phase I and Phase II)

Total Area (phase 1 and phase 2)	19.8 acres
12" Intermediate Cover	32,900 CY
18" Clay Liner	49,400 CY
18" Vegetative Cover	49,400 CY

Summary of Required Soil Quantities for Phase II:

Excavation	370,000 CY
Structural Fill	287,500 CY
Stockpile Material (landfill const)	82,500 CY
Stockpile Material (baling facility const)	30,000 CY
Borrow Area	95,000 CY
Total Available Stockpile	207,500 CY
Compacted Clay Liner	41,700 CY
Operational Cover	131,536 CY
Intermediate Cover	32,900 CY
Closure Compacted Clay Liner	49,400 CY
Vegetative Cover	49,400 CY
Subtotal	274,936 CY
15% Compaction	41,240 CY
Total Required Soil	316,176 CY

Soil Balance:

Total Required Soil	316,176 CY
Total Available Soil	207,500 CY
Soil Deficit	138,676 CY

The Phase II Expansion will require approximately 11,250 cubic yards of cover soils each year, based on a six (6) to one (1) waste to soil ratio. The soil quantities required for closure will include, 32,900 cubic yards of intermediate cover soils, 49,400 cubic yards of clay with a possible bentonite admixture, and 49,400 cubic yards of vegetation-supportive soil. The soil borrow and stockpile areas are shown on sheet 2 and 3. The above soil volume analysis shows that the landfill will require an additional 140,000 cubic yards of material to construct, operate, and close the landfill. This additional material will be obtained from the construction of Cell 3.

Future Landfill Development

Cell 3

Capacity	
Waste Area	22.0 Acres
Gross Air space	1,405,600 CY
Final Cover (3' thick)	106,500 CY
Protective Cover (2' thick)	71,000 CY
Net Airspace	1,228,100 CY
Available Waste Volume	1,052,650 CY
Total Waste	631,500 Tons
Life @ 40,000 tons/yr	15.8 Years
Construction	
Excavation	650,000 CY
Embankment	150,000 CY
Clay liner (in-place)	71,000 CY
Protective Cover (in-place)	71,000 CY
Stockpiled Material	500,000 CY
Operation	
Operational cover	175,400 CY
Closure	
18-inch vegetative cover	53,250 CY
18-inch clay cover	53,250 CY
Summary	
Stockpiled Material	500,000 CY
Deficit from Cell 2	138,676 CY
Available Material	361,324 CY
Clay Layer	71,000 CY
Operational Cover	175,400 CY
Closure	106,500 CY
Surplus Deficit	+8,424 CY

Cell 4

Capacity	
Waste Area	4.8 acres
Gross Airspace	127,900 CY
Final Cover (3.0 thick)	23,200 CY
Protective Cover (2' thick)	19,400 CY
Net Airspace	85,300 CY

Available Waste Volume	73,100 CY
Total Waste	43,860 Tons
Life @ 49,250 tons/yr	0.9 years
Construction	
Excavation	125,000 CY
Embankment	125,000 CY
Clay liner (in-place)	15,500 CY
Protective Cover (in-place)	15,500 CY
Stockpiled Material	0 CY
Operation	
Operational cover	12,200 CY
Closure	
18-inch vegetative cover	11,600 CY
18-inch clay cover	11,600 CY
Summary	
Surplus from Cell 3	8,424 CY
Clay Layer	15,500 CY
Operational Cover	12,200 CY
Closure	23,200 CY
Surplus/Deficit	-42,476 CY

3.0 Environmental Control System

The major components of the Environmental Control System are a composite clay liner constructed of a 24-inch, low-permeability clay layer with a permeability not greater than 1×10^{-7} cm/sec, and overlain by a 60 mil HDPE liner. Once a protective 16-ounce geotextile was placed on the HDPE liner, a two (2)-foot drainage layer including leachate collection pipes was placed on top of the composite liner system. The composite liner provides a redundant system for assuring that leachate is contained within the cell and does not affect local hydrogeology. The high permeability of the drainage layer assures quick and efficient removal of leachate from the cell floor to the sump areas at the northern side of the cell floor, therefore further reducing leak potential. Once leachate reaches the sump areas, it is pumped to the leachate surface impoundment through a dual-contained leachate force main. Leachate pumps located in the sump areas are activated by head heights less than twelve (12) inches to assure leachate maximum head requirements are not exceeded. Disposal of leachate from the leachate storage pond is discussed in the Operations Plan.

4.0 Leachate Management

4.1 Design Concepts

The Phase II leachate collection system was designed to remove leachate from the lined waste area at a rate so as not to allow more than one (1) foot depth of leachate on the composite liner. This is achieved by using a high permeability drainage layer, appropriately spaced perforated leachate collection pipes, double lined leachate sump, and appropriately sized leachate pump stations.

4.2 Leachate Generation

The amount of leachate estimated to be generated by the Phase II Expansion was analyzed using the HELP model. Phase II was analyzed under seven (7) different stages of development using the HELP model. The stages varied from the first stage analyzing the landfill with only a small portion active and the seventh (7th) stage analyzing the landfill after closure was complete. Stage six (6) analyzed the landfill near capacity and just prior to closure. At this stage, most of the landfill would be filled with waste and be covered with one (1) foot of intermediate cover. Stage (6) produced the highest monthly average of leachate with an average flow of 23,758 gallons per month.

4.3 Leachate Management System

The leachate collection system is shown on sheet 4 and is detailed on sheet 22 of the permit drawings. The collection system consists of a high permeability drainage layer, 6-inch perforated HDPE laterals, 8-inch HDPE collectors, and leachate pump stations.

The leachate collection pipes were designed to handle the projected peak leachate flow demonstrated in H.E.L.P. analysis. The highest leachate design flow was in case 1. The largest area draining into a single pipe was 2.5 acres. Applying the case 1 rate to the 2.5 acres produces a design flow of 0.13 gallons per minute (GPM). The leachate pipes are placed at a minimum slope of 3.0%. A six-inch pipe at this slope can carry a minimum of 5.1 GPM.

The leachate pump stations were designed with the peak leachate flow with a peaking factor of 4.0. The average monthly flow of 362,077 gallons with a 4.0 peak factor equals a design flow rate of 33.3 gallons per minute. Both sumps and leachate pumps were designed to accommodate the design flow of 33.3 gpm. The system curve for the two (2) pumps in parallel and the pump curve were analyzed. Individually the pumps can provide 42.3 gpm at 72.5 feet of head and together they can provide 64.8 gpm at 83.5 feet of head. The pumps feed into a 3" dual-contained force main located along the edge of the access road on the western side of the cell. The force main accommodates the 42.3 gpm flow with a velocity of 3.81 feet per second and the 64.8 gpm at a velocity of 5.8 feet per second. The force main empties into the existing leachate surface impoundment located below Phase 1 Cell 1.

The existing leachate surface impoundment has a capacity of 770,000 gallons with the minimum two (2) feet of freeboard. The existing waste areas are averaging between 12,000 and 13,000 gallons per day of leachate. The pond will provide storage for the maximum average monthly flow from Phase 1 and 2. Macon County has an agreement with the Town of Franklin for treatment of the leachate produced at the landfill at the Town of Franklin Wastewater Treatment Plant.

4.4 Contingency Plan

The Phase II Expansion has a maximum working area of approximately 3.8 acres at any one time during operation of the landfill. This area is covered by lifts of waste with a maximum of only 1 acre without intermediate cover in place. The effects of an intense storm event would be greatly dampened by the waste due to the time it would take the stormwater to percolate through the layers of waste and daily cover. The average combined flow that will reach the sump is estimated to be 8.3 gpm. A peaking factor of 4.0 was applied to the average flow for a design flow of 33.3 gpm. Although the flow will be divided between the two sumps, both pumps were conservatively sized to pump the full 33.3 gpm. The pumps will pump approximately 42.3 gpm at 72.5 feet of head each. This would mean that each pump could pump over 5 times the estimated average flow of leachate. The leachate surface impoundment will accommodate the maximum average monthly flow, but the frequency of pumping by the Town of Franklin WWTP could be easily increased since the pond is located beside the WWTP.

In the event that there was a temporary failure with any of the leachate removal and storage equipment, the geometry of the landfill would allow for the landfill to contain the leachate for a period of several months. Action will be taken to remedy any malfunction

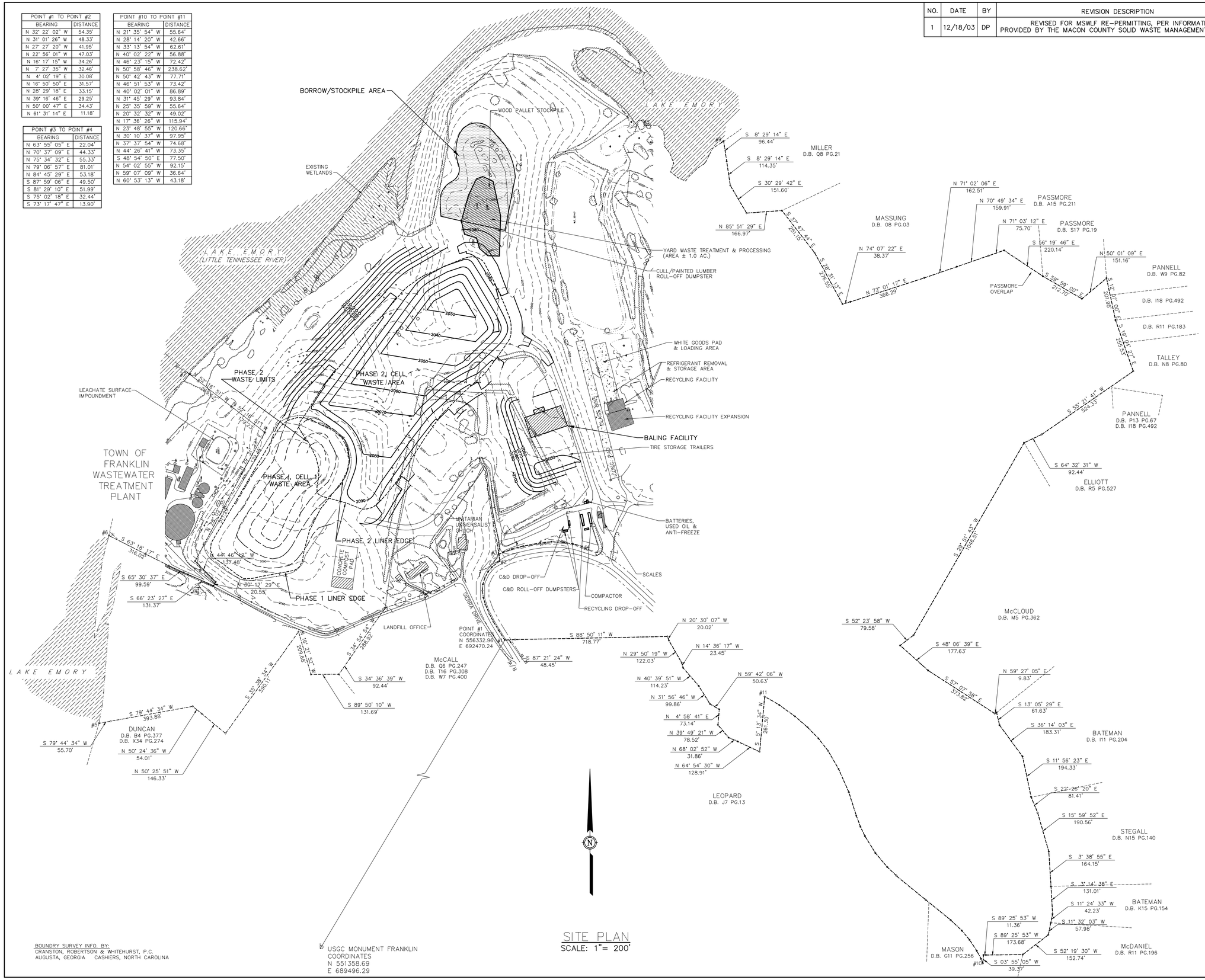
within 2 days. Due to the conservative design of the leachate removal and storage equipment and the geometry of the landfill, the possibility of leachate overflowing the perimeter berm is virtually impossible.

NO.	DATE	BY	REVISION DESCRIPTION
1	12/18/03	DP	REVISED FOR MSWLF RE-PERMITTING, PER INFORMATION PROVIDED BY THE MACON COUNTY SOLID WASTE MANAGEMENT DEPARTMENT

POINT #1 TO POINT #2	
BEARING	DISTANCE
N 32° 22' 02" W	54.35'
N 31° 01' 26" W	48.33'
N 27° 27' 20" W	41.95'
N 22° 56' 01" W	47.03'
N 16° 17' 15" W	34.26'
N 7° 27' 35" W	32.46'
N 4° 02' 19" E	30.08'
N 16° 50' 50" E	31.57'
N 28° 29' 18" E	33.15'
N 39° 16' 46" E	29.25'
N 50° 00' 47" E	34.43'
N 61° 31' 14" E	11.18'

POINT #3 TO POINT #4	
BEARING	DISTANCE
N 63° 55' 05" E	22.04'
N 70° 37' 09" E	44.33'
N 75° 34' 32" E	55.33'
N 79° 06' 57" E	81.01'
N 84° 45' 29" E	53.18'
S 87° 59' 06" E	49.50'
S 81° 29' 10" E	51.99'
S 75° 02' 18" E	32.44'
S 73° 17' 47" E	13.90'

POINT #10 TO POINT #11	
BEARING	DISTANCE
N 21° 35' 54" W	55.64'
N 28° 14' 20" W	42.66'
N 33° 13' 54" W	62.61'
N 40° 02' 22" W	56.88'
N 46° 23' 15" W	72.42'
N 50° 58' 46" W	238.62'
N 50° 42' 43" W	77.71'
N 46° 51' 53" W	73.42'
N 40° 02' 01" W	86.89'
N 31° 45' 29" W	93.84'
N 25° 35' 59" W	55.64'
N 20° 32' 32" W	49.02'
N 17° 36' 26" W	115.94'
N 23° 48' 55" W	120.66'
N 30° 10' 37" W	97.95'
N 37° 37' 54" W	74.68'
N 44° 26' 41" W	73.35'
S 48° 54' 50" E	77.50'
N 54° 02' 55" W	92.15'
N 59° 07' 09" W	36.64'
N 60° 53' 13" W	43.18'



SITE PLAN
SCALE: 1"= 200'

BOUNDRY SURVEY INFO. BY:
CRANSTON, ROBERTSON & WHITEHURST, P.C.
AUGUSTA, GEORGIA CASHIERS, NORTH CAROLINA

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC PH. (828) 252-0575

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 24993 MARK D. CASTELLO

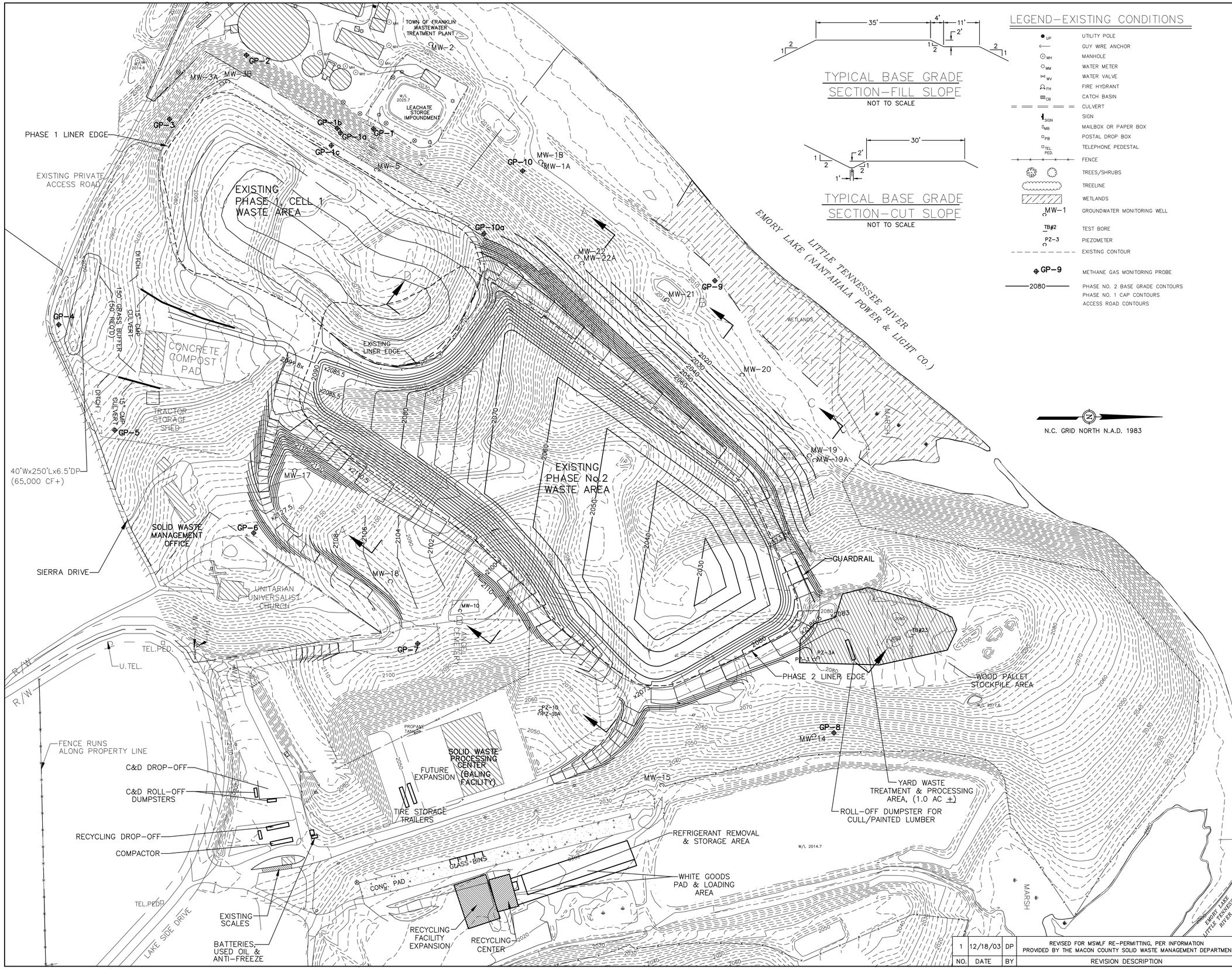
PHASE 2, CELL 1
MACON COUNTY
MSW LANDFILL
MACON COUNTY, NORTH CAROLINA

JOB NO.: 96117.01
DATE: MAY 1997
SCALE: 1" = 200'
REVISION: NOV. 2003

96117/PermitRenewalDwgs-03/96117SIT

SITE PLAN

SHEET 2 OF 23



NO.	DATE	BY	REVISION DESCRIPTION
1	12/18/03	DP	REVISED FOR MSWLF RE-PERMITTING, PER INFORMATION PROVIDED BY THE MACON COUNTY SOLID WASTE MANAGEMENT DEPARTMENT

McGill ASSOCIATES
ENGINEERING·PLANNING·FINANCE
55 BROAD STREET ASHEVILLE, NC PH. (828) 252-0575

NORTH CAROLINA PROFESSIONAL SEAL 24993 ENGINEER MARK D. CATHEY

PHASE 2, CELL 1
MACON COUNTY
MSW LANDFILL
MACON COUNTY, NORTH CAROLINA

JOB NO.: 96117.01
DATE: MAY 1997
SCALE: 1" = 100'
REVISION: NOV. 2003

96117/PermitRenewalDwgs-03/96117BG

BASE GRADING PLAN

SHEET 3 OF 23