

LEACHATE EVAPORATION SYSTEM DEMONSTRATION

REPUBLIC SERVICES OF NORTH CAROLINA, LLC

APRIL 2012



HODGES, HARBIN,
NEWBERRY & TRIBBLE, INC.

Consulting Engineers



**LEACHATE EVAPORATION / IRRIGATION
SYSTEM DEMONSTRATION**

FOR

REPUBLIC SERVICES OF NORTH CAROLINA, LLC

APRIL 2012

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I. INTRODUCTION

Republic Services of NC, LLC operates and maintains (4) active, MSW landfills in North Carolina. These landfills are Foothills (14-03), Uwharrie (62-04), Upper Piedmont (73-04) and East Carolina (08-03).

These facilities collect leachate by a system of perforated pipes and sand or gravel media on top of the base liner system. Leachate flows by gravity through this system to leachate sumps where it is pumped through a dual contained force main pipe into one of two leachate storage tanks.

These facilities are currently permitted to manage leachate by the following methods; offsite disposal/treatment to an acceptable POTW facility, on-site leachate recirculation, and leachate irrigation over the lined cells. Leachate recirculation at all 4 facilities is limited to areas with 24" thick $k \leq 1 \times 10^{-7}$ clay liner and is not approved over alternate liner systems.

The purpose of this report is to request approval from the Section to demonstrate a system to manage and reduce leachate volumes through a simplified evaporation process, while also promoting vegetative growth through irrigation and mineral supplements typically found in leachate. This Demonstration request provides the necessary technical information and operational procedures that will be followed by the Third Party Vendor (TPV) to demonstrate the capability and management of this system in a way that will be consistent with the Rules.

At the completion of the demonstration period, a completed summary report documenting the trial period will be submitted to the Section for review and approval for the continued operation of this evaporation system. Once approved, Republic Services of NC, LLC will submit a request for permit modifications consisting of revised Operation Plans that incorporates the details for evaporating / irrigating leachate through the proposed system at each of the four referenced Facilities.

II. LEACHATE EVAPORATION / IRRIGATION SYSTEM

a. Process

The proposed Leachate Evaporation System (LES) will incorporate the use of an evaporator (fan/mist), booster pump, and generator along with solar energy and low humidity levels to evaporate / irrigate leachate over the lined areas of the MSW landfill.

Leachate will be pumped from the existing leachate storage tanks through an existing leachate recirculation line that directs the leachate into a temporary holding tank (frac tank) or directly to the LES located over the lined landfill area.

Flexible piping will be connected to the frac tank and/or recirculation line and directed to the spray area for the LES. The flexible piping will be connected to a booster pump, which can deliver leachate at a minimum pressure of 100 psi to the evaporator unit(s) via flexible piping where it will be distributed over the spray area in a fine mist. The evaporator unit(s) will be powered by a portable generator unit.

For the demonstration at Foothills LF, the site proposes to locate the evaporator unit along the internal cell boundary of Cell No. 3C and Cell No. 4. The evaporator unit will be directed in a southeasterly direction onto an internal sideslope on the constructed landfill. The approximate location of the evaporator unit is shown on the attached Site Plan, located in the Appendix of this document. This orientation will provide full containment of all leachate being evaporated, as the water droplets and vapor will be directed onto a large interior slope. Leachate that does not evaporate will be absorbed and utilized by the vegetation as a nutrient and irrigation source. No run-off will be allowed to flow outside of the lined landfill footprint.

For the demonstration at Uwharrie LF, the site proposes to locate the evaporator unit inside the "bowl shaped area", located approximately within Cells No. 10 and 11. The evaporator unit will be directed in a southeasterly direction onto an internal sideslope on the constructed landfill. The approximate location of the evaporator unit is shown on the attached Site Plan, located in the Appendix of this document (this is where the posi-shell silo storage area is currently). This unit may be moved to the top of the landfill that has reached final grade in an effort to help condition the top soils for vegetation. This orientation will provide full containment of all leachate being evaporated, as the water droplets and vapor will be directed onto a large interior slope. Leachate that does not evaporate will be absorbed and utilized by the vegetation as a nutrient and irrigation source. No run-off will be allowed to flow outside of the lined landfill footprint.

For the demonstration at Upper Piedmont LF, the site proposes to locate the evaporator unit along the internal cell boundary of Cell No. 4A and Cell No. 5A (to be operational in June 2012). The evaporator unit will be directed in a southerly direction onto an internal sideslope (Cell 4A) on the constructed landfill. The approximate location of the evaporator unit is shown on the attached Site Plan, located in the Appendix of this document. This unit may be moved to the top of the landfill that has reached final grade in an effort to help condition the top soils for vegetation. This orientation will provide full containment of all leachate being evaporated, as the water droplets and vapor will be directed onto a large interior

slope. Leachate that does not evaporate will be absorbed and utilized by the vegetation as a nutrient and irrigation source. No run-off will be allowed to flow outside of the lined landfill footprint.

For the demonstration at East Carolina LF, the site proposes to locate the evaporator unit along the top of Cell No. 7 through Cell No. 12. The evaporator unit will be directed as needed to compensate for wind direction. The approximate location of the evaporator unit is shown on the attached Site Plan, located in the Appendix of this document. This location will provide full containment of all leachate being evaporated, as the water droplets and vapor will be directed over a large area, located inside the lined footprint. Leachate that does not evaporate will be absorbed and utilized by the vegetation as a nutrient and irrigation source. No run-off will be allowed to flow outside of the lined landfill footprint.

This system has been designed so that up to a 75% leachate volume reduction will occur as a result of liquid evaporation. Actual rates will depend on many factors including ambient temperature, relative humidity, and wind speed. The remaining volume will be absorbed by existing, or future vegetation and will act to irrigate this vegetation. In areas with established vegetation, additional loss of leachate volume is anticipated through the process of evapotranspiration.

b. Equipment

The application equipment that will be used during the demonstration period includes the following:

- i. Evaporator (fan/mister): This unit (or similar) will have a 33 inch diameter fan that produces 26,000 CFM and has a fan rotation of 1800 RPM. The throw distance is approximately 200 feet with a designed flow rate of 55 gpm.
- ii. Pump: This unit will be a Godwin self-priming pump capable of providing a minimum pressure of 100 psi to the Evaporator.
- iii. Generator: This unit will be a minimum 50KW generator capable of meeting the power requirement for the Evaporator unit.

c. Monitoring & Evaluation Parameters

Operation of the LES will be performed by representatives from American Environmental Control & Landscaping, LLC (AEC&L). All personnel provided by AEC&L will be properly trained in the proper use and shut-down of the proposed equipment. All personnel provided by AEC&L will be required to familiarize themselves with the contents and approvals of this demonstration request.

A minimum of 2 persons will be required on site at all times during the leachate operation of the proposed system. Daily logs will be completed each time the evaporation system is operated. In addition, a daily Inspection Worksheet will be completed each time the system is operated. These forms will document the

conditions prior to, during, and after the evaporation system is operated. Copies of all forms will be submitted to the Landfill Site Manager at the end of each day's operation.

Trained personnel will provide oversight of the system during operation to monitor the equipment and the spray area. They will also observe the system operation to ensure that no leachate leaves the lined cell area at any time during the demonstration period as a result of this operation. The Evaporator is designed to move easily around the site, which will allow the operators to reposition the unit in the event of changing wind direction and speed to control overspray. Evaporation will typically be performed when ambient wind speeds are less than 35 mph.

d. Demonstration Period Timeline

Republic Services of NC, LLC plans to complete the demonstration project within 6 months of receiving approval from the Section for the demonstration. During this time, AEC&L will demonstrate expertise in managing the proposed LES.

e. Evaluation and Final Reporting

Republic Services of NC, LLC shall maintain detailed records throughout the Demonstration Period. These records will include days that the LES was used, the volume of leachate that is evaporated, the length of time that the system operated, any problems encountered during the inspections, and weather conditions on days that the system was operated. Records shall also be maintained in the Facility Operating Record. The records must be kept and made available in accordance with Solid Waste Rule .1626(10).

At the end of the 6 month Demonstration Period, a written summary report that demonstrates and documents the ability to effectively operate the LES while maintaining compliance with the NC Solid Waste Rules will be submitted to the Section for review. A North Carolina registered professional engineer will periodically observe and document the operation of the system during the demonstration period and will certify the final report. Upon acceptance and approval by the Section, a letter requesting permit modifications, including revised Operation Plans which incorporates the details for the proposed, continued use of the LES, will be submitted to the Section for review and approval.

III. APPENDIX

a. Leachate Evaporation / Irrigation System Log

SITE NAME: _____

**LANDFILL OPERATING RECORD
LEACHATE EVAPORATION / IRRIGATION SYSTEM LOG**

DAY: _____ DATE: _____ SITE MANAGER: _____

WEATHER CONDITIONS

Wind Speed: _____ Temperature: _____ Other: _____ 24 Hour Rainfall: _____ 24 Hour Snowfall: _____
Wind Direction: _____ Relative Humidity: _____

ACCIDENTS/INCIDENTS:

LEACHATE EVAPORATION

Flow meter (Start): _____

Flow meter (End): _____

Gallons of leachate evaporated: _____

Location of leachate evaporation: _____

(Cell No. or GPS coordinates)

Problem Areas:

Seeps: Yes No Other _____

Runoff: Yes No Other _____

Corrective action: _____

Comments:

Accident Report Filed: Yes No

Site Operator Notes:

Location of Active Fill Area: _____

Please complete an operating record for each day, or partial day of operations. Include other operating information such as environmental monitoring points, NCDNR inspections, Republic Staff site visits, etc. USE REVERSE SIDE IF NEEDED.

**This form may be updated or revised periodically at the Operator's discretion.*

b. Leachate Evaporation / Irrigation System Inspection Log

Site Name: _____
Landfill Operating Record
Leachate Evaporation / Irrigation System Inspection Log
Daily Start-Up Operations & Shut-Down Plan

Start-Up Procedures

1. Check weather forecast and enter in Part 1 of daily worksheet. Based on recent weather, current weather, and the weather forecast over the next 24 hours, make a decision whether or not to run the system.
2. Walk the system prior to start-up and look for damaged piping or other issues which need addressing prior to system start-up. Check box with time in Part 2.
3. Start the system. Fill in Part 3. Operation of the system requires a minimum of two (2) persons at all times. At least one (1) person must be at the evaporator station during start-up and remain as long as the system is operational.
4. The second person shall inspect the system during operation to assure the system is working properly. Fill in Part 4.
5. During operation, full time observation of the spray area will be conducted to ensure that leachate is not leaving the designated spray area.

Shut Down Procedures

1. After the system is shut down, trained evaporation system personnel will walk the entire perimeter of the spray area to ensure no ponding or runoff from the spray area developed during system operation.
2. Part 5 of the daily worksheet shall be completed.
3. All shut-off valves from the Frac Tank or recirculation system to the evaporator system will be closed by one of the operators and confirmed by the second operator.
4. Completed log and daily worksheets will be turned into the Landfill Site Manager.

Site Name: _____
Leachate Evaporation / Irrigation System Inspection Log

DATE: _____

PART 1 – WEATHER

Time: _____ **a.m. / p.m.**

1. Current Conditions (circle one): Clear / Cloudy Hot / Cool Wet / Dry Calm / Windy
2. Current Temperature: _____ Degrees
3. Wind Direction: _____
4. Relative Humidity: _____
5. Has it rained in the last 24 hours? _____ Yes _____ No
6. Is the proposed evaporation area wet or saturated? _____ Yes _____ No
7. Is rain forecast in the next 24 hours? _____ Yes _____ No
8. Decision to irrigate? _____ Yes _____ No

PART 2 – INITIAL INSPECTION

Time: _____ **a.m. / p.m.**

System: _____ OK _____ Problem

Describe Issues: _____

PART 3 – START-UP

Time: _____ **a.m. / p.m.**

System: _____ OK _____ Problem

Describe Issues: _____

PART 4 – OPERATION INSPECTION

Time: _____ **a.m. / p.m.**

System: _____ OK _____ Problem

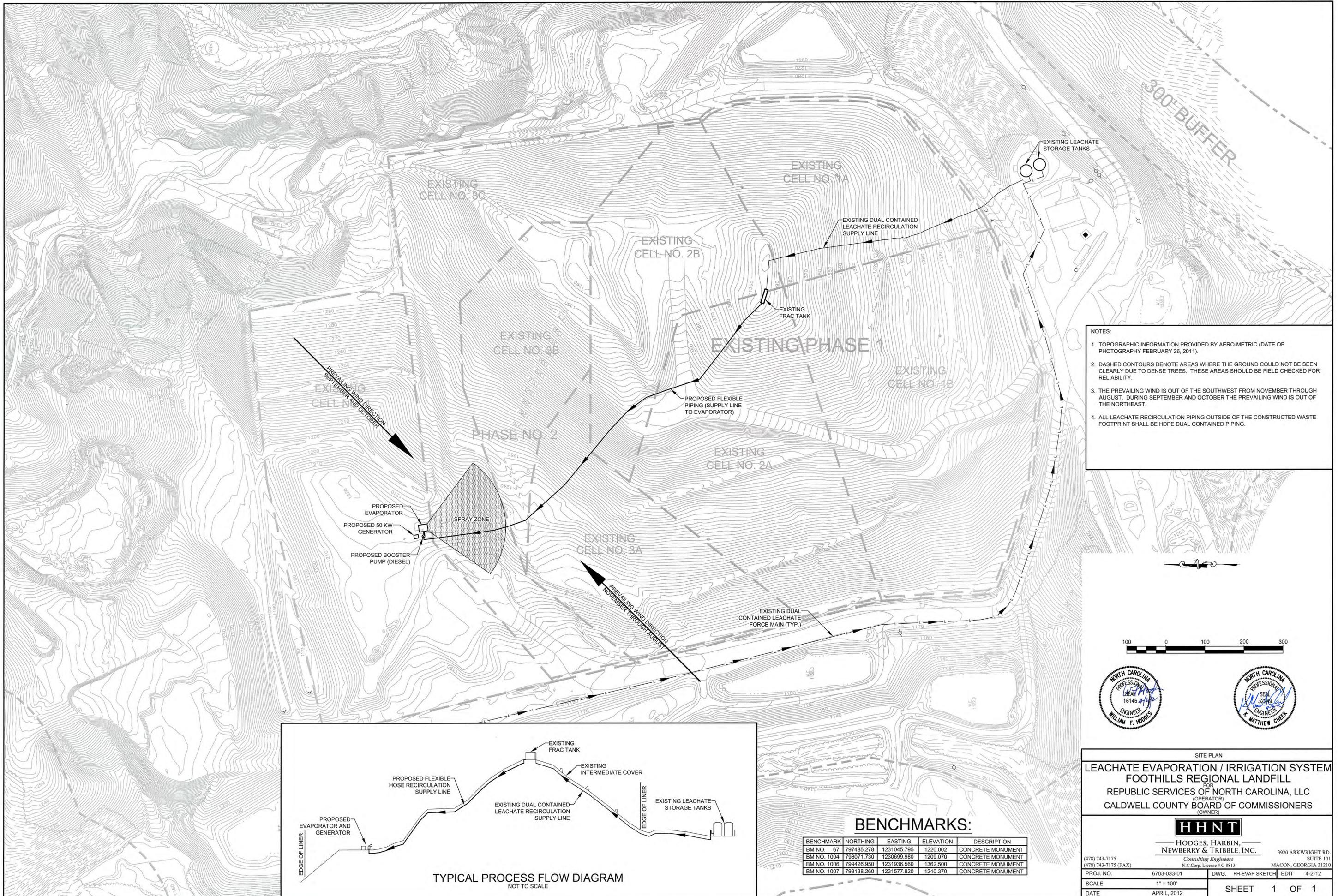
Describe Issues: _____

PART 5 – SHUT-DOWN

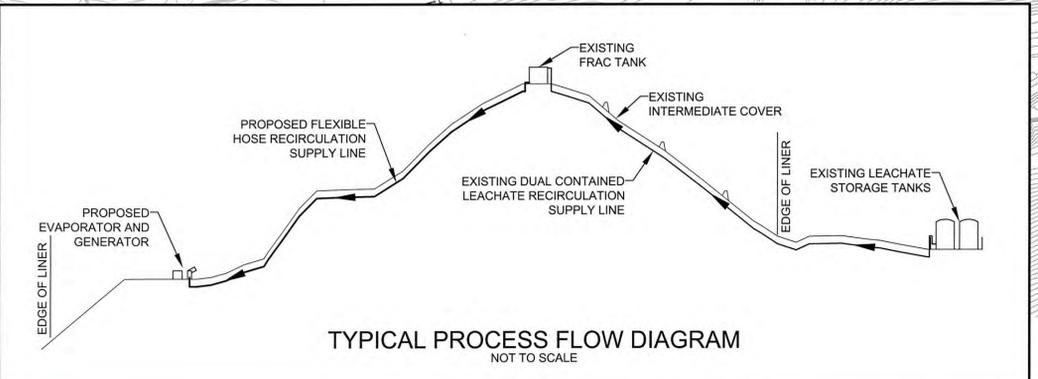
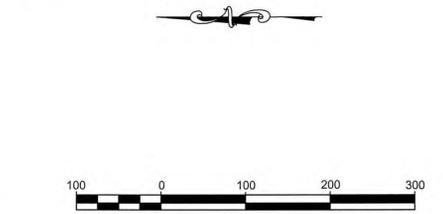
Time: _____ **a.m. / p.m.**

1. Erosion within the spray area? _____ Yes _____ No
2. Runoff observed from the spray area? _____ Yes _____ No
3. Ponding observed in the spray area? _____ Yes _____ No
4. Shut-off valves closed by: _____ (Initials)
5. Shut-off valves confirmed by: _____ (Initials)
6. Daily log and worksheet received by LF Site Manager: _____ (Initials) _____ (Date)

c. Site Plans



- NOTES:
1. TOPOGRAPHIC INFORMATION PROVIDED BY AERO-METRIC (DATE OF PHOTOGRAPHY FEBRUARY 26, 2011).
 2. DASHED CONTOURS DENOTE AREAS WHERE THE GROUND COULD NOT BE SEEN CLEARLY DUE TO DENSE TREES. THESE AREAS SHOULD BE FIELD CHECKED FOR RELIABILITY.
 3. THE PREVAILING WIND IS OUT OF THE SOUTHWEST FROM NOVEMBER THROUGH AUGUST. DURING SEPTEMBER AND OCTOBER THE PREVAILING WIND IS OUT OF THE NORTHEAST.
 4. ALL LEACHATE RECIRCULATION PIPING OUTSIDE OF THE CONSTRUCTED WASTE FOOTPRINT SHALL BE HDPE DUAL CONTAINED PIPING.



BENCHMARKS:

BENCHMARK	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM NO. 67	797485.278	1231045.795	1220.002	CONCRETE MONUMENT
BM NO. 1004	798071.730	1230699.980	1209.070	CONCRETE MONUMENT
BM NO. 1006	799426.950	1231936.560	1362.500	CONCRETE MONUMENT
BM NO. 1007	798138.260	1231577.820	1240.370	CONCRETE MONUMENT

SITE PLAN

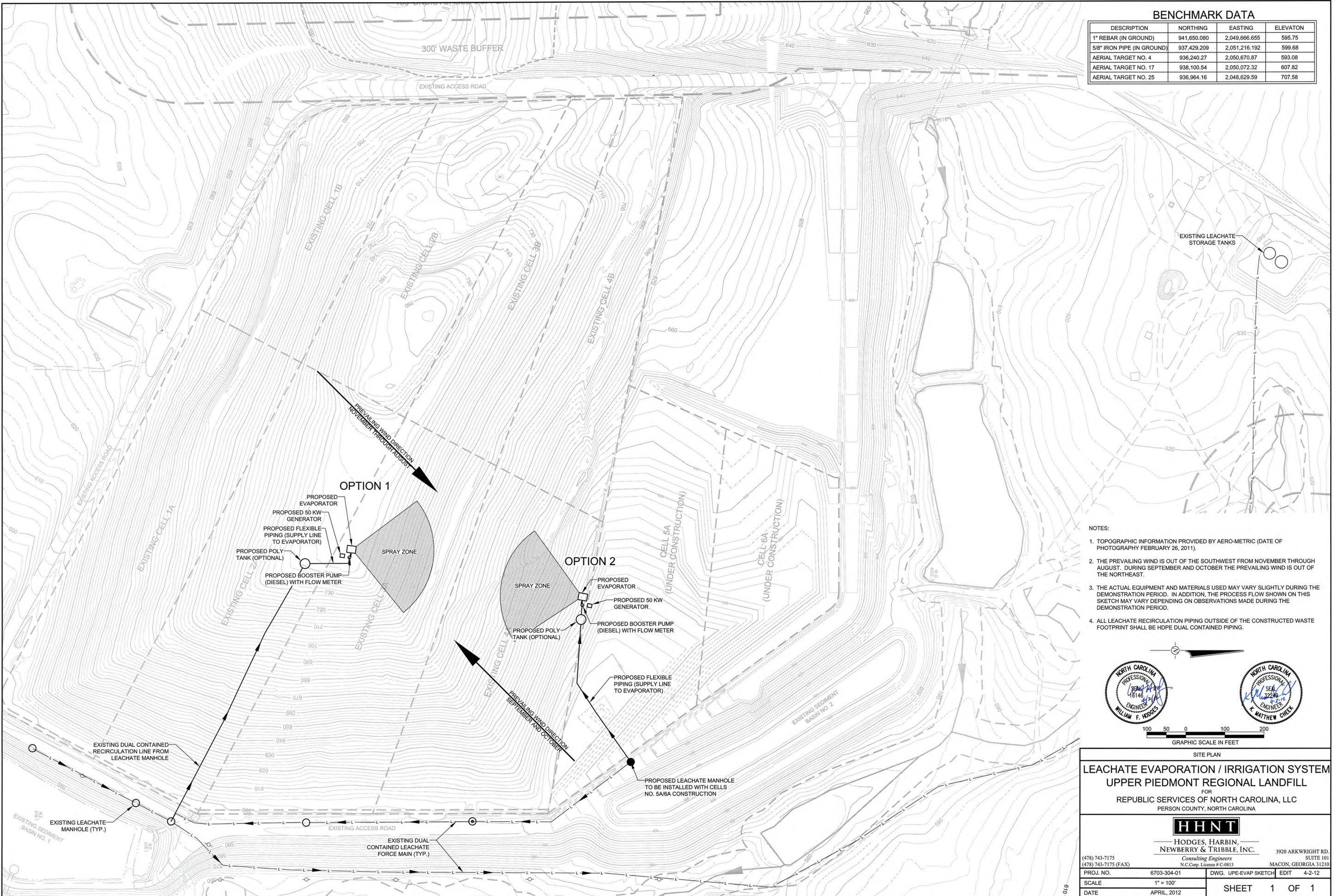
LEACHATE EVAPORATION / IRRIGATION SYSTEM
FOOTHILLS REGIONAL LANDFILL
 FOR
REPUBLIC SERVICES OF NORTH CAROLINA, LLC
(OPERATOR)
CALDWELL COUNTY BOARD OF COMMISSIONERS
(OWNER)

HHNT
HODGES, HARBIN,
NEWBERRY & TRIBBLE, INC. 3920 ARKWRIGHT RD., SUITE 101
Consulting Engineers (478) 743-7175 (FAX)
N.C. Corp. License # C-0813 MACON, GEORGIA 31210

PROJ. NO.	6703-033-01	DWG.	FH-EVAP SKETCH	EDIT	4-2-12
SCALE	1" = 100'				
DATE	APRIL, 2012		SHEET 1 OF 1		

BENCHMARK DATA

DESCRIPTION	NORTHING	EASTING	ELEVATION
1" REBAR (IN GROUND)	941,650.080	2,049,666.655	595.75
5/8" IRON PIPE (IN GROUND)	937,429.209	2,051,216.192	599.68
AERIAL TARGET NO. 4	936,240.27	2,050,670.87	593.08
AERIAL TARGET NO. 17	938,100.54	2,050,072.32	607.82
AERIAL TARGET NO. 25	936,964.16	2,048,629.59	707.58



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 3. THE ACTUAL EQUIPMENT AND MATERIALS USED MAY VARY SLIGHTLY DURING THE DEMONSTRATION PERIOD. IN ADDITION, THE PROCESS FLOW SHOWN ON THIS SKETCH MAY VARY DEPENDING ON OBSERVATIONS MADE DURING THE DEMONSTRATION PERIOD.
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Professional Engineer seals for William F. Doves and Matthew Cheek, North Carolina. A graphic scale in feet (0 to 200) and a north arrow are also present.

SITE PLAN
LEACHATE EVAPORATION / IRRIGATION SYSTEM
UPPER PIEDMONT REGIONAL LANDFILL
 FOR
 REPUBLIC SERVICES OF NORTH CAROLINA, LLC
 PERSON COUNTY, NORTH CAROLINA

HHNT
 HODGES, HARBIN,
 NEWBERRY & TRIBBLE, INC.
 Consulting Engineers
 N.C. Corp. License # C-0813

3920 ARK WRIGHT RD. SUITE 101
 MACON, GEORGIA 31210

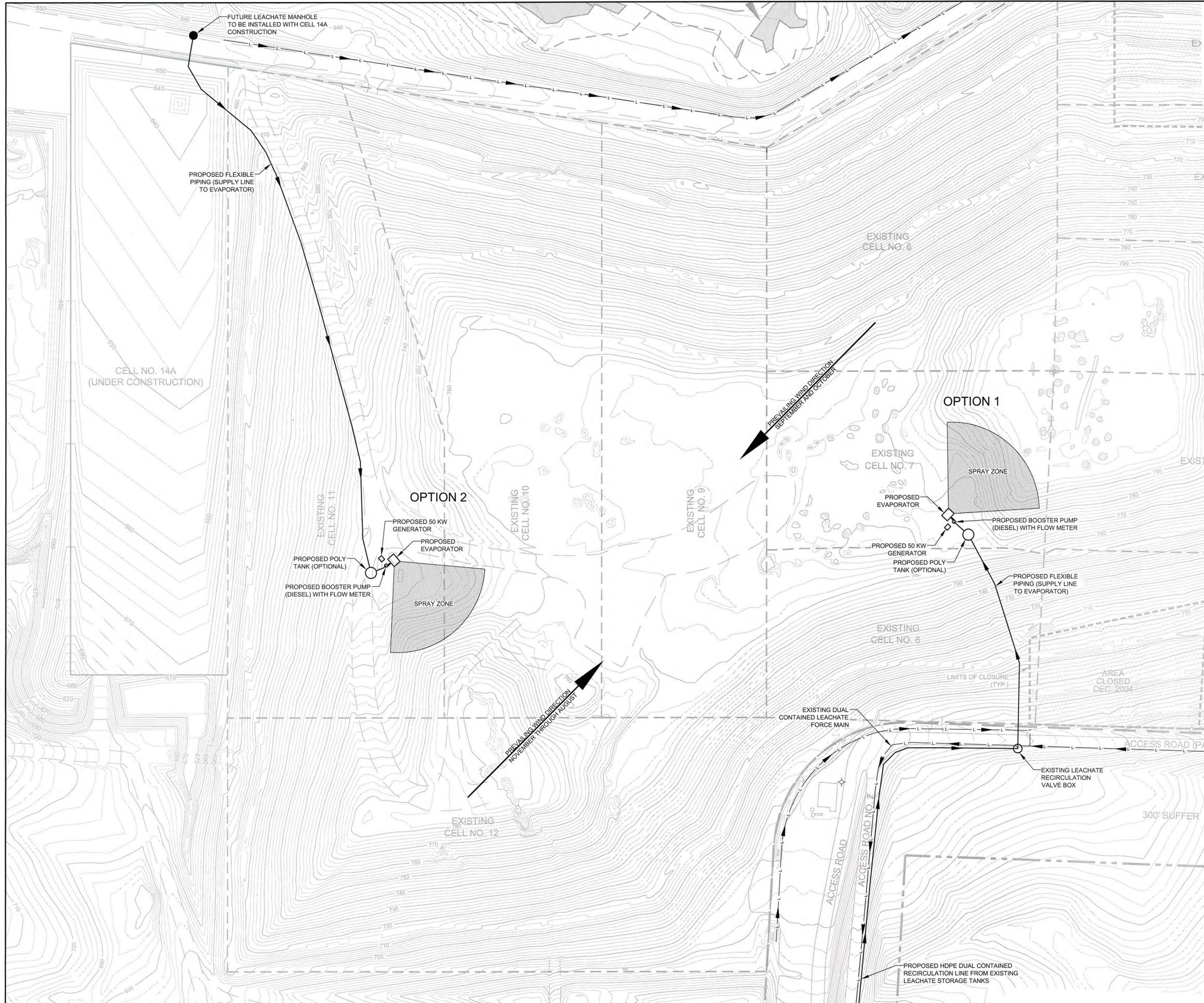
(478) 743-7175
 (478) 743-7175 (FAX)

PROJ. NO. 6703-304-01 DWG. UPE-EVAP SKETCH EDIT 4-2-12
 SCALE 1" = 100'
 DATE APRIL, 2012

SHEET 1 OF 1

BENCHMARK DATA

BENCHMARK	NORTHING	EASTING	ELEVATION	DESCRIPTION
BM NO. 22	579,277.89	1,710,327.70	735.29	3/4" IRON REBAR
BM NO. 17	579,255.66	1,711,015.98	690.78	3/4" IRON REBAR
BM NO. 27	580,900.49	1,711,565.57	642.69	GW-18 DISK



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AREA CLOSED DEC. 2002

AREA CLOSED DEC. 2004

300' BUFFER

EXISTING LEACHATE RECIRCULATION VALVE BOX

ACCESS ROAD (PAVE)

EXISTING DUAL CONTAINED LEACHATE FORCE MAIN

ACCESS ROAD NO. 2

ACCESS ROAD

GRAPHIC SCALE IN FEET

100 50 0 100 200

SITE PLAN

LEACHATE EVAPORATION / IRRIGATION SYSTEM

UWHARRIE REGIONAL LANDFILL

FOR

REPUBLIC SERVICES OF NORTH CAROLINA, LLC

MONTGOMERY COUNTY, NORTH CAROLINA

HHNT

HODGES, HARBIN,
NEWBERRY & TRIBBLE, INC.

3920 ARKWRIGHT RD.
SUITE 101
MACON, GEORGIA 31210

(478) 743-7175
(478) 743-7175 (FAX)

Consulting Engineers
N.C. Corp. License # C-0813

PROJ. NO. 6703-291-01 DWG. UWH-EVAP SKETCH EDIT 4-2-12

SCALE 1" = 100'

DATE APRIL, 2012

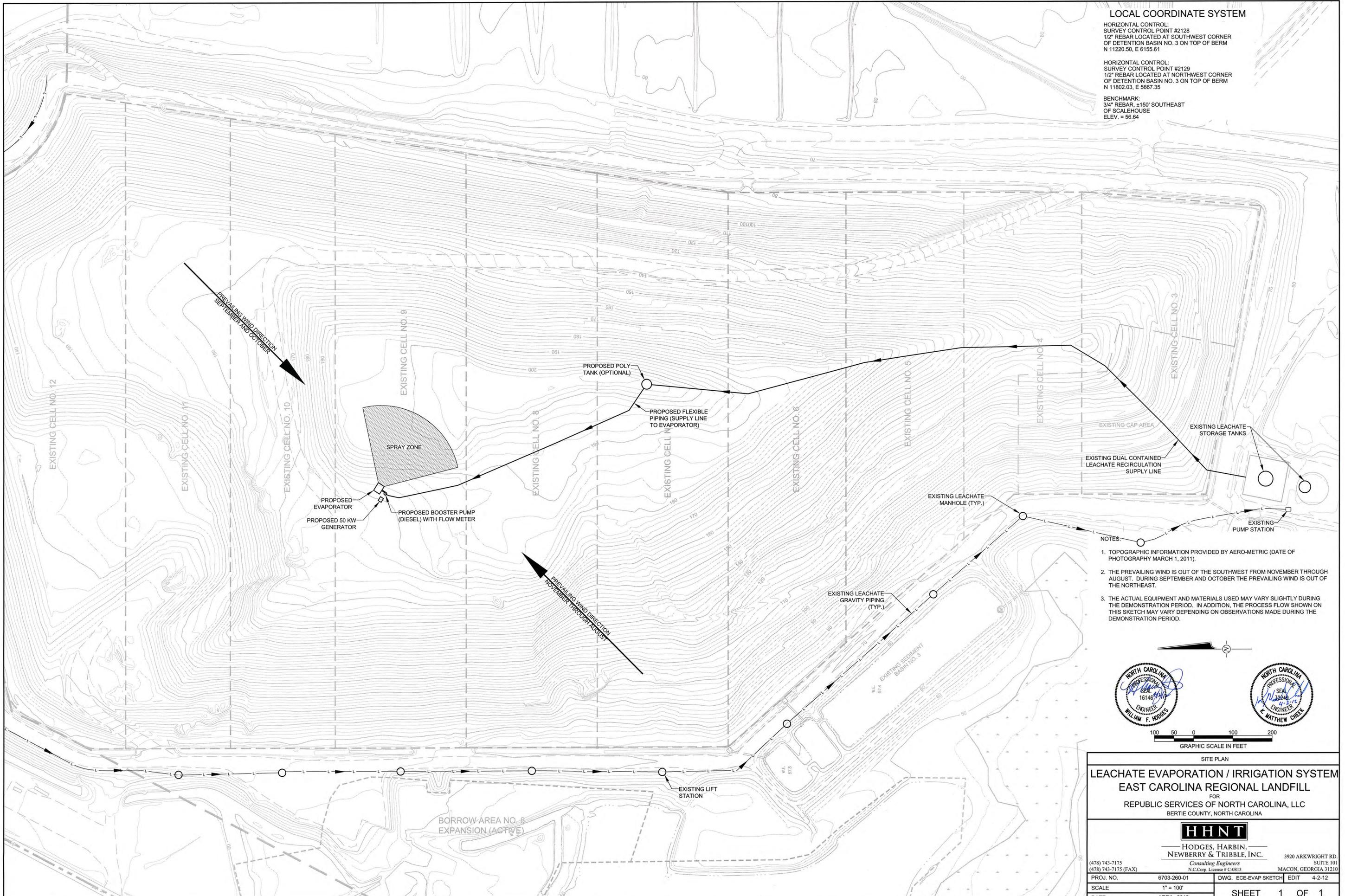
SHEET 1 OF 1

LOCAL COORDINATE SYSTEM

HORIZONTAL CONTROL:
 SURVEY CONTROL POINT #2128
 1/2" REBAR LOCATED AT SOUTHWEST CORNER
 OF DETENTION BASIN NO. 3 ON TOP OF BERM
 N 11220.50, E 6155.61

HORIZONTAL CONTROL:
 SURVEY CONTROL POINT #2129
 1/2" REBAR LOCATED AT NORTHWEST CORNER
 OF DETENTION BASIN NO. 3 ON TOP OF BERM
 N 11802.03, E 5667.35

BENCHMARK:
 3/4" REBAR, ±150' SOUTHEAST
 OF SCALEHOUSE
 ELEV. = 56.64



- NOTES:
1. TOPOGRAPHIC INFORMATION PROVIDED BY AERO-METRIC (DATE OF PHOTOGRAPHY MARCH 1, 2011).
 2. THE PREVAILING WIND IS OUT OF THE SOUTHWEST FROM NOVEMBER THROUGH AUGUST. DURING SEPTEMBER AND OCTOBER THE PREVAILING WIND IS OUT OF THE NORTHEAST.
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Professional Engineer seals for William F. Hodges and Matthew Oreck, North Carolina. A north arrow and a graphic scale in feet (0 to 200) are also included.

SITE PLAN
LEACHATE EVAPORATION / IRRIGATION SYSTEM
EAST CAROLINA REGIONAL LANDFILL
 FOR
 REPUBLIC SERVICES OF NORTH CAROLINA, LLC
 BERTIE COUNTY, NORTH CAROLINA

HHNT
 HODGES, HARBIN,
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3920 ARKWRIGHT RD., SUITE 101
 MACON, GEORGIA 31210

PROJ. NO.	6703-260-01	DWG.	ECE-EVAP SKETCH	EDIT	4-2-12
SCALE	1" = 100'				
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