

## **Appendix H**

### **Waste Evaluation – 2015**

EA Project No. 14982.01

*Topic:* Waste Evaluation: Temporary Piezometer Installation Summary  
Gude Landfill, Montgomery County, Maryland

*Date:* 19 November 2015

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## **INTRODUCTION**

EA Engineering, Science, and Technology, Inc., PBC (EA) has completed installation of four temporary piezometers for the Gude Landfill (the Site) as part of the Waste Evaluation component of the Revised Assessment of Corrective Measures (ACM). Gude Landfill was used by Montgomery County for municipal solid waste disposal between 1965 and 1982. The 120 acre site is located at 600 East Gude Drive in Rockville, Maryland (Figure 1). The Site is bordered to the east by industrial operations, to the south by Gude Drive, to the west by the community of Derwood, and to the north by Maryland-National Capital Park and Planning Commission land.

The purpose of this Technical Memorandum is to present a summary of the work completed and information collected during the installation of temporary piezometers and initial monitoring of groundwater elevations relative to the landfill waste.

## **DRILLING ACTIVITIES AND METHODOLOGY**

EA's subcontractor, Eichelbergers, Inc., performed temporary piezometer installation and project-related activities from 14 September to 5 October 2015. The completed piezometer installation locations, as presented in Figure 2, were selected to provide adequate and representative coverage of the landfill footprint while ensuring feasible access to the locations for installation and monitoring activities. The piezometers were installed to determine accurate depths of unconsolidated sediments, waste materials, bedrock, and groundwater elevations.

Prior to piezometer installation, the drilling contractor completed initial pilot borings at four locations within the landfill's waste footprint for characterization of subsurface lithology to provide information regarding waste thickness and elevation. Next, a truck-mounted air-rotary drill rig and a track-mounted rig with spin-casing tools were utilized to complete the boreholes and piezometer installations. The drilling contractor installed and developed a total of four temporary piezometers (TPZ-1, TPZ-3, TPZ-4, and TPZ-6).

During borehole completion, EA personnel monitored the work areas with a combustible gas meter. When elevated methane concentrations were detected, work was stopped and engineering controls such as borehole ventilation were implemented until gas readings were acceptable. It was not possible to complete two proposed piezometer locations (TPZ-2 and TPZ-5) due to combustible gas concentrations in the subsurface that remained above the lower explosive level despite mitigation methods such as dry-ice and forced-air ventilation of the borehole. In addition, several attempts were made to offset the locations up to 30 feet (ft) away with similar results. EA considers the geographic distribution of the completed locations adequate to provide representative coverage of the landfill subsurface and achieve the project goals. Therefore, it was decided to abandon the TPZ-2 and TPZ-5 locations.

## **Subsurface Characterization**

At each proposed location, a track-mounted Geoprobe® was utilized to provide detailed characterization of subsurface lithology. Due to the prevalence of near-surface obstructions, hollow-stem auger techniques were used to complete pilot borings to a depth of 40 ft below ground surface (bgs) at each location. Borehole cuttings recovered from the subsurface were logged by an EA geologist for lithologic characteristics such as color, moisture, grain size, and the presence of waste materials. Beyond 40 ft bgs, Direct Push Technology (DPT) was utilized to enable precise determination of the deepest extent of landfill waste and to establish the necessary outer casing depth at each proposed location. Material from the borings was collected continuously using 5-ft-long, 2-inch (in.) outside diameter sampling rods containing 60-in. polyvinyl chloride (PVC) liners, which allow for undisturbed collection of specific intervals. Additional lithologic observations were made during the following stages of drilling to provide a complete boring log for each location. Completed boring logs are attached as Figures 3 through 6.

## **Temporary Piezometer Installation**

Subsequent to the subsurface characterization activities, an approximate 8-in. borehole was advanced at each location to at least 5 ft below the landfill waste layer via the Stratex® Drilling System and air-rotary drilling techniques. Simultaneously, 8-in. nominal diameter steel outer casing was installed from the surface to prevent collapse of the surrounding unconsolidated materials during subsequent activities. Next, the 8-in. borehole was advanced several additional feet, and 5-in. nominal steel casing was installed within the annulus. The annular space surrounding the 5-in. steel casing was pressure-grouted using a tremie-pipe to pump Portland cement/10% bentonite slurry from the bottom of the casing upward in order to mitigate the potential for downward migration of contaminants from the waste layer to the underlying groundwater aquifer.

Once the grout had cured, each borehole was over-drilled using air-rotary techniques to at least 20 ft below the saturated zone. A 2-in. diameter, schedule 40 PVC casing with 20 to 30 ft of 0.020-slot screen was installed no more than 2 ft above the bottom of the boreholes, followed by a section of solid PVC riser extending above the land surface. The annular space below and surrounding the piezometers was packed with #2 sand to a level 3 ft above the top of the screen. The remaining annular space was filled with a 2-ft lift of #1 sand and then sealed with 2 ft of bentonite pellets above the finer sand. Two hours were allowed for the bentonite pellets to hydrate prior to cement/bentonite slurry emplacement via pressure-grouting to the surface as discussed above. Each piezometer was completed as a stickup above the land surface, finished with protective steel casing, locking watertight cap, and 2.7-ft diameter concrete pad. Completed well construction diagrams are attached as Figures 3 through 6.

All piezometers were properly tagged, with the well construction permit number. Well completion reports will be completed for each location, submitted to the County Health Department, and copies will be forwarded to the Maryland Department of Environment.

On 14 October 2015, EA's subcontractor Wallace Montgomery completed an elevation survey of the ground surface and piezometers at each location, including Global Positioning System (GPS) coordinates. The survey results are attached as Figure 7.

**Investigative Derived Waste and Piezometer Development**

Soil cuttings not containing visible trash were spread on the ground surface at the well locations. Soil cuttings containing visible trash were containerized in roll-off waste bins and transported to the Shady Grove Transfer Station on 30 September 2015. For areas where soil cuttings were spread on site, grass seed and straw were applied by the drilling contractor to ensure surface cover regrowth. The drilling components that came into contact with landfill waste such as augers, rods, and drive shoes were decontaminated between boreholes. Decontamination fluids were containerized and transported to Oaks Landfill and emptied into the leachate treatment plant on 1 and 5 October 2015.

The piezometers were developed via air-lifting and/or submersible pump until the water was free of sediment. Development liquids were containerized and disposed of with decontamination fluids at Oaks Landfill.

**Groundwater Monitoring**

Piezometers will remain in place until the evaluation is complete. EA performed three gauging events to document the water levels. Gauging events were synoptic and included monitoring locations previously installed at the Site. The synoptic gauging events were completed on 15 October 2015, 3 November 2015, and 16 November 2015. The gauging data are attached as Figure 8.

**RESULTS AND CONCLUSIONS**

Based on the findings of the subsurface characterization, piezometer installation, and initial groundwater gauging events, EA has developed estimated cross sections and a preliminary evaluation regarding groundwater and waste elevations at the site. The cross sections are attached as Figures 9, 10 and 11. While lenses of perched leachate were observed within the waste layer in several of the boreholes during subsurface characterization, the uppermost aquifer was not encountered within the waste layer. This observation is supported by water level data from the synoptic gauging events.

The table below presents the elevation of the deepest extent of landfill waste at each location relative to the ground surface and groundwater table based on the post-installation gauging events.

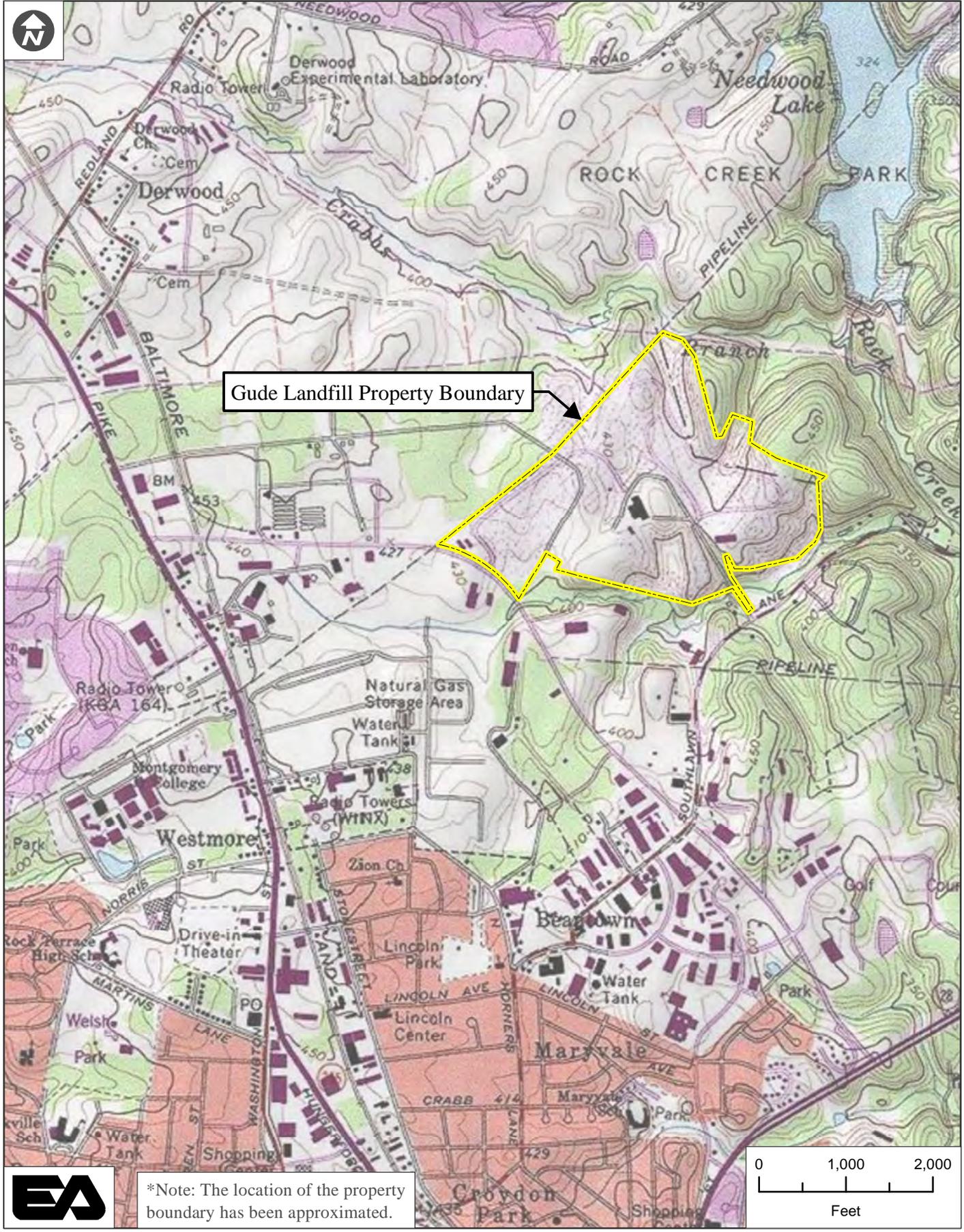
<b>Piezometer Location ID</b>	<b>Ground Surface Elevation (MSL)</b>	<b>Bottom of Waste Elevation (MSL)</b>	<b>10-15-2015 Groundwater Elevation (MSL)</b>	<b>11-03-2015 Groundwater Elevation (MSL)</b>	<b>11-16-2015 Groundwater Elevation (MSL)</b>
TPZ-1	457.67	402.67	393.47	393.84	393.83
TPZ-3	470.93	405.93	380.88	380.68	380.70
TPZ-4	453.92	418.92	377.52	376.42	376.33
TPZ-6	467.82	421.82	367.98	<368.59	367.31

Notes:

MSL - Feet above mean sea level

Attachments:

Figures



Gude Landfill Property Boundary



\*Note: The location of the property boundary has been approximated.

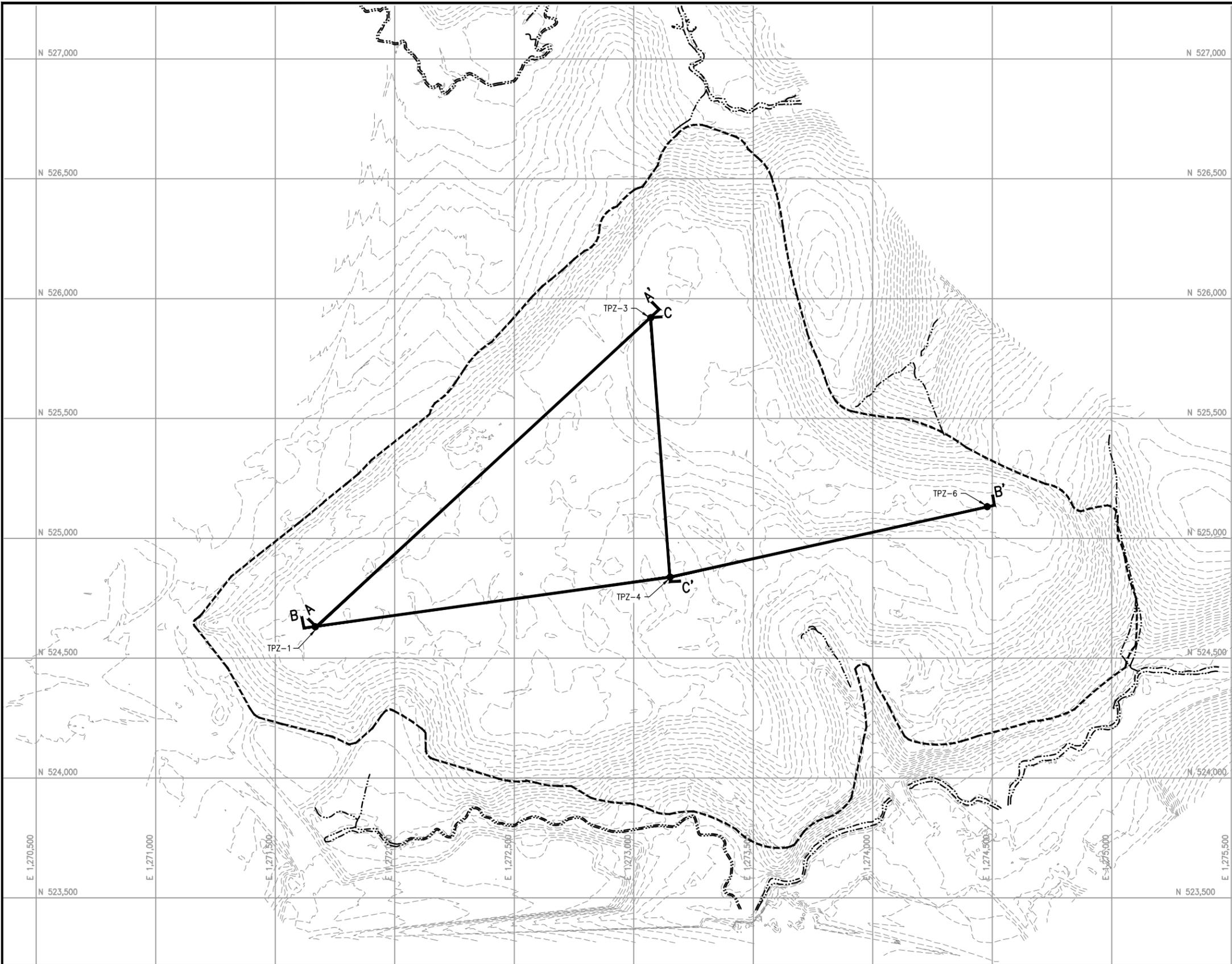
Gude Landfill  
Montgomery County, Maryland

Figure 1 Site Location Map

Sources  
EDR, 2009  
National Geographic Society, 2013

H:\projects\6219608\_out\MXD\Figure1

FILE PATH: C:\PROJECTS\1498201 - GUDE PHASE 2 ACM\GUDE FIGURE - CROSS SECTIONS.DWG [SITE MAP] 11/17/15



NOTES:  
 1. TOPOGRAPHY COMPILED USING FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER 2015.  
 2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983/91 (NAD-83/91). COORDINATE SYSTEM IS MARYLAND STATE PLANE, U.S. SURVEY FEET. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD-88) WITH ELEVATIONS SHOWN IN FEET.

**LEGEND**

- 5-FT CONTOUR
- STREAM
- LIMIT OF WASTE



GUDE LANDFILL  
 PHASE 2 ASSESSMENT OF CORRECTIVE MEASURES  
 MONTGOMERY COUNTY, MARYLAND

**FIGURE 2  
 SITE MAP**

DESIGNED BY -	DRAWN BY WJV	DATE NOV. 2015	PROJECT NO. 14982.01
CHECKED BY -	PROJECT MGR. JK	DRAWING NO. -	FIGURE 2



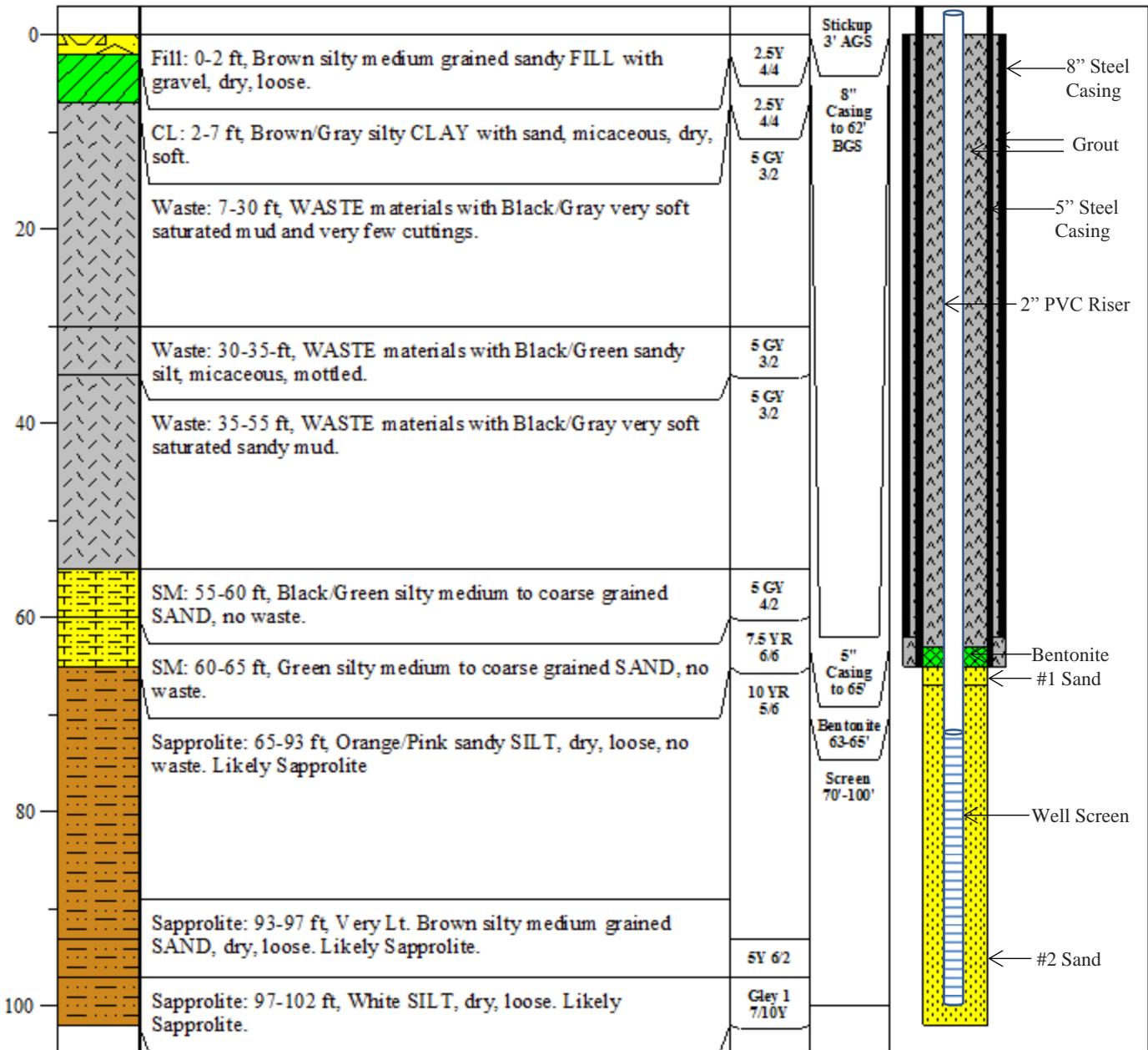
# Gude Landfill

Rockville, Maryland

TPZ-1

<b>Client</b> Montgomery County	<b>EA Project Manager</b> Mark Gutberlet	<b>EA Project Number</b> 1498201
<b>Recorded By</b> Jesse Drummond	<b>Date</b> 09/23 - 09/28/2015	<b>Start Time</b> 08:00 <b>End Time</b> 11:45
<b>Drilling Method</b> HSA/Air Rotary		<b>Driller</b> Shane Albert & Jesse Tish, Eichelbergers
<b>Position (feet)</b> Easting: 1271668.086 Northing: 524631.169 Elevation: 459.871 TOC MD State Plane NAD 83 US FT		

Depth (ft)	Lithology	Description	Munsell	Well Construction
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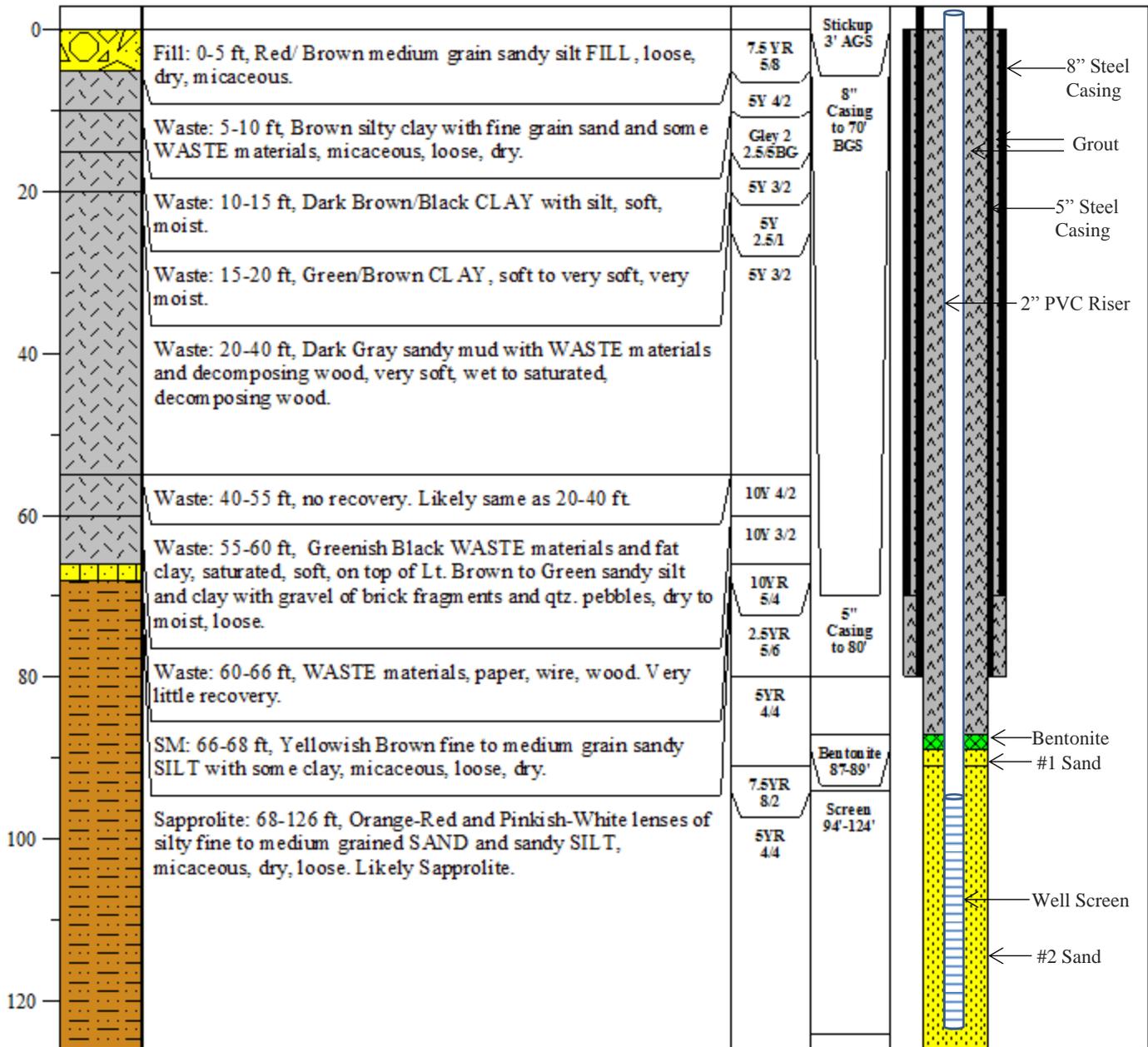
# Gude Landfill

Rockville, Maryland

TPZ-3

Client	Montgomery County	EA Project Manager	Mark Gutberlet	EA Project Number	1498201
Recorded By	Jesse Drummond	Date	09/15 - 09/29/2015	Start Time	09:30
End Time	09:30				
Drilling Method	HSA/Air Rotary		Driller Shane Albert & Jesse Tish, Eichelbergers		
Position (feet)	Easting: 1273070.686 Northing: 525921.229		Elevation: 472.632 TOC MD State Plane NAD 83 US FT		

Depth (ft)	Lithology	Description	Munsell	Well Construction
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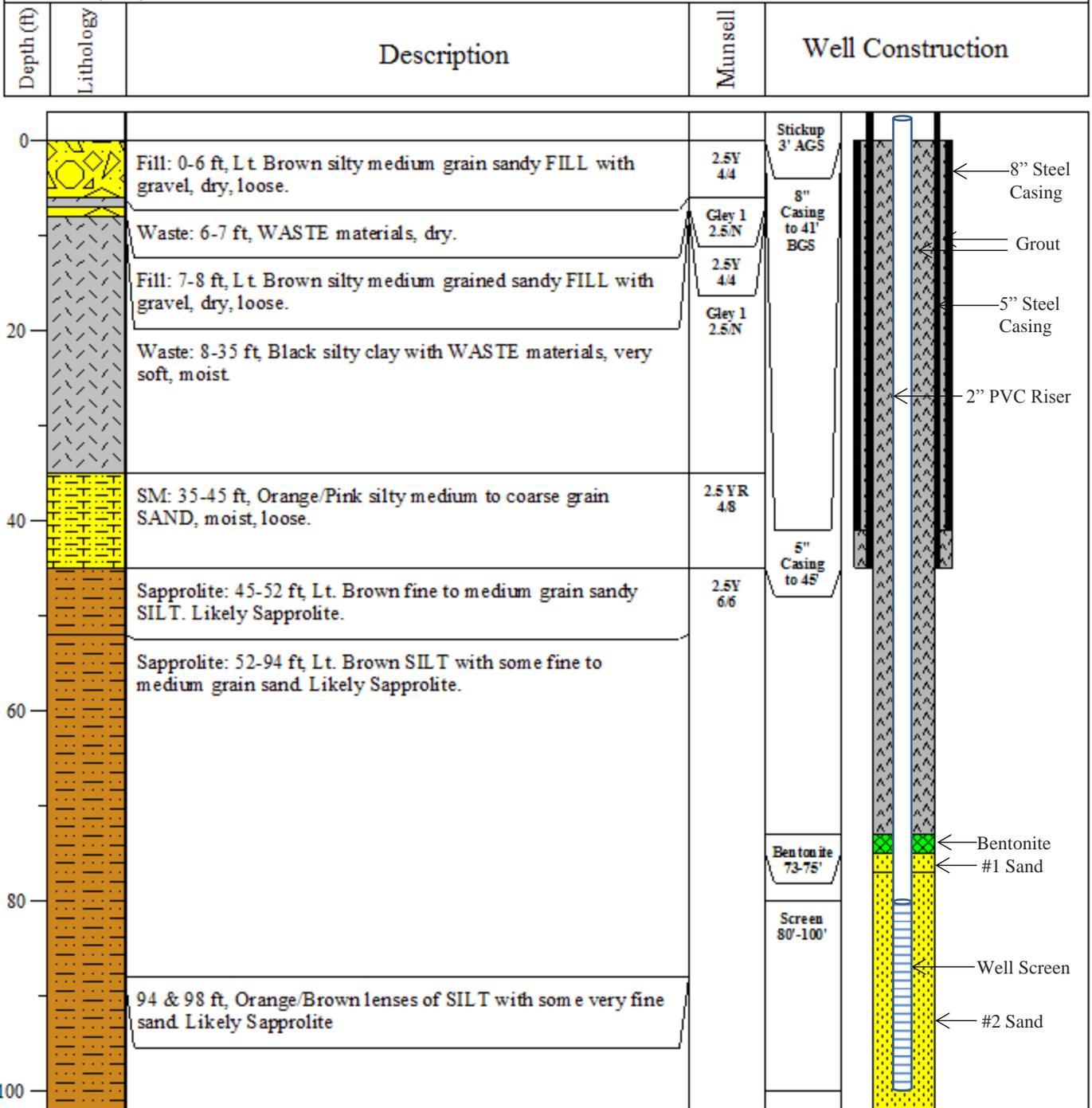


# Gude Landfill

Rockville, Maryland

TPZ-4

Client	Montgomery County	EA Project Manager	Mark Gutberlet	EA Project Number	1498201
Recorded By	Jesse Drummond	Date	09/21 - 09/24/2015	Start Time	12:00
		End Time	09:30		
Drilling Method	HSA/Air Rotary		Driller Shane Albert & Jesse Tish, Eichelbergers		
Position (feet)	Easting: 1273151.317	Northing: 524838.026	Elevation: 456.029	TOC MD State Plane NAD 83 US FT	





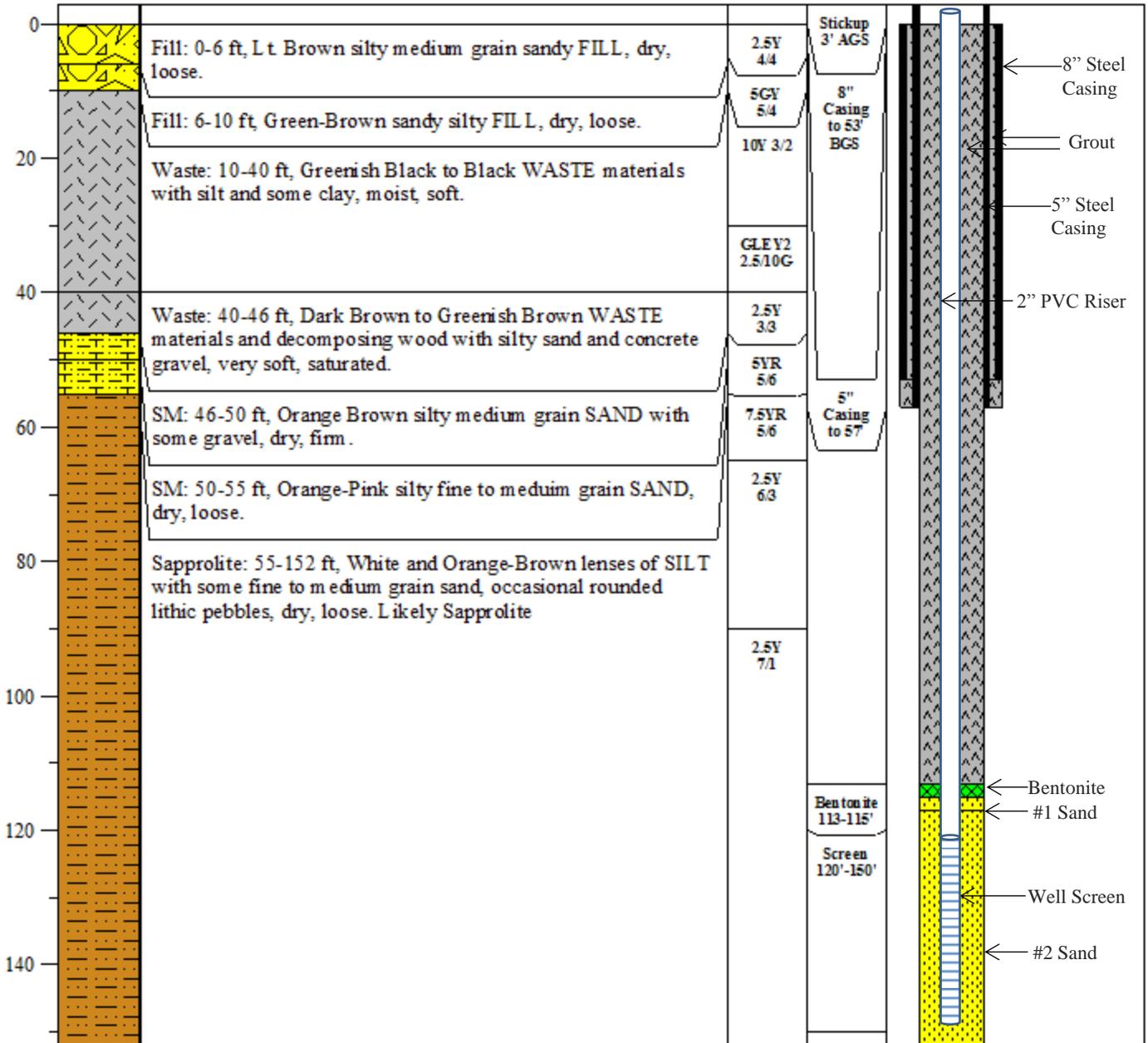
# Gude Landfill

Rockville, Maryland

TPZ-6

<b>Client</b> Montgomery County	<b>EA Project Manager</b> Mark Gutberlet	<b>EA Project Number</b> 1498201
<b>Recorded By</b> Jesse Drummond	<b>Date</b> 09/16 - 09/23/2015	<b>Start Time</b> 13:30 <b>End Time</b> 13:00
<b>Drilling Method</b> HSA/Air Rotary		<b>Driller</b> Shane Albert & Jesse Tish, Eichelbergers
<b>Position (feet)</b> Easting: 1274479.523 Northing: 525131.750 Elevation: 468.587 TOC MD State Plane NAD 83 US FT		

Depth (ft)	Lithology	Description	Munsell	Well Construction
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**Figure 7.**

**Temporary Piezometer Survey Summary Table**

Piezometer ID	Northing	Easting	Piezometer Top of Casing Elevation (MSL)	Ground Surface Elevation (MSL)
TPZ-1	524631.169	1271668.086	459.871	457.67
TPZ-3	525921.229	1273070.686	472.632	470.93
TPZ-4	524838.026	1273151.317	456.029	453.92
TPZ-6	525131.750	1274479.523	468.587	467.82

Notes:

Survey data collected: 14 October 2015

Coordinate System: NAD 1983 State Plane Maryland US Survey Feet

MSL - Feet above mean sea level

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**Figure 8.**

**Gude Landfill Synoptic Groundwater Gauging Summary Table**

Well ID	10-15-2015 DTW (ft)	11-03-2015 DTW (ft)	11-16-2015 DTW (ft)	Well ID	10-15-2015 DTW (ft)	11-03-2015 DTW (ft)	11-16-2015 DTW (ft)	Piezometer ID	10-15-2015 DTW (ft)	11-03-2015 DTW (ft)	11-16-2015 DTW (ft)
MW-1	47.70	48.11	48.38	OB01	16.10	16.22	15.91	TPZ-1	66.40	66.03	66.04
MW-10	11.40	11.56	11.31	OB015	23.50	23.49	23.2	TPZ-3	91.75	91.95	91.93
MW-11A	18.80	18.45	17.96	OB02	19.20	19.75	19.15	TPZ-4	78.50	79.61	79.70
MW-11B	19.15	18.94	18.67	OB025	9.50	9.47	9.34	TPZ-6	100.60	>100	101.28
MW-12	17.45	17.63	17.49	OB02A	19.58	19.45	19.50				
MW-13A	7.20	7.00	6.81	OB04	4.70	4.88	4.75				
MW-13B	6.45	6.18	5.98	OB04A	5.81	5.76	5.63				
MW-14A	22.80	23.10	23.06	OB06	11.85	10.71	10.45				
MW-14B	24.50	24.94	24.96	OB07A	8.50	8.00	7.63				
MW-15	16.80	17.88	17.58	OB08	7.05	7.24	7.25				
MW-2A	65.20	66.09	66.55	OB08A	7.40	7.83	7.80				
MW-2B	64.30	65.04	65.51	OB10	7.00	6.93	6.84				
MW-3A	9.55	9.56	9.50	OB102	12.51	12.57	12.45				
MW-3B	9.60	8.45	8.32	OB105	4.40	3.49	3.36				
MW-4	6.70	6.61	6.54	OB11A	8.75	8.69	8.53				
MW-6	17.63	17.89	17.58	OB11	8.95	8.92	8.83				
MW-7	47.50	48.17	48.44	OB12	18.85	18.91	18.66				
MW-9	22.60	21.91	21.88								

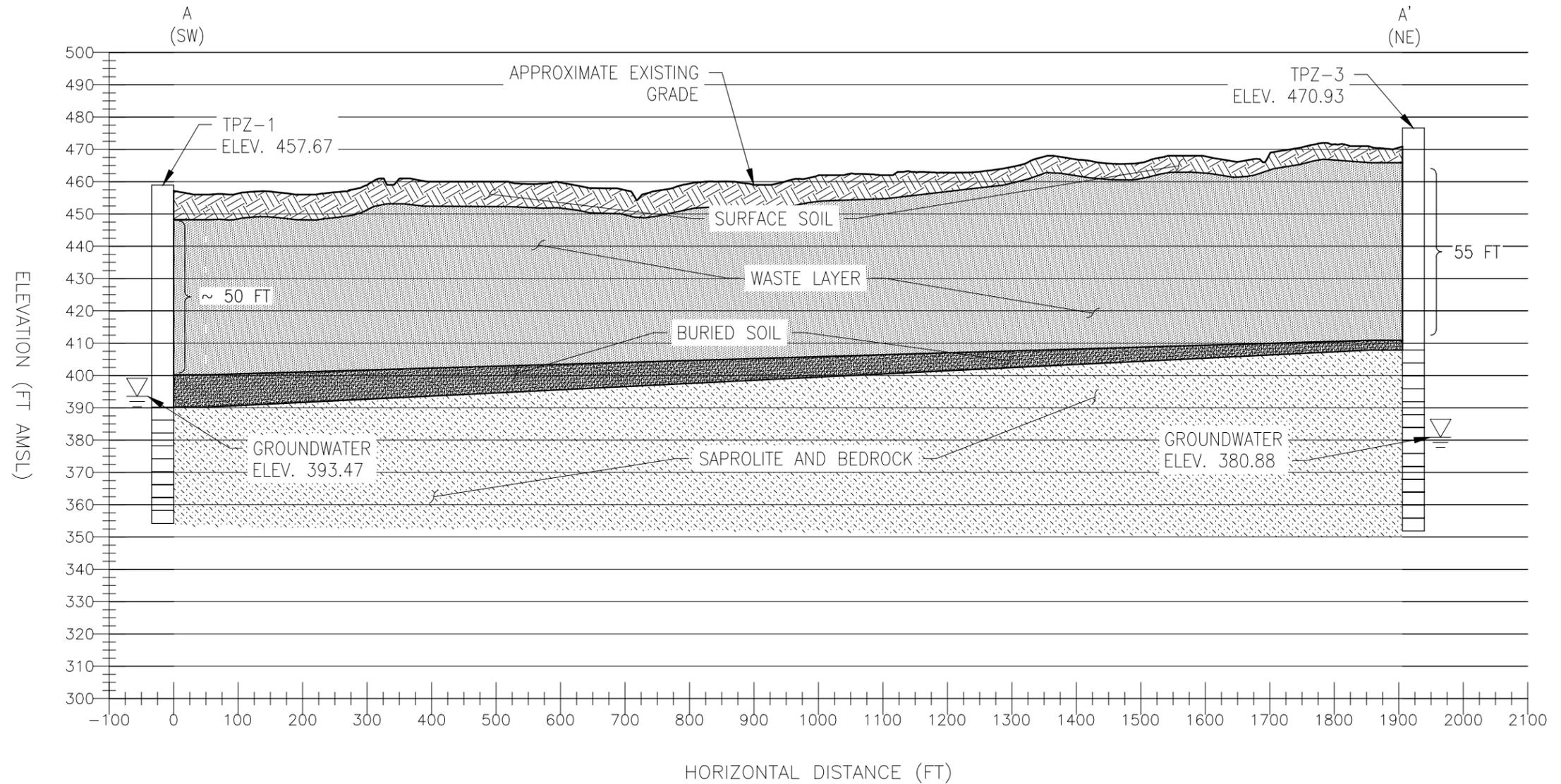
Notes:

Reference level is top of casing for all measurements.

DTW – Depth to water

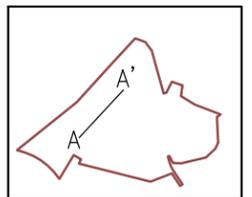
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3. THE PROPERTY BOUNDARY SHOWN REFLECTS A LAND EXCHANGE BETWEEN MONTGOMERY COUNTY AND M-NCPPC WHICH OCCURRED ON 21 OCTOBER 2014.



LEGEND

-  OBSERVED GROUNDWATER LEVEL (OCTOBER 2015)
-  SCREENED INTERVAL



PLAN VIEW

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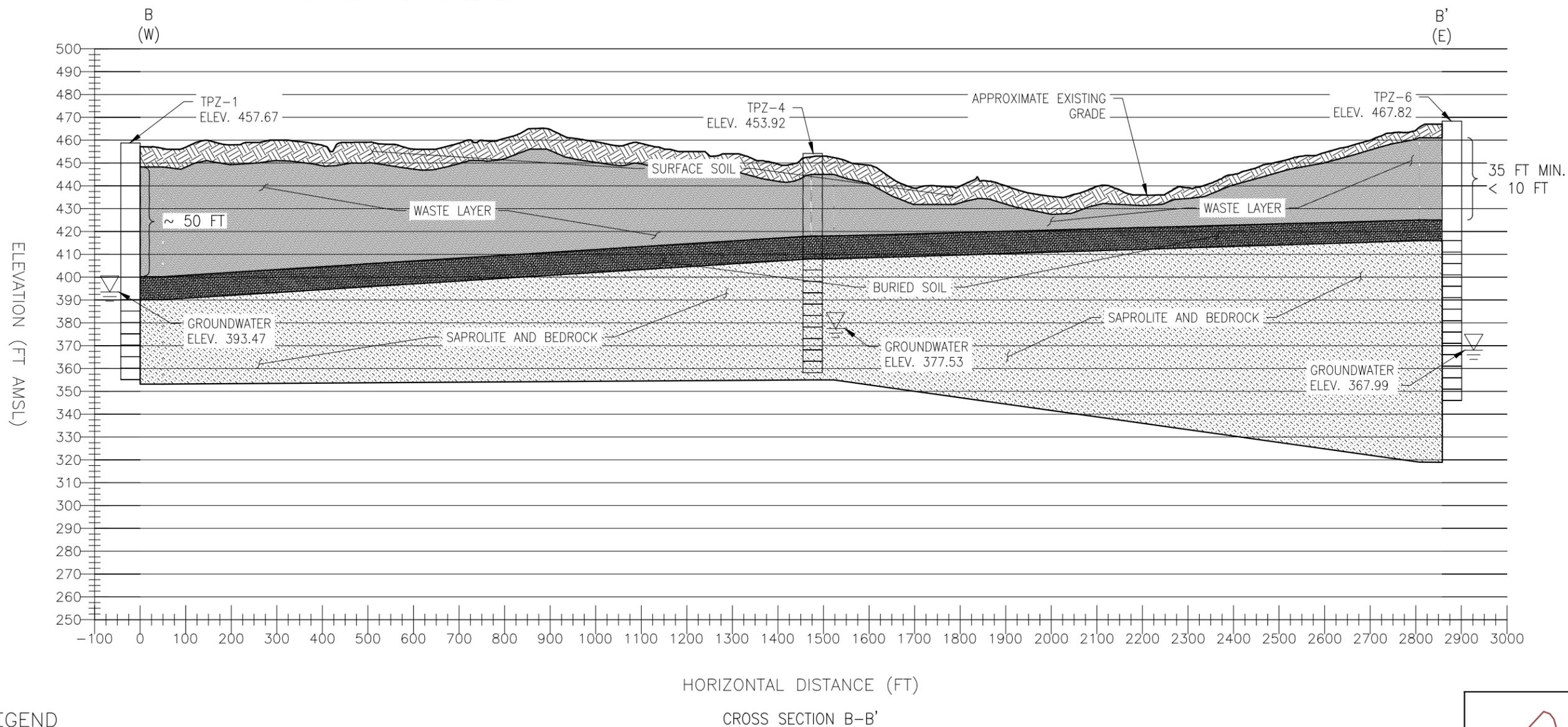


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ASSESSMENT OF CORRECTIVE MEASURES  
MONTGOMERY COUNTY, MARYLAND

FIGURE 9  
GEOLOGIC CROSS SECTION A-A'

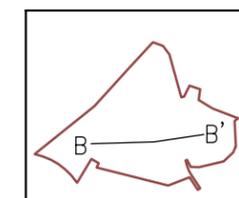
DESIGNED BY -	DRAWN BY WJV	DATE APR. 2016	PROJECT NO. 14982.01
CHECKED BY BR	PROJECT MGR. MJG	DRAWING NO. -	FIGURE 9

- NOTES:
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**LEGEND**

- OBSERVED GROUNDWATER LEVEL (OCTOBER 2015)
- SCREENED INTERVAL



PLAN VIEW

FILE PATH: G:\PROJECTS\1498201 - GUDE PHASE 2 ACM\GUIDE FIGURE - CROSS SECTIONS.DWG [X: B-B'] 4/8/16

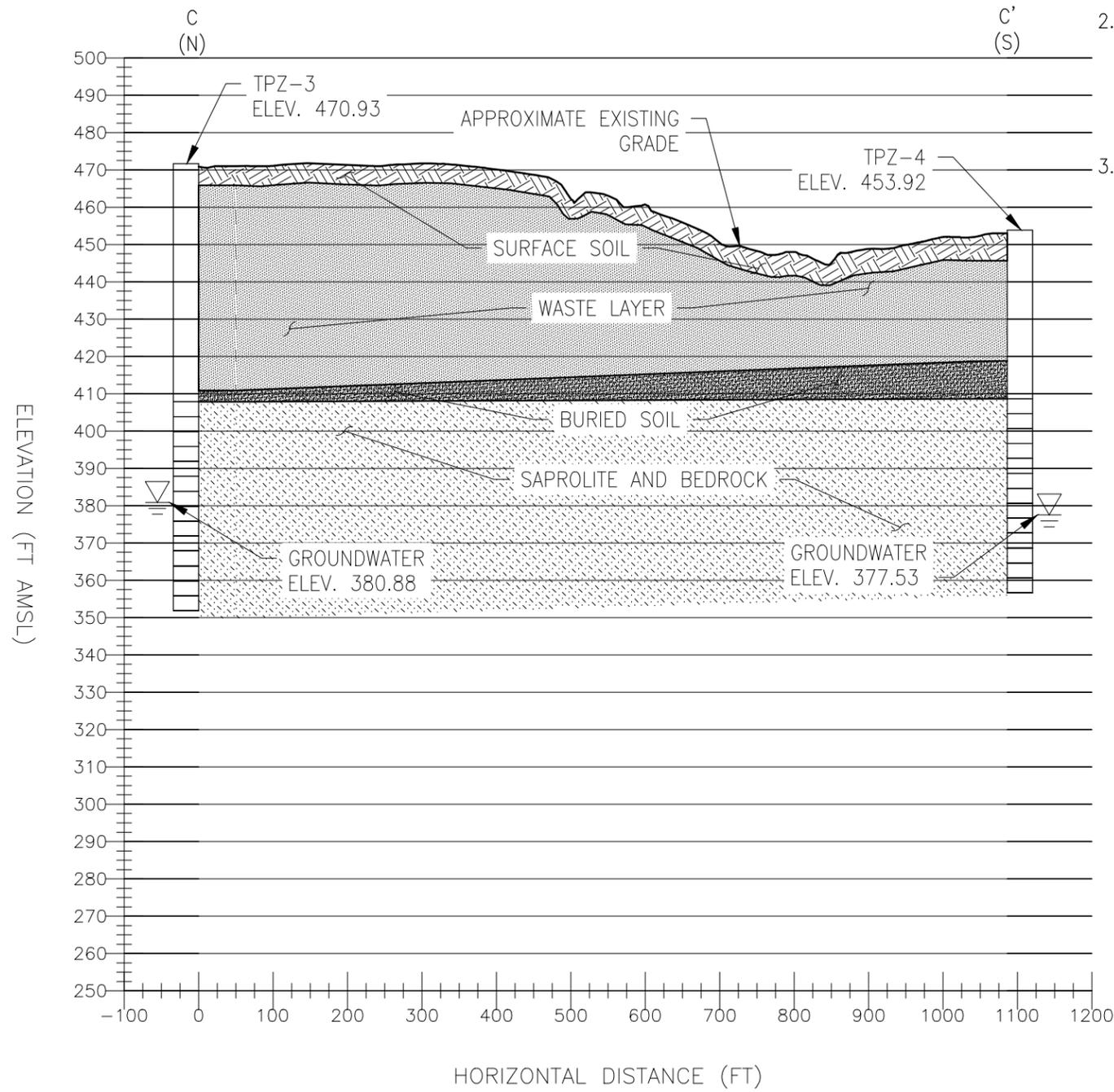


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ASSESSMENT OF CORRECTIVE MEASURES  
MONTGOMERY COUNTY, MARYLAND

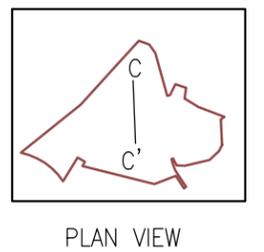
FIGURE 10  
GEOLOGIC CROSS SECTION B-B'

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CHECKED BY BR	PROJECT MGR. MJG	DRAWING NO. -	FIGURE 10

- NOTES:
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- LEGEND**
- OBSERVED GROUNDWATER LEVEL (OCTOBER 2015)
  - SCREENED INTERVAL



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FIGURE 11  
GEOLOGIC CROSS SECTION C-C'

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