May 13, 2014

ELECTRONIC SUBMITTAL
jaclynne.drummond@ncdenr.gov

Ms. Jaclynne Drummond
Compliance Hydrogeologist
Solid Waste Section
Division of Waste Management
North Carolina Department of Environment
and Natural Resources
1646 Mail Service Center
Raleigh, NC 27699-1646

Dear Ms. Drummond:

Subject: *Proposed Contaminant Delineation Plan*
North Mecklenburg C&D Landfill – Closed Phase I
Solid Waste Permit Number 60-13
DIN 20573
CEC Project 111-370.001

On behalf of Greenway Waste Solutions of North Meck, LLC. (GWS), Civil & Environmental Consultants, Inc. (CEC) has provided this additional documentation and information in response to the Solid Waste Section's request dated February 12, 2014.

The following information has been provided in response to the Solid Waste Section's request:

1. Baseline Risk Assessment

The attached baseline risk assessment is intended to:

- *Identify potential Chemicals of Concern (COC);*
- *Assess potential human and ecological exposure to the potential COCs;*
- *Provide a toxicity assessment of COCs; and*
- *Characterize risk.*

Both the Site Conceptual Model and Baseline Risk Assessment are combined as one report and is attached.

2. Installation of Two Additional Deep Groundwater Monitoring Wells

Inclement weather during much of March and April combined with topographic access challenges has delayed the installation of these wells. However, these wells (MW-4D-1 and MW-6D-1) were installed on May 7th – 9th, 2014 . The sampling results for these wells will be submitted to the Solid Waste Section as soon as they become available.

3. Downhole Camera Video

As described in Appendix E ("Additional Site Characterization Report" by Enviro-Pro, P.C.) of the attached Site Conceptual Model and Baseline Risk Assessment:

On March 31, 2014 Mr. Mike Vaught with EGIS performed a downhole video inspection of the Gilkerson water supply well at the direction of Enviro-Pro (EP) personnel. This investigation showed that there is minimal water leaking at the bottom of the 6" PVC casing set to a depth of 46 feet below ground surface (bgs). As the submersible pump was turned on and the water level declined, it was clearly evident that the majority of recharge for this well was derived from two weathered zones – one at 48 to 49 feet bgs and the other at 59 to 60 feet bgs. Each of these weathered zones were estimated to produce approximately 4 to 5 gallons per minute. There appeared to be minimal recharge produced from the deeper fractures in this well.

Monitor well MW-4D was also inspected with the video camera on March 31. The 6" PVC casing set to a depth of 55 feet was not leaking. A high angle iron stained fracture was observed at 92.5 to 93 feet bgs, but it produced no water. The water level was pumped down to near the well bottom and the entire open rock interval from 55 feet to 98 feet bgs was examined via the video camera in an attempt to identify any water seeping into the well bore. Numerous small healed fractures were observed, but there was no visible porosity or evidence of water seepage on the rock walls. The well recharge was measured at approximately 0.25 inches per minute.

Due to the file size of the video, it is not submitted as part of this electronic submittal, but is available upon request.

4. Site Conceptual Model

The goal of the attached conceptual site model is to provide a description of relevant site features and the surface and subsurface conditions to understand the extent of identified contaminants of concern (COC) and the risk they pose to receptors. The conceptual site model uses data currently available for the site and is subject to change as more data is collected. Again, both the Site Conceptual Model and Baseline Risk Assessment are combined as one report in this submittal.

5. Hydraulic Evaluation of Landfill Performance (HELP) Model

CEC is concerned that the requested modeling to estimate possible leachate flowrates into the groundwater using the HELP software is not a viable alternative for the closed Phase I/II North Meck C&D Landfill. The HELP Model may not be a good approach to estimate leachate impacts on groundwater because many of the parameters needed to model the landfill layers and waste mass are missing or the materials are not homogenous. There is a lack of information on the design and construction of the

landfill base grade. The waste mass is not a homogenous layer and the HELP Model does not have default values for C&D waste. Further, the closure cap material was not engineered and is not a homogenous layer. These complications in determining the most basic information needed for the HELP Model will likely render the estimate inaccurate at best.

CEC proposes that rather than using a modeling approach to estimate potential leachate impacts on groundwater, a field study would be more helpful. The field study would be implemented to determine the efficacy of the closure cap of the landfill and the in-situ moisture field capacity of the waste mass. With accurate field data on these parameters, a better estimate on the possible leachate impact to groundwater can be achieved. CEC proposes to submit to the Solid Waste Section a field study plan for review and approval within 90 days of this submittal.

Hopefully this information addresses your concerns. Should you have any questions or need any additional information, please feel free to contact me at 704-773-6465 or by email at sbrown@cecinc.com or Tom Bolyard 803-547-4955 or by email at enviropro@comporium.net.

Sincerely,

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.

Scott L. Brown, PE
Vice President

Cc sent via email:
Mike Griffin, GWS
Michael Scott, Solid Waste Section Chief
Ellie Allen, GWS
Jason Watkins, Western District Supervisor
Teresa Bradford, Environmental Senior Specialist
John Murray, Permitting Engineer
Brian Wooten, Permitting Hydrogeologist
Tom Bolyard, Enviro-Pro, P.C.

ATTACHMENTS

Site Conceptual Model and Baseline Risk Assessment Report

SITE CONCEPTUAL MODEL AND BASELINE RISK ASSESSMENT

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
NORTH MECK C&D LANDFILL

Prepared For:

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC.

Prepared By:

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
CHARLOTTE, NORTH CAROLINA

CEC Project 111-370.0001

MAY 2014

Civil & Environmental Consultants, Inc.

Charlotte 1900 Center Park Drive, Suite A | Charlotte, NC 28217 | p: 980-237-0373 f: 980-237-0372 | www.cecinc.com

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Appendix C – Historical Groundwater Monitoring Results (Private Wells)
Appendix D – Illustrated Conceptual Site Model
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Appendix F – Surface Water Analytical Results
Appendix G – Landfill Gas Monitoring Wells
Appendix H – Landfill Gas Monitor Reports
Appendix I – Toxicological Data Sheets

1.0 INTRODUCTION

1.1 CONTAMINANTS OF CONCERN (COC)

Groundwater samples have been collected from groundwater monitoring wells located along the periphery of Expansion Areas 1&2 and the Infill Area (collectively referred to as the Infill Area) since October of 2001 and from the periphery of the Closed Phase I/II Landfill area since June of 1996. An Area Map can be found in Appendix A. The most recent groundwater analytical results are summarized in Appendix B.

On October 3, 2013 volatile organic compounds (VOC) were detected at concentrations exceeding the 15A NCAC 2L Standard (2L Standards) in groundwater samples collected from the Infill/Closed C&D areas. Contaminants detected in concentrations greater than 2L Standards are identified as contaminants of concern (COC). The following COC have been identified in groundwater monitoring wells located in the landfill areas: vinyl chloride, heptachlor, benzene, methylene chloride, tetrachloroethene.

1.2 GROUNDWATER MONITORING AND PRIVATE WATER WELLS

Landfill area groundwater monitoring wells are located in Appendix A, and listed in Table 1, below.

Table 1 - AOC Groundwater Monitoring Wells

Well ID	Installation Date	Depth (bgs)	Well ID	Installation Date	Depth (bgs)
INFILL			**CLOSED C&D**		
MW-1	2/06	60	MW-1	Unknown	25
MW-2	2/06	25	MW-4	Unknown	42
MW-3	4/12	22	MW-4A	9/13	44
MW-4	4/12	12	MW-4D	9/13	100
MW-4D	9/13	52	MW-5	7/96	29
MW-5	4/12	17	MW-5D	9/13	55
MW-5D	9/13	58	MW-6	Unknown	67
MW-6	4/12	17	MW-6D	9/13	95
MW-7	10/01	23	MW-7	Unknown	85
MW-7D	9/13	64	MW-7A	9/13	60
MW-8	10/01	33	MW-7D	9/13	110
MW-8D	9/13	100	MW-8	Unknown	80
MW-9	10/12	30	MW-8D	9/13	122
MW-9D	9/13	80	MW-9	Unknown	24
MW-10	10/01	60	MW-10	7/96	24
			MW-10D	9/13	65
			MW-11	4/10	73
			MW-11A	9/13	30
			MW-11B	9/13	27
			MW-11-D-1	9/13	60
			MW-11-D-2	9/13	40

Due to the proximity of the landfill areas to private water wells, water samples were collected from these private wells. Analytical results indicate that concentrations of COCs detected in the landfill area groundwater monitoring wells were also detected in Gilkerson's private drinking water well. The private wells are currently sampled on a monthly basis. Historical and current analytical results for the private wells are summarized in Appendix C.

Table 2 - Private Water Wells

Property	Parcel ID	Wells	COC Detected?
Wright	01918135	Potable	No
Hammill	01918162	Potable/Irrig.	No
Gilkerson	01934118	Private Drinking Water	Yes
Gilkerson	01934106	None	N/A
Tinsley	01934105	Private Drinking Water	No
Long	01930105	None	N/A

2.0 SITE CONCEPTUAL MODEL AND BASELINE RISK ASSESSMENT

The goal of this conceptual site model is to provide a description of relevant site features and the surface and subsurface conditions to understand the extent of identified contaminants of concern (COC) and the risk they pose to receptors. The conceptual site model uses data currently available for the site and is subject to change as more data is collected.

Similar to the conceptual site model, a baseline risk assessment intended to:

- Identify potential Chemicals of Concern (COC);
- Assess potential human and ecological exposure to the potential COCs;
- Provide a toxicity assessment of COCs; and
- Characterize risk.

Both the site conceptual model and baseline risk assessment are presented in this report.

The area of concern (AOC) includes landfill areas and residential properties located along the closed Phase I/II Landfill southern property boundaries. An illustrative summary of the site conceptual model is provided in Appendix D.

2.1 MIGRATION PATHWAYS

2.1.1 Soil

Since the primary source is likely solid waste disposed at the site, and the mechanism is percolation or transport via landfill gas, soil will not be considered as a migration pathway. The landfill cap of the Phase I/II Landfill is comprised of a minimum of 24 inches of soil material that was removed during the initial and on-going construction of the North Mecklenburg Landfill. The closure of this area was complete in June of 2002. The Infill Area is actively accepting waste.

2.1.2 Groundwater

Groundwater is expected to be the primary migration pathway for COCs originating from the source of contamination (landfill area). The method of contaminant transport is primarily infiltration/percolation of contaminants through the solid waste disposal area to groundwater. Migration of contaminants present in gasses produced within the landfill to groundwater is also a potential contaminant transport mechanism.

The solid waste disposed in the landfill areas is likely the primary source of the presence of COCs in groundwater. Private wells are located downgradient of the groundwater monitoring wells in which the COC has been detected. Enviro-Pro, P.C. has developed a report entitled "Additional Site Characterization Report" (Characterization Report) which can be found in Appendix E. A potentiometric map based on the most recent groundwater sampling event is included as Figure 2 of the Characterization Report.

The Characterization Report discusses in detail:

- Regional Hydrogeology
    - Geology
    - Hydrogeology
- 3.0 Hydrogeologic Evaluation
    - Monitor Well Installation
    - Field Testing
    - Site Hydrogeology
    - Video Camera Well Investigation
- Conclusions

2.1.3 Surface Water and Sediment

One stream, an unnamed tributary of Cane Creek, runs through the AOC between the Infill Area and the Closed C&D Area. Cane Creek is located southeast of the AOC. Surface water samples have been collected semi-annually from the unnamed tributary of Cane Creek since the Expansion Area I Permit was approved in 2001. Analytical results are summarized in Appendix F.

Any COCs in the surface water from groundwater recharge are expected to volatilize fairly rapidly into the atmosphere.

2.1.4 Vapor and Air

There is the potential for the presence of COCs in vapor/air if COCs are present in landfill gas. Landfill gas monitoring wells have been installed at and near the AOC. Landfill area landfill gas monitoring wells are located in Appendix G. The results from the May 2, 2014 landfill gas monitoring activities are located in Appendix H.

Landfill gas collected from the landfill gas monitoring wells will be analyzed for identified COCs. COCs present in landfill gas have the potential to migrate with landfill gas to area buildings and structures. The landfill gas transport migration pathway is different mechanism than the diffusion of vapors from groundwater. While the relatively low COC concentrations present in groundwater are not expected to migrate in vapor form through soil (outside of the landfill footprint, where soil is present); human exposure to vapors may occur through exposure to impacted water from private wells.

2.2 EXPOSURE PATHWAYS

The potential human exposure pathways of identified COCs may include the following:

- Ingestion (Direct contact of well water);
- Inhalation (Direct contact of well water);
- Dermal Contact (Direct contact of well water); and,
- Inhalation (Migrating landfill gas).

2.3 TOXICOLOGICAL DATA

Toxicological data sheets for identified COCs are provided as Appendix I. It is very important to understand that the effects to exposure of any chemical are dependent upon the dose, the duration, how one is exposed, personal traits and habits, and whether other chemicals are present.

The Minimum Risk Level (MRL) is an estimate of the daily human exposure to a hazardous substance that is likely to be without appreciable risk of adverse, non-cancer health effects over a specified duration of exposure. MRLs are listed in Table 3 with each of the identified COCs and the highest concentration that has been detected in groundwater monitoring wells located on the landfill property. In most cases, COC concentrations become diluted as the groundwater migrates away from a source (i.e. the landfill). Samples from private water wells are collected and analyzed monthly.

Table 3 - COCs, Minimum Risk Levels (MRL)[1] and Maximum Detected Concentrations

COC	Exposure Duration						Highest Concentration Detected in Groundwater (ug/l)
	Inhalation Acute (ppm)	Inhalation Intermediate (ppm)	Inhalation Chronic (ppm)	Oral Acute (mg/kg/day)	Oral Intermediate (mg/kg/day)	Oral Chronic (mg/kg/day)	
Vinyl Chloride	0.5	0.03	N/A	N/A	N/A	0.003	25
Benzene	0.009	0.006	0.003	N/A	N/A	0.0005	3.1
Heptachlor	N/A	N/A	N/A	0.0006	0.0001	N/A	0.069
Methylene chloride	0.6	0.3	0.3	0.2	N/A	0.06	9.3
Tetrachloroethene (Tetrachloroethylene)	0.2	N/A	0.04	0.05	N/A	N/A	1.0

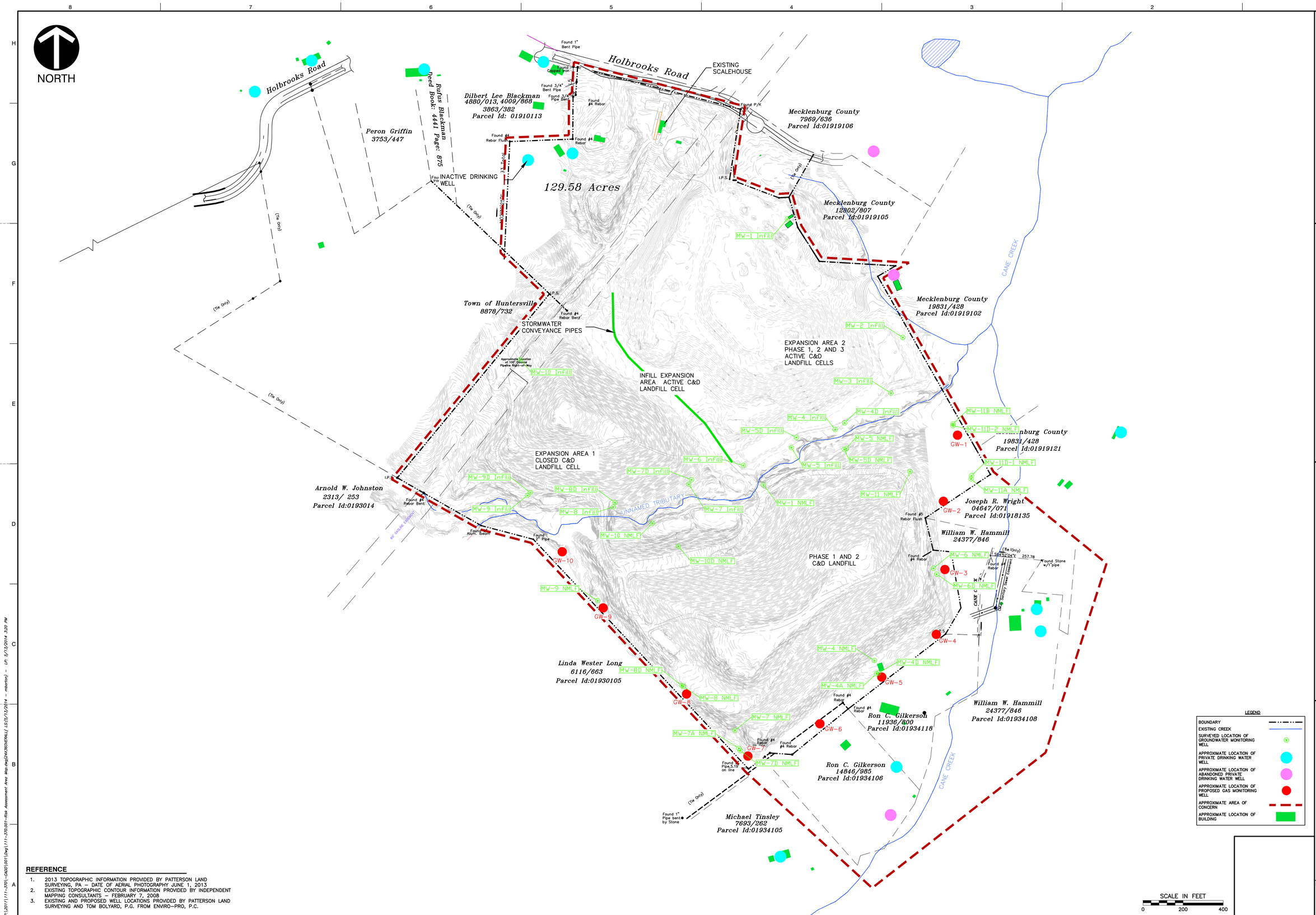
[1]For Duration, Acute = 1 to 14 days, Intermediate = 15 to 364 days, and Chronic = 1 year or longer.
[2]Example for a person weighing 72 kg (160 lbs): 0.003 x 72 = 0.2 mg/day = minimum risk level.

2.4 RISK CHARACTERIZATION

COCs have been detected in private water wells. A temporary alternate source of water has been provided for the Gilkerson residence. COCs have not been detected in any other private drinking water wells to date. Data gaps remain in delineating the groundwater COC plume and in characterizing hydrogeological characteristics; therefore risk characterization is incomplete at this time.

APPENDIX A

AREA MAP



REFERENCE

1. 2013 TOPOGRAPHIC INFORMATION PROVIDED BY PATTERSON LAND SURVEYING, PA – DATE OF AERIAL PHOTOGRAPHY JUNE 1, 2013
2. EXISTING TOPOGRAPHIC CONTOUR INFORMATION PROVIDED BY INDEPENDENT MAPPING CONSULTANTS – FEBRUARY 7, 2008
3. EXISTING AND PROPOSED WELL LOCATIONS PROVIDED BY PATTERSON LAND SURVEYING AND TOM BOLYARD, P.G. FROM ENVIRO-PRO, P.C.

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 · Fax: 980.237.0372
www.cecinc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC.
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NC

AREA MAP

DATE:	MAY 2014	DRAWN BY:	MTB
DWG SCALE:	1"=200'	CHECKED BY:	TMG
PROJECT NO:		111-370.001	
APPROVED BY:			SLB

DRAWING NO.: A

SHEET 1 OF 1

P:\2011\111-370\-CADD\001\Dwg\111-370.001-Risk Assessment Area Map.dwg[24X36CKENALL] LS:(5/13/2014 - mbartos) - LP: 5/13/2014 3:30 PM

APPENDIX B

HISTORICAL GROUNDWATER MONITORING RESULTS

North Meck C&D Landfill

Well ID: MW-1 NMLF

				Sample Date											
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000	2.2	3.3	2.2	31.4	2.2	2.6						
Arsenic	EPA 6010	7440-38-2	10	2.7	5.2	0.2	33.5			5	13.1	10	12		
Barium	EPA 6010	7440-39-3	700	0.4	0.55			5	25.2	5	193	25	120	25	71
Chromium	EPA 6010	7440-47-3	10	0.4	0.55	0.4	0.66			5	8.6				
Copper	EPA 6010	7440-50-8	1000							5	31.4				
Mercury	EPA 7470	7439-97-6	1											0.1	0.1
Vanadium	EPA 6010	7440-62-2	0.3							5	53.4				
Zinc	EPA 6010	7440-66-6	1000							10	45.7			20	20
Alkalinity	SM 2320B	NA	-					5000	348000	1000	289000	10000	330000		
Total Disolved Solids	SM 2540C	NA	500000					25000	353000	25000	371000	10000	380000		
Sulfate	EPA 300.0	14808-79-8	250000					5000	14600	2000	14400	1000	31000		
Chloride	4500-Cl-E	16887-00-6	250000					5000		1000	3040	1000	3600		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-1 Infill

				12/10/2010		4/20/2011		10/25/2011		4/12/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000																
Arsenic	EPA 6010	7440-38-2	10															1	1.1
Barium	EPA 6010	7440-39-3	700	0.2	70.5	0.2	67.5	5	62.2	5	68	5	73.3	5	70.6	25	95	5	150
Chromium	EPA 6010	7440-47-3	10			0.4	0.54												
Copper	EPA 6010	7440-50-8	1000															1	17
Lead	EPA 6010	7439-92-1	15															1	2.3
Mercury	EPA 7470	7439-97-6	1																
Nickel	EPA 6010	7440-02-0	100															5	5.1
Thalium	EPA 6010	7440-28-0	0.2							5.4	6.7								
Vanadium	EPA 6010	7440-62-2	0.3					5	6.9	5	8.1	5	7.9	5	7.4			5	23
Zinc	EPA 6010	7440-66-6	1000					10	29.1	10	17.2	10	17.5	10	12	20	28	10	47
Alkalinity	SM 2320B	NA	-					5000	130000	5000	139000	1000	120000	1000	126000	10000	130000		
Total Disolved Solids	SM 2540C	NA	500000					25000	239000	25000	208000	25000	203000	25000	223000	10000	210000		
Sulfate	EPA 300.0	14808-79-8	250000					5000	5130	5000	7270	2000	7600	2000	8210	1000	15000		
Chloride	4500-Cl-E	16887-00-6	250000					5000	5690	5000	6350	1000	6500	1000	6970	1000	6200		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-2 Infill

				Sample Date															
				12/10/2010		4/20/2011		10/25/2011		4/12/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000					2.2	2.5										
Arsenic	EPA 6010	7440-38-2	10											5	10.9				
Barium	EPA 6010	7440-39-3	700	0.2	121	0.2	27.7	5	42.2	5	35.6	5	50.1	5	639	25	82	5	190
Berylium	EPA 6010	7440-41-7	4											1	2.7			0.4	0.43
Chromium	EPA 6010	7440-47-3	10	0.4	2.6	0.4	2.3							5	21.4				
Cobalt	EPA 6010	7440-48-4	1															5	6.6
Copper	EPA 6010	7440-50-8	1000											5	95.1	5	9	1	37
Lead	EPA 6010	7439-92-1	15											5	21.3			1	2
Mercury	EPA 7470	7439-97-6	1											0.1	0.14				
Nickel	EPA 6010	7440-02-0	100											5	19.1				
Vanadium	EPA 6010	7440-62-2	0.3											5	206			5	23
Zinc	EPA 6010	7440-66-6	1000									10	11.8	10	171			10	44
Alkalinity	SM 2320B	NA	-					5000	23800	5000	22200	1000	17900	1000	14400	10000	13000		
Total Disolved Solids	SM 2540C	NA	500000					25000	232000	25000	191000	25000	201000	25000	259000	10000	270000		
Sulfate	EPA 300.0	14808-79-8	250000					25000	80800	25000	68400	10000	92200	10000	74100	1000	140000		
Chloride	4500-Cl-E	16887-00-6	250000					5000		5000	6350	1000	6470	1000	8740	1000	6600		

Approximate Value

Not Detected / Not Tested

Information Required

North Meck C&D Landfill

Well ID: MW-3 Infill

				Sample Date							
				6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	107	5	76.7	25	79	5	77
Copper	EPA 6010	7440-50-8	1000							1	1.5
Vanadium	EPA 6010	7440-62-2	0.3	5	15.3						
Zinc	EPA 6010	7440-66-6	1000	10	10.3	10	12.8			10	16
Alkalinity	SM 2320B	NA	-	1000	25800	1000	27500	10000	28000		
Total Disolved Solids	SM 2540C	NA	500000	25000	314000	25000	268000	10000	250000		
Sulfate	EPA 300.0	14808-79-8	250000	20000	168000	20000	126000	1000	140000		
Chloride	4500-Cl-E	16887-00-6	250000	1000	11600	1000	7950	1000	7700		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-4 NMLF

				Sample Date													
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000	2.2	4.1	2.2	8.9	2.2	5					20	28		
Arsenic	EPA 6010	7440-38-2	10					5	7.6								
Barium	EPA 6010	7440-39-3	700	0.2	526	0.2	525	5	557	5	527	25	620	25	620		
Chromium	EPA 6010	7440-47-3	10	0.4	1.4	0.4	0.53										
Cobalt	EPA 6010	7440-48-4	1					5	10.2	5	11.7						
Copper	EPA 6010	7440-50-8	1000											5	5.9		
Vinyl Chloride	EPA 8260	75-01-4	0.03									1	3.5	1	7.1	1	5
Zinc	EPA 6010	7440-66-6	1000											20	27		
Alkalinity	SM 2320B	NA	-					5000	332000	1000	306000	10000	390000				
Total Disolved Solids	SM 2540C	NA	500000					25000	427000	25000	357000	10000	420000				
Sulfate	EPA 300.0	14808-79-8	250000					5000		2000		1000	8000				
Chloride	4500-Cl-E	16887-00-6	250000					5000	6230	1000	5740	1000	4700				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-4A NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	270		
Chromium	EPA 6010	7440-47-3	10	5	27		
Copper	EPA 6010	7440-50-8	1000	5	86		
Lead	EPA 6010	7439-92-1	15	10	26		
Mercury	EPA 7470	7439-97-6	1	0.1	0.32		
Vanadium	EPA 6010	7440-62-2	0.3	50	68		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	3.4	1	3
Zinc	EPA 6010	7440-66-6	1000	20	130		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-4D NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	86		
1,1-Dichloroethane	EPA 8260	75-34-3	6	1	2.4	1	1.8
1,1-Dichloroethene	EPA 8260	75-35-4	350	1	1.1		
Ethylbenzene	EPA 8260	100-40-4	600	1	1.5		
Toluene	EPA 8260	108-88-3	600	1	7.4		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	4.7	1	4
Xylenes	EPA 8260	1330-20-7	500	1	8.1		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-4 Infill

				Sample Date									
				6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	328	5	79.4	25	650	5	330		
Chromium	EPA 6010	7440-47-3	10	5	18.8			5	30				
Cobalt	EPA 6010	7440-48-4	1	5	14.2			25	33	5	42		
Copper	EPA 6010	7440-50-8	1000	5	33.1	5	14.8	5	63	1	1.2		
Dinoseb	8151A	88-85-7	7							1	1.7		
Heptachlor	8081B	76-44-8	0.008							0.025	0.069		
Lead	EPA 6010	7439-92-1	15	5	8.6			10	10				
Nickel	EPA 6010	7440-02-0	100	5	11.4								
Selenium	6020A	7782-49-2	20							1	2.6		
Vanadium	EPA 6010	7440-62-2	0.3	5	63.2	5	6.3	50	120				
Vinyl Chloride	EPA 8260	75-01-4	0.03					1	2.3	1	13	1	19
Zinc	EPA 6010	7440-66-6	1000	10	83.4	10	14	20	110	10	16		
Alkalinity	SM 2320B	NA	-	1000	218000	1000	248000	10000	110000				
Total Disolved Solids	SM 2540C	NA	500000	25000	339000	25000	373000	10000	230000				
Sulfate	EPA 300.0	14808-79-8	250000	2000	23800	2000	6880	1000	23000				
Chloride	4500-Cl-E	16887-00-6	250000	1000	12100	1000	9960	1000	12000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-4D Infill

				Sample Date	
				10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	41
Copper	EPA 6010	7440-50-8	1000	1	5.4
Lead	EPA 6010	7439-92-1	15	1	1.9
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-5 NMLF

				Sample Date													
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000			2.2	21.4	2.2	3.8								
Barium	EPA 6010	7440-39-3	700	0.2	323	0.2	237	5	247	5	1320	25	460	25	410		
Benzene	EPA 8260	71-43-2	1							0.25	0.53						
Berylium	EPA 6010	7440-41-7	4							1	1						
Chromium	EPA 6010	7440-47-3	10	0.4	4.4	0.4	0.78			5	31.9	5	5.3				
Cobalt	EPA 6010	7440-48-4	1							5	33.8						
Copper	EPA 6010	7440-50-8	1000					5	27.3	5	1130	5	160	5	110		
1,1-Dichloroethane	EPA 8260	75-34-3	6							0.32	0.73						
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70							0.19	1.9	1	2.1	1	2.1	1	1.9
Lead	EPA 6010	7439-92-1	15							5	13.7						
Nickel	EPA 6010	7440-02-0	100							5	24.3						
Silver	EPA 6010	7440-22-4	20	0.1	0.16												
Vanadium	EPA 6010	7440-62-2	0.3					5	6.3	5	324	50	51				
Vinyl Chloride	EPA 8260	75-01-4	0.03							0.62	0.95	1	4.6	1	6.8	1	7.5
Zinc	EPA 6010	7440-66-6	1000					10	27.9	10	327	20	49	20	31		
Alkalinity	SM 2320B	NA	-					5000	343000	1000	232000	10000	230000				
Total Disolved Solids	SM 2540C	NA	500000					25000	344000	25000	433000	10000	470000				
Sulfate	EPA 300.0	14808-79-8	250000					5000	14600	20000	114000	1000	100000				
Chloride	4500-Cl-E	16887-00-6	250000					5000		1000	26800	1000	25000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-5D NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	280		
Chromium	EPA 6010	7440-47-3	10	5	13		
Copper	EPA 6010	7440-50-8	1000	5	28		
1,1-Dichloroethane	EPA 8260	75-34-3	6	1	3.6	1	3
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70	1	6.5	1	5.2
Tetrahydrofuran	EPA 8260	109-99-9	-	5	36	5	31
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	12	1	12
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-5 Infill

				Sample Date									
				6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Arsenic	EPA 6010	7440-38-2	10	5	8.5	5	5.9			1	1.3		
Barium	EPA 6010	7440-39-3	700	5	260	5	379	25	320	5	340		
Chromium	EPA 6010	7440-47-3	10	5	9								
Cobalt	EPA 6010	7440-48-4	1	5	6.9								
Copper	EPA 6010	7440-50-8	1000	5	10.5	5	22.9			1	3.5		
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70			0.19	0.66	1	1.1				
Dinoseb	8151A	88-85-7	7							1	2.3		
Lead	EPA 6010	7439-92-1	15	5	5.3	5	8.3			1	1.8		
Selenium	6020A	7782-49-2	20							1	1.9		
Tetrahydrofuran	EPA 8260	109-99-9	-							5	42	5	32
Vanadium	EPA 6010	7440-62-2	0.3	5	37	5	50.2			5	11		
Vinyl Chloride	EPA 8260	75-01-4	0.03	10	24.4			1	3	1	7.7	1	6.6
Zinc	EPA 6010	7440-66-6	1000			10	14.7						
Alkalinity	SM 2320B	NA	-	1000	517000	1000	508000	10000	430000				
Total Disolved Solids	SM 2540C	NA	500000	25000	625000	25000	607000	10000	460000				
Sulfate	EPA 300.0	14808-79-8	250000	2000	4500	2000	7050	1000	5300				
Chloride	4500-Cl-E	16887-00-6	250000	1000	33100	1000	28800	1000	25000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-5D Infill

				Sample Date	
				10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	65
Copper	EPA 6010	7440-50-8	1000	1	3.9
Zinc	EPA 6010	7440-66-6	1000	10	10
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-6 NMLF

				Sample Date													
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000					2.2	2.7								
Arsenic	EPA 6010	7440-38-2	10	2.7	4.8												
Barium	EPA 6010	7440-39-3	700	0.2	249	0.2	255	5	255	5	288	25	310	25	320		
Chromium	EPA 6010	7440-47-3	10	0.4	1.8	0.4	1.7										
Copper	EPA 6010	7440-50-8	1000							5	9.6			5	10		
Mercury	EPA 7470	7439-97-6	1											0.1	0.17		
Nickel	EPA 6010	7440-02-0	100					5	11.7	5	13.1						
Silver	EPA 6010	7440-22-4	20	0.1	0.25	0.1	0.39										
Vinyl Chloride	EPA 8260	75-01-4	0.03													1	2.9
Zinc	EPA 6010	7440-66-6	1000					10	26	10	28	20	21	20	130		
Alkalinity	SM 2320B	NA	-					5000	675000	1000	662000	10000	670000				
Total Disolved Solids	SM 2540C	NA	500000					25000	692000	25000	773000	10000	700000				
Sulfate	EPA 300.0	14808-79-8	250000					5000	26100	20000	31300	1000	17000				
Chloride	4500-Cl-E	16887-00-6	250000					5000	27000	1000	30000	1000	30000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-6D NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	210		
Copper	EPA 6010	7440-50-8	1000	5	11		
Tetrahydrofuran	EPA 8260	109-99-9	-	5	17	5	18
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	2.8	1	4.7
Zinc	EPA 6010	7440-66-6	1000	20	20		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-6 Infill

				Sample Date									
				6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000	2.2	14.1								
Arsenic	EPA 6010	7440-38-2	10							1	1.9		
Barium	EPA 6010	7440-39-3	700	5	359	5	122	25	220	5	220		
Cadmium	6020A	7440-43-9	2	1	1.7								
Chromium	EPA 6010	7440-47-3	10							5	5.2		
Cobalt	EPA 6010	7440-48-4	1							5	5.5		
Copper	EPA 6010	7440-50-8	1000	5	6.7					1	11		
Lead	EPA 6010	7439-92-1	15							1	4.5		
Tetrahydrofuran	EPA 8260	109-99-9	-	3.1	5.5								
Vanadium	EPA 6010	7440-62-2	0.3	5	15.8					5	25		
Vinyl Chloride	EPA 8260	75-01-4	0.03							1	1.1	1	9.1
Zinc	EPA 6010	7440-66-6	1000	10	12.2					10	22		
Alkalinity	SM 2320B	NA	-	1000	470000	1000	362000	10000	270000				
Total Disolved Solids	SM 2540C	NA	500000	25000	591000	25000	514000	10000	380000				
Sulfate	EPA 300.0	14808-79-8	250000	2000	3060	2000	4040	1000	44000				
Chloride	4500-Cl-E	16887-00-6	250000	5000	49300	1000	27500	1000	20000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-7 NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	260		
Copper	EPA 6010	7440-50-8	1000	5	6.3		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	1.4	1	1.1
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-7A NMLF

				Sample Date	
				10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	220
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-7D NMLF

				Sample Date	
				10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	190
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-7 Infill

				Sample Date																			
				10/21/2009		11/10/2010		4/19/2011		10/25/2011		5/3/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	0.2	238	0.2	59.8	0.2	50.3	5	48.8	5	33.9	5	79.5	5	82.3	25	150	5	140		
Benzene	EPA 8260	71-43-2	1	0.25	0.49					0.25	0.73					0.25	0.55			1	1.1	1	1.5
Cadmium	6020A	7440-43-9	2																	0.1	0.25		
Chloroform	EPA 8260	67-66-3	70									0.14	1.3										
Chromium	EPA 6010	7440-47-3	10	0.4	13.3	0.4	1.1																
Cobalt	EPA 6010	7440-48-4	1																	5	5.5		
Copper	EPA 6010	7440-50-8	1000													5	5.9	5	13	1	11		
1,1-Dichloroethene	EPA 8260	75-35-4	350															1	1	1	1.8	1	2.3
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70													0.19	0.19						
Dinoseb	8151A	88-85-7	7																	1	1.1		
Lead	EPA 6010	7439-92-1	15	4	6															1	1.5		
Mercury	EPA 7470	7439-97-6	1	0.07	0.25															0.1	0.17		
Selenium	6020A	7782-49-2	20																	1	1.1		
Silver	EPA 6010	7440-22-4	20	0.1	1.6			0.1	0.19														
Vanadium	EPA 6010	7440-62-2	0.3											5	7.5	5	7.3			5	27		
Vinyl Chloride	EPA 8260	75-01-4	0.03															1	1.1	1	5.6	1	6.2
o-Xylene	EPA 8260	95-47-6	500							0.23	0.24												
Zinc	EPA 6010	7440-66-6	1000							10	29.5			10	25.1	10	24.4	20	31	10	88		
Alkalinity	SM 2320B	NA	-							5000	192000	5000	176000	1000	210000	1000	223000	10000	230000				
Total Disolved Solids	SM 2540C	NA	500000							25000	392000	25000	386000	25000	378000	25000	409000	10000	420000				
Sulfate	EPA 300.0	14808-79-8	250000							10000	42200	5000	8460	4000	62700	4000	60900	1000	83000				
Chloride	4500-Cl-E	16887-00-6	250000							5000	23000	25000	69400	1000	26500	1000	29500	1000	31000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-7D Infill

				Sample Date			
				10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	190		
Cadmium	6020A	7440-43-9	2	0.1	0.12		
Carbon Disulfide	8260B	75-15-0	700			1	2
Cobalt	EPA 6010	7440-48-4	1	5	6.2		
Copper	EPA 6010	7440-50-8	1000	1	2.6		
Dinoseb	8151A	88-85-7	7	1	1.5 / 2.6		
Nickel	EPA 6010	7440-02-0	100	5	14		
Selenium	6020A	7782-49-2	20	1	2.2		
Tetrahydrofuran	EPA 8260	109-99-9	-	5	6.1	5	7.9
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	7.5	1	7.4
Zinc	EPA 6010	7440-66-6	1000	10	19		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-8 NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	230		
Chromium	EPA 6010	7440-47-3	10	5	6.6		
Copper	EPA 6010	7440-50-8	1000	5	35		
Lead	EPA 6010	7439-92-1	15	10	15		
Vanadium	EPA 6010	7440-62-2	0.3	50	82		
Zinc	EPA 6010	7440-66-6	1000	20	71		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-8D NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	140		
Copper	EPA 6010	7440-50-8	1000	5	38		
Mercury	EPA 7470	7439-97-6	1	0.1	0.12		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	1.3	1	1.6
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-8 Infill

				Sample Date																			
				10/21/2009		11/10/2010		4/19/2011		10/25/2011		5/3/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	0.2	60.5	0.2	35.4	0.2	26.1	5	26.9	5	33.2	5	36	5	40.5	25	50	5	130		
Berylium	EPA 6010	7440-41-7	4																	0.4	0.47		
Chloroform	EPA 8260	67-66-3	70			0.14	0.48	0.14	0.63			0.14	1.3			0.14	0.24						
Chromium	EPA 6010	7440-47-3	10	0.4	16.5	0.4	0.89	0.63	2.6											5	27		
Cobalt	EPA 6010	7440-48-4	1													5	6.9			5	22		
Copper	EPA 6010	7440-50-8	1000													5	6.9	5	20	1	93		
Lead	EPA 6010	7439-92-1	15																	1	4.7		
Nickel	EPA 6010	7440-02-0	100																	5	23		
Silver	EPA 6010	7440-22-4	20	0.1	0.68																		
Vanadium	EPA 6010	7440-62-2	0.3							5	5.3			5	9.2	5	7.4			5	87		
Vinyl Chloride	EPA 8260	75-01-4	0.03													10	17.5	1	2.3	1	3.3	1	4.1
Zinc	EPA 6010	7440-66-6	1000											10	11.2			20	32	10	83		
Alkalinity	SM 2320B	NA	-							5000	117000	5000	160000	1000	140000	1000	154000	10000	140000				
Total Disolved Solids	SM 2540C	NA	500000							25000	331000	25000	425000	25000	342000	25000	379000	10000	310000				
Sulfate	EPA 300.0	14808-79-8	250000							5000	6030	5000	7460	2000	7820	2000	7850	1000	4900				
Chloride	4500-Cl-E	16887-00-6	250000							25000	66000	25000	71000	5000	72000	5000	70700	1000	63000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-8D Infill

				Sample Date			
				10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	56		
Chromium	EPA 6010	7440-47-3	10	5	6.1		
Copper	EPA 6010	7440-50-8	1000	1	5.1		
1,1-Dichloroethene	EPA 8260	75-35-4	350	1	1.3	1	1.8
Trichlorofluoromethane	8260B	75-69-4	2000	1	1.2	1	1.6
Vanadium	EPA 6010	7440-62-2	0.3	5	7.3		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	1		
Zinc	EPA 6010	7440-66-6	1000	10	11		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-9 NMLF

				Sample Date	
				10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	250
Chromium	EPA 6010	7440-47-3	10	5	16
Copper	EPA 6010	7440-50-8	1000	5	43
Vanadium	EPA 6010	7440-62-2	0.3	50	58
Zinc	EPA 6010	7440-66-6	1000	20	81
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-9 Infill

				Sample Date									
				6/15/2012		11/26/2012		4/25/2013		10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	27.8	5	259	25	260	5	400		
Benzene	EPA 8260	71-43-2	1			0.25	1	1	1.4	1	1.3	1	1.4
Cobalt	EPA 6010	7440-48-4	1			5	16.1			5	9		
Copper	EPA 6010	7440-50-8	1000			5	6.1			1	16		
1,1-Dichloroethane	EPA 8260	75-34-3	6							1	1.2	1	1.3
1,1-Dichloroethene	EPA 8260	75-35-4	350					1	2.2	1	3.7	1	5.8
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70			0.19	1.7	1	2.6	1	3.4	1	4.1
Mercury	EPA 7470	7439-97-6	1							0.1	0.91		
Methylene Chloride	EPA 8260B	75-09-2	5					1	1.2	1	1.3	1	1.9
Nickel	EPA 6010	7440-02-0	100			5	5.9			5	6.6		
Trichlorofluoromethane	EPA 8260	75-69-4	2000	0.2	0.99	0.2	0.32						
Vanadium	EPA 6010	7440-62-2	0.3			5	6.4			5	25		
Vinyl Chloride	EPA 8260	75-01-4	0.03					1	36	1	63	1	73
Zinc	EPA 6010	7440-66-6	1000			10	12.8			10	24		
Alkalinity	SM 2320B	NA	-	1000	175000	1000	326000	10000	310000				
Total Disolved Solids	SM 2540C	NA	500000	25000	430000	25000	489000	10000	350000				
Sulfate	EPA 300.0	14808-79-8	250000	10000	105000	4000	71300	1000	5900				
Chloride	4500-Cl-E	16887-00-6	250000	1000	20300	1000	32200	1000	4300				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-9D Infill

				Sample Date			
				10/9/2013		11/19/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Arsenic	EPA 6010	7440-38-2	10	1	1		
Barium	EPA 6010	7440-39-3	700	5	230		
Copper	EPA 6010	7440-50-8	1000	1	2.2		
1,1-Dichloroethane	EPA 8260	75-34-3	6	1	1.4	1	1.3
1,1-Dichloroethene	EPA 8260	75-35-4	350	1	16	1	18
cis-1,2-Dichloroethene	EPA 8260	156-59-2	70	1	2.5	1	2.4
Methylene Chloride	EPA 8260B	75-09-2	5	1	9.3	1	8.9
Nickel	EPA 6010	7440-02-0	100	5	11		
Selenium	6020A	7782-49-2	20	1	1.7		
Tetrachloroethene	8260B	127-18-4	0.7	1	1	1	1
Tetrahydrofuran	EPA 8260	109-99-9	-	5	9.7	5	8.5
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	59	1	57
Zinc	EPA 6010	7440-66-6	1000	10	16		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-10 NMLF

				Sample Date													
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000					2.2	2.6								
Arsenic	EPA 6010	7440-38-2	10	2.7	8.6			5	110	5	9.6	10	12				
Barium	EPA 6010	7440-39-3	700	0.2	104	0.2	63.2			5	426	25	220	25	170		
Berylium	EPA 6010	7440-41-7	4							1	1.5						
Chromium	EPA 6010	7440-47-3	10	0.4	2.6					5	33						
Cobalt	EPA 6010	7440-48-4	1					5	6.4	5	18.3						
Copper	EPA 6010	7440-50-8	1000							5	65.5			5	11		
Lead	EPA 6010	7439-92-1	15							5	31.1						
Mercury	EPA 7470	7439-97-6	1							0.1	0.12						
Nickel	EPA 6010	7440-02-0	100							5	17						
Silver	EPA 6010	7440-22-4	20			0.1	0.18										
Vanadium	EPA 6010	7440-62-2	0.3					5	7.1	5	162						
Vinyl Chloride	EPA 8260	75-01-4	0.03									1	2.2	1	5.3	1	2.9
Zinc	EPA 6010	7440-66-6	1000					10	14.6	10	107						
Alkalinity	SM 2320B	NA	-					5000	188000	1000	175000	10000	220000				
Total Disolved Solids	SM 2540C	NA	500000					25000	244000	25000	212000	10000	130000				
Sulfate	EPA 300.0	14808-79-8	250000					5000		2000	2720	1000					
Chloride	4500-Cl-E	16887-00-6	250000					5000	11300	1000	12300	1000	13000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-10D NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	290		
Benzene	EPA 8260	71-43-2	1	1	3.1	1	2.4
Cobalt	EPA 6010	7440-48-4	1	25	33		
Copper	EPA 6010	7440-50-8	1000	5	68		
1,4-Dichlorobenzene	EPA 8260	106-46-7	6	1	3	1	2.7
Mercury	EPA 7470	7439-97-6	1	0.1	0.13		
Nickel	EPA 6010	7440-02-0	100	40	51		
Tetrahydrofuran	EPA 8260	109-99-9	-	5	110	5	120
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	25	1	21
Zinc	EPA 6010	7440-66-6	1000	20	37		
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-10 Infill

				Sample Date																	
				10/21/2009		11/10/2010		4/19/2011		10/25/2011		5/3/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	0.2	52.1	0.2	27.1	0.2	59.3	5	30.2	5	32.7	5	32.2	5	37	25	35	5	43
Chloroform	EPA 8260	67-66-3	70					0.14	0.67												
Chromium	EPA 6010	7440-47-3	10	0.4	2.4	0.4	0.58	0.4	10.3												
Copper	EPA 6010	7440-50-8	1000													5	6.6			1	15
Selenium	6020A	7782-49-2	20																	1	1.6
Silver	EPA 6010	7440-22-4	20	0.1	0.64																
Trichlorofluoromethane	EPA 8260	75-69-4	2000											0.2	1	0.2	0.37				
Vanadium	EPA 6010	7440-62-2	0.3																	5	8.2
Zinc	EPA 6010	7440-66-6	1000							10	15.4					10	12.1			10	17
Alkalinity	SM 2320B	NA	-							5000	150000	5000	185000	1000	175000	1000	193000	10000	190000		
Total Disolved Solids	SM 2540C	NA	500000							25000	406000	25000	401000	25000	413000	25000	442000	10000	400000		
Sulfate	EPA 300.0	14808-79-8	250000							25000	120000	25000	94300	10000	112000	20000	118000	1000	120000		
Chloride	4500-Cl-E	16887-00-6	250000							5000	19300	5000	18200	1000	20500	1000	20700	1000	18000		

Approximate Value

Not Detected / Not Tested

Information Required

North Meck C&D Landfill

Well ID: MW-11 NMLF

				Sample Date													
				11/11/2010		4/19/2011		10/18/2011		10/24/2012		4/25/2013		10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000			2.2	12	2.2	3.2								
Arsenic	EPA 6010	7440-38-2	10	2.7	10.4									10	14		
Barium	EPA 6010	7440-39-3	700	0.2	386	0.2	283	5	343	5	244	25	140	25	270		
Benzene	EPA 8260	71-43-2	1							0.25	0.87			1	1		
Chromium	EPA 6010	7440-47-3	10	0.4	2.2	0.4	1.6										
Copper	EPA 6010	7440-50-8	1000									5	10	5	6.5		
Nickel	EPA 6010	7440-02-0	100					5	18.1	5	16.4						
Silver	EPA 6010	7440-22-4	20	0.1	1.5	0.1	0.75										
Tetrahydrofuran	EPA 8260	109-99-9	-							3.1	28.4	5	28	5	52	5	31
Vinyl Chloride	EPA 8260	75-01-4	0.03									1	2.7	1	8.6	1	6.3
Alkalinity	SM 2320B	NA	-					5000	331000	1000	227000	10000	990000				
Total Disolved Solids	SM 2540C	NA	500000					25000	382000	25000	1160000	10000	1200000				
Sulfate	EPA 300.0	14808-79-8	250000					5000		20000	156000	1000	100000				
Chloride	4500-Cl-E	16887-00-6	250000					5000	6180	5000	59700	1000	49000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-11A NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	47		
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	1.3	1	3.7
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-11B NMLF

				Sample Date	
				10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	89
Copper	EPA 6010	7440-50-8	1000	5	7.2
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-11D-1 NMLF

				Sample Date			
				10/3/2013		10/30/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	130		
Chromium	EPA 6010	7440-47-3	10	5	7.6		
Copper	EPA 6010	7440-50-8	1000	5	5.9		
Mercury	EPA 7470	7439-97-6	1	0.1	0.14		
Tetrahydrofuran	EPA 8260	109-99-9	-	5	8.4	5	6.6
Vinyl Chloride	EPA 8260	75-01-4	0.03	1	4.5	1	3.1
Alkalinity	SM 2320B	NA	-				
Total Disolved Solids	SM 2540C	NA	500000				
Sulfate	EPA 300.0	14808-79-8	250000				
Chloride	4500-Cl-E	16887-00-6	250000				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: MW-11D-2 NMLF

				Sample Date	
				10/3/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	25	120
Copper	EPA 6010	7440-50-8	1000	5	7.8
Alkalinity	SM 2320B	NA	-		
Total Disolved Solids	SM 2540C	NA	500000		
Sulfate	EPA 300.0	14808-79-8	250000		
Chloride	4500-Cl-E	16887-00-6	250000		

Approximate Value
Not Detected / Not Tested
Information Required

APPENDIX C

HISTORICAL GROUNDWATER MONITORING RESULTS (PRIVATE WELLS)

North Meck C&D Landfill

Well ID: Tinsley WSW-Inf.

				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	Method	CAS Number	NCDENR Standard (ug/L)	PQL (ug/L)	Result (ug/L)	PQL (ug/L)	Result (ug/L)	PQL (ug/L)	Result (ug/L)
				None Detected		None Detected		None Detected	

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Tinsley WSW-Eff.

				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
				None Detected		None Detected		None Detected	

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Hamill WSW-1-Inf.

				Sample Date					
				2/3/2014		2/3/2014		3/4/2014	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000	20	39				
2-Butanone (MEK)	8260B	78-93-3	4000	10	41				

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Hamill WSW-1-Eff.

				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000					20	22
2-Butanone (MEK)	8260B	78-93-3	4000			10	25		
Tetrahydrofuran	EPA 8260	109-99-9	-					5	11

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Hamill WSW-2-Inf.

				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Tetrahydrofuran	EPA 8260	109-99-9	-					5	5

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Hamill WSW-2-Eff.

				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	Method	CAS Number	NCDENR Standard (ug/L)	PQL (ug/L)	Result (ug/L)	PQL (ug/L)	Result (ug/L)	PQL (ug/L)	Result (ug/L)
				None Detected		None Detected		None Detected	

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: Wright WSW

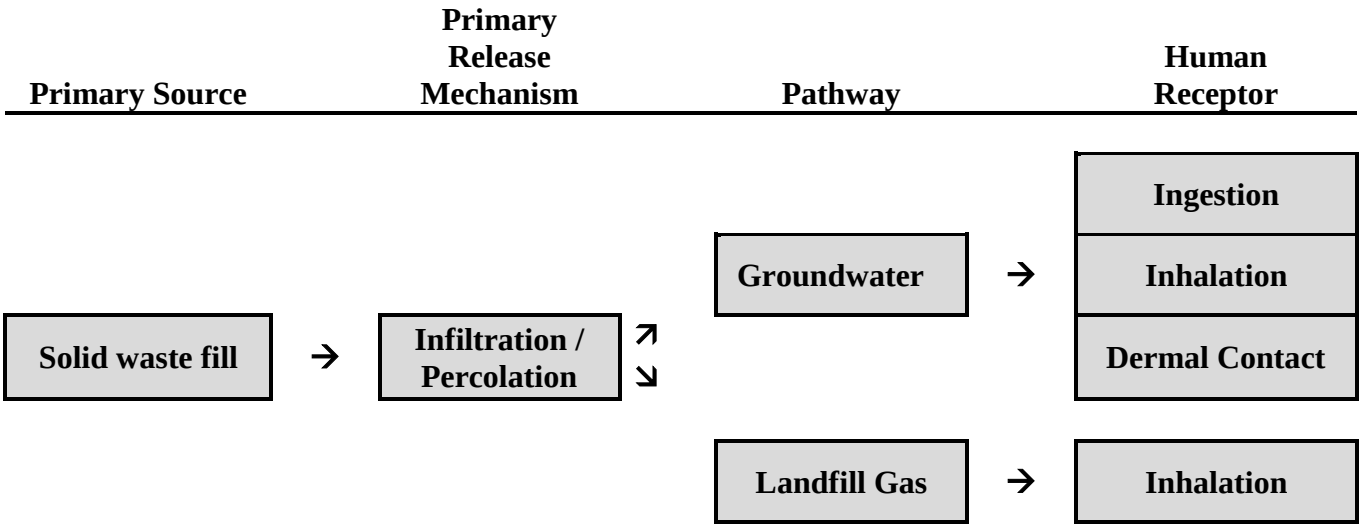
				Sample Date					
				1/3/2014		2/3/2014		3/4/2014	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
				None Detected		None Detected		None Detected	

Approximate Value
Not Detected / Not Tested
Information Required

APPENDIX D

ILLUSTRATED CONCEPTUAL SITE MODEL

ILLUSTRATED SITE CONCEPTUAL MODEL



APPENDIX E

ADDITIONAL SITE CHARACTERIZATION REPORT

ADDITIONAL SITE CHARACTERIZATION REPORT

Closed North Mecklenburg C&D Landfill
Huntersville, North Carolina

Prepared for:

Greenway Waste Solutions at North Meck, LLC
19109 West Catawba Avenue, Suite 200
Cornelius, North Carolina 28031

Prepared by:

Enviro-Pro, P.C.
2646 Farmlake lane
Fort Mill, South Carolina 29708

Project No. EP-1217(A)

May 13, 2014

NORTH CAROLINA LICENSED SEAL 492 GEOLOGIST THOMAS H. BOLYARD

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Appendix A - Well Lithologic Logs and Well Completion Logs
Appendix B - In-Situ Permeability Field Test Data

1.0 BACKGROUND INFORMATION

As the result of their review of the Second 2013 Semi-Annual Monitoring Report, the Solid Waste Section notified Greenway Waste Solutions at North Meck, LLC (GWS) on December 3, 2013 of a request for additional documentation and activities related to this closed landfill facility. A Proposed Contaminant Delineation Work Plan submitted on February 6, 2014 addressed one of the requested items in this letter from the Solid Waste Section. The submission of this report includes additional hydrogeologic information to further characterize the closed North Mecklenburg C&D Landfill site.

2.0 REGIONAL HYDROGEOLOGY

2.1 GEOLOGY

The subject site is located within the Charlotte Belt Geologic Province of North Carolina. Rocks of the Charlotte Belt range in age from late Proterozoic to middle Paleozoic. Dominant rock types in the Charlotte Belt are metamorphosed intrusive rocks, with large areas of metavolcanic rocks, and lesser amounts of metasedimentary rocks (Goldsmith and others, 1988).

Bedrock in the vicinity of the site is characterized as a weathered gray medium to coarse-grained granite and gray coarse-grained granodiorite. Major mineral constituents are quartz and feldspar phenocrysts with subsidary hornblende, biotite and olivine.

2.2 HYDROGEOLOGY

Groundwater recharge in this northern area of Mecklenburg County is derived from precipitation, which averages approximately 47 inches annually. The surficial materials at many places in the County are composed of relatively impermeable saprolite and the fraction of precipitation that reaches the water table may be less than one-third. Seasonal fluctuations of the water table may be considerable during wet or dry seasons. However, the net change in water level elevation is generally small on average, indicating that the average annual discharge of groundwater is about equal to the average annual recharge.

In humid regions, such as the area of concern, the water table is an undulating surface which reflects the topographic irregularities in a more subdued manner. Depth to the water table in this area is a function of the climate, lithology, and most importantly, topography. In Mecklenburg County, water levels generally begin to decline in April or May and continue this trend through summer and early autumn. During late autumn, typically in November or December, the water levels begin to rise.

Groundwater movement in crystallized granitic rock, such as those evident at the subject site which have little primary pore space, is dependent upon secondary permeabilities created by features including fractures, joints, bedding planes, cleavage lanes, and solution channels.

The porosity of a rock is defined as the percentage of the total volume that is occupied by the interstices. Porosities of the different rock materials cover a wide range. For example, some clays may have a porosity of more than 50 percent, while some crystalline rock may be less than 1 percent. A material may have a high porosity and yet yield little water. For example, some clays have high porosities and yet they yield very little water due to their flat particle shape which tends to layer and trap water. The same is true for rocks such as granite, granodiorite, gabbro, and syenite where their interstices are poorly interconnected. Estimated porosities for the residual soils on site range from 30 to 40 percent. The partially weathered rock (PWR) material is estimated to have a porosity of 20 to 30 percent, while the fractured bedrock's porosity is estimated to be 10 percent or less.

3.0 HYDROGEOLOGIC EVALUATION

3.1 MONITOR WELL INSTALLATION

Well Lithologic Logs and Well Completion Logs characterizing the 12 additional groundwater monitor wells installed in September 2013 around the perimeter of the closed landfill site are included in Appendix A. The locations of these wells are indicated on Figure 1. A total of four Type II wells (MW-4A, MW-7A, MW-11A, and MW-11B) and eight Type III bedrock wells (MW-4D, MW-5D, MW-6D, MW-7D, MW-8D, MW-10D, MW-11D-1, and MW-11D-2) were installed.

Based on the detection of the volatile organic compound (VOC) vinyl chloride in wells MW-4D and MW-6D, located up gradient from the Gilkerson and Hammill residential water supply wells, it was determined that deeper Type III bedrock wells should be installed at both of these locations to determine the vertical extent of VOC contamination in the bedrock aquifer. Inclement weather during much of March and April combined with topographic access challenges has prevented the installation of these wells. However, these wells (MW-4D-1 and MW-6D-1) were installed on May 7th – 9th . The sampling results for these wells will be submitted to the Solid Waste Section as soon as they become available.

3.2 FIELD TESTING

In order to evaluate hydraulic conductivity characteristics of the subsurface lithologies present at the site, in-situ field permeability ("slug") testing was performed in monitor wells MW-4A, MW-4D, MW-5, MW-5D, MW-6, MW-6D, MW-7A, MW-7D, MW-8, MW-8D, MW-10, MW-10D, MW-11A, and MW-11D-1. The tests were conducted using the rising head technique, with the test data analyzed by the Bouwer and Rice Method. Test data sheets and calculations are included in Appendix B, with a summary of calculated field permeability test results presented in Table 1.

Based on the field permeability tests performed in the monitor wells screened in the saprolite/PWR (MW-5, MW-10, and MW-11A), the hydraulic conductivity of the residuum averages 0.21 feet per day. The average bedrock hydraulic conductivity as calculated from testing in MW-4A, MW-5D, MW-6, MW-6D, MW-7A, MW-7D, MW-8, MW-10D, and MW-11D-1 is 0.11 feet per day. The recharge in wells MW-4D and MW-8D was too slow to allow an accurate calculation of hydraulic conductivity.

3.3 SITE HYDROGEOLOGY

Water levels have been measured periodically since 1996 for several monitor wells at this landfill facility. Groundwater depths recorded from the most recent groundwater sampling event conducted on April 10, 2014 are presented in Table 2, along with corresponding groundwater elevations. These elevations were used to construct the Groundwater Contour Map (Figure 2). This map indicates that groundwater elevations decrease radially outward from the top of the closed landfill area in all directions towards Cane Creek to the south and east and towards the unnamed tributary of Cane Creek to the north. The average hydraulic gradient calculated across the site from the April 2014 data was approximately 0.080, with steeper gradients evident to the northeast and east.

Vertical gradients were evaluated in six pairs of shallow and deep paired monitor wells by dividing the difference in the shallow/deep well groundwater elevations by the difference in the midpoint elevations of the saturated portion of each well's sandpack.

The October 1, 2013 data indicates upward vertical gradients of 0.072, 0.15, and 0.0007 in the MW-5/MW-5D, MW-10/MW-10D, and MW-11A/ MW-11D-1 well pairs, respectively. This is characteristic of groundwater discharge conditions. The MW-4A/MW-4D, MW-6/MW-6D, and MW-7A/MW-7D well pairs exhibit respective downward vertical gradients of 0.082, 0.1, and 0.026 on the same date, indicative of recharge conditions.

3.4 VIDEO CAMERA WELL INVESTIGATION

On March 31, 2014 Mr. Mike Vaught with EGIS performed a downhole video inspection of the Gilkerson water supply well at the direction of Enviro-Pro (EP) personnel. This investigation showed that there is minimal water leaking at the bottom of the 6" PVC casing set to a depth of 46 feet below ground surface (bgs). As the submersible pump was turned on and the water level declined, it was clearly evident that the majority of recharge for this well was derived from two weathered zones – one at 48 to 49 feet bgs and the other at 59 to 60 feet bgs. Each of these weathered zones were estimated to produce approximately 4 to 5 gallons per minute. There appeared to be minimal recharge produced from the deeper fractures in this well.

Monitor well MW-4D was also inspected with the video camera on March 31. The 6" PVC casing set to a depth of 55 feet was not leaking. A high angle iron stained fracture was observed at 92.5 to 93 feet bgs, but it produced no water. The water level was pumped down to near the well bottom and the entire open rock interval from 55 feet to 98 feet bgs was examined via the video camera in an attempt to identify any water seeping into the well bore. Numerous small healed fractures were observed, but there was no visible porosity or evidence of water seepage on the rock walls. The well recharge was measured at approximately 0.25 inches per minute.

EP planned to also conduct video camera inspections of the Tinsley and Hammill water supply wells. However, both residents declined to allow this inspection.

4.0 CONCLUSIONS

Groundwater occurs within the shallow saprolite/PWR material only in the northeastern and northern perimeter areas of the landfill in the vicinity of Cane Creek and an unnamed tributary of Cane Creek. In the majority of the site groundwater occurs within fractures and weathered zones of the granitic bedrock aquifer. Some of these weathered intervals appear to be laterally extensive, as demonstrated by the correlation between the detection of vinyl chloride and the evidence of significant water-bearing fractures at depths of 48 to 49 feet and 59 to 60 feet bgs in the Gilkerson water supply well. In other areas of the site minimal bedrock fractures and recharge were observed as in MW-4D and MW-8D.

Groundwater flow appears to occur in a radial fashion outward from the closed landfill area to the north, east, and south and generally mimics the local topography. Hydraulic gradients are greatest in the northeastern and eastern portions of the site due to the steeper topography in these areas. The average hydraulic gradient from the upper area of the landfill towards the surrounding streams is 0.080. Average groundwater flow rates range from 0.11 feet per day within the bedrock to 0.21 feet per day within the saprolite/PWR material near the surface water features. Although there appears to be an upward vertical hydraulic gradient within the well pairs located near the surface water features, the occurrence of higher concentrations of vinyl chloride in the deeper Type III bedrock wells at locations MW-5/5D, MW-6/6D, MW-10/10D, and MW-11A/11D-1) indicate that contamination has the potential to migrate beneath the surface water features surrounding most of the closed landfill area. This also appears to be the case with the Gilkerson water supply well located near Cane Creek. The water level was measured at 15.5 feet, but the majority of suspected contaminated recharge was evident at depths of 48 to 49 feet and possibly 59 to 60 feet.

5.0 REFERENCES

Bouwer, H., and Rice, R.C., 1976, A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers With Completely or Partially Penetrating Wells, American Geophysical Union.

Brown, et. al., 1985, Geologic Map of North Carolina: North Carolina Department of Natural Resources and Community Development, Raleigh, North Carolina.

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Goldsmith, R., Milton, D.J., Horton, J.W., Jr., 1988, Geologic Map of the Charlotte 1X2 Quadrangle, North Carolina and South Carolina: Department of the Interior U.S. Geologic Survey.

Horton, J.W., Jr., Zullo, V.A., and others, 1991, The Geology of the Carolinas: The University of Tennessee Press, 11 p., 25 p.

LeGrand, H.E., and Mundorff, M.J., 1952, Geology and Ground Water in the Charlotte Area, North Carolina: Department of the Interior U.S. Geologic Survey Bulletin No. 63.

TABLE 1

SUMMARY OF IN-SITU FIELD PERMEABILITY DATA

North Mecklenburg C&D Closed Landfill
Huntersville, North Carolina

Well No.	Hydraulic Conductivity (ft/day)
MW-4A	0.02
MW-4D	*
MW-5	0.13
MW-5D	0.04
MW-6	0.21
MW-6D	0.04
MW-7A	0.51
MW-7D	0.05
MW-8	0.08
MW-8D	*
MW-10	0.35
MW-10D	0.10
MW-11A	0.14
MW-11D-1	0.02

Notes: * Denotes that recharge was too slow to allow calculation

TABLE 2

SUMMARY OF GROUNDWATER DEPTHS AND ELEVATIONS

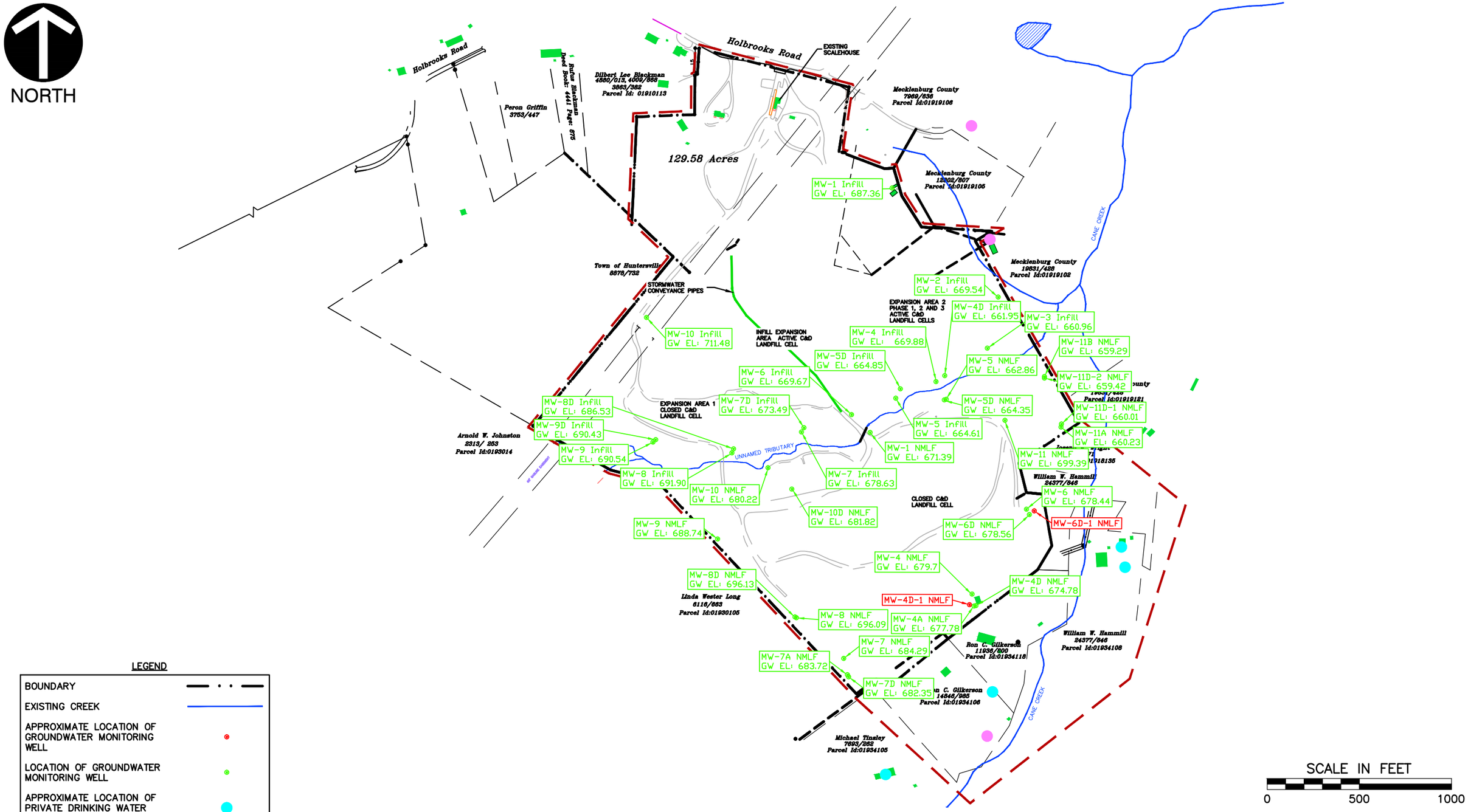
North Mecklenburg Closed C&D Landfill
Huntersville, North Carolina

4-10-14 Gauging Event

Well No.	T.O.C. Elevation	Water Level Depth (ft)	Groundwater Elevation
MW-1	685.31	14.08	671.23
MW-4	717.55	37.42	680.13
MW-4A	711.63	33.02	678.61
MW-4D	711.30	41.12	670.18
MW-5	682.99	18.90	664.09
MW-5D	681.84	16.39	665.45
MW-6	738.25	56.55	681.70
MW-6D	737.90	58.05	679.85
MW-7	738.27	53.97	684.30
MW-7A	727.52	43.87	683.65
MW-7D	727.36	44.61	682.75
MW-8	764.39	68.91	695.48
MW-8D	768.20	72.20	696.00
MW-9	706.30	16.32	689.98
MW-10	696.81	15.51	681.30
MW-10D	726.77	41.91	684.86
MW-11	745.40	44.35	701.05
MW-11A	675.74	12.54	663.20
MW-11B	673.24	9.55	663.69
MW-11D-1	674.44	11.22	663.22
MW-11D-2	673.92	12.11	661.81

Notes: All elevations are presented in feet above mean sea level.
T.O.C. = Top of Casing

FIGURES



LEGEND

BOUNDARY	
EXISTING CREEK	
APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL	
LOCATION OF GROUNDWATER MONITORING WELL	
APPROXIMATE LOCATION OF PRIVATE DRINKING WATER WELL	
APPROXIMATE LOCATION OF ABANDONED PRIVATE DRINKING WATER WELL	
APPROXIMATE AREA OF CONCERN	
APPROXIMATE LOCATION OF BUILDING	

ENVIRO-PRO PROFESSIONAL CORPORATION
2646 FARMLAKE LANE
FORT MILL, SC 29708

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
NORTH MECKLENBURG C&D LANDFILL
HUNTERSVILLE, NC

SITE MAP WITH WELL LOCATIONS

DATE:	MAY 2014	APPROVED BY:	TB	FIGURE NO.:
DWG SCALE:	1"=500'	PROJECT NO:	EP-1217	1

NORTH

Holbrooks Road

Peron Griffin
3753/447

Rufus Blackman
Deed Book: 4441 Page: 875

Dilbert Lee Blackman
4880/013, 4008/888
3883/382
Parcel Id: 01910113

Holbrooks Road

EXISTING SCALEHOUSE

Mecklenburg County
7969/836
Parcel Id:01919108

129.58 Acres

Mecklenburg County
12202/807
Parcel Id:01919105

Mecklenburg County
19831/428
Parcel Id:01919102

CANE CREEK

Town of Huntersville
8878/732

STORMWATER CONVEYANCE PIPES

INFILL EXPANSION AREA ACTIVE C&D LANDFILL CELL

EXPANSION AREA 2
PHASE 1, 2 AND 3
ACTIVE C&D
LANDFILL CELLS

EXPANSION AREA 1
CLOSED C&D
LANDFILL CELL

Mecklenburg County
19831/428
Parcel Id:01919121

Arnold W. Johnston
2313/ 253
Parcel Id:0193014

UNNAMED TRIBUTARY

Joseph R. Wright
04647/071
Parcel Id:01918135

William W. Hammill
24377/846

CLOSED C&D
LANDFILL CELL

MW-6D-1 NMLF

MW-4D-1 NMLF

Linda Wester Long
6116/663
Parcel Id:01930105

Ron C. Gilkerson
11936/600
Parcel Id:01934118

William W. Hammill
24377/846
Parcel Id:01934108

Ron C. Gilkerson
14846/985
Parcel Id:01934106

CANE CREEK

Michael Tinsley
7693/262
Parcel Id:01934105

670 680 690 700 710

NOTE:
GROUNDWATER CONTOURS ARE BASED ON WELL GAUGING DATA FROM 04/10/2014 AND 01/2005.

LEGEND

GROUNDWATER CONTOUR	700
BOUNDARY	
EXISTING CREEK	
APPROXIMATE LOCATION OF PRIVATE DRINKING WATER WELL	
APPROXIMATE LOCATION OF ABANDONED PRIVATE DRINKING WATER WELL	
APPROXIMATE AREA OF CONCERN	
APPROXIMATE LOCATION OF BUILDING	

SCALE IN FEET
0 500 1000

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2646 FARMLAKE LANE
FORT MILL, SC 29708

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC
NORTH MECKLENBURG C&D LANDFILL
HUNTERSVILLE, NC

GROUNDWATER CONTOUR MAP

DATE:	MAY 2014	APPROVED BY:	TB	FIGURE NO.:	2
DWG SCALE:	1"=500'	PROJECT NO:	EP-1217		

APPENDIX A

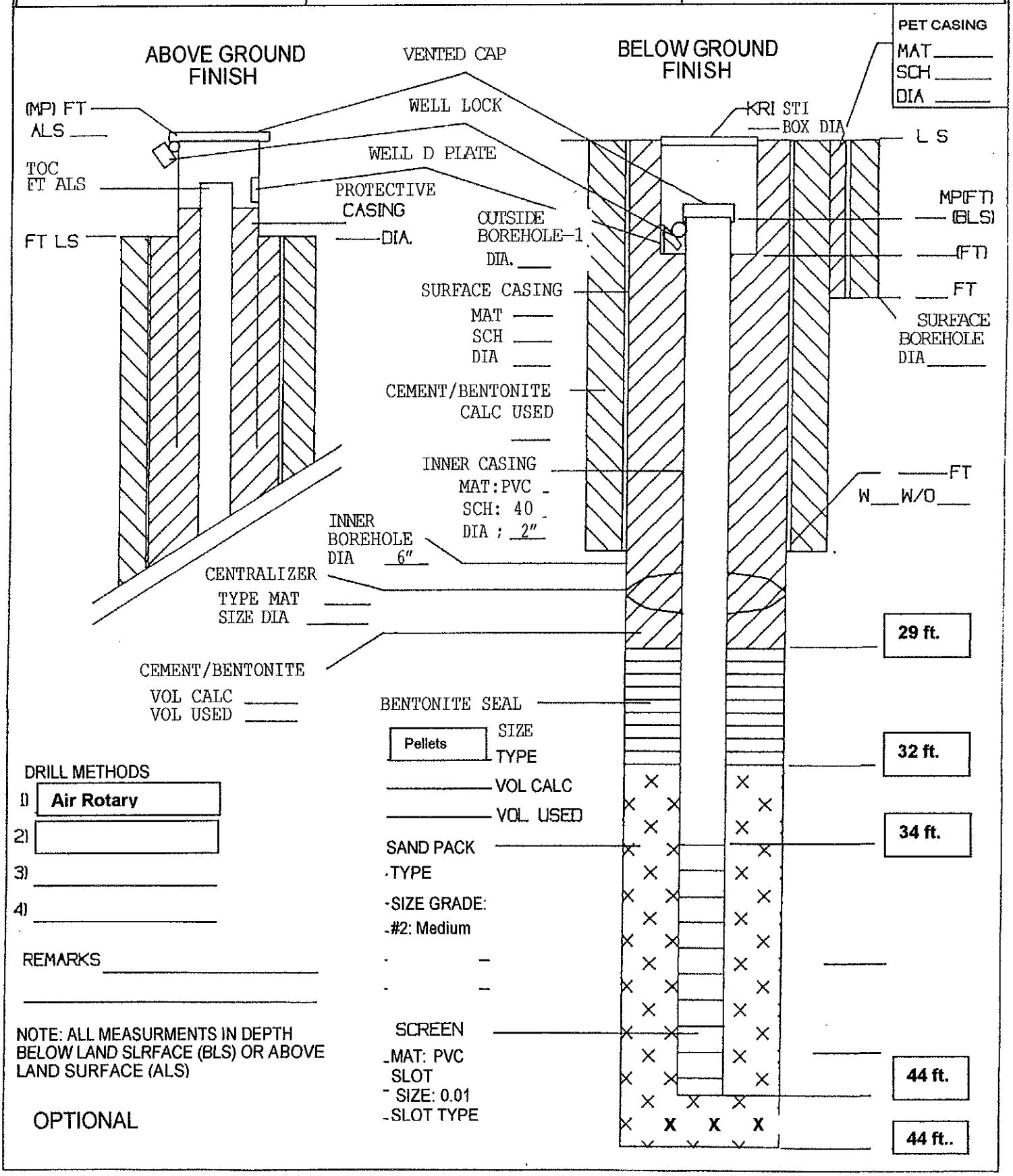
WELL LITHOLOGIC LOGS AND WELL COMPLETION LOGS

ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-4A Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 100'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/13/2013 Date Complete: 9/13/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				brown sandy Silt				
				tan-brown slightly clayey sandy Silt				
	10.0							
	20.0			Light gray-brown silty Sand w/rock fragments (PWR)				
	30.0							
								water @ 33'
				Bedrock				
	40.0							
				Terminated Air Drilling @ 44 ft. bgs				
				Set 2" PVC sch.40 well; screened from 34-44';				
				sand to 32'; bentonite to 29'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-4A Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/13/13 Date Completed: 9/13/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:



ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-4D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 100'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/12/2013 Date Complete: 9/13/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

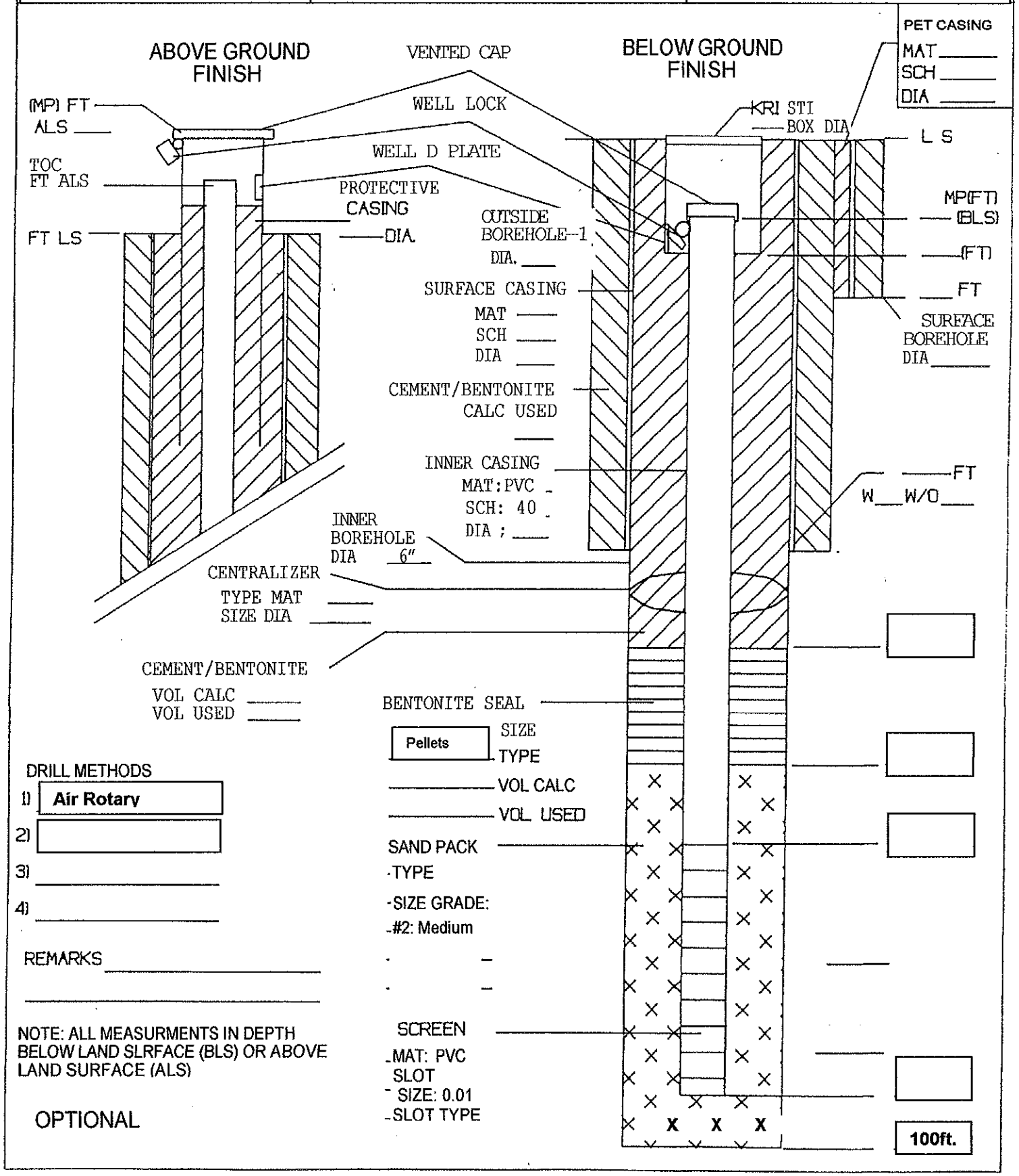
Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
	10.0			Tan-brown slightly clayey Silt				
	20.0			Light gray-brown silty Sand w/rock fragments (PWR)				
	30.0							
	40.0			Bedrock				
	50.0							
				Set 6" sch.40 PVC casing to 55 ft. bgs & grouted it to ground surface				No Fractures No Water
	60.0							
	70.0							

ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-4D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 100'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/12/2013 Date Complete: 9/13/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
	80.0							
	90.0							
	100.0			Terminated Air Drilling @ 100 ft. bgs				No fractures
				Open Borehole				No water

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-4D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/12/13 Date Completed: 9/13/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

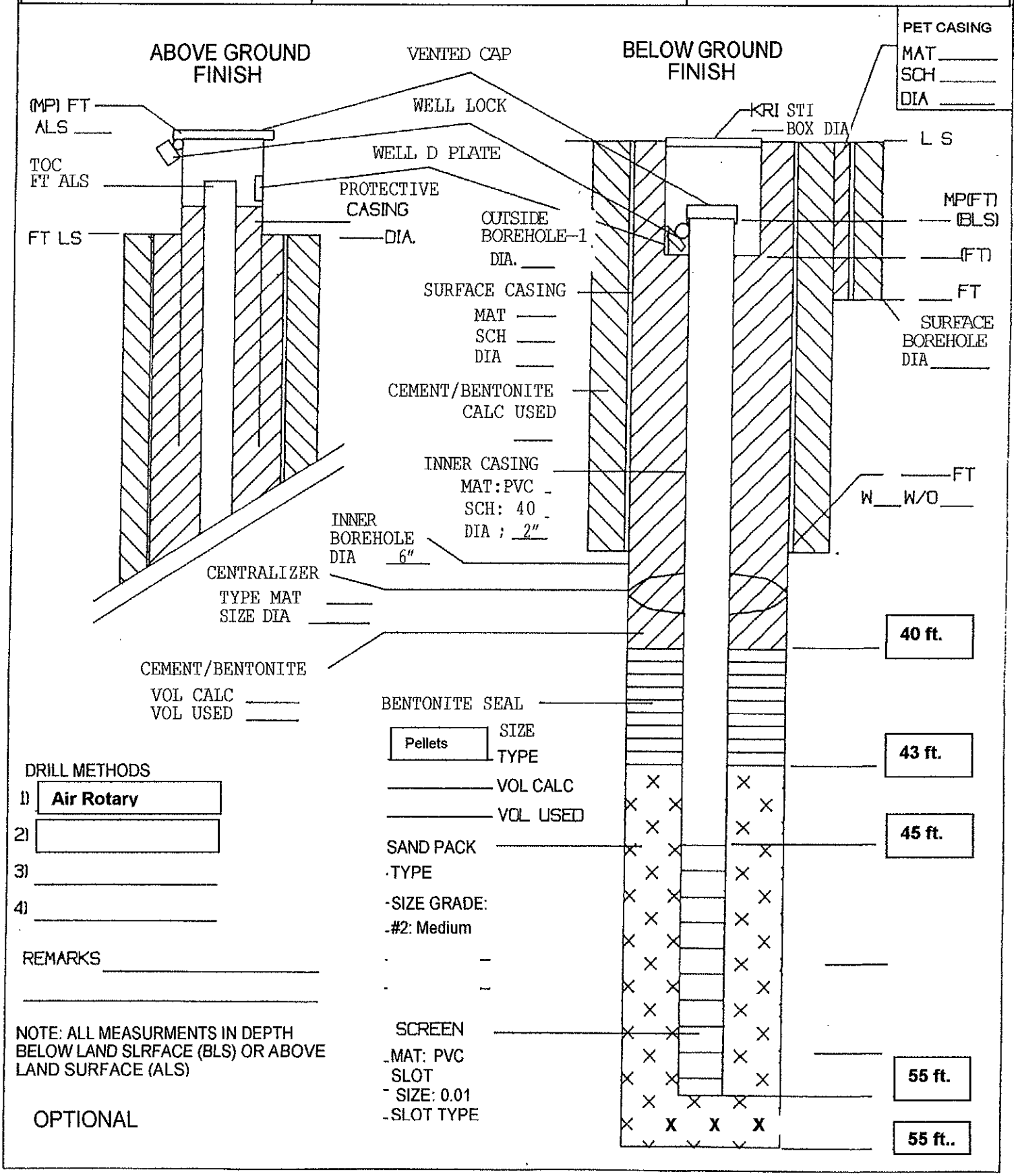


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-5D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 55'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/13/2013 Date Complete: 9/16/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
	10.0							
				Gray-brown silty Sand w/rock fragments (PWR)				
	20.0							
	30.0							
				Set 6" sch.40 PVC casing to 35' bgs & grouted it to ground surface				
	40.0							fracture @ 38'
				Bedrock				no water
	50.0							fracture from 49'-51' 1 gpm
				Terminated Air Drilling @ 55 ft. bgs				
				Set 2" PVC sch.40 well; screened from 45-55';				
				sand to 43'; bentonite to 40'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-5D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/13/13 Date Completed: 9/16/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:



ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-6D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 95'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/11/2013 Date Complete: 9/12/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

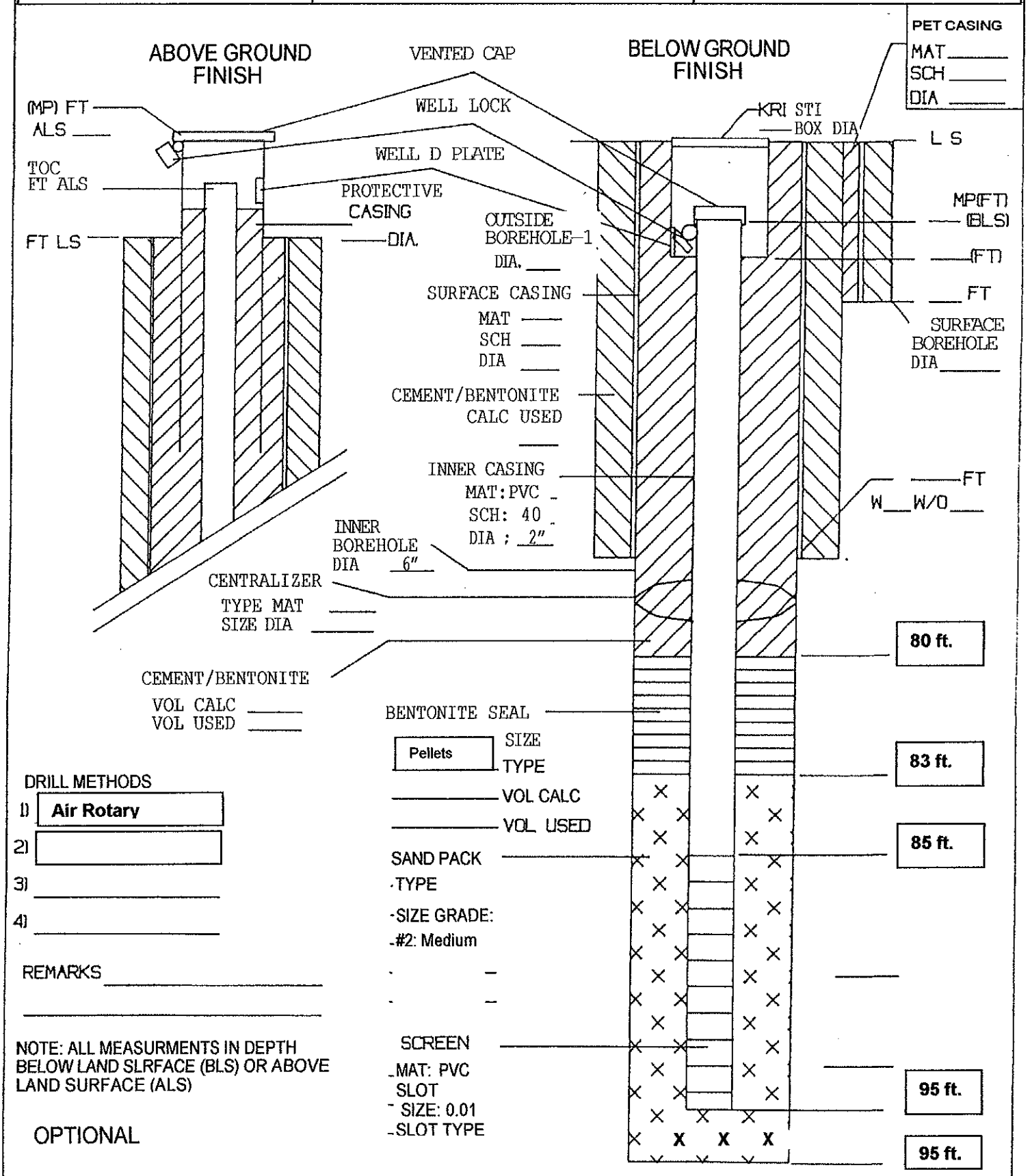
Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Light brown silty Sand				
	10.0							
	20.0			Light gray-tan silty Sand with rock fragments (PWR)				
	30.0							
	40.0			Bedrock				
	50.0							
	60.0							
	70.0							Few fractures
								No water
				Set 6" sch. 40 PVC casing to 75' bgs & grouted it to ground surface				

ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-6D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 95'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/11/2013 Date Complete: 9/12/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
	80.0							
								Fracture @ 87ft. (1-2gpm)
	90.0							Fracture @ 90ft. (1-2 gpm)
				Terminated Air Drilling @ 95 ft. bgs				
				Set 2" PVC sch.40 well; screened from 85-95';				
				sand to 83'; bentonite to 80'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-6D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/11/13 Date Completed: 9/12/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

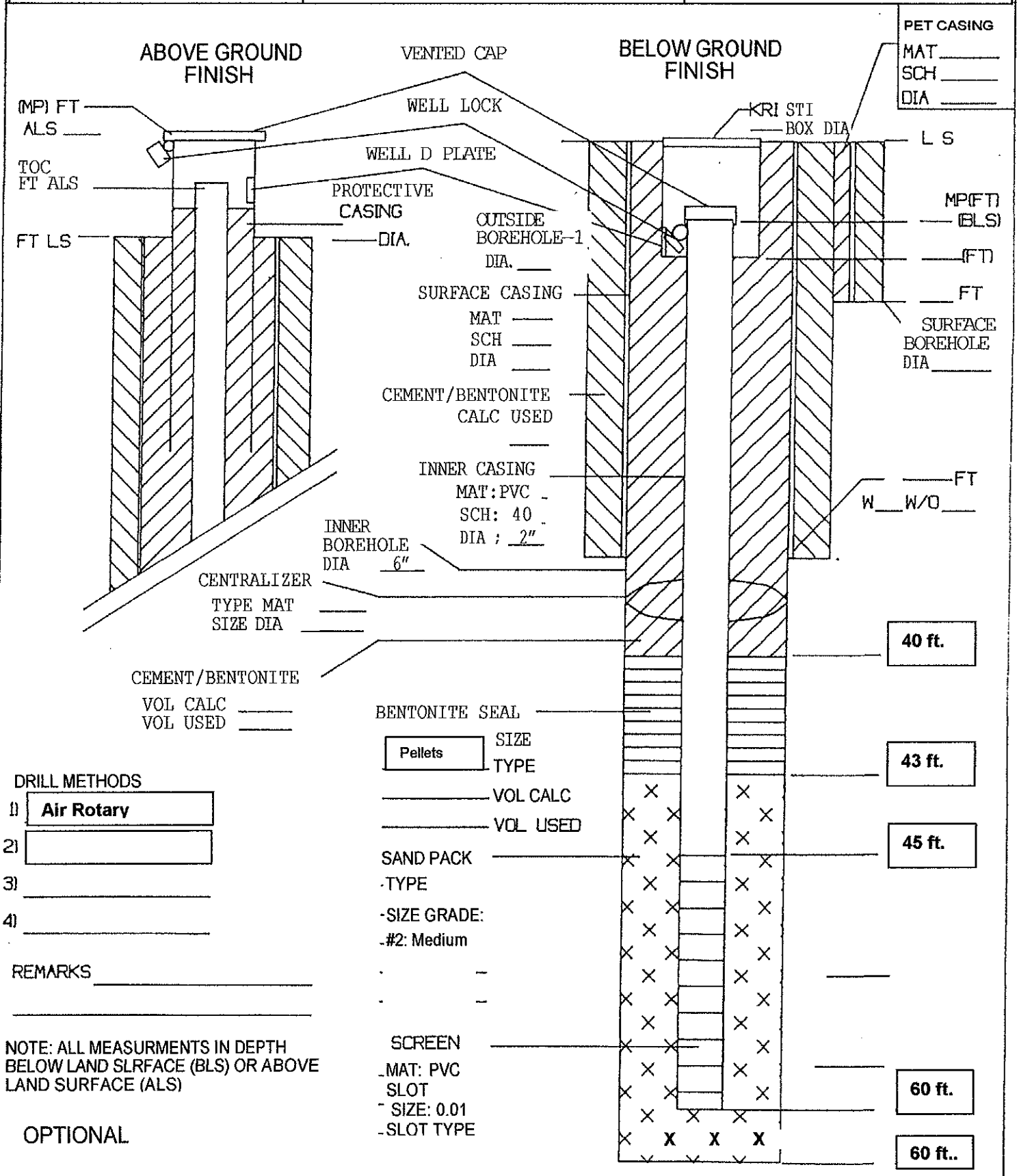


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-7A Job No: EP-1217(A) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 60'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/18/2013 Date Complete: 9/18/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Tan-brown silty Sand				
	10.0							
				Gray-brown silty Sand (PWR)				
	20.0							
	30.0			Brown silty Sand with rock fragments				
	40.0							
				Bedrock (granite)				
	50.0							
	60.0							
				Terminated Air Drilling @ 60 ft. bgs				
				Set 2" PVC well screened from 45-60';				
				sand to 43'; bentonite to 40'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type II	Well #: MW-7A Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/18/13 Date Completed: 9/18/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:



ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-7D Job No: EP-1217(A) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 110'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/17/2013 Date Complete: 9/18/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

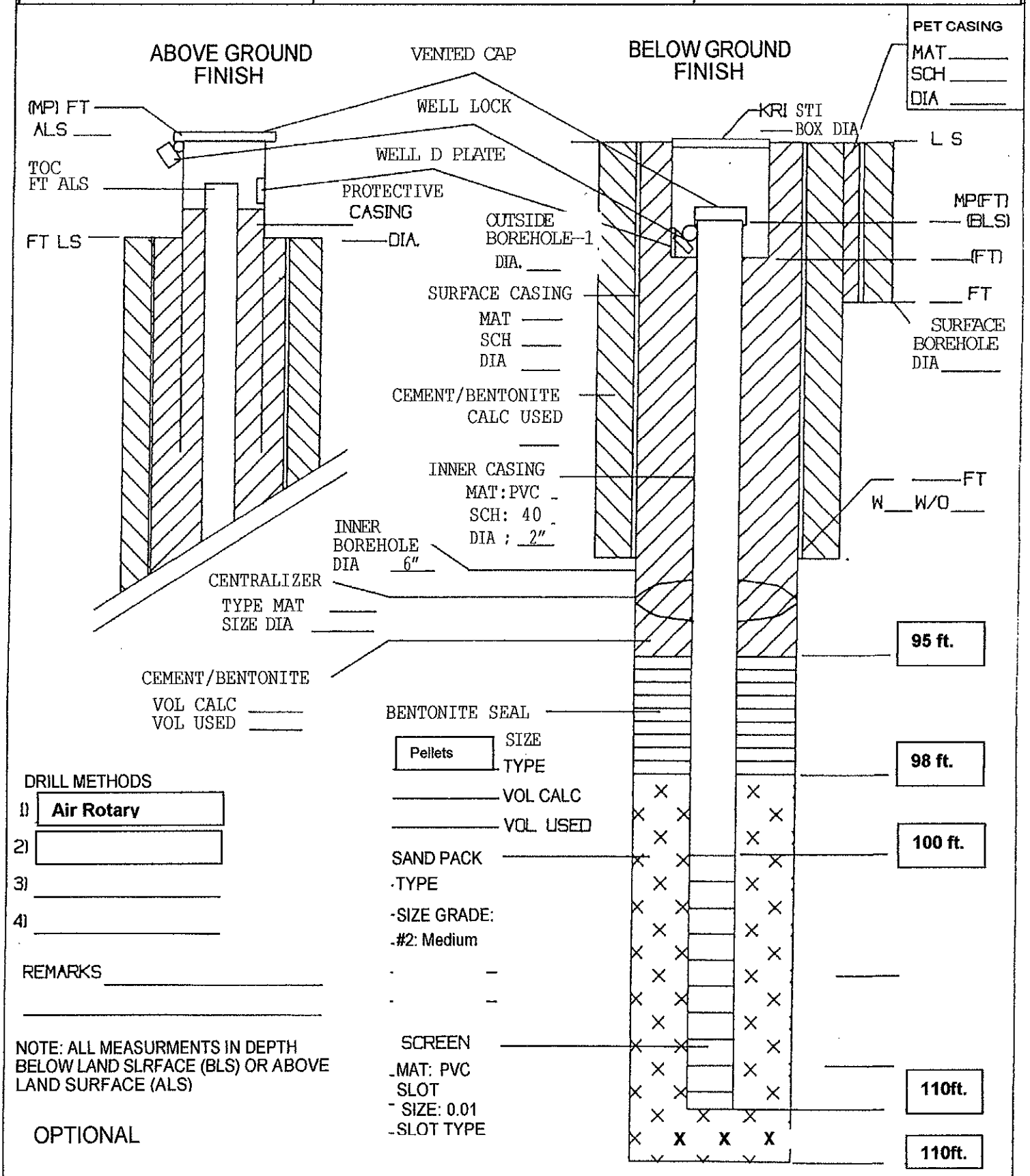
Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Tan-brown silty Sand				
	10.0							
				Gray-brown silty Sand with rock fragments (PWR)				
	20.0							
	30.0			Brown silty Sand with rock fragments				
	40.0							
	50.0							
				Bedrock (hard granite)				
	60.0							
	70.0							

ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-7D Job No: EP-1217(A) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 110'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/17/2013 Date Complete: 9/18/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
	80.0			Set 6" sch.40 PVC casing to 80' bgs & grouted it to ground surface				
	90.0							
				Bedrock (hard granite)				
	100.0							fracture zone from 100' to 105'
	110.0			Terminated Air Drilling @ 110 ft. bgs				
				Set 2" PVC well screened from 100-110'; sand to 98'; bentonite to 95'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-7D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/17/13 Date Completed: 9/18/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:



ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-8D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 122'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/16/2013 Date Complete: 9/17/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

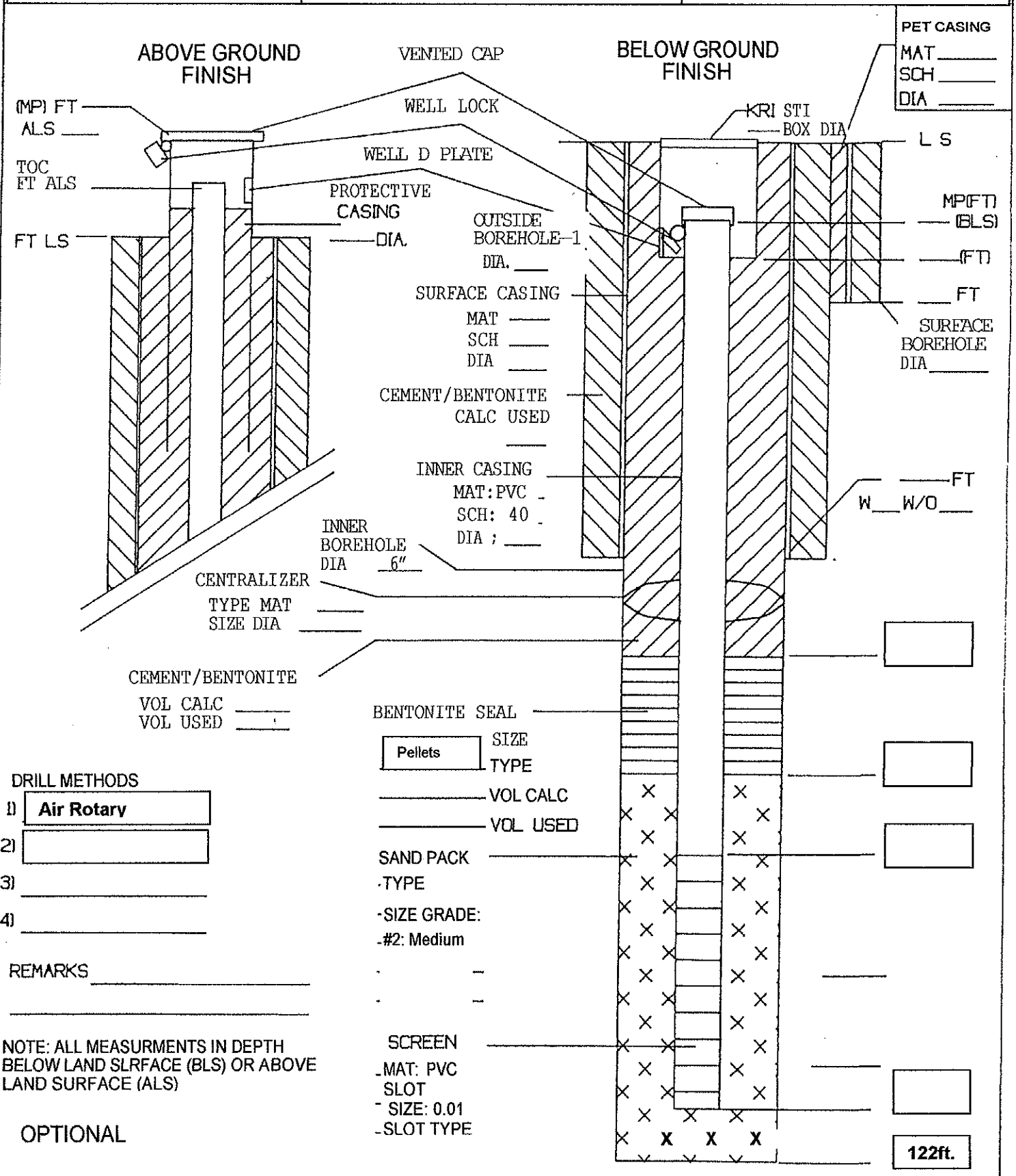
Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Gray-brown silty fine Sand				
	10.0							
				Tan-brown silty Sand with rock fragments				
	20.0							
	30.0							
	40.0							
				Bedrock (hard granite)				
	50.0							
	60.0							
	70.0							

ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-8D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 122'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/16/2013 Date Complete: 9/17/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
	80.0			Bedrock (hard granite)				
	90.0			Set 6" sch.40 PVC casing to 90' bgs & grouted it to ground surface				
	100.0							
	110.0			Bedrock (hard granite)				
	120.0							fracture from 119'-120' no water
				Terminated Air Drilling @ 122 ft. bgs				
				Open Borehole				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-8D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/16/13 Date Completed: 9/17/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

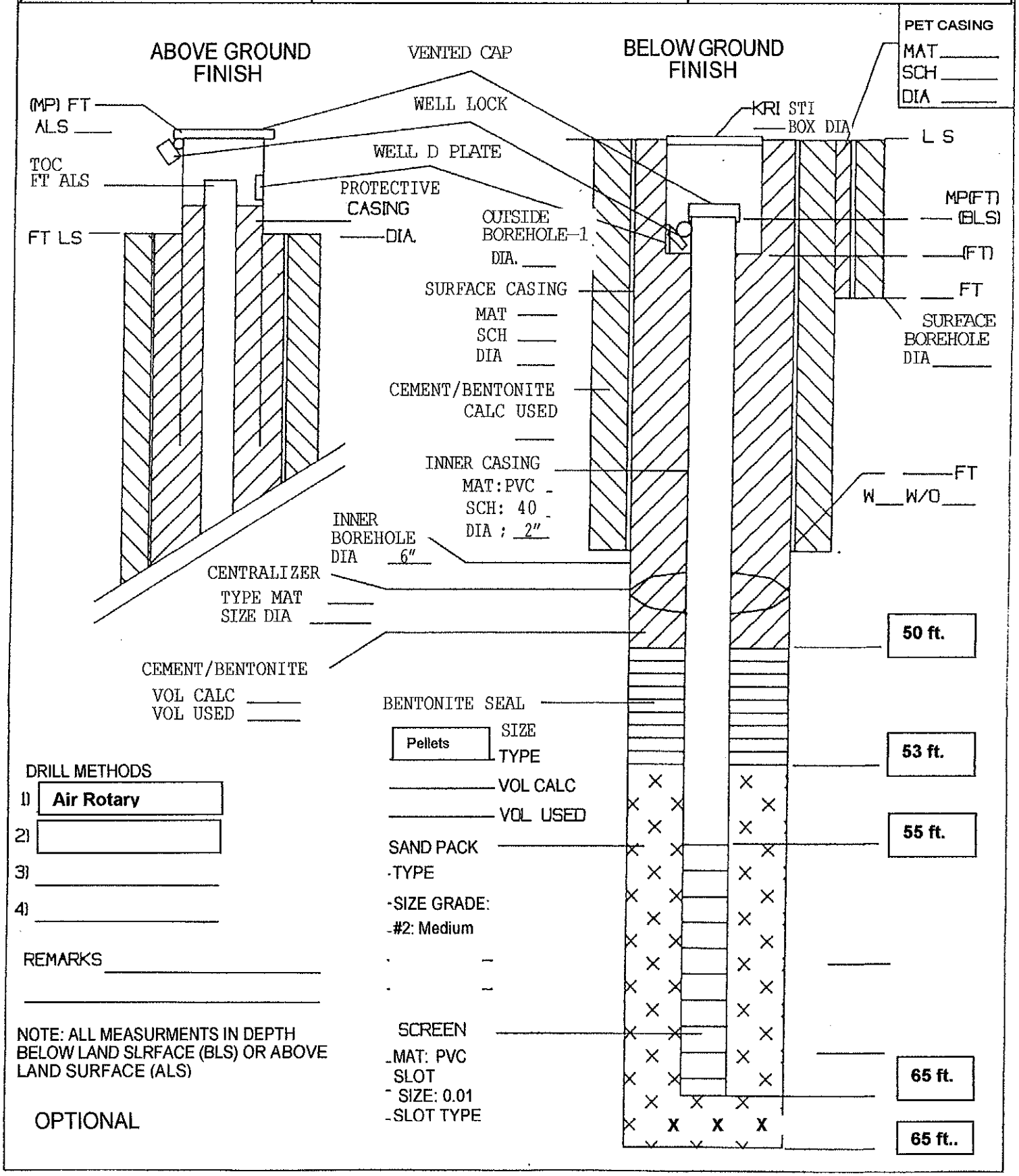


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-10D Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 65'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/16/2013 Date Complete: 9/19/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Gray-brown slightly clayey sandy Silt				
	10.0							
				Gray silty Sand with rock fragments (PWR)				
	20.0			Gray-brown silty Sand				
	30.0							
	40.0			Bedrock				
	50.0			Set 6" sch.40 PVC casing to 50' bgs & grouted it to ground surface				weathered zones @ 56', 59', and 64'
	60.0							
				Terminated Air Drilling @ 65 ft. bgs Set 2" PVC sch.40 well; screened from 55-65'; sand to 53'; bentonite to 50'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-10D Job #: EP-1217(a) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/16/13 Date Completed: 9/19/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

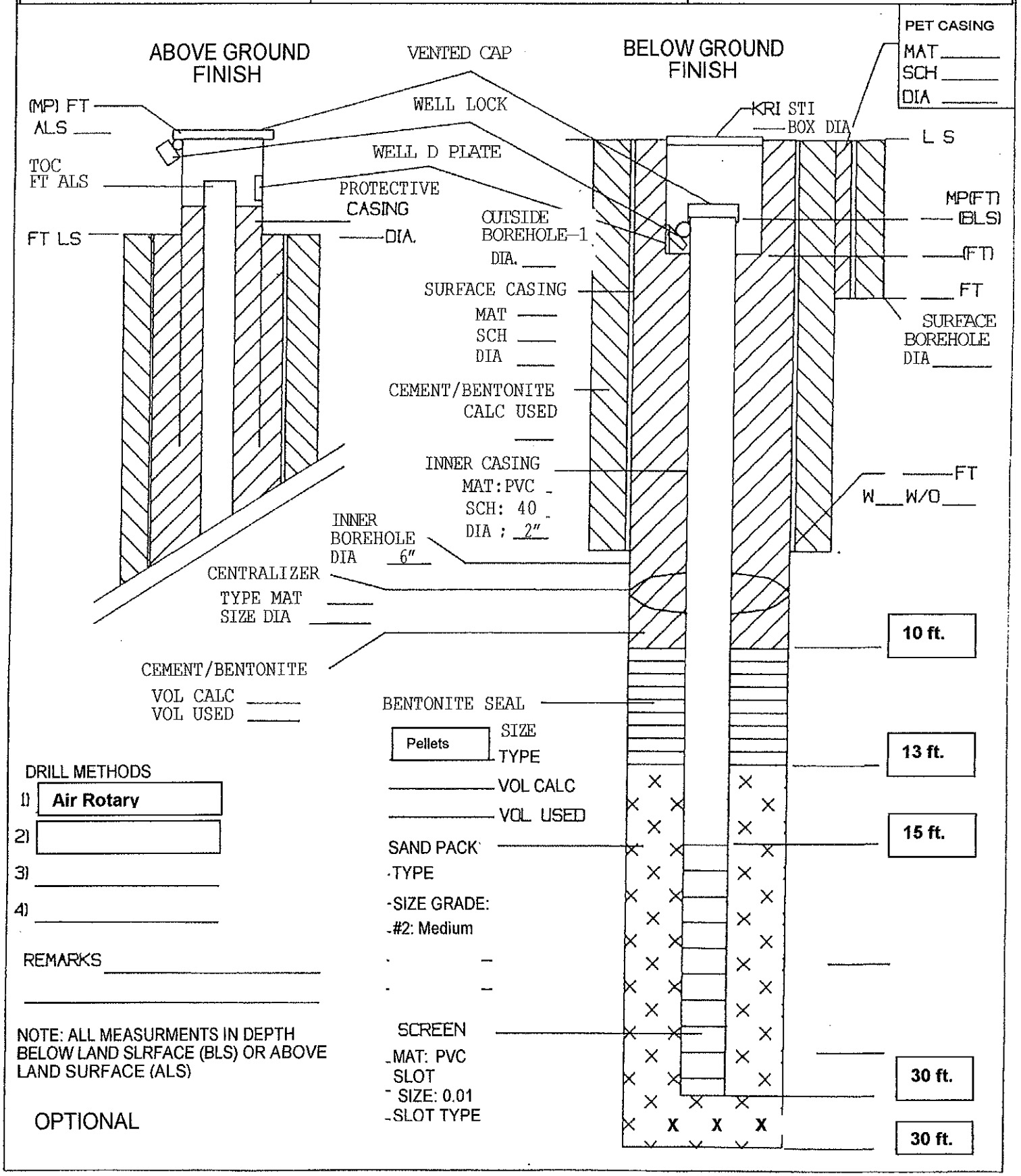


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-11A Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 30'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/24/2013 Date Complete: 9/24/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Orange-brown slightly clayey sandy Silt				
	10.0			Tan-brown silty Sand				
				Gray-brown silty Sand with rock fragments (PWR)				
	20.0							
				Bedrock (granite)				
	30.0							
				Terminated Air Drilling @ 30 ft. bgs				
				Set 2" PVC well screened from 15-30';				
				sand to 13'; bentonite to 10'; grout to surface				
	40.0							
	50.0							
	60.0							
	70.0							

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type II	Well #: MW-11A Job #: EP-1217(A) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/24/13 Date Completed: 9/24/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

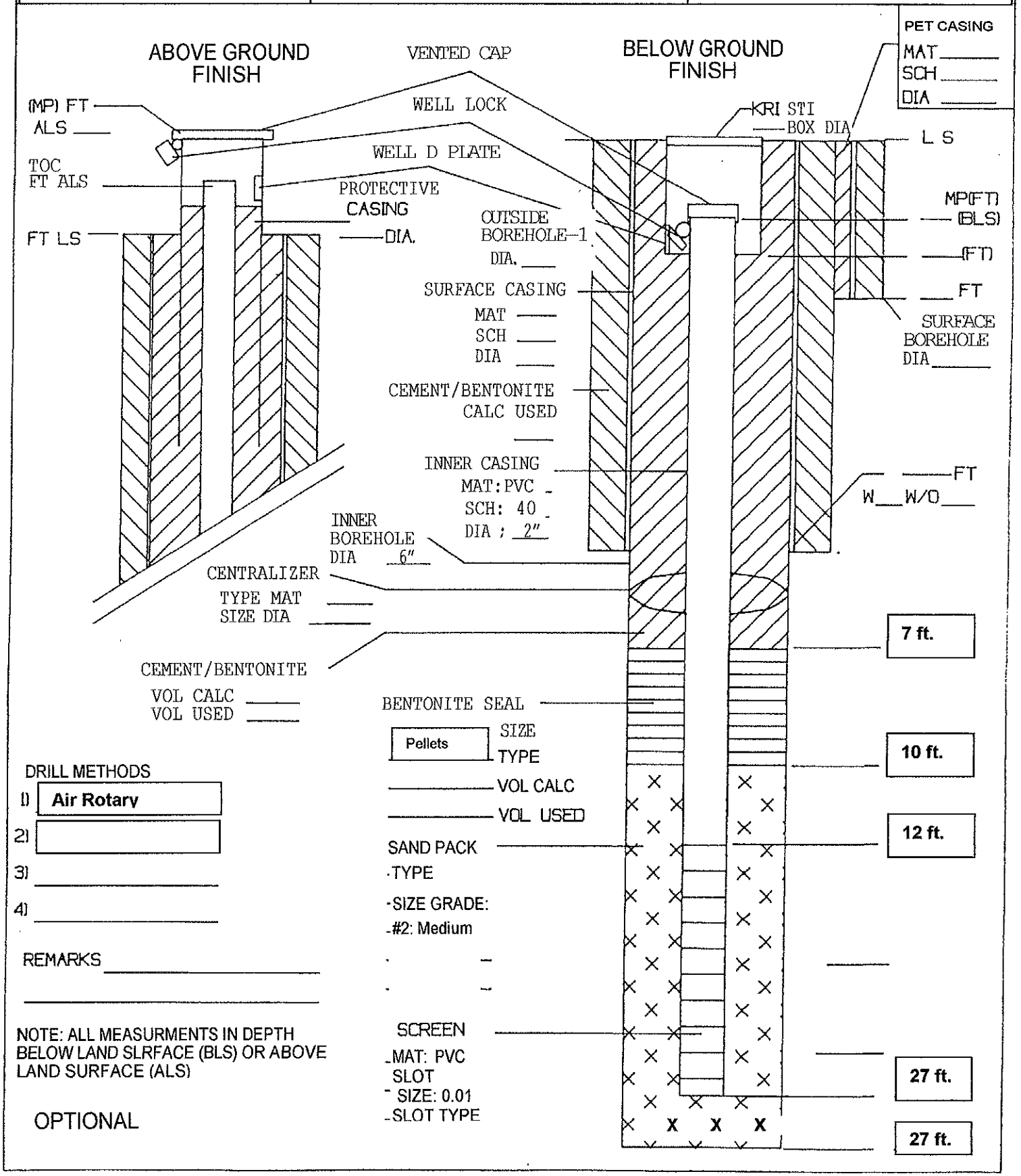


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-11B Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 27'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/25/2013 Date Complete: 9/25/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Orange-brown slightly clayey sandy Silt				
	10.0							
				Tan-brown silty Sand				
				Gray-brown silty Sand with rock fragments (PWR)				
	20.0			Bedrock (granite)				
				Terminated Air Drilling @ 27 ft. bgs				fracture zone
				Set 2" PVC well screened from 12-27';				at 26 ft.
				sand to 10'; bentonite to 7'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type II	Well #: MW-11B Job #: EP-1217(A) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/25/13 Date Completed: 9/25/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

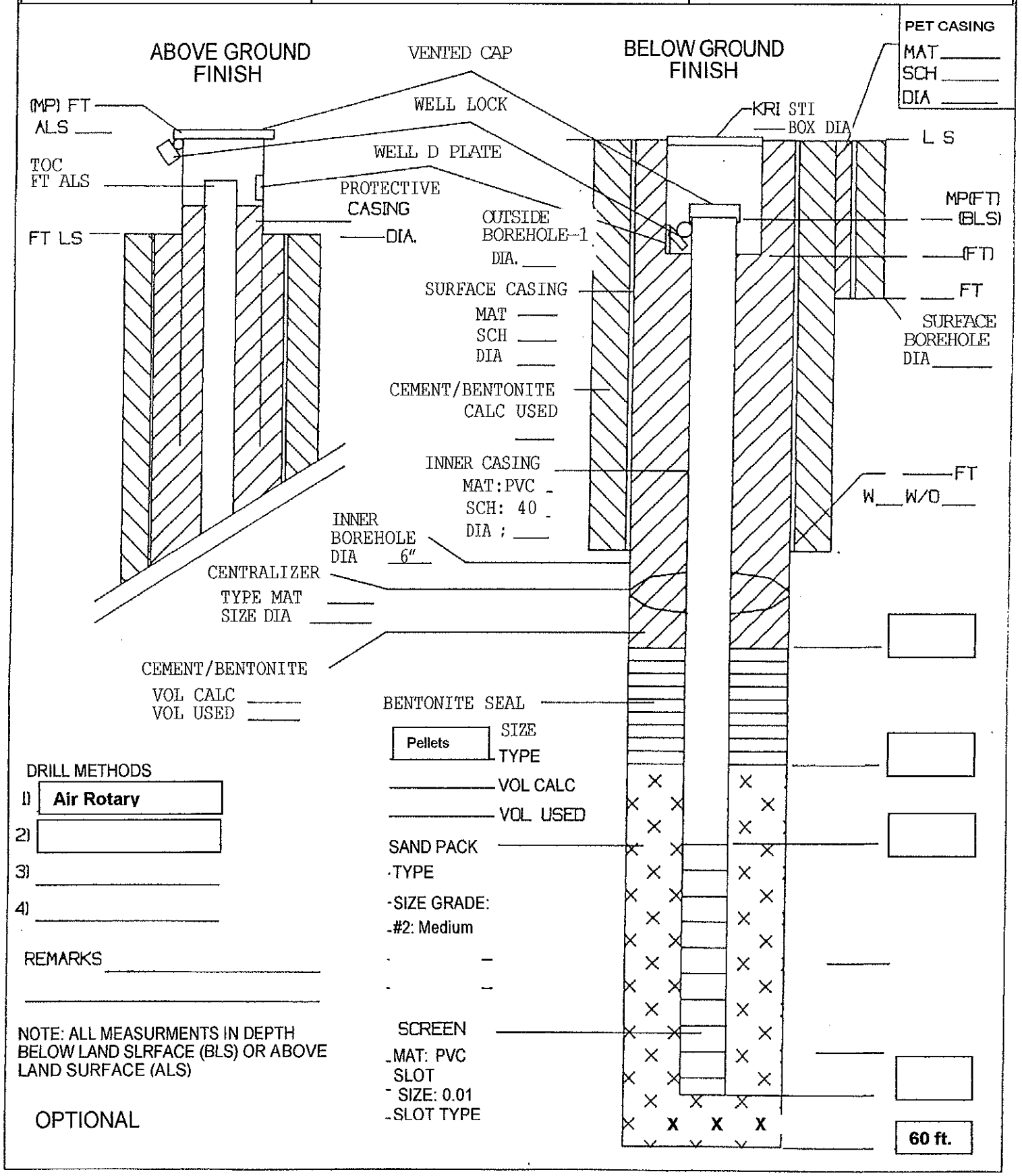


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-11D-I Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 60'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/24/2013 Date Complete: 9/25/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Orange-brown slightly clayey sandy Silt				
	10.0			Tan-brown silty Sand				
				Gray-brown silty Sand with rock fragments (PWR)				
	20.0							
	30.0			Bedrock (granite)				
	40.0			Set 6" sch.40 PVC casing to 40' bgs & grouted it to ground surface				
	50.0							
	60.0			Terminated Air Drilling @ 60 ft. bgs Open Borehole No fractures				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-11D-1 Job #: EP-1217(A) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/24/13 Date Completed: 9/25/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:

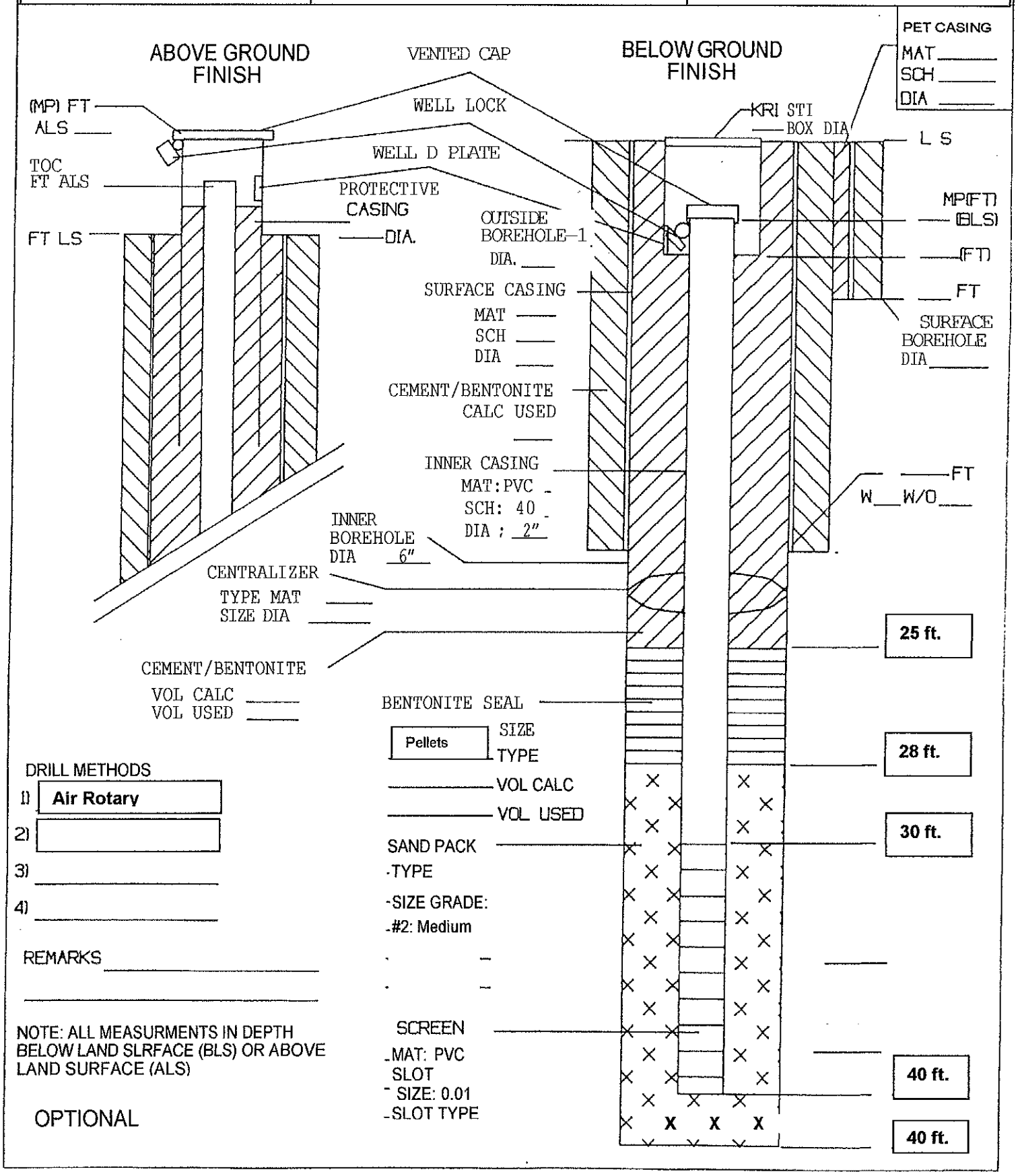


ENVIRO-PRO, P.C. Fort Mill, South Carolina	LITHOLOGIC LOG	Boring No.: MW-11D-2 Job No: EP-1217(a) Client: Greenway Waste Solutions, LLC

Project Location: 15300 Holbrooks Road, Huntersville State: NC Total Depth: 40'
Logged By: THB Soil Sample Method: Soil Cuttings Date Started: 9/24/2013 Date Complete: 9/25/2013
Driller: Tommy w/EDPS Drill Method: Air Rotary Equipment Type: Canterra CT-450 Boring Diameter: 6"
Soil Gas Sample Method: Groundwater (bmp): 0 hrs 24 hrs
Land Surface Elevation (LS): Measuring Point Elev. (MP): Remarks:

Elevation ft.	Depth ft.	SPT/Interval	Sample ID No.	Description	Soil Gas	Moisture	USCS Log	Comments
				Brown sandy Silt				
				Orange-brown slightly clayey sandy Silt				
	10.0							
				Tan-brown silty Sand				
				Gray-brown silty Sand with rock fragments (PWR)				
	20.0							
				Bedrock (granite)				
	30.0			Set 6" sch.40 PVC casing to 30' bgs & grouted it to ground surface				
								fracture @ 32'
	40.0			Terminated Air Drilling @ 40 ft. bgs				
				Set 2" PVC well screened from 30-40';				
				sand to 28'; bentonite to 25'; grout to surface				

ENVIRO-PRO, P.C. Fort Mill, SC	Well Completion Log Type III	Well #: MW-11D-2 Job #: EP-1217(A) Client: Greenway Waste Solutions, LLC
Project Location 15300 Holbrooks Road, Huntersville	County Mecklenburg State NC	Logged By: THB
Land Surface Elev.	Measuring Pt. Elev.	Date Began: 9/24/13 Date Completed: 9/25/13
Well Dev. Method	Volume Evacuated: Appearance:	Monitored Formation:



APPENDIX B

IN-SITU PERMEABILITY FIELD TEST DATA

SLUG TEST DATA SHEET

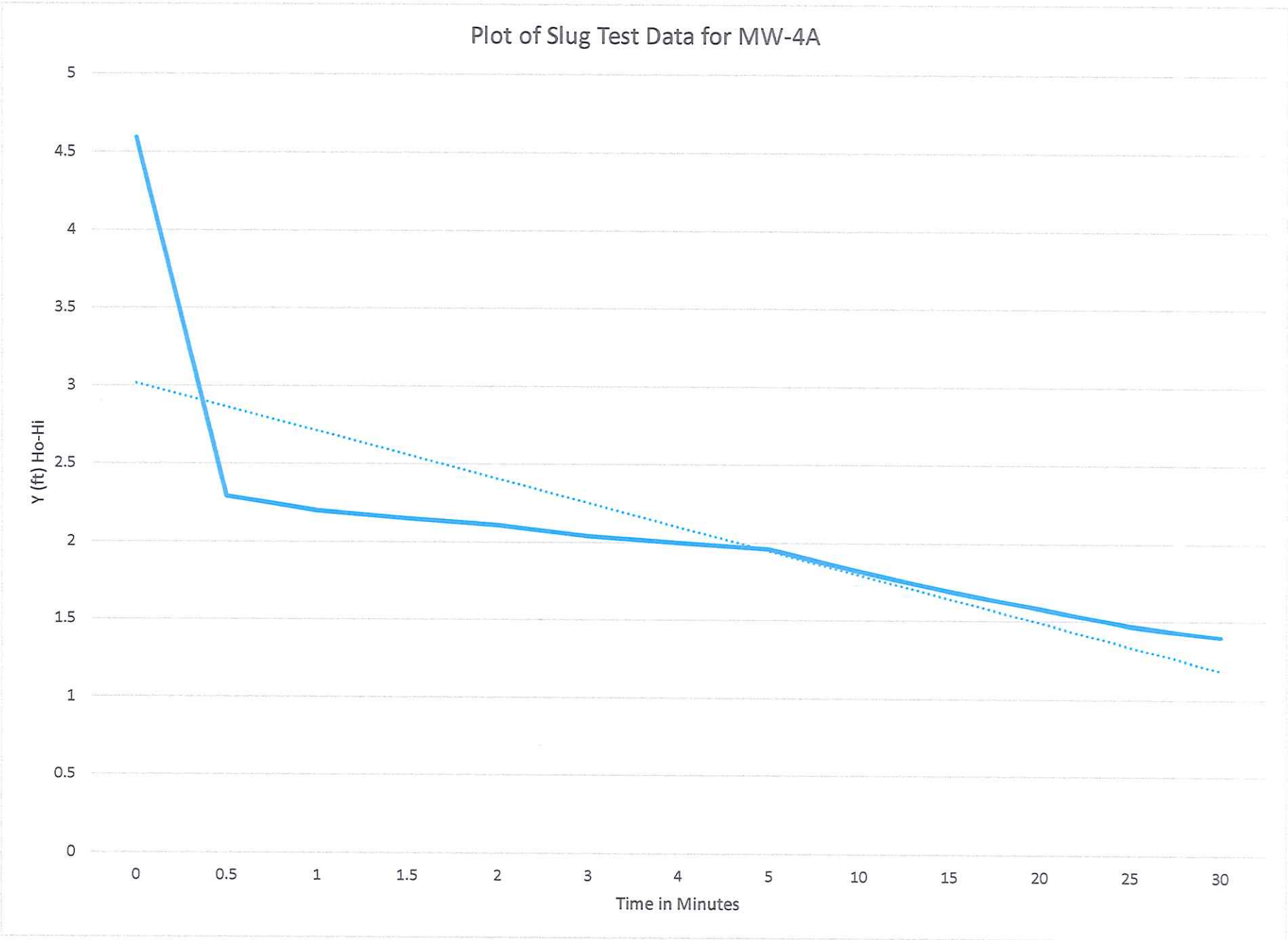
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	44	WELL I.D.	MW-4A
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	33.32
SCREEN INTERVAL (ft)	34-44	WATER LEVEL @ t=0 (Ho)	37.91
SCREEN DIAMETER (in)	2	MP DESCRIPTION	Ground Surface
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	24
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	37.91	4.59	
1	0.5	35.61	2.29	
2	1	35.52	2.20	
3	1.5	35.47	2.15	
4	2	35.43	2.11	
5	3	35.36	2.04	
6	4	35.32	2.00	
7	5	35.28	1.96	
8	10	35.14	1.82	
9	15	35.01	1.69	
10	20	34.90	1.58	
11	25	34.79	1.47	
12	30	34.72	1.40	


Plot of Slug Test Data for MW-4A
Y (ft) Ho-Hi
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
3
4
5
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-4A
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	44
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	44
Static WT - Bottom of Intake (H)	10.68
Saturated Aquifer Thickness (D)	50

Worksheet Generated Values

L/rw:	176.00
D-H:	39.32
H/rw:	42.72

Analysis Input (From Coefficient Curves)

Coefficient A	6
Coefficient B	0.5
Coefficient C(if necessary)	
If H<D then use A & B	

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	3
Drawdown at time t (Yt) (ft):	1.7
Time (t) (min):	10

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.93**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **1.30E-05** **Ft/min**

= **0.02** **Ft/day**

T= Kb

= **0.94** **Ft^2/day**

SLUG TEST DATA SHEET

PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	100	WELL I.D.	MW-4D
SCREEN LENGTH (ft)	45 (open Borehole)	STATIC WATER LEVEL (Hi)	36.18
SCREEN INTERVAL (ft)	55-100	WATER LEVEL @ t=0 (Ho)	39.02
SCREEN DIAMETER (in)	6	MP DESCRIPTION	Ground Surface
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	23
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	39.02	2.84	
1	1	39.02	2.84	
2	2	39.02	2.84	
3	3	39.02	2.84	
4	5	39.01	2.83	
5	10	39.00	2.82	
6	15	38.99	2.81	
7	20	38.98	2.80	

SLUG TEST DATA SHEET

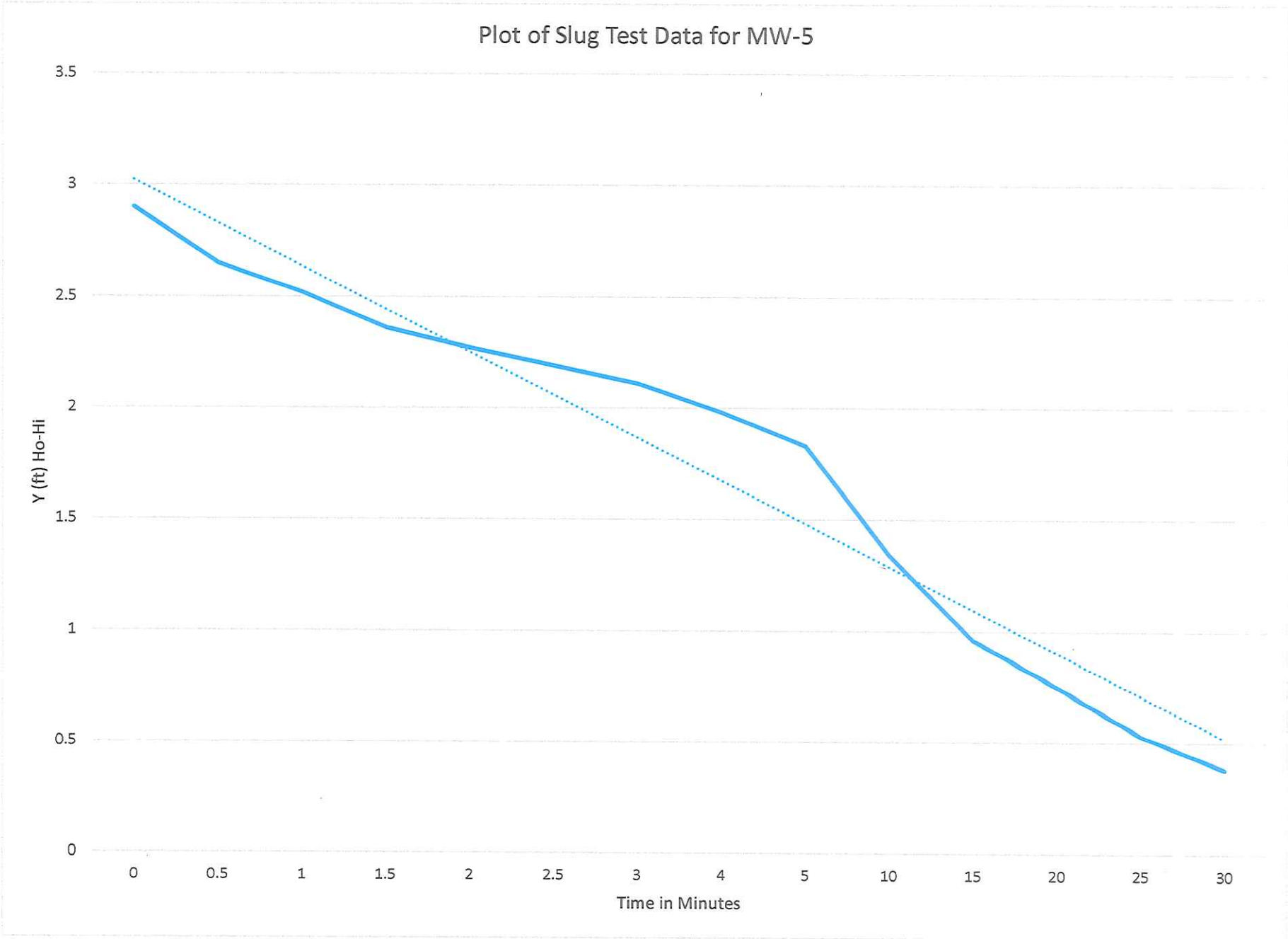
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	29	WELL I.D.	MW-5
SCREEN LENGTH (ft)	15	STATIC WATER LEVEL (Hi)	20.20
SCREEN INTERVAL (ft)	14-29	WATER LEVEL @ t=0 (Ho)	23.10
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING		DEPTH TO BEDROCK (ft BGS)	29
FULLY PENETRATING	√	AQUIFER THICKNESS (ft)	8.8

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	23.10	2.90	
1	0.5	22.85	2.65	
2	1	22.72	2.52	
3	1.5	22.56	2.36	
4	2	22.47	2.27	
5	2.5	22.39	2.19	
6	3	22.31	2.11	
7	4	22.18	1.98	
8	5	22.03	1.83	
9	10	21.54	1.34	
10	15	21.16	0.96	
11	20	20.95	0.75	
12	25	20.73	0.53	
13	30	20.58	0.38	


Plot of Slug Test Data for MW-5
3.5
3
2.5
2
1.5
1
0.5
0
Y (ft) Ho-Hi
0
0.5
1
1.5
2
2.5
3
4
5
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-5
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	29
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	8.8
Static WT - Bottom of Intake (H) (ft):	8.8
Saturated Aquifer Thickness (D) (ft):	8.8

Worksheet Generated Values

L/rw:	35.20
D-H:	0.00
H/rw:	35.20

Analysis Input (From Coefficient Curves)

Coefficient A	
Coefficient B	
Coefficient C(if necessary)	2.3

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	3.02
Drawdown at time t (Yt) (ft):	1.25
Time (t) (min):	10

Analysis

ln Re/rw= [1.1/ln(H/rw)+(C/(L/rw))]-1

= **2.67**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **9.23E-05** **Ft/min**

= **0.13** **Ft/day**

T= Kb

= **1.17** **Ft^2/day**

SLUG TEST DATA SHEET

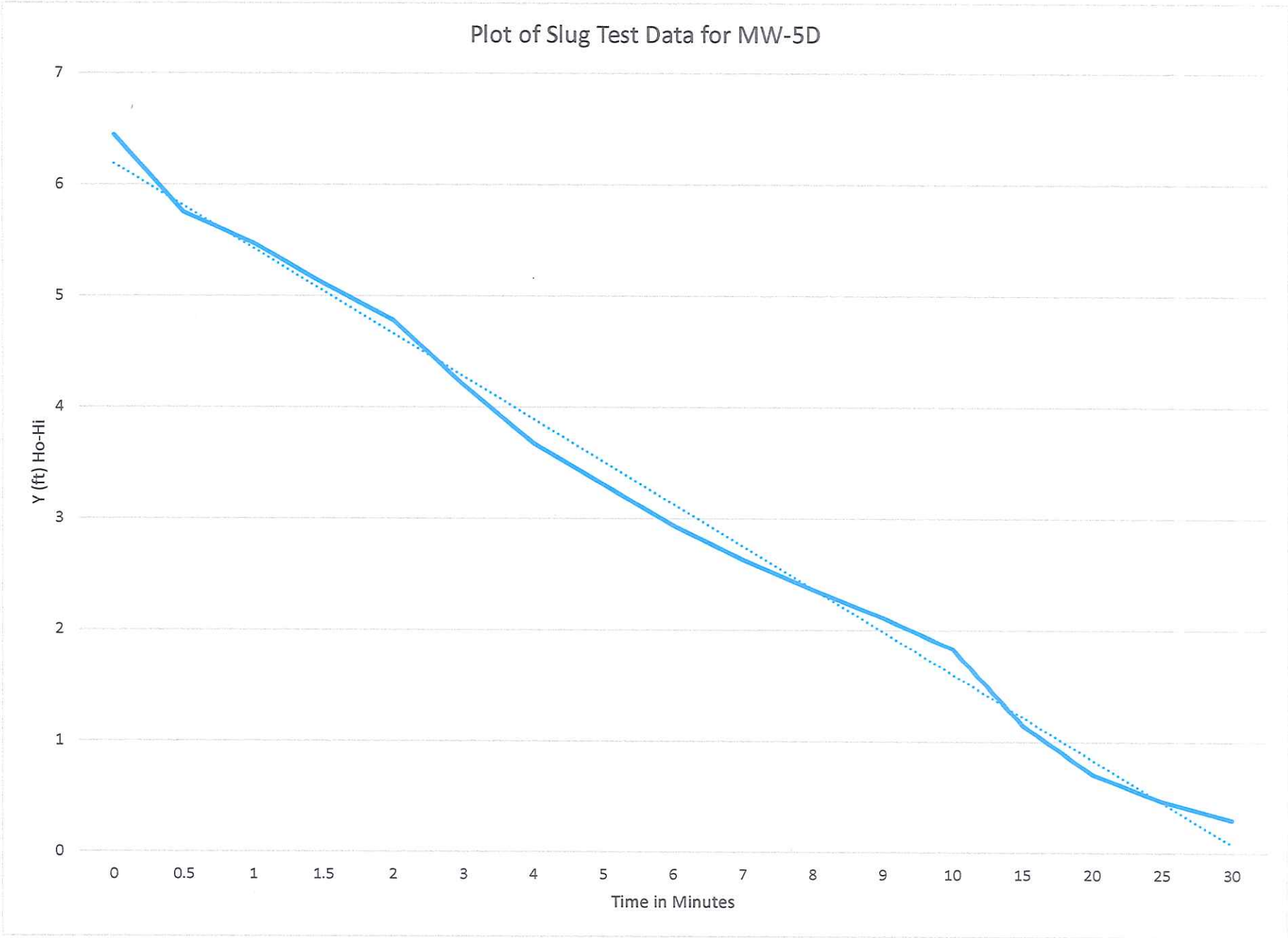
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	55	WELL I.D.	MW-5D
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	17.33
SCREEN INTERVAL (ft)	45-55	WATER LEVEL @ t=0 (Ho)	23.78
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	20
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	23.78	6.45	
1	0.5	23.08	5.75	
2	1	22.80	5.47	
3	2	22.44	5.11	
4	2	22.11	4.78	
5	3	21.53	4.20	
6	4	21.01	3.68	
7	5	20.64	3.31	
8	6	20.27	2.94	
9	7	19.96	2.63	
10	8	19.69	2.36	
11	9	19.44	2.11	
12	10	19.16	1.83	
13	15	18.48	1.15	
14	20	18.04	0.71	
15	25	17.80	0.47	
16	30	17.63	0.30	


Plot of Slug Test Data for MW-5D
Y (ft) Ho-Hi
7
6
5
4
3
2
1
0
0
0.5
1
1.5
2
3
4
5
6
7
8
9
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-5A
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	55
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	55
Static WT - Bottom of Intake (H) (ft):	37.67
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	220.00
D-H:	12.33
H/rw:	150.68

Analysis Input (From Coefficient Curves)

Coefficient A	6.5
Coefficient B	1.25
Coefficient C(if necessary)	

If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	6.25
Drawdown at time t (Yt) (ft):	2.4
Time (t) (min):	8

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **3.69**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **2.76E-05** **Ft/min**

= **0.04** **Ft/day**

T= Kb

= **1.99** **Ft^2/day**

SLUG TEST DATA SHEET

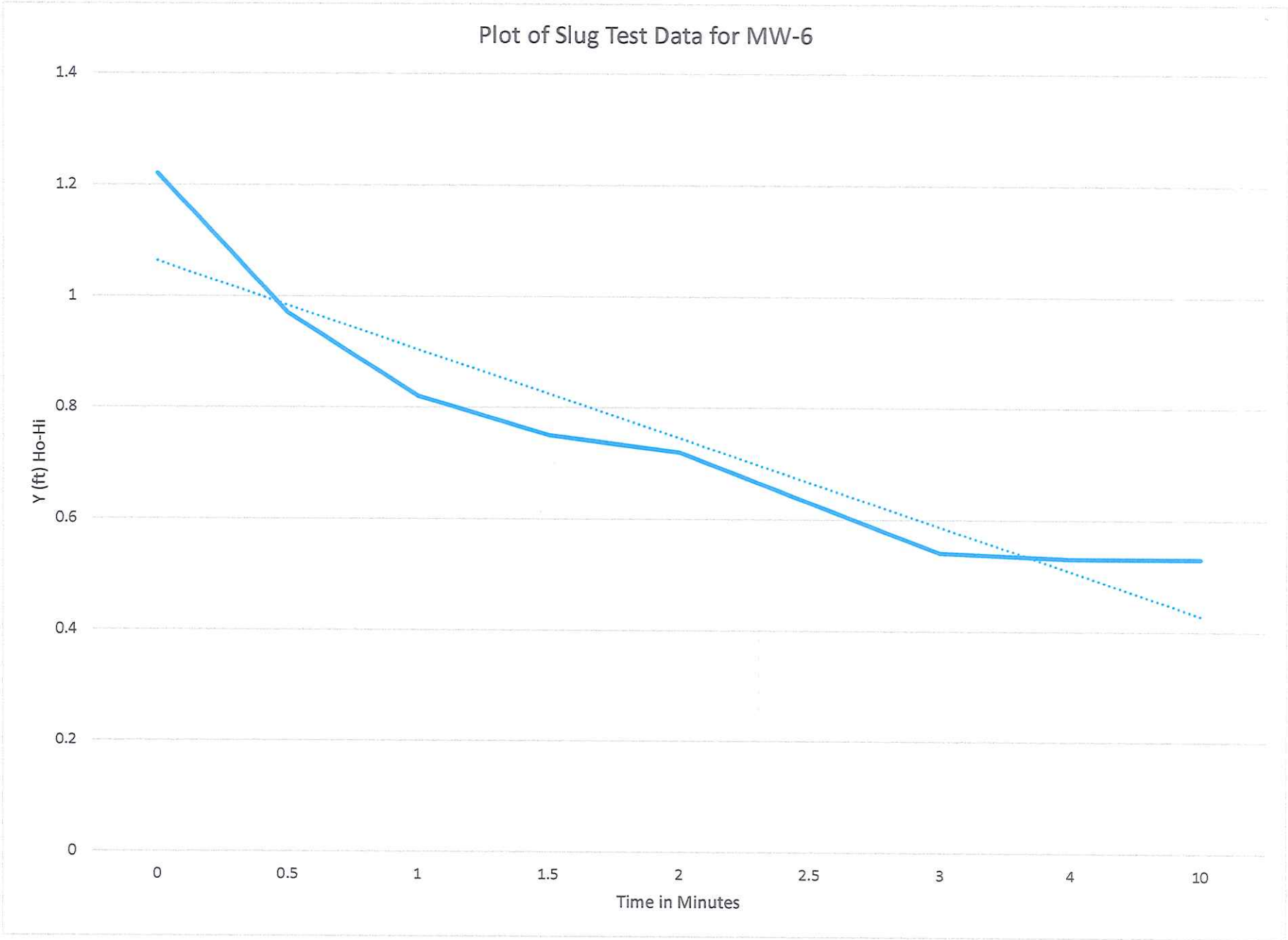
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	67	WELL I.D.	MW-6
SCREEN LENGTH (ft)	15	STATIC WATER LEVEL (Hi)	56.28
SCREEN INTERVAL (ft)	52-67	WATER LEVEL @ t=0 (Ho)	57.50
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	25
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	57.50	1.22	
1	0.5	57.25	0.97	
2	1	57.10	0.82	
3	2	57.03	0.75	
4	2	57.00	0.72	
5	2.5	56.91	0.63	
6	3	56.82	0.54	
7	4	56.81	0.53	
8	10	56.81	0.53	


Plot of Slug Test Data for MW-6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Y (ft) Ho-Hi
0
0.5
1
1.5
2
2.5
3
4
10
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-6
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	67
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	10.72
Static WT - Bottom of Intake (H) (ft):	10.72
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	42.88
D-H:	39.28
H/rw:	42.88

Analysis Input (From Coefficient Curves)

Coefficient A	3
Coefficient B	0.5
Coefficient C(if necessary)	

If H<D then use A & B

If fully penetrating H=D, then use C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	1.1
Drawdown at time t (Yt) (ft):	1
Time (t) (min):	0.5

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.37**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **1.45E-04 Ft/min**

= **0.21 Ft/day**

T= Kb

= **10.46 Ft^2/day**

SLUG TEST DATA SHEET

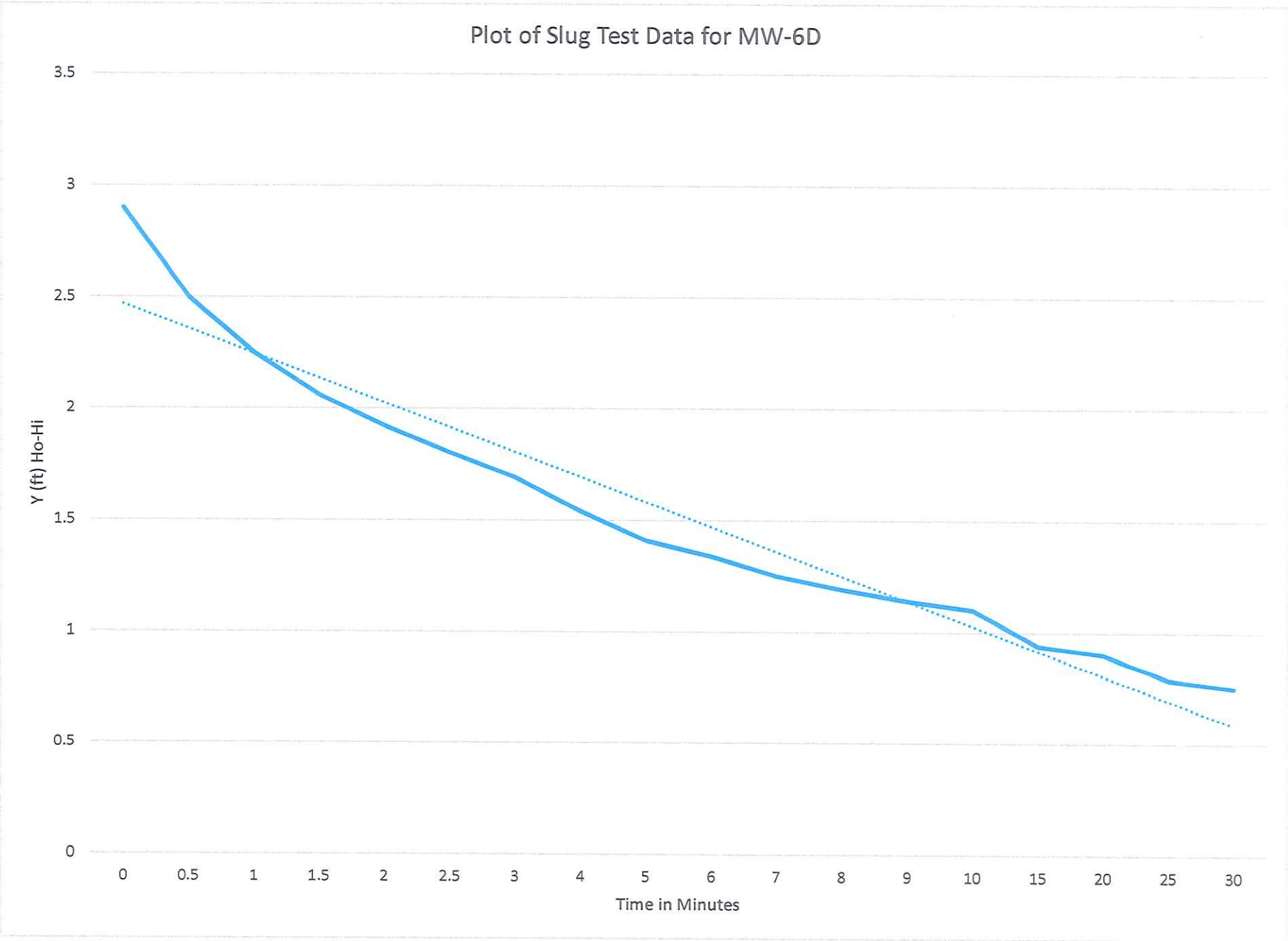
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	95	WELL I.D.	MW-6D
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	59.05
SCREEN INTERVAL (ft)	85-95	WATER LEVEL @ t=0 (Ho)	61.95
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	23
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	61.95	2.90	
1	0.5	61.55	2.50	
2	1	61.30	2.25	
3	1.5	61.11	2.06	
4	2	60.97	1.92	
5	2.5	60.85	1.80	
6	3	60.74	1.69	
7	4	60.59	1.54	
8	5	60.46	1.41	
9	6	60.39	1.34	
10	7	60.30	1.25	
11	8	60.24	1.19	
12	9	60.19	1.14	
13	10	60.15	1.10	
14	15	59.99	0.94	
15	20	59.95	0.90	
16	25	59.84	0.79	
17	30	59.80	0.75	


Plot of Slug Test Data for MW-6D
Y (ft) Ho-Hi
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
1.5
2
2.5
3
4
5
6
7
8
9
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-6D
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	95
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	35.95
Static WT - Bottom of Intake (H) (ft):	10
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	143.80
D-H:	40.00
H/rw:	40.00

Analysis Input (From Coefficient Curves)

Coefficient A	5.5
Coefficient B	1

Coefficient C(if necessary)
If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	2.5
Drawdown at time t (Yt) (ft):	2.25
Time (t) (min):	1

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.69**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **2.72E-05** **Ft/min**

= **0.04** **Ft/day**

T= Kb

= **1.96** **Ft^2/day**

SLUG TEST DATA SHEET

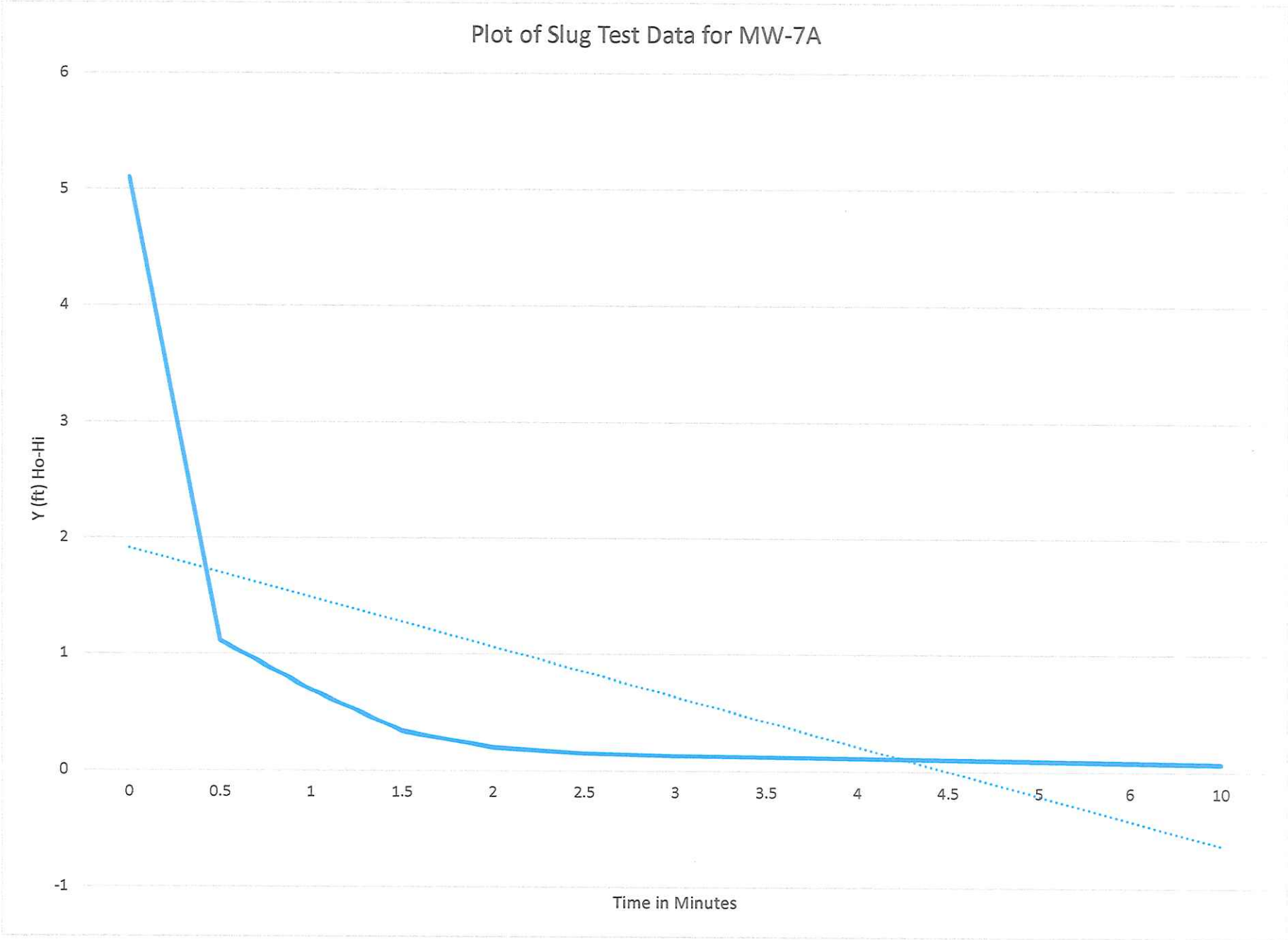
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	60	WELL I.D.	MW-7A
SCREEN LENGTH (ft)	15	STATIC WATER LEVEL (Hi)	43.80
SCREEN INTERVAL (ft)	45-60	WATER LEVEL @ t=0 (Ho)	48.90
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	34
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	48.90	5.10	
1	0.5	44.91	1.11	
2	1	44.49	0.69	
3	1.5	44.14	0.34	
4	2	44.00	0.20	
5	2.5	43.95	0.15	
6	3	43.93	0.13	
7	3.5	43.92	0.12	
8	4	43.91	0.11	
9	4.5	43.90	0.10	
10	5	43.89	0.09	
11	6	43.88	0.08	
12	10	43.87	0.07	


Plot of Slug Test Data for MW-7A
Y (ft) Ho-Hi
6
5
4
3
2
1
0
-1
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6
10
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-7A
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	60
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	16.2
Static WT - Bottom of Intake (H) (ft):	15
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	64.80
D-H:	35.00
H/rw:	60.00

Analysis Input (From Coefficient Curves)

Coefficient A	3.5
Coefficient B	0.5

Coefficient C(if necessary)
If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	1.9
Drawdown at time t (Yt) (ft):	0.15
Time (t) (min):	4.25

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.77**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **3.52E-04 Ft/min**

= **0.51 Ft/day**

T= Kb

= **25.35 Ft^2/day**

SLUG TEST DATA SHEET

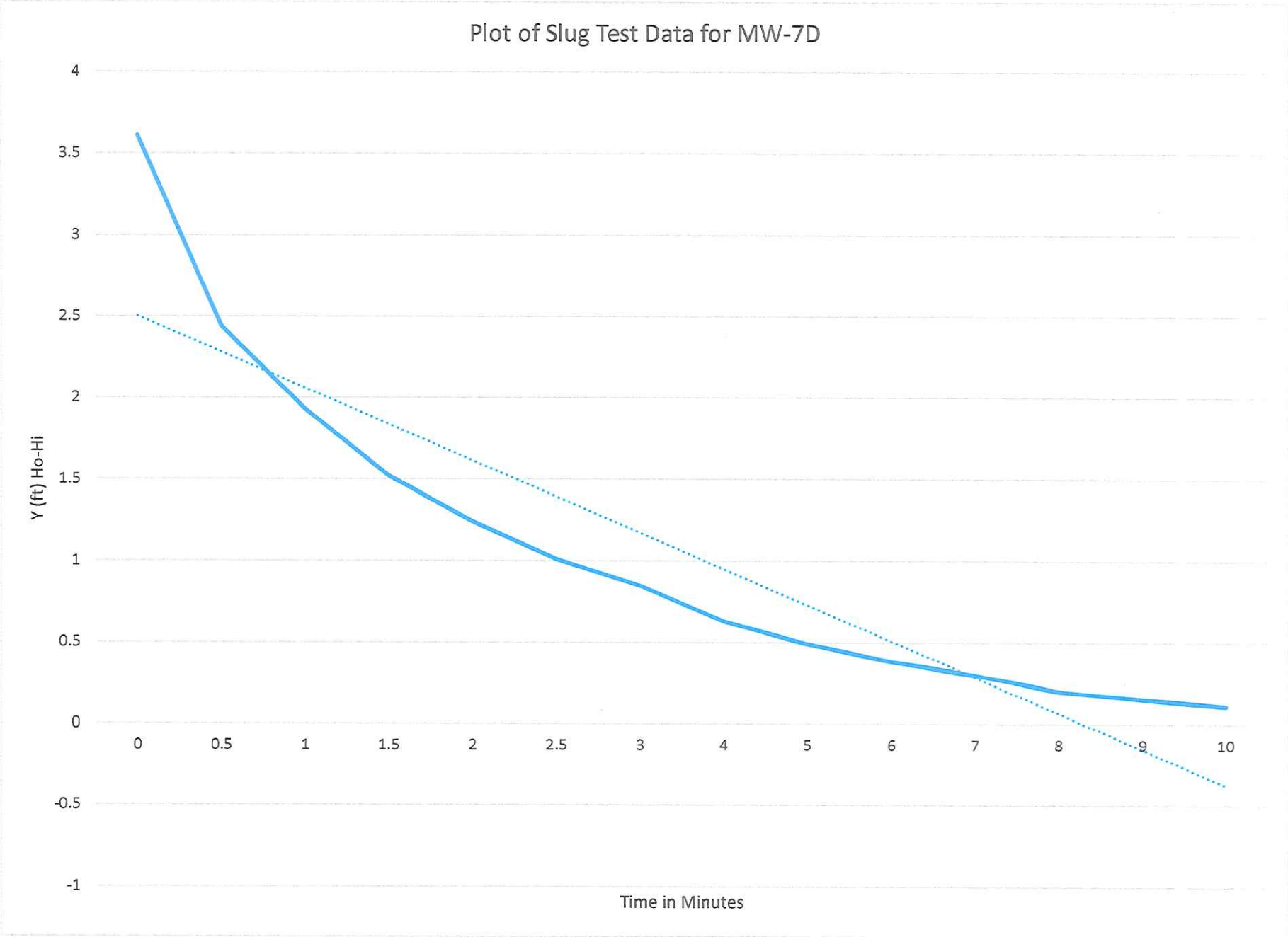
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	110	WELL I.D.	MW-7D
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	45.01
SCREEN INTERVAL (ft)	100-110	WATER LEVEL @ t=0 (Ho)	48.62
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	36
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	48.62	3.61	
1	0.5	47.45	2.44	
2	1	46.94	1.93	
3	1.5	46.53	1.52	
4	2	46.25	1.24	
5	2.5	46.02	1.01	
6	3	45.86	0.85	
7	4	45.64	0.63	
8	5	45.50	0.49	
9	6	45.39	0.38	
10	7	45.31	0.30	
11	8	45.21	0.20	
12	9	45.16	0.15	
13	10	45.12	0.11	


Plot of Slug Test Data for MW-7D
Y (ft) Ho-Hi
4
3.5
3
2.5
2
1.5
1
0.5
0
-0.5
-1
0
0.5
1
1.5
2
2.5
3
4
5
6
7
8
9
10
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-7D	
Well Casing Radius (rc) (ft):		0.083
Well Depth from TOC (ft):		110
Boring Radius (rw) (ft):		0.25
Length of Intake(L) (ft):		64.99
Static WT - Bottom of Intake (H) (ft):		10
Saturated Aquifer Thickness (D) (ft):		50

Worksheet Generated Values

L/rw:	259.96
D-H:	40.00
H/rw:	40.00

Analysis Input (From Coefficient Curves)

Coefficient A	7
Coefficient B	1.5
Coefficient C(if necessary)	

If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	2.5
Drawdown at time t (Yt) (ft):	0.75
Time (t) (min):	5

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.82**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **3.60E-05** **Ft/min**

= **0.05** **Ft/day**

T= Kb

= **2.59** **Ft^2/day**

SLUG TEST DATA SHEET

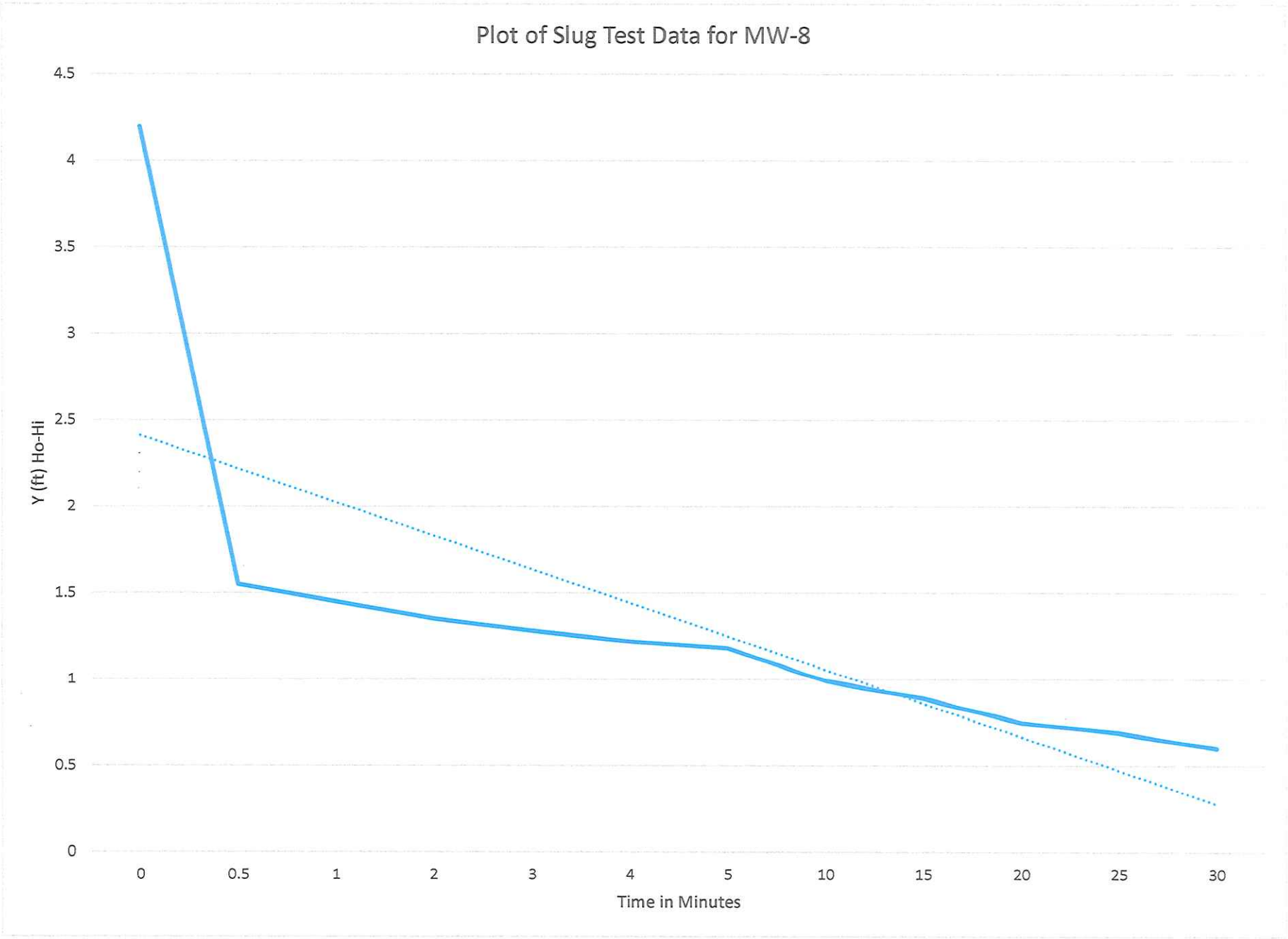
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	80	WELL I.D.	MW-8
SCREEN LENGTH (ft)	15	STATIC WATER LEVEL (Hi)	68.25
SCREEN INTERVAL (ft)	65-80	WATER LEVEL @ t=0 (Ho)	72.45
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	20
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	72.45	4.20	
1	0.5	69.80	1.55	
2	1	69.70	1.45	
3	2.0	69.60	1.35	
4	3	69.53	1.28	
5	4	69.47	1.22	
6	5	69.43	1.18	
7	10	69.24	0.99	
8	15	69.14	0.89	
9	20	69.00	0.75	
10	25	68.94	0.69	
11	30	68.85	0.60	


Plot of Slug Test Data for MW-8
Y (ft) Ho-Hi
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
2
3
4
5
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-8
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	80
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	11.75
Static WT - Bottom of Intake (H) (ft):	11.75
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	47.00
D-H:	38.25
H/rw:	47.00

Analysis Input (From Coefficient Curves)

Coefficient A	3
Coefficient B	0.5

Coefficient C(if necessary)
If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	2.4
Drawdown at time t (Yt) (ft):	1.07
Time (t) (min):	10

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.48**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **5.88E-05** **Ft/min**

= **0.08** **Ft/day**

T= Kb

= **4.23** **Ft^2/day**

SLUG TEST DATA SHEET

PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	122	WELL I.D.	MW-8D
SCREEN LENGTH (ft)	90-122 (open borehole)	STATIC WATER LEVEL (Hi)	71.95
SCREEN INTERVAL (ft)	32	WATER LEVEL @ t=0 (Ho)	75.25
SCREEN DIAMETER (in)	6	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	20
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS Recharge too slow to measure recovery

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	75.25	3.30	
1	0.5	75.25	3.30	
2	1	75.25	3.30	
3	5.0	75.24	3.29	
4	10	75.23	3.28	
5	15	75.22	3.27	

SLUG TEST DATA SHEET

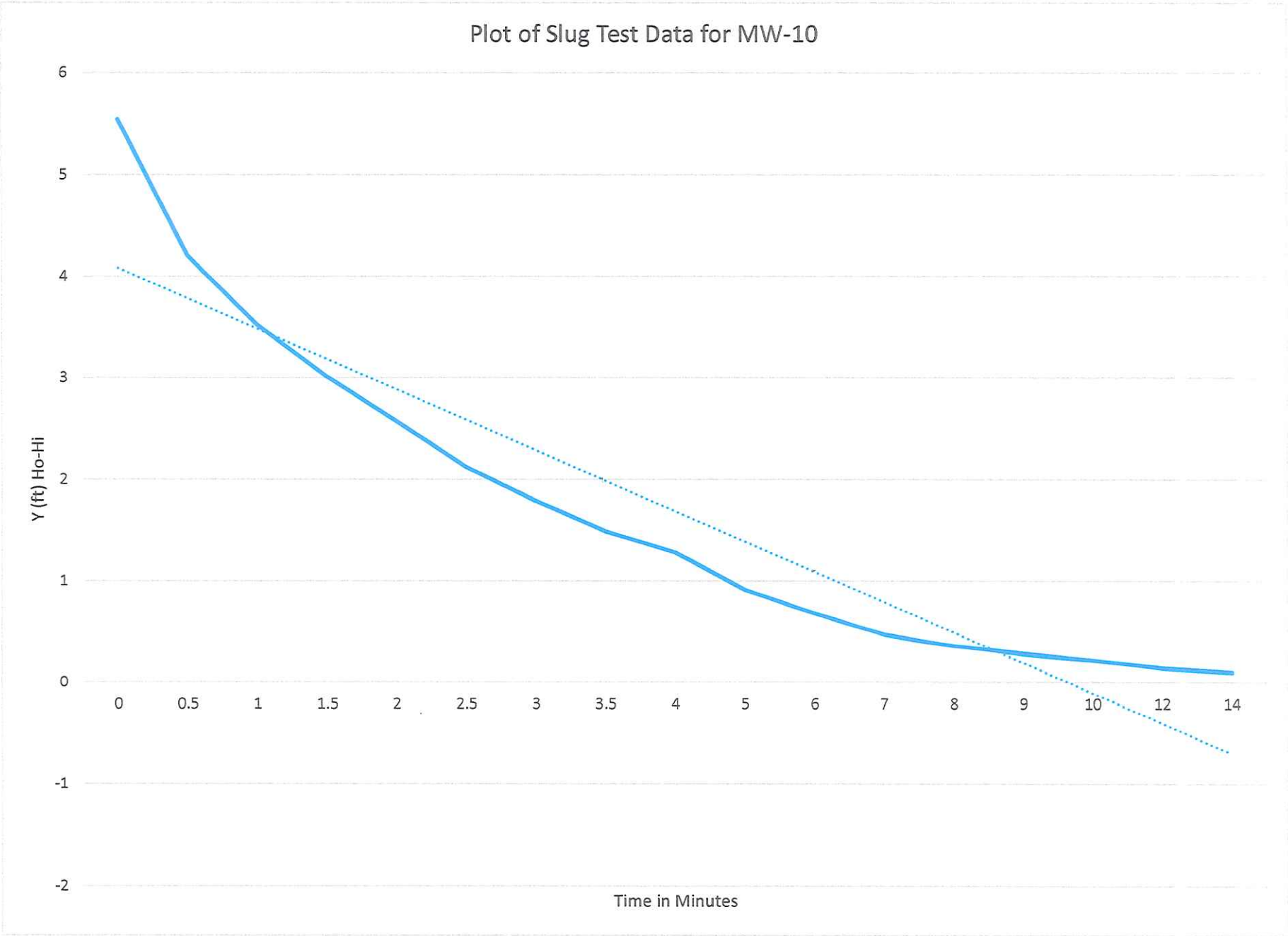
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	24	WELL I.D.	MW-10
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	16.50
SCREEN INTERVAL (ft)	14-24	WATER LEVEL @ t=0 (Ho)	22.05
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING		DEPTH TO BEDROCK (ft BGS)	24
FULLY PENETRATING	√	AQUIFER THICKNESS (ft)	7.5

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	22.05	5.55	
1	0.5	20.70	4.20	
2	1	20.02	3.52	
3	1.5	19.51	3.01	
4	2	19.07	2.57	
5	2.5	18.62	2.12	
6	3	18.29	1.79	
7	3.5	17.99	1.49	
8	4	17.78	1.28	
9	5	17.41	0.91	
10	6	17.18	0.68	
11	7	16.97	0.47	
12	8	16.86	0.36	
13	9	16.78	0.28	
14	10	16.72	0.22	
15	12	16.64	0.14	
16	14	16.60	0.10	


Plot of Slug Test Data for MW-10
Y (ft) Ho-Hi
6
5
4
3
2
1
0
-1
-2
0
0.5
1
1.5
2
2.5
3
3.5
4
5
6
7
8
9
10
12
14
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	Ep-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-10
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	24
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	7.5
Static WT - Bottom of Intake (H) (ft):	7.5
Saturated Aquifer Thickness (D) (ft):	7.5

Worksheet Generated Values

L/rw:	30.00
D-H:	0.00
H/rw:	30.00

Analysis Input (From Coefficient Curves)

Coefficient A	
Coefficient B	
Coefficient C(if necessary)	2

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	4.1
Drawdown at time t (Yt) (ft):	2
Time (t) (min):	3.5

Analysis

ln Re/rw= [1.1/ln(H/rw)+(C/(L/rw))]-1

= **2.56**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **2.41E-04** **Ft/min**

= **0.35** **Ft/day**

T= Kb

= **2.61** **Ft^2/day**

SLUG TEST DATA SHEET

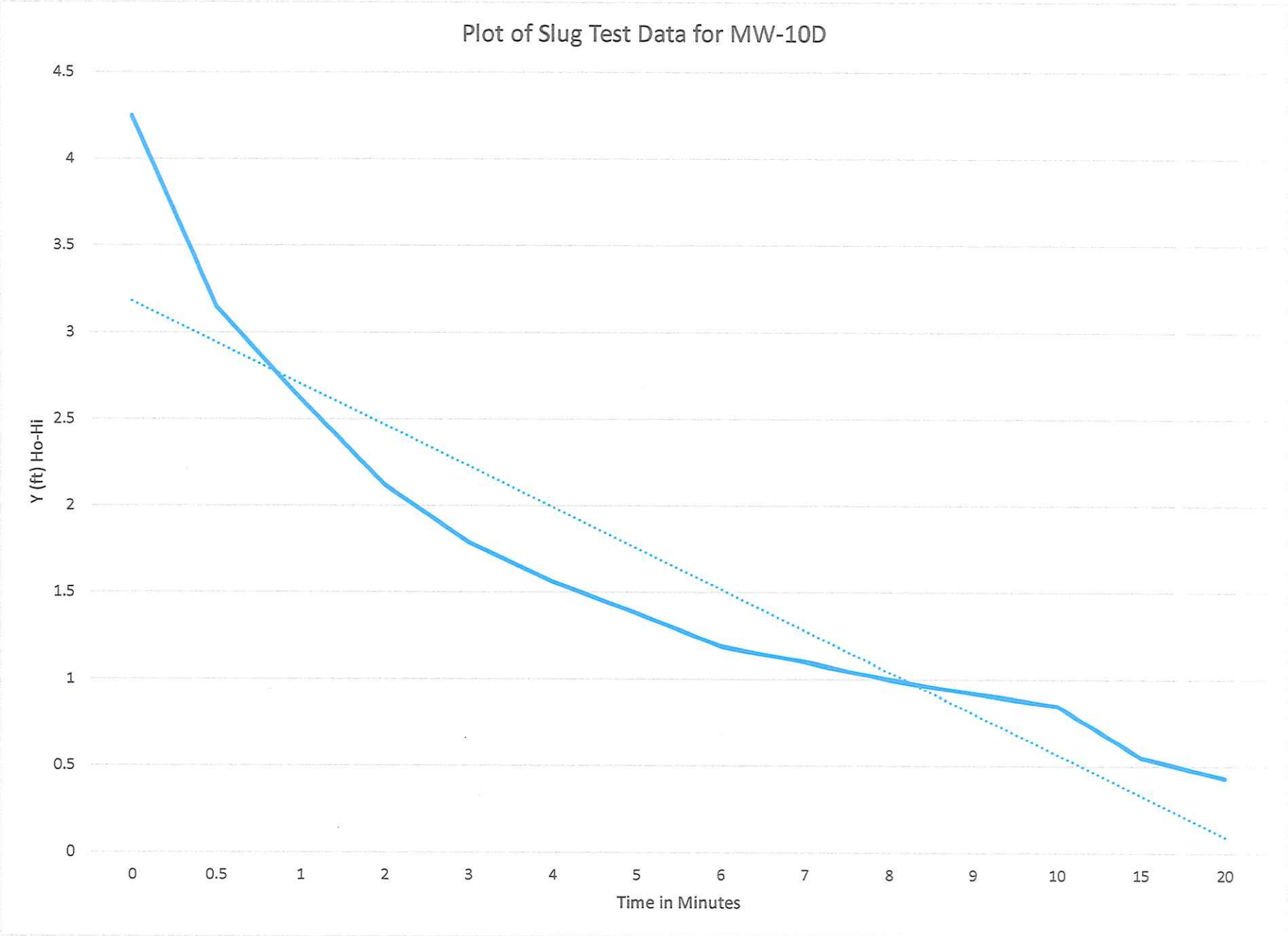
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	65	WELL I.D.	MW-10D
SCREEN LENGTH (ft)	10	STATIC WATER LEVEL (Hi)	44.80
SCREEN INTERVAL (ft)	55-65	WATER LEVEL @ t=0 (Ho)	49.05
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	23
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	49.05	4.25	
1	0.5	47.95	3.15	
2	1	47.42	2.62	
3	2.0	46.92	2.12	
4	3	46.59	1.79	
5	4	46.36	1.56	
6	5	46.18	1.38	
7	6	45.99	1.19	
8	7	45.90	1.10	
9	8	45.80	1.00	
10	9	45.72	0.92	
11	10	45.65	0.85	
12	15	45.35	0.55	
13	20	45.23	0.43	


Plot of Slug Test Data for MW-10D
Y (ft) Ho-Hi
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
2
3
4
5
6
7
8
9
10
15
20
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-10D
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	65
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	20.2
Static WT - Bottom of Intake (H) (ft):	10
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	80.80
D-H:	40.00
H/rw:	40.00

Analysis Input (From Coefficient Curves)

Coefficient A	4
Coefficient B	0.06

Coefficient C(if necessary)
If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	3.35
Drawdown at time t (Yt) (ft):	1.1
Time (t) (min):	8

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **2.85**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **6.75E-05** **Ft/min**

= **0.10** **Ft/day**

T= Kb

= **4.86** **Ft^2/day**

SLUG TEST DATA SHEET

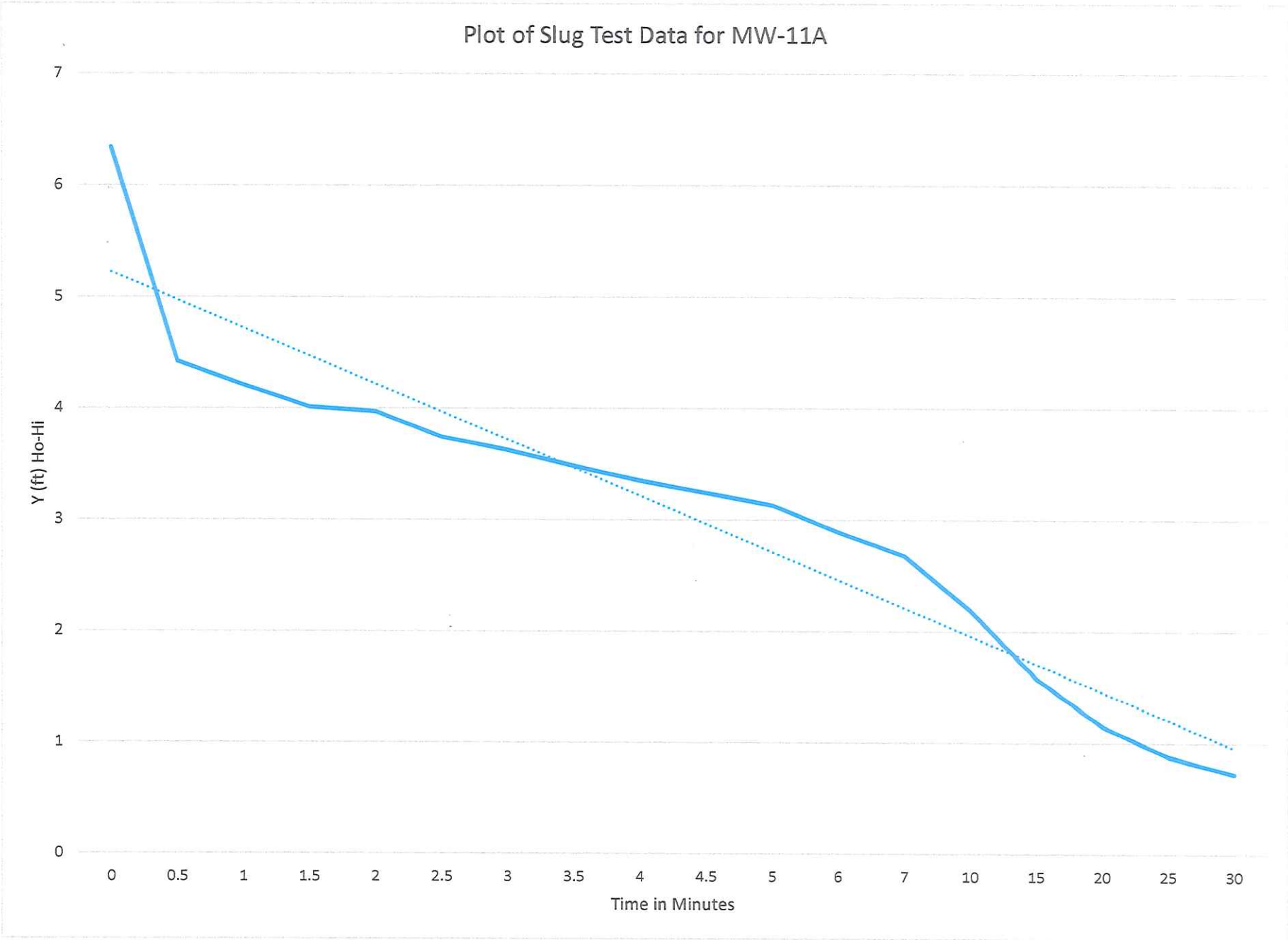
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	30	WELL I.D.	MW-11A
SCREEN LENGTH (ft)	15	STATIC WATER LEVEL (Hi)	15.56
SCREEN INTERVAL (ft)	15-30	WATER LEVEL @ t=0 (Ho)	21.90
SCREEN DIAMETER (in)	2	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING		DEPTH TO BEDROCK (ft BGS)	30
FULLY PENETRATING	√	AQUIFER THICKNESS (ft)	14.44

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	21.90	6.34	
1	0.5	19.98	4.42	
2	1	19.77	4.21	
3	1.5	19.57	4.01	
4	2	19.53	3.97	
5	2.5	19.30	3.74	
6	3	19.18	3.62	
7	3.5	19.04	3.48	
8	4	18.91	3.35	
9	4.5	18.80	3.24	
10	5	18.69	3.13	
11	6	18.45	2.89	
12	7	18.24	2.68	
13	10	17.75	2.19	
14	15	17.14	1.58	
15	20	16.71	1.15	
16	25	16.44	0.88	
17	30	16.28	0.72	


Plot of Slug Test Data for MW-11A
Y (ft) Ho-Hi
7
6
5
4
3
2
1
0
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
6
7
10
15
20
25
30
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-11A
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	30
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	14.44
Static WT - Bottom of Intake (H) (	14.44
Saturated Aquifer Thickness (D) (	14.44

Worksheet Generated Values

L/rw:	57.76
D-H:	0.00
H/rw:	57.76

Analysis Input (From Coefficient Curves)

Coefficient A	
Coefficient B	
Coefficient C(if necessary)	2.25

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	5.25
Drawdown at time t (Yt) (ft):	2.95
Time (t) (min):	4.5

Analysis

ln Re/rw= [1.1/ln(H/rw)+(C/(L/rw))]-1

= **3.22**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **9.85E-05** **Ft/min**

= **0.14** **Ft/day**

T= Kb

= **2.05** **Ft^2/day**

SLUG TEST DATA SHEET

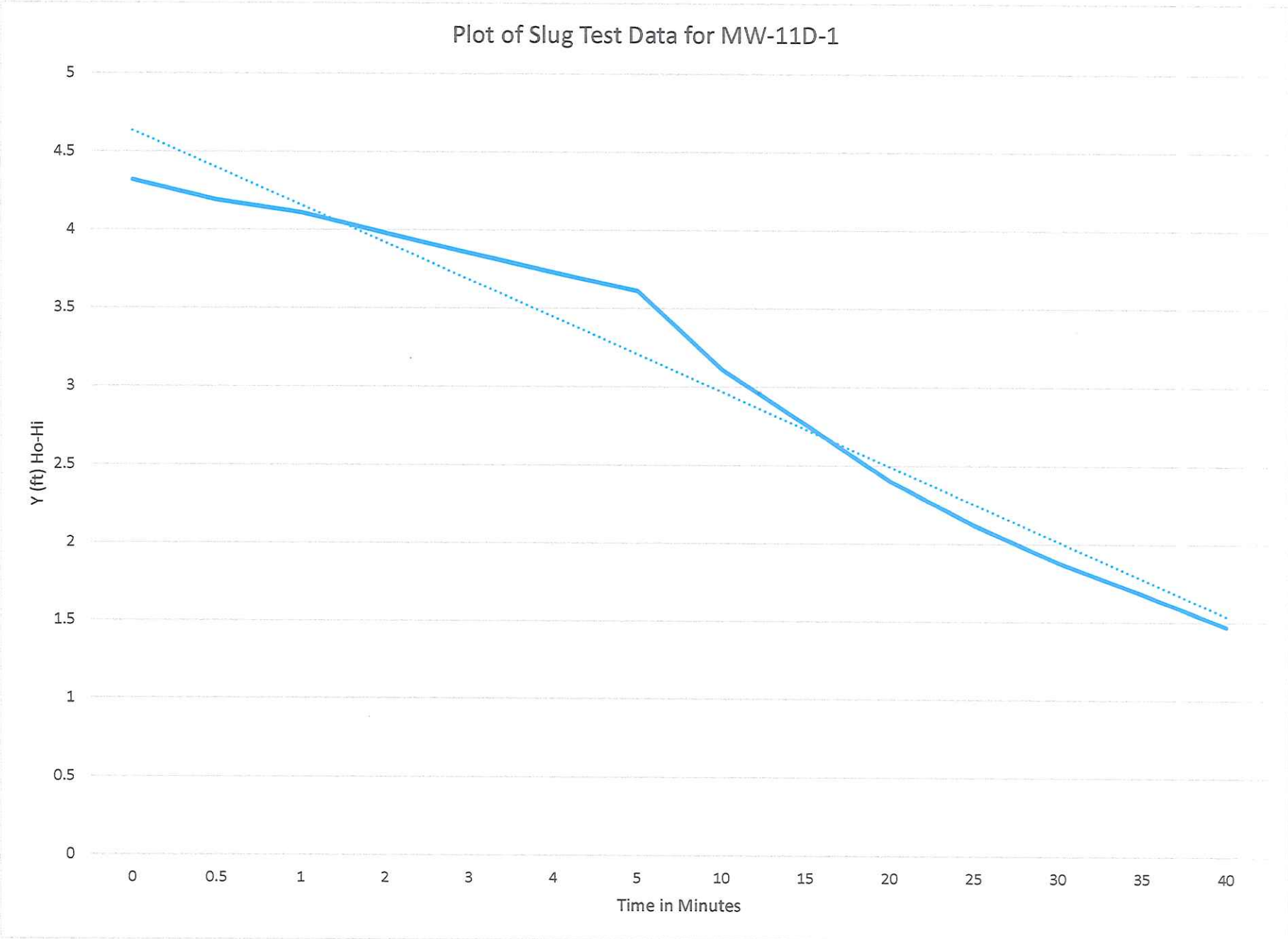
PROJECT NAME	NMLF	DATE	10/1/2013
PROJECT NUMBER	EP-1217(A)	PERSONNEL	THB/BVB

METHOD USED: BAIL √ SLUG

DEPTH OF WELL (ft)	60	WELL I.D.	MW-11D-1
SCREEN LENGTH (ft)	20 (open borehole)	STATIC WATER LEVEL (Hi)	14.26
SCREEN INTERVAL (ft)	40-60	WATER LEVEL @ t=0 (Ho)	18.58
SCREEN DIAMETER (in)	6	MP DESCRIPTION	T.O.C.
BORING DIAMETER (in)	6	STICKUP AGS (ft)	NA
PARTIALLY PENETRATING	√	DEPTH TO BEDROCK (ft BGS)	21
FULLY PENETRATING		AQUIFER THICKNESS (ft)	50

REMARKS

READING #	TIME (min)	DEPTH TO WATER (ft bmp)	HEAD CHANGE (Ho-Hi) (ft)	REMARKS
0	0	18.58	4.32	
1	0.5	18.45	4.19	
2	1	18.37	4.11	
3	2	18.24	3.98	
4	3	18.11	3.85	
5	4	17.99	3.73	
6	5	17.87	3.61	
7	10	17.37	3.11	
8	15	17.02	2.76	
9	20	16.66	2.40	
10	25	16.38	2.12	
11	30	16.14	1.88	
12	35	15.94	1.68	
13	40	15.73	1.47	


Plot of Slug Test Data for MW-11D-1
Y (ft) Ho-Hi
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
0
0.5
1
2
3
4
5
10
15
20
25
30
35
40
Time in Minutes

Bouwer & Rice Method/Slug (Bail out) Testing Analysis

Site Information

Project Number:	EP-1217(A)
Site Location:	Huntersville, NC
Client:	Greenway Waste Solutions
Site Name:	NMLF

Well and Aquifer Information

Well Number:	MW-11D-1
Well Casing Radius (rc) (ft):	0.083
Well Depth from TOC (ft):	60
Boring Radius (rw) (ft):	0.25
Length of Intake(L) (ft):	45.74
Static WT - Bottom of Intake (H) (ft):	20
Saturated Aquifer Thickness (D) (ft):	50

Worksheet Generated Values

L/rw:	182.96
D-H:	30.00
H/rw:	80.00

Analysis Input (From Coefficient Curves)

Coefficient A	2
Coefficient B	1.1

Coefficient C(if necessary)
If H<D then use A & B
If fully penetrating H=D, then use C
Note:must change worksheet formula if using C

Analysis Input (From Recovery Graph)

Initial Drawdown (Yo) (ft):	4.65
Drawdown at time t (Yt) (ft):	2.95
Time (t) (min):	10

Analysis

ln Re/rw= [1.1/ln(H/rw)+(A+Bln[(D-H)/rw]/(L/rw))]-1

= **3.44**

K= rc^2ln(Re/rw)/2L *1/t*ln(Yo/Yt)

= **1.18E-05** **Ft/min**

= **0.02** **Ft/day**

T= Kb

= **0.85** **Ft^2/day**

APPENDIX F

SURFACE WATER ANALYTICAL RESULTS

North Meck C&D Landfill

Well ID: SW-1

				Sample Date																							
				10/21/2009		11/10/2010		12/10/2010		4/19/2011		4/20/2011		10/25/2011		4/12/2012		5/3/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000					2.2	2.5			2.2	4	2.2	4.4												
Aluminum	6020A	7429-90-5	-																							40	560
Barium	EPA 6010	7440-39-3	700	0.2	21.6	0.2	23.2	0.2	38.9	0.2	28.9	0.2	42.2	5	41.9 / 31.2	5	43	5	25.9	5	25.1	5	23.5	25	29	5	29
Chromium	EPA 6010	7440-47-3	10							0.4	1.5	0.4	1.4														
Silver	EPA 6010	7440-22-4	20	0.1	0.18																						
Alkalinity	SM 2320B	NA	-																								
Total Disolved Solids	SM 2540C	NA	500000																								
Sulfate	EPA 300.0	14808-79-8	250000																								
Chloride	4500-Cl-E	16887-00-6	250000																								

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: SW-2

				Sample Date																							
				10/21/2009		11/10/2010		12/10/2010		4/19/2011		4/20/2011		10/25/2011		4/12/2012		5/3/2012		6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Acetone	EPA 8260	67-64-1	6000									2.2	4.2	2.2	4.5												
Aluminum	6020A	7429-90-5	-																							40	300
Barium	EPA 6010	7440-39-3	700	0.2	83	0.2	24	0.2	38.5	0.2	28.1	0.2	39.6	5	41.4 / 28.9	5	42.2	5	31.5	5	39.6	5	36.4	25 EPA	47	5	110
Chromium	EPA 6010	7440-47-3	10	0.4	288							0.4	0.56														
Copper	EPA 6010	7440-50-8	1000																							1	2
Nickel	EPA 6010	7440-02-0	100																							5	5
Silver	EPA 6010	7440-22-4	20	0.1	0.55																						
Vinyl Chloride	EPA 8260	75-01-4	0.03																							1	1.3
Alkalinity	SM 2320B	NA	-																								
Total Disolved Solids	SM 2540C	NA	500000																								
Sulfate	EPA 300.0	14808-79-8	250000																								
Chloride	4500-Cl-E	16887-00-6	250000																								

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: SW-3

				Sample Date							
				6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Aluminum	6020A	7429-90-5	-							40	99
Barium	EPA 6010	7440-39-3	700	5	43.9	5	36	25	49	5	56
Alkalinity	SM 2320B	NA	-								
Total Disolved Solids	SM 2540C	NA	500000								
Sulfate	EPA 300.0	14808-79-8	250000								
Chloride	4500-Cl-E	16887-00-6	250000								

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: SW-4

				Sample Date							
				6/15/2012		11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	62.4	5	34.8	25	50	5	120
Selenium	6020A	7782-49-2	20							1	1
Tetrahydrofuran	EPA 8260	109-99-9	-							5	12
Vanadium	EPA 6010	7440-62-2	0.3	5	6.4						
Zinc	EPA 6010	7440-66-6	1000	10	28.9						
Alkalinity	SM 2320B	NA	-								
Total Disolved Solids	SM 2540C	NA	500000								
Sulfate	EPA 300.0	14808-79-8	250000								
Chloride	4500-Cl-E	16887-00-6	250000								

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

Well ID: SWInf.

				Sample Date					
				11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Barium	EPA 6010	7440-39-3	700	5	50.3	25	52	5	55
Alkalinity	SM 2320B	NA	-						
Total Disolved Solids	SM 2540C	NA	500000						
Sulfate	EPA 300.0	14808-79-8	250000						
Chloride	4500-Cl-E	16887-00-6	250000						

Approximate Value
Not Detected / Not Tested
Information Required

North Meck C&D Landfill

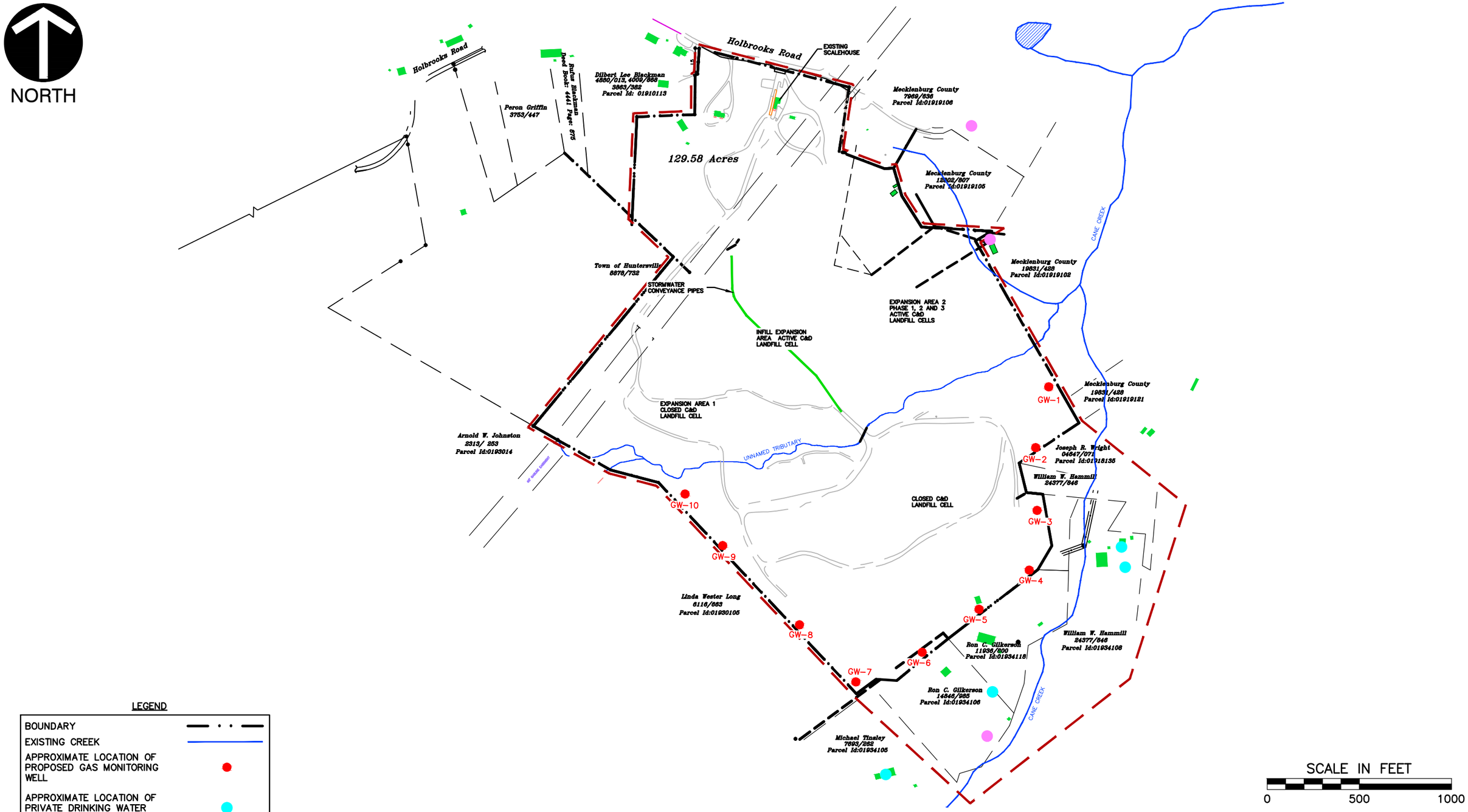
Well ID: SWEff.

				Sample Date					
				11/26/2012		4/25/2013		10/9/2013	
Constituent	**Method**	**CAS Number**	**NCDENR Standard (ug/L)**	**MDL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**	**PQL (ug/L)**	**Result (ug/L)**
Aluminum	6020A	7429-90-5	-					40	150
Arsenic	EPA 6010	7440-38-2	10					1	2.4
Barium	EPA 6010	7440-39-3	700	5	36.6	25	55	5	66
Copper	EPA 6010	7440-50-8	1000					1	1.7
Selenium	6020A	7782-49-2	20					1	1.8
Zinc	EPA 6010	7440-66-6	1000	10	11.2				
Alkalinity	SM 2320B	NA	-						
Total Disolved Solids	SM 2540C	NA	500000						
Sulfate	EPA 300.0	14808-79-8	250000						
Chloride	4500-Cl-E	16887-00-6	250000						

Approximate Value
Not Detected / Not Tested
Information Required

APPENDIX G

LANDFILL GAS MONITORING WELLS



LEGEND

- BOUNDARY
- EXISTING CREEK
- APPROXIMATE LOCATION OF PROPOSED GAS MONITORING WELL
- APPROXIMATE LOCATION OF PRIVATE DRINKING WATER WELL
- APPROXIMATE LOCATION OF ABANDONED PRIVATE DRINKING WATER WELL
- APPROXIMATE AREA OF CONCERN
- APPROXIMATE LOCATION OF BUILDING

Civil & Environmental Consultants, Inc.
1900 Center Park Drive - Suite A - Charlotte, NC 28217
Ph: 980.237.0373 · Fax: 980.237.0372
www.cecinc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC.
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NC

LANDFILL GAS MONITORING WELLS

DRAWN BY:	MTB	CHECKED BY:	TMG	APPROVED BY:	SLB	DRAWING NO.:	G
DATE:	MAY 2014	DWG SCALE:	1"=500'	PROJECT NO:	111-370.001		

P:\2011\111-370\-CADD\001\Dwg\111-370.001-Risk Assessment Gas Wells.dwg{FIGURE 1} LS:(5/13/2014 - mbarton) - LP: 5/13/2014 3:21 PM

APPENDIX H

LANDFILL GAS MONITOR REPORTS

DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) Doc/Event #:

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Instructions:

- **Prepare one form for each individually monitored unit.**
- **Please type or print legibly.**
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Solid Waste Monitoring Data Submittal Information

Name of entity submitting data (laboratory, consultant, facility owner):

Enviro-Pro, PC

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: Thomas H. Bolyard, P.G. Phone: (803) 547-4955

E-mail: enviropro@comporium.net

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
North Mecklenburg C&D Landfill	15300 Holbrooks Road, Huntersville, NC	60-13	.0500	March 24, 2014

Environmental Status: (Check all that apply)

☒ Initial/Background Monitoring ☐ Detection Monitoring ☐ Assessment Monitoring ☐ Corrective Action

Type of data submitted: (Check all that apply)

☐ Groundwater monitoring data from monitoring wells
☐ Groundwater monitoring data from private water supply wells
☐ Leachate monitoring data
☐ Surface water monitoring data
☒ Methane gas monitoring data
☐ Corrective action data (specify) _____
☐ Other(specify) _____

Notification attached?

☐ No. No groundwater or surface water standards were exceeded.
☐ Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
☒ Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

Thomas H. Bolyard — Senior Hydrogeologist — (803) 547-4955

Facility Representative Name (Print) — Title — (Area Code) Telephone Number

Thomas H. Bolyard — 4/2/14

Signature — Date

Affix NC Licensed/ Professional Geologist Seal

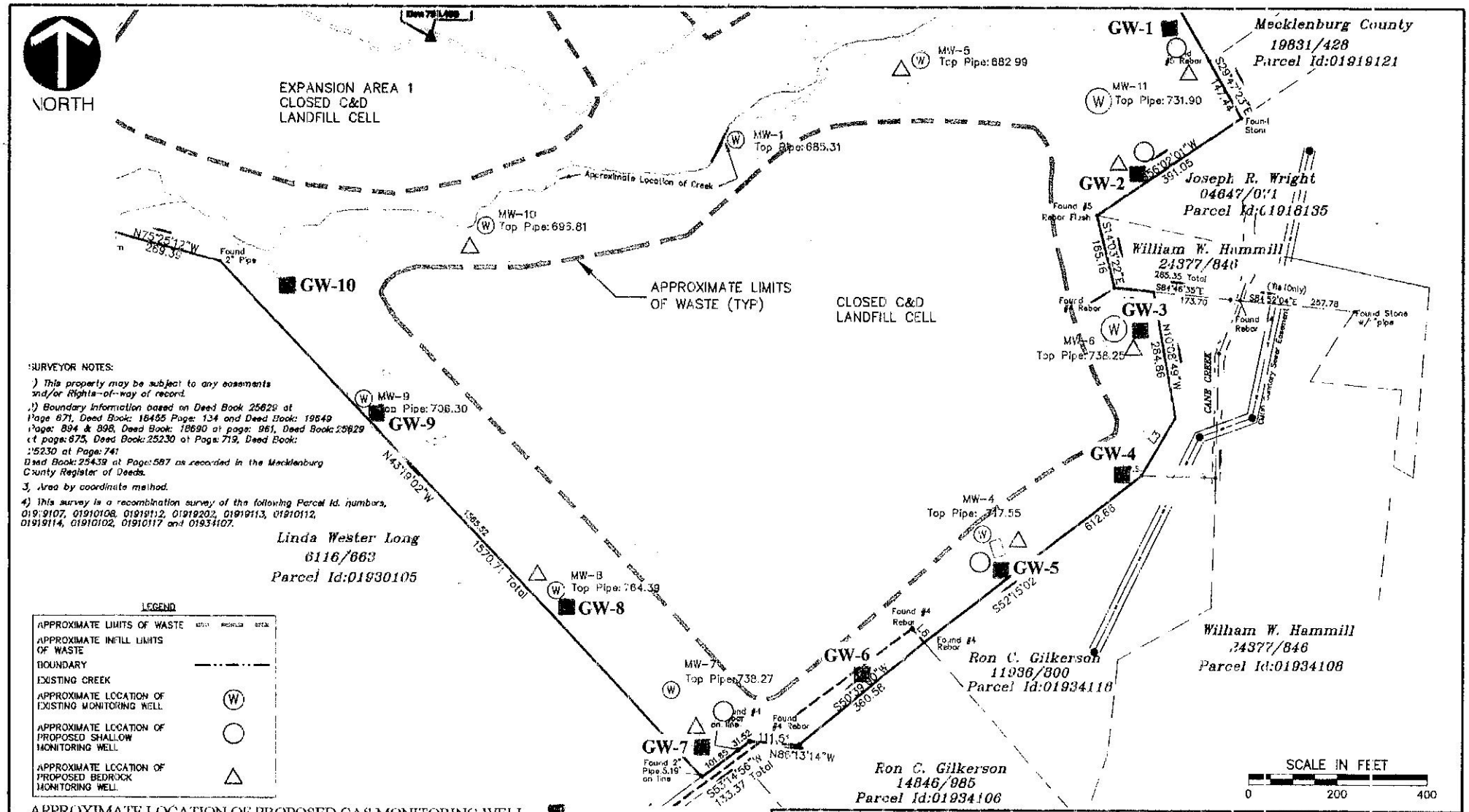
NORTH CAROLINA LICENSED SEAL 492 GEOLOGIST THOMAS H. BOLYARD

2646 Farmlake Lane, Fort Mill, SC

Facility Representative Address

NC PE Firm License Number (if applicable effective May 1, 2009)

Revised 6/2009



SURVEYOR NOTES:

1) This property may be subject to any easements and/or Rights-of-way of record.

2) Boundary information based on Deed Book 25629 at Page 671, Deed Book: 18455 Page: 134 and Deed Book: 19649 Page: 894 & 898, Deed Book: 18690 at page: 961, Deed Book: 25629 at page: 675, Deed Book: 25230 at Page: 719, Deed Book: 25230 at Page: 741 Deed Book: 25439 at Page: 587 as recorded in the Mecklenburg County Register of Deeds.

3. Area by coordinate method.

4) This survey is a recombination survey of the following Parcel Id. numbers, 01919107, 01910108, 01919112, 01919202, 01919113, 01910112, 01919114, 01910102, 01910117 and 01934107.

LEGEND

APPROXIMATE LIMITS OF WASTE	
APPROXIMATE INFILL LIMITS OF WASTE	
BOUNDARY	
EXISTING CREEK	
APPROXIMATE LOCATION OF EXISTING MONITORING WELL	W
APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL	○
APPROXIMATE LOCATION OF PROPOSED BEDROCK MONITORING WELL	△

APPROXIMATE LOCATION OF PROPOSED GAS MONITORING WELL ■

REFERENCE

1. 2013 TOPOGRAPHIC INFORMATION PROVIDED BY PATTERSON LAND SURVEYING, PA – DATE OF AERIAL PHOTOGRAPHY JUNE 1, 2013
2. EXISTING TOPOGRAPHIC CONTOUR INFORMATION PROVIDED BY INDEPENDENT MAPPING CONSULTANTS – FEBRUARY 7, 2008
3. EXISTING AND PROPOSED WELL LOCATIONS PROVIDED BY PATTERSON LAND SURVEYING AND TOM BOLYARD, P.G. FROM ENVIRO-PRO, P.C.

Map Modified by Enviro-Pro, PC on Jan 21, 2014

Civil & Environmental Consultants, Inc.
2030 S Tryon Street - Suite 3E - Charlotte, NC 28203
Ph: 980.224.6104 - Fax: 980.224.6172
www.ceci-nc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC.
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NC

PHASE 1
MONITORING WELL LOCATION MAP

DRAWN BY:	TMG	CHECKED BY:	SLB	APPROVED BY:	TMG	FIGURE NO.:	1
DATE:	AUG. 2013	DWG SCALE:	1"=200'	PROJECT NO:	111-370.0001		

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-1

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bolyard

Time: 10:30 Am

Ambient Temperature: 54°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, Mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-2

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bolyard

Time: 10:40 AM

Ambient Temperature: 54°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-3

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bohyard

Time: 10:50 AM

Ambient Temperature: 55°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, Mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 28.9 % LEL: 100

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-4

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217 (A)

Date: 3-24-14

Personnel: B. Bolyard

Time: 11:10 AM

Ambient Temperature: 55°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 5.1 % LEL: 100

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-5

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bolyard

Time: 11:20 AM

Ambient Temperature: 56°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, Mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 6.2 % LEL: 100

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: G-W-6

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bolyard

Time: 11:30 AM

Ambient Temperature: 56°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 31.6 % LEL: 100

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-7

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217 (A)

Date: 3-24-14

Personnel: B. Belyard

Time: 11:40AM

Ambient Temperature: 56°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: G-W-8

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Balyand

Time: 11:50 Am

Ambient Temperature: 57°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, Mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 1.2 % LEL: 24

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-9

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Balyard

Time: 12:00 pm

Ambient Temperature: 57°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, Mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: Date of Calibration: 3/11/14

LANDFILL GAS MONITORING FIELD DATA

Well Number: EW-10

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 3-24-14

Personnel: B. Bohyard

Time: 12:10 Pm

Ambient Temperature: 57°F

Barometric Pressure: 30.12

Weather Conditions: Cloudy, mild

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: Date of Calibration: 3/11/14

DENR USE ONLY: ☐ Paper Report ☐ Electronic Data - Email CD (data loaded: Yes / No) Doc/Event #:

NC DENR
Division of Waste Management - Solid Waste

Environmental Monitoring Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

Instructions:

- **Prepare one form for each individually monitored unit.**
- **Please type or print legibly.**
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing condition, etc.).
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste Section, 1646 Mail Service Center, Raleigh, NC 27699-1646.

Solid Waste Monitoring Data Submittal Information

Name of entity submitting data (laboratory, consultant, facility owner):

Enviro-Pro, PC

Contact for questions about data formatting. Include data preparer's name, telephone number and E-mail address:

Name: Thomas H. Bolyard, P.G. Phone: (803) 547-4955

E-mail: enviropro@comporium.net

Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)
North Mecklenburg C&D Landfill	15300 Holbrooks Road, Huntersville, NC	60-13	.0500	May 2, 2014

Environmental Status: (Check all that apply)

☒ Initial/Background Monitoring ☐ Detection Monitoring ☐ Assessment Monitoring ☐ Corrective Action

Type of data submitted: (Check all that apply)

☐ Groundwater monitoring data from monitoring wells
☐ Groundwater monitoring data from private water supply wells
☐ Leachate monitoring data
☐ Surface water monitoring data
☒ Methane gas monitoring data
☐ Corrective action data (specify) _____
☐ Other(specify) _____

Notification attached?

☐ No. No groundwater or surface water standards were exceeded.
☐ Yes, a notification of values exceeding a groundwater or surface water standard is attached. It includes a list of groundwater and surface water monitoring points, dates, analytical values, NC 2L groundwater standard, NC 2B surface water standard or NC Solid Waste GWPS and preliminary analysis of the cause and significance of any concentration.
☒ Yes, a notification of values exceeding an explosive methane gas limit is attached. It includes the methane monitoring points, dates, sample values and explosive methane gas limits.

Certification

To the best of my knowledge, the information reported and statements made on this data submittal and attachments are true and correct. Furthermore, I have attached complete notification of any sampling values meeting or exceeding groundwater standards or explosive gas levels, and a preliminary analysis of the cause and significance of concentrations exceeding groundwater standards. I am aware that there are significant penalties for making any false statement, representation, or certification including the possibility of a fine and imprisonment.

Thomas H. Bolyard — Senior Hydrogeologist — (803) 547-4955

Facility Representative Name (Print) — Title — (Area Code) Telephone Number

Thomas H. Bolyard — 5/2/14 — Affix NC Licensed/ Professional Geologist Seal

Signature — Date

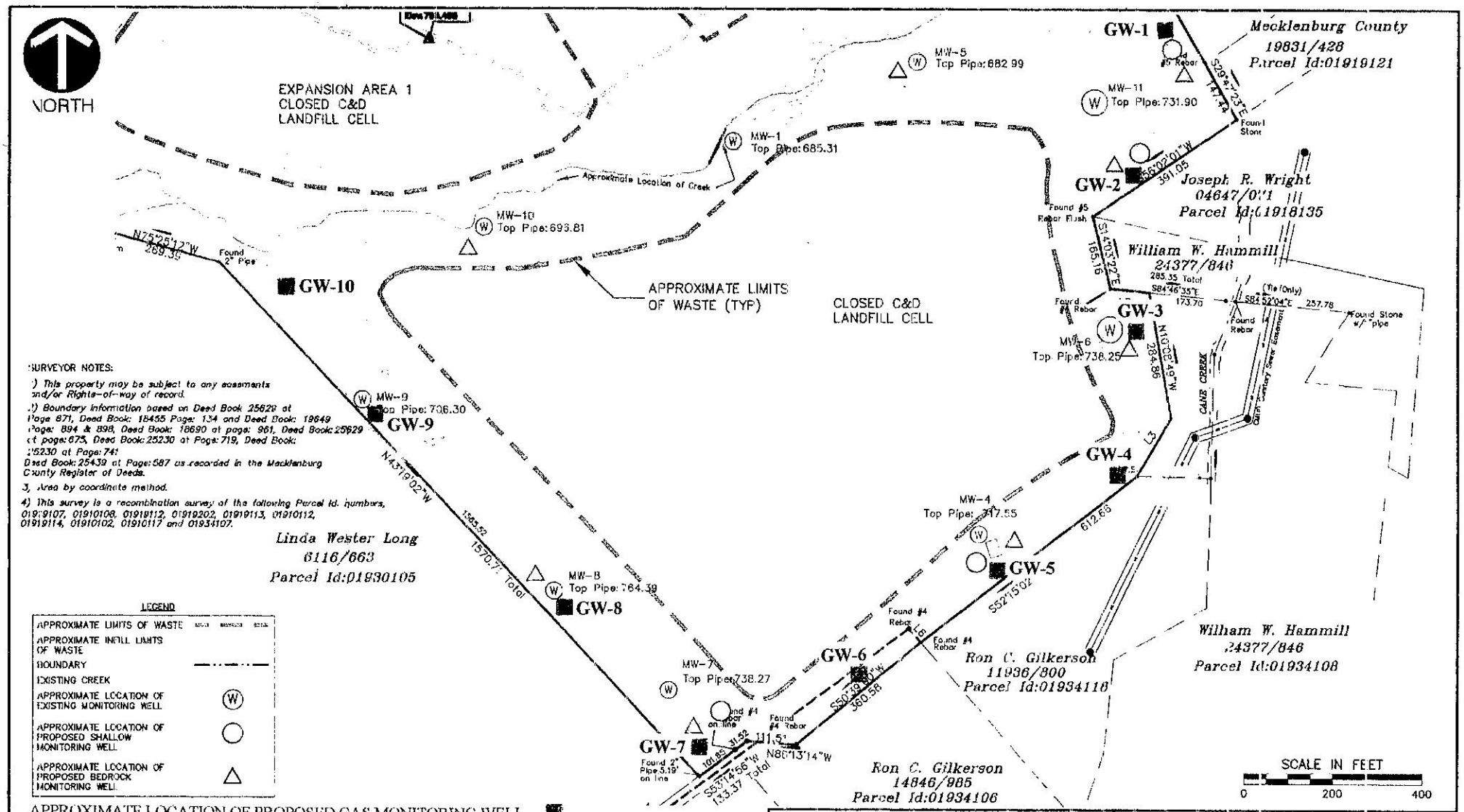
NORTH CAROLINA LICENSED SEAL 492 GEOLOGIST THOMAS H. BOLYARD

2646 Farmlake Lane, Fort Mill, SC

Facility Representative Address

NC PE Firm License Number (if applicable effective May 1, 2009)

Revised 6/2009



SURVEYOR NOTES:

1) This property may be subject to any easements and/or Rights-of-way of record.

2) Boundary information based on Deed Book 25629 at Page 871, Deed Book: 18455 Page: 134 and Deed Book: 19649 Page: 894 & 898, Deed Book: 18690 at page: 961, Deed Book: 25629 at page: 675, Deed Book: 25230 at Page: 719, Deed Book: 25230 at Page: 741 Deed Book: 25439 at Page: 587 as recorded in the Mecklenburg County Register of Deeds.

3) Area by coordinate method.

4) This survey is a recombination survey of the following Parcel Id. numbers, 01919107, 01910108, 01919112, 01919202, 01919113, 01910112, 01919114, 01910102, 01910117 and 01934107.

LEGEND

APPROXIMATE LIMITS OF WASTE	
APPROXIMATE INFILL LIMITS OF WASTE	
BOUNDARY	
EXISTING CREEK	
APPROXIMATE LOCATION OF EXISTING MONITORING WELL	(W)
APPROXIMATE LOCATION OF PROPOSED SHALLOW MONITORING WELL	○
APPROXIMATE LOCATION OF PROPOSED BEDROCK MONITORING WELL	△

APPROXIMATE LOCATION OF PROPOSED GAS MONITORING WELL ■

REFERENCE

1. 2013 TOPOGRAPHIC INFORMATION PROVIDED BY PATTERSON LAND SURVEYING, PA – DATE OF AERIAL PHOTOGRAPHY JUNE 1, 2013
2. EXISTING TOPOGRAPHIC CONTOUR INFORMATION PROVIDED BY INDEPENDENT MAPPING CONSULTANTS – FEBRUARY 7, 2008
3. EXISTING AND PROPOSED WELL LOCATIONS PROVIDED BY PATTERSON LAND SURVEYING AND TOM BOLYARD, P.G. FROM ENVIRO-PRO, P.C.

Map Modified by Enviro-Pro, PC on Jan 21, 2014

CEC
Civil & Environmental Consultants, Inc.
2030 S. Tryon Street - Suite 3E - Charlotte, NC 28203
Ph: 980.224.8104 - Fax: 980.224.8172
www.cec-nc.com

GREENWAY WASTE SOLUTIONS OF NORTH MECK, LLC.
NORTH MECKLENBURG LANDFILL
HUNTERSVILLE, NC

PHASE 1
MONITORING WELL LOCATION MAP

DRAWN BY:	TMG	CHECKED BY:	SLB	APPROVED BY:	TMG	FIGURE NO.:	1
DATE:	AUG. 2013	DWG SCALE:	1"=200'	PROJECT NO:	111-370.0001		

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-1

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:00 AM

Ambient Temperature: 56°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy and Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: 0 %

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-2

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:25 AM

Ambient Temperature: 57°

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0.1 % LEL: 0.03

Hydrogen Sulfide:

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-3

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:40 Am

Ambient Temperature: 57°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 23.5 % LEL: 100 Max

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-4

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217 (A)

Date: 5-2-14

Personnel: BVB

Time: 10:50 AM

Ambient Temperature: 57°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: .9 % LEL: 17

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-5

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217 (A)

Date: 5-2-14

Personnel: BVB

Time: 11:00 AM

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 1.4 % LEL: 29

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-6

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 11:10 Am

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: St. Moist

Condition of Well: Good

Methane Reading: % Methane: 13.3 % LEL: 100 Max

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-7

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217 (A)

Date: 5-2-14

Personnel: BVB

Time: 11:20 AM

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0.01

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-8

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:30Am

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0.8 % LEL: 015

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-9

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:40 AM

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: GW-10

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 10:50 AM

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: Gilkerson Shed (Wooden)

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 11:00 Am

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: 0 %

Date of Last Calibration: 5-1-14

LANDFILL GAS MONITORING FIELD DATA

Well Number: Gilkerson Barn (metal)

Project Name: NMLF

Location: Huntersville, NC

Project Number: EP-1217(A)

Date: 5-2-14

Personnel: BVB

Time: 11:15 AM

Ambient Temperature: 58°F

Barometric Pressure: 29.98

Weather Conditions: Cloudy, Cool

Soil Moisture Conditions: Sl. Moist

Condition of Well: Good

Methane Reading: % Methane: 0 % LEL: 0

Hydrogen Sulfide: 0%

Date of Last Calibration: 5-1-14

APPENDIX I

TOXICOLOGICAL DATA SHEETS

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

VINYL CHLORIDE

CAS # 75-01-4

Division of Toxicology and Environmental Medicine ToxFAQs™ July 2006

This fact sheet answers the most frequently asked health questions (FAQs) about vinyl chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to vinyl chloride occurs mainly in the workplace. Breathing high levels of vinyl chloride for short periods of time can cause dizziness, sleepiness, unconsciousness, and at extremely high levels can cause death. Breathing vinyl chloride for long periods of time can result in permanent liver damage, immune reactions, nerve damage, and liver cancer. This substance has been found in at least 616 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is vinyl chloride?

Vinyl chloride is a colorless gas. It burns easily and it is not stable at high temperatures. It has a mild, sweet odor. It is a manufactured substance that does not occur naturally. It can be formed when other substances such as trichloroethane, trichloroethylene, and tetrachloroethylene are broken down. Vinyl chloride is used to make polyvinyl chloride (PVC). PVC is used to make a variety of plastic products, including pipes, wire and cable coatings, and packaging materials.

Vinyl chloride is also known as chloroethene, chloroethylene, and ethylene monochloride.

What happens to vinyl chloride when it enters the environment?

❑ Liquid vinyl chloride evaporates easily. Vinyl chloride in water or soil evaporates rapidly if it is near the surface.
❑ Vinyl chloride in the air breaks down in a few days to other substances, some of which can be harmful.
❑ Small amounts of vinyl chloride can dissolve in water.
❑ Vinyl chloride is unlikely to build up in plants or animals that you might eat.

How might I be exposed to vinyl chloride?

❑ Breathing vinyl chloride that has been released from plastics industries, hazardous waste sites, and landfills.
❑ Breathing vinyl chloride in air or during contact with your skin or eyes in the workplace.
❑ Drinking water from contaminated wells.

How can vinyl chloride affect my health?

Breathing high levels of vinyl chloride can cause you to feel dizzy or sleepy. Breathing very high levels can cause you to pass out, and breathing extremely high levels can cause death.

Some people who have breathed vinyl chloride for several years have changes in the structure of their livers. People are more likely to develop these changes if they breathe high levels of vinyl chloride. Some people who work with vinyl chloride have nerve damage and develop immune reactions. The lowest levels that produce liver changes, nerve damage, and immune reaction in people are not known. Some workers exposed to very high levels of vinyl chloride have problems with the blood flow in their hands. Their fingers turn white and hurt when they go into the cold.

The effects of drinking high levels of vinyl chloride are unknown. If you spill vinyl chloride on your skin, it will cause numbness, redness, and blisters.

Animal studies have shown that long-term exposure to vinyl chloride can damage the sperm and testes.

How likely is vinyl chloride to cause cancer?

The U.S. Department of Health and Human Services has determined that vinyl chloride is a known carcinogen. Studies in workers who have breathed vinyl chloride over many years showed an increased risk of liver, brain, lung cancer, and some cancers of the blood have also been observed in workers.

How can vinyl chloride affect children?

It has not been proven that vinyl chloride causes birth defects in humans, but studies in animals suggest that vinyl chloride might affect growth and development. Animal studies also suggest that infants and young children might be more susceptible than adults to vinyl chloride-induced cancer.

How can families reduce the risk of exposure to vinyl chloride?

Tobacco smoke contains low levels of vinyl chloride, so limiting your family's exposure to cigarette or cigar smoke may help reduce their exposure to vinyl chloride.

Is there a medical test to show whether I've been exposed to vinyl chloride?

The results of several tests can sometimes show if you have been exposed to vinyl chloride. Vinyl chloride can be measured in your breath, but the test must be done shortly after exposure. This is not helpful for measuring very low levels of vinyl chloride. The amount of the major breakdown product of vinyl chloride, thiodiglycolic acid, in the urine may give some information about exposure. However, this test must be done shortly after exposure and does not reliably indicate the level of exposure.

Has the federal government made recommendations to protect human health?

Vinyl chloride is regulated in drinking water, food, and air. The EPA requires that the amount of vinyl chloride in drinking water not exceed 0.002 milligrams per liter (mg/L) of water.

The Occupational Safety and Health Administration (OSHA) has set a limit of 1 part vinyl chloride per 1 million parts of air (1 ppm) in the workplace.

The Food and Drug Administration (FDA) regulates the vinyl chloride content of various plastics. These include plastics that carry liquids and plastics that contact food. The limits for vinyl chloride content vary depending on the nature of the plastic and its use.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2006. Toxicological Profile for Vinyl Chloride (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

BENZENE

CAS # 71-43-2

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 1,000 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and other synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include emissions from volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

❏ Industrial processes are the main source of benzene in the environment.
❏ Benzene can pass into the air from water and soil.
❏ It reacts with other chemicals in the air and breaks down within a few days.
❏ Benzene in the air can attach to rain or snow and be carried back down to the ground.
❏ It breaks down more slowly in water and soil, and can pass through the soil into underground water.
❏ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

❏ Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
❏ Vapors (or gases) from products that contain benzene, such as glues, paints, furniture wax, and detergents, can also be a source of exposure.
❏ Air around hazardous waste sites or gas stations will contain higher levels of benzene.
❏ Working in industries that make or use benzene.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

The major effect of benzene from long-term exposure is on the blood. Benzene causes harmful effects on the bone

marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries, but we do not know for certain that benzene caused the effects. It is not known whether benzene will affect fertility in men.

How likely is benzene to cause cancer?

Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia, often referred to as AML. This is a cancer of the blood-forming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen. The International Agency for Research on Cancer (IARC) and the EPA have determined that benzene is carcinogenic to humans.

How can benzene affect children?

Children can be affected by benzene exposure in the same ways as adults. It is not known if children are more susceptible to benzene poisoning than adults.

Benzene can pass from the mother's blood to a fetus. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How can families reduce the risks of exposure to benzene?

Benzene exposure can be reduced by limiting contact with gasoline and cigarette smoke. Families are encouraged not to smoke in their house, in enclosed environments, or near their children.

Is there a medical test to determine whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is a test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood; however, since benzene disappears rapidly from the blood, this test is only useful for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. The metabolite S-phenylmercapturic acid in urine is a sensitive indicator of benzene exposure. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 5 parts benzene per billion parts of water (5 ppb).

The Occupational Safety and Health Administration (OSHA) has set limits of 1 part benzene per million parts of workplace air (1 ppm) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Benzene (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

HEPTACHLOR and HEPTACHLOR EPOXIDE

CAS # 76-44-8 and 1024-57-3

Division of Toxicology and Environmental Medicine ToxFAQs™ August 2007

This fact sheet answers the most frequently asked health questions (FAQs) about heptachlor and heptachlor epoxide. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The primary exposure to heptachlor and heptachlor epoxide is from contaminated foods and milk. Little is known about their health effects in humans. At high levels, they may cause damage to your liver and nervous system. Exposure of animals during gestation and infancy can result in damage to the nervous system and the immune systems. Heptachlor and heptachlor epoxide have been found in at least 210 and 200, respectively, of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What are heptachlor and heptachlor epoxide?

Heptachlor is a manufactured chemical and doesn't occur naturally. Pure heptachlor is a white powder that smells like camphor (mothballs). The less pure grade is tan. Trade names include Heptagran®, Basaklor®, Drinox®, Soleptax®, Termide®, Gold Crest H-60®, and Velsicol 104®.

Heptachlor was used extensively in the past for killing insects in homes, buildings, and on food crops. These uses stopped in 1988. Currently it can only be used for fire ant control in underground power transformers.

Heptachlor epoxide is also a white powder. Bacteria and animals break down heptachlor to form heptachlor epoxide. The epoxide is more likely to be found in the environment than heptachlor.

What happens to heptachlor and heptachlor epoxide when they enter the environment?

❏ Heptachlor doesn't dissolve easily in water; heptachlor epoxide dissolves more easily
❏ They stick strongly to soil particles and evaporate slowly to air.
❏ Heptachlor epoxide can stay in the soil and water for many years.
❏ Plants can take up heptachlor from the soil. Levels of heptachlor and heptachlor epoxide can build up in the tissues of fish and cattle.

How might I be exposed to heptachlor or heptachlor epoxide?

❏ Eating fish, dairy products, and fatty meats from animals exposed to heptachlor in their food.
❏ Breast milk from mothers who had high exposures can expose breastfed infants.
❏ Drinking water, breathing air, or touching soil at waste sites that contain these substances.

How can heptachlor and heptachlor epoxide affect my health?

There is no reliable information on health effects in humans. Liver damage, excitability, and decreases in fertility have been observed in animals ingesting heptachlor. The effects are worse when the exposure levels were high or when exposure lasted many weeks.

Although there is very little information on heptachlor epoxide, it is likely that similar effects would also occur after exposure to this compound.

How likely are heptachlor and heptachlor epoxide to cause cancer?

Lifetime exposure to heptachlor resulted in liver tumors in animals. The International Agency for Research on Cancer (IARC) and the EPA have classified heptachlor as a possible human carcinogen. EPA also considers heptachlor epoxide as a possible human carcinogen.

How can heptachlor and heptachlor epoxide affect children?

Animals exposed to heptachlor during gestation and infancy may be very sensitive to heptachlor and heptachlor epoxide. Changes in nervous system and immune function were found in these animals. Exposure to higher doses of heptachlor in animals can also result in decreases in body weight and death in newborn animals.

How can families reduce the risks of exposure to heptachlor and heptachlor epoxide?

❏ People who live in homes where heptachlor was used for termite control or on farms where heptachlor was used on crops may have a higher risk of exposure through contaminated crops, soil, water, and air. To avoid exposure from contaminated soil, you should discourage your children from eating dirt. Make sure they wash their hands frequently and before eating. Discourage children from putting their hands in their mouths or other hand-to-mouth activities.

❏ Heptachlor and heptachlor epoxide are also persistent in food and milk. Eating fish from contaminated water can increase exposure to heptachlor. Do not fish or eat fish from contaminated water. Local fishing advisories can tell you if the water is contaminated.

Is there a medical test to determine whether I've been exposed to heptachlor or heptachlor epoxide?

Laboratory tests can detect heptachlor and heptachlor epoxide in blood, fat, breast milk, and body tissues after exposure to high levels of these chemicals. These tests are not commonly available at your doctor's office. Most often, the test for heptachlor epoxide is used because heptachlor is quickly changed into heptachlor epoxide in your body. Blood samples are used most often because they are easy to collect. These tests are specific for heptachlor and heptachlor epoxide.

Methods for measuring heptachlor and heptachlor epoxide in body fat are more precise and can detect lower levels than tests that measure levels in blood. If heptachlor or heptachlor epoxide is found in your blood or fat, it is not possible to tell when you were exposed to these chemicals or if harmful health effects will occur.

Has the federal government made recommendations to protect human health?

The EPA requires that drinking water should not contain more than 0.0004 milligrams heptachlor per liter of water (0.0004 mg/L) and 0.0002 mg heptachlor epoxide per liter of water (0.0002 mg/L).

The FDA controls the amount of heptachlor and heptachlor epoxide on raw food crops and on edible seafood. The limit on food crops is 0.01 parts heptachlor per million parts food (0.01 ppm). The limit in milk is 0.1 parts per million of milk fat. The limit on edible seafood is 0.3 ppm.

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.5 milligrams heptachlor per cubic meter of workplace air (0.5 mg/m^3) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Heptachlor and Heptachlor Epoxide (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

METHYLENE CHLORIDE

CAS # 75-09-2

Division of Toxicology ToxFAQs™ February 2001

This fact sheet answers the most frequently asked health questions (FAQs) about methylene chloride. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to methylene chloride occurs mostly from breathing contaminated air, but may also occur through skin contact or by drinking contaminated water. Breathing in large amounts of methylene chloride can damage the central nervous system. Contact of eyes or skin with methylene chloride can result in burns. Methylene chloride has been found in at least 882 of 1,569 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is methylene chloride?

Methylene chloride is a colorless liquid with a mild, sweet odor. Another name for it is dichloromethane. Methylene chloride does not occur naturally in the environment.

Methylene chloride is used as an industrial solvent and as a paint stripper. It may also be found in some aerosol and pesticide products and is used in the manufacture of photographic film.

What happens to methylene chloride when it enters the environment?

❑ Methylene chloride is mainly released to the environment in air. About half of the methylene chloride in air disappears in 53 to 127 days.

❑ Methylene chloride does not easily dissolve in water, but small amounts may be found in drinking water.

❑ We do not expect methylene chloride to build up in plants or animals.

How might I be exposed to methylene chloride?

❑ The most likely way to be exposed to methylene chloride is by breathing contaminated air.

❑ Breathing the vapors given off by products containing methylene chloride. Exposure to high levels of methylene chloride is likely if methylene chloride or a product containing it is used in a room with inadequate ventilation.

How can methylene chloride affect my health?

If you breathe in large amounts of methylene chloride you may feel unsteady, dizzy, and have nausea and a tingling or numbness of your finger and toes. A person breathing smaller amounts of methylene chloride may become less attentive and less accurate in tasks requiring hand-eye coordination. Skin contact with methylene chloride causes burning and redness of the skin.

How likely is methylene chloride to cause cancer?

We do not know if methylene chloride can cause cancer in humans. An increased cancer risk was seen in mice

breathing large amounts of methylene chloride for a long time.

The World Health Organization (WHO) has determined that methylene chloride may cause cancer in humans.

The Department of Health and Human Services (DHHS) has determined that methylene chloride can be reasonably anticipated to be a cancer-causing chemical.

The EPA has determined that methylene chloride is a probable cancer-causing agent in humans.

How can methylene chloride affect children?

It is likely that health effects seen in children exposed to high amounts of methylene chloride will be similar to the effects seen in adults. We do not know if methylene chloride can affect the ability of people to have children or if it causes birth defects. Some birth defects have been seen in animals inhaling very high levels of methylene chloride.

How can families reduce the risk of exposure to methylene chloride?

❏ Families may be exposed to methylene chloride while using products such as paint removers. Such products should always be used in well-ventilated areas and skin contact should be avoided.
❏ Children should not be allowed to remain near indoor paint removal activities.

Is there a medical test to show whether I've been exposed to methylene chloride?

❏ Several tests can measure exposure to methylene chloride. These tests are not routinely available in your doctor's office.
❏ Methylene chloride can be detected in the air you breathe out and in your blood. These tests are only useful for detecting exposures that have occurred within a few days.
❏ It is also possible to measure carboxyhemoglobin (a chemical formed in the blood as methylene chloride breaks down in the body) in the blood or formic acid (a breakdown product of methylene chloride) in the urine. These tests are not specific for methylene chloride.

Has the federal government made recommendations to protect human health?

❏ The EPA requires that releases of methylene chloride of 1,000 pounds or more be reported to the federal government.
❏ The EPA recommends that exposure of children to methylene chloride be limited to less than 10 milligrams per liter of drinking water (10 mg/L) for 1 day or 2 mg/L for 10 days.
❏ The Food and Drug Administration (FDA) has established limits on the amounts of methylene chloride that can remain after processing of spices, hops extract, and decaffeinated coffee.
❏ The Occupational Safety and Health Administration (OSHA) has set limits of 25 parts methylene chloride per million parts of workplace air (25 ppm) for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for methylene chloride. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is http://www.atsdr.cdc.gov/toxfaq.html . ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

TETRACHLOROETHYLENE
CAS # 127-18-4

Agency for Toxic Substances and Disease Registry ToxFAQs September 1997

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tĕt′rə-klôr′ ō-ĕth′ə-lēn′)

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be performed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone:1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.