

Fac/Perm/Co ID #	Date	Doc ID#
43-02	07/29/09	DIN 8910



July 16, 2009

PN: 03002C

Mr. Geof Little
Solid Waste Section
Division of Waste Management
North Carolina Department of Environment and Natural Resources
Mail Service Center 1646
Raleigh, NC 27699-1646

**RE: Leachate Management System
Dunn-Erwin Landfill
Permit 43-02
Harnett County, North Carolina**

Dear Mr. Little:

On behalf of Harnett County, C. T. Clayton, Sr., P.E., Inc. (CTC) would like to inform you of our proposed leachate management system for the Dunn-Erwin Landfill (DELFL) MSW landfill topped with C&D, Permit 43-02.

Over the last 2 to 3 years, routine landfill inspections have uncovered several leachate pop-outs on the active C&D cell over closed MSW that have required attention. The standard method of repair has been to dig back down and into the cell down-gradient of the pop-out and fill the area with stone. This directs the leachate back into the cell. The cap material and vegetative cover would then be replaced.

At the lower end of the landfill, several of these standard repairs have been attempted and in the last month, inspections have indicated that this method will not work any further. Therefore, the Owner has implemented a two-phased plan to manage the leachate. Phase 1, the temporary solution, is shown on the attached map. It is described as follows:

- A sump will be dug into the side of the landfill where a perforated 18" corrugated plastic pipe (CPP) will be surrounded with rip-rap.
- A 4" PVC pipe will be inserted into the 18" CPP and exit out the top and down the slope to a truck loading area. The 4" PVC pipe will have a valve located at the discharge point. This pipe will act as a suction pipe.
- An all-weather road will be constructed to the leachate loading station.

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Coats, NC 27521
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Offices located in Coats and New Bern, North Carolina
www.ctclayton.com



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-
- The ABC Stone leachate loading station will be graded on a 8:1 slope surrounded by a clay containment berm to hold any potential spills. A 4" PVC drain pipe will be installed on the lower end of the loading station to allow release of storm water. If the hauler has a spill, a plug valve is located on this line which the driver would immediately close to contain the spill within the berm.
 - The permitted septic hauler will transport the leachate to the Harnett County WWTP in Lillington, NC which has a septic receiving station at the facility.

Phase 2 will be the permanent leachate management solution and will involve installing a pumping station on the DELF facility and running a force main to the nearest gravity sewer that discharges to the Harnett county owned Erwin WWTP. See draft PER attached. Discussions and planning are currently occurring with Harnett County Department of Public Utilities concerning location/ownership of the permanent wastewater pump station, laboratory analysis of the leachate, and general logistics of including the leachate into the WWTP. The PER will be updated and a final solution designed shortly upon completion of these discussions.

In order to not incur any violations for leachate release, the County is proceeding with Phase 1 as of today, July 16, 2009. If you have any problems or concerns with this plan, please contact CTC and Harnett County Solid Waste Department immediately. Also, please inform us of any permitting requirements that will be needed, and they will be addressed right away.

Should you have any questions or comments, please contact me or Ryan Sadler at the telephone numbers below or by e-mail at tyrus@ctclayton.com or ryan@ctclayton.com.

Sincerely,



C. Tyrus Clayton, Jr., P.E.

cc: C. T. Clayton, Sr., P. E.
C. J. Poran, PhD, P. E., (ENSOL)
Jerry Blanchard

PRELIMINARY ENGINEERING REPORT

Dunn-Erwin Landfill Leachate Management System Phase II Harnett County, North Carolina

July 2009



**DRAFT DOCUMENT
- FOR REVIEW ONLY -
NOT RELEASED FOR
PUBLICATION**

Prepared by:



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EXHIBITS

- Exhibit 1 – Plan of Existing Landfill**
- Exhibit 2 – Plan of Alternative 1**
- Exhibit 3 – Plan of Alternative 2**
- Exhibit 4 – Plan of Alternative 3**
- Exhibit 5 – Plan of Alternative 4**

1.0 INTRODUCTION

Harnett County owns and operates the Dunn-Erwin Landfill, located approximately two miles north of Erwin in the eastern part of the county. The landfill handles municipal solid waste, yard waste, construction and demolition debris and several categories of recyclable materials under permits issued by the North Carolina Department of Environment and Natural Resources, Division of Waste Management, Solid Waste Section. The landfill contains several landfill cells that have been closed after reaching their capacity. One municipal solid waste cell, the origin of the proposed project, was converted to a construction and demolition debris cell following the opening of a municipal solid waste transfer station within the landfill in 1998 (see Exhibit 1). The transfer station now handles all of the municipal solid waste coming to the landfill by loading it on trucks for transportation to another landfill facility. The Dunn-Erwin landfill is expected to continue operating in its current mode for several decades.

All landfills produce leachate as a by-product. Leachate is the liquid that leaches from the waste as water from the surface as it migrates down through the waste. Leachate from municipal solid waste landfills typically contains a very large number of chemical substances, many of them harmful, in unknown and constantly changing concentrations. It is considered to be hazardous to ground water and to drinking water wells that withdraw the ground water. The North Carolina Administrative Code requires that “A site shall not cause a discharge of pollutants into waters of the state that is in violation of the requirements of the National Pollutant Discharge Elimination System (NPDES), under Section 402 of the Clean Water Act, as amended, or that is in violation of standards promulgated under G.S. 143-214.1 and G.S. 143-215,” (15NCAC 13B .0503(2)(c)(i)) and “Leachate shall be contained on site or properly treated prior to discharge” (15NCAC 13B. 0505(7)(c)) and “In the event of noncompliance with the permit, the permittee shall take all reasonable steps to minimize releases to the environment, and shall carry out such measures as are reasonable to prevent adverse impacts on human health or the environment” (15NCAC 13B. 1604(b)(2)(B)). Regulations governing the design and operation of such landfills require an array of monitoring wells near each cell and

a program of ground water monitoring to detect contamination from landfill leachate. The monitoring program at the Dunn-Erwin landfill has detected contamination leaving the converted municipal solid waste cell both in the ground water and on the surface (see Exhibit 1).

This report describes the problem of unmanaged leachate, examines four alternative management responses and presents recommendations for addressing the problem.

2.0 EXECUTIVE SUMMARY

This report is intended to describe the problem of seeping leachate at the Dunn-Erwin Landfill, to describe options for managing the leachate and to present recommendations to the Harnett County Manager and Commissioners so that the County can allocate funds to implement management of the leachate in a functionally effective and cost effective manner.

Included as part of this report are tables detailing the estimated cost of design, permitting, construction and operation of the four alternative management schemes. The tables were used in analyzing the relative cost effectiveness of the alternatives.

It is the conclusion of CTC that Harnett County should expend, in the most cost effective manner, its resources for a leachate management system for the Dunn-Erwin Landfill in order to protect the environment and to comply with North Carolina solid waste management regulations and the provisions of the County's existing landfill permits.

3.0 EXISTING FACILITIES

The converted municipal solid waste landfill cell at the Dunn-Erwin Landfill Facility consists of a low, wide layer of municipal solid waste that extends below the adjoining grade and is covered with a soil cap above grade, and a pyramid of construction and demolition debris that is being built on top of the municipal solid waste layer and covered with soil as it progresses. The cell does not have a plastic liner to prevent leachate from migrating down into the subgrade or a leachate collection system to collect and hold the leachate for pumping and hauling to a wastewater treatment plant. At the time the cell was originally permitted, such special leachate control measures were not required by landfill regulations. Rather, a ground water monitoring program was required, which would enable response to a ground water contamination problem if it should arise.

4.0 NEED FOR LEACHATE MANAGEMENT

Since 2003 observations from monitoring wells surrounding the converted municipal solid waste cell have revealed that a plume of contamination is migrating horizontally to the west in the ground water beneath the landfill. A corrective action plan has been submitted to the Solid Waste Section to address the ground water contamination threat posed by that plume. More recently leachate has been discovered seeping from the side of the cell on the southern side (see Exhibit 1). Onsite diversions to redirect the flow back with the cell have shown short-term success but eventually failed at diverting these seeps on the southern side of the cell. This new leachate flow threatens to contaminate surface water as it flows downhill toward the stream and wetlands on the south side of the cell. The flow is not expected to cease since it is driven and contributed to by precipitation falling on the surface of the cell and traveling down through the waste. It is clear that a means of containing and safely disposing of the leachate from the converted municipal solid waste cell must be put into place.

5.0 ALTERNATIVES CONSIDERED

ALTERNATIVES 1 AND 2

Alternatives 1 and 2 for disposing of collected landfill leachate that is approved by regulatory authorities is to discharge it into a permitted wastewater collection system or treatment facility. The closest such systems to the Dunn-Erwin landfill are the Harnett County wastewater collection system. A gravity sewer line extends north from Erwin along NC Highway 55 to Coats-Erwin Middle School at the intersection of Highway 55 and Turlington Road SR 1723, approximately 4100 feet west of the converted municipal solid waste cell (see Exhibit 2) It would be possible to collect leachate seeping from the cell and pipe it to a manhole in this sewer line south of the school. Due to the terrain between the landfill and the school the leachate could not flow by gravity but would have to be pumped to the manhole. Along with leachate seeping from the cell, water collected in floor drains at the transfer station could be sent to the sewer line on Highway 55. This water is currently held in tanks adjacent to the transfer station, pumped into a tank truck and hauled to the Harnett County Wastewater Treatment Plant. In order to pump wastewater (leachate and floor water) from two sources, two pump stations would be needed. A small pump station would be located near the point where leachate has been observed seeping from the cell. Leachate would drain into perforated pipe in an underground gravel bed from which it would flow to a concrete or plastic wet well containing a submersible pump. From there it would be pumped to a similar but larger wet well with two submersible pumps near the transfer station. This wet well would collect the leachate and floor water by gravity, which would then be pumped to the manhole at Highway 55 through a 4-inch PVC force main.

There are two possible routes the force main could follow from the landfill to Highway 55. The shorter route runs from the north corner of the landfill west across the property of Edward S. Turlington and across the Coats-Erwin Middle School property near the south edge of that property to the right of way of Highway 55, then south within the right of way to the destination manhole. The two pump stations and force main following the above route are designated Alternative 1 (see Exhibit 2).

The second possible route runs from the north side of the landfill north along the west side of Daniels Road SR 1724 to Turlington Road SR 1723 then west along the south side of Turlington Road to Highway 55 and south along the east side of Highway 55 to the destination manhole, all within the rights of way of public roads. The two pump stations and force main following the above route are designated Alternative 2 (see Exhibit 3).

ALTERNATIVE 3

Another possible destination for the wastewater is an existing pump station at the intersection of Red Hill Church Road SR 1703 and Bryant Road SR 1720, approximately 12,000 feet south of the converted cell, part of the Harnett County wastewater collection system. Sending the wastewater to this destination would involve the same two pump stations as in the two previous alternatives. The force main would run south from the transfer station pump station to the south edge of the landfill property on Ashe Avenue SR 1725, then under Ashe Avenue and southeast along the southwest side of Ashe Avenue to Red Hill Church Road SR 1703, then under Red Hill Church Road and south along the east side of Red Hill Church Road to Bryant Road SR 1720, then under Bryant Road and to the pump station. The two pump stations and force main following the above route are designated Alternative 3 (see Exhibit 4).

ALTERNATIVE 4

Instead of the pump stations and force mains of Alternatives 1-3, the wastewater could be held in an underground concrete tank near the transfer station and periodically pumped into a tank truck, hauled to a wastewater treatment plant and discharged. This alternative would include the same small pump station at the converted cell as the prior three alternatives. A new concrete tank would be required in addition to the two existing tanks. It is designated Alternative 4 (see Exhibit 5).

The advantages of conveying wastewater by pump stations and a force main include:

- Operation is automated, requiring very little operator attention.
- Components are underground, so possibility of a wastewater spill is minimized.
- Components can accommodate wide variations in flow rate.

The disadvantages of conveying wastewater by pump stations and a force main include:

- Installation (capital cost) is expensive, particularly boring under roads and streams.

The advantages of the force main route of Alternative 1 include:

- It is the shortest force main route (approximately 5400 feet from the transfer station pump station to the manhole).
- Necessity of coordination with other underground facilities in road rights of way is minimized.

The disadvantages of the force main route of Alternative 1 include:

- It would require an easement across the property of Edward S. Turlington, which may or may not be available.
- The bore under Stewart Creek and adjoining wetlands by horizontal directional drilling would be long.
- Coordination with other underground facilities on the school property might be necessary.

The advantages of the force main route of Alternative 2 include:

- No easement would be required.
- The bore under Stewart Creek by horizontal directional drilling would be shorter than the bore of Alternative 1.

The disadvantages of the force main route of Alternative 2 include:

- It is a longer route than that of Alternative 1 (approximately 9900 feet from the transfer station pump station to the manhole).
- Coordination with other underground facilities in road rights of way might be necessary.
- Air relief valves and manholes might be necessary.

The disadvantages of the force main route of Alternative 3 include:

- It is a longer route than that of Alternative 2 (approximately 16,500 feet from the transfer station pump station to the existing [owner] pump station).
- A bore under the tributary to Stewart Creek on the landfill property by horizontal directional drilling would be required.
- Three bores under roads by boring and jacking would be required.
- Coordination with other underground facilities in road rights of way might be necessary.
- One or more air relief valves and manholes might be necessary.

There are no advantages of the force main route of Alternative 3.

The advantages of Alternative 4 include:

- No construction outside the landfill would be required.
- Initial design, equipment and construction costs (capital cost) would be relatively low in comparison.

The disadvantages of Alternative 4 include:

- Operating costs would be the highest of all alternatives.
- An additional employee would probably have to be hired.
- A haul truck would need to be purchased.
- Daily monitoring of the liquid level in the holding tanks would be required in order to avoid overflows.
- Some disruption of normal solid waste operations might occur on days when the truck driver is not available.
- The possibility of a wastewater spill is greater than for conveying wastewater by force main.

6.0 SELECTION OF AN ALTERNATIVE

Selection of an alternative from among the four described involves consideration of the initial costs of design, permitting and construction and the continuing costs of operation and maintenance of each alternative. The following tables give the estimated costs of the alternatives.

6.1 Initial Costs

Table 1-1

CONSTRUCTION COST OPINION ALTERNATIVE 1 DUNN ERWIN LANDFILL LEACHATE MANAGEMENT					
Item	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1	Gravel Bed & Drain System	LS	1	\$20,000.00	\$20,000.00
2	Small Pump Station	LS	1	\$10,000.00	\$10,000.00
3	Electrical Service to Pump Station	LS	1	\$4,000.00	\$4,000.00
4	2" PVC Force Main to Large Pump Station	FT	1,860	\$10.00	\$18,600.00
5	3hp Solids Handling Pump Station w/ Controls & Generator	LS	1	\$100,000.00	\$100,000.00
6	4" PVC Force Main to NC 55	FT	4,450	\$13.00	\$57,850.00
7	Air Release Valve & Manhole	EA	1	\$4,500.00	\$4,500.00
8	6" HDPE Stream Crossing	FT	930	\$125.00	\$116,250.00
Subtotal					\$331,200
Permitting, Surveying, Administration, Contingency, Easements and Engineering (30%)					\$99,360
TOTAL					\$430,560

Table 1-2

CONSTRUCTION COST OPINION ALTERNATIVE 2 DUNN ERWIN LANDFILL LEACHATE MANAGEMENT					
Item	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1	Gravel Bed & Drain System	LS	1	\$20,000.00	\$20,000.00
2	Small Pump Station	LS	1	\$10,000.00	\$10,000.00
3	Electrical Service to Pump Station	LS	1	\$4,000.00	\$4,000.00
4	2" PVC Force Main to Large Pump Station	FT	1,860	\$10.00	\$18,600.00
5	4hp Grinder Pump Station w/ Controls & Generator	LS	1	\$115,000.00	\$115,000.00
6	2" PVC Force Main to NC 55	FT	9,570	\$10.00	\$95,700.00
7	6" HDPE Stream Crossing	FT	300	\$125.00	\$37,500.00
8	Air Release Valve & Manhole	EA	1	\$4,500.00	\$4,500.00
Subtotal					\$305,300
Permitting, Surveying, Administration, Contingency, Easements and Engineering (30%)					\$91,590
TOTAL					\$396,890

Table 1-3

CONSTRUCTION COST OPINION ALTERNATIVE 3 DUNN ERWIN LANDFILL LEACHATE MANAGEMENT					
Item	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1	Gravel Bed & Drain System	LS	1	\$20,000.00	\$20,000.00
2	Small Pump Station	LS	1	\$10,000.00	\$10,000.00
3	Electrical Service to Pump Station	LS	1	\$4,000.00	\$4,000.00
4	2" PVC Force Main to Large Pump Station	FT	1,860	\$10.00	\$18,600.00
5	10hp Grinder Pump Station w/ Controls & Generator	LS	1	\$180,000.00	\$180,000.00
6	2" PVC Force Main to SR 1703 and SR 1720	FT	16,200	\$10.00	\$162,000.00
7	6" HDPE Stream Crossing	FT	300	\$125.00	\$37,500.00
8	Encasement Pipes at Road Crossings	FT	140	\$210.00	\$29,400.00
9	Air Release Valve & Manhole	EA	2	\$4,500.00	\$9,000.00
Subtotal					\$470,500
Permitting, Surveying, Administration, Contingency, Easements and Engineering (30%)					\$141,150
TOTAL					\$611,650

Table 1-4

CONSTRUCTION COST OPINION ALTERNATIVE 4 DUNN ERWIN LANDFILL LEACHATE MANAGEMENT					
Item	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1	Gravel Bed & Drain System	LS	1	\$20,000.00	\$20,000.00
2	Small Pump Station	LS	1	\$10,000.00	\$10,000.00
3	Electrical Service to Pump Station	LS	1	\$4,000.00	\$4,000.00
4	2" PVC Force Main to Holding Tank	FT	1,860	\$10.00	\$18,600.00
5	Holding Tank	EA	1	\$40,000.00	\$40,000.00
6	New 4,000gal Pump & Haul Truck	LS	1	\$120,000.00	\$120,000.00
Subtotal					\$212,600
Permitting, Surveying, Administration, Contingency, and Engineering (25%)					\$53,150
TOTAL					\$265,750

6.2 Continuing Costs

An annual Operation & Maintenance cost comparison is presented below.

Table 2

Dunn Erwin Landfill Leachate Management Operation and Maintenance Cost Alternative Comparison				
O&M Item	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Electricity Usage	\$6,000	\$6,000	\$6,000	\$1,200
Equipment Maintenance	\$1,500	\$1,500	\$1,500	\$2,500
Discharge Fee				
Fuel	\$500	\$500	\$500	\$6,500
Vehicle Registration & Insurance	N/A	N/A	N/A	\$1,000
Employee Pay and Benefits	N/A	N/A	N/A	\$36,000
PRICE	\$8,000	\$8,000	\$8,000	\$47,200

6.3 Total Equivalent Annual Cost Comparison

The following tables give the combined initial costs and continuing costs for ten years.

Table 3

Dunn Erwin Landfill Leachate Management Alternative Analysis Annual Cost Comparison				
Leachate Management Option	Capital Cost (construction cost estimate)	Annual* Debt Service	Annual O&M Cost	Total Equivalent Annual Cost
Alternative 1	\$430,560	\$32,387	\$8,000	\$40,387
Alternative 2	\$396,890	\$29,854	\$8,000	\$37,854
Alternative 3	\$611,650	\$46,008	\$8,000	\$54,008
Alternative 4	\$265,750	\$19,990	\$47,200	\$67,190

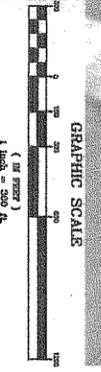
* Based on 4.25% interest, financed over 20 year period

7.0 CONCLUSIONS AND RECOMMENDATIONS

Table 3 clearly shows that Alternative 2 is the most cost effective of the Alternatives. Moreover, it offers the advantages cited in Section 5.0 above of a force main. Accordingly, CTC recommends that Alternative 2 be constructed if the required easements and permits can be obtained, and the Harnett County Wastewater Treatment Facility can accept the additional flow.

At this time, the leachate has been sampled and is being analyzed to determine the impact of any constituents to the wastewater treatment facility.

No conversations have occurred at this time with the Harnett County Public Utilities concerning available capacity and if treatment can be handled by the existing treatment facilities. As information is obtained, this document will be updated.



General Notes

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No.	Revisions/Issues	Date



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**DUNN-ERWIN LANDFILL
LEACHATE CORRECTIVE
ACTION MANAGEMENT**
HARRIETT COUNTY, NORTH CAROLINA

Project No.	03002C	File Name	03002C.MAS.dwg
Drawn By	CTC	Checked By	WLF
Scale	1" = 200'	Sheet No.	1 OF 5



DISCHARGE TO EXISTING MANHOLE

LARGE PUMP STATION

SMALL PUMP STATION



General Notes

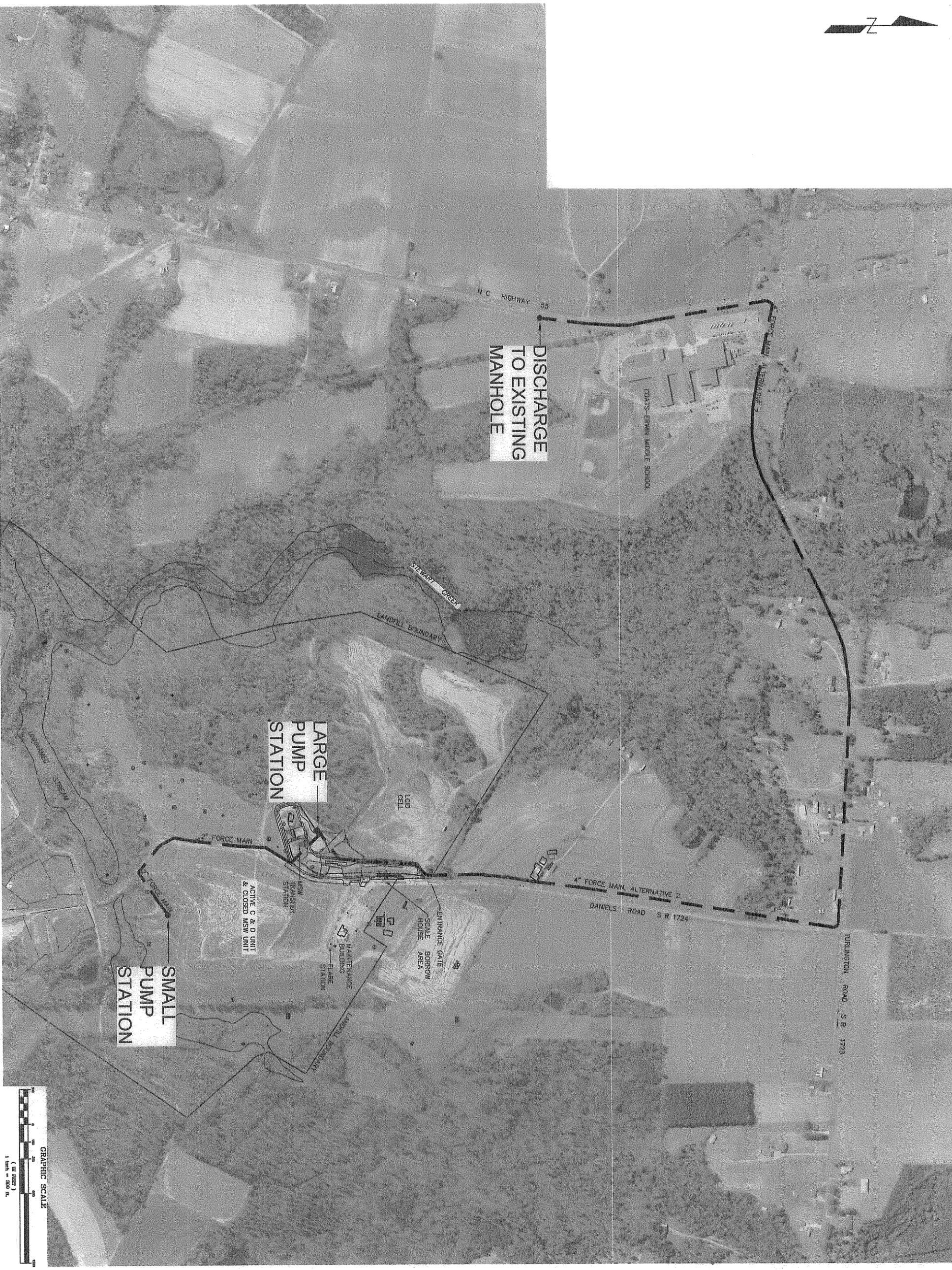
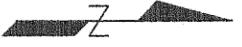
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No.	Revision/Issue	Date

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DUNNER-ERWIN LANDFILL
LEACHATE CORRECTIVE
ACTION MANAGEMENT
HARRIETT COUNTY, NORTH CAROLINA

Project No.	03B02C	Project Name	DUNNER-ERWIN LANDFILL
Designed By	CTC	Drawn By	WLP
Checked By	CTC	Proj. Mgr.	CTC
Scale	1" = 200'	Sheet No.	2 OF 5



General Notes

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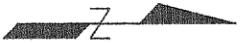
System	Date



**DUNN-ERWIN LANDFILL
LEACHATE CORRECTIVE
ACTION MANAGEMENT
PLAN**

HARRIS COUNTY, NORTH CAROLINA

Project No.	03002C	Plan Name	03002C HMB.dwg
Designed by	CTC	Drawn by	WLF
Checked by	CTC	Proj. Eng.	CTC
Sheet No.	PLAN OF ALTERNATIVE 2		
Date			
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3		OF 5	



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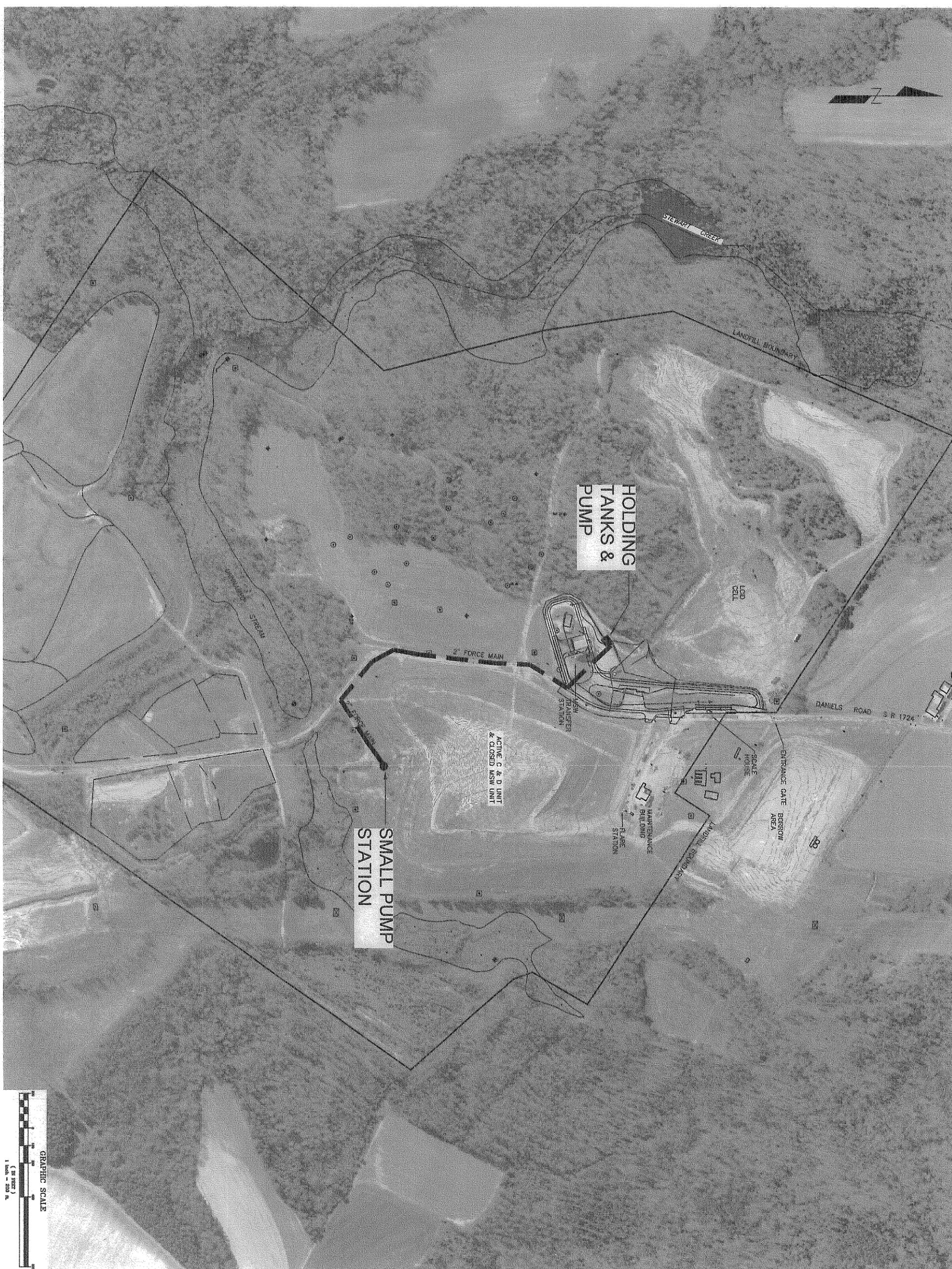
DUNN-ERWIN LANDFILL
LEACHATE CORRECTIVE
ACTION MANAGEMENT

HARNETT COUNTY, NORTH CAROLINA

Project No.	030202C	Prepared By	030202C.HMS.dwg
Designed By	CTC	Checked By	WLF
Drawn By	CTC	Reg. Eng.	CTC

PLAN OF ALTERNATIVE 3

Scale	1" = 500'	Sheet No.	4
			OF 5



General Notes

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No.	Revision/Issue	Date

Signature _____
Title _____



CLAYTON, SR., P.E., INC.
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Wichita, KS 67203
Phone: 316.261.1234 Fax: 316.261.1235
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**DUNN-ERWIN LANDFILL
LEACHATE CORRECTIVE
ACTION MANAGEMENT**

HARRIETT COUNTY, NORTH CAROLINA

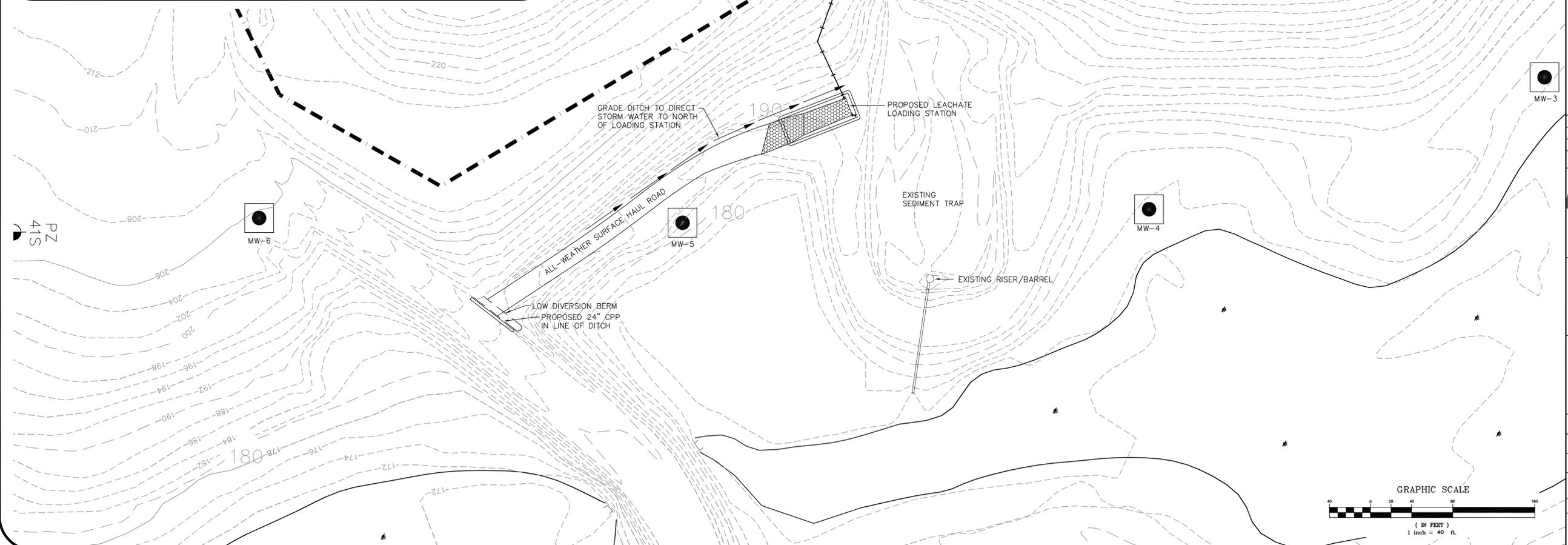
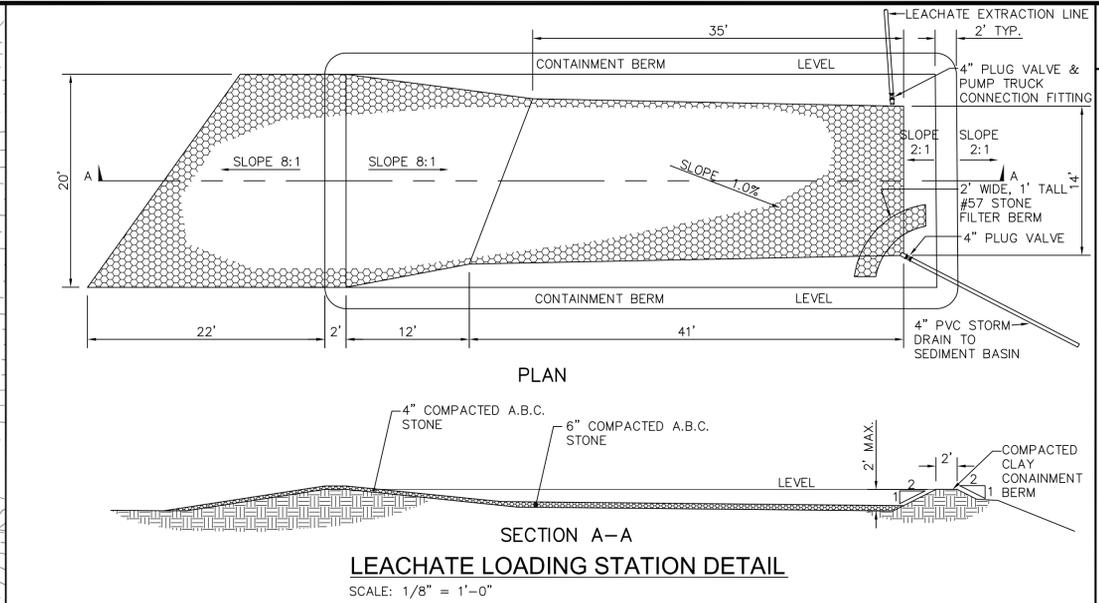
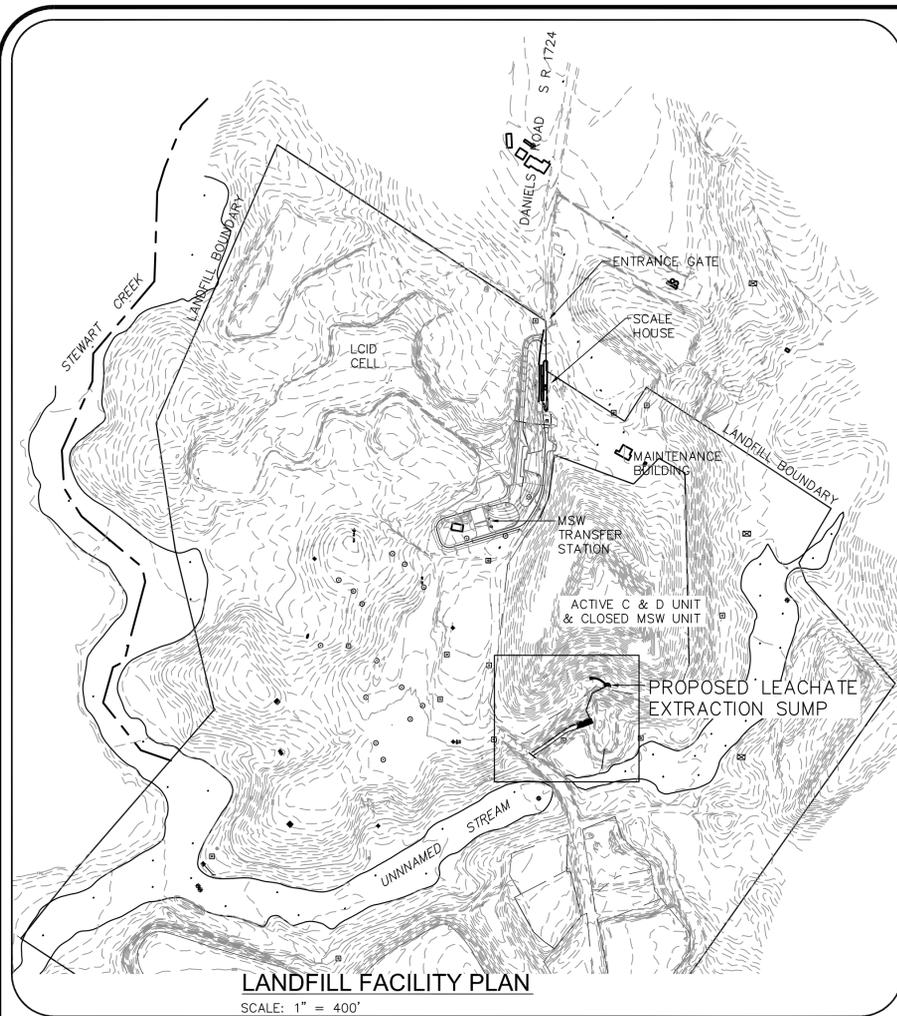
Project No: 03002C
Site No: 03002C (MS4) (MS4)

Designed By: CTC
Checked By: CTC

Drawn By: WLF
Print Date: CTC

Sheet No: PLAN OF ALTERNATIVE 4
Sheet

Scale: 1" = 200'
Date: 5 OF 5



General Notes

No.	Revision/Issue	Date

Signature: _____

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**DUNN-ERWIN LANDFILL
LEACHATE PHASE 1 -
TEMPORARY PUMP & HAUL**
HARNETT COUNTY, NORTH CAROLINA

Project No:	03002C	File Name:	03002C MAS.dwg
Designed By:	CTC	Drawn By:	WLF
Checked By:	CTC	Proj. Eng.:	CTC

Sheet Title: **LEACHATE EXTRACTION
PLAN & DETAILS**

Date: 7/15/09 Sheet: 1 OF 1

Scale: AS NOTED

P:\03 Harnett County\03002C BELF Leachate Corrective Action\CA\03002C\MAS.dwg:30 PM