Gude Landfill
Nature and Extent Study Plan
Montgomery County, Maryland

Prepared for:

Department of Environmental Protection
Division of Solid Waste Services
Montgomery County, Maryland

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LIST OF ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
ac.	Acre(s)
AOC	Area of Concern
bgs	Below Ground Surface
CCJM	C.C. Johnson and Malhotra, P.C.
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
COMAR	Code of Maryland Regulations
DEP/DSWS	Department of Environmental Protection – Division of Solid Waste Services
DO	Dissolved Oxygen
EA	EA Engineering, Science, and Technology, Inc.
EDR	Environmental Data Resources
EPA	Environmental Protection Agency
EW	Landfill Gas Extraction Well
FSD	Forest Stand Delineation
ft	Foot or Feet
ft/ft	Feet Per Foot
GLCC	Gude Landfill Concerned Citizens
GPS	Global Positioning System
in.	Inch(es)
L/min	Liter(s) Per Minute
LEL	Lower Explosive Limit
l.f.	Linear Feet
LFG	Landfill Gas
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
MD-DNR	Maryland Department of Natural Resources
MHT	Maryland Historical Trust
mg/L	Milligram(s) Per Liter
MNCPPC	Maryland-National Capital Park and Planning Commission
NMWDA	Northeast Maryland Waste Disposal Authority
OHWM	Ordinary High Water Mark
ORP	Oxidation-Reduction Potential

LIST OF ACRONYMS AND ABBREVIATIONS (continued)

PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photo-Ionization Detector
PVC	Polyvinyl Chloride
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RPW	Relatively Permanent Water
SOP	Standard Operating Procedure
spp.	Species
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
UEL	Upper Explosive Limit
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	Volatile Organic Compound
WSSC	Washington Suburban Sanitary Commission
µg/L	Microgram(s) Per Liter

SECTION 1. INTRODUCTION

Gude Landfill (the Landfill) was used by Montgomery County (the County) for municipal solid waste disposal between 1964 and 1982 and predated current Subtitle D design standards per the U.S. Environmental Protection Agency (EPA) – Resource Conservation and Recovery Act (RCRA 1976). The Landfill was not constructed with a bottom liner, capping system, or leachate collection system. The Landfill was permitted by Refuse Disposal Permit No. 73-15-04-02A, dated February 22, 1973. In 1979, Refuse Disposal Permit No. 79-15-04-06A was issued to the County to revise the grades and elevations of the landfill, providing capacity for waste disposal through April 1982 when it was mandated to close by the Department of Health and Mental Hygiene. The County currently maintains an active landfill gas (LFG) collection, flare, and gas-to-energy system; a network of onsite and offsite groundwater monitoring wells and stormwater management infrastructure at the Landfill.

Soil was reportedly used as daily cover during waste filling, and a 2-foot (ft) final layer of soil was reportedly placed as natural cover to support vegetation, which currently includes grasses, shrubs, and trees. Since final closure of the Landfill in 1982, the County has conducted voluntary groundwater and surface water monitoring and laboratory analyses. During calendar year 2008, the Landfill water quality data were requested by a local citizens group (Gude Landfill Concerned Citizens – GLCC) that was opposed to a County plan to construct a bus depot on the Landfill property. GLCC contended that the reported analyte concentrations in the groundwater samples exceeded the Maximum Contaminant Levels (MCLs) established by EPA as limits for drinking water. The Maryland Department of the Environment (MDE) also reviewed the water quality data, acknowledged GLCC's concerns and the regulatory standards, and required the County to initiate a Nature and Extent Study to assess potential adverse environmental or health and safety impacts of the Landfill.

EA Engineering, Science, and Technology, Inc. (EA) was contracted by the Northeast Maryland Waste Disposal Authority (NMWDA) to assist the Montgomery County Department of Environmental Protection – Division of Solid Waste Services (DEP/DSWS) with the assessment and remediation activities. The purpose of the assessment activities at the Landfill is to characterize the nature and extent of potential groundwater and surface water impacts from landfill leachate, including hydrogeologic and fate and transport assessments. This Nature and Extent Study Plan presents a brief site description; summarizes historical groundwater, surface water, leachate seep, stormwater, LFG, and topographic data; and describes the study plan to complete the investigation.

SECTION 2. SITE DESCRIPTION

2.1 SITE LOCATION AND CHARACTERISTICS

The Landfill property consists of 160 acres, located at 600 East Gude Drive in Rockville, Maryland. Figure 2-1 presents a site location map. The surrounding area is mixed use, bounded to the south by industrial operations, to the west/northwest by the community of Derwood Station South, and to the north and east by Maryland-National Capital Park and Planning Commission (MNCPPC) property. The Landfill was constructed before current design standards for liners and caps were in place; therefore, it does not have a bottom liner system or a synthetic cap system. Approximately 2 ft of soil cover was reportedly placed on the Landfill surface in the 1980s. This soil layer may decrease in thickness along portions of the Landfill side slopes. The site topography is plateau-like and consists of gentle relief along the top of the waste-mass and sharp relief along the Landfill boundary. The elevation along the top of the plateau gently slopes to the south, with localized mounds and depressions throughout. The side slope falls sharply from the top of the waste-mass to elevations ranging from 60 to 90 ft below the plateau. The site generally consists of open grassy fields with sporadic patches of trees. Major site features include an extensive LFG collection piping system throughout the property; a paved area and road in the vicinity of a former incinerator in the southeastern portion of the Landfill; a model airplane flying area in the northern portion of the Landfill; and a landfill gas-to-energy plant and flare station and men’s shelter in the southwest corner of the property. The general site features are shown on the site plan presented in Figure 2-2.

2.2 SITE GEOLOGY AND HYDROGEOLOGY

The Landfill is located in central Montgomery County, within the upland section of the Piedmont Plateau physiographic province. The geology in the upland section of the Piedmont Plateau physiographic province primarily consists of metamorphic and igneous rock formations of Paleozoic and Precambrian age. The Piedmont Plateau is underlain by an assortment of phyllite, slate, marble, schist, gneiss, and gabbro formations. Unconsolidated sediments overlying bedrock in the vicinity of the site range in thickness from 20 to 60 ft below ground surface (bgs). Based on available well construction logs from ATEC Associates Inc. (1988), the sediments primarily consist of silt and clay.

The uplands section of the Piedmont is underlain by three principle types of bedrock aquifers consisting of crystalline-rock and undifferentiated sedimentary-rock aquifers, aquifers in early Mesozoic basins, and carbonate-rock aquifers. The Landfill is underlain by the crystalline rock aquifer that extends over approximately 86 percent of the Piedmont Plateau Physiographic Province. The crystalline-rock aquifer is overlain by the unconsolidated surface aquifer consisting of interbedded silts and clays and saprolite. Groundwater movement in the unconsolidated aquifer occurs more readily than in the underlying bedrock and is highly dependent on the composition and grain size of the sediments. Groundwater in the bedrock (typically 20 to 60 ft below grade) is stored and moves through fractures. Documentation on the degree of fracturing and orientation of bedrock fractures at the Landfill was not found.

Groundwater is present in the unconsolidated sediments along the perimeter of the Landfill at depths ranging from 0 to 25 ft bgs. Groundwater recharge at the Landfill is variable and is primarily determined by precipitation and runoff. Topographic relief and the capacity of the unconsolidated surface layer to accept water are influencing factors that affect groundwater recharge at the Landfill. The elevated plateau and potentially highly permeable surface layer formed by the Landfill indicates that surface water infiltration is likely occurring. Infiltrating water likely moves laterally through the unconsolidated layer on the surface of the bedrock and discharges to nearby streams and surface depressions.

SECTION 3. HISTORICAL DATA AND FIELD REVIEW

3.1 GROUNDWATER

3.1.1 Monitoring Well Construction

Well construction logs and historical groundwater monitoring data were reviewed for the existing groundwater monitoring wells at the Landfill. The groundwater monitoring well network consists of 20 monitoring wells generally situated around the perimeter of the site (Figure 2-2).

Sixteen monitoring wells are constructed of 2-inch (in.) diameter polyvinyl chloride (PVC) with screened intervals ranging in depth from 31 to 154 ft bgs. Six well pairs were installed with screened intervals at different depths. For example, OB03 was installed with a screened interval from 104 to 154 ft below grade, and OB03A was installed adjacent to OB03 with a screened interval from 50 to 97 ft bgs. The well pairs include OB02/OB02A, OB03/OB03A, OB04/OB04A, OB07/OB07A, OB08/OB08A, and OB11/OB11A. Monitoring well construction logs are not available for four of the 2-in.-diameter wells (OB06, OB10, OB11A, and OB12). Available well construction logs indicate that the wells were installed from April through October 1988 by ATEC Associates, Inc.

Four monitoring wells (OB15, OB25, OB102, and OB105) are constructed of 4-in.-diameter PVC or steel casing to depths ranging from 13 to 28 ft bgs. The date of installation and well construction details, including the depth of the screened intervals for these wells is not known because the well construction logs are not available.

On 22 and 23 October 2009, EA conducted a field assessment of the existing monitoring wells at the Landfill. The field inspection consisted of an evaluation of surface completion components and collection of total depth and water quality measurements at each well. Recommendations to address monitoring well deficiencies and missing well construction documentation are presented in a technical memorandum provided as Appendix A. Recommendations include concrete pad replacement/repair, manhole installation, well development, gripper plug replacement, and downhole video inspection of well construction. A detailed review of the existing monitoring well assessment is provided in Appendix A.

Available well construction data are summarized in Table 3-1.

TABLE 3-1 SUMMARY OF MONITORING WELL CONSTRUCTION DATA, GUDE LANDFILL, 600 EAST GUDE DRIVE, ROCKVILLE, MARYLAND 20850

Well ID	Permit #	Date Installed	Drilling Method	Diameter (inches)	Reported Total Depth (ft bgs)	Measured Total Depth - 10/22/2009 and 10/23/2009 (ft bgs)	Casing Depth (ft bgs)	Screen Depth (ft bgs)	Historic Depth to GW (ft bgs)	Geology
OB01	MO880058	4/26/88	HSA / Mud Rotary	2	75	76.42	35	35-75	10-15	0-30 feet : unknown, 30-77 feet : rock
OB02	MO880059	5/20/88	Mud Rotary	2	121	113.25	71	no screen - open from 71-121'	10-17	0-21 feet : red clay & saprolite, 21-121 feet : rock
OB02A	MO880060	5/13/88	Mud Rotary	2	77	76.4	37	37-77	10-17	0-26.5 feet : unknown, 26.5-77 feet : rock
OB03	MO880061	6/30/88	Mud Rotary	2	154	133.13	104	104-154	16-24	0-54 feet : red clay & saprolite, 54- 154 feet : rock
OB03A	MO880062	7/8/88	Mud Rotary	2	97	94.55	50	50-97	15-25	0-47 feet : red clay & saprolite, 47-97 feet : rock
OB04	MO880063	7/22/88	Mud Rotary	2	136	131.66	86	86-136	1-3	0-30 feet : red clay & saprolite, 30-36 feet : decomposed rock, 36-136 feet : rock
OB04A	MO880064	7/29/88	Mud Rotary	2	83	81.92	33	33-83	1-4	0-3 feet : fill, 3-33 feet sandy silt with rock & quartz, 33-83 feet : rock
OB06	MO880065 *			2		66.63	Well Completion Report Missing		4-10	
OB07	MO880066 *	8/7/88	Mud Rotary	2	81	142.87	31	31-81	2-10	0-31 feet : saprolite, 31-81 feet : rock
OB07A	MO880067 *	8/30/88	Mud Rotary	2	76	97.17	26	26-76	2-8	0-26 feet : clay & saprolite, 26-76 feet : rock
OB08	MO880068 *	8/26/88	Mud Rotary	2	109	137.01	59	59-109	0-5	0-57 feet : saprolite, 57-109 feet : rock
OB08A	MO880069 *	10/5/88	Mud Rotary	2	145	79.25	95	95-145	1-6	0-40 feet : saprolite, 40-145 feet : rock
OB10	MO880070 *			2		66.82	Well Completion Report Missing		1-5	
OB11	MO880071 *	10/12/88	Mud Rotary	2	90	100.9	40	40-90	4-7	0-40 feet : saprolite, 40-90 feet : rock
OB11A	MO880072*			2		64.3	Well Completion Report Missing		3-7	
OB12	MO880073*			2		25.58	Well Completion Report Missing		12-17	
OB15	*			4	27.5	22.79	Well Completion Report Missing		16-21	
OB25	*			4	15	15.46	Well Completion Report Missing		3-7	
OB102	*			4	24.5	22.2	Well Completion Report Missing		7-11	
OB105	*			4	13	16.5	Well Completion Report Missing		0-2	

Notes:
GW=groundwater
ft=feet
HSA=hollow stem auger
bgs=below ground surface
* indicates missing well completion reports or reports that indicate conflicting well identification information and total depth measurements that do not match the total depths on the completion reports
Reported total depth data is from well completion reports. For wells OB15, OB25, OB102 and OB105 the total reported total depth data was provided by Montgomery County

3.1.2 Groundwater Flow

The depth to groundwater was measured in the 20 existing monitoring wells by EA personnel on 5 November 2009. Measurements were collected by lowering an electronic water level indicator to determine the depth to water at each well. Depth-to-water measurements were collected from surveyed locations marked along the well casings.

Groundwater elevation data collected from the existing monitoring wells indicates an easterly flow direction at a hydraulic gradient of approximately 0.02 to 0.03 feet per foot (ft/ft) across the site. A contoured groundwater elevation map is included as Figure 3-1 and includes the calculated groundwater elevation data and illustration of the groundwater flow regime based on data collected on 5 November 2009. As shown in Figure 3-1, the easterly flow direction and gradient are generally consistent across the site. There are minor flow components to the northeast and southeast in the northeastern and southeastern portions of the site.

Groundwater is historically encountered at the site from 0 to 25 ft bgs and flows generally to the east based on existing monitoring well locations. At this site, topographic relief, unconsolidated sediment, and surface recharge variations created by the former landfill may significantly affect the groundwater flow. It is likely that some degree of groundwater mounding is present beneath and around the perimeter of the Landfill. The proximity of the existing monitoring wells to the waste may have an influence on groundwater elevations within the wells. For example, local groundwater mounding beneath the landfill (for which there are currently no monitoring wells) may result in radial flow away from the landfill to the immediate perimeter monitoring wells. Monitoring wells further outside the waste perimeter would more accurately reflect regional groundwater flow and dissolved-phase constituent migration in the vicinity of the Landfill.

3.1.3 Dissolved Phase Constituents (2001-Present)

The MCLs are criteria established by the U.S. EPA for protection of drinking water. These criteria have been used to determine the constituents of concern for this study. Concentration-time graphs were plotted to evaluate potential trends for each constituent in each well (Appendix B). Historical data (2001-present) for the dissolved phase constituents reported in samples collected from the 20 groundwater monitoring wells at the Landfill are provided in Appendix C.

Groundwater monitoring wells OB01, OB02, and OB02A are located on the western boundary (upgradient) of the Landfill. MCL exceedances for four constituents have been detected in these monitoring wells between 2001 and 2009. In general, these wells show a trend of decreasing volatile organic constituent concentrations. A summary of these results can be found in Table 3-2.

- Trichloroethene (TCE) was reported from 2001 to 2005 in all three wells with concentrations ranging between 5.06 and 30.84 micrograms per liter (µg/L), which is greater than the MCL of 5 µg/L. Concentrations of TCE have been less than the MCL and decreasing in these monitoring wells since 2005.
- Cis-1,2-dichloroethene was reported historically in OB02A at concentrations ranging from 189.59 µg/L (10/2003) to 0.56 µg/L (3/2008). Concentrations have been less than the MCL of 70 µg/L since 2003 and were non-detect during the most recent sampling event (9/2009).
- Tetrachloroethene (PCE) was reported historically in OB02A at concentrations ranging from 12.1 µg/L to less than 0.2 µg/L (non-detect). Concentrations of PCE have been less than the MCL of 5 µg/L since 2004.
- Vinyl chloride has been reported historically in OB01 and OB02A, ranging from 11.19 µg/L to non-detected levels. Vinyl chloride has been less than the MCL of 2 µg/L since 2004 in OB02A and 2008 in OB01.

Groundwater monitoring wells OB03 and OB03A are located along the northwest boundary (approximate cross-gradient) of the Landfill. MCL exceedances for six constituents have been detected in the following monitoring wells between 2001 and 2009. In general, these wells show a trend of increasing volatile organic constituent concentrations.

- Benzene was historically reported in both OB03 and OB03A at concentrations ranging from 11.29 µg/L (March 2002) to 2.4 µg/L (April 2005). Concentrations have been less than the MCL of 5 µg/L in the most recent sampling event (September 2009).
- 1,2-Dichloropropane has been historically reported in both OB03 and OB03A at concentrations ranging from 16.5 µg/L (March 2002) to non-detect (April 2005). Concentrations have been generally greater than the MCL of 5 µg/L and increasing in both monitoring wells.
- Cis-1,2-dichloroethene has been reported historically in both OB03 and OB03A in concentration ranging from 168µg/L (3/2008) to non-detect (3/2004). Concentrations in

TABLE 3-2 GROUNDWATER CONSTITUENTS OF CONCERN SUMMARY TABLE

Location	Constituent of Concern	MCL	Units	Maximum Result	Date	Minimum Result	Date
OB01	Trichloroethene	5	µg/L	12.71	10/08/03	0.73	09/21/09
OB01	Vinyl Chloride	2	µg/L	6.02	10/08/03	0.55	09/21/09
OB02	Trichloroethene	5	µg/L	8.04	10/08/03	0.32	09/21/09
OB02A	cis-1,2-Dichloroethene	70	µg/L	189.59	10/08/03	0.56	03/26/08
OB02A	Tetrachloroethene	5	µg/L	12.1	10/08/03	0.45	09/21/09
OB02A	Trichloroethene	5	µg/L	30.84	10/08/03	1.01	03/05/09
OB02A	Vinyl Chloride	2	µg/L	11.19	10/08/03	1.39	04/05/05
OB03	1,2-Dichloropropane	5	µg/L	16.14	03/09/09	6.32	06/02/03
OB03	Benzene	5	µg/L	9.03	03/12/02	2.4	04/05/05
OB03	cis-1,2-Dichloroethene	70	µg/L	164.77	03/09/09	46.23	10/08/03
OB03	Tetrachloroethene	5	µg/L	90.52	03/12/02	0.61	09/21/09
OB03	Trichloroethene	5	µg/L	132.6	03/25/08	47.33	06/02/03
OB03	Vinyl Chloride	2	µg/L	31.39	10/03/07	11.67	04/04/06
OB03A	1,2-Dichloropropane	5	µg/L	16.5	03/12/02	1.27	10/08/03
OB03A	Benzene	5	µg/L	11.29	03/12/02	2.73	04/04/06
OB03A	cis-1,2-Dichloroethene	70	µg/L	168.82	03/25/08	2.57	06/02/03
OB03A	Tetrachloroethene	5	µg/L	102.1	03/12/02	1.65	06/02/03
OB03A	Trichloroethene	5	µg/L	141.41	03/25/08	1.26	06/02/03
OB03A	Vinyl Chloride	2	µg/L	30.58	10/03/07	1.47	04/05/05
OB04A	Vinyl Chloride	2	µg/L	2.12	09/21/09	1.06	04/17/07
OB102	Vinyl Chloride	2	µg/L	2.98	09/21/04	0.1	03/24/04
OB105	Vinyl Chloride	2	µg/L	2.04	10/03/07	0.04	03/23/04
OB08	Tetrachloroethene	5	µg/L	28.07	09/16/02	28.07	09/16/02
OB08	Trichloroethene	5	µg/L	21.35	09/16/02	0.44	09/21/09
OB08	Vinyl Chloride	2	µg/L	2.98	10/02/07	0.04	03/25/04
OB08A	1,2-Dichloropropane	5	µg/L	6.61	09/16/02	0.94	09/24/08
OB08A	Benzene	5	µg/L	10.31	09/16/02	0.52	03/26/08
OB08A	cis-1,2-Dichloroethene	70	µg/L	72.56	09/16/02	2.46	03/25/04
OB08A	Tetrachloroethene	5	µg/L	58.78	09/16/02	1.12	06/03/03
OB08A	Trichloroethene	5	µg/L	61.1	09/16/02	0.84	03/26/08
OB08A	Vinyl Chloride	2	µg/L	6.5	09/21/09	0.06	03/25/04
OB10	cis-1,2-Dichloroethene	70	µg/L	85.97	09/05/01	4.81	04/05/06
OB10	Tetrachloroethene	5	µg/L	12.02	03/13/02	1.03	09/21/09
OB10	Trichloroethene	5	µg/L	50.56	09/05/01	1.31	03/27/08
OB10	Vinyl Chloride	2	µg/L	16.03	10/04/07	2.13	10/09/03
OB11	1,2-Dichloropropane	5	µg/L	8.28	03/09/09	1.25	04/27/01
OB11	Benzene	5	µg/L	10.69	10/03/07	1.07	06/03/03

TABLE 3-2 GROUNDWATER CONSTITUENTS OF CONCERN SUMMARY TABLE

Location	Constituent of Concern	MCL	Units	Maximum Result	Date	Minimum Result	Date
OB11	cis-1,2-Dichloroethene	70	µg/L	190.55	03/09/09	1.7	09/16/02
OB11	Methylene Chloride	5	µg/L	42.44	09/25/06	2.51	04/04/06
OB11	Tetrachloroethene	5	µg/L	67.92	03/09/09	15.38	04/27/01
OB11	Trichloroethene	5	µg/L	59.1	10/03/07	10.45	04/27/01
OB11	Vinyl Chloride	2	µg/L	20.3	09/21/09	1.75	04/04/06
OB11A	1,2-Dichloropropane	5	µg/L	10.71	03/13/02	1.19	09/16/02
OB11A	Benzene	5	µg/L	17.54	03/13/02	4.7	06/03/03
OB11A	cis-1,2-Dichloroethene	70	µg/L	189.64	10/03/07	13.44	09/16/02
OB11A	Methylene Chloride	5	µg/L	52.22	03/13/02	1.73	09/24/08
OB11A	Tetrachloroethene	5	µg/L	115.7	03/13/02	15.44	03/25/04
OB11A	Trichloroethene	5	µg/L	101.67	03/13/02	7.41	09/16/02
OB11A	Vinyl Chloride	2	µg/L	18.34	10/03/07	0.96	03/25/04
OB12	1,2-Dichloropropane	5	µg/L	7.25	10/04/07	1.13	04/18/07
OB12	Methylene Chloride	5	µg/L	12.3	09/26/06	1	04/06/05
OB12	Tetrachloroethene	5	µg/L	23.67	10/04/07	4.85	04/06/05
OB12	Trichloroethene	5	µg/L	24.95	10/04/07	6.22	03/10/09
OB12	Vinyl Chloride	2	µg/L	6.99	03/10/09	1.01	04/06/05
OB015	Vinyl Chloride	2	µg/L	18.4	04/18/07	2.78	03/10/09
OB025	Vinyl Chloride	2	µg/L	5.29	10/03/07	0.12	03/30/04

both wells have been generally greater than the MCL of 70 µg/L and have an increasing trend.

- TCE has been reported historically in both OB03 and OB03A at concentrations ranging from non-detect (3/2004) to 141 µg/L (3/2008). The concentrations are currently greater than the MCL of 5 µg/L and are generally increasing over time in these wells.
- PCE has been reported historically in both OB03 and OB03A at concentrations ranging from non-detect (3/2004) to 102 µg/L (3/2002). The concentrations in OB03 are currently non-detect and concentrations in OB03A are 7.11 µg/L, which is greater than the MCL of 5 µg/L. There is a general decreasing trend for PCE in both OB03 and OB03A.
- Vinyl chloride has been reported historically in both OB03 and OB03A at concentrations ranging from 1.47 µg/L (4/2005) to 31.39 µg/L (10/2007). Concentrations have been consistently greater than the MCL of 2 µg/L and generally increasing.

Groundwater monitoring wells OB04, OB04A, 0B06, OB07, OB07A, OB102, and OB105 are located beyond the northeastern boundary (approximate cross-gradient to downgradient) of the site. In general, these wells show a trend of decreasing volatile organic constituent concentrations.

- Vinyl chloride has been intermittently reported greater than the MCL of 2 µg/L in OB04A, OB102, and OB105, at concentrations ranging between 2.02 and 2.98 µg/L. Concentrations of vinyl chloride are generally increasing at these locations. There were no other MCL exceedances reported in these wells.

Groundwater monitoring wells OB08, OB08A, and OB10 are located in the southeastern (downgradient) portion of the Landfill. MCL exceedances for six constituents have been detected in the following monitoring wells between 2001 and 2009. In general, these wells show a trend of decreasing volatile organic constituent concentrations.

- PCE has been reported historically in all three wells greater than the MCL of 5 µg/L at concentrations ranging from 6.03 µg/L in OB10 (3/2004) to 58.78 µg/L in OB08A (9/2002). Concentrations in all three wells have been less than the MCL since 2005 and levels have generally decreased over this time period.

- TCE has been reported historically in all three wells greater than the MCL of 5 µg/L at concentrations ranging from 8.76 µg/L in OB10 (4/2006) to 61.10 µg/L in OB08A (9/2002). Concentrations in OB08 and OB08A have been less than the MCL of 5 µg/L since 2005. Concentrations in OB10 continue to be greater than the MCL but are general decreasing.
- Vinyl chloride was reported historically in all three monitoring greater than the MCL of 2 µg/L with concentrations ranging from 2.04 µg/L in OB08 (3/2009) to 16.03 µg/L in OB10 (10/2007). Concentrations in all three wells continue to be greater than the MCL of 2 µg/L.

In addition, OB08A reported MCL exceedances for cis-1,2-dichloroethene (72.56 µg/L), benzene (10.31 µg/L), and 1,2-dichloropropane (6.61 µg/L) in 2002. There is a general increasing trend in concentration for all constituents present in groundwater wells OB08 and OB08A. There is a general decreasing trend in concentration for all constituents present in OB10.

Groundwater monitoring wells OB11, OB11A, OB12, OB015, and OB025 are located along the southern boundary (approximate cross-gradient) of the Landfill. MCL exceedances for seven constituents have been detected in the following monitoring wells between 2001 and 2009. In general, these wells show a trend of increasing volatile organic constituent concentrations.

- Vinyl Chloride was reported in all the monitoring wells greater than the MCL of 2 µg/L at concentrations ranging between 2.15 µg/L in OB025 (9/2006) and 20.30 µg/L in OB11 (9/2009). Concentrations are generally increasing in all wells except OB015, which is generally decreasing in concentration.
- 1,2-Dichloropropane has been reported historically in OB11, OB11A, and OB12 at concentrations greater than the MCL of 5 µg/L, ranging from 5.03 µg/L in OB11A (9/2006) to 10.71 in OB11A (3/2002). Concentrations in all three wells are generally consistent or generally increasing.
- PCE has been reported consistently greater than the MCL of 5 µg/L in OB11, OB11A, and OB12 at concentrations ranging from 5.03 µg/L in OB12 (4/2006) to 67.92 in OB11 (3/2009). Concentrations in all three wells are generally consistent or generally increasing.

- TCE has been reported historically in OB11, OB11A, and OB12 greater than the MCL of 5 µg/L, ranging from 6.22 µg/L in OB12 (3/2009) to 101.67 µg/L in OB11A (3/2002). Concentrations are generally consistent or generally increasing in these monitoring wells.
- Methylene chloride has been reported historically at concentrations greater than the MCL of 5 µg/L, ranging from 5.59 µg/L in OB11A (3/2008) to 52.22 in OB11A (3/2002). Concentrations in OB11 have a generally increasing trend; OB11A has a generally decreasing trend, and OB12 is generally consistent.
- Benzene has been reported historically above the MCL of 5 µg/L, ranging from 10.69 µg/L in OB11 (10/2007) to 5.66 µg/L in OB11A (4/2006). Concentrations of benzene have been generally consistent over time.
- Cis-1,2-dichloroethene has been reported historically in concentrations greater than the MCL of 70 µg/L in OB11 and OB11A, ranging from 86.72 µg/L in OB11A (4/2007) to 190 µg/L in OB11 (3/2009). Concentrations in both wells have a generally increasing trend.

Concentrations of contaminants are generally consistent or increasing in most of the wells surrounding the Landfill. The occurrence of dissolved TCE, cis-1,2-dichloroethene, and vinyl chloride (breakdown products of PCE) could be evidence of natural attenuation in the groundwater beneath and surrounding the landfill. Further investigation is necessary to determine the extent of dissolved phase constituents in the groundwater and any natural attenuation that may be occurring.

3.1.4 Groundwater Data Gaps

EA reviewed the analytical results for groundwater samples collected at the Landfill, dating back to 2001. Additionally, EA evaluated the existing monitoring well network, including available well construction documentation, and conducted a field inspection of the wells. Based upon the review, several data gaps exist related to the existing groundwater monitoring well network and are summarized below.

Groundwater Monitoring Well Locations and Construction

The current groundwater monitoring well network consists of 20 monitoring wells generally situated around the perimeter of the waste. The location of existing monitoring wells is indicated on the site plan shown in Figure 2-2. The lateral spacing between the wells ranges from 550 ft between wells along the southeast property boundary (OB08/OB08A and OB10) to 1,750 ft along the western boundary (OB02/OB02A and OB03/OB03A). The lateral well spacing is inconsistent and should be supplemented with additional locations around the perimeter of the site. Additional monitoring wells in the Derwood residential community are recommended in Section 4.2 to determine the extent of potential impacts to the west and northwest of OB03/OB03A. Additional wells are recommended around the perimeter of the Landfill to complete the delineation of potential offsite groundwater impacts from the Landfill.

During review of monitoring well construction documentation, well construction logs were not available for eight wells (OB06, OB10, OB11A, OB12, OB15, OB25, OB102, and OB105). Additionally, during the monitoring well field inspection, total depth measurements were significantly different than depths indicated on the construction logs for five monitoring wells (OB07, OB07A, OB08, OB08A, and OB11). Table 3-1 indicates which construction logs are missing, and which wells have conflicting total depth measurements.

As shown in Table 3-1, for wells with construction logs available, it appears that most or all of the 2-in.-diameter wells are screened significantly below the surface of the groundwater and all wells are screened below the interface where the unconsolidated sediments are in contact with consolidated bedrock. Screened intervals range from 26-76 ft bgs in OB07A to 104-154 ft bgs in OB03. Based on historical data, depth to groundwater at the site ranges from 0 to 25 ft bgs; therefore, screened intervals in the existing wells range from 20 ft below groundwater in OB01, OB02, and OB07A to 90 ft below groundwater in OB08A. Part 258 of the Code of Federal Regulations (CFR) for municipal solid waste landfills requires that groundwater sampling be conducted from the uppermost aquifer (nearest the natural ground surface). Water quality data collected from wells that intersect the surface of the groundwater are important to properly characterize potential non-aqueous contaminants that may be migrating along the groundwater surface (e.g., petroleum or other liquids lighter than water). Additionally, the saturated interface where the unconsolidated sediments are in contact with consolidated bedrock is important to characterize, as potential contaminants may be migrating along this interface prior to entering the bedrock fracture system.

3.2 SURFACE WATER

3.2.1 Topographic and Aerial Photography Review

Historical U.S. Geological Survey (USGS) topographic maps dated 1908, 1923, 1944, 1951, 1956, 1965, 1971, 1979, and 1984 and aerial photographs dated 1950, 1951, 1957, 1963, 1970, 1975, 1979, 1988, 1993-1996, 2005, and 2008 were reviewed for surface water background information. Surface water bodies in the vicinity of the Landfill include Crabbs Branch along the northeastern property boundary and Rock Creek east of the Landfill. Southlawn Branch and other un-named tributaries of Rock Creek are located south of Crabbs Branch and along the southern property boundary. The results of the topographic and aerial photography review are summarized in Section 3.6.

3.2.2 Surface Water Field Review

On 5 November 2009, EA conducted a field review of the five surface water sampling locations (ST015, ST065, ST070, ST080, and ST120). Photographs were taken of each location (Figure 4-2), and the sample location, including surface water flow direction, was described (Appendix F). Surface sampling locations were not previously marked; therefore, each location was staked and coordinates were recorded using a Trimble™ global positioning system (GPS) to ensure a consistent sampling location. Surface water is generally flowing from west to east toward Rock Creek.

ST070 is the only onsite surface water sampling location. During the field review of this location, fine white sediment was observed on the stream bottom. This sediment was not observed at the other surface water sampling locations. This location is downstream of several active industrial properties.

3.2.3 Surface Water Dissolved Phase Constituents (2001-Present)

The MCLs are criteria established by the U.S. EPA for protection of drinking water. These criteria have been used to determine the constituents of concern for this study. Historical data (2001-present) for the dissolved phase constituents for the five surface water sampling locations (Figure 4-2) are provided in Appendix D.

Surface water sample location ST065 is located beyond the northwest boundary (approximate cross-gradient to upgradient) of the Landfill. Three constituents were detected with concentrations above the MCL. Bis(2-ethylhexyl)phthalate was detected in September 2002 at a concentration of 30.81 µg/L. Total cyanide was detected in September 2006 at a concentration of 0.63 µg/L. TCE was most recently detected in March 2009 at a concentration of 7.13 µg/L. The concentrations of bis(2-ethylhexyl)phthalate, cyanide, and TCE have historically been non-detect during the other sampling events. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant and this could be the cause of this isolated constituent concentration.

Surface water sample location ST015 is located along the southwest boundary (approximate cross-gradient to upgradient) of the Landfill. Total Cyanide was detected above the MCL at a concentration of 0.47 µg/L in March 2004. Concentrations of cyanide are historically non-detect.

Surface water sample location ST120 is located along the northern boundary (approximate cross-gradient to upgradient) of the Landfill. Bis(2-ethylhexyl)phthalate was detected above the MCL at a concentration of 12.08 µg/L in March 2009. The concentrations of Bis(2-ethylhexyl) phthalate have historically been non-detect. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant and this could be the cause of this isolated constituent concentration.

Surface water sample location ST70 is located in the southeastern (downgradient) portion of the Landfill. Bis(2-ethylhexyl)phthalate was detected above the MCL between October 2007 and March 2008 at concentrations of 50.29 and 21.78 µg/L, respectively. Methylene chloride was detected in September 2001 at a concentration of 12.18 µg/L. The concentrations of Bis(2-ethylhexyl)phthalate and methylene chloride have historically been non-detect. Bis(2-ethylhexyl)phthalate and methylene chloride are a common laboratory contaminants and this could be the cause of this isolated constituents concentration.

Surface water sample location ST80 is located along the western boundary (downgradient) of the Landfill. Methylene chloride was detected above the MCL at a concentration of 5.23 µg/L in September 2009. The concentrations of methylene chloride have historically been non-detect. Methylene chloride is a common laboratory contaminant and this could be the cause of this isolated constituent concentration.

3.2.4 Surface Water Data Gaps

EA reviewed the analytical results for the surface water samples collected at the Landfill from 2001 to present. In addition, EA also conducted a field review of the surface water sampling locations. Based upon the review, several data gaps exist related to the existing surface water monitoring network. A summary of the surface water data gaps is included below.

Surface Water Historical Data Review

Review of the historical Montgomery County DEP semi-annual data indicated that generally each surface water location was sampled semi-annually for herbicides, pesticides, metals, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs). It was noted that the detection limit for bis(2-ethylhexyl)phthalate is greater than the MCL established by the U.S. EPA for that constituent. The detection limit set by the analytical laboratory should be less than the screening and regulatory criteria for future sampling events. Bis(2-ethylhexyl)phthalate and methylene chloride are a common laboratory contaminants and this could be the cause of this isolated constituent concentrations.

Surface Water Monitoring Locations

Five additional surface water monitoring locations are recommended as to provide additional data for the evaluation of potential surface water impacts from the Landfill. Surface water sampling locations are recommended immediately downstream of the stormwater outfalls adjacent to OB08/OB08A and OB11/OB11A. These sampling locations are near other industrial sources on Southlawn Lane, which may impact the water quality sampled in stormwater outfalls. A third location is recommended upstream of current sampling location ST065. TCE was historically reported at ST065. This additional surface water sampling location will be used to evaluate whether the concentrations increase with proximity to the Landfill. Two additional locations are recommended in two separate ponds at the northern corner of the Landfill property to evaluate potential surface water impacts within the Landfill property.

3.3 LEACHATE SEEPS

3.3.1 Leachate Seep Chronology

Precipitation reaching the landfill surface can evaporate, transpire, infiltrate through the landfill surface, or leave the site as surface runoff. When an adequate amount of precipitation penetrates the landfill surface and comes into contact with waste leachate is generated. The volume of leachate generated and migrating from the landfill depends upon such factors as landfill surface conditions, volume of water percolating through the waste, refuse conditions, and underlying soil conditions.

The Landfill has neither a liner nor a cap to control the generation or migration of leachate. Therefore, leachate is produced and enters groundwater or seeps out of the surface of the Landfill, particularly along side slopes and at lower points in the Landfill where the slope significantly changes. According to County personnel, the Landfill has historically exhibited several areas where leachate seeps have formed and have been repaired

An MDE inspector visited the Landfill on 8 July 2009 at the behest of the GLCC to investigate seven potential leachate outbreaks near the northwest boundary of the Landfill. The MDE inspector located all seven areas, took pictures, provided written descriptions, and advised the County on follow-up actions for each area. The MDE inspector's main purpose during the inspection was to differentiate between stormwater flowing off of the Landfill and leachate outbreaks.

3.3.2 Potential Groundwater and Surface Water Impacts

Typical landfill leachate contains heavy metals, VOCs, and ammonia. Leachate seeps comingle with stormwater during rainfall events at the site. The stormwater runoff could then, if flow from the seeps is significant, convey leachate to nearby surface water bodies and potentially impact surface water quality. Stormwater runoff can also convey the leachate to flat or ponded areas where the leachate could potentially infiltrate into groundwater and impact groundwater quality.

3.3.3 Leachate Seep Data Gaps

In order to characterize the composition of the leachate that is discharging from the Landfill, analytical testing of five leachate seeps was performed by the DSWS near the gas pipeline right-of-way on the northwest boundary of the Landfill on 16 July 2009. In addition to the five seeps, two springs, S1 and S2 (as referred to by DEP/DSWS), located in the gas pipeline right-of-way, were sampled by the DSWS on 8 July 2009. Results from the sampling show that S1 and S2 are the only seeps to have MCL exceedances. These seeps are the furthest away from the Landfill. S1 exceeded the MCL for mercury at 0.00419 mg/L and S2 exceeded the MCL action level for lead at 0.0364 mg/L. Some VOCs were detected in the other seeps that were sampled, but no MCL exceedances occurred.

Further evaluation and mitigation of seeps is ongoing by the County as a separate initiative. Data collected to date is sufficient for the study plan. Therefore, additional sampling is not included in this study plan.

3.4 STORMWATER

3.4.1 Stormwater Data Review

EA reviewed drawings prepared by SCS Engineers (SCS) titled "Gude Landfill Post Closure Engineering Design and Management Tasks," dated 1992. These drawings were provided by the County for location and evaluation of the existing stormwater management structures at the Landfill. EA created a pre-inspection inventory list of existing site stormwater management infrastructure, which identified more than 90 stormwater management devices from the SCS documents. The inventory included swales, berms, inlet structures, outlet structures, culverts, detention ponds, and sediment basins.

3.4.2 Stormwater Field Review

The pre-inspection inventory list was used to establish the baseline condition for comparison with stormwater structures identified during the field review. Structures were located and visually inspected in the field to assess the integrity of the structure, and indentify any impediments to the structure functioning properly.

EA performed the field review of the stormwater structures at the site on 5 November 2009, with a supplementary review conducted on 11 November 2009. Many of the structures identified in the pre-inspection inventory were located and assessed; however, approximately 12 stormwater management structures identified in the pre-inspection inventory could not be located. Additional structures not identified in the pre-inspection inventory list were also located in the field. A total of 103 stormwater management structures were located and assessed in the field. A Stormwater Structure Map is included as Figure 3-2 and indicates the location of the inspected structures. Individual inspection forms detailing each structure identified were prepared and are included in Appendix G.

In general, most of the structures appeared to function as intended; however, the structures did not appear to be receiving regular maintenance. In addition, the Landfill was heavily overgrown with vegetation, which was impacting the operations of many of the stormwater management structures.

3.4.3 Drainage Map

EA developed a drainage area map (Figure 3-3) for the site based upon current topography and as-built drainage infrastructure information. These boundaries indicate the catchment areas and flow directions for surface runoff from the cap. The drainage area boundaries were delineated based upon the contours and surface features collected in the 2009 survey. Boundaries were truncated at the property boundary or were terminated where no topography was collected. Drainage areas were also delineated to drainage structures where contours indicated flow concentrations. In other circumstances where contours did not clearly define a drainage feature, such as a ditch or graded bench, a boundary was interpreted based upon features shown in the design drawings entitled "Gude Landfill Post Closure Engineering Design and Management Tasks" prepared by SCS Engineers and dated 22 June 1992. Some drainage areas on the cap are captured and conveyed by storm drains that then discharge further downgradient at the Landfill perimeter or into another drainage area. Areas where runoff is conveyed by drainage infrastructure are indicated by a bold arrow.

3.4.4 Stormwater Data Gaps

EA reviewed drawings prepared by SCS Engineers and compiled a pre-inspection inventory of stormwater structures. In addition, EA conducted the field review of stormwater structures. Based upon the comparison of the pre-inspection inventory and the field review, EA did not identify additional data gaps in the stormwater network at the Landfill.

3.5 LANDFILL GAS

LFG has been collected at the site and has been primarily utilized as an energy source since 1984. The system currently consists of a series of vertical gas extraction wells (approximately 51 vertical gas extraction wells that are located throughout the Landfill and 33 vertical gas extraction wells that are located on the northwest property boundary) and 7 permanent LFG monitoring wells (W-03 through W-09), which are located along the northwest property boundary (Figure 3-4). The vertical extraction wells are connected by above-grade horizontal conveyance piping, which conveys LFG to the recently upgraded landfill gas-to-energy facility and flare station. Both the gas-to-energy facility and the flare station are used continuously for gas management. LFG is primarily composed of methane and carbon dioxide. Methane is a highly combustible gas, with a lower explosive limit (LEL) of 5 percent by volume and an upper explosive limit (UEL) of 15 percent by volume. Therefore, at ambient conditions, air composed of methane between the LEL and the UEL creates an explosive condition. Therefore, the collection and monitoring of LFG is regulated.

3.5.1 Landfill Gas Monitoring Data (2005-Present)

In April 2005, the County's LFG consultant installed twenty temporary gas monitoring wells along the western edge of the gas pipeline right-of-way adjacent to the Derwood Station South residential development. These temporary wells were monitored weekly by the County, and high methane concentrations were identified in a group of six wells. The County mitigated the gas migration problem by installing additional gas extraction wells along the northwest slope of the landfill and installing a ground flare station that was more reliable than the older engines which were being retired. The temporary probes were later removed at the request of the gas companies.

The County notified homeowners of the potential risk of methane entering their homes in May 2005 and also performed monitoring within homes. In June 2005 the County offered to install methane detection systems within the homes adjacent to the gas pipeline right-of-way. A dozen residents allowed the County to install the methane monitors within their home. There have been no reported detections in the residents' homes.

LFG has been monitored at each of the seven monitoring wells on a weekly basis since their installation in September/October 2005. Each monitoring well consists of a series of probes set to depths considered to be shallow (10 to15 ft), intermediate (23 to 28 ft), and deep (33 to 38 ft). At the time of installation, it was believed that waste was placed 10 to15 ft from the property boundary in this area. Waste was delineated along the northwest property boundary in August 2009. The waste delineation illustrated that waste is located in shallow depths up to and in some areas slightly beyond the property boundary. Therefore, at a minimum, all of the shallow probes are likely placed already within waste areas likely to have the potential to provide LFG measurements that exceed the Code of Maryland Regulations (COMAR) 26.04.07 compliance limit of 5 percent by volume (the LEL) of methane at the Landfill property boundary.

Initial readings (Table 3-3) recorded from the permanent LFG monitoring wells in 2005 and early 2006 are representative of LFG monitoring wells placed within waste, with readings ranging from 52 to 66 percent methane by volume in the shallow monitoring wells. Beginning in 2006 and continuing through 2008, several series of extraction wells were added along the northwest side of the property in an attempt to reduce LFG migration and maintain compliance at the property boundary.

Since the completion of the most recent extraction wells in 2008, methane has continued to periodically exceed the compliance limit at W-03, W-05, and W-06. The County's LFG consultant is currently managing the compliance issue by making adjustments to the well field as required. More recent methane concentrations are shown in Table 3-4.

Table 3-3. Initial Methane Concentrations

October 2005 Through January 2006 Methane Concentration – % by Volume			
LFG Monitoring Well No.	**Average**	**Max.**	**Min.**
3S	60.4	66.2	57.1
4S	60.7	66.6	58.0
5S	60.0	62.9	57.9
6S	60.0	63.4	57.7
7S	60.2	64.5	57.5
8S	60.6	63.8	58.2
9S	58.1	61.0	52.8
3I	47.8	65.4	15.8
4I	59.3	62.5	53.1
5I	61.1	64.9	58.4
6I	58.9	61.2	56.5
7I	59.6	62.9	57.4
8I	55.4	64.4	23.6
9I	52.8	60.0	32.9
3D	5.7	39.5	1.3
4D	24.1	63.4	10.0
5D	60.0	63.2	57.1
6D	59.0	61.7	57.0
8D	9.5	22.0	0.7
9D	52.1	60.4	3.3

S = Shallow, I = Intermediate, D = Deep Depth

Table 3-4. Current Methane Concentrations

January 2009 Through November 2009 Methane Concentration – % by Volume			
LFG Monitoring Well No.	**Average**	**Max.**	**Min.**
3S	5.7	62.2	0.0
4S	0.0	0.0	0.0
5S	2.1	20.1	0.0
6S	2.1	21.5	0.0
7S	3.0	58.0	0.0
8S	0.1	3.3	0.0
9S	0.0	0.2	0.0
3I	0.0	0.6	0.0
4I	0.0	0.0	0.0
5I	1.2	33.1	0.0
6I	2.6	21.7	0.0
7I	1.6	57.7	0.0
8I	0.0	0.3	0.0
9I	0.0	0.1	0.0
3D	0.3	10.0	0.0
4D	0.0	0.0	0.0
5D	0.0	0.7	0.0
6D	1.6	20.5	0.0
8D	0.0	0.4	0.0
9D	0.0	0.2	0.0

S = Shallow, I = Intermediate, D = Deep Depth

3.5.2 Landfill Gas Monitoring Well Installation

As a measure of compliance, additional LFG monitoring wells are proposed along the remaining portion of the site property boundary. The County is pursuing this as a separate initiative, so LFG monitoring activities are not included in this study plan. In March 2009, the County's LFG consultant performed an LFG bar punch survey along the property boundary and in areas on the MNCPPC property where waste extends offsite. Based on the bar punch survey; it is likely that the newly installed LFG monitoring wells along the northwest and western property boundary will have readings that exceed the regulatory compliance limits. Based on the recent waste delineation, it was concluded that waste was placed offsite, onto MNCPPC property along the northwest property boundary. LFG wells placed along the property boundary in this area will most likely result in high methane readings (i.e., greater than 5 percent by volume) because the wells would be directly in waste. At the time of this report, the County had met with MDE to discuss the placement of permanent LFG monitoring wells in this area.

3.5.3 Landfill Gas Data Gaps

LFG is primarily composed of methane gas, which is explosive in the range of 5 to 15 percent by volume. Subsurface migration of LFG is common and gas can potentially enter homes and confined spaces through openings in structures and utility lines, causing the potential for an explosion hazard. However, there have been no cases of LFG migration into homes adjacent to the Gude Landfill. As evidenced by the investigation performed in 2005, LFG migration was occurring from the Landfill into and beyond the gas pipeline right-of-way, prior to the installation of additional extraction wells along the area of concern. These improvements have resulted in a reduction of the gas migration issues.

Areas of potential human risk include the homeowners adjacent to the gas pipeline right-of-way and Montgomery County Men's Shelter located on the Landfill property. Per the February 2009 LFG Monitoring Plan prepared by Montgomery County DEP/DSWS, methane monitors were to be placed in all onsite structures, including the Men's Shelter.

The following tasks are recommended as part of the Nature and Extent Study Plan:

- Methane detector installation documents should be reviewed, and structures with methane detectors installed should be identified on a figure with the current LFG monitoring network.
- The frequency of methane monitor calibration should be determined and reviewed.

3.6 TOPOGRAPHY

3.6.1 Site Survey and Aerial Photography Review

Site Survey

As an initial phase to the Nature and Extent Study (Phase 0), aerial and supplemental field surveys were performed to provide a site survey (Figure 3-5). Topography was compiled by Applied Mapping Solutions, Inc. using photogrammetric methods with photography dated 24 June 2009. The mapping was compiled to meet 100 scale and 2-ft contours per national map accuracy standards. Targets for the aerial survey and the additional field survey of site features were performed by C.C. Johnson and Malhotra, P.C. (CCJM). Field survey site features that were captured as part of the field survey include:

- Topography of open drainage features including benches, swales, downchutes, and ponds.
- Horizontal location and inverts of culverts, storm drains, and pond risers.
- Horizontal location, top of casing elevation, and ground surface elevation of existing groundwater (approximately 20) and LFG (approximately 7) monitoring wells.
- Horizontal location and ground surface elevation of all existing gas extraction wells and landfill conveyance piping.
- Horizontal location and elevation of LFG header pipe junctions.
- Horizontal location and ground surface elevation of building corners and fence line for flare station and power plant.

Topographic Map and Aerial Photography Review

Historical USGS topographic maps dated 1908, 1923, 1944, 1951, 1956, 1965, 1971, 1979, and 1984 and aerial photographs dated 1950, 1951, 1957, 1963, 1970, 1975, 1979, 1988, 1993-1996, 2005, and 2008 were reviewed as part of this assessment. Copies of the topographic maps and aerial photographs are presented in Appendix E. Observations made from the reviewed topographic maps and aerial photographs are summarized in Tables 3-5 and 3-6.

Table 3-5: Topographic Map Review Summary

Date	Source	Subject Site	Adjacent Properties
1908	Environmental Data Resources (EDR) – USGS	The subject site is located in a generally undeveloped area north of the city of Rockville. Crabbs Branch flows through the northeast corner of the subject site. Another stream appears along the southern boundary and flows into rock creek.	The adjacent properties are generally undeveloped with few residential structures. Crabbs Branch, Rock Creek, and a tributary border the subject site to the north, east, and south.
1923	EDR – USGS	Subject site appears as it does in 1908.	Adjacent properties appear as they do in 1908.
1944	EDR – USGS	Subject site appears as it does in 1923.	Adjacent properties appear as they do in 1923.
1951	EDR – USGS	Subject site appears as it does in 1944.	Adjacent properties appear as they do in 1944.
1956	EDR – USGS	Subject site appears as it does in 1951.	Adjacent properties appear as they do in 1951. Southlawn Lane appears to the southeast of the site with several structures along the road.
1965	EDR – USGS	The surface water on the subject site appears as it does in 1956. The subject site contains a large building in the central portion of the site along with two other smaller buildings in the southern portion. Incinerator Lane leads onsite from Southlawn Lane.	Adjacent properties appear as they do in 1956 with the addition of Lake Needwood to the northeast.
1971	EDR – USGS	The surface water on the subject site appears as it does in 1965. The subject site appears with the addition of the incinerator building and another smaller building in the central portion of the site.	Adjacent properties appear as they do in 1965 with fewer buildings along Southlawn Lane at the southeast boundary of the subject site.
1979	EDR – USGS	Subject site appears as it does in 1971.	Adjacent properties appear as they do in 1971.
1984	EDR – USGS	The surface water on the subject site appears as it does in 1979. The subject site appears as it does in 1979 with the addition of two small buildings at the subject site entrance.	Adjacent properties appear as they do in 1971 with the addition of two buildings along the southern border of the subject site.

Table 3-6: Aerial Photograph Review Summary

Date	Source	Subject Site	Adjacent Properties
1950	EDR	The subject site appears to be a mix of farmland and wooded areas. Crabbs Branch flows through the northeast corner of the subject site. Another stream appears along the southern boundary and flows into rock creek.	Adjacent properties are a mix of farmland and wooded areas. Crabbs Branch, Rock Creek, and a tributary border the subject site to the north, east, and south.
1951	Montgomery County	The subject site appears as it does in 1950.	The adjacent properties appear as they do in 1950.
1957	EDR	The subject site appears as it does in 1951 with the addition of residential building in the southern portion and southwest corner of the site.	The adjacent properties appear as they do in 1951 with the addition of several residential buildings along Southlawn Lane.
1963	EDR/ Montgomery County	The subject appears as it does in 1957 with the addition of Incinerator Lane and excavation activities along the northern and eastern sections of the site.	The adjacent properties appear as they do in 1957.
1970	EDR	The subject site appears to have undergone major excavation and grading activities throughout the site. Three large buildings appear onsite along with several large storage areas, possibly for landfill equipment. Landfill activities appear to have extended off the subject site along the eastern boundary of the site.	The adjacent properties appear as they do in 1963 with the addition of Lake Needwood to the northeast.
1975	EDR	The subject site appears as it does in 1970 with the extension of excavation and grading activities in the southeastern and southwestern portions of the site. Construction of a stormwater management pond is also observed in the southwest corner of the subject site. Landfill activities continue outside the subject site boundary along the eastern side.	The adjacent properties appear as they do in 1970 with the addition of the wastewater treatment plant along the southern boundary of the subject site.
1979	EDR	The subject site appears as it does in 1975.	The adjacent properties appear as they do in 1963 with the addition of several buildings along the western boundary of the subject site.

Date	Source	Subject Site	Adjacent Properties
1988	EDR	Excavation activities appear to be complete on the subject site and the stormwater retention pond appears to be filled in (possibly soil). The subject site no longer contains the three large buildings in the central portion of the site. Three buildings appear in the southwest corner of the subject site.	The adjacent properties along Southlawn Lane appear to be heavily populated with industrial buildings. Industrial and commercial properties appear along Gude Drive. A residential neighborhood appears along the northwest boundary of the subject site.
1993-1996	EDR/ Montgomery County	The subject site appears as it does in 1988 with the addition of a fourth building in the southwest corner of the subject site.	The adjacent properties appear as they do in 1988.
2005	EDR	The subject site appears as it does in 1996.	The adjacent properties appear as they do in 1988 with the addition of a golf course along the northern boundary.
2008	EDR	The subject site appears as it does in 2005.	The adjacent properties appear as they do in 2005.

3.6.2 Waste Delineation

As part of Phase 0, EA performed a waste delineation study to locate the approximate horizontal extent of waste at the Landfill. It was determined that waste was generally placed within the Landfill property boundary in most locations, as shown in Figure 3-6. Waste was placed beyond the property boundary along the MNCPPC property boundary to the north and east of the Landfill, with the limit of waste approximately 200 to 250 ft from the Landfill property boundary. Surficial waste was found along the gas pipeline right of way and the Washington Suburban Sanitary Commission (WSSC) property boundary with the Landfill.

The Waste Delineation Report was referenced during the identification of groundwater well locations on the MNCPPC property to the north and east of the Landfill.

3.6.3 Settlement Analysis

Overview

Due to decomposition of trash, settlement at closed landfills can occur for decades after the last load of trash is received. Settlement also can be a result of compaction of void spaces in the trash. While compactors are typically used to compress trash at the time of placement in order to maximize landfill capacity, void spaces still occur in many trash layers.

To estimate settlement that has occurred at the Landfill, topographic surveys from two different dates were compared. The base survey is from an aerial survey dated 28 February 2007 performed by Axis Geospatial, LLC. The comparison survey is from an aerial survey dated 24 June 2009 performed by Applied Mapping Solutions, and supplemented by field survey in October 2009 performed by CCJM.

Analysis

Only the semi-flat crown of the Landfill was assessed for settlement (86.3 acres of the total 160 acres) because a majority of the side slopes of the Landfill were obscured from aerial photogrammetry in 2009 by heavy vegetation. The accuracy of aerial surveys is typically ±1 ft; therefore, the accuracy of this settlement analysis is ±1 ft. In general, areas showing between 1 ft of settlement and 1 ft of swell may not have changed significantly. Therefore, approximately 70 percent (60.8 acres of the 86.3 acres analyzed) of the Landfill has not changed significantly. If the Landfill had been left idle since closure, a majority would be expected to settle; however, portions of the Landfill have been used for soil stockpiling and have therefore increased in elevation considerably (refer to Area B, figure west, on Figure 3-7). Grading along the access road relating to construction of the LFG collection system has taken place, which has also raised the ground elevation slightly.

In summation, 17.9 acres (21 percent of the total acreage analyzed) experienced settlement from a low of -1 ft to an upper limit of -13.2 ft. Of the 17.9 acres, 0.5 acres (3 percent) experienced settlement from -3 ft to -13.2 ft, and 17.4 acres (97 percent) experienced settlement from -1 ft to -3 ft. Areas that have settled are depicted in “cool” colors (i.e., blue and green) on Figure 3-7.

Of the total 86.3 acres analyzed, 7.6 acres (9 percent) of the Landfill increased in elevation when comparing the 2009 survey to the 2007 survey. Elevation increases ranged from +1.0 ft to +10.1 ft. Of the 7.6 acres, 1.3 acres (17 percent) increased in elevation from +3 ft to +10.1 ft, and 6.30 acres (83 percent) increased in elevation from +1 ft to +3 ft. Areas that have increased in elevation are depicted in “warm” colors (i.e., red and yellow) on Figure 3-7. The largest increase in elevation took place where DEP/DSWS stockpiled soil since the 2007 survey. This area is depicted in Figure 3-7 as Area B (figure east). One particular large area appears to have settled; however, it is actually the former location of a large soil stockpile that has since been used onsite. This area is depicted as Area A in Figure 3-7.

3.6.4 Topographic Data Gaps

Historical aerial and topographic data were reviewed dating back to the 1950s and appeared to be adequate to discern the sequence of activities that occurred at the Landfill. The site survey is currently in draft form and any data that was not captured will be addressed as part of the Phase 0 scope of work and not as part of this study plan.

3.7 SUMMARY OF HISTORICAL DATA AND FIELD REVIEW

Based on EA's review of historical data and a field review of current conditions, several data gaps and areas for additional investigation were identified. The proposed study plan presented in Section 4 is designed to address those data gaps and complete additional investigative activities to thoroughly evaluate the nature and extent of potential contaminants at the Landfill. A Summary of Historical Data and Field Review is provided as Table 3-7.

3.8 INVESTIGATION OF PROTECTED RESOURCES

As part of the preliminary site assessment for the project site, EA performed a wetland delineation and forest stand delineation in an effort to document and map the existing natural resources onsite. The complete Forest Stand Delineation and Wetland Delineation Reports are provided in Appendices I and J, respectively, and summarized in the following sections.

3.8.1 Wetland Delineation

EA performed a wetland delineation to evaluate the presence and extent of wetlands/waterways with respect to federal and state jurisdictional authority for the project site and based its evaluation on the United States Army Corps of Engineers' (USACE) definition of "waters of the United States," and "navigable waters of the U.S.," which are defined in 33 CFR Parts 328 and 329. EA employed the three-parameter approach set forth in the *Corps of Engineers Wetland Delineation Manual, Technical Report Y-87-01* (1987) as a reference for delineating wetlands.

On 28 and 30 October, as well as 2 November 2009, EA personnel conducted an onsite review of the project site for the presence of jurisdictional wetlands and waterways. A total of three wetlands and three stream channels were identified within the areas of review. In addition, EA identified multiple ponds that appeared to be previously used as stormwater management ponds or sediment basins. However, these ponds were contained within chain-link fences and not accessible during the field review, and could not be flagged in the field. Therefore, these areas

TABLE 3-7
SUMMARY OF HISTORICAL DATA AND FIELD REVIEW
600 EAST GUDE DRIVE, ROCKVILLE, MARYLAND 20850

Data Set Reviewed	Review Methodology	Results	Proposed Study Plan
Groundwater	Well construction logs and historical groundwater monitoring data were reviewed for the existing groundwater monitoring wells at the Gude Landfill. EA conducted a field assessment of the existing monitoring wells at the Landfill. The field inspection consisted of an evaluation of surface completion components and collection of total depth and water quality measurements at each well. For the purpose of groundwater flow evaluation, EA measured the depth to groundwater in the 20 existing monitoring wells and prepared a contoured groundwater elevation map depicting flow direction and gradient. EA reviewed historical data from 2001-present for the dissolved phase constituents reported in samples collected from the 20 existing groundwater monitoring wells.	Well construction logs are missing or indicate inconsistent data for 13 existing monitoring wells. The lateral well spacing is inconsistent and should be supplemented with additional locations around the perimeter of the site. Additional monitoring well locations in the Derwood residential community are recommended to determine the extent of potential impacts to the west and northwest of OB03/OB03A. Additional well locations are recommended around the perimeter of the Landfill to complete the delineation of potential offsite groundwater impacts from the Landfill. Considering that the existing monitoring wells are located primarily around the Landfill perimeter, conditions beneath the Landfill and further outside the perimeter of the waste are unknown. Data collection borings are recommended within the interior of the Landfill to evaluate potential groundwater mounding conditions and dissolved concentrations beneath the Landfill. Additionally, groundwater monitoring wells located further outside the Landfill perimeter are recommended to provide more information on regional groundwater elevations and flow direction(s).	• EA recommends some minor well repairs, redevelopment of two existing monitoring wells and downhole video inspection of 13 existing monitoring wells to determine their construction. • 17 additional groundwater monitoring wells are proposed to 1) obtain groundwater elevation data at or beyond the Landfill property boundary in areas that are not currently measured by existing groundwater wells; 2) to obtain new groundwater samples and chemical constituent data that can be used to assess the integrity of existing groundwater monitoring wells that are reported to have the highest historical concentrations; 3) to prepare an accurate potentiometric map to delineate groundwater elevation and flow direction; and 4) to identify the extent and potential routes of migration for chemical constituents from the Landfill waste disposal footprint in the groundwater. • After the installation and development of the new wells, groundwater sampling events will be conducted at the 17 new wells and borings and 20 existing groundwater monitoring wells.
Surface Water	EA reviewed historical data from 2001-present for the dissolved phase constituents reported in samples collected from five surface water sample locations. EA conducted a field inspection of the existing surface water locations. The surface water location inspection consisted of staking each sampling location and recording the position with a GPS, noting a description of where sampling is conducted, stream condition, and stream flow direction.	Additional surface water sampling locations are recommended to complete the evaluation of potential surface water impacts from the Landfill.	• Sampling events at the 5 existing and 5 additional surface water sampling locations are proposed to provide additional data for the evaluation of potential surface water impacts from the Landfill. Surface water sampling locations are recommended immediately downstream of the stormwater outfalls adjacent to OB08/OB08A and OB11/OB11A. These sampling locations will be used to evaluate whether the stormwater outfalls have an adverse effect on the surface water. A third location is recommended upstream of current sampling location ST065. TCE was historically reported at ST065. This additional surface water sampling location will be used to evaluate whether the concentrations increase with proximity to the Landfill. Two additional locations are recommended in two separate ponds at the northern corner of the Landfill property to evaluate potential surface water impacts within the Landfill property.
Surface Soil	No historical surface soil sampling data was available for review.	Surface soil sampling locations are recommended to assess the condition of surface soil along the Derwood Station South property boundary, in the northern portion of the site, near the men's shelter, and near the model airplane flying area.	• 11 surface soil samples are proposed to assess the condition of surface soil along the Derwood Station South property boundary, in the northern portion of the site, near the men's shelter, and near the model airplane flying area.
Leachate Seeps	A review was performed of photos and a memo summarizing repairs to leachate seeps performed during the Spring of 2009. Additionally, a field review was performed by EA with County personnel on 11/5/09 and the location of historical seeps and seeps identified at the time of the inspection were recorded with GPS. Following the field review, the County provided copies of an inspection performed by MDE on 7/8/09 which identified seven AOCs and analytical results of these areas and two springs with orange precipitate were sampled in July of 2009 following the inspection.	Leachate seeps are concentrated along the northwest slope of the Landfill. The AOCs and two springs with orange precipitate were sampled and resulted in low concentrations of VOCs in the AOC and spring samples and two occurences of metals above MCLs in the spring samples.	• Based on recent communication with MDE, the County will continue to repair leachate seeps as they occur onsite. Existing data appears sufficient at this time to infer risk associated with the springs located to the northwest of the landfill in the gas-line right-of-way. The Study Plan does not propose additional data to be collected at this time.

TABLE 3-7
SUMMARY OF HISTORICAL DATA AND FIELD REVIEW
600 EAST GUDE DRIVE, ROCKVILLE, MARYLAND 20850

Data Set Reviewed	Review Methodology	Results	Proposed Study Plan
Stormwater	The Gude Landfill Post Closure Engineering Design and Management Tasks by SCS Engineers, dated 1992, were reviewed and an inventory list of existing site stormwater management infrastructure was created. The stormwater management infrastructure that was included in the inventory included swales and stormwater control structures. Each structure was visually inspected in the field and compared to the available as-built drawings in November 2009. An inspection form and photo was completed for each structure. Many of the structures identified in the pre-inspection inventory were located and assessed; however, approximately 12 stormwater management structures identified in the pre-inspection inventory could not be located. Additional structures not identified in the pre-inspection inventory list were also located in the field. A total of 103 stormwater management structures were located and assessed in the field.	In general, most of the structures appeared to function as intended; however, the structures did not appear to be receiving regular maintenance. In addition, the Landfill was heavily overgrown with vegetation, which was impacting the operations of many of the stormwater management structures.	• No additional data is required for the Study Plan.
Landfill Gas	Historical landfill gas data, monitoring locations and a chronology of the landfill gas management system dating back to 2005 were reviewed. Additionally, the location plan of proposed landfill gas monitoring wells was reviewed.	Detections of methane over than the LEL (5% by volume for methane) continue to occur at several locations along the northwest property boundary. The County and their landfill gas consultant met with MDE to discuss the placement of permanent monitoring probes along the site boundary.	• Installation documents should be reviewed, and structures with methane detectors installed should be identified on a figure with the current LFG monitoring network. • The frequency of methane monitor calibration should be determined and reviewed.
Topography	**Survey -** An aerial and supplemental field survey were performed as an earlier phase of the Nature and Extent Study. **Document Review -** Historical aerial photos and topographic maps were obtained and reviewed dating back to 1950. **Waste Delineation Study -** EA performed a waste delineation study to locate the approximate horizontal extent of waste at the Landfill. **Settlement Analysis -** The aerial survey performed in 2009 was compared to a survey performed in 2007 to determine any significant settlement that may have occurred.	**Survey -** The supplemental field survey is in the process of being finalized. **Document Review -** The documents reviewed illustrated that between 1963 and 1970 landfill activities extended beyond the County property on to M-NCPPC property. **Waste Delineation Study -** The waste delineation confirmed the document review and delineated the waste on M-NCPPC property. **Settlement Analysis -** Changes in elevation were identified as being mainly due to grading and stockpiling activities, not settlement.	• The site survey is currently in draft form and any data that was not captured will be addressed as part of the Phase 0 scope of work and not as part of this Study Plan.

Notes:
GPS = Global Positioning System
TCE = Trichloroethylene
AOC = Area of Concern
VOC = Volatile Organic Compound
MCL = Maximum Contaminant Level
LFG = Landfill Gas
LEL = Lower Explosive Limit
MDE = Maryland Department of the Environment
M-NCPPC = Maryland-National Capital Park and Planning Commission

were approximated on the *Wetland Delineation Plan* based on the topographic contours. Five separate "ponds" were identified during the review; however, only two of the ponds were included in the delineation as the other three ponds were either considered non-jurisdictional or located outside of the area of review for the wetland delineation.

Table 3-8: Wetland Delineation Results

Delineated Feature	Resource	Significant Nexus Determination	Dimensions
Stream Channel #1	Perennial stream	RPW (year round)	372.25 l.f.
Stream Channel #2	Perennial stream	RPW (year round)	5,112.42 l.f.
Stream Channel #3	Ephemeral stream	Non-RPW	193.36 l.f.
Wetland System A / Pond #2	Emergent wetland	Abutting RPW	1,936.13 s.f. / 0.45 ac.
Wetland System B	Emergent/Forested wetland	Abutting RPW	7,535.26 s.f. / 0.17 ac.
Wetland System C	Emergent wetland	Adjacent RPW	1,342.46 s.f. / 0.03 ac.
Pond #4	Open Water Pond w/ potential emergent wetland	Adjacent RPW	6,303.30 s.f. / 0.15 ac. **

** Approximate area determined from topography and aerial photography.

The features identified in Table 3-8, in EA's opinion, either exhibited characteristics of "waters of the U.S." or all three wetland parameters as defined in the 1987 Manual. Therefore, these areas were flagged in the field and are identified on the *Wetland Delineation Plan*.

Furthermore, the Landfill property contains an extensive system of drainage swales, inlets, pipes, and roadside ditches throughout the cleared portion of the site. EA personnel did not flag the roadside ditches or drainage swales within the cleared area of the Landfill, and it is EA's professional opinion that these areas are not jurisdictional. These features appear to have been created as part of the stormwater management and sediment control practices for the Landfill and appear to have been constructed through upland conditions to promote interior drainage for the Landfill. The existing drainage swales and roadside ditches did not possess an Ordinary High Water Mark (OHWM), defined bed, or bank, nor were they part of a natural watershed. Regulatory jurisdiction typically does not extend to swales or erosional features (e.g., gullies, small washes with low volume, infrequent or short duration flow). Upland ditches (including roadside ditches) excavated wholly in and draining only uplands are generally not considered jurisdictional unless there is a surface water connection between an adjacent wetland and a Relatively Permanent Water (RPW).

It is important to note that USACE is the federal agency that determines the official jurisdictional status of wetlands/waterways. Furthermore, MDE can regulate wetlands/waterways considered non-jurisdictional by USACE. To determine whether USACE or MDE will take jurisdiction over any areas of the subject property, a Jurisdictional Determination request should be submitted jointly to these agencies.

3.8.2 Forest Stand Delineation

EA conducted a Forest Stand Delineation (FSD) on October 27 and 29 2009 following guidelines of the State Forest Conservation Technical Manual (Third edition, 1997). Four forest stands were identified within the area of review, predominantly along the perimeter of the Landfill. The cover types were red maple/tulip poplar, oak/hickory, red maple, and red cedar/black locust. Stand variations resulted from changes in topographic position, degree of slope, and amount and type of historical human disturbance. Four specimen trees (white oak [two], scarlet oak, and tulip poplar) were located within the area of review, specifically within Forest Stands 1 and 2. The site contains wetlands, streams, and steep slopes. Invasive species were present in each of the delineated stands but occurred at higher percent coverage in disturbed or regrowth stands (Forest Stands 3 and 4) located on the Landfill. Stands 1 and 2 were ranked as priority retention areas.

Table 3-9: Forest Stand Summaries

Forest Stand	Cover Type	Size of Stand	Notes
Stand #1	Red maple, tulip poplar	4.01 ac.	Specimen trees, wetlands, and streams present
Stand #2	Oak & hickory spp.	32.82 ac.	Specimen trees, wetlands, and streams present
Stand #3	Red maple	5.57 ac.	High % invasive spp.
Stand #4	Red cedar, Black locust	15.48 ac.	High % invasive spp.

In addition to the FSD, EA completed written inquiries to the U.S Fish and Wildlife Service (USFWS), and Maryland Department of Natural Resources (MD-DNR), regarding whether they are aware of any records of rare, threatened, or endangered species present within the project boundary. EA also completed a written inquiry to the Office of Preservation and Compliance, Maryland Historical Trust (MHT) to determine whether there are known occurrences of historical, cultural, and/or archaeological sites/features present at the site. USFWS and MD-DNR have determined that no state or federal records exist for rare, threatened, or endangered species within the project area that could be impacted by the project. Furthermore, MHT has determined that there are no records regarding the presence of cultural, archaeological, or historic resources within the project area that may be affected by remedial activities.

SECTION 4. PROPOSED STUDY PLAN

4.1 HEALTH AND SAFETY PLAN UPDATE

The Site-Specific Health and Safety Plan Addendum developed during the Waste Delineation Study will be reviewed and updated to include the scope of work and associated hazards proposed in this Study Plan. The hazard analysis will be updated to include hazards associated with monitoring well installation; handling of investigative-derived waste; soil, groundwater, and surface water sampling; and surveying. Emergency contact information, protective equipment requirements, and monitoring and decontamination procedures will be updated accordingly. The Site-Specific Health and Safety Plan Addendum will be updated and reviewed by involved personnel prior to initiating field activities proposed in this study plan.

4.2 GROUNDWATER

4.2.1 Permitting, Utility Clearance, and Right-of-Entry Coordination

Prior to initiating investigative activities proposed in this study plan, well permits, construction permits, utility clearance, and right-of-entry for offsite locations will be obtained. A Maryland licensed well driller will obtain well permits for proposed monitoring wells. The well permits will be submitted to EA prior to mobilization to the site for installation of the wells. Montgomery County DEP will apply for a Park Construction Permit to install the wells proposed on park property in Derwood Station South and along the eastern property boundary. Montgomery County DEP will contact WSSC to coordinate permission to install the well proposed on their property.

EA will contact Miss Utility and will coordinate utility clearance to be conducted by a private utility locator in areas of proposed excavation. The utility contractor will utilize electro-magnetic or other detection methods to sense the presence of subsurface utilities and mark the horizontal location of utilities on the ground surface.

Montgomery County DEP will coordinate property access and obtain permission for all work performed in the Derwood Station South residential community.

4.2.2 Monitoring Well Installation and Soil Sample Collection

EA reviewed historical groundwater analytical data and the existing monitoring well network at the Landfill. Based on that review and the data gaps described in Section 3.1.4, 17 additional groundwater monitoring wells are proposed. The proposed monitoring well locations are shown on Figure 4-1. The proposed well locations were negotiated by EA, DEP, and the GLCC in late 2009 and early 2010 to ensure that data requirements, utility locations, reasonable access options, and potential nuisance considerations within Derwood Station South were carefully evaluated. Meetings were conducted on 12 November, 10 December, and 14 January with representatives of the GLCC to ensure that their concerns regarding the investigation were addressed. A site visit was conducted on 7 January 2010 by EA and the DEP to evaluate access issues and logistical considerations for wells proposed in areas of limited access. The proposed groundwater monitoring wells are generally recommended for the following reasons:

- to obtain groundwater elevation data at or beyond the Landfill property boundary in areas that are not currently measured by existing groundwater wells;
- to obtain new groundwater samples and chemical constituent data that can be used to assess the integrity of existing groundwater monitoring wells that are reported to have the highest historical concentrations;
- to prepare a potentiometric map to delineate groundwater elevation and flow direction; and
- to identify the extent and potential routes of migration for chemical constituents from the Landfill waste disposal footprint in the groundwater.

Proposed groundwater monitoring well depths are designed to evaluate groundwater concentrations at several intervals of potential impact starting at the perimeter of the Landfill and working out (away from the perimeter). For example, shallow/deep well pairs are proposed in areas where there is no existing data and shallow wells are proposed in areas where shallow groundwater data is not available from existing deep monitoring wells. Screened intervals in the shallow monitoring wells will be 20 to 30 ft long and will properly intersect the groundwater surface. Screened intervals in the deep wells will be 20 ft long and will be positioned at the bottom of the borings. The location, estimated depth, and purpose of each proposed monitoring well are summarized in Table 4-1.

TABLE 4-1
SUMMARY OF PROPOSED GROUNDWATER MONITORING WELLS
600 EAST GUDE DRIVE, ROCKVILLE, MARYLAND 20850

Well ID	Location	On-Site / Off-Site	Estimated Depth	Purpose
MW-1A/MW-1B	Northeastern landfill boundary, on M-NCPPC property. Reference pictures 1, 2, and 3 in the attached photographic log.	Off-Site	Shallow and deep well pair. Shallow well depth approximately 15 – 30 feet bgs. Deep well approximately 70 – 100 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments (shallow) and the bedrock (deep) in the area between existing wells OB04/OB04A and OB102.
MW-2A/MW-2B	Eastern landfill boundary, on M-NCPPC property. Reference pictures 4, 5 and 6 in the attached photographic log.	Off-Site	Shallow and deep well pair. Shallow well depth approximately 15 – 30 feet bgs. Deep well approximately 70 – 100 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments (shallow) and the bedrock (deep) in the area between existing wells OB102 and OB08/OB08A.
MW-3A/MW-3B	Southeastern landfill boundary, on M-NCPPC property, east of existing well OB08/OB08A. Reference pictures 7 and 8 in the attached photographic log.	Off-Site	Shallow and deep well pair. Shallow well depth approximately 15 – 30 feet bgs. Deep well approximately 70 – 100 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments (shallow) and the bedrock (deep) in the area east of OB08/OB08A.
MW-4	Southeastern landfill boundary, on landfill property, adjacent to well OB10. Reference pictures 9 and 10 in the attached photographic log.	On-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide chemical analytical data in the unconsolidated shallow sediments in the area of OB10.
MW-5	Southern landfill boundary, on WSSC property, south of wells OB11 & OB25. Reference pictures 11, 12, and 13 in the attached photographic log.	Off-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments in the area south of OB11 and OB25. MW-5 would also provide data to evaluate whether the stream (north of the proposed location) is acting as a hydraulic barrier, potentially intercepting dissolved constituents migrating south of OB11 and OB25. Note: This location was deemed infeasible due to terrain access issues.
MW-6	Southwestern landfill boundary, on landfill property, adjacent to well OB01.	On-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide chemical analytical data in the unconsolidated shallow sediments in the area of OB01.
MW-7	Northwestern landfill boundary, on landfill property, down slope from soil stockpile.	On-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide chemical analytical data along northwest slope in the unconsolidated shallow sediments in the area southwest of OB03.
MW-8	Northwestern Landfill Boundary, on landfill property, adjacent to well OB03.	On-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide chemical analytical data along northwest slope in the unconsolidated shallow sediments in the area of OB03.
MW-9	West of landfill property in Derwood Station South, near Dubuque Court.	Off-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments in the area of Dubuque Court, west of the landfill boundary in Derwood Station South.
MW-10	Northwest of landfill property on M-NCPPC property, near Bettendorf Court. Reference pictures 15, 16, 17, and 18 in the attached photographic log.	Off-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments southeast of Bettendorf Court, northwest of the landfill boundary.
MW-11A/MW-11B	Northwest of landfill property on M-NCPPC property, near Bettendorf Court. Reference pictures 14 and 18 in the attached photographic log.	Off-Site	Shallow and deep well pair. Shallow well depth approximately 15 – 30 feet bgs. Deep well approximately 70 – 100 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments (shallow) and the bedrock (deep) in the area east of Bettendorf Court, northwest of the landfill boundary.
MW-12	Northwest of landfill property on M-NCPPC property, near Grinnell Terrace.	Off-Site	Shallow well depth, approximately 15 - 30 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments in the area of Grinnell Terrace, northwest of the landfill boundary.
MW-13A/MW-13B	Northwestern landfill property boundary, near property corner. Reference pictures 19, 20, 21, and 22 in the attached photographic log.	On-Site	Shallow and deep well pair. Shallow well depth approximately 15 – 30 feet bgs. Deep well approximately 70 – 100 feet bgs.	To provide groundwater elevation data and chemical analytical data in the unconsolidated shallow sediments (shallow) and the bedrock (deep) in the area of the northwestern landfill property boundary.

Notes:
1. M-NCPPC=Maryland-National Capital Park and Planning Commission Property
2. bgs=below ground surface

The annular space of each well will be packed with #2 morie gravel pack and sealed with bentonite and cement at the surface. The wells will be completed with steel protective stickup and concrete pads. Offsite monitoring well locations may be completed with a flush-to-grade manhole if preferred by offsite property owners. The new monitoring wells will be developed by standard surging or pumping techniques until the water is free of sediment.

The installation of the groundwater monitoring wells will be completed in accordance with the MDE "Specifications for the Design and Construction of Groundwater Monitoring Wells at Solids Waste Disposal Facilities" included in Appendix H. During completion of the monitoring well boreholes, soil sampling will be conducted via continuous split-spoon samples collected until sample refusal is encountered or to a depth of 30 ft bgs (average depth to consolidated rock). The EA Soil Sampling Standard Operating Procedure (SOP) is provided in Appendix H. Soil samples will be inspected for geologic classification, and photo-ionization detector (PID) readings will be recorded to assess organic vapor concentrations. The PID will be calibrated daily according to manufacturer specifications provided in Appendix H. A detailed log of PID calibration results will be maintained by field personnel. A combustible gas indicator (CGI) will be used to monitor the work area for health and safety purposes. The CGI will be calibrated daily according to manufacturer specifications provided in Appendix H. A detailed log of CGI calibration results will be maintained by field personnel. Samples from the monitoring well borings exhibiting visible evidence of staining, odors, or elevated PID readings will be submitted for laboratory analysis. Laboratory analysis of submitted soil samples will include:

- VOCs by U.S. EPA Method 8260;
- SVOCs by U.S. EPA Method 8270;
- Metals by U.S. EPA Method 6020;
- Herbicides by U.S. EPA Method 8151;
- Chlorinated pesticides by U.S. EPA Method 8081;
- Organophosphate pesticides by U.S. EPA Method 8141;
- Polychlorinated biphenyls (PCBs) by U.S. EPA Method 8082;
- Cyanide by U.S. EPA Method 9010; and
- Sulfide by U.S. EPA Method 9030.

After well installation is complete, the location of each of the wells will be recorded using appropriate landmarks and/or a GPS unit.

4.2.3 Well Development

Well development of the newly constructed wells will occur subsequent to the installation of the new monitoring wells. The groundwater in the monitoring wells will be developed by overpumping. A 2-in. stainless steel submersible pump, or similar (without a foot or check valve), will be lowered into the well screen and pumped at a rate that exceeds the recharge capacity of the well. The pump will be alternated on and off to allow for backwashing of the borehole with water from the plumbing. A surge block will also be used to agitate and mobilize sediment around the well screen. Pumping and surging will be continued until at least three to five well volumes have been purged and there is low turbidity in the discharge water (less than 10 nephelometric turbidity units and clear to the unaided eye). Turbidity, pH, and temperature will be measured and recorded on the Well Development Log for each well. If low turbidity water is not present after 2 hours, pumping will end. Water produced during well development will be containerized and disposed of as referenced in Section 4.8 below.

4.2.3.1 Well Volume Calculations

Static water level will be measured immediately prior to purging each monitoring well. After unlocking the well and removing the cap, a decontaminated water level indicator will be placed into the well to measure the depth to the static water level and total depth of the well. The measurement will be recorded to the nearest 0.01 ft and will be measured from a clearly marked reference point at the top of the well casing. The water column height is calculated from the difference between the total well depth measurement and the static water level measurement. The well volume per foot (in gallons) can be equated based on the diameter of the well casing (in inches). The total well volume is determined from the product of the water column height for the well and the well volume per foot (based on the diameter of the well casing).

4.2.4 Groundwater Monitoring and Sampling Program

After the installation and development of the wells, groundwater sampling will be conducted at the 17 new wells and 20 existing groundwater monitoring wells. Prior to sampling, the wells will be allowed to sit for a minimum period of 2 weeks to allow for equilibration with subsurface conditions. The groundwater monitoring event will consist of groundwater gauging and sampling of both the existing and newly installed monitoring wells.

Field activities to be completed during the groundwater sampling events include measurement of water levels and water quality parameters, well purging, and collection of groundwater samples from each well. Well sampling information (including well depth, purge volume, and water quality parameters) will be recorded on Groundwater Sampling Logs.

The monitoring wells will be sampled in accordance with the EA SOP for collection of samples from groundwater monitoring wells at landfills (Appendix H). Sampling will be conducted using the methods described below.

- A physical inspection will be performed and observations will be noted on the Groundwater Sampling Log before sampling begins.
- The static water level in the monitoring well will be determined to the nearest 0.01 ft using a decontaminated water level indicator probe.
- Purging will be accomplished by pumping with a stainless steel submersible pump or by a certified, pre-cleaned bottom-filling Teflon bailer. The volume to be purged is a minimum of three static casing volumes. Purge water will be containerized in 55-gallon drums.
- A minimum of 15 minutes will be allowed for well recovery before sampling.
- Samples will be collected by a certified, pre-cleaned bottom-filling Teflon bailer in accordance with the EA SOP included in Appendix H.
- Temperature, pH, and conductivity will be measured in the field.

Upon completion of sampling, the submersible pump will be removed from the well and the tubing disposed as municipal waste. The necessary entries on the chain-of-custody form will be completed. The labeled and filled sample containers will be immediately placed into an iced cooler with bubble wrap or vermiculite to prevent breakage. At the end of the sampling day, the chain-of-custody form will be placed in a waterproof plastic bag and taped to the inside lid of the cooler. The purge water, containerized in 55-gallon drums will be transported to the leachate treatment plant at the County's Oaks Landfill. Decontamination, sample labeling, chain-of-custody documentation and sampling packing/shipping will be conducted in accordance with the EA SOPs provided in Appendix H. Samples will be submitted for the following laboratory analyses:

- VOCs by U.S. EPA Method 8260
- SVOCs by U.S. EPA Method 8270
- Metals by U.S. EPA Method 6020
- Herbicides by U.S. EPA Method 8151
- Chlorinated pesticides by U.S. EPA Method 8081
- Organophosphate Pesticides by U.S. EPA Method 8141
- PCBs by U.S. EPA Method 8082
- Cyanide by U.S. EPA Method 9010
- Sulfide by U.S. EPA Method 9030

4.3 SURFACE WATER

Ten surface water samples, including five existing surface water sampling locations and five proposed surface water sampling locations, will be collected from offsite streams around the perimeter of the Landfill to monitor the water quality (Figure 4-2).

4.3.1 Sample Collection Procedures and Analysis

The surface water samples will be collected from the designated stream sampling locations and placed directly into the sample bottles provided by the analytical laboratory. For samples that require pre-preserved sample bottles, surface water samples will be collected in a decontaminated, long-handled or measuring cup-type polytetrafluoroethylene or stainless steel sampler, or a sampling container which will then be transferred into the appropriate bottle ware. Sampling should be performed deliberately and methodically to minimize disturbance of bottom sediments, yet as quickly as possible to ensure a representative sample. The EA Surface Water Sampling SOP is provided in Appendix H.

The surface water samples will be analyzed for VOCs by EPA method 8260, SVOCs by EPA method 8270, metals by EPA method 6020, herbicides by EPA method 8151, chlorinated pesticides by EPA method 8081, organophosphate pesticides by EPA method 8141, PCBs by EPA method 8082, cyanide by EPA method 9010, and sulfide by EPA method 9030.

4.4 SURFACE SOIL

To assess the condition of surface soil along the Derwood Station South property boundary, in the northern portion of the site, near the men's shelter, and near the model airplane flying area, collection of eleven surface soil samples is proposed. The proposed locations are shown on Figure 4-3.

4.4.1 Sample Collection Procedures and Analysis

Surface soil grab samples will be collected from the surface at the eleven proposed locations. The samples will be packed directly into the sample bottles provided by the analytical laboratory, labeled, and packed on ice according to the EA Soil Sampling SOP provided in Appendix H. Surface soil samples collected from locations within the community of Derwood Station South will be collected just beneath the grass cover. The grass cover will be replaced following sample collection, such that the area of disturbance is not visible.

The surface soil samples will be delivered to the laboratory under proper chain-of custody protocol for analysis of VOCs by EPA method 8260, SVOCs by EPA method 8270, metals by EPA method 6020, herbicides by EPA method 8151, chlorinated pesticides by EPA method 8081, organophosphate pesticides by EPA method 8141, PCBs by EPA method 8082, cyanide by EPA method 9010, and sulfide by EPA method 9030.

4.5 QUALITY CONTROL SAMPLES

A summary of planned quality control (QC) samples is indicated below. Trip blanks (for VOCs in water only) and field duplicate samples (for solid and liquid samples) will be collected to monitor sampling and laboratory quality control.

QC Method	Purpose	Frequency
Field Duplicate Samples	Measures precision	10% (matrix)
Trip Blanks	Measures cross-contamination	1 per cooler (aqueous VOC samples only)

A complete record of QC samples will be maintained as a part of the field sampling documentation. A brief description of the quality control samples and collection procedures is listed below.

Trip Blanks

Trip blanks are sample bottles containing analyte-free, de-ionized water prepared at the laboratory, and stored and shipped with the samples. The trip blanks will not be opened in the field. Care will be taken to ensure that the trip blank and sample bottles originate from the same shipment of bottles from the laboratory. Information obtained from the trip blank analyses will be used to determine whether, and to what extent, sample handling and analysis has introduced positive bias to the sample results.

Field Duplicates

Field duplicates are co-located samples (collected at the same time from the same location using the same sampling procedures) that will be analyzed to evaluate the precision of the sampling and analysis system. Field duplicate samples submitted for laboratory analyses will be submitted without indication of which investigative sample the duplicate represents.

4.6 SAMPLE IDENTIFICATION

Each sample will be given a unique sample designation, referenced to the established sampling location:

GUDE - α - β - δ

where, GUDE identifies the site location, "α"designates the sample location, "β" identifies the sample matrix, and δ designates the sample depth interval (if appropriate). For example, a soil sample collected during completion of MW-2A at a depth interval of 16-18 ft bgs will be designated GUDE-MW2A-SO-16 to 18. Additionally, a surface water sample collected at SW-1 will be designated GUDE-SW1-SW.

Duplicates shall be designated such that the laboratory will not be able to discern the parent sample. The following sample identification number will be assigned:

GUDE - β - DUP - X

where, GUDE identifies the site location, "β" identifies the sample matrix, "DUP" indicates a field duplicate, and X designates duplicate number. For example, the second duplicate groundwater sample collected during a given sampling event will be designated GUDE-GW-DUP-2. The parent sample associated with each duplicate sample will be noted in the field notes.

4.7 SAMPLE SUMMARY

The proposed analytical methods, required glassware/preservatives, and the anticipated samples, including quality control samples are summarized below:

	SAMPLE ANALYTICAL SUMMARY	
	Aqueous Samples	***Required Glassware/Preservative***
1	Metals – EPA 6020	1 – 250-mL plastic bottle with nitric acid to a pH<2
2	VOCs – EPA 8260	3 – 40-ml glass vials with hydrochloric acid to a pH<2
3	SVOC – EPA 8270	1-liter glass amber bottle
4	Herbicides – EPA 8151	1-liter glass amber bottle
5	Chlorinated Pesticides – EPA 8081	1-liter glass amber bottle
6	PCBs – EPA 8082	1-liter glass amber bottle (can be combined with Pesticides if same sample)
7	Organophos Pesticides – EPA 8141	1-liter glass amber bottle
8	Cyanide – EPA 9010	1 – 250-mL plastic bottle with sodium hydroxide to a pH >12
9	Sulfide – EPA 9030	1 – 250-mL plastic bottle with sodium hydroxide to a pH >9 + zinc acetate
	Soil Samples	
1	Metals – EPA 6020	1 – 4-ounce jar
2	VOCs – EPA 8260/5035	1 – terra core kit
3	SVOC – EPA 8270	1 – 4-ounce jar
4	Herbicides – EPA 8151	1 – 4-ounce jar
5	Chlorinated Pesticides – EPA 8081	1 – 4-ounce jar
6	PCBs – EPA 8082	1 – 4-ounce jar
7	Organophos Pesticides – EPA 8141	1 – 4-ounce jar
8	Cyanide – EPA 9010	1 – 4-ounce jar
9	Sulfide – EPA 9030	1 – 4-ounce jar

SAMPLE SUMMARY					
Analyte and Method	**Matrix**	**Discrete Samples**	**Trip Blanks (estimated)**	**Field Dups**	**Total # Samples**
Metals – EPA 6020	aq	47	-	5	52
VOCs – EPA 8260	aq	47	47	5	99
SVOC – EPA 8270	aq	47	-	5	52
Herbicides – EPA 8151	aq	47	-	5	52
Chlorinated Pesticides – EPA 8081	aq	47	-	5	52
PCBs – EPA 8082	aq	47	-	5	52
Organophos Pesticides – EPA 8141	aq	47	-	5	52
Cyanide – EPA 9010	aq	47	-	5	52
Sulfide – EPA 9030	aq	47	-	5	52
Metals – EPA 6020	so	28	-	3	31
VOCs – EPA 8260/5035	so	28	-	3	31
SVOC – EPA 8270	so	28	-	3	31
Herbicides – EPA 8151	so	28	-	3	31
Chlorinated Pesticides – EPA 8081	so	28	-	3	31
PCBs – EPA 8082	so	28	-	3	31
Organophos Pesticides – EPA 8141	so	28	-	3	31
Cyanide – EPA 9010	so	28	-	3	31
Sulfide – EPA 9030	so	28	-	3	31

Notes:

Aqueous discrete sample estimate assumes one sampling event with 37 groundwater and 10 surface water samples collected each event.

Soil discrete sample estimate assumes one sampling event with 17 soil (1 per boring outside the waste footprint) and 11 surface soil samples collected.

4.8 INVESTIGATIVE-DERIVED WASTE

As approved by the MDE, soil cuttings generated during well installation that do not contain visible waste will be spread onsite at the well locations. As directed by the County, soil cuttings containing visible waste will be reburied at the Landfill.

Decontamination fluids, well development water, and purge water generated during groundwater sampling will be containerized and transported by EA to the County's Oaks Landfill for disposal in the leachate treatment plant. Up to two samples will be collected if characterization is required prior to acceptance of the water at the Oaks Landfill treatment plant.

Disposable personal protective equipment will be disposed of as municipal waste.

4.9 SURVEYING AND SITE RESTORATION

Top of casing elevations for the new wells will be surveyed to a common datum to allow for groundwater elevation calculations. For consistency purposes, elevations will be surveyed to a marked location along the top of the steel protective casing. Upon completion of investigative activities, the site will be restored as close as possible to its original condition.

4.10 SUBCONTRACTORS

To complete the scope of work, EA identified the need for four subcontractors to complete the following project services:

- Utility Clearance,
- Drilling,
- Surveying, and
- Analytical Laboratory.

EA solicited qualifications and pricing from multiple potential subcontractors. Based on the qualifications and pricing packages received, the following subcontractors have been selected to complete the associated services:

Subcontractor	Location	Project Services	Contact Information
Utility Locating Service, Inc	Brookeville, Maryland	Utility Locating Services	Tom Gormley, 301-978-9778
Summit Site Services, Inc	Baltimore, Maryland	Monitoring Well and Boring Installation and Development, Services	Rich Kimes, 410-282-8100
C.C. Johnson and Malhotra, P.C. (CCJM)	Columbia, Maryland	Monitoring Well and Boring Surveying Services	Thomas Holbrook, 410-461-9920
Phase Separation Science, Inc.	Baltimore, Maryland	Laboratory Analytical Services	John Slowikowski, 410-747-8770

SECTION 5. SCHEDULE

A detailed schedule is attached as Figure 5-1 and illustrates anticipated durations for project tasks and milestones proposed in this study plan. The overall estimated duration to implement the proposed activities is expected to be approximately 4 months, depending on the duration of the public participation and permitting / offsite access phases. The schedule may need to be adjusted based on public participation, permitting, and offsite access coordination, and upon review of new site data as it is obtained during the investigation.

SECTION 6. REFERENCES

EA Engineering, Science, and Technology, Inc. 2010. *Gude Landfill, Waste Delineation Study*. January.

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Fetter, C.W. 1994. *Applied Hydrogeology.* Prentice-Hall Inc., Upper Saddle River, New Jersey.

Maryland Dept. of Natural Resources, 3rd ed., 1997. *State Forest Conservation Technical Manual*. Dept. of Natural Resources, Annapolis, Maryland.

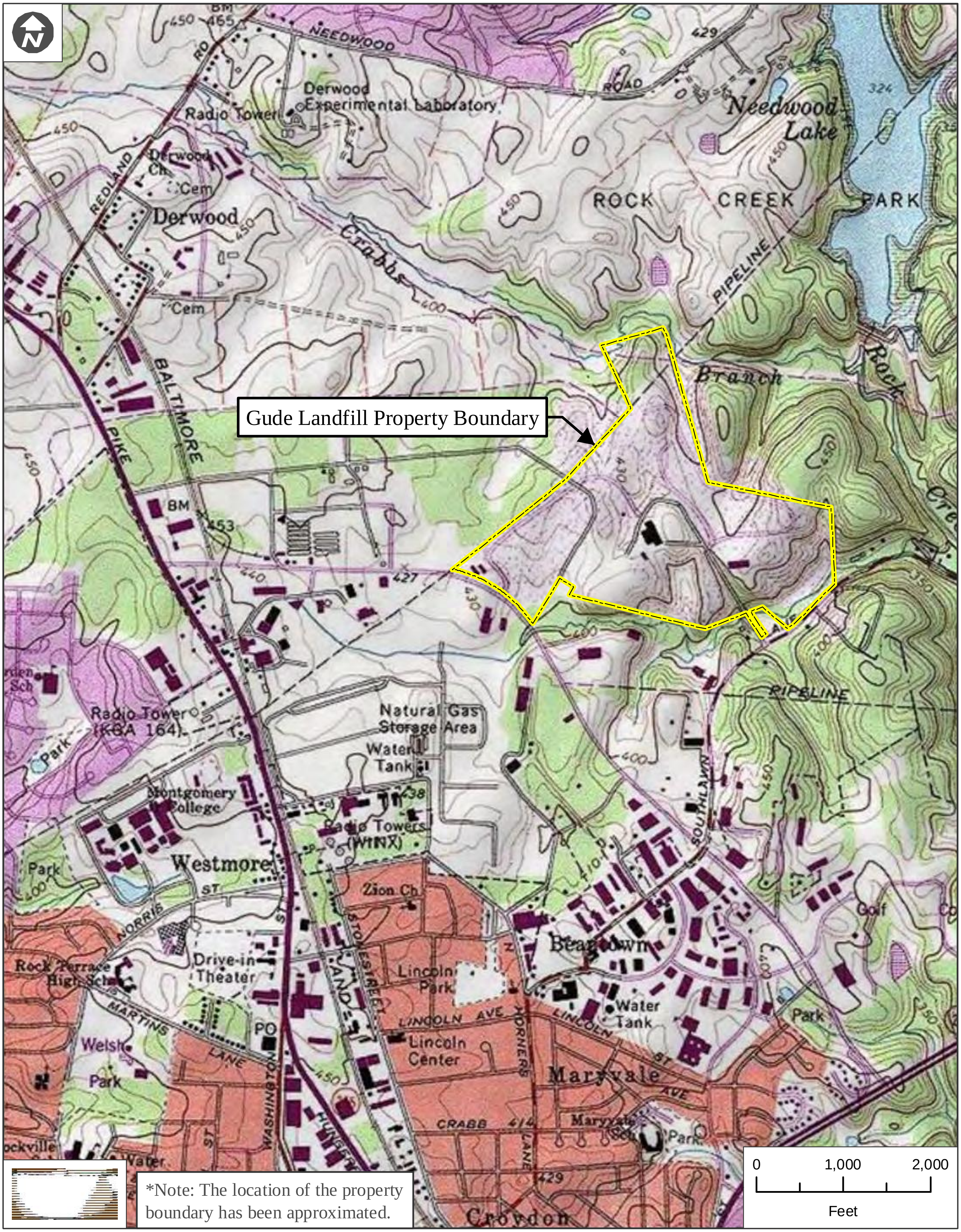
Maryland Geological Survey. 1968. *Geologic Map of Maryland, Montgomery County, Maryland.*

Montgomery County, Department of Environmental Protection. 2009a. *Gude Landfill, Landfill Gas Monitoring Plan.* February; amended April.

Montgomery County, Department of Environmental Protection. 2009b. *Gude Landfill, Groundwater and Surface Water Monitoring Plan.* March.

Trapp, Henry, Jr., and Marilee A. Horn. 1997. *Hydrologic Atlas 730-L.* U.S. Geological Survey.

Figures

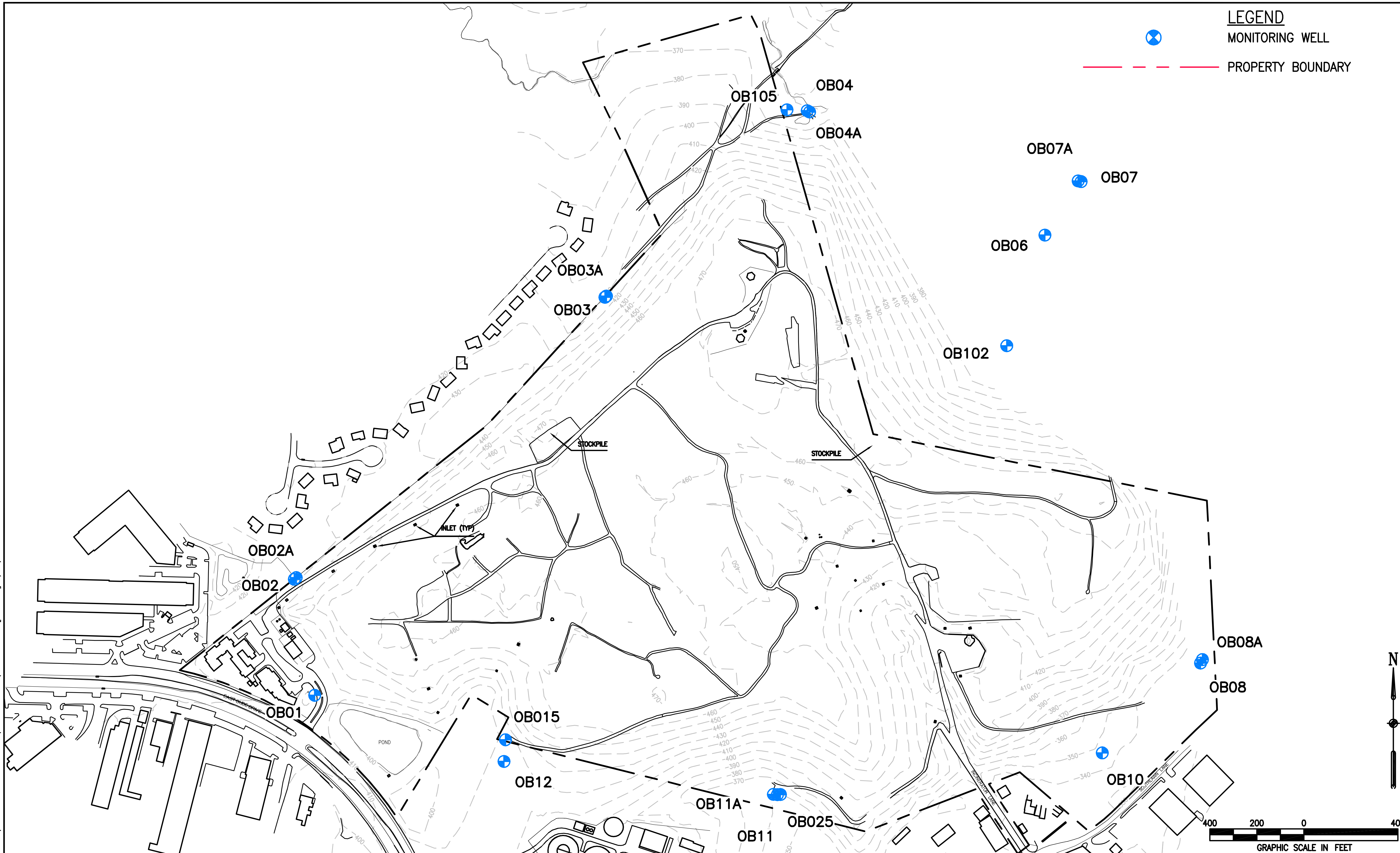


Gude Landfill
Montgomery County, Maryland

Figure 2-1. Site Location Map

Sources:
- EDR, 2009

H:\projects\6219608_out\MXD\Figure1



FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\GROUNDWATER\FIG 2-2.DWG [FIG 2-2] 6/22/10

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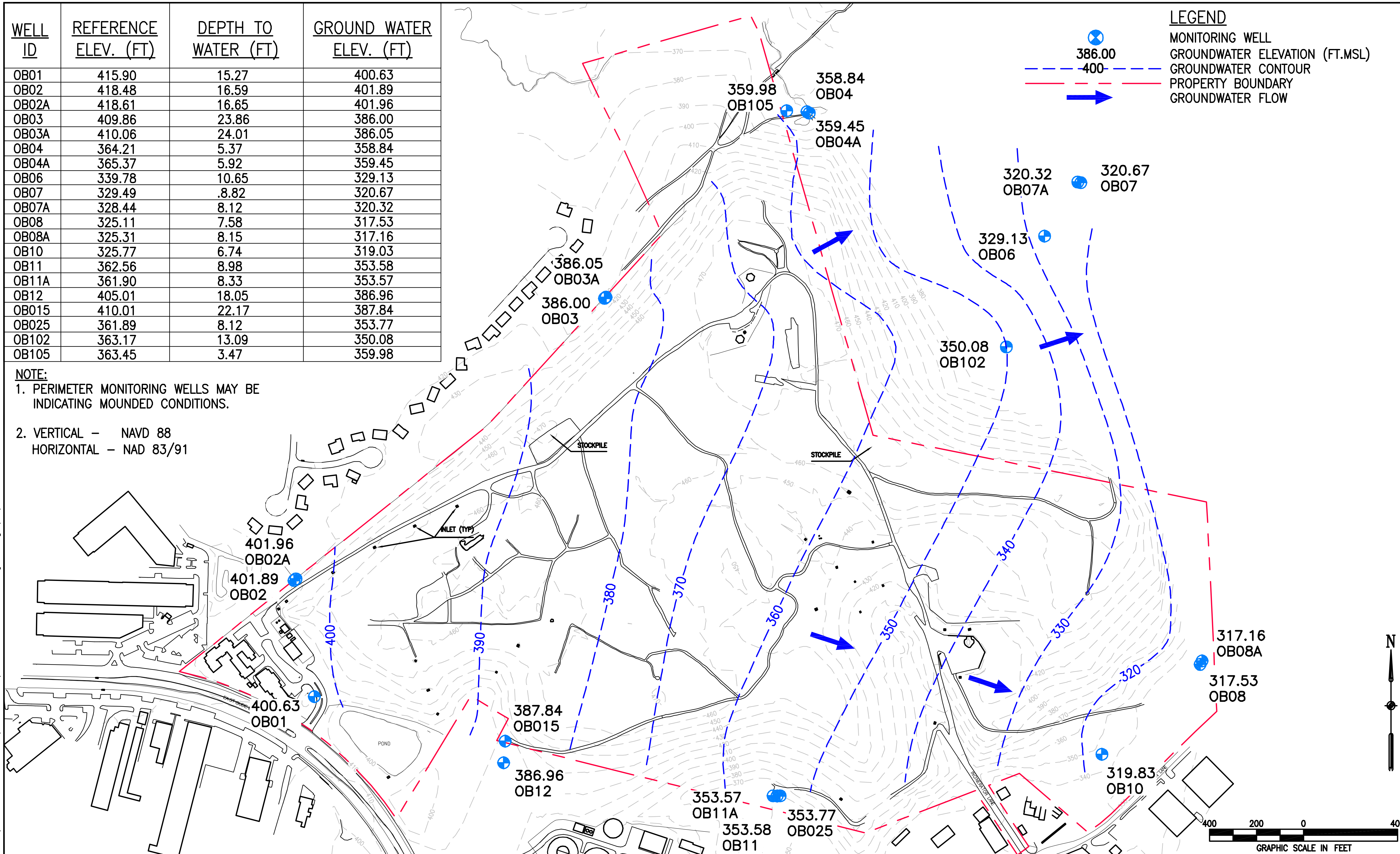
GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

FIGURE 2-2
SITE PLAN

DESIGNED BY	DRAWN BY	DATE	PROJECT NO.
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	-	2-2

WELL ID	REFERENCE ELEV. (FT)	DEPTH TO WATER (FT)	GROUND WATER ELEV. (FT)
OB01	415.90	15.27	400.63
OB02	418.48	16.59	401.89
OB02A	418.61	16.65	401.96
OB03	409.86	23.86	386.00
OB03A	410.06	24.01	386.05
OB04	364.21	5.37	358.84
OB04A	365.37	5.92	359.45
OB06	339.78	10.65	329.13
OB07	329.49	.8.82	320.67
OB07A	328.44	8.12	320.32
OB08	325.11	7.58	317.53
OB08A	325.31	8.15	317.16
OB10	325.77	6.74	319.03
OB11	362.56	8.98	353.58
OB11A	361.90	8.33	353.57
OB12	405.01	18.05	386.96
OB015	410.01	22.17	387.84
OB025	361.89	8.12	353.77
OB102	363.17	13.09	350.08
OB105	363.45	3.47	359.98

NOTE:
1. PERIMETER MONITORING WELLS MAY BE INDICATING MOUNDED CONDITIONS.
2. VERTICAL – NAVD 88
   HORIZONTAL – NAD 83/91



FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\GROUNDWATER\FIG 3-1 GWCONTOURS.DWG [FIG 3-1] 3/26/10

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GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

FIGURE 3–1
CONTOURED GROUNDWATER ELEVATION MAP
DATA DATE 5 NOVEMBER 2009

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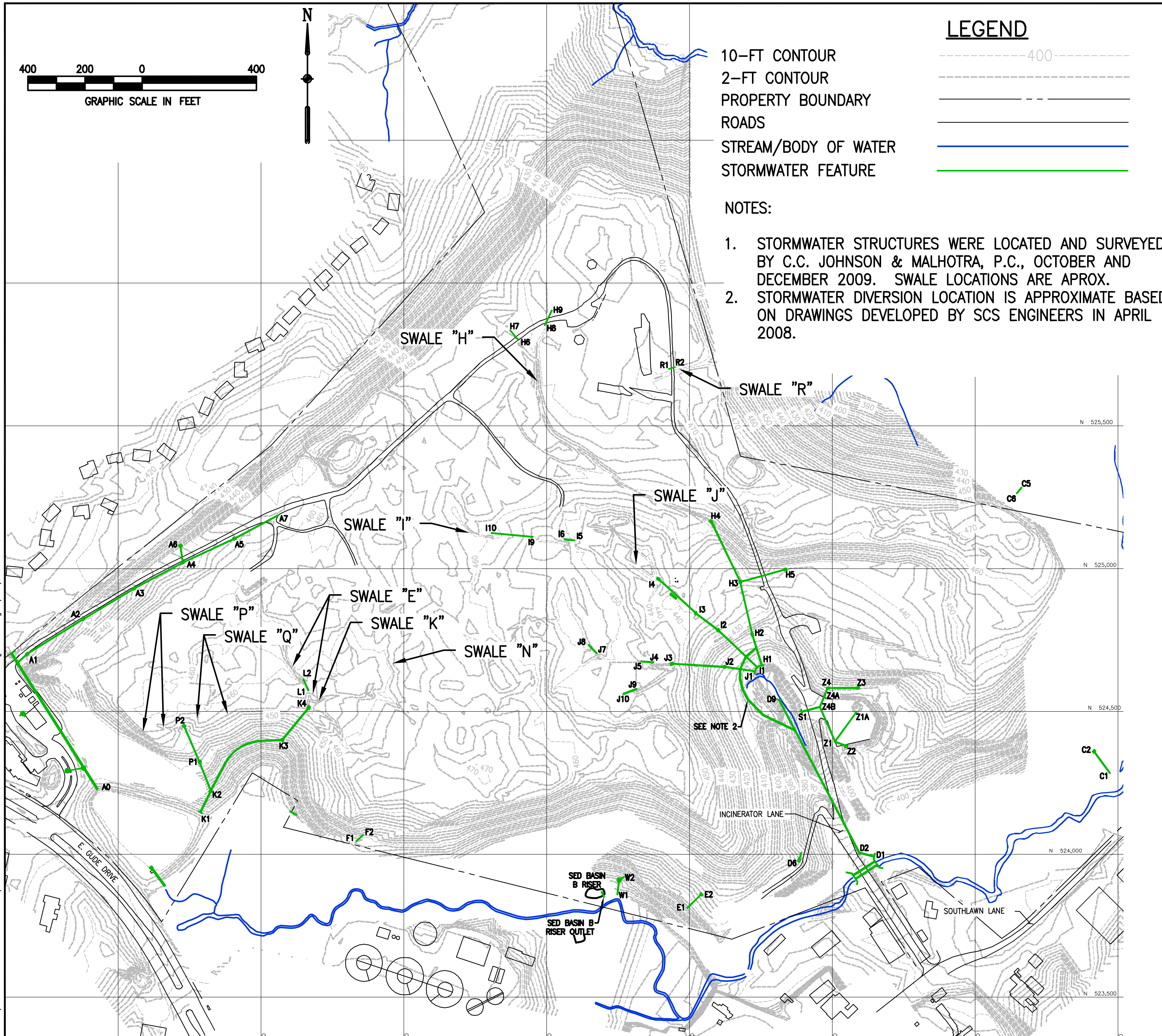
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	3–1



NOTES:

1. STORMWATER STRUCTURES WERE LOCATED AND SURVEYED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER AND DECEMBER 2009. SWALE LOCATIONS ARE APROX.
2. STORMWATER DIVERSION LOCATION IS APPROXIMATE BASED ON DRAWINGS DEVELOPED BY SCS ENGINEERS IN APRIL 2008.

Point No	Description	Condition
A0	Manhole to 60" CMP	Not available
A1	Inlet to 18" HDPE	Good
A2	Inlet to 18" HDPE	Vegetative overgrowth and debris
A3	Inlet to 18" HDPE	Vegetative overgrowth and debris
A4	Inlet to 18" HDPE	Vegetative overgrowth and debris
A6	Inlet to 18" HDPE	Rip rap settlement
A5	Inlet to 18" HDPE	Rip rap settlement
A7	Inlet to 24" HDPE	Heavy vegetative overgrowth
P1	Inlet to 18" CPP	Vegetative overgrowth and debris
P2	Inlet to 18" CPP	Good
K2	Tie in Point for 18" CPP To 30" CPP	Vegetative overgrowth
K3	Inlet to 30" CPP	Vegetative overgrowth
K4	Inlet to 30" CPP	Minimal erosion
L1	24" CPP Culvert	Heavy vegetative overgrowth
L2	24" CPP Culvert	Moderate vegetative overgrowth
J1	30" CPP Outlet	Trees in channel
J2	Inlet to 24" CPP	Vegetative overgrowth and debris
J3	Inlet to 24" CPP	Concrete bowing – overgrowth
J4	24" CMP Culvert	Good
J5	24" CMP Culvert	Good
J7	24" CPP Culvert	Vegetative overgrowth
J8	24" CPP Culvert	Good
J9	24" CMP Culvert	Vegetative overgrowth
J10	24" CMP Culvert	Vegetative overgrowth
I1	30" CPP Outlet	Trees in channel
I2	Inlet to 24" CPP	Concrete in need of repair
I3	Inlet to 24" CPP	Vegetative overgrowth
I4	Inlet to 24" CPP	Vegetative overgrowth and debris
I5	24" RCP Culvert	Heavy vegetative overgrowth
I6	24" RCP Culvert	Heavy vegetative overgrowth
I9	24" RCP Culvert	Heavy vegetative overgrowth
I10	24" RCP Culvert	Good
H2	Inlet to 24" CPP	Heavy vegetative overgrowth
H3	Tie in Point for 18" pipe to 24" pipe	Excellent
H5	Inlet to 24" CPP	Potentially clogged with debris
H4	Inlet to 24" CPP	Rip rap settlement and vegetation
H6	12–18" CMP Culvert	Minimal erosion
H7	12–18" CMP Culvert	Good
H8	15" CMP Culvert	Not available
H9	15" CMP Culvert	Not available
Z1	Tie in Point for 18" and 8" pipes to 24" pipe	Silt fence around inlet
Z1A	Inlet to 8" pipe	
Z2	Inlet to 18" pipe	Rip rap settlement and vegetation
Z3	Inlet to 18" pipe	Silt fence around inlet and vegetation
Z4	Inlet to 18" pipe	Silt fence around inlet and vegetation
Z4A	Inlet to 24" pipe	
Z4B	Tie in Point for 18" and 8" pipes to 24" pipe	
S1	30" RCP Outlet	Heavy vegetative overgrowth
D9	Inlet to 30" RCP	Debris around inlet
D2	Inlet	Debris around inlet
D1	Outlet	Debris around inlet
R1	8" PVC Culvert	Not available
R2	8" PVC Culvert	Not available
C2	Inlet to 18" CPP	Debris around inlet
C1	18" CPP Outlet	Debris around inlet
B5	12" Concrete Culvert	Minimal erosion and leaf debris
B6	12" Concrete Culvert	Debris around inlet
E2	Inlet to 18" CPP	Rip rap settlement
E1	18" CPP Outlet	Good
W2	15" RCP Culvert	Vegetative overgrowth
W1	15" RCP Culvert	Good
Sed Basin B Riser	15" Pipe	Requires further evaluation
Sed Basin B Riser Outlet	15" Pipe	Requires further evaluation

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\FIG 3-3 STORMWATER STRUCTURE LOCATIONS.DWG [FIG 3-3] 6/18/10

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GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

Figure 3–2
STORMWATER STRUCTURE LOCATION MAP

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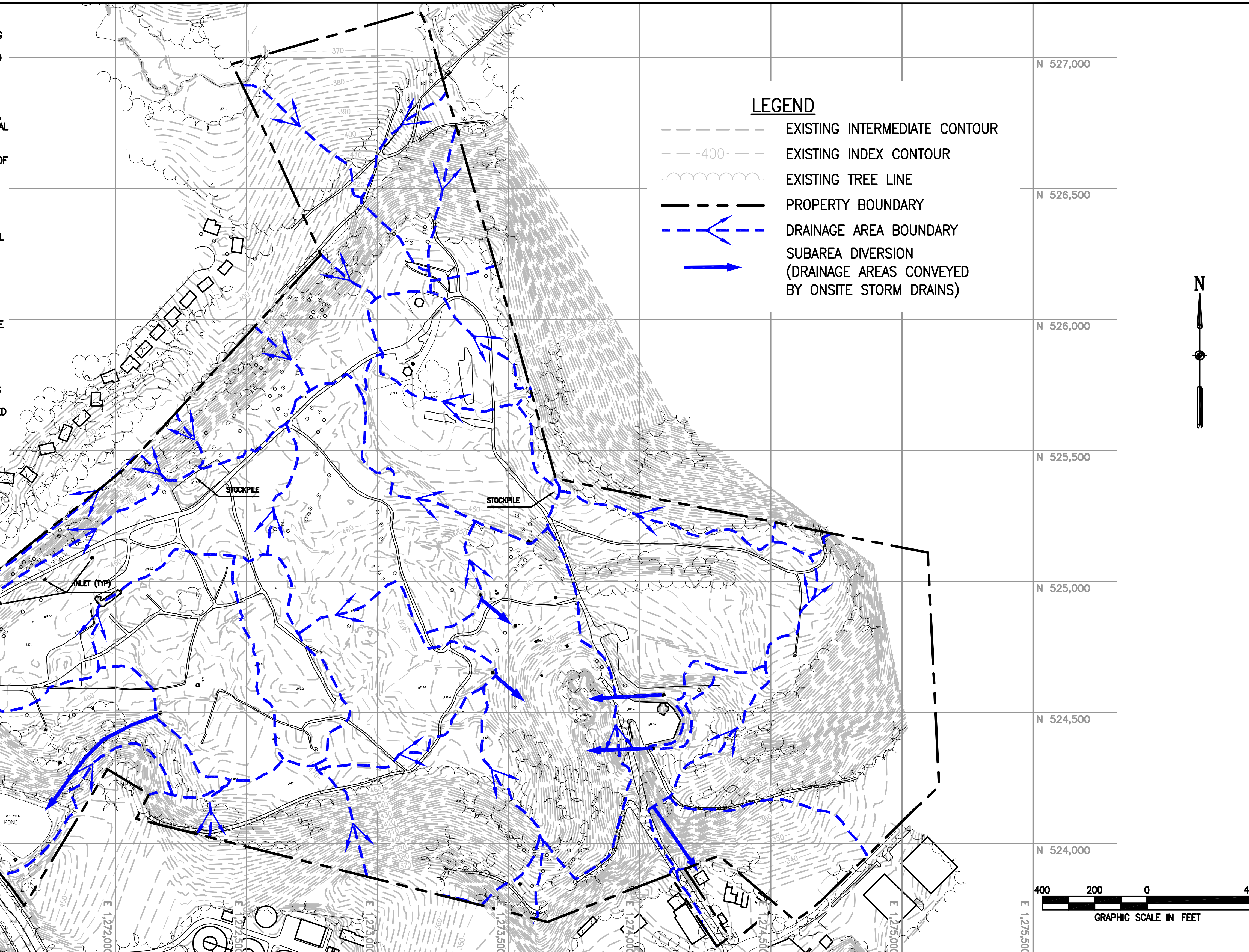
REO	REO	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	3–2

NOTES:

1. THIS FIGURE REPRESENTS ONSITE DRAINAGE AREA BOUNDARIES BASED UPON 2009 TOPOGRAPHY COMPILED BY APPLIED MAPPING SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 06/24/09 AND SUPPLEMENTED WITH FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER 2009.
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.
3. THE PROPERTY BOUNDARY WAS LAID OUT AND THE PLAT THEREOF PREPARED BY A REGISTERED PROPERTY LINE SURVEYOR OF THE STATE OF MARYLAND, IN COMPLIANCE WITH SECTION 3-108 OF THE REAL PROPERTY ARTICLE OF THE ANNOTATED CODE OF MARYLAND, EDITION 2005.
4. THE PROPERTY BOUNDARY REPRESENTS THE LANDS OWNED BY MONTGOMERY COUNTY, MARYLAND KNOWN AS THE GUDE LANDFILL WHICH IS A COMPILATION OF THREE DEEDS, LISTED BELOW, RECORDED IN THE LAND RECORDS OF MONTGOMERY COUNTY, MARYLAND, WITHOUT BENEFIT OF FULL TITLE COMMITMENT.
   - LIBER 2975 FOLIO 213
   - LIBER 4501 FOLIO 453
   - LIBER 5174 FOLIO 309
5. DRAINAGE AREA BOUNDARIES WERE DELINEATED BASED UPON THE CONTOURS AND SURFACE FEATURES COLLECTED IN THE 2009 SURVEY. BOUNDARIES WERE TRUNCATED AT THE PROPERTY BOUNDARY OR WERE TERMINATED WHERE NO TOPOGRAPHY WAS COLLECTED. DRAINAGE AREAS WERE ALSO DELINEATED TO DRAINAGE STRUCTURES WHERE CONTOURS INDICATED FLOW CONCENTRATIONS. IN OTHER CIRCUMSTANCES WHERE CONTOURS DID NOT CLEARLY DEFINE A DRAINAGE FEATURES, SUCH AS A DITCH OR GRADED BENCH, A BOUNDARY WAS INTERPRETED BASED UPON FEATURES SHOWN IN THE DESIGN DRAWINGS ENTITLED "GUDE LANDFILL POST CLOSURE ENGINEERING DESIGN AND MANAGEMENT TASKS" PREPARED BY SCS ENGINEERS DATED 22 JUNE 1992.



FILE PATH: Q:\PROJECTS\6219605 GUDE PHASE 0\STORMWATER\FIG 3-4 DRAINAGE AREA MAP.DWG [FIG 3-4] 6/18/10

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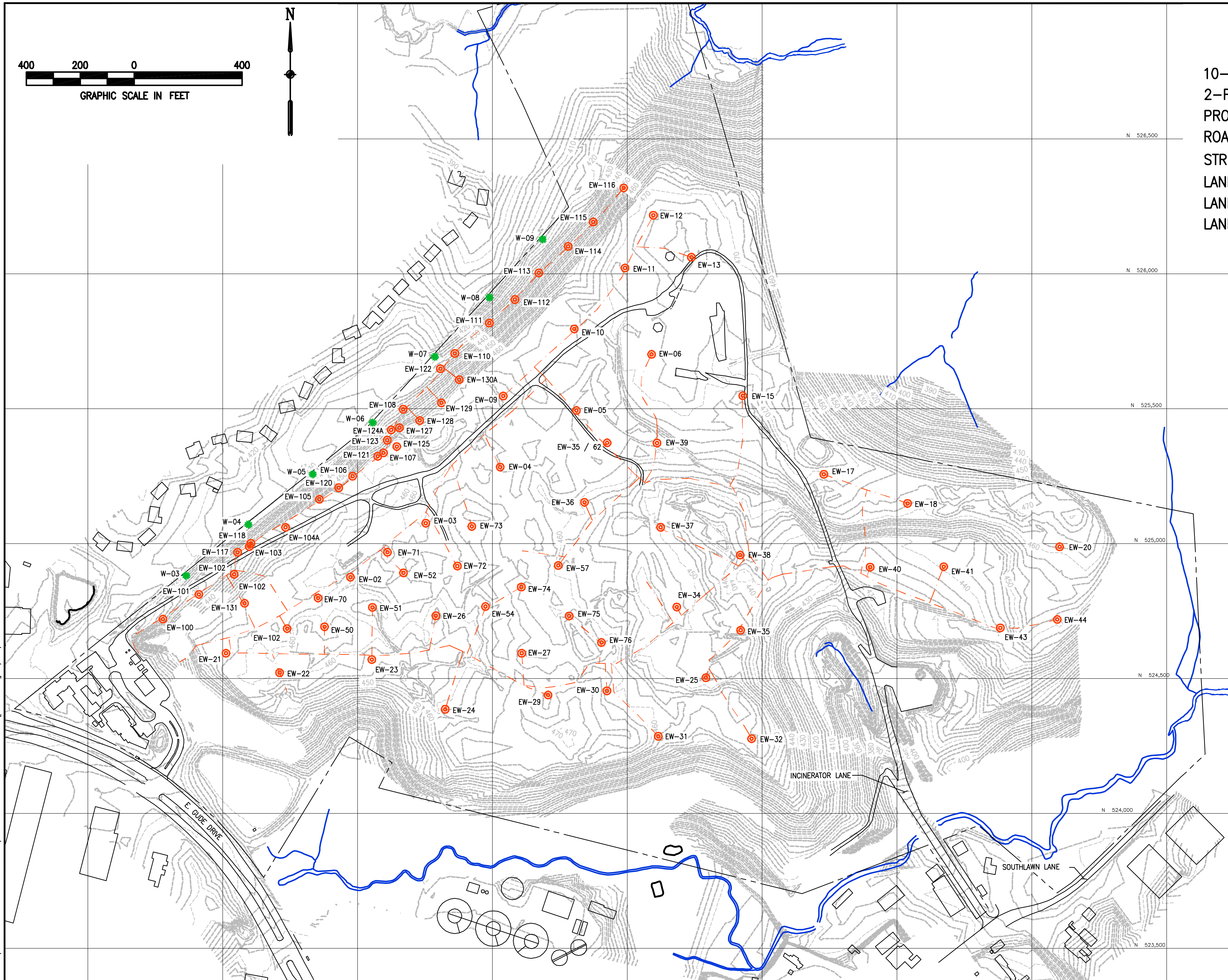
GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

FIGURE 3-3
DRAINAGE AREA MAP

DESIGNED BY	DRAWN BY	DATE	PROJECT NO.
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	3-3



LEGEND

- 10–FT CONTOUR
- 2–FT CONTOUR
- PROPERTY BOUNDARY
- ROADS
- STREAM/BODY OF WATER
- LANDFILL GAS EXTRACTION PIPING
- LANDFILL GAS EXTRACTION WELL
- LANDFILL GAS MONITORING WELL

NOTES:

1. 2009 TOPOGRAPHY COMPILED BY APPLIED MAPPING SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 06/24/09 AND SUPPLEMENTED WITH FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER 2009.

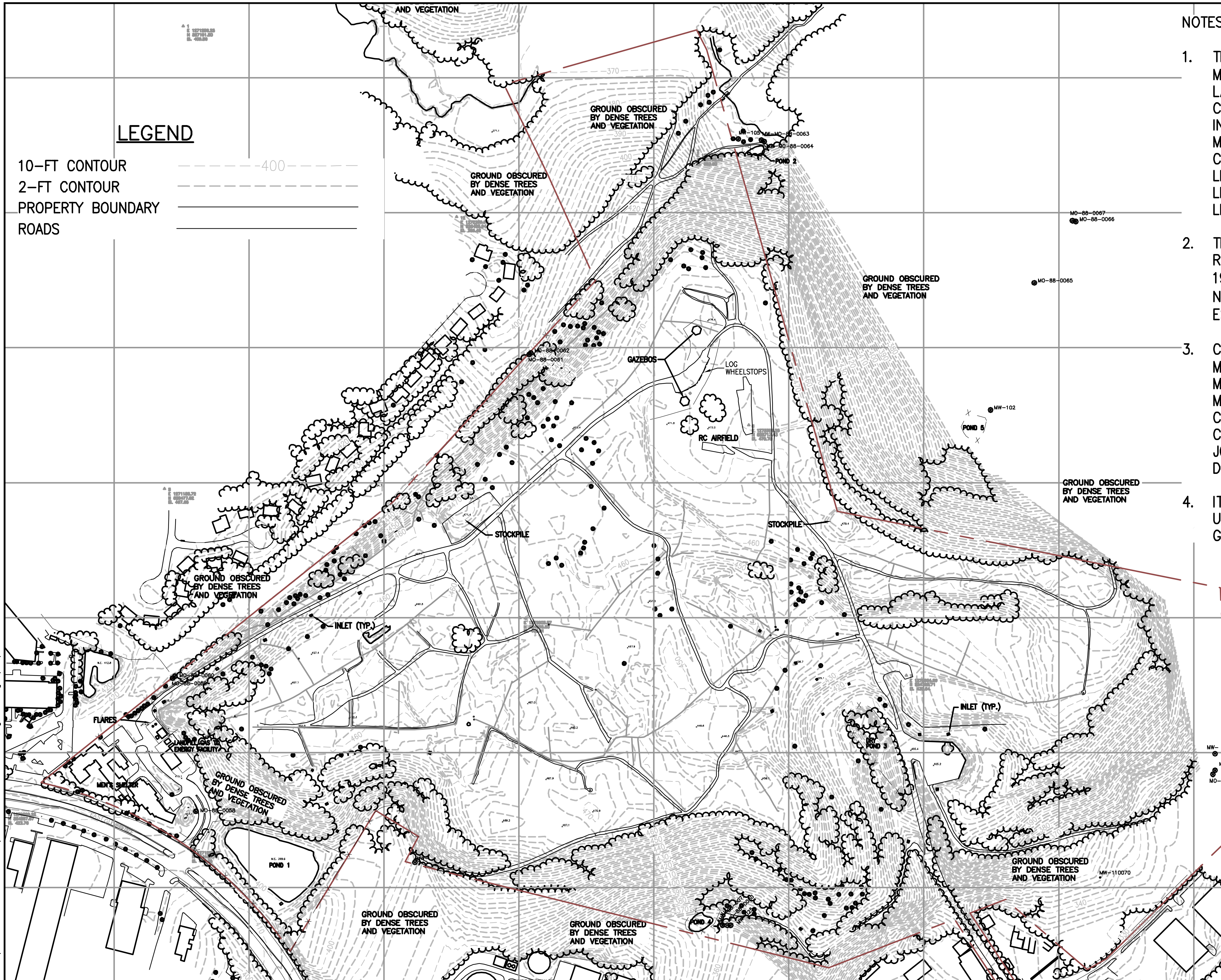
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983/91 (NAD–83/91). COORDINATE SYSTEM IS MARYLAND STATE PLANE, U.S. SURVEY FEET. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD–88) WITH ELEVATIONS SHOWN IN FEET.

3. THE PROPERTY BOUNDARY WAS LAID OUT AND THE PLAT THEREOF PREPARED BY A REGISTERED PROPERTY LINE SURVEYOR OF THE STATE OF MARYLAND, IN COMPLIANCE WITH SECTION 3–108 OF THE REAL PROPERTY ARTICLE OF THE ANNOTATED CODE OF MARYLAND, EDITION 2005.

4. THE PROPERTY BOUNDARY REPRESENTS THE LANDS OWNED BY MONTGOMERY COUNTY, MARYLAND KNOWN AS THE GUDE LANDFILL WHICH IS A COMPILATION OF THREE DEEDS, LISTED BELOW, RECORDED IN THE LAND RECORDS OF MONTGOMERY COUNTY, MARYLAND, WITHOUT BENEFIT OF FULL TITLE COMMITMENT.
   LIBER 2975 FOLIO 213
   LIBER 4501 FOLIO 453
   LIBER 5174 FOLIO 309

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	GUDE LANDFILL NATURE AND EXTENT STUDY PLAN MONTGOMERY COUNTY, MARYLAND	Figure 3–4 EXISTING GUDE LANDFILL GAS EXTRACTION AND MONITORING SYSTEMS	DESIGNED BY: PL	DRAWN BY: JP	DATE: FEB. 2010	PROJECT NO.: 62196.08
			CHECKED BY: BR	PROJECT MGR.: JK	DRAWING NO.: –	FIGURE: 3–4

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\FIG 3-5 LANDFILL GAS.DWG [FIG 3-5] 6/18/10



NOTES:

1. THIS PLAN'S OUTLINE REPRESENTS THE LANDS OWNED BY MONTGOMERY COUNTY, MARYLAND AND KNOWN AS GUDE LANDFILL TOTALING 162.4139 ACRES± WHICH IS A COMPILATION OF THREE DEEDS, LISTED BELOW, RECORDED IN THE LAND RECORDS OF MONTGOMERY COUNTY, MARYLAND. WITHOUT THE BENEFIT OF FULL TITLE COMMITMENT.
   LIBER 2975 FOLIO 213
   LIBER 4501 FOLIO 453
   LIBER 5174 FOLIO 309

2. THE COURSES AND COORDINATES SHOWN HEREON ARE REFERRED TO THE NORTH AMERICAN DATUM OF 1983/91(MARYLAND STATE PLANE) (NAD-83/91) AND NORTH AMERICAL VERTICAL DATUM OF 1988 (NAVD-88) AS ESTABLISHED BY GPS POSITIONING.

3. CONTOUR INTERVAL 2' TOPOGRAPHY COMPILED BY APPLIED MAPPING SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 06-24-2009. MAPPING COMPLIED TO MEET 100 SCALE AND 2 FOOT CONTOUR NATIONAL MAP ACCURACY STANDARDS. FIELD CHECK OF LFG AND DRAINAGE STRUCTURES BY C.C. JOHNSON & MALHOTRA, P.C., DATED JUNE 2009 THRU DECEMBER 2009.

4. IT IS BELIEVED BY THIS OFFICE THAT THE CONTOURING UNDER TREE CANOPY IS GROSSLY MISREPRESENTED DUE TO GROUND COVER AT TIME OF AERIAL FLYOVER.

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\FIG 3-6 AERIAL MAP.DWG [LAYOUT1] 6/18/10

EA® EA ENGINEERING, SCIENCE, AND TECHNOLOGY

GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

FIGURE 3-5
SITE SURVEY

DESIGNED BY	DRAWN BY	DATE	PROJECT NO.
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
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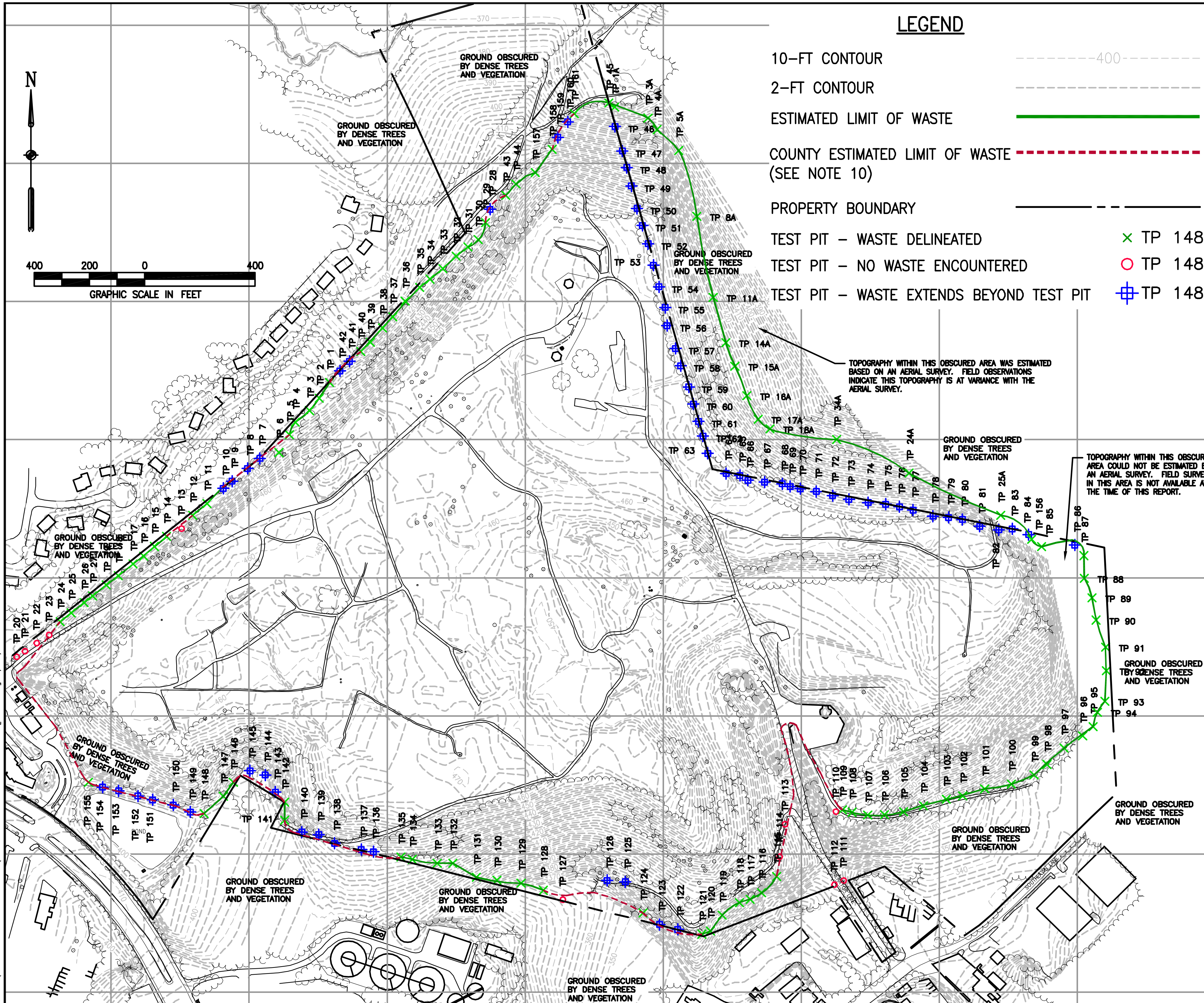
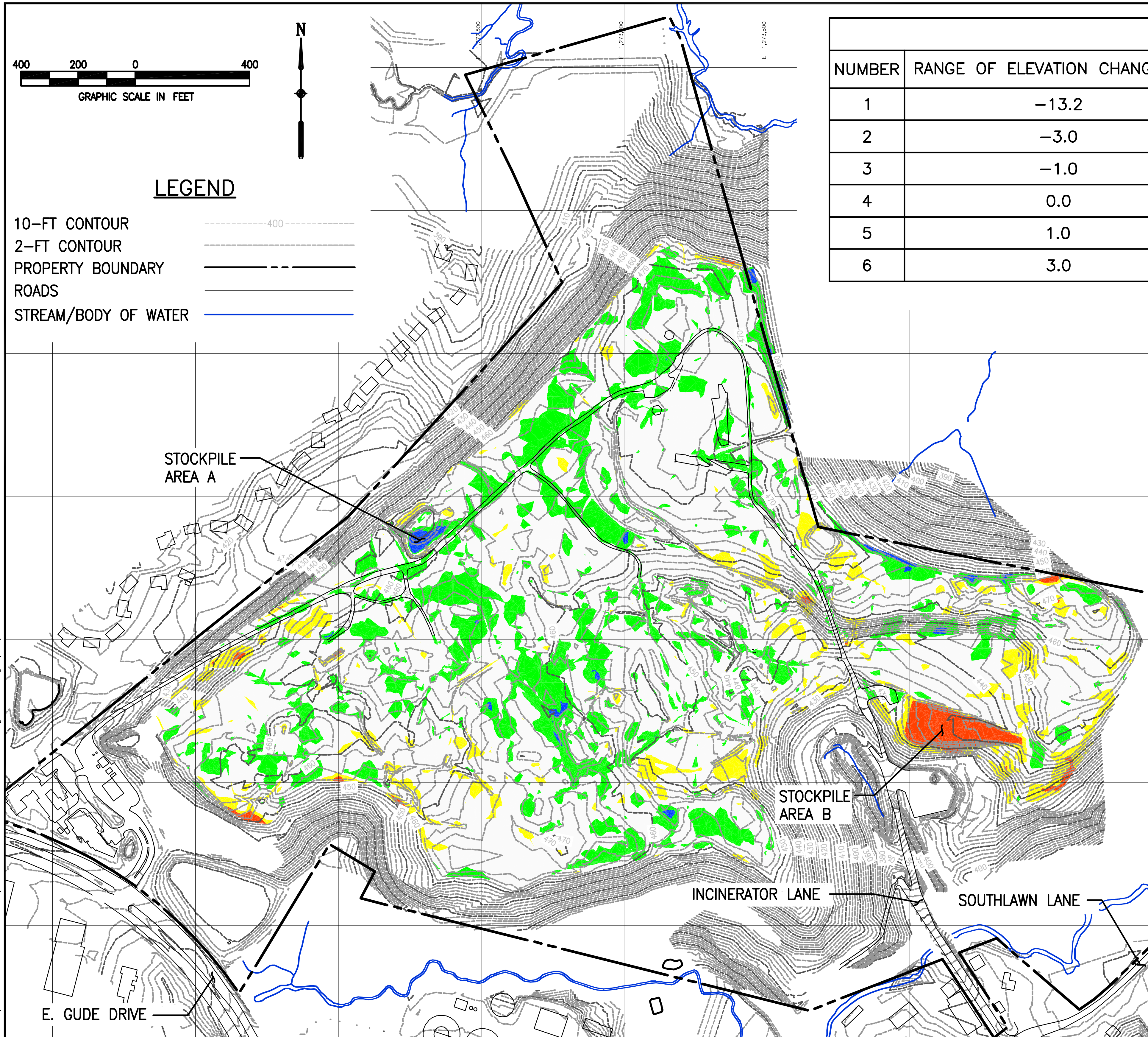


NOTES:

1. TOPOGRAPHY COMPILED BY APPLIED MAPPING SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 06/24/09 AND SUPPLEMENTED WITH FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER 2009.
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.
3. THE PROPERTY BOUNDARY WAS LAID OUT AND THE PLAT THEREOF PREPARED BY A REGISTERED PROPERTY LINE SURVEYOR OF THE STATE OF MARYLAND, IN COMPLIANCE WITH SECTION 3–108 OF THE REAL PROPERTY ARTICLE OF THE ANNOTATED CODE OF MARYLAND, EDITION 2005.
4. THE PROPERTY BOUNDARY REPRESENTS THE LANDS OWNED BY MONTGOMERY COUNTY, MARYLAND KNOWN AS THE GUDE LANDFILL WHICH IS A COMPILATION OF THREE DEEDS, LISTED BELOW, RECORDED IN THE LAND RECORDS OF MONTGOMERY COUNTY, MARYLAND, WITHOUT BENEFIT OF FULL TITLE COMMITMENT.
   LIBER 2975 FOLIO 213
   LIBER 4501 FOLIO 453
   LIBER 5174 FOLIO 309
5. TEST PITTING WAS PERFORMED AT AN APPROXIMATE SPACING OF 50 FEET ALONG THE ASSUMED LIMIT OF WASTE WHERE THE HORIZONTAL LIMIT OF WASTE WAS TO BE DETERMINED.
6. THE HORIZONTAL LIMIT OF WASTE DEPICTED IS ESTIMATED BASED UPON TEST PIT FINDINGS AND SITE TOPOGRAPHY.
7. AT TEST PIT LOCATIONS ALONG THE ACCESS ROAD AND THE PROPERTY LINE WHERE WASTE WAS NOT ENCOUNTERED, THE HORIZONTAL LIMIT OF WASTE IS NOT DEPICTED AND IS BELIEVED TO BE WITHIN THE PROPERTY BOUNDARY.
8. AT TEST PIT LOCATIONS ALONG THE PROPERTY LINE WHERE WASTE WAS ENCOUNTERED, THE HORIZONTAL LIMIT OF WASTE IS NOT DEPICTED AND IS BELIEVED TO EXTEND BEYOND THE PROPERTY BOUNDARY.
9. TOPOGRAPHY IS APPROXIMATE IN AREAS NOTED "GROUND OBSCURED BY DENSE TREES AND VEGETATION". THE APPROXIMATED TOPOGRAPHY DOES NOT IMPACT THE DELINEATION OF WASTE IN THESE AREAS.
10. IN AREAS WHERE A DEFINITIVE LIMIT OF WASTE WAS NOT ESTABLISHED BY EA ENGINEERING, THE LIMIT OF WASTE WAS ESTIMATED BASED UPON COUNTY STAFF KNOWLEDGE.

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	GUDE LANDFILL NATURE AND EXTENT STUDY PLAN MONTGOMERY COUNTY, MARYLAND	FIGURE 3–6 GUDE LANDFILL WASTE DELINEATION	DESIGNED BY PL	DRAWN BY JP	DATE FEB. 2010	PROJECT NO. 62196.08
			CHECKED BY BR	PROJECT MGR. JK	DRAWING NO. –	FIGURE 3–6

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\FIG 3–7 LIMIT OF WASTE.DWG [FIG 3–7] 6/18/10



		ELEVATION CHANGE		
NUMBER	RANGE OF ELEVATION CHANGE (FT)	RANGE OF ELEVATION CHANGE (FT)	COLOR	AREA (ACRE)
1	−13.2	−3.0		0.5
2	−3.0	−1.0		17.4
3	−1.0	0.0		38.3
4	0.0	1.0		22.5
5	1.0	3.0		6.3
6	3.0	10.1		1.3

TOTAL: 86.3 ACRES

NOTES:

1. THIS FIGURE IS GENERATED BY COMPARING TWO TOPOGRAPHIC SURVEYS – ONE FROM FEBRUARY 2007 AND ONE FROM JUNE/OCTOBER 2009. AREAS THAT HAVE SETTLED OR OTHERWISE ARE LOWER TOPOGRAPHICALLY SINCE THE 2007 BASELINE SURVEY ARE DEPICTED IN BLUE AND GREEN COLORS. AREAS THAT HAVE BEEN DISTRUBED AND ARE HIGHER TOPOGRAPHICALLY SINCE THE 2007 BASELINE SURVEY ARE DEPICTED IN YELLOW, ORANGE AND RED COLORS.

2. 2007 TOPOGRAPHY COMPILED BY AXIS GEOSPATIAL LLC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 02/28/07.

3. 2009 TOPOGRAPHY COMPILED BY APPLIED MAPPING SOLUTIONS, INC. USING PHOTOGRAMMETRIC METHODS WITH PHOTOGRAPHY DATED 06/24/09 AND SUPPLEMENTED WITH FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C., OCTOBER 2009.

4. TOPOGRAPHIC CONTOURS DEPICTED ON THIS DRAWING ARE FROM THE 2009 SURVEYS.

5. 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.

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   LIBER 2975 FOLIO 213
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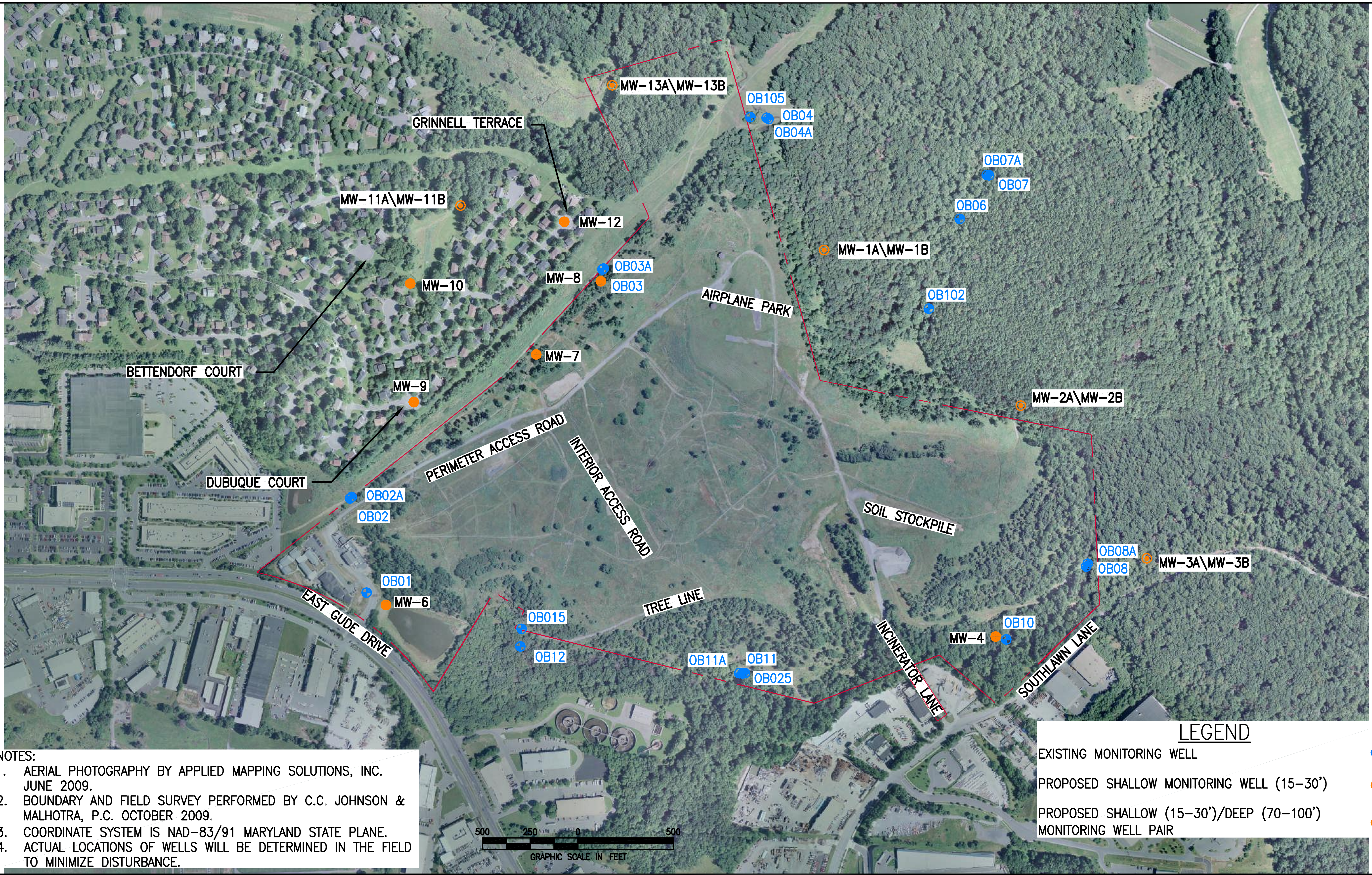
GUDE LANDFILL
NATURE AND EXTENT STUDY PLAN
MONTGOMERY COUNTY, MARYLAND

FIGURE 3–7
SETTLEMENT ANALYSIS FIGURE

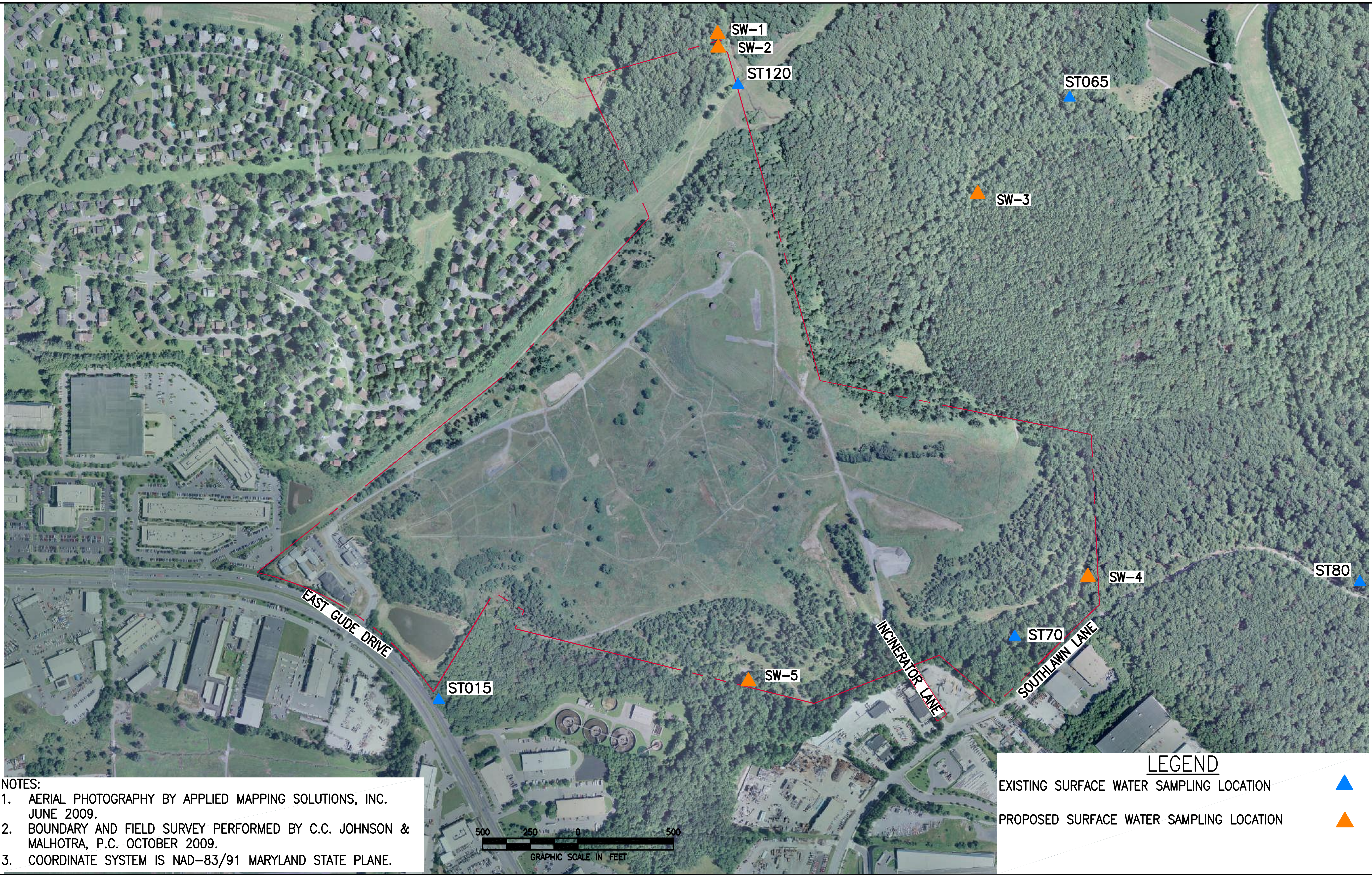
DESIGNED BY	DRAWN BY	DATE	PROJECT NO.
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	3–7



NOTES:
1. AERIAL PHOTOGRAPHY BY APPLIED MAPPING SOLUTIONS, INC. JUNE 2009.
2. BOUNDARY AND FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C. OCTOBER 2009.
3. COORDINATE SYSTEM IS NAD-83/91 MARYLAND STATE PLANE.
4. ACTUAL LOCATIONS OF WELLS WILL BE DETERMINED IN THE FIELD TO MINIMIZE DISTURBANCE.

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\GROUNDWATER\FIG 4-1_4-2_4-3 GWFIGURE.DWG [FIG 4-1] 7/14/10

EA ENGINEERING, SCIENCE, AND TECHNOLOGY	GUDE LANDFILL NATURE AND EXTENT STUDY PLAN MONTGOMERY COUNTY, MARYLAND	Figure 4-1 PROPOSED GROUNDWATER MONITORING WELL LOCATION MAP	DESIGNED BY PL	DRAWN BY JP	DATE FEB. 2010	PROJECT NO. 62196.08
			CHECKED BY BR	PROJECT MGR. JK	DRAWING NO. –	FIGURE 4-1



NOTES:
1. AERIAL PHOTOGRAPHY BY APPLIED MAPPING SOLUTIONS, INC. JUNE 2009.
2. BOUNDARY AND FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C. OCTOBER 2009.
3. COORDINATE SYSTEM IS NAD-83/91 MARYLAND STATE PLANE.

LEGEND

EXISTING SURFACE WATER SAMPLING LOCATION ▲

PROPOSED SURFACE WATER SAMPLING LOCATION ▲

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\GROUNDWATER\FIG 4-1_4-2_4-3 GWFIGURE.DWG [FIG 4-2] 3/26/10

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Figure 4-2
PROPOSED SURFACE WATER SAMPLING LOCATION MAP

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PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	4-2

NOTES:
1. AERIAL PHOTOGRAPHY BY APPLIED MAPPING SOLUTIONS, INC. JUNE 2009.
2. BOUNDARY AND FIELD SURVEY PERFORMED BY C.C. JOHNSON & MALHOTRA, P.C. OCTOBER 2009.
3. COORDINATE SYSTEM IS NAD-83/91 MARYLAND STATE PLANE.

LEGEND

PROPOSED SURFACE SOIL GRAB SAMPLE ■

FILE PATH: Q:\PROJECTS\6219608 GUDE PHASE 1\GROUNDWATER\FIG 4-1_4-2_4-3 GWFIGURE.DWG [FIG 4-3] 3/26/10

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MONTGOMERY COUNTY, MARYLAND

Figure 4-3
PROPOSED SURFACE SOIL SAMPLE LOCATION MAP

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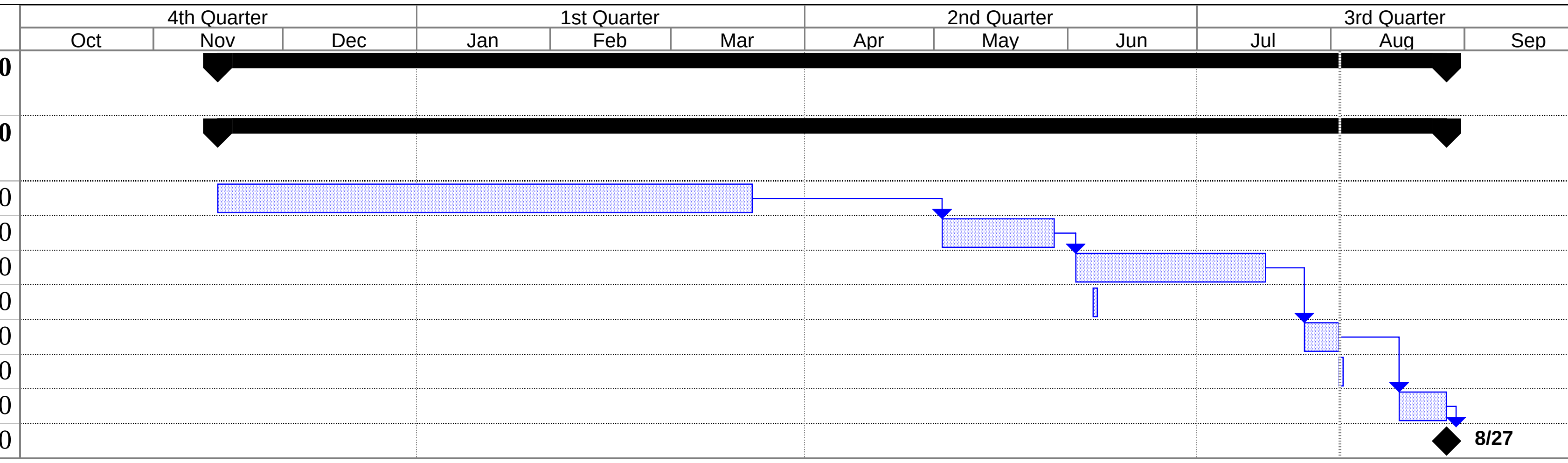
PL	JP	FEB. 2010	62196.08
CHECKED BY	PROJECT MGR.	DRAWING NO.	FIGURE
BR	JK	–	4-3

Figure 5-1

Gude Landfill Nature and Extent Study

Phase 1 - Nature and Extent Study Schedule

ID	Task Name	Duration	Start	Finish
1	**TASK 2: Nature and Extent Study Planning and Implementation**	**205 days**	**Mon 11/16/09**	**Fri 8/27/10**
2	**Subtask 2d - Additional Sampling and Data Gathering**	**205 days**	**Mon 11/16/09**	**Fri 8/27/10**
3	Coordination for off-site sampling locations (County)	90 days	Mon 11/16/09	Fri 3/19/10
4	Coordination for well permits and field logistics	20 days	Mon 5/3/10	Fri 5/28/10
5	Install and develop new monitoring wells	32 days	Thu 6/3/10	Fri 7/16/10
6	Surface Soil Sampling	1 day	Mon 6/7/10	Mon 6/7/10
7	Sample monitoring wells	6 days	Mon 7/26/10	Mon 8/2/10
8	Surface Water Sampling Event	1 day	Tue 8/3/10	Tue 8/3/10
9	Incorporate data into database	9 days	Tue 8/17/10	Fri 8/27/10
10	Discuss data with County	0 days	Fri 8/27/10	Fri 8/27/10



Project: Gude1-Schedule
Date: Tue 8/3/10

Task | Progress | Summary | External Tasks | Split
Split | Milestone | Project Summary | External MileTask