

**Interim Remedial Measure  
NAPL Recovery Well Work Plan  
for the 50 Kent Avenue Parcel  
Former Williamsburg Works MGP Site  
Site ID No. 224055  
Brooklyn, Kings County, New York**

*Prepared for:*

**nationalgrid**

One MetroTech Center  
Brooklyn, New York 11201

*Prepared by:*

**URS**

77 Goodell Street  
Buffalo, NY 14203

**October 2013**

**INTERIM REMEDIAL MEASURE  
NAPL RECOVERY WELL WORK PLAN  
FOR THE  
50 KENT AVENUE PROPERTY  
FORMER WILLIAMSBURG WORKS MGP SITE  
SITE ID NO. 224055  
BROOKLYN, KINGS COUNTY, NEW YORK**

**PREPARED FOR:**

**NATIONAL GRID  
ONE METROTECH CENTER  
BROOKLYN, NEW YORK 11201**

**PREPARED BY:**

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**OCTOBER 2013**

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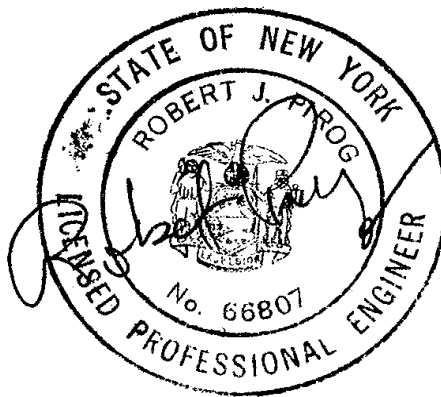
APPENDIX C Community Air Monitoring Plan

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## CERTIFICATION

I, Robert Pirog, certify that I am currently a NYS registered professional engineer and that this NAPL Recovery Well Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



## **GLOSSARY**

bgs	below ground surface
BUG	The Brooklyn Union Gas Company
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
ft	feet
HASP	Health and Safety Plan
IDIP	IRM Design and Implementation Plan
IRM	Interim Remedial Measure
MGP	Manufactured Gas Plant
NAPL	Non-Aqueous Phase Liquid
NTUs	Nephelometric Turbidity Units
NYCDOS	New York City Department of Sanitation
NYCDOT	New York City Department of Transportation
NYCPR	New York City Parks & Recreation
NYSDEC	New York State Department of Environmental Conservation
PPE	Personal Protection Equipment
URS	URS Corporation

## **EXECUTIVE SUMMARY**

On behalf of National Grid, URS Corporation (URS) has prepared this Non-aqueous Phase Liquid (NAPL) Recovery Well Work Plan to describe the initial component of the Interim Remedial Measure (IRM) for the 50 Kent Avenue property (“the Site”) of the former Williamsburg Works Manufactured Gas Plant (MGP). The former Williamsburg Works MGP site is covered under an Order on Consent and Administrative Settlement, #A2-0552-0606, which was entered into by KeySpan Corporation (a predecessor to National Grid) and New York State Department of Environmental Conservation (NYSDEC).

The former Williamsburg Works MGP site is located on four properties along North 12th and North 11th Streets, Kent Avenue, and the East River in the Williamsburg neighborhood of Brooklyn, New York.

The purpose of the IRM is to address MGP-related source material at the Site. This work plan addresses one component of the IRM—the installation of 13 NAPL recovery wells –and includes an outline of the scope of work and basic well design details. URS and National Grid will use the contents of this work plan to develop the final design documents and bid package for the construction work. Installation is planned for winter 2013-2014 and is expected to require approximately two months.

Based on a review of soil boring logs, recovery wells for the Site will be mainly located along North 12<sup>th</sup> St., with two wells along North 11<sup>th</sup> St and three wells located towards the west end of the Site. Each well will be six inches in diameter, be screened from the top of clay to 25 feet (ft) - 35 ft above the top of clay and at other intervals where warranted, and have a five-foot long sump installed beneath the screened interval.

Following installation of the recovery wells, NAPL will be gauged and recovered from the wells on a to-be-determined period, based on post-development NAPL thicknesses and observed recovery rates. NAPL collection and disposal will be documented in e-mail following each gauging/recovery event and in annual letter reports.

## **1. Introduction**

On behalf of National Grid, URS Corporation – New York (URS) has prepared this Non-Aqueous Phase Liquid (NAPL) Recovery Well Work Plan to describe the initial component of the Interim Remedial Measure (IRM) for the Williamsburg Works former Manufactured Gas Plant (MGP). This work plan is limited in scope to presenting the basis for the design and initial operation and maintenance of the recovery wells.

### **1.1 Site History**

The Williamsburg Works MGP operated from approximately 1863 through the late 1930s, first by the Williamsburg Gas Light Company and later by The Brooklyn Union Gas Company (BUG). The MGP was located along North 12th and North 11th Streets, Kent Avenue, and the East River, in the Williamsburg neighborhood of Brooklyn, New York. Today, the footprint of the former MGP site occupies four properties: 2 North 11<sup>th</sup> Street, 20 North 12<sup>th</sup> Street, 35 Kent Avenue, and 50 Kent Avenue.

Following the closure of the MGP, the above-ground structures were dismantled sometime prior to 1941. However, the gas holder tanks, their foundations, and other structures remain underground. In February 2007, KeySpan Corporation (successor to BUG and a predecessor to National Grid) and New York State Department of Environmental Conservation (NYSDEC) entered into a multi-site Order on Consent and Administrative Settlement, #A2-0552-0606 (the Order). The former Williamsburg Works MGP site was added to the Order by a modification executed in August 2007.

The IRM will address only the 50 Kent Avenue property of the former MGP footprint. This property, referred to in this work plan as “the Site,” is at Block 2287, Lot 1 (Figure 1-1), and was the location for purifying operations, condensers and three gas holders. The 50 Kent Avenue property is bordered by North 12th Street to the northeast, Kent Avenue to the southeast, North 11th Street to the southwest, and Block 2287, Lot 16 to the northwest.

Most recently, the Site was used by the New York City Department of Sanitation (NYCDOS) and included a NYCDOS garage on the northwestern half of the Site. The garage was demolished in 2009 and the Site is currently vacant, and owned by the New York City Department of Parks&

Recreation (NYCPR). Figure 1-2 shows the Site location with the outlines of the historic MGP structures.

The investigation history of the Site is summarized in detail in the IRM Design and Implementation Plan (IDIP) dated April 2013.

## **1.2 IRM Process**

The intent of the IRM is to remediate source material at the Site while allowing the Site to be used by the property owner (NYCPR) with few or no restrictions. The IRM at the 50 Kent Avenue Property will precede remediation of the remaining former MGP footprint, which occupies properties beyond the Site, where access is not possible at this time due to current property uses. The two principal components of the IRM are 1) the installation of passive NAPL recovery wells and 2) the excavation and off-site disposal of certain contaminated soils and the gas holder tanks and their foundations. Figure 1-2 shows the general areas of well installation and soil excavation as outlined in the IDIP.

As described herein, the NAPL Recovery wells will be installed independently of the soil excavation effort. Following the final approval of this NAPL Recovery Well Work Plan, a recovery well design package, including specifications and drawings for well installation, will be issued for the competitive procurement of a construction contractor. A separate design report and contract document package will later be developed for the excavation portion of the IRM.

## **2. Recovery Well Design Basis**

The goal of the NAPL recovery wells is the capture and collection, for disposal, of source material. The 13 recovery wells will be installed prior to implementation of the excavation component of the IRM. Based on remedial work at similar sites, NYSDEC expects increased NAPL mobility during subsequent IRM excavation, as a result of vibrations from construction operations and/or other not-well-understood mechanisms. Therefore, per the request of NYSDEC, National Grid has agreed to install the NAPL collection wells prior to the soil excavation component of the IRM.

### **2.1 Well Location Rationale**

The originally planned general location of the recovery wells, as described in the April 2013 IDIP, is shown on Figure 1-2. The currently proposed locations of the wells are shown on Figure 2-1, and include two wells outside the L-shaped Product Recovery Area as defined in the April 2013 IDIP. The proposed locations were selected based on the review of the visual contamination observations in borings installed at the Site.

Along the L-shaped Product Recovery Area, the borings reviewed for this work plan, starting from the intersection of North 12<sup>th</sup> Street and Kent Avenue and proceeding north-west, as shown on Figure 2-2, are:

- BPB-21
- WW-SB-101
- BPB-18/MW-7
- WW-MW-07
- WW-SB-24
- GR-1
- WW-SB-09
- BPB-13/MW-4
- WW-SB-11
- WW-SB-110
- WW-MW-17
- WW-SB-109

Logs of these borings are included in Appendix A. Of these borings, only borings WW-SB-101 and GR-1, both near the relief holder, demonstrated significant horizons of NAPL saturation. In addition, boring BPB-13/MW-4 indicated heavy coal tar at the bottom of the boring. Therefore, along North 12<sup>th</sup> Street the recovery well locations were biased towards these locations. In total, eight recovery wells are planned for North 12<sup>th</sup> Street.

Three recovery wells are planned for the west end of the Site to collect recoverable NAPL that may be present at, or migrate to this portion of the Product Recovery Area. The locations of these wells are biased toward the North 12<sup>th</sup> Street side of the Site, since more NAPL has been observed in wells along North 12<sup>th</sup> Street than along North 11<sup>th</sup> Street.

Pursuant to the teleconference with NYSDEC on August 2, 2013, records of borings along North 11<sup>th</sup> Street were also reviewed to determine whether product recovery wells are warranted along the south side of the Site. Specifically, NYSDEC referenced the presence of NAPL in boring BPB-16/MW-6. The wells referenced by a BPB prefix were installed during a 2006 investigation by Metcalf and Eddy, Inc. for the City of New York. As these wells were not installed as part of National Grid's MGP investigations, the borings were not logged with the same descriptors and thus are of limited use in determining the presence of potentially mobile NAPL. The log of boring BPB-16/MW-6 indicated the presence of "product in sample" from an elevation of 15 feet (ft) bgs to the bottom of the boring at 57 feet, suggesting the presence of NAPL. However, in the log for boring WW-MW-06 (which was installed by GEI in 2009, on behalf of National Grid), located adjacent (within 10 ft of boring BPB-16/MW-6), only sheens and coatings were documented (at both 10–18 ft bgs and 23–28 ft bgs); no saturation was observed. To shed light on this discrepancy, the narrative description from the overseeing geologist of this borehole's installation (provided in the appendices of the Metcalf and Eddy report) was reviewed. This narrative did not mention the presence of product, other than indicating the sample that was collected at 21–23 ft bgs was "saturated with coal tar." In contrast, the narrative description of boring BPB-15/MW-5 about 50 ft to the north specifically mentioned the presence of "free coal tar product" in the 15–17 foot and the 43–49 foot intervals. The absence of such a description in boring BPB-16/MW-6, and the absence of observed saturation in the WW-MW-06 boring, suggests that the boring BPB-16/MW-6 "product in sample" description on many intervals of the boring log refers to contamination other than NAPL saturation.

Based on this review, it appears there is conflicting information about whether recoverable NAPL will be present along 11<sup>th</sup> Street. However, given the information from the 2006 borings, two product recovery wells are planned for the vicinity of borings BPB-15/MW-5 and BPB-16/MW-6.

Wells located along 11<sup>th</sup> Street and 12<sup>th</sup> Street will be located as far from the Site fence line as possible given constraints of the presence of subsurface utilities. The final selected locations may be moved as far as the street gutter, but not into the street so as to not hinder routine NAPL collection activities.

## **2.2 Well Depth and Screen Intervals**

NAPL is present at varying depths throughout the Site. Figure 2-3 depicts an interpreted cross section of the borings along the L-shaped area where eleven of the thirteen wells will be installed. Potentially mobile NAPL may be present in zones identified on the cross-sections by dark brown shading, designating tar saturation, and by yellow shading, designating blebs and coatings. The Metcalf & Eddy borings (prefixed with “BPB-”) did not use the same description of MGP contamination as subsequent investigations performed for National Grid and thus do not include any shading. However, only the tar saturated zones (dark brown) are expected to produce recoverable NAPL.

As shown on the cross section, geologic conditions and tar occurrence at the Site are variable. For example, boring WW-SB-101, located adjacent to the relief holder tank, exhibited intermittent zones of NAPL saturation from 21–49 ft bgs. Boring GR-1, also adjacent to the relief holder, primarily had NAPL saturation only in the 35–41 ft bgs interval, but had other saturated seams (less than one foot thick) intermixed among stained areas in shallower (13–23 ft bgs) and deeper zones (43–47 ft bgs). In contrast, “heavy coal tar” was only recorded at the very bottom (52 ft bgs) of boring BPB-13/MW-4.

Proposed screen intervals are generally based on depths where NAPL contamination is known to exist at the Site (not necessarily at each proposed location). Screens will also be installed where such contamination is discovered during the actual well drilling process. Based on the variable geologic and NAPL saturation conditions at the Site, the wells will be installed with a minimum 25-foot long screen. This will allow for capture of NAPL which may be present at varying depths. The bottom of the screen will be located at the top of the basal clay layer. A five foot long sump will be installed into the basal clay layer, beneath the lowest screened zone, for collection of NAPL.

Additional screen lengths may be installed if warranted based on field observations of NAPL saturation or coating during advancement of the well borings. At this time additional screen lengths may include the following locations:



- NRW-08 through NRW-13: Located near borings WW-SB-101 and GR-1 near the relief holder. Logs for these borings show NAPL saturation as high as 35 ft above the clay. Recovery wells NRW-08 through NRW-13 may be screened up to 35 ft above the clay.
- NRW-04: Located near boring WW-SB-110. A screened interval at approximately 23-28 ft bgs is proposed to address NAPL saturation observed at this interval in boring WW-SB-110. The additional interval may not be installed if similar conditions are not observed in the recovery well NRW-04 boring.
- NRW-01 and NRW-02: Located along 11<sup>th</sup> St. Screened intervals at approximately 20-30 ft bgs are proposed based on the contaminant logging in boring WW-MW-06, in which a shallower interval of sheens and coatings was observed at 10-18 ft bgs and 23-28 ft bgs. The additional intervals may not be installed if similar conditions are not observed in the recovery well NRW-04 boring.

Additional screened intervals will be installed at depth intervals as presented above and at other intervals, only where NAPL saturation or coating is observed during recovery well installation.

Table 2-1 presents a summary of the depths of each well and the proposed screen intervals.

### **2.3 Well Construction Details**

The proposed typical construction of the NAPL recovery wells is shown on Figure 2-4. To maximize the potential for product recovery and the storage capacity of the well sumps, the wells will be six-inch diameter. The wells screens will be mixed stainless steel and PVC construction, as summarized in Table 2-1.

Where NAPL is expected as indicated by nearby boring data – specifically in the 35-foot screens of NRW-08 (near boring WW-SB-101), NRW-12 (near boring GR-1), and NRW-06 (near boring BPB-13/MW-4 where “heavy coal tar” was reported at the bottom of the boring), and the upper 5-foot screen of NRW-04 (near boring WW-SB-110), the screens will be stainless steel. Additionally, due to the observation of NAPL coating at boring WW-MW-06, the upper screen of NRW-01 and NRW-02 will also be stainless steel. If NAPL saturation or coating is observed at other intervals during well installation, stainless steel will be used at those intervals as well. All the sumps

will be constructed of stainless steel. All other sections of the risers and screens will be PVC. Centralizers will be used to keep the well centered in the borehole during construction.

Appendix C describes the selection of the sand pack and screen size. Twenty-slot (0.020-inch) continuous wire wrap screens will be installed within a Filpro size #0 sand pack.

### **3. Installation**

#### **3.1 Contractor Procurement**

National Grid will procure a recovery well construction contractor through competitive bidding. URS will develop comprehensive plans, specifications, and terms for contractor bid submission. To minimize drilling refusals due to cobbles and other subsurface obstructions, as well as to minimize waste soil generation, the use of sonic drilling technique will be required.

Contractors prequalified by National Grid's IS NetWorld system will be invited to submit bids. As it is anticipated that the drilling work will be subcontracted, each bidder will be required to disclose the qualifications of their proposed drilling subcontractor.

#### **3.2 Preconstruction Activities**

Upon contract award, the contractor will provide submittals as required by the contract documents for review by URS. Submittals will include, but not be limited to:

- Installation work plan including a staffing plan, schedule, specific drilling techniques (if applicable), well development techniques, and quality control;
- Well construction materials;
- Contractor's Health and Safety Plan (HASP);
- Maintenance and Protection of Traffic Plan;
- Decontamination procedures; and
- Waste management procedures.

Concurrent with the submittal process, a preconstruction meeting will be held on-site and/or at the nearby National Grid Greenpoint Energy Center. The preconstruction meeting will be attended by National Grid, the construction contractor, and URS. The site owner (NYCPR) will also be invited to attend. The purpose of the meeting will be to review the selected drilling locations, waste storage locations, access, schedule, and submittals received to date.

The contractor will be required to procure permits. A sidewalk opening permit will be required from the New York City Department of Transportation (NYCDOT). If the contractor wishes

to use water from nearby hydrants, a permit will be required from the New York City Department of Environmental Protection.

Prior to start of field activities, the contractor will be required to both contact the Underground Protection Facilities Organization for utilities markout and subsequently retain the services of a geophysical survey subcontractor to further delineate the location of subsurface utilities.

### **3.3 Recovery Well Installation**

Throughout the well installation and restoration process, URS will provide full time oversight to maintain compliance with the plans and specifications. URS will operate under the HASP attached as Appendix B. URS will also monitor the compliance of the contractor with their HASP, as approved during the submittal process. URS will perform community air monitoring in accordance with the Community Air Monitoring Plan (CAMP) presented in Appendix B.

The contractor will be required to maintain odor control foam generation capacity during the installation of the wells. In the case where odor complaints are received from adjacent building owners or tenants, the contractor will be instructed to reduce odors through the application of foam on the waste soil or water causing the odor.

URS will log each boring to identify stratigraphic and contamination zone, and make adjustments to the screen elevations as discussed in Section 2.2 above. The URS representative will have had experience at the site in logging the presence of contamination in accordance with the National Grid standard definitions of contamination, including percent saturation, presence or sheens, staining, blebs and odor, and distinction between coal tar related contamination and petroleum related contamination. URS will record the amount of water that is lost to the formation during installation.

The contractor will develop each well by extracting a minimum of 5 well volumes of water, and until turbidity is reduced to below 50 Nephelometric Turbidity Units (NTUs), and until the following parameters have stabilized:

- pH
- Conductivity
- Temperature

However, regardless of values of these parameters, no greater volume of water will be removed during development than twice the amount of water lost to the formation during well installation.

### **3.4     Waste Management**

The contractor will generate wastes including soil from drilling, water from decontamination and development, and waste Personal Protection Equipment (PPE). The contractor will be required to sample the waste material for characterization prior to disposal, in accordance with the requirements of the contractor's approved disposal facility. If characterization results indicate that wastes are characteristically hazardous as defined by the Resource Conservation and Recovery Act (RCRA), then storage will have to be managed in accordance with this regulation.

The contractor will be allowed to temporarily store wastes on site while awaiting sampling results and transport/disposal coordination. However, storage duration will be subject to site access time constraints and, should the wastes be hazardous, the maximum permissible storage durations.

If the aqueous wastes are determined to be hazardous, the contractor may elect to treat the water on site to reduce concentrations of constituents to levels that render the water non-hazardous. Such treatment will generate other wastes, such as activated carbon which will also require characterization and disposal.

### **3.5     Site Restoration**

The contractor will be required to restore the Site to preexisting conditions. Recovery well curb boxes will be installed flush with existing sidewalk pavement or the Site surface. Any sidewalk flags that are cracked during installation will be replaced in accordance with NYSDOT specifications. All waste material will be removed from the Site.

#### **4. Operation, Maintenance & Monitoring**

The recovery wells will be gauged for NAPL on a monthly basis. Each well will be sounded for water level measurements, and the presence of NAPL will be measured by observing coating on a string or through the use of NAPL detection equipment.

NAPL will be collected at intervals frequent enough to prevent complete filling of sumps, as monitoring during the gauging events. NAPL will be recovered manually through bailing or will be pumped out using a Watera pump or similar methods, with the extracted NAPL directed to a bucket or other vessel. Extraction will continue until relatively clear water is recovered.

Collected NAPL will be consolidated into drums that will be disposed of off-site. Arrangements will be made for either storage of recovered NAPL on-site or daily pickup depending on the rate of collection obtained. Any storage on-site would have to comply with the appropriate local, State, and Federal Requirements. If the NAPL is shown to be characteristically hazardous, RCRA hazardous waste storage requirements would apply and on-site storage would be subject to maximum permissible storage durations.

## **5. Schedule and Reporting**

Upon selection of a bidder, installation will commence. Installation is planned for winter 2013-2014 and is expected to require approximately two months. In accordance with access constraints from the site owner (NYCPR), all construction activities, including waste disposal and demobilization, will be completed prior to May 1, 2014. At the completion of well installation, a Construction Completion Report (CCR) will be prepared in accordance with NYSDEC DER-10 guidance to document the well installations.

The NAPL gauging and recovery results will be reported initially via e-mails to NYSDEC, listing which wells accumulated NAPL and quantity removed during each event. These results will then be formally documented in annual letter reports to NYSDEC. The letter reports will provide summaries of each month's activities, and provide cumulative tables and graphs of NAPL recovery from each well.

## 6. **Project Responsibilities**

This project has the following stakeholders, with their respective roles and responsibilities.

- National Grid is the project owner and has ultimate authority on the performance of the well installation and NAPL recovery project. Also, National Grid through its consultant URS, has the authority to monitor contractor performance and construction quality. National Grid has authority to select and dismiss contractors and also the authority to accept or reject plans, materials, specifications, workmanship.
- URS is the project engineer and construction manager. URS will develop the contract documents used for solicitation and retaining a construction contractor. URS will provide construction administration services during well installation, including monitoring the contractor performance for compliance with the contract documents, logging the borings, and performing the community air monitoring. URS will prepare the CCR documenting the installation process. URS will perform NAPL recovery activities, including arrangement for recovered NAPL disposal.
- The Contractor will be retained by National Grid and will install the wells in accordance with the contract documents and the project schedule.
- NYSDEC approves the well installation plan, and monitors National Grid, URS and the Contractor's compliance with this plan.
- NYCPR owns the 50 Kent Ave. Site. Although most of the wells will be installed on public rights of way just outside the Site, the Site will be used for staging and storage. NYCPR makes the Site available for these purposes through April 30, 2014.



## **7. Summary**

National Grid will install 13 NAPL wells to collect recoverable NAPL along the edges of the 50 Kent Avenue property of the former Williamsburg Works MGP site in advance of the soil excavation portion of the IRM. The installation of NAPL recovery wells is one component of the overall IRM. Well installation is planned for winter 2013-2014. The excavation portion of the IRM will follow the well installation and is not scheduled at this time.

**TABLES**

**Table 2-1**  
**Proposed NAPL Recovery Well Installation Details**

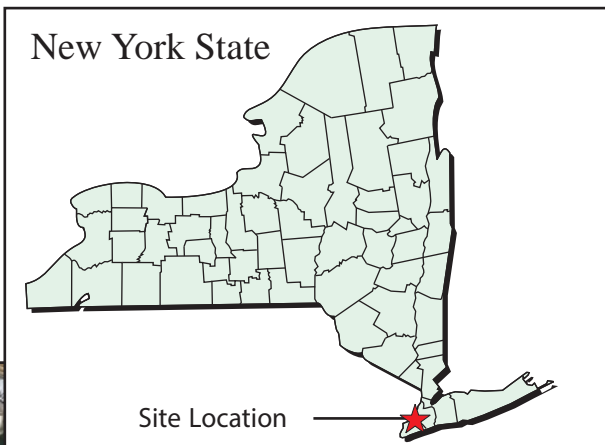
	NRW-01	NRW-02	NRW-03	NRW-04	NRW-05	NRW-06	NRW-07	NRW-08	NRW-09	NRW-10	NRW-11	NRW-12	NRW-13
Upper Screen Interval (feet bgs)	20-30 <sup>1</sup>	20-30 <sup>1</sup>	-	23-28 <sup>1</sup>	-	-	-	-	-	-	-	-	-
Upper Screen Material	Stainless Steel	Stainless Steel	-	Stainless Steel	-	-	-	-	-	-	-	-	-
Lower Screen Interval ( feet bgs)	35-60	35-60	30-55	38-63	39-64	34-59	32-57	19-54	21-56	22-57	18-53	21-56	20-55
Lower Screen Material	PVC	PVC	PVC	PVC	PVC	PVC and Stainless Steel <sup>2</sup>	PVC and Stainless Steel <sup>2</sup>	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	PVC
Sump Interval (feet bgs)	60-65	60-65	55-60	63-68	64-69	59-64	57-62	54-59	56-61	57-62	53-58	56-61	55-60

<sup>1</sup> if observations support screen installation

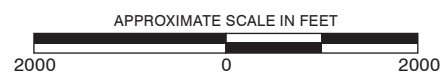
<sup>2</sup> Screen materials in this interval to be determined during boring. Both materials may be used.

Note: Installation details to be modified based on observations during boring

## **FIGURES**

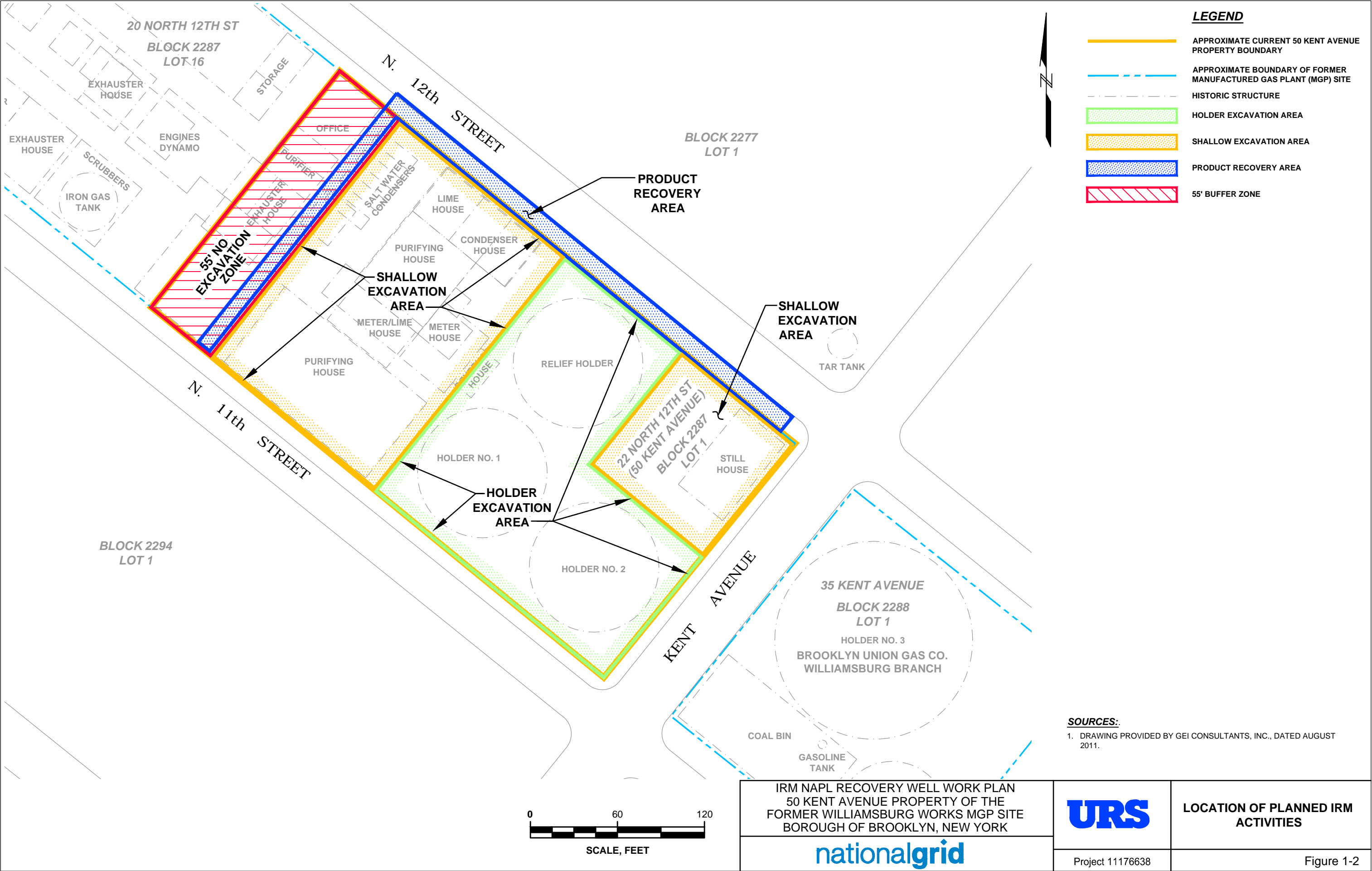


Source: Google Earth Pro - © 2012 Google

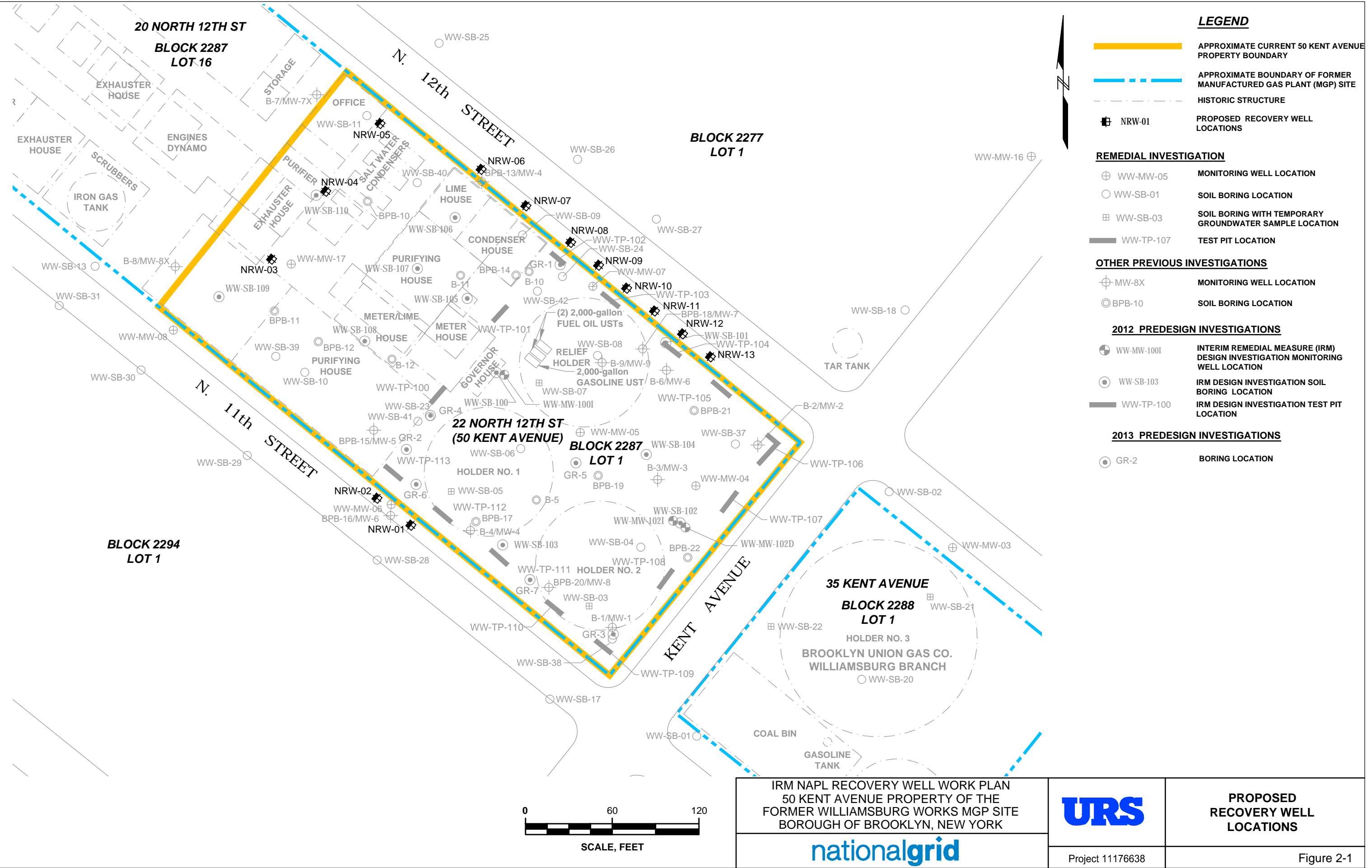


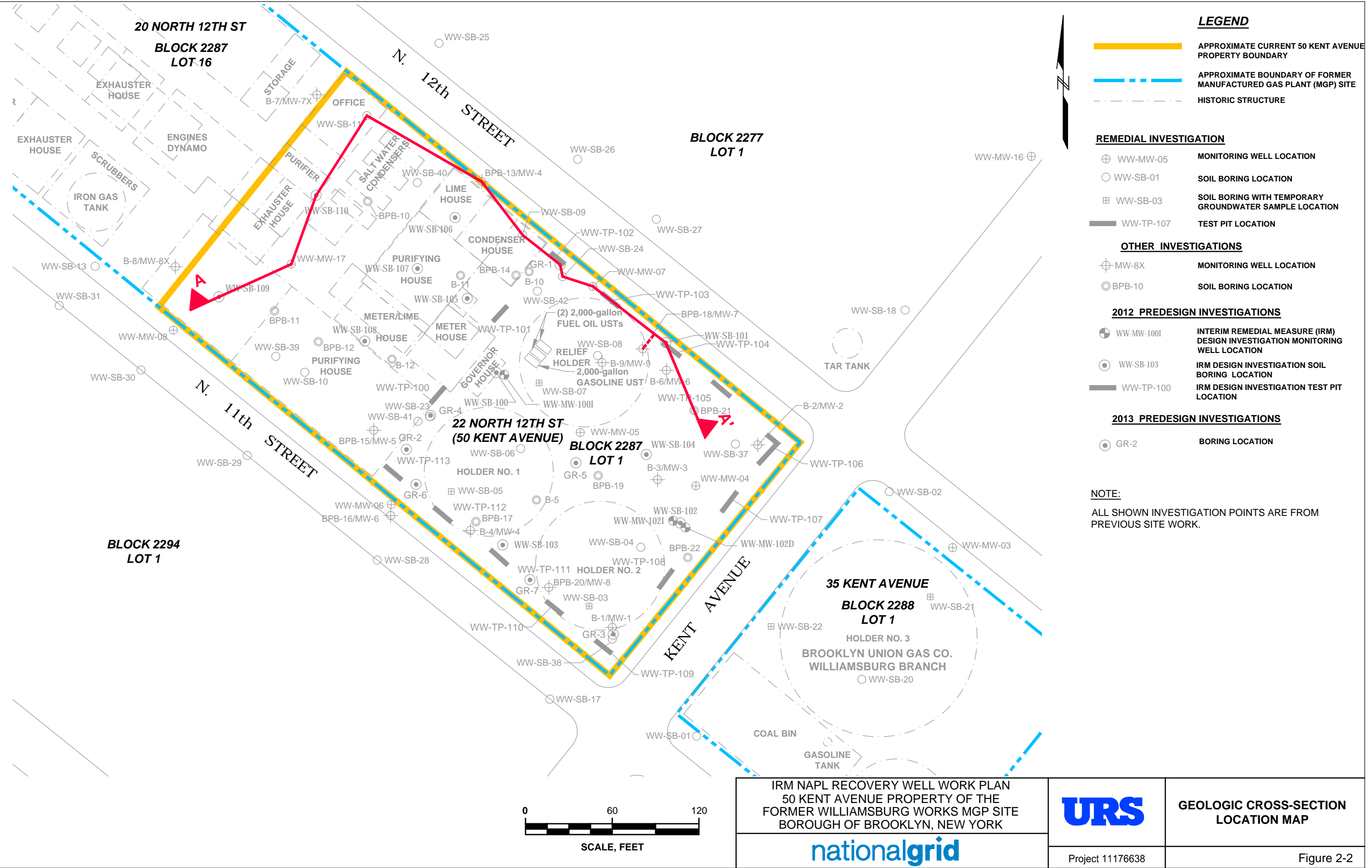
50 KENT AVENUE PARCEL OF THE  
WILLIAMSBURG WORKS FORMER MGP SITE  
BOROUGH OF BROOKLYN, NEW YORK  
SITE LOCATION MAP

FIGURE 1-1



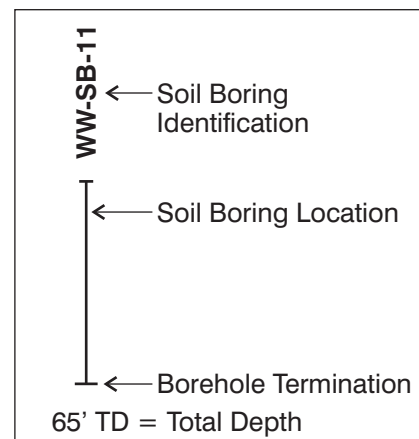
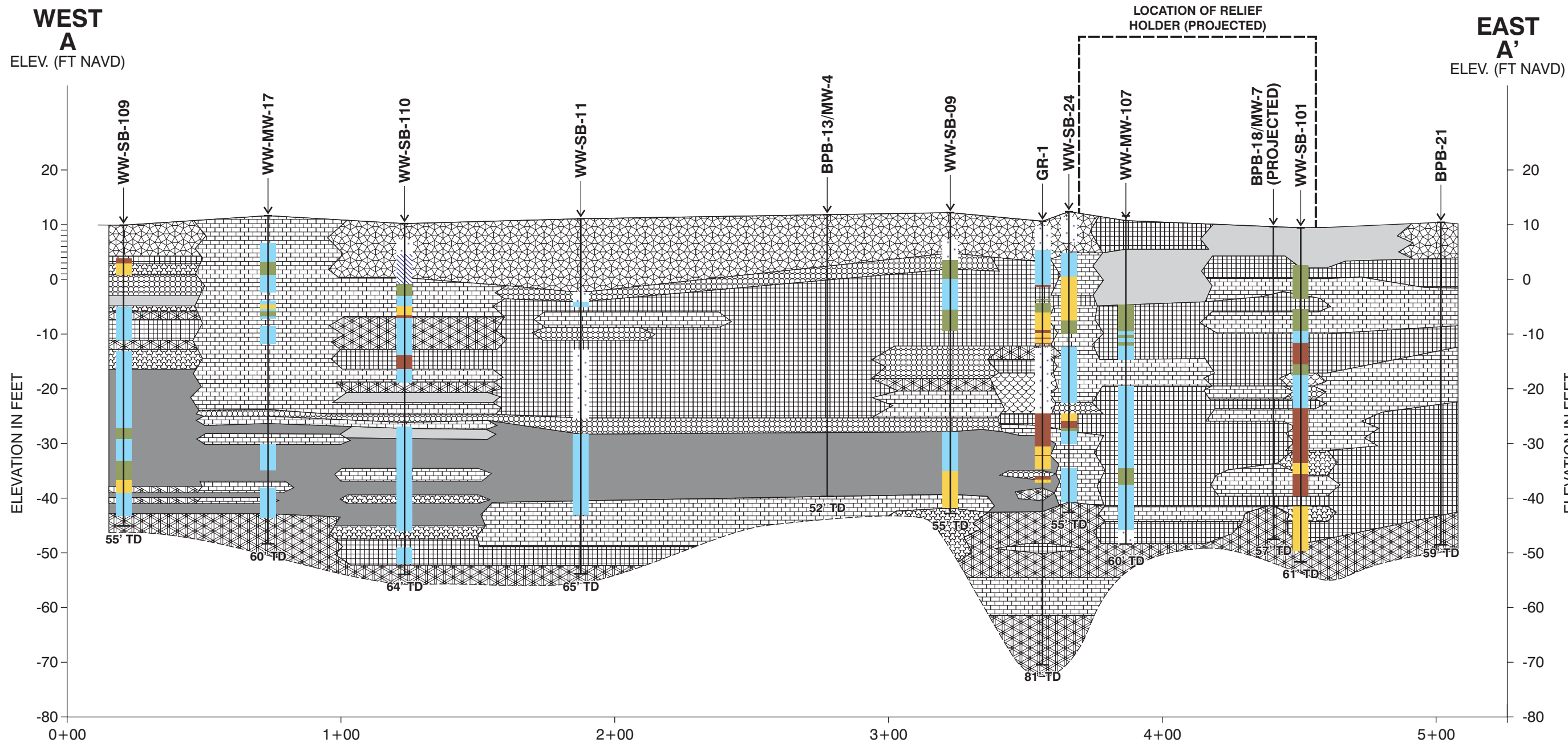








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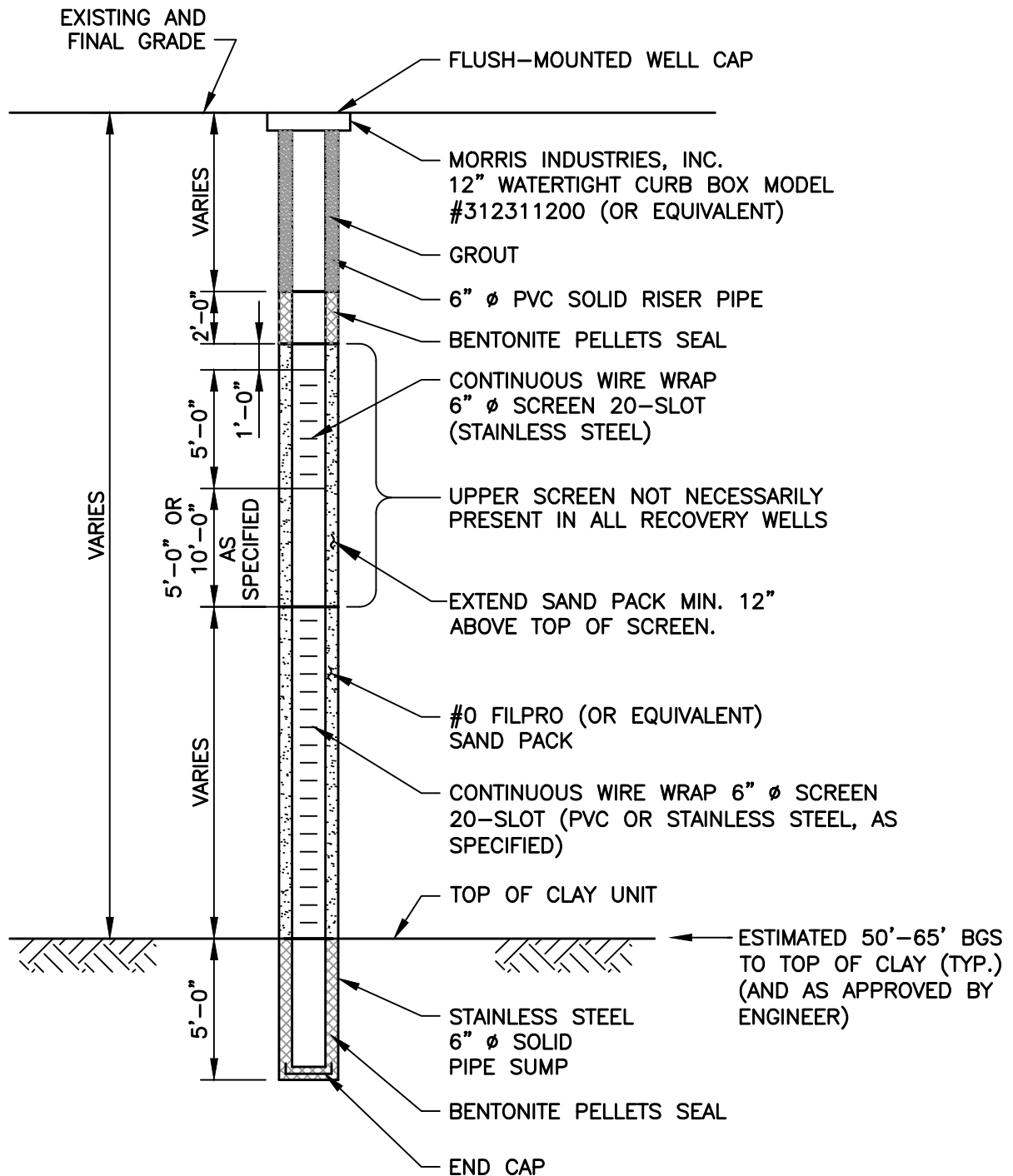
IRM NAPL RECOVERY WORK PLAN  
50 KENT AVENUE PROPERTY  
OF THE FORMER WILLIAMSBURG  
WORKS MGP SITE

GEOLOGIC CROSS SECTION

**nationalgrid**

**URS**

FIGURE 2-3



NOT TO SCALE

IRM NAPL RECOVERY WELL WORK PLAN  
50 KENT AVENUE PROPERTY OF THE  
FORMER WILLIAMSBURG WORKS MGP SITE  
BOROUGH OF BROOKLYN, NEW YORK

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TYPICAL NAPL RECOVERY  
WELL DETAIL

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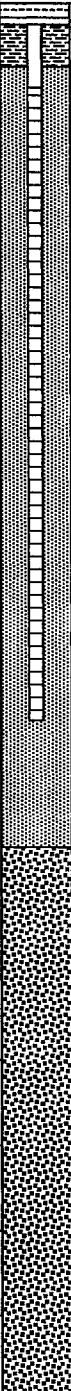
Project 11176638

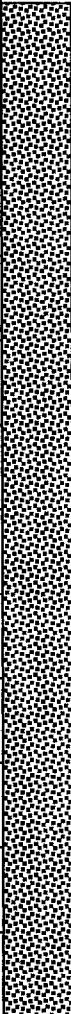
Figure 2-4

**APPENDIX A**  
**Select Boring Logs**

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-21		
LOCATION: NYDOS Yard, Brooklyn NY				ELEVATION: 10.4'			DEPTH: 59'		
				DATE BEGUN: 05/08/06			DATE FINISHED: 05/09/06		
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs			
DRILLING RIG: CME-55 - Track Mounted						DRILLER: Tony Palanque			
WEATHER: Overcast 60"s						DRILL FLUID: Water		HOLE SIZE: 6.25"Aug/3" Cas	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION		PID Reading	NOTES	
0					Borehole Cleared to 5 Feet for Utilities			Coal tar odor  " "	
5	S1	5'-7'	3"	2, 3, 3, 2	Loose Black Granular Fine to Coarse Sand (Ash & Cinders), tr Fine to Coarse Gravel (SW)		0		
	S2	7'-9'	18"	2, 2, 1, 2	Loose Gray Brown Fine Sand, tr to little Silt (SP)		0		
10	S3	9'-11'	14"	2, 3, 3, 4	Loose Gray Brown Fine Sand, little Silt (SP)		0		
	S4	11'-13'	10"	4, 5, 6, 8	Medium Dense Gray Fine Sand, little Silt (SP)		4.3		
	S5	13'-15'	12"	4, 6, 6, 5	Medium Dense Gray Fine Sand, some Silt (SM)		10.8		
15	S6	15'-17'	14"	8, 6, 10, 12	Medium Dense Gray Fine Sand, some Silt (SM)		42.3		
	S7	17'-19'	8"	10, 15, 12, 14	Medium Dense Gray Fine Sand, little to some Silt (SM)		62.2		
20	S8	19'-21'	8"	8, 10, 12, 15	Medium Dense Gray Fine to Medium Sand, little Silt, tr Fine to Medium Gravel (SP)		880		
	S9	21'-23'	10"	8, 11, 12, 14	Medium Dense Gray Fine to Medium Sand, little Silt, tr Fine to Medium Gravel (SP)		946		
	S10	23'-25'	8"	13, 9, 8, 10	Medium Dense Gray Silty Fine Sand (SM)		43.6		
25	S11	25'-27'	8"	5, 6, 6, 5	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)		36.2		
	S12	27'-29'	10"	5, 5, 8, 7	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)		52.8		
30	S13	29'-31'	12"	8, 14, 9, 10	Medium Dense Gray Silty Fine Sand, tr Fine to Coarse Gravel (SM)		60.6	" "	

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-21				
LOCATION: NYDOS Yard, Brooklyn NY				ELEVATION: 10.4'			DEPTH: 59'				
				DATE BEGUN: 05/08/06			DATE FINISHED: 05/09/06				
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs					
DRILLING RIG: CME-55 - Track Mounted						DRILLER: Tony Palanque					
WEATHER: Overcast 60"s						DRILL FLUID: Water			HOLE SIZE: 6.25"Aug/3" Cas		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION			PID Reading	NOTES		
35	S14	31'-33'	14"	10, 12, 16, 15	Medium Dense Gray Silty Fine Sand, tr Fine to Coarse Gravel (SM)			34.4	"	"	
	S15	33'-35'	12"	10, 12, 12, 14	Medium Dense Gray/Brown Fine Sand (SP)			20.6	"	"	
	S16	35'-37'	14"	8, 12, 12, 16	Medium Dense Gray/Brown Fine Sand, tr Silt (SP)			263.2	Coal tar staining		
	S17	37'-39'	12"	12, 14, 18, 20	Dense Gray/Brown Fine Sand, tr Silt (SP)			53.6	"	"	
40	S18	39'-41'	14"	15, 18, 18, 18	Dense Gray/Brown Fine Sand, tr Silt (SP)			55.5	"	"	
	S19	41'-43'	14"	20, 22, 24, 26	Dense Gray/Brown Fine to Medium Sand, tr Silt (SP)			25	Coal tar odor		
45	S20	43'-45'	10"	9, 15, 20, 22	Dense Gray/Brown Fine Sand, tr Silt (SP)			20.6	"	"	
	S21	45'-47'	14"	15, 16, 18, 20	Dense Red/Brown Fine Sand, tr Silt (SP)			9.9	"	"	
	S22	47'-49'	12"	12, 16, 18, 22	Dense Red/Brown Fine Sand, tr Silt (SP)			10.4	"	"	
50	S23	49'-51'	12"	8, 8, 10, 12	A) Dense Gray Fine Sand, little Silt (SP) B) Very Stiff Gray Silty Clay (CL)			12.2	Sand 6", Clay 6"		
	S24	51'-53'	14"	14, 16, 18, 16	Dense Brown Fine Sand, tr Silt (SP)			2.3			
55	S25	53'-55'	10"	8, 10, 11, 14	Very Stiff Gray Clay (CL)			2.2			
	S26	55'-57'	14"	10, 12, 12, 10	Very Stiff Red/White Clay (CL)			2			
	S27	57'-59'	12"	10, 10, 8, 12	Very Stiff Gray to Red/White Clay (CL)			2	Sample collected for lab analysis		
60					Boring Terminated @ 59'						

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-18/ MW-7		
LOCATION: NYDOS Yard, Brooklyn NY				ELEVATION: 9.5'			DEPTH: 57'		
				DATE BEGUN: 05/01/06			DATE FINISHED: 05/02/06		
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs			
DRILLING RIG: CME-55						DRILLER: Tony Palanque			
WEATHER: Sunny 60's						DRILL FLUID: Water		HOLE SIZE: 6.25"	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction	NOTES	
0					Borehole Cleared to 5 Feet for Utilities		 <p>Curb Box Set in Concrete Bentonite Seal 2" Diameter Schedule 40 PVC Riser Pipe #1 More Well Sand 2" Diameter 0.010" PVC Well Screen Portland/Bentonite Backfill</p>		
5	S1	5'-7'	12"	1, 2, 2, 1	Very Loose Gray Fine to Medium Sand, some Silt, tr Fine to Coarse Gravel (SP)	186		Coal tar odor & staining	
	S2	7'-9'	12"	2, 1, 1, 1	Very Loose Gray Fine to Medium Sand, some Silt, tr Fine to Coarse Gravel (SP)	190		" "	
10	S3	9'-11'	8"	1, 1/12", 1	Very Loose Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	107		" "	
	S4	11'-13'	24"	1, 2, 2, 2	Very Loose Gray Fine Sand, little to some Silt, tr Fine Gravel and Brick Fragments (SP)	305		" "	
	S5	13'-15'	3"	1, 1, 1, 1	Very Loose Gray Fine Sand, little Silt, tr Fine to Coarse Gravel (SP)	80.2		" "	
15	S6	15'-17'	14"	1/12", 1/12"	Very Loose Gray Fine Sand, some Silt, tr Fine Gravel (SM)	810		Sample collected for lab analysis. Product in Sample	
	S7	17'-19'	4"	woh, 1, 1, 1	Very Loose Gray Fine Sand, some Silt, tr Fine to Medium Gravel (SM)	95.2			
20	S8	19'-21'	20"	2, 2, 12, 8	Loose Gray Fine Sand, little Silt, tr Fine to Coarse Gravel (SP)	180			
	S9	21'-23'	16"	3, 2, 2, 3	Loose Gray Fine Sand, little to some Silt, tr Fine to Medium Gravel (SP)	320		Product in sample	
	S10	23'-25'	10"	3, 4, 4, 6	Loose Gray Fine Sand, little Silt, tr Fine to Medium Gravel (SP)	350		Boulder @ 26' prevents auger advancement	
25	S11	25'-27'	12"	5, 4, 50/0'	Loose Brown Fine Sand, little Silt, tr Fine Gravel (SP)	650		move borehole approx. 5' north and continue sampling from 29'	
					Auger Through Boulder in Relocated Borehole				
30	S12	29'-31'	12"	15, 10, 11, 13	Medium Dense Gray Silty Fine Sand, tr Fine to Coarse Gravel (SM)	25.6	Portland/Bentonite Backfill		
	S13	31'-33'	10"	6, 8, 12, 14	Medium Dense Gray Fine Sand, little Silt, tr Fine Gravel (SP)	285		Product in sample	

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-18/ MW-7			
LOCATION: NYDOS Yard, Brooklyn NY				ELEVATION: 9.5'			DEPTH: 57'			
				DATE BEGUN: 05/01/06			DATE FINISHED: 05/02/06			
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs				
DRILLING RIG: CME-55						DRILLER: Tony Palanque				
WEATHER: Sunny 60's						DRILL FLUID: Water		HOLE SIZE: 6.25"		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction		NOTES	
35	S14	33'-35'	12"	9, 10, 27, 20	Dense Gray Silty Fine Sand, tr Fine to Coarse gravel (SM)	143			Product in sample	
	S15	35'-37'	14"	10, 9, 20, 22	Dense Gray Fine to Medium Sand, little Silt, tr Fine to Coarse Gravel (SP)	843			" "	
	S16	37'-39'	2"	100/6"	Very Dense Gray Fine to Medium Sand, tr Silt (SP)	343				
40	S17	39'-41'	12"	20, 18, 16, 32	Very Dense Gray Fine to Medium Sand, tr Silt, tr Fine to Medium Gravel (SP)	232				
	S18	41'-43'	14"	5, 6, 4, 8	Very Dense Gray Fine to Medium Sand, tr Silt, tr Fine to Medium Gravel (SP)	340			Product in sample 5/1/2006	
45	S19	43'-45'	14"	8, 7, 11, 14	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	125				5/2/06
	S20	45'-47'	14"	10, 16, 18, 20	Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	104				
	S21	47'-49'	16"	12, 16, 18, 22	Dense Gray/Brown Silty Fine Sand, tr Fine to Medium Gravel (SM)	160				
50	S22	49'-51'	16"	15, 16, 18, 22	Dense Gray Fine to Medium Sand, tr Silt (SP)	326				Product in sample
	S23	51'-53'	15"	14, 10, 8, 10	Very Stiff Gray Silty Clay (CL)	20.2				
55	S24	53'-55'	16"	10, 12, 12, 14	Very Stiff Gray Silty Clay (CL)	19.2				
	S25	55'-57'	10"	12, 12, 14, 16	Very Stiff Gray Silty Clay (CL)	15.2				Sample collected for lab analysis
					Boring Terminated @ 57'					
60										
65										

PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 1 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00001

BORING CONTRACTOR: Fenley & Nicol

NORTHING: 688837.9514 EASTING: 642005.5190

GROUNDWATER: 21'

CAS.

SAMPLER

CORE

TUBE

GROUND ELEVATION: 9.47

DATE

TIME

LEVEL

TYPE

TYPE

Split Spoon

DATE STARTED: 3/26/2012

DIA.

2"

DATE FINISHED: 3/28/2012

WT.

140 lb

DRILLER: Mike Meade

FALL

24"

GEOLOGIST: Andreas Papanecoleous

REVIEWED BY: Tim Burmeier

DEPTH  
FEET

STRATA

VISUAL  
IMPACTS

SAMPLE

"S"  
NO.

"N"  
NO.

BLOW  
COUNT

REC%

RQD%

COLOR

MATERIAL  
DESCRIPTION

PID

REMARKS

0

-5

-10

-15

-20

-25

Boring hand  
cleared to 5 ft  
bgs

No Recovery

Brown

Fine to medium SAND (SW), some silt, trace  
gravel, very loose

Fine SAND and SILT (SM), trace clay, loose

No Recovery

Fine to medium SAND and SILT (SW/ML),  
some clay and mica, dense

medium dense

Fine SAND (SP), some silt, clay and mica,  
dense

Fine to medium SAND (SW), some silt,  
medium dense

dense

Moist  
Strong CT-like  
odor, slight  
sheen,  
moderate  
staining

Strong CT-like  
odor, slight  
sheen

Faint CT-like  
odor

Faint CT-like  
odor

Wet  
100% dark  
brown NAPL  
saturation,  
strong CT-like  
odor

PID not working  
properly

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid



PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 2 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00001

DEPTH FEET	STRATA	VISUAL IMPACTS	SAMPLE			REC%	COLOR	MATERIAL DESCRIPTION	PID	REMARKS	
			"S" NO.	"N" NO.	BLOW COUNT	RQD%					
<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	11	71	26, 32, 39, 41	75		trace silt and mica, very dense		Strong CT-like odor, moderate staining, slight sheen	
										Moderate CT-like odor	
				12	50	50/2, -, -, -	8		Fine to medium SAND and CLAY (SW/CL), trace silt and mica, very dense		
				13	125	45, 50, 75/3, -	50				
				14	120	150, 120, -, -	25		Fine SAND (SP), some gravel, trace silt, very dense		
				15	100	80, 100/4, -, -	42				100 % NAPL saturation, strong CT-like odor
				16	130	40, 50, 80, 100/4	75		some gravel		
				17	150	150/3, -, -, -	13			265	
				18	94	30, 42, 52, 80	21	Gray		600	
				19	98	35, 42, 56, 48	54		SILT (ML), some fine to coarse sand, very dense	130	Strong CT-like odor, 50-75% NAPL saturation
			20	56	18, 24, 32, 56	71	Brown and Gray		531	Light coating, strong CT-like odor	
									232		
			21	56	18, 24, 32, 52	100		Brown	Fine to coarse SAND and SILT (SW/ML), trace mica, very dense	914	100% NAPL saturation, strong CT-like odor
										613	
			22	78	41, 55, 23, 45	92			82.9	100% NAPL saturation, strong CT-like odor	
									57		
			23	50	24, 28, 22, 33	0		No Recovery			
			24	49	25, 28, 21, 29	38			SILT (ML), some clay, trace fine to medium sand and mica, dense	58.2	Moderate CT-like odor, light coating
									73.3		
			25	78	21, 32, 46, 53	42	Brown	Fine SAND (SP), trace silt and mica, very dense	15.5		
			26	94	40, 44, 50, 95	100		Fine to coarse SAND (SW), trace silt and mica, very dense	2.3		

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 3 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00001

DEPTH FEET	STRATA	VISUAL IMPACTS	SAMPLE			REC%	COLOR	MATERIAL DESCRIPTION	PID	REMARKS
			"S" NO.	"N" NO.	BLOW COUNT	RQD%				
-60			27	138	50, 62, 76, 83	71		CLAY (CL), trace fine sand and mica, medium plasticity, hard	250	Shelby Tube collected from 59 to 61 ft bgs
									182	
			SH1	-	- , - , - , -	-				
								End of boring at 61 ft bgs.		

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI

CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
1 of 3

WWW-07

GROUND SURFACE ELEVATION (FT): 10.69

LOCATION: North 12th Street

NORTHING: 688889.72 EASTING: 641970.87

TOTAL DEPTH (FT): 60.00

DRILLED BY: Zebra Environmental / Luke Caballero

DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY East Zone

LOGGED BY: Maura MacLeod

DATE START / END: 6/22/2009 - 6/23/2009

DRILLING DETAILS: Geoprobe

WATER LEVEL DEPTHS (FT): 4.00 6/22/2009

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
0	S1	5.0		2.3				WWW-07 (4-5)	(0'- 5') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine, ~5% fines, non plastic; max. size 0.5 in., wet, brown, hand cleared.
5	S2	5.0	0						(5'- 10') no recovery.
10	S3	5.0	0						(10'- 15') no recovery.
15	S4	5.0	5				NLO		(15'- 16.8') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, medium plasticity; moderate naphthalene-like odor, wet, gray, sheen.
							NLO		(16.8'- 19.1') NARROWLY GRADED SAND (SP); ~95% sand, fine, ~5% fines, medium plasticity; moderate naphthalene-like odor, gray, lense of widely graded sand from 17.6 to 17.8 ft, tar-like staining, moderate petroleum-like odor.
20				> 9999			NLO		(19.1'- 20') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, medium plasticity; strong naphthalene-like

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL  
REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI










CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
2 of 3

WWW-07

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
20	S5	5.0	1.67	3372			NLO		odor, wet, gray, sheen, tar-like staining. (20'- 20.5') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown, dense. (20.5'- 20.8') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, dense, tar-like staining. (20.8'- 21.8') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown, dense. (21.8'- 22') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, dense, tar-like staining. (22'- 25') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown, dense. (25'- 30') WIDELY GRADED SAND WITH SILT (SP-SM); ~85% sand, fine to coarse, ~10% fines, medium plasticity, ~5% gravel, fine; max. size 0.5 in., brown, dense, slight solvent/ burnt-like odor.
							NLO		
							NLO		
							NLO		
25	S6	5.0	4.67	784					
30	S7	5.0	4.67	1982					(30'- 31.9') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% fines, medium plasticity, ~5% gravel, fine; max. size 0.5 in., moderate naphthalene-like odor, brown, dense.  (31.9'- 35') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines, non plastic; max. size 1 in., slight naphthalene-like odor, brown.
35	S8	5.0		565					(35'- 45') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; moderate naphthalene-like odor, brown.
40	S9	5.0		401					

NOTES:

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REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI

CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
3 of 3

WWW-07

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
45							NLO		(45'- 49.2') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, strong petroleum-like odor from 46.3 to 49.4 ft, tar-like staining.
	S10	5.0	4.42	> 9999			NLO		
50							NLO	WWW-07 (48.5-49.5)	(49.2'- 50') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown. (50'- 52.8') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; slight naphthalene-like odor, brown, moderate petroleum-like odor.
	S11	5.0	3.83	1269			NLO		
55							NLO		(52.8'- 54.1') SILTY SAND (SM); ~85% sand, fine, ~15% fines, medium plasticity; slight naphthalene-like odor, brown, slight petroleum-like odor. (54.1'- 54.3') WIDELY GRADED SAND (SW); fine to coarse; moderate naphthalene-like odor, brown, moderate petroleum-like odor. (54.3'- 55') SILTY SAND (SM); ~85% sand, fine, ~15% fines, medium plasticity; slight naphthalene-like odor, brown, slight petroleum-like odor. (55'- 57.1') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, wet, brown, slight petroleum-like odor. (57.1'- 59.6') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight petroleum-like odor, wet, brown.
	S12	5.0	4	0.0			NLO		
60							PLO	WWW-07 (59-60)	(59.6'- 59.8') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; wet, brown, slight solvent-like odor. (59.8'- 60') LEAN CLAY (CL); ~90% fines, medium plasticity, ~10% sand, fine; red gray. Bottom of borehole at 60.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL  
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FT. = FEET

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CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10

PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 1 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00011

BORING CONTRACTOR: Associated Environmental Services, Inc.

NORTHING: 688891.976

EASTING: 641932.499

GROUNDWATER: ~5'

CAS.

SAMPLER

CORE

TUBE

GROUND ELEVATION: 10.57 ft amsl

DATE

TIME

LEVEL

TYPE

TYPE

Split Spoon

DATE STARTED: 4/1/2013

DIA.

2"

DATE FINISHED: 4/3/2013

WT.

140

DRILLER: Charles Blumberg Jr.

FALL

24"

GEOLOGIST: Tim Ifkovich

REVIEWED BY: Scott McCabe

DEPTH  
FEET

STRATA

VISUAL  
IMPACTS

SAMPLE

"S"  
NO.

"N"  
NO.

BLOW  
COUNT

REC%

RQD%

COLOR

MATERIAL  
DESCRIPTION

PID

REMARKS

0

-5

-10

-15

-20

-25

Brown to Black

Asphalt

Concrete

FILL: sand, silt, gravel, and brick, some wood and cobbles

Dark Gray

FILL: sand and gravel, trace wood, loose

Very fine to medium SAND (SW), little silt, trace gravel, very loose

gravel medium dense

Dark Gray to Beige

1/2" clay seam, some silt and fine sand, loose

1" clay seam, some silt and fine sand

Med. Gray to Med. Brown

Very fine to fine SAND (SP), some clay, little silt, loose

2" clay layer, some silt and little very fine sand

Med. Brown

SILT (ML) with very fine sand, loose

Very fine SAND (SP), some silt and clay, loose

Dark Brown

medium dense

Dark Gray Med. Brown

Very fine to medium SAND (SW), some silt loose

Dark Brown

trace gravel, medium dense

Dark Brown

CLAY (CL), some fine to medium sand, very stiff

Med. Brown to Med. Gray

Silty CLAY (CL), trace fine to medium sand, hard

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

0.0

489

9.8

16.7

37.8

37.0

90.8

296

349

720

85.7

289

25.8

44.8

Boring hand cleared to 5 ft bgs. Moist, faint petroleum-like odor

Wet, faint CT-like odor

Coal tar NAPL saturation, mod. CT-like odor

Black staining, faint CT-like odor Moist, sheen, mod. CT-like odor

Light to heavy coating, mod. CT-like odor

Heavy coating, mod. CT-like odor

Coal tar NAPL saturation

Wet, heavy coating

Coal tar NAPL saturation

Faint petroleum-like odor

COMMENTS: Boring advanced using a Diedrich D-120 truck-mounted drill rig.

CT = Coal Tar, NAPL = Non-Aqueous Phase Liquid

Composite soil samples were collected from 11 to 17', 27 to 35', 65 to 71', and 73 to 77' for geotechnical analysis.

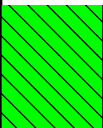

























PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 3 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00011

DEPTH FEET	STRATA	VISUAL IMPACTS	SAMPLE			REC%	COLOR	MATERIAL DESCRIPTION	PID	REMARKS
			"S" NO.	"N" NO.	BLOW COUNT	RQD%				
-60			27	29	9, 11, 18, 11	80	Gray to Dark Gray	1/4" silt seam 58' and 58.5'	0.0	
									0.0	
-60			28	22	8, 9, 13, 12	100	Brown	Fine to medium SAND (SW), medium dense	15.3	
							Red to Gray	CLAY (CL), little silt, very stiff	0.0	
-65			29	27	7, 12, 15, 14	65	Gray	Silty CLAY (CL), very stiff	0.0	
								hard	0.0	
-65			30	64	8, 14, 50/4	25			0.0	
-70			31	30	11, 15, 15, 14	65		Silty SAND (SM), medium dense interspersed black banding from 65' to 67'	0.0	
									0.0	
-70			32	42	10, 17, 25, 34	85		dense interspersed gray clay seams (1/16" to 1/2") from 68.3' to 69'	0.0	
									0.0	
-70			33	23	10, 12, 11, 10	65		trace gravel, some black silt, medium dense	0.9	
								1/16" clay seam	0.0	
-75			34	29	8, 10, 19, 19	95			0.0	
									0.0	
-75			35	30	9, 12, 18, 23	65	Brown	Silty CLAY (CL), very stiff	0.0	
									0.0	
-75			36	37	10, 16, 21, 25	30		hard	0.0	
-80			37	33	13, 15, 18, 22	0		no recovery, stone is shoe		
-80			38	54	18, 22, 32, 39	25	Gray	CLAY (CL), hard	0.0	
-85								Boring completed at 81 ft bgs.		

COMMENTS: Boring advanced using a Diedrich D-120 truck-mounted drill rig.

CT = Coal Tar, NAPL = Non-Aqueous Phase Liquid

Composite soil samples were collected from 11 to 17', 27 to 35', 65 to 71', and 73 to 77' for geotechnical analysis.





GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI

CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
1 of 3

WWSB-24

GROUND SURFACE ELEVATION (FT): 12.3

LOCATION: 50 Kent Ave

NORTHING: 688883.82 EASTING: 641934.45

TOTAL DEPTH (FT): 55.00

DRILLED BY: Boart Longyear / Fred Lavoie

DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY East Zone

LOGGED BY: Sarah Hay

DATE START / END: 7/16/2009 - 7/16/2009

DRILLING DETAILS: Sonic Coring

WATER LEVEL DEPTHS (FT):  $\nabla$  5.00 7/16/2009

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
0	S1	5.0		5.5					(0'- 0.5') CONCRETE. (0.5'- 5') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, angular, ~10% fines, non plastic; max. size 2 in., slight petroleum-like odor, moist, brown, FILL, slight organic-like odor, hand cleared.
5	S2	10.0	6.5				PLO	WWSB-24 (4-5)	(5'- 7.6') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, angular to rounded, ~10% fines, non plastic; max. size 2 in., wet, dark gray, FILL, asphalt and brick fragments.  (7.6'- 12.1') SILTY SAND (SM); ~70% sand, fine to medium, ~25% fines, ~5% gravel, subangular; slight naphthalene-like odor, dark gray to brown, lenses of sand with petroleum-like odor.
10							NLO		
15	S3	10.0	8				NLO		(12.1'- 15') SILTY SAND (SM); ~70% sand, fine to medium, ~25% fines, ~5% gravel, subangular; moderate naphthalene-like odor, brown, light tar-like staining, trace tar-like blebs.
				8959			NLO		
				6418			NLO		(15'- 16.7') WIDELY GRADED SAND (SW); ~90% sand, fine to medium, ~5% gravel, rounded, ~5% fines; max. size 0.25 in., strong naphthalene-like odor, dark gray, shells, tar-like staining, tar-like seam. (16.7'- 20.2') WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, fine to coarse, ~10% gravel, angular to rounded, ~10% fines; max. size 2.5 in., light brown to dark brown, tar-like staining and blebs.
20									

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ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



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455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid  
PROJECT: Williamsburg MGP RI  
CITY/STATE: Brooklyn, New York  
GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
2 of 3

WWSB-24

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
20				1326			NLO		(20.2'- 21.8') SILTY SAND (SM); ~85% sand, fine to medium, ~15% fines; moderate naphthalene-like odor, light brown, sheen.  (21.8'- 25') SANDY SILT (ML); ~60% fines, ~35% sand, fine to medium, ~5% gravel; moist, light brown to orange, dense.
25	S4	10.0	5						(25'- 35') SANDY SILT (ML); ~60% fines, ~35% sand, fine to medium, ~5% gravel; slight naphthalene-like odor, moist, light brown to orange, very dense, likely marine deposited.
30							NLO		
35	S5	10.0	10	>9999				WWSB-24 (38-40)	(35'- 36.5') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~75% sand, fine to coarse, ~15% gravel, subrounded, ~10% fines; max. size 1 in., wet, brown, shale fragments, dense.  (36.5'- 37.7') WIDELY GRADED SAND (SW); ~90% sand, fine to medium, ~5% gravel, subrounded, ~5% fines, non plastic; max. size 1 in., tar-like staining and blebs. (37.7'- 39.5') WIDELY GRADED SAND (SW); ~90% sand, fine to medium, ~5% gravel, subrounded, ~5% fines, non plastic; max. size 1 in., tar saturated.  (39.5'- 40.3') WIDELY GRADED SAND (SW); ~90% sand, fine to medium, ~5% gravel, subrounded, ~5% fines, non plastic; max. size 1 in., tar-like staining. (40.3'- 42') SANDY ELASTIC SILT (ML); ~70% fines, ~30% sand, fine; slight naphthalene-like odor, gray, dense.  (42'- 47.7') SANDY SILT (ML); ~70% fines, ~30% sand, fine to medium; moist, gray, occational sand lenses, slight burnt-like odor.
40							NLO		

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ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



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GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
3 of 3

WWSB-24

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
45	S6	10.0	9.17	31.8					
50							NLO		(47.7'- 53.4') WIDELY GRADED SAND WITH SILT (SW-SM); ~80% sand, fine to coarse, ~10% gravel, subangular, ~10% fines; moderate naphthalene-like odor, wet, brown, moderate organic-like odor.
55								WWSB-24 (53-55)	(53.4'- 55') LEAN CLAY (CL); ~95% fines, ~5% sand; red, very small sand lenses.

Bottom of borehole at 55.0 feet.

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BORING LOG

PAGE  
1 of 3

WWSB-09

GROUND SURFACE ELEVATION (FT): 12.28

LOCATION: 50 Kent Ave

NORTHING: 688912.53 EASTING: 641906.47

TOTAL DEPTH (FT): 55.00

DRILLED BY: Boart Longyear / Fred Lavoie

DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY East Zone

LOGGED BY: Maura MacLeod

DATE START / END: 6/25/2009 - 7/13/2009

DRILLING DETAILS: Sonic Coring

WATER LEVEL DEPTHS (FT):  $\nabla$  5.00 7/13/2009

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
0	S1	5.0						WWSB-09 (2-4)	(0'- 1') WIDELY GRADED SAND WITH GRAVEL (SW); ~55% sand, fine to coarse, ~40% gravel, fine to coarse, subangular, ~5% fines, non plastic; max. size 3 in., brown, FILL, fragments of coal, brick, and glass, hand cleared. (1'- 2') CONCRETE; FILL. (2'- 5') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, subangular, ~5% fines, non plastic; max. size 1 in., brown, FILL, fragments of brick and coal, hand cleared.
				2.1					
$\nabla$ 5	S2	10.0	7.25	2.2			PLO	WWSB-09 (11-12)	(5'- 7.3') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~70% sand, fine to coarse, ~15% gravel, fine to coarse, ~10% fines, non plastic; max. size 2 in., slight petroleum-like odor, brown, FILL, fragments of coal and brick.
							PLO		(7.3'- 8.4') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to medium, ~20% gravel, fine to coarse, ~10% fines, non plastic; max. size 3 in., moderate petroleum-like odor, gray brown.
							NLO		(8.4'- 10.5') WIDELY GRADED SAND WITH SILT AND GRAVEL (SW-SM); ~65% sand, fine to coarse, ~20% gravel, fine to coarse, ~10% fines, non plastic; max. size 3 in., strong naphthalene-like odor, gray brown, tar-like staining.
10				1805			NLO		(10.5'- 11.8') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown gray, sheen.
							NLO		(11.8'- 15') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, brown gray.
									(15'- 17.4') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, low plasticity; moderate naphthalene-like odor, gray.
15	S3	10.0	7.25	644			NLO		
							NLO		(17.4'- 18.1') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, low plasticity; moderate naphthalene-like odor, gray, sheen, tar-like staining.
							NLO		(18.1'- 19.3') WIDELY GRADED SAND (SW); ~90% sand, fine to coarse, ~5% gravel, fine to coarse, ~5% fines, non plastic; max. size 1.5 in., moderate naphthalene-like odor, gray brown, sheen,
20							NLO		

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ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



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CLIENT: National Grid

PROJECT: Williamsburg MGP RI

CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
2 of 3

WWSB-09

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
20				1297			NLO		tar-like staining. (19.3'- 20.6') WIDELY GRADED SAND (SW); ~90% sand, fine to coarse, ~5% gravel, fine to coarse, ~5% fines, non plastic; max. size 2 in., slight naphthalene-like odor, brown, sheen. (20.6'- 25') WIDELY GRADED SAND (SW); ~90% sand, fine to coarse, ~5% gravel, fine to coarse, ~5% fines, non plastic; max. size 2 in., brown.
25	S4	5.0	3.83	6.8					(25'- 30') WIDELY GRADED SAND WITH CLAY AND GRAVEL (SW-SC); ~80% sand, fine to medium, ~15% gravel, fine to coarse; max. size 1.5 in., gray.
30	S5	5.0	1	0.1					(30'- 32.5') Bolder.
35	S6	5.0	4.17	104					(32.5'- 37.8') WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, fine to medium, ~10% fines, low plasticity; gray.
40	S7	5.0	5	642			NLO		(37.8'- 40') WIDELY GRADED SAND WITH GRAVEL (SW); ~75% sand, fine to coarse, ~20% gravel, fine to coarse, ~5% fines, non plastic; max. size 2.5 in., brown, dense, iron oxide bands. (40'- 45') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, brown.

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ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



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BORING LOG

PAGE  
3 of 3

WWSB-09

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
45				592			NLO	WWSB-09 (53-54)	(45'- 47.3') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; moderate naphthalene-like odor, brown.
	S8	10.0	6.5	3159			NLO		(47.3'- 51.4') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, sheen, tar-like staining, lenses of tar-like coating.
50				2435			NLO		(51.4'- 54') WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, fine to medium, ~10% fines, non plastic; strong naphthalene-like odor, gray brown, sheen, tar-like staining and blebs.
							NLO		(54'- 55') SILT (ML); ~80% fines, medium plasticity, ~20% sand, fine; gray.
55									Bottom of borehole at 55.0 feet.

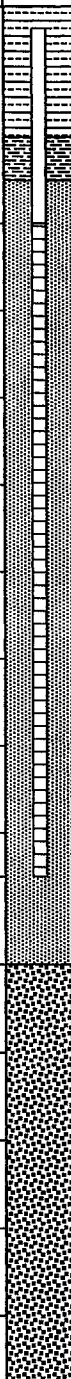
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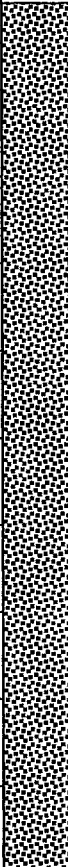
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PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-13 / MW-4				
LOCATION: North 12th St, Brooklyn, NY				ELEVATION: 8.37'			DEPTH: 52'				
				DATE BEGUN: 06/01/06			DATE FINISHED: 06/06/06				
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Michael Davies					
DRILLING RIG: CME-75						DRILLER: Jerry Heller					
WEATHER: Hazy, Humid, 85 F						DRILL FLUID: Water			HOLE SIZE: 3" Casing		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction			NOTES	
0					Borehole Cleared to 5 Feet for Utilities					Strong product odor	
5	S1	5'-7'	4"	2, 2, 2, 3	Very Loose Brown Fine to Medium Sand, tr Silt/Clay and Brick Fragments (SP)	0					
	S2	7'-9'	10"	3, 2, 4, 6	Loose Brown Fine to Medium Sand, tr Silt/Clay and Brick Fragments (SP)	254					
10	S3	9'-11'	10"	3, 5, 7, 4	Loose Brown Fine to Medium Sand, tr Silt/Clay and Brick Fragments (SP)	117					
	S4	11'-13'	6"	4, 3, 6, 4	Loose Brown Fine to Medium Sand, tr Silt/Clay (SP)	424					
	S5	13'-15'	10"	5, 10, 9, 11	Medium Dense Gray Fine to Medium Sand, tr Silt/Clay (SP)	274					
15	S6	15'-17'	8"	2, 4, 5, 6	Loose Gray Fine to Medium Sand, tr Silt/Clay (SP)	232					
	S7	17'-19'	6"	17, 22, 50/4'	Dense Gray Fine to Medium Sand, tr Silt/Clay (SP)	217					
20					Roller Bit Through Boulder						
	S8	20'-22'	10"	8, 9, 10, 11	Medium Dense Brown to Gray Fine Sand, some Coarse Gravel, tr Silt (SP)	68.3					
	S9	22'-24'	15"	4, 6, 9, 6	Loose Gray/Brown Fine to Medium Sand, tr Silt (SP)	16.4					
25	S10	24'-26'	8"	6, 11, 13, 14	Dense Gray/Brown Fine to Medium Sand, little Fine to Medium Gravel, tr Silt (SP)	0					
	S11	26'-28'	10"	5, 8, 10, 12	Dense Brown Fine to Medium Sand, little Silt (SP)	0					
	S12	28'-30'	12"	7, 14, 16, 15	Dense Brown Fine to Medium Sand, little Silt and Fine Gravel (SP)	0					
30	S13	30'-32'	8"	7, 16, 15, 10	Dense Brown Fine to Medium Sand, little Fine Gravel, tr Silt (SP)	0	Portland/Bentonite Backfill			Switch to roller bit and casing drilling	

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-13 / MW-4		
LOCATION: North 12th St, Brooklyn, NY				ELEVATION: 8.37'			DEPTH: 52'		
				DATE BEGUN: 06/01/06			DATE FINISHED: 06/06/06		
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Michael Davies			
DRILLING RIG: CME-75						DRILLER: Jerry Heller			
WEATHER: Hazy, Humid, 85 F						DRILL FLUID: Water		HOLE SIZE: 3" Casing	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction	NOTES	
35	S14	32'-34'	15"	12, 13, 25, 32	Dense Brown Fine to Medium Sand, little Silt (SP)	0			
	S15	34'-36'	6"	5, 8, 18, 38	Dense Brown/Red Fine to Medium Sand, little Fine Gravel and Silt (SP)	0			
	S16	36'-38'	18"	5, 18, 28, 33	Dense Brown/Black Fine to Medium Sand, tr Silt (SP)	12.6			
40	S17	38'-40'	16"	12, 10, 9, 16	Medium Dense Brown/Black Fine to Medium Sand, tr Silt (SP)	72.9			
	S18	40'-42'	9"	9, 8, 5, 3	Medium Dense Brown Fine to Medium Sand, tr Silt (SP)	123			
	S19	42'-44'	18"	11, 10, 9, 4	Medium Dense Brown Fine to Medium Sand, tr Silt (SP)	54			
45	S20	44'-46'	15"	22, 33, 50/4"	Dense Brown Fine to Medium Sand, tr Silt (SP)	11.8		Switch to mud drilling	
	S21	46'-48'	4"	4, 50/5"	Dense Brown Fine to Medium Sand, little Fine Gravel, tr Silt (SP)	6.5			
	50	S22	48'-50'	6"	2, 3, 13, 30	Medium Dense Brown Fine to Medium Sand, tr Silt (SP)			416
S23		50'-52'	15"	41, 46, 50/5"	Very Dense Brown Fine to Medium Sand, little Silt (SP)	349			
					Boring Terminated @ 52'				
55									
60									



PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-10		
LOCATION: Inside NYDOS Maintenance Garage				ELEVATION: 9.9'			DEPTH: 57'		
				DATE BEGUN: 04/28/06			DATE FINISHED: 04/28/06		
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs			
DRILLING RIG: CME-55 - Track Mounted						DRILLER: Tony Palanque			
WEATHER: Sunny 60's						DRILL FLUID: Water		HOLE SIZE: 6.25"	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION		PID Reading	NOTES	
0					Borehole Cleared to 5 Feet for Utilities			Petroleum Odor  Stained black in places  Sample collected for lab analysis  Petroleum Odor  " "  " "  Silty Sand 12", Fine Sand 12"  Dense Gray/Brown Fine Sand, tr Silt (SP)  Coal tar odor  " "  " "  Coal tar odor	
5	S1	5'-7'	6"	5, 7, 7, 5	Medium Dense Gray/Brown Fine to Medium Sand, tr Silt. Tr Fine to Coarse Gravel (SP)		0.6		
	S2	7'-9'	8"	4, 8, 6, 3	Medium Dense Gray Fine to Medium Sand, tr Silt, tr Fine to Coarse Gravel (SP)		3		
10	S3	9'-11'	10"	7, 8, 14, 50/3"	Medium Dense Black Silty Fine Sand, tr Fine to Coarse Gravel (SM)		94		
	S4	11'-13'	12"	Auger/12", 2, 2	A) Concrete B) Loose Gray silty Fine Sand (SM)		18		
	S5	13'-15'	12"	1, 2, 2, 1	Loose Gray Silty Fine Sand (SM)		12.8		
15	S6	15'-17'	16"	1, 2, 2, 2	Loose Gray Silty Fine Sand (SM)		12.6		
	S7	17'-19'	18"	4, 4, 8, 10	A) Loose Gray Silty Fine Sand (SM) B) Medium Dense Gray/Brown Fine Sand, little Silt, tr Fine to Coarse Gravel (SP)		16.2		
20	S8	19'-21'	10"	28, 22, 16, 16	Dense Gray/Brown Fine Sand, tr Silt (SP)		6.2		
	S9	21'-23'	8"	6, 10, 12, 16	Medium Dense Gray/Brown Silty Fine Sand, tr Fine to Coarse Gravel (SM)		19.2		
	S10	23'-25'	12"	12, 10, 12, 15	Medium Dense Gray/Brown Fine Sand, little Silt (SP)		6.2		
25	S11	25'-27'	12"	5, 6, 7, 7	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)		6.2		
	S12	27'-29'	12"	8, 8, 10, 8	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)		0		
30	S13	29'-31'	12"	6, 10, 11, 12	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)		3.6		

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01		BORING NO: BPB-10	
LOCATION: Inside NYDOS Maintenance Garage				ELEVATION: 9.9'		DEPTH: 57'	
				DATE BEGUN: 04/28/06		DATE FINISHED: 04/28/06	
DRILL CONTRACTOR: Aquifer Drilling and Testing					GEOLOGIST: Eric Acs		
DRILLING RIG: CME-55 - Track Mounted					DRILLER: Tony Palanque		
WEATHER: Sunny 60's					DRILL FLUID: Water		HOLE SIZE: 6.25"
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	NOTES
35	S14	31'-33'	6"	5, 5, 50/0"	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	3.2	Boulder @ 31'
	S15	33'-35'	3"	38, 20, 14, 14	Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	0.5	
	S16	35'-37'	8"	30, 22, 15, 16	Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	2.5	
	S17	37'-39'	4"	50/5"	Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	4.5	Boulder @ 37.5'
40	S18	39'-41'	10"	15, 16, 10, 12	Medium Dense Gray Fine to Medium Sand, tr Silt (SP)	16.2	
45	S19	41'-43'	12"	5, 8, 8, 12	Medium Dense Brown Fine to Medium Sand, tr Silt (SP)	175	Coal tar odor and staining
	S20	43'-45'	12"	12, 18, 26, 24	Dense Brown Fine to Medium Sand, tr Silt (SP)	283	" "
	S21	45'-47'	14"	30, 32, 30, 28	Very Dense Brown Fine to Medium Sand, tr Silt (SP)	305	" "
	S22	47'-49'	20"	8, 9, 12, 14	Very Stiff Gray Silty Clay (CL)	50.5	
50	S23	49'-51'	18"	5, 8, 15, 18	Very Stiff Gray Clay (CL)	3.8	
55	S24	51'-53'	16"	18, 24, 20, 18	Hard Gray Clay (CL)	4	
	S25	53'-55'	16"	12, 10, 10, 18	Very Stiff Red/White Clay (CL)	3.5	
	S26	55'-57'	12"	8, 11, 12, 10	Very Stiff Red/White Clay (CL)	1.3	Sample collected for lab analysis
					Boring Terminated @ 57'		
60							

PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 1 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00001

BORING CONTRACTOR: Fenley & Nicol

NORTHING: 688940.0666 EASTING: 641763.6288

GROUNDWATER: 6'

CAS.

SAMPLER

CORE

TUBE

GROUND ELEVATION: 10.09

DATE

TIME

LEVEL

TYPE

TYPE

Split Spoon

DATE STARTED: 2/28/2012

DIA.

2"

DATE FINISHED: 3/1/2012

WT.

140 lb

DRILLER: Mike Meade

FALL

24"

GEOLOGIST: Megan Dascoli

REVIEWED BY: Tim Burmeier

DEPTH  
FEET

STRATA

VISUAL  
IMPACTS

SAMPLE

"S"  
NO.

"N"  
NO.

BLOW  
COUNT

REC%  
RQD%

COLOR

MATERIAL  
DESCRIPTION

PID

REMARKS

0

-5

-10

-15

-20

-25

Med Brown

Dk Brown

Black

Med Brown

Med Gray

Reddish Brown

FILL: concrete, brick, gravel and asphalt, some sand and silt

FILL: sand and silt, trace gravel, loose

SILT and very fine SAND (SM), trace fine gravel, medium dense

Silty SAND (SM), dense

Very fine to medium Sandy SILT (ML), medium dense

trace gravel, loose

CLAY (CL), soft

some very fine sand and silt plastic, hard

some fine to medium sand, trace angular gravel

Very fine to medium SAND (SW), some silt, medium dense

0.0

0.0

0.0

4.6

10.6

100

123

296

321

248

35.5

59.2

89.8

60

349

108

35.7

55.5

59

12.5

97.1

70.8

10

32.4

335

Boring hand cleared to 5 ft bgs

Moist Petroleum odor

Moderate petroleum odor, black staining Wet

Strong petroleum odor, moderate coating

Moist Petroleum odor

Wet Black staining, CT-like odor

Faint CT-like odor

Heavy NAPL coating

50% CT saturation

Faint CT-like odor

75% NAPL

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

DEPTH FEET	STRATA	VISUAL IMPACTS	SAMPLE			REC%	COLOR	MATERIAL DESCRIPTION	PID	REMARKS
			"S" NO.	"N" NO.	BLOW COUNT	RQD%				
			11	34	4, 13, 21, 22	96	Med Brown	SILT (ML), some very fine to medium sand, trace fine to medium subangular gravel, medium dense	640	saturation, strong CT-like odor
									26.5	
			12	67	8, 12, 55, 30	42		Silty SAND (SM), very dense	35.8	Moderate CT-like odor
									39.8	
-30			13	47	6, 25, 22, 31	29	Med Brown to Gray	CLAY and SILT (CL/ML), some very fine to medium sand, trace very fine to medium angular gravel, dense	4.5	No odor
									6.7	
			14	49	6, 9, 40, 44	0		No Recovery		
-35			15	48	9, 21, 27, 60	42	Med Gray	Very fine to fine Sandy SILT (ML), trace medium gravel, dense	14.9	
									12.1	
			16	51	5, 11, 40, 100/3	42		Coarse angular GRAVEL (GW), some very fine to medium sand, silt and clay, very dense	3.3	
									3.9	
			17	100	100/6, -, -, -	0		Very fine to medium sandy SILT (ML), trace clay and fine to medium gravel, very dense	11.1	Faint CT-like odor
								No Recovery	12.5	
-40			18	98	28, 47, 51, 62	67	Med Brown to Gray	Very fine to fine SAND (SP), some silt, very dense		Moderate CT-like odor
								medium dense	76.4	
			19	28	10, 12, 16, 28	58			57.9	
									48.3	Faint CT-like odor
-45			20	65	22, 33, 32, 37	58	Med Gray	very dense	68.4	
							Med Gray to Brown			
			21	100	26, 40, 60, 57	58		Silty SAND (SM), very dense	33.7	
								Sandy SILT (ML), very dense	63.2	
			22	208	44, 110, 98, 132	75		Very fine to coarse SAND (SW), some silt, very dense	27.7	
							Med Brown		15.1	
-50			23	119	15, 51, 68, 78	88			46.2	
							Med Gray	SILT (ML), very dense	35.7	Faint CT-like odor
			24	141	23, 37, 104, 156	96	Med Gray to Brown	Very fine to medium SAND (SW), trace silt and coarse sand, very dense	27	
									12	
-55			25	122	6, 22, 100/2, -	67		some clay	2.7	
									14.7	
			26	90	15, 35, 55, 68	100		Very fine Sandy SILT (ML), very dense	17.1	

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 3 OF 3

CLIENT: National Grid

JOB NO. : 11176638.00001

DEPTH FEET	STRATA	VISUAL IMPACTS	SAMPLE			REC%	COLOR	MATERIAL DESCRIPTION	PID	REMARKS
			"S" NO.	"N" NO.	BLOW COUNT	RQD%				
-60			27	75	5, 16, 59, 91	17	Med Brown	trace clay	12.2	Faint CT-like odor
								Very fine to medium SAND (SW), some silt, very dense	19.4	
									9.4	
			28	65	33, 28, 37, 38	38	Med Gray		23.4	
							Med Brown	trace coarse sand		
			29	54	50, 54, -, -	100		CLAY (CL), hard	30.4	
			30	35	8, 10, 25, 46	50	Med Gray to Brown Lt Gray	Very fine to fine SAND (SP), some silt, dense	2.5	
								CLAY (CL), hard	0.0	
-65								End of boring at 64 ft bgs.		
-70										
-75										
-80										
-85										

COMMENTS: Boring advanced using a Cantera CT-450 drill rig.

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid  
PROJECT: Williamsburg MGP RI  
CITY/STATE: Brooklyn, New York  
GEI PROJECT NUMBER: 093060

**BORING LOG**

PAGE  
1 of 3

**WWW-17**

GROUND SURFACE ELEVATION (FT): 11.62 LOCATION: 50 Kent Ave  
NORTHING: 688916.75 EASTING: 641757.91 TOTAL DEPTH (FT): 60.00  
DRILLED BY: Zebra Environmental / Luke Caballero DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY East Zone  
LOGGED BY: Maura MacLeod DATE START / END: 6/8/2009 - 6/9/2009  
DRILLING DETAILS: Geoprobe  
WATER LEVEL DEPTHS (FT):

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
0	S1	5.0		2.1				WWW-17 (1-2)	(0'- 0.33') CONCRETE. (0.3'- 5') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine; brown, hand cleared.
5	S2	5.0	2				NLO	WWW-17 (7-8)	(5'- 8.3') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, brown.
				868			NLO		(8.3'- 10') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., moderate naphthalene-like odor, brown, sheen, tar-like staining.
10	S3	5.0	4.08				NLO		(10'- 12.9') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, brown, sand and gravel lenses.
				349					(12.9'- 15') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., brown, sand and gravel lenses.
15	S4	5.0	3.75	1281			NLO		(15'- 15.2') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, black, organics.
							NLO		(15.2'- 15.3') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, black, organics, tar-like coating.
							NLO		(15.3'- 17') SILTY SAND (SM); ~80% sand, ~15% fines, non plastic, ~5% gravel; max. size 2 in., slight naphthalene-like odor, black, organics, sandy silt lense from 16.3 to 16.7 ft.
							NLO		(17'- 17.6') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, black, organics, sheen.
20									

**NOTES:**

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL  
REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid  
PROJECT: Williamsburg MGP RI  
CITY/STATE: Brooklyn, New York  
GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
2 of 3

WWW-17

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
20	S5	5.0	2.92	71.3			NLO		(17.6'- 18.2') SILTY SAND (SM); ~55% sand, fine, ~45% fines, low plasticity; slight naphthalene-like odor, black. (18.2'- 20') SANDY SILT (ML); ~70% fines, low plasticity, ~30% sand, fine; gray, shells from 19.2 to 20 ft. (20'- 23.3') SILTY SAND (SM); ~80% sand, fine to coarse, ~15% fines, non plastic, ~5% gravel, fine to coarse; max. size 2 in., slight naphthalene-like odor, brown.
25	S6	5.0	1.58	0					(23.3'- 25') SANDY SILT (ML); ~70% fines, low plasticity, ~30% sand, fine; brown gray.
30	S7	5.0	3.67	0					(25'- 30') SILTY SAND (SM); ~60% sand, fine to coarse, ~30% fines, non plastic, ~10% gravel, fine to coarse; max. size 2 in., brown.
35	S8	5.0	3.92	0					(30'- 35.3') SILTY SAND (SM); ~70% sand, fine to coarse, ~20% fines, non plastic, ~10% gravel, fine to coarse; max. size 2 in., brown, gravel layer from 43.9 to 44.4 ft.
40	S9	5.0	3.42	6.2			OLO		(35.3'- 36.1') WIDELY GRADED GRAVEL WITH SAND (GW); ~50% gravel, fine to coarse, ~45% sand, fine to coarse, ~5% fines, non plastic; max. size 2 in., gray. (36.1'- 38') SILTY SAND (SM); ~70% sand, fine to coarse, ~20% fines, non plastic, ~10% gravel, fine to coarse; brown, 1" lense of fine to coarse gravel at 37.9 ft.
							NLO		(38'- 40') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; brown.
									(40'- 41.6') SILTY SAND (SM); ~80% sand, fine to medium, ~20% fines, non plastic; moderate organic-like odor, brown.
									(41.6'- 46.8') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; slight naphthalene-like odor, black, lense of brown silty sand from 43.9 to 44.4 ft, organic odor.

NOTES:

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REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI







CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

PAGE  
3 of 3

WWW-17

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
45							NLO		(46.8'- 49.2') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; brown, silty sand lenses.  (49.2'- 50') SILT (ML); ~80% fines, non plastic, ~20% sand, fine; brown. (50'- 50.3') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, brown. (50.3'- 50.7') SILTY SAND (SM); ~70% sand, fine, ~30% fines, non plastic; slight naphthalene-like odor, gray. (50.7'- 51.8') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, brown. (51.8'- 52.4') SANDY SILT (ML); ~60% fines, non plastic, ~40% sand, fine; slight naphthalene-like odor, gray. (52.4'- 54.7') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; slight naphthalene-like odor, brown. (54.7'- 55') LEAN CLAY (CL); ~95% fines, medium plasticity, ~5% sand, fine; slight naphthalene-like odor, reddish brown. (55'- 60') LEAN CLAY (CL); ~95% fines, medium plasticity, ~5% sand, fine; brown, reddish brown varves.
	S10	5.0	3.25	11.6					
50									
	S11	5.0	3.17	55			NLO		
							NLO		
							NLO		
							NLO		
55								WWW-17 (54-55)	
	S12	5.0	1.67	1.4		NLO			
60									
Bottom of borehole at 60.0 feet.									

NOTES:

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ppm = PARTS PER MILLION  
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NLO = NAPHTHALENE LIKE ODOR  
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TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10



PROJECT/PROJECT LOCATION: National Grid - Williamsburg

SHEET: 1 OF 2

CLIENT: National Grid

JOB NO. : 11176638.00001

BORING CONTRACTOR: Fenley & Nicol

NORTHING: 688869.7424 EASTING: 641696.3812

GROUNDWATER: 5'

CAS.

SAMPLER

CORE

TUBE

GROUND ELEVATION: 9.81

DATE

TIME

LEVEL

TYPE

TYPE

Split Spoon

DATE STARTED: 3/12/2012

DIA.

2"

DATE FINISHED: 3/13/2012

WT.

140, 300

DRILLER: Mike Meade

FALL

24"

GEOLOGIST: Megan Dascoli

REVIEWED BY: Tim Burmeier

DEPTH  
FEET

STRATA

VISUAL  
IMPACTS

SAMPLE

"S"  
NO.

"N"  
NO.

BLOW  
COUNT

REC%

RQD%

COLOR

MATERIAL  
DESCRIPTION

PID

REMARKS

0

-5

-10

-15

-20

-25

Med Brown

FILL: sand, silt, cobbles, concrete and brick

0.0

Boring hand  
cleared to 5 ft  
bgs  
Dry

Concrete

0.0

FILL: sand, silt, concrete and brick, trace metal

0.0

0.0

0.0

Dk Gray

FILL: sand, silt and gravel

6.1

Wet

Very fine to fine SAND (SP)

52.8

30% NAPL  
saturation,  
petroleum and  
CT-like odor

Med Gray

SILT (ML), some very fine to medium sand

8.4

Moderate NAPL  
odor, blebs,  
sheen

4.8

COBBLES (GW)

0.2

Drilled through  
cobbles to 13 ft  
bgs

0.8

No Recovery

SILT (ML), some very fine sand, trace coarse  
sand

0.2

Faint CT-like  
odor

CLAY (CL), trace fine sand, highly plastic

0.8

Very fine to fine SAND (SP), some silt, trace  
fine gravel

1.1

Moderate CT-  
like odor

some cobbles from 18 to 19'

2.3

2.4

4.8

COBBLES (GW), some very fine to fine sand

0.8

No odor

Lt Gray

SILT (ML), some very fine to fine and coarse  
sand

1.1

Faint CT-like  
odor

Med Brown

3.8

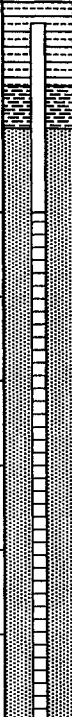
COMMENTS: Boring advanced using a Cantera CT-450 drill rig.


CT = Coal Tar

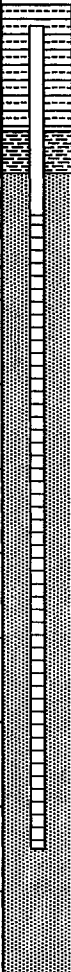
NAPL = Non-Aqueous Phase Liquid


BORING NO. : WW-SB-109



PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-15 / MW-5				
LOCATION:				ELEVATION: 10.3'			DEPTH: 61'				
Inside NYDOS Maintenance Garage				DATE BEGUN: 05/10/06			DATE FINISHED: 05/11/06				
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs					
DRILLING RIG: CME-55 - Track Mounted						DRILLER: Tony Palanque					
WEATHER: Overcast, 60's						DRILL FLUID: Water			HOLE SIZE: 6.25" Aug / 3" Cas		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction		NOTES		
0					Borehole Cleared to 5 Feet for Utilities						
5	S1	5'-7'	10"	2, 3, 4, 3	Loose Gray Silty Fine Sand, tr Fine to Coarse Gravel (SM)	232			Petroleum stain & odor		
	S2	7'-9'	14"	5, 8, 10, 12	Medium Dense Gray Fine to Medium Sand, little Silt, tr Fine Gravel (SP)	5.3			"		
10	S3	9'-11'	12"	8, 6, 6, 10	Medium Dense Gray Fine Sand, little Silt, tr Fine Gravel (SP)	53.8			"		
	S4	11'-13'	14"	2, 2, 3, 2	Loose Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	32.6			"		
	S5	13'-15'	12"	2, 4, 3, 3	Loose Gray Fine Sand, little Silt, tr Fine to Medium Gravel (SP)	325			Coal tar odor & staining		
15	S6	15'-17'	10"	3, 25, 8, 14	Medium Dense Gray Fine Sand, little Silt, tr Fine to Coarse Gravel (SP)	980			Sample collected for lab analysis. Product in sample. Move borehole approx. 6' east due to obstruction. Switch to roller bit and casing drilling 5/10/2006		
	S7	17'-19'	6"	6, 5, 4, 6	Loose Gray Fine to Medium Sand, tr Silt, tr Fine Gravel (SP)	42.2			5/11/06		
20	S8	19'-21'	10"	4, 6, 6, 8	A) Medium Dense Gray Fine to Coarse Sand (SW) B) Medium Dense Gray Silty Fine Sand (SM)	55.2			Coal tar odor		
	S9	21'-23'	6"	8, 6, 8, 10	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	37.2			"		
	S10	23'-25'	8"	8, 12, 22, 24	Dense Gray/Black Fine Sand, tr Silt (SP)	34.4			"		
25	S11	25'-27'	8"	12, 10, 8, 8	Medium Dense Gray Fine Sand, tr to little Silt (SP)	34.4			"		
	S12	27'-29'	10"	8, 6, 8, 10	Medium Dense Gray Fine Sand, tr to little Silt (SP)	37.5			"		
30	S13	29'-31'	12"	8, 16, 16, 18	Dense Gray Silty Fine Sand, tr Fine Gravel (SM)	38.2			"		
	S14	31'-33'	2"	12, 18, 18, 16	Dense Gray Silty Fine Sand, tr Fine to Coarse Gravel (SM)	66.2	Portland/Bentonite Backfill		"		

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-15 / MW-5				
LOCATION:				ELEVATION: 10.3'			DEPTH: 61'				
Inside NYDOS Maintenance Garage				DATE BEGUN: 05/10/06			DATE FINISHED: 05/11/06				
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Eric Acs					
DRILLING RIG: CME-55 - Track Mounted						DRILLER: Tony Palanque					
WEATHER: Overcast, 60's						DRILL FLUID: Water			HOLE SIZE: 6.25" Aug / 3" Cas		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction		NOTES		
35	S15	33'-35'	10"	8, 6, 6, 8	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	19.8			Coal tar odor		
	S16	35'-37'	8'	6, 8, 6, 8	Medium Dense Gray Silty Fine Sand, tr Fine to Medium Gravel (SM)	37.7			"		
	S17	37'-39'	14"	12, 12, 12, 14	Medium Dense Gray Fine Sand, some Silt (SM)	128			"		
40	S18	39'-41'	10"	13, 14, 12, 14	Medium Dense Gray Fine to Medium Sand, tr Silt, tr Fine to Coarse Gravel (SP)	15.2			"		
	S19	41'-43'	14"	14, 14, 18, 22	Dense Gray Silty Fine Sand, tr Fine Gravel (SM)	78.2			"		
	S20	43'-45'	12"	40, 32, 30, 36	A) Very Dense Gray Silty Fine Sand, tr Fine Gravel (SM) B) Very Dense Gray Fine to Medium Sand (SP)	528			Product in sample Sand 6", Silty Sand 6"		
45	S21	45'-47'	12"	20, 18, 18, 22	Dense Gray Fine Sand, tr Silt (SP)	1010			Product in sample		
	S22	47'-49'	14"	26, 32, 34, 32	Very Dense Gray Fine Sand, tr Silt (SP)	1220			"		
	S23	49'-51'	12"	12, 14, 14, 16	Dense Gray Fine Sand, tr Silt (SP)	1105			"		
50	S24	51'-53'	14"	18, 16, 16, 20	Dense Gray Fine Sand, tr Silt (SP)	985			"		
	S25	53'-55'	12"	20, 18, 16, 16	Hard Red/Brown Silty Clay, tr Silt (CL)	20					
	S26	55'-57'	4'	18, 20, 20, 22	Hard Red/White to Gray Silty Clay (CL)	10.5					
55	S27	57'-59'	6"	18, 20, 20, 20	Hard Red/White Silty Clay (CL)	8.6					
	S28	59'-61'	12"	18, 22, 24, 26	Hard Red/White Silty Clay (CL)	3.2			Sample collected for lab analysis		
60					Boring Terminated @ 61'						
65											

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-16/ MW-6				
LOCATION: North 11th St, Brooklyn, NY				ELEVATION: 4.1'			DEPTH: 57'				
				DATE BEGUN: 05/26/06			DATE FINISHED: 06/01/06				
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Sirish Musthyala / Michael Davies					
DRILLING RIG: CME-75						DRILLER: Jerry Heller					
WEATHER: Overcast, 60's						DRILL FLUID: Water			HOLE SIZE: 4"/3" Casing		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction		NOTES		
0					Borehole Cleared to 5 Feet for Utilities				Curb Box Set in Concrete		
5	S1	5'-7'	12"	5, 4, 4, 6	Medium Dense Gray Fine to Medium Sand, some Coarse Gravel, tr Silt and Brick Fragments (SP)	12.8			Bentonite Seal		
	S2	7'-9'	16"	8, 11, 13, 13	A) Medium Dense Black Fine to Medium Sand, some Gravel, tr Ash (SP) B) Medium Dense Fine to Medium Sand (Ash & Cinders), some Gravel, tr Silt (SW)	86.8			#1 Morie Well Sand		
10	S3	9'-11'	14"	11, 10, 1, 1	A) Medium Dense Fine to Medium Sand (Ash & Cinders), some Gravel, tr Silt (SW) B) Medium Dense Gray Fine to Medium Sand, some Coarse gravel, tr Silt (SP)	8.6					
	S4	11'-13'	9"	3, 2, 2, 3	Loose Gray Fine Sand, tr Silt (SP)	0.9			2" Diameter 0.010" PVC Well Screen		
	S5	13'-15'	8"	11, 9, 4, 9	Medium Dense Gray Fine Sand, tr Silt (SP)	90.5			Product in sample		
15	S6	15'-17'	9"	6, 4, 3, 6	Medium Dense Gray Fine Sand, little Gravel, tr Silt (SP)	210			" "		
	S7	17'-19'	1"	3, 2, 4, 7	Medium Dense Gray Fine Sand, some Gravel, tr Silt (SP)	34			" "		
20	S8	19'-21'	0"	50/3"	No Recovery						
	S9	21'-23'	10"	5, 7, 8, 11	Medium Dense Gray to Black Fine Sand, tr Gravel, tr Silt (SP)	1313			Sample collected for lab analysis Product in Sample		
	S10	23'-25'	12"	9, 13, 13, 13	Medium Dense Gray Fine Sand, some Coarse Gravel, tr Silt (SP)	1591			Product in sample		
25	S11	25'-27'	4"	2, 5, 10, 13	Medium Dense Gray Fine to Medium Sand, some Gravel, tr Silt (SP)	878			" "		
	S12	27'-29'	9"	2, 4, 9, 16	Medium Dense Gray Fine to Medium Sand, some Gravel, tr Silt (SP)	702			" "		
30					Drill and Case Through Intervals with Product		Portland/Bentonite Backfill				

PROJECT: Brodsky Property (DDC)				JOB NO: 60005392.01			BORING NO: BPB-16/ MW-6		
LOCATION: North 11th St, Brooklyn, NY				ELEVATION: 4.1'			DEPTH: 57'		
				DATE BEGUN: 05/26/06			DATE FINISHED: 06/01/06		
DRILL CONTRACTOR: Aquifer Drilling and Testing						GEOLOGIST: Sirish Musthyala / Michael Davies			
DRILLING RIG: CME-75						DRILLER: Jerry Heller			
WEATHER: Overcast, 60's						DRILL FLUID: Water		HOLE SIZE: 4"/3" Casing	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE DESCRIPTION	PID Reading	Monitoring Well Construction	NOTES	
35									
	S13	35'-37'	8"	41, 30, 19, 27	Very Dense Brown Fine to Medium Sand (SP)	47		Product odor	
	S14	37'-39'	9"	5, 5, 11, 18	Medium Dense Dark Gray Fine to Medium Sand (SP)	183		" "	
40	S15	39'-41'	9"	10, 18, 21, 27	Dense Gray Fine to Medium Sand (SP)	336		" "	
	S16	41'-43'	9"	11, 17, 33, 50/5"	Very Dense Gray Fine to Medium Sand (SP)	994		Product in sample	
	S17	43'-45'	8"	11, 13, 12, 19	Medium Dense Gray Fine to Medium Sand (SP)	338			
45	S18	45'-47'	8"	11, 22, 33, 50/5"	Very Dense Dark Gray Fine to Medium Sand (SP)	1834		Product in sample	
	S19	47'-49'	9"	5, 18, 25, 33	Dense Gray Fine to Medium Sand, tr Silt (SP)	594		" "	
50	S20	49'-51'	9"	14, 17, 19, 19	Dense Gray Fine to Medium Sand, tr Silt (SP)	511		" "	
	S21	51'-53'	8"	11, 20, 21, 25	Dense Gray Fine to Medium Sand, tr Silt (SP)	58		" "	
	S22	53'-55'	8"	11, 17, 21, 22	Dense Gray Fine to Medium Sand (SP)	473		" "	
55	S23	55'-57'	8"	5, 11, 16, 22	Very Stiff Brown Clay (CL)	5.1		Sample collected for lab analysis	
					Boring Terminated @ 57'				
60									
65									



GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid

PROJECT: Williamsburg MGP RI

CITY/STATE: Brooklyn, New York

GEI PROJECT NUMBER: 093060

BORING LOG

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WWMW-06

GROUND SURFACE ELEVATION (FT): 12.23

LOCATION: North 11th Street

NORTHING: 688730.17 EASTING: 641823.66

TOTAL DEPTH (FT): 65.00

DRILLED BY: Zebra Environmental / Luke Caballero

DATUM VERT. / HORZ.: NAVD 88 / NAD83 NY East Zone

LOGGED BY: Maura MacLeod

DATE START / END: 6/17/2009 - 6/18/2009

DRILLING DETAILS: Geoprobe

WATER LEVEL DEPTHS (FT):  $\nabla$  2.50 6/17/2009

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
0	S1	5.0		0.4				WWMW-06 (0.5-1.5)	(0'- 5') WIDELY GRADED SAND (SW); ~90% sand, fine to coarse, ~5% gravel, fine, ~5% fines, non plastic; max. size 0.5 in., brown, hand cleared.
5	S2	5.0	5				NLO		(5'- 6.5') SILTY SAND (SM); ~80% sand, fine to coarse, ~20% fines, non plastic; slight naphthalene-like odor, brown.
				581			NLO		(6.5'- 10') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines, non plastic; max. size 1 in., moderate naphthalene-like odor, brown, black stained interbeds, lenses of petroleum-like odor.
10	S3	5.0	4.42				NLO		(10'- 11') WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, fine to medium, ~10% fines, non plastic; moderate naphthalene-like odor, brown, sheen.
				1601			NLO		(11'- 13') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, sheen, tar-like blebs, staining, and pockets of coating.
							NLO		(13'- 14.4') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, tar-like coating.
15	S4	5.0	3				PLO		(14.4'- 15') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong petroleum-like odor, black, sheen, black petroleum-like staining.
				3194			NLO		(15'- 15.6') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown, moderate petroleum and sulfur-like odor.
							NLO		(15.6'- 17.1') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; strong naphthalene-like odor, brown, tar-like coating.
							OLO		(17.1'- 18.3') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; strong naphthalene-like odor, brown, tar-like staining.
20							OLO		(18.3'- 19.3') SILTY SAND (SM); ~80% sand, fine, ~20% fines, non plastic; slight organic-like odor, brown, slight burnt/sulfur-like

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL  
REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
20	S5	5.0	3	2567			SLO		odor. (19.3'- 20') NARROWLY GRADED SAND (SP); ~95% sand, fine, ~5% fines, non plastic; slight organic-like odor, brown, slight burnt/sulfur-like odor. (20'- 21') SILT (ML); ~90% fines, medium plasticity, ~10% sand, fine; slight sulfur-like odor, brown, slight burnt-like odor. (21'- 21.9') SILTY SAND (SM); ~80% sand, fine, ~20% fines, non plastic; slight petroleum-like odor, brown. (21.9'- 22.5') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines, non plastic; max. size 1.5 in., slight petroleum-like odor, brown, slight sulfur-like odor. (22.5'- 22.9') WIDELY GRADED GRAVEL (GW); fine to coarse; orange and reddish brown. (22.9'- 23.1') WIDELY GRADED GRAVEL (GW); fine to coarse; strong naphthalene-like odor, orange and reddish brown, tar-like coating. (23.1'- 24.2') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, tar-like coating. (24.2'- 25') WIDELY GRADED SAND (SW); ~85% sand, fine to coarse, ~10% gravel, fine to coarse, ~5% fines, non plastic; slight naphthalene-like odor, brown. (25'- 25.8') WIDELY GRADED SAND WITH SILT (SW-SM); ~90% sand, fine to medium, ~10% fines, non plastic; strong naphthalene-like odor, brown, bands of tar-like staining. (25.8'- 28.1') WIDELY GRADED SAND (SW); ~95% sand, fine to coarse, ~5% fines, non plastic; strong naphthalene-like odor, brown, tar-like coating. (28.1'- 30') SILTY SAND (SP); ~70% sand, fine to medium, ~30% fines, medium plasticity; strong naphthalene-like odor, brown. (30'- 40') SILTY SAND (SP); ~70% sand, fine to medium, ~30% fines, medium plasticity; strong naphthalene-like odor, brown, dense.
							PLO		
							PLO		
							NLO		
							NLO		
25	S6	5.0	4.42	2310			NLO		
							NLO		
							NLO		
30	S7	5.0	3.75	2205					
35	S8	5.0	2.25	1300				NLO	
40	S9	5.0	1.92	286				NLO	

CrLO= CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10





GEI Consultants, Inc.  
455 Winding Brook Road  
Glastonbury, CT 06033  
(860) 368-5300

CLIENT: National Grid  
PROJECT: Williamsburg MGP RI  
CITY/STATE: Brooklyn, New York  
GEI PROJECT NUMBER: 093060

BORING LOG

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WWMW-06

DEPTH FT.	SAMPLE INFO				STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID	SOIL / BEDROCK DESCRIPTION
	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)					
45	S10	5.0	1.33	9316			NLO	WWMW-06 (50-52)	(45'- 50') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; strong naphthalene-like odor, brown, sheen, tar-like staining.
50	S11	5.0	4.17	>9999			NLO		
55	S12	5.0	2.25				NLO	WWMW-06 (58-60)	(54'- 55') SILT (ML); ~90% fines, medium plasticity, ~10% sand, fine; strong naphthalene-like odor, brown.
60	S13	5.0	2.25	0.0			NLO		(55'- 57.6') SILT (ML); ~90% fines, medium plasticity, ~10% sand, fine; moderate naphthalene-like odor, brown.
65									(57.6'- 59.1') WIDELY GRADED SAND (SW); ~95% sand, fine to medium, ~5% fines, non plastic; moderate naphthalene-like odor, brown.
									(59.1'- 59.8') SILT (ML); ~90% fines, medium plasticity, ~10% sand, fine; moderate naphthalene-like odor, brown.
									(59.8'- 60') LEAN CLAY (CL); ~90% fines, medium plasticity, ~10% sand, fine; moderate naphthalene-like odor, reddish brown.
									(60'- 65') LEAN CLAY (CL); ~90% fines, medium plasticity, ~10% sand, fine; reddish brown.
									Bottom of borehole at 65.0 feet.

NOTES:

PEN = PENETRATION LENGTH OF SAMPLER OR CORE BARREL  
REC = RECOVERY LENGTH OF SAMPLE  
PID = PHOTOIONIZATION DETECTOR READING (JAR HEADSPACE)

ppm = PARTS PER MILLION  
IN. = INCHES  
FT. = FEET

NLO = NAPHTHALENE LIKE ODOR  
PLO = PETROLEUM LIKE ODOR  
TLO = TAR LIKE ODOR  
CLO = CHEMICAL LIKE ODOR  
ALO = ASPHALT LIKE ODOR

CrLO = CREOSOTE LIKE ODOR  
OLO = ORGANIC LIKE ODOR  
SLO = SULFUR LIKE ODOR  
MLO = MUSTY LIKE ODOR

ENVIRONMENTAL BORING LOG WILLIAMSBURG.GPJ GEI CONSULTANTS.GDT 4/15/10

**APPENDIX B**  
**URS Health and Safety Plan**

**APPENDIX C**  
**Community Air Monitoring Plan**

## **1.0 COMMUNITY AIR MONITORING PLAN**

Real time air monitoring for volatile organic compounds (VOCs) and particulates will be conducted at the perimeter of the Exclusion Zone during the well installation program in accordance with the *New York State Department of Health Generic Community Air Monitoring Plan* (New York State Department of Environmental Conservation [NYSDEC] DER-10, Appendix 1A). The Community Air Monitoring Plan (CAMP) requirements for this project are summarized below:

- VOCs and dust particulates will be monitored at the downwind perimeter of the exclusion zone on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities will be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings will be recorded and be made available for the NYSDEC and the NYSDOH personnel to review if requested.
- If particulates levels at the downwind station exceed particulate levels at the upwind station by more than 100 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ ), work activities will be halted and appropriate dust suppression measures will be employed. All readings will be recorded and be made available for the NYSDEC and the New York State Department of Health (NYSDOH) personnel to review if requested.

### **1.1 Vapor Emission Response Plan**

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 ppm above background for the 15-minute average, work activities will be temporarily suspended and monitoring continued. If the total organic vapor levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the exclusion zone, activities can resume provided the total organic vapor levels 200 feet downwind of the exclusion zone or half the distance to the nearest residential or commercial structure (whichever is less) is below 5 ppm over background.

If the total organic vapor level is above 10 ppm at the perimeter of the exclusion zone, activities will be shut down. When work shutdown occurs, downwind air monitoring as directed by the Site SSO will be implemented to ensure that vapor emissions do not impact the nearest residential or commercial structure levels exceeding those specified in the Major Vapor Response Plan described below.

If total organic vapor levels exceed 25 ppm, at the perimeter of the work area, activities will be shutdown.

## **1.2 Major Vapor Emission Response Plan**

If any total organic vapor levels greater than 5 ppm over background are identified 200 feet downwind of the exclusion zone or half the distance to the nearest residential or commercial structure (whichever is less) all work activities will be halted.

If, following the cessation of work activities, or as a result of an emergency, total organic vapors persist above ppm above background 200 feet downwind from the exclusion zone or half the distance to the nearest residential or commercial structure (whichever is less), then the air quality will be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20-ft. zone).

If efforts to abate the emission source are unsuccessful and total organic vapor levels approaching 5 ppm persist for more than 30 minutes in the 20-ft. zone, then the Major Vapor Emission Response Plan shall be immediately placed into effect. Also the Major Vapor Emission Response Plan shall be immediately placed into effect if the 20-ft. zone total organic vapor levels are greater than 10 ppm above background.

Upon activation of the Major Vapor Emission Response Plan, the following activities will be undertaken:

- All Emergency Response Authorities will be contacted by the SSO and advised of the situation (NYSDEC, NYSDOH, and Local Fire Dpt.)
- Air monitoring will be conducted at 30 minute intervals within the 20-ft. zone. If two successive readings below the action levels are measured, air monitoring may be halted or modified by the SSO.

## **1.3 Particulate Monitoring, Response Levels and Actions**

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations except on days where precipitation warrant suspension of such monitoring. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne

particulate action level of  $150 \mu\text{g}/\text{m}^3$ . In addition, fugitive dust migration will be visually assessed during all work activities.

If the downwind PM-10 particulate levels are  $100 \mu\text{g}/\text{m}^3$  greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression provided that downwind PM-10 particulate levels do not exceed  $150 \mu\text{g}/\text{m}^3$  above the upwind concentration and provided that no visible dust is migrating from the work area.

If, after the implementation of dust suppression activities, downwind PM-10 levels are greater than  $150 \mu\text{g}/\text{m}^3$  above the upwind levels, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within  $150 \mu\text{g}/\text{m}^3$  of the upwind level and visible dust migration is prevented.

All data will be recorded and made available to the NYSDEC and NYSDOH personnel for review.

**APPENDIX D**  
**Screen Slot Size and Sand Pack Size Calculation**

**URS Corporation**

PROJECT: Nat Grid Wmsbrg NAPL Well  
SUBJECT: Well Screen/Filter

JOB NO. 11176638  
MADE BY: RJP DATE: 9-19-13  
CHECKED BY: MPG DATE: 9/19/2013

**1. PURPOSE:**

Determine the NAPL recovery well filter pack and well screen slot size.

**2. REMARKS/BASES:**

- Numerous passive recovery wells to be placed on/around site;
- Site geotechnical data (Refs. 1 and 2)
- Screened zone to be approx 25 feet directly on top of clayey layer that is about 60 feet bgs.

**3. CALCULATIONS AND RESULTS:**

Follow the method outlined in Ref. 3 and shown on attached computation pages. Site geology is highly variable as shown by site-specific grain size curves. Attached shows that sand filter pack is recommended.



PROJECT: Nat Grid Wmsbrg NAPL Well  
SUBJECT: Well Screen/Filter

JOB NO. 11176638  
MADE BY: RJP DATE: 9-19-13  
CHECKED BY: MPG DATE: 9/19/2013

## REFERENCES

- (1) Report entitled "Interim Remedial Measure, Design Investigation for the 50 Kent Avenue Parcel," August 2012, URS.
- (2) Report entitled "Interim Remedial Measure, Supplemental Pre-Design Investigation Report for the 50 Kent Avenue Parcel," July 2013, URS.
- (3) Navy Manual NAVFAC DM 7.01.
- (4) Groundwater and Wells, 2<sup>nd</sup> Edition, Driscoll.
- (5) Paper entitled "Filter Pack And Well Screen Design," US Department of the Interior Geological Survey, by A.I. Johnson, 1963.
- (6) NYSDOT Standard Specifications.
- (7) US Silica Filpro Product Data.

National Grid  
Williamsburg Works Former MGP Site  
Screen Slot Size and Sand Pack Size Calculation - Geotechnical

Boring	Depth (feet bgs)	Formation Soil (Base)			Max Allow Slot Size $D_{85}/1.3$ (mm) (E)	Native Soil as "Filter"		Filter			
		$D_{15}$ (mm)	$D_{50}$ (mm)	$D_{85}$ (mm)		20 Slot (0.50 mm)	10 Slot (0.25 mm)	(A) $(D_{15})_F$ must be > $(4)(D_{15})_B$ (mm)	(B) $(D_{15})_F$ must be < $(5)(D_{85})_B$ USE FINEST (mm)	(C) $(D_{50})_F$ must be < $(25)(D_{50})_B$ (mm)	(D) $(D_{15})_F$ must be < $(20)(D_{15})_B$ USE COARSEST (mm)
SB-100	23-29	0.0045	0.12	0.8	0.6	OK	OK	0.018	4.0	3.00	0.09
SB-100	39-45	0.003	0.15	2.5	1.9	OK	OK	0.012	12.5	3.75	0.06
SB-101	19-25	0.03	0.28	1.2	0.9	OK	OK	0.120	6.0	7.00	0.60
SB-101	37-47	0.004	0.18	1.5	1.2	OK	OK	0.016	7.5	4.50	0.08
SB-101	43-45	0.003	0.08	0.85	0.7	OK	OK	0.012	4.3	2.00	0.06
SB-102	35-41	0.09	0.2	0.4	0.3	Not OK	OK	0.360	2.0	5.00	1.80
SB-103	43-49	0.11	0.25	0.6	0.5	OK	OK	0.440	3.0	6.25	2.20
SB-103	55-61	0.01	0.1	0.25	0.2	Not OK	Marginal	0.040	1.3	2.50	0.20
GR-1	27-35	0.006	0.2	22	16.9	OK	OK	0.024	110.0	5.00	0.12
GR-2	31-39	0.009	0.25	7	5.4	OK	OK	0.036	35.0	6.25	0.18
GR-3	31-37	0.08	0.23	0.5	0.4	Not OK	OK	0.320	2.5	5.75	1.60
GR-4	35-41	0.004	0.15	1	0.8	OK	OK	0.016	5.0	3.75	0.08
GR-5	39-43	0.09	0.28	0.6	0.5	OK	OK	0.360	3.0	7.00	1.80
GR-6	29-35	0.005	0.1	2	1.5	OK	OK	0.020	10.0	2.50	0.10
GR-6	45-49	0.09	0.24	0.5	0.4	Not OK	OK	0.360	2.5	6.00	1.80
GR-7	33-39	0.1	0.28	0.7	0.5	OK	OK	0.400	3.5	7.00	2.00

0.440 1.3 2.00 2.20

NOTES:

- (1) "OK" means natural formation may be acceptable provided minimal fines pass chosen slot size (normally up to 10% may pass slot size per Driscoll Ref.). Inspection of native soil grain size curves show, however, that typically at least 50% passing slot size as small as 10 slot (0.25 mm). Therefore, native soil not OK with no additional filter layer.
- (2) For best filter design, the filter sand should parallel the native soil as much as possible. Therefore, consider the potential filter materials shown on accompanying grain size distribution curves. See NYSDOT 703-07 Concrete Sand. However, this filter would allow on average 30% passing through 20 slot. Instead see Filpro #1 and #0 which both meet particle retention criteria.
- (3) Slot size - Select 20 slot (0.50 mm). Less than 5% of Filpro sands above might pass this slot size based on inspection of accompanying grain size distribution curve. Such percent is acceptable per "Groundwater and Wells" Ref by Driscoll.
- (4) CONCLUSION - Use 20 slot for maximizing inflow and select Filpro #0 (zero) for best restriction of fines from native soil.

OK  
MPG  
2/19/2013  
b7  
RDP  
9-19-13

Job NATIONAL GRID

Project No. 11176638

Sheet \_\_\_\_ of \_\_\_\_

Description Williamsburg

Computed by RJP

Date 9-17-13

Checked by MAG

Date 9/19/2013

Reference

Following NAVFAC FIGURE 4

$$\frac{(D_{15})_F}{(D_{15})_B} > 4 \Rightarrow (D_{15})_F > (4 \times D_{15})_B \quad \text{HEAD LOSS CRITERIA} \quad (A)$$

$$\frac{(D_{15})_F}{(D_{85})_B} < 5 \Rightarrow (D_{15})_F < (5 \times D_{85})_B \quad (B)$$

↑ FINEST SOIL

$$\frac{(D_{50})_F}{(D_{50})_B} < 25 \Rightarrow (D_{50})_F < (25 \times D_{50})_B \quad (C)$$

$$\frac{(D_{15})_F}{(D_{15})_B} < 20 \Rightarrow (D_{15})_F < 20 (D_{15})_B \quad (D)$$

↑ COARSEST SOIL

Use 40 if  $C_u > 4$   $C_u = \frac{D_{60}}{D_{10}} \star$

$$\frac{(D_{85})_F}{\text{SLOT WIDTH}} > (1.2 \text{ to } 1.4) \Rightarrow \text{SLOT WIDTH} < \frac{(D_{85})_F}{1.3} \quad (E)$$

Typical Slot Widths

$$0.010 \text{ inch} \times 25.4 \text{ mm/in} = 0.25 \text{ mm}$$

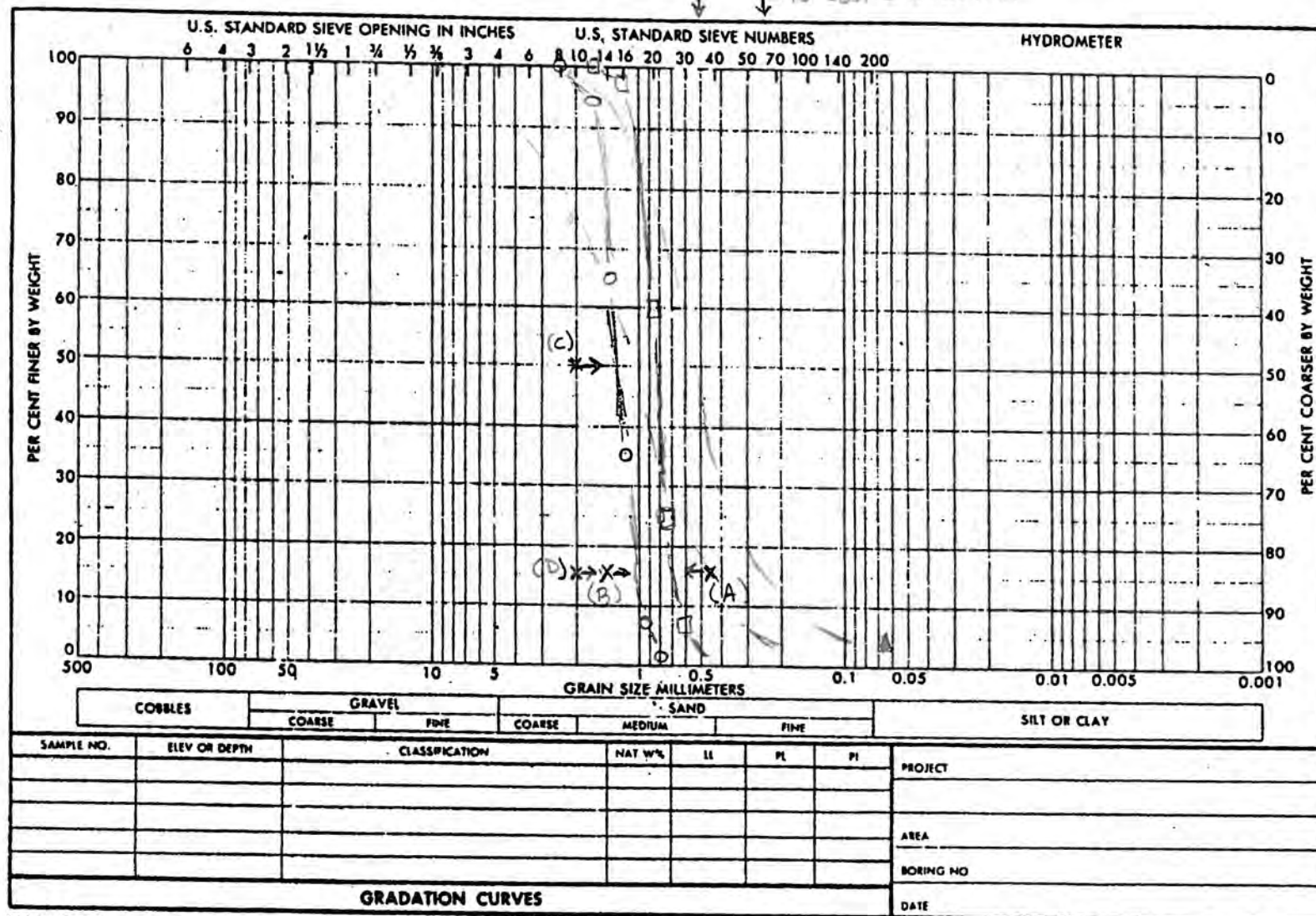
$$0.020 \text{ inch} = 0.50 \text{ mm}$$

First step: Use Equation (E) to determine if native soil can act as "filter" for typical slot widths.

Screen zone is the 25 ft above top of clay that is ~ 60 feet deep.  
Investigate soils at about 30 to 60 feet bgs.

V-28

PLATE V-2



ENG FORM 2087  
1 MAY 63

REPLACES WES FORM NO. 1241, SEP 1962, WHICH IS OBSOLETE. (TRANSLUCENT)

U.S. GOVERNMENT PRINTING OFFICE 1963 OF - 109-118

\*  
x = REQ'D FILTER PACK GRADATION  
MAX. FILTER SIZE 3" PER NAVFAC  
▲ MAX. % FINES 5% PER NAVFAC

o = FILPRO #1  
□ = FILPRO #0  
● = NYSDOT 703-07  
CONCRETE SAND

EM 1110-2-1906  
Appendix V  
30 Nov 70

**URS Corporation**

PROJECT: Nat Grid Wmsbrg NAPL Well  
SUBJECT: Well Screen/Filter

PAGE \_\_\_\_\_ OF \_\_\_\_\_  
JOB NO. 11176638  
MADE BY: RJP DATE: 9-19-13  
CHECKED BY: MPG DATE: 9/19/2013

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## REFERENCES

(Attached)

nationalgrid

**Interim Remedial Measure  
Design Investigation for the  
50 Kent Avenue Parcel  
Williamsburg Works Former MGP Site  
Site ID No. 224055  
Brooklyn, Kings County, New York**

*Prepared for:*

**National Grid**

287 Maspeth Avenue  
Brooklyn, New York 11211

*Prepared by:*

**URS**

77 Goodell Street  
Buffalo, NY 14203

**Draft  
August 2012**



**URS Corporation #11176638**  
**National Grid - Williamsburg Works Former MGP Site**  
**LABORATORY TESTING DATA SUMMARY**

SAMPLE IDENTIFICATION			INDEX TESTS							ENGINEERING TESTS							REMARKS
BORING NO	SAMPLE NO.	DEPTH (ft)	USCS SYMB. (1)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 $\mu$ m (%)	ORGANIC CONTENT (burnoff) (%)	TEST TYPE	WATER CONTENT (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	HYDRAULIC CONDUCTIVITY (cm/sec)	PEAK COMP. STRESS (psi)	STRAIN @ PEAK STRESS (%)	
SB-100	S-3,4,5	9-15	SC-SM	22	17	5	40.0	9		w	17.1						
SB-100	S-10,11,12	23-29	SM	np	np	np	41.5	11		w	14.5						
SB-100	S-18,19,20	39-45	SC-SM	26	21	5	40.3	10		w	15.3						
SB-100		59-61								UW		126.6					
SB-100		59.35								w	30.1						
SB-100	A	59.6								K	24.0	128.4	103.6	2.1E-8			P9395
SB-100		59.9								w	23.6						
SB-100	B	60.15	CL	48	23	25	91.5	41		UC	21.8	131.0	107.6		32.6	8.4	UC122b
SB-100		60.45								w	20.2						
SB-100	S-31,32,33	67-73	SC-SM	24	18	6	47.2	6		w	23.8						
SB-100	S-35,36	75-79	SM	27	22	5	47.3	8		w	29.9						
SB-101	S-2,3,4	7-13	SM	np	np	np	27.7	5		w	15.5						
SB-101	S-8,9,10	19-25	SM	np	np	np	21.3	5		w	15.7						
SB-101	S-17,18,21	37-47	SC	30	19	11	37.4	11		w	16.0						
SB-101	S-20	43-45	SC	30	18	12	49.2	12		w	12.0						
SB-101		59-61								UW		128.7					
SB-101	A	59.4	CL	45	25	20	90.0	41		w	27.2						
SB-101		59.7								w	27.0						

Prepared by: JR  
Reviewed by: GET  
Date: 5/17/2012

**TerraSense, LLC**  
45H Commerce Way  
Totowa, NJ 07512

Project No.: T11176638  
File: Indx1.xls  
Page 1 of 2

1.2

**URS Corporation #11176638**  
**National Grid - Williamsburg Works Former MGP Site**  
**LABORATORY TESTING DATA SUMMARY**

SAMPLE IDENTIFICATION			INDEX TESTS							ENGINEERING TESTS							REMARKS
BORING NO.	SAMPLE NO.	DEPTH (ft)	USCS SYMB. (1)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 µm (%)	ORGANIC CONTENT (burnoff) (%)	TEST TYPE	WATER CONTENT (%)	TOTAL UNIT WEIGHT (pcf)	DRY UNIT WEIGHT (pcf)	HYDRAULIC CONDUCTIVITY (cm/sec)	PEAK COMP. STRESS (psi)	STRAIN @ PEAK STRESS (%)	
SB-102	S-5,6,7	13-19	SM	np	np	np	15.9	2		w	19.4						
SB-102	S-9,10,11	21-27	SP-SM	np	np	np	11.5	2		w	23.9						
SB-102	S-16,17,18	35-41	SP-SM	np	np	np	11.6	2		w	21.3						
SB-102		63-65								UW		111.3					
SB-102		63.4								w	20.4						
SB-102	B	63.65								K	31.5	122.6	93.2	5.8E-8			P9396
SB-102		63.95								w	31.5						
SB-102	C	64.2	CL	47	22	25	83.2	41		UC	26.7	126.2	99.6		10.3	15.0	UC123e
SB-102	S-33,34,35	71-77	CL	41	23	18	97.9	33		w	29.0						
SB-102	S-38,39,40	81-87	CL	32	20	12	55.7	32	4.4	w	23.5						
SB-103	S-5,6,7	13-19	SM	np	np	np	29.7	4		w	16.4						
SB-103	S-10,12,13	23-31	CL	33	17	16	64.4	11		w	17.0						
SB-103	S-20,21,22	43-49	SP-SM	np	np	np	10.3	2		w	17.9						
SB-103	S-26,27,28	55-61	SC	26	17	9	43.1	7		w	24.2						
SB-103	S-33,34,35	69-75	CL	26	15	11	59.7	15		w	24.7						
SB-103		75-77								UW		125.3					
SB-103	A	75.15								K	26.2	125.9	99.8	2.3E-8			P9394
SB-103		75.4								w	25.8						
SB-103	B	75.65	CL	37	22	15	94.3	20		UC	23.2	129.5	105.2		23.0	15.0	UC122a

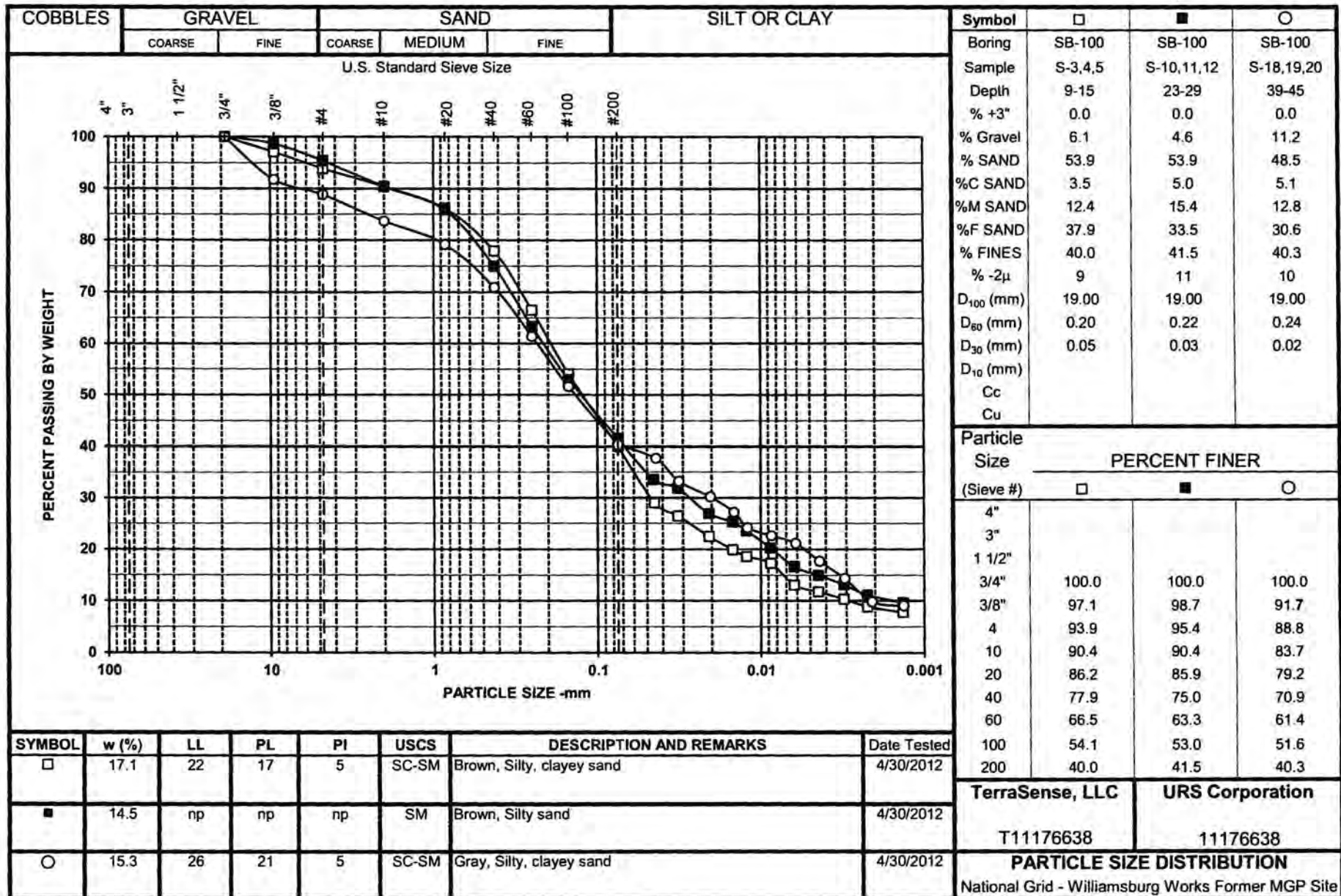
Note: (1) USCS symbol based on visual observation, Sieve results, and Atterberg limits reported.

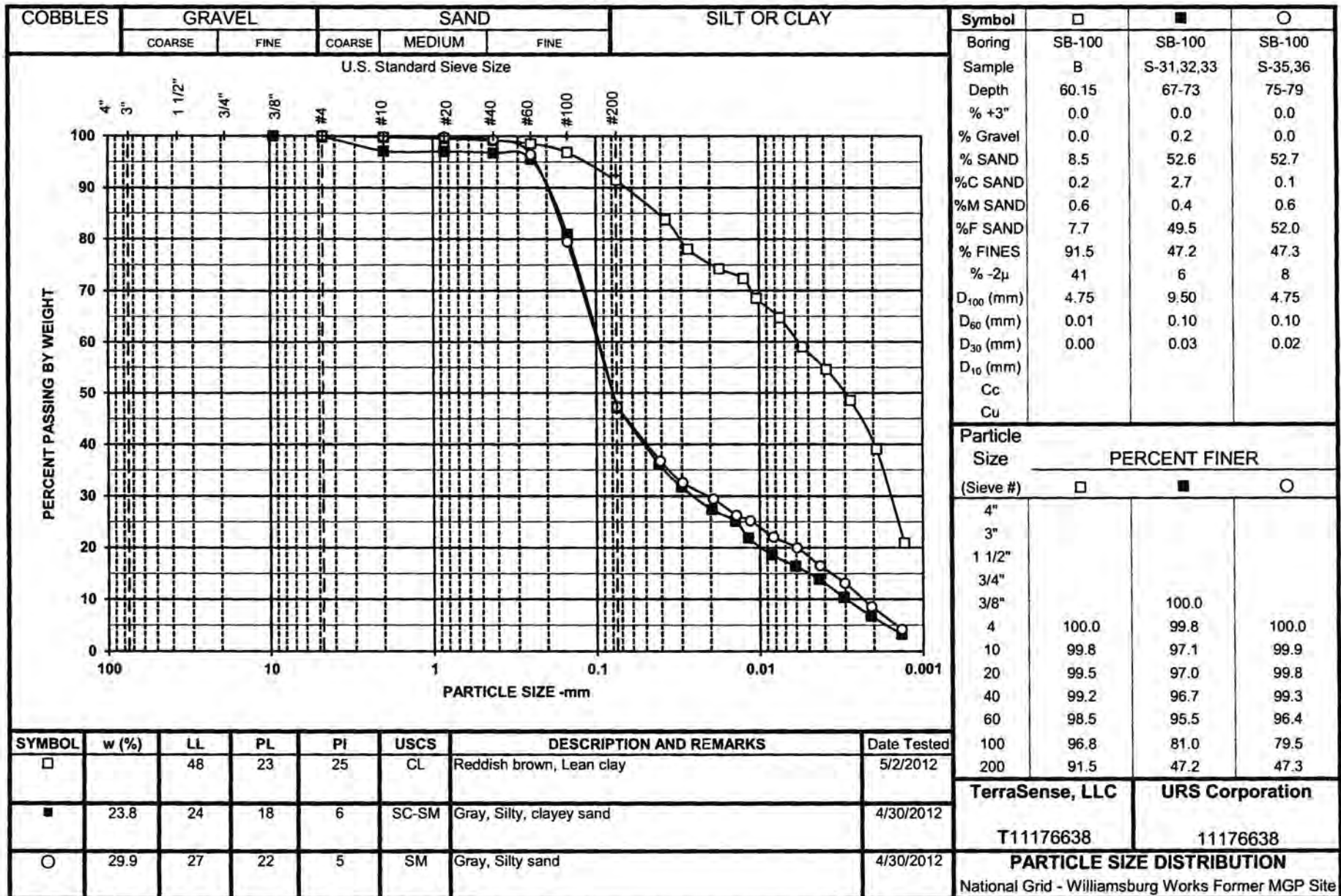
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Reviewed by: GET  
Date: 5/17/2012

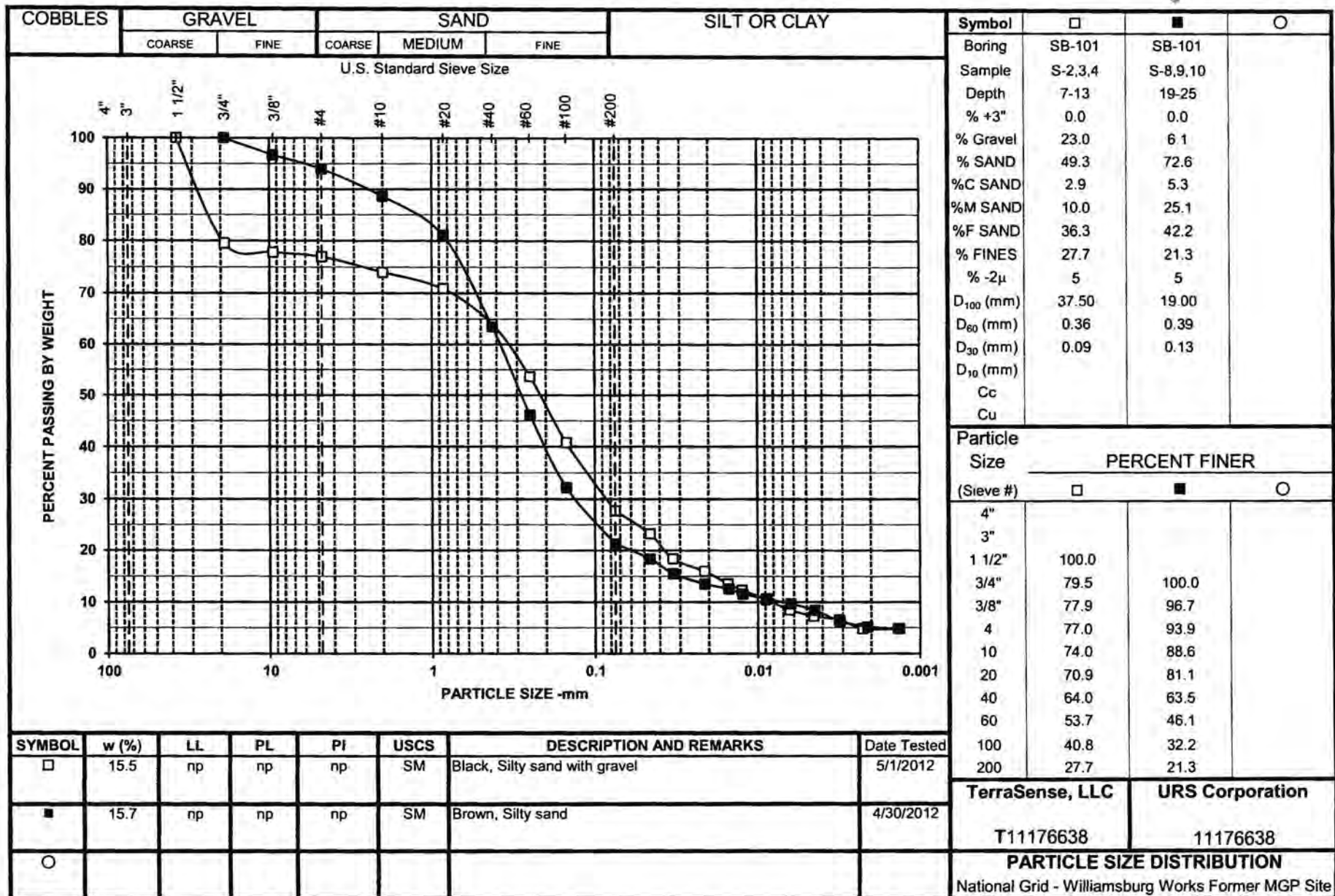
**TerraSense, LLC**  
45H Commerce Way  
Totowa, NJ 07512

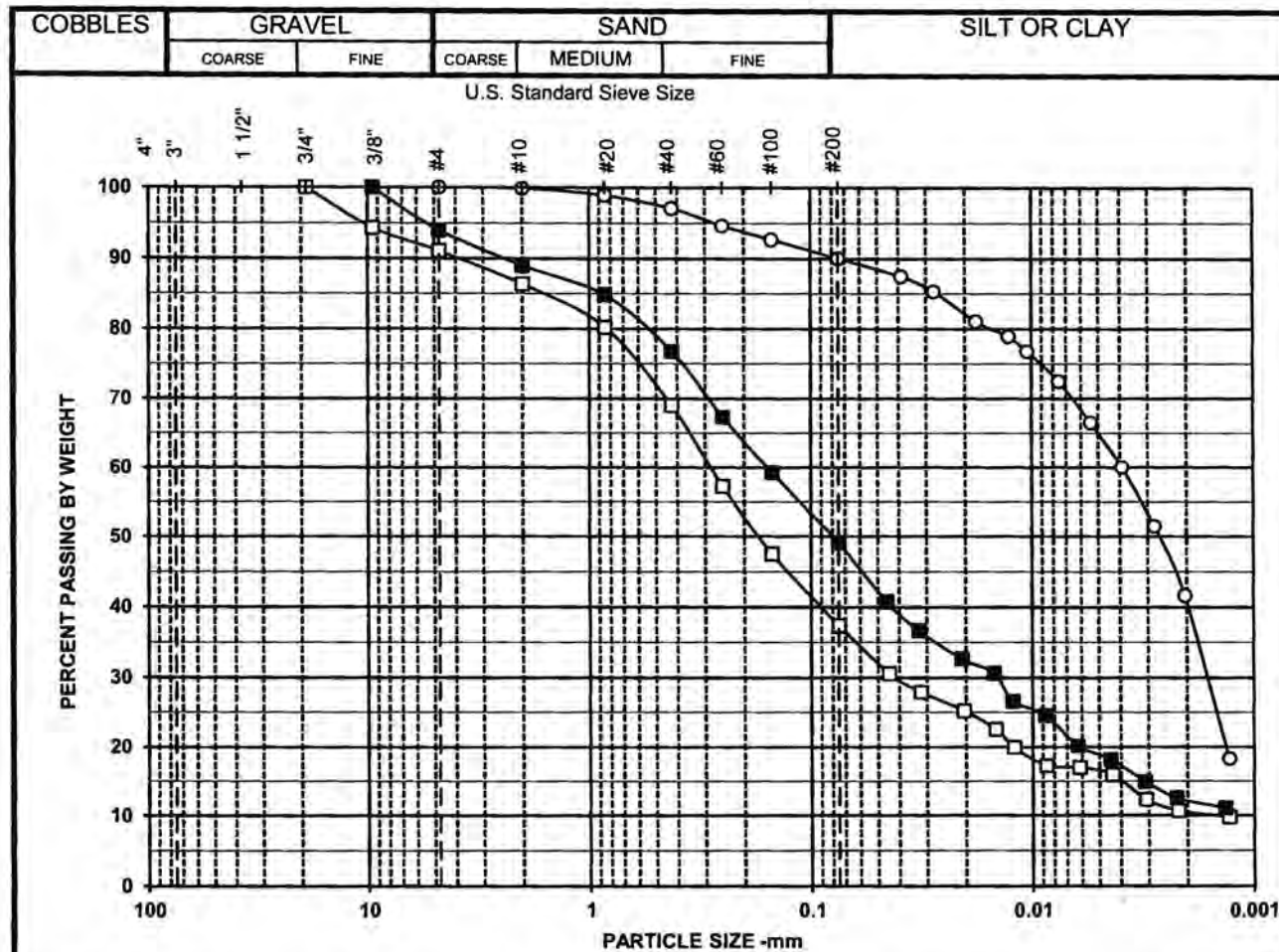
Project No.: T11176638  
File: Indx1.xls  
Page 2 of 2











SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	16.0	30	19	11	SC	Gray, Clayey sand	4/30/2012
■	12.0	30	18	12	SC	Brown, Clayey sand	4/30/2012
○		45	25	20	CL	Red, Lean clay	3/7/2012

Symbol	□	■	○
Boring	SB-101	SB-101	SB-101
Sample	S-17,18,21	S-20	A
Depth	37-47	43-45	59.4
% +3"	0.0	0.0	0.0
% Gravel	9.0	6.0	0.0
% SAND	53.6	44.8	10.0
%C SAND	4.6	5.0	0.1
%M SAND	17.4	12.2	2.8
%F SAND	31.6	27.7	7.1
% FINES	37.4	49.2	90.0
% -2μ	11	12	41
D <sub>100</sub> (mm)	19.00	9.50	4.75
D <sub>60</sub> (mm)	0.29	0.16	0.00
D <sub>30</sub> (mm)	0.04	0.01	0.00
D <sub>10</sub> (mm)			
Cc			
Cu			

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			
3/4"	100.0		
3/8"	94.3	100.0	
4	91.0	94.0	100.0
10	86.4	89.0	99.9
20	80.3	84.9	98.9
40	69.0	76.8	97.1
60	57.2	67.3	94.6
100	47.5	59.3	92.7
200	37.4	49.2	90.0

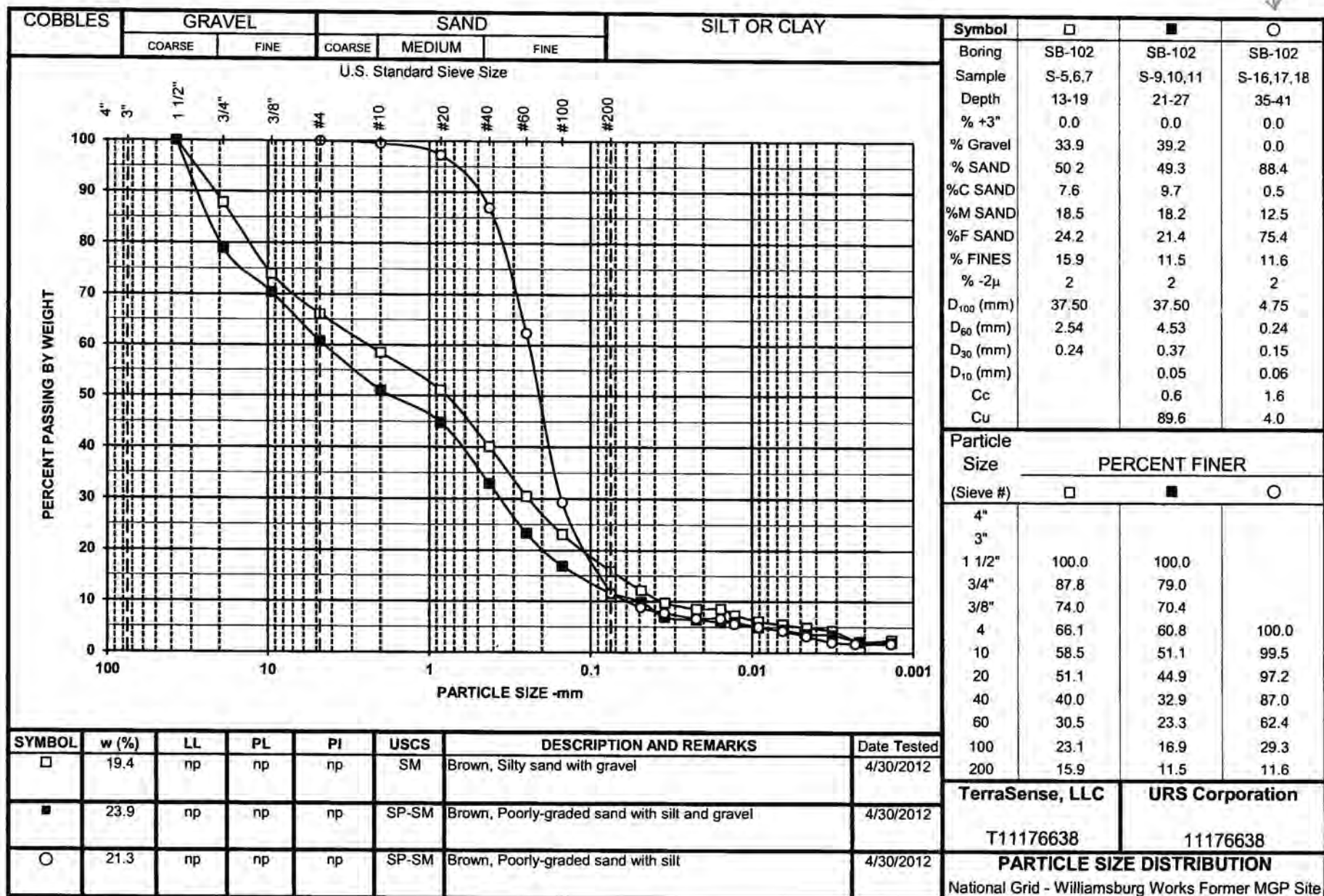
  

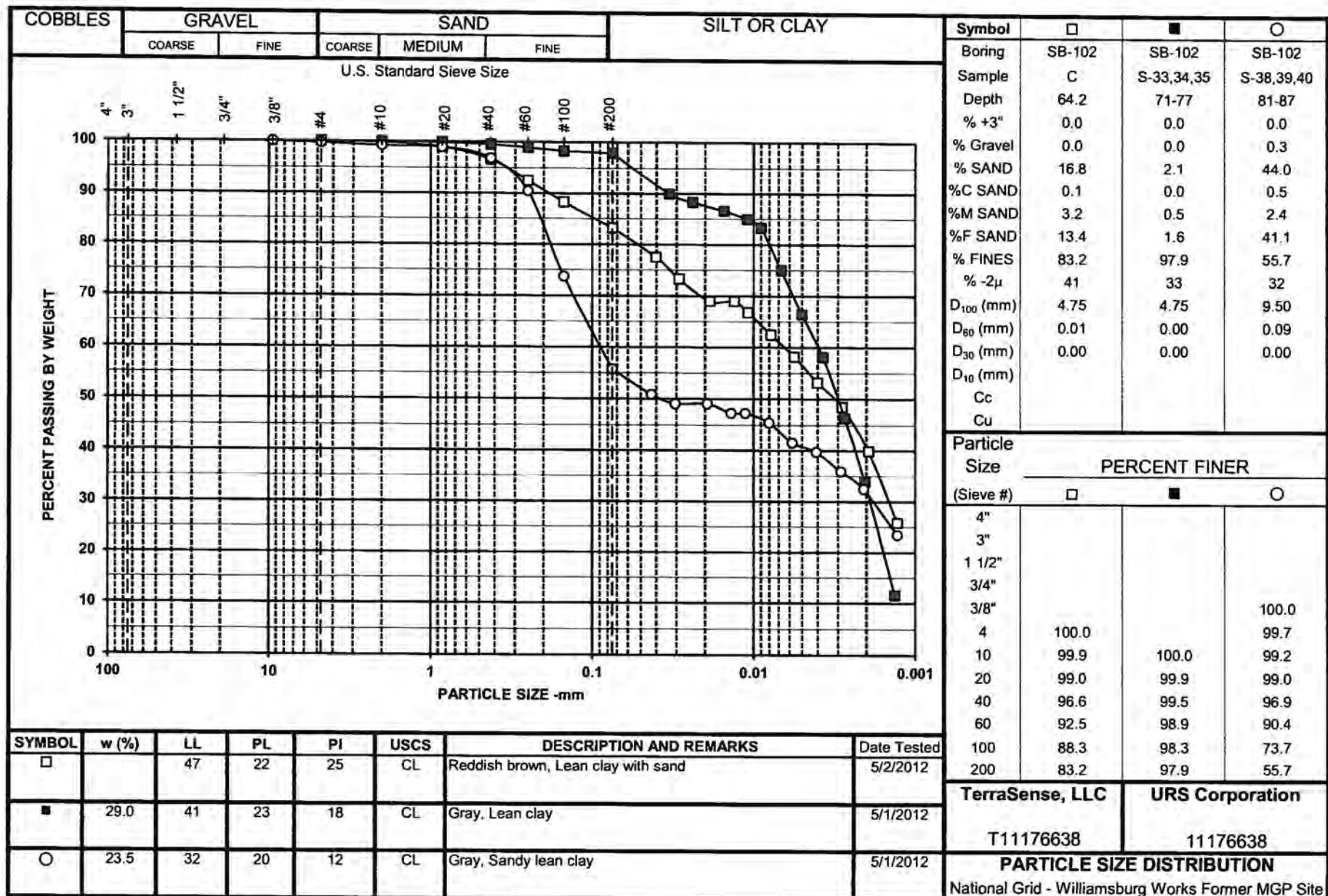
TerraSense, LLC		URS Corporation	
T11176638		11176638	

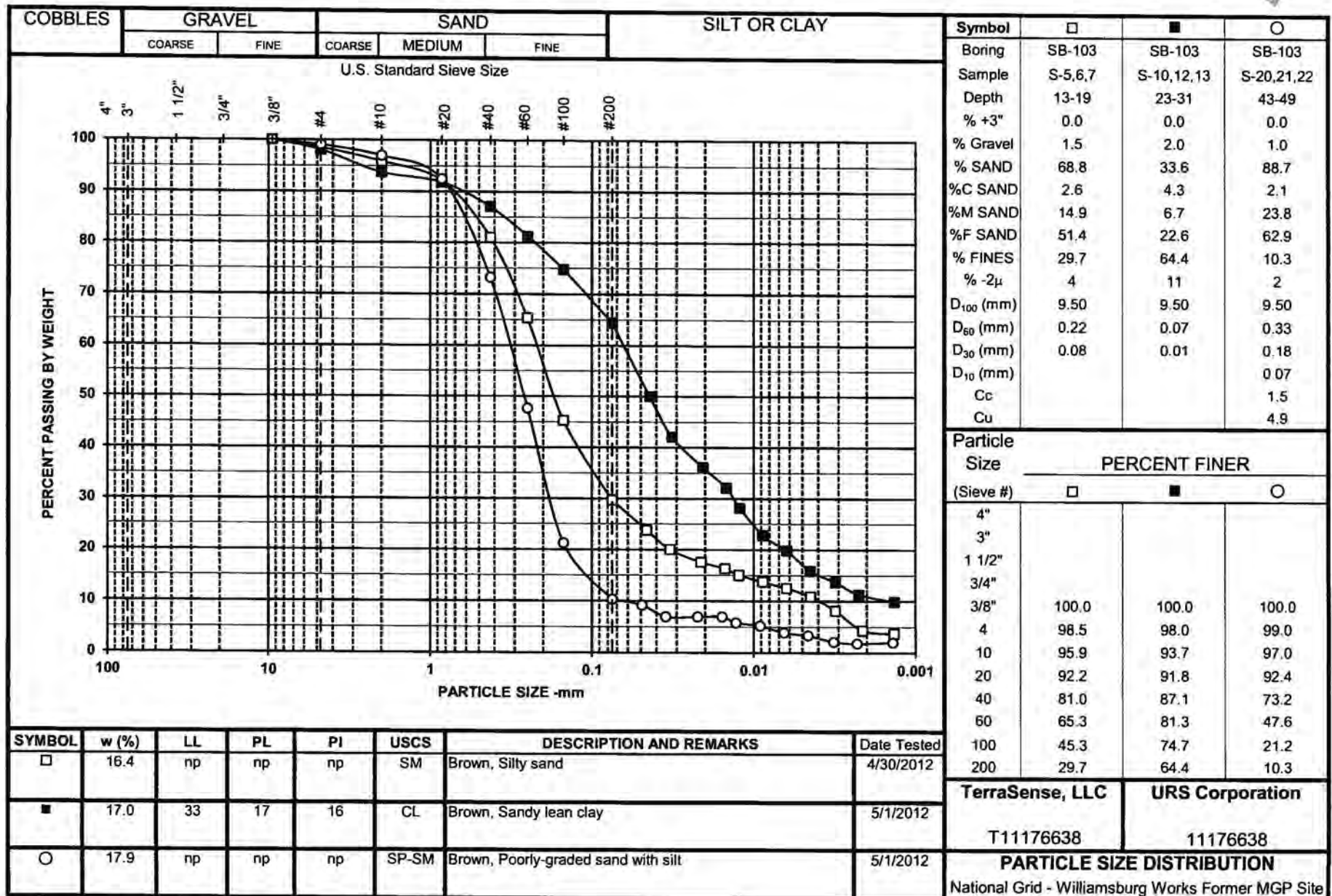
  

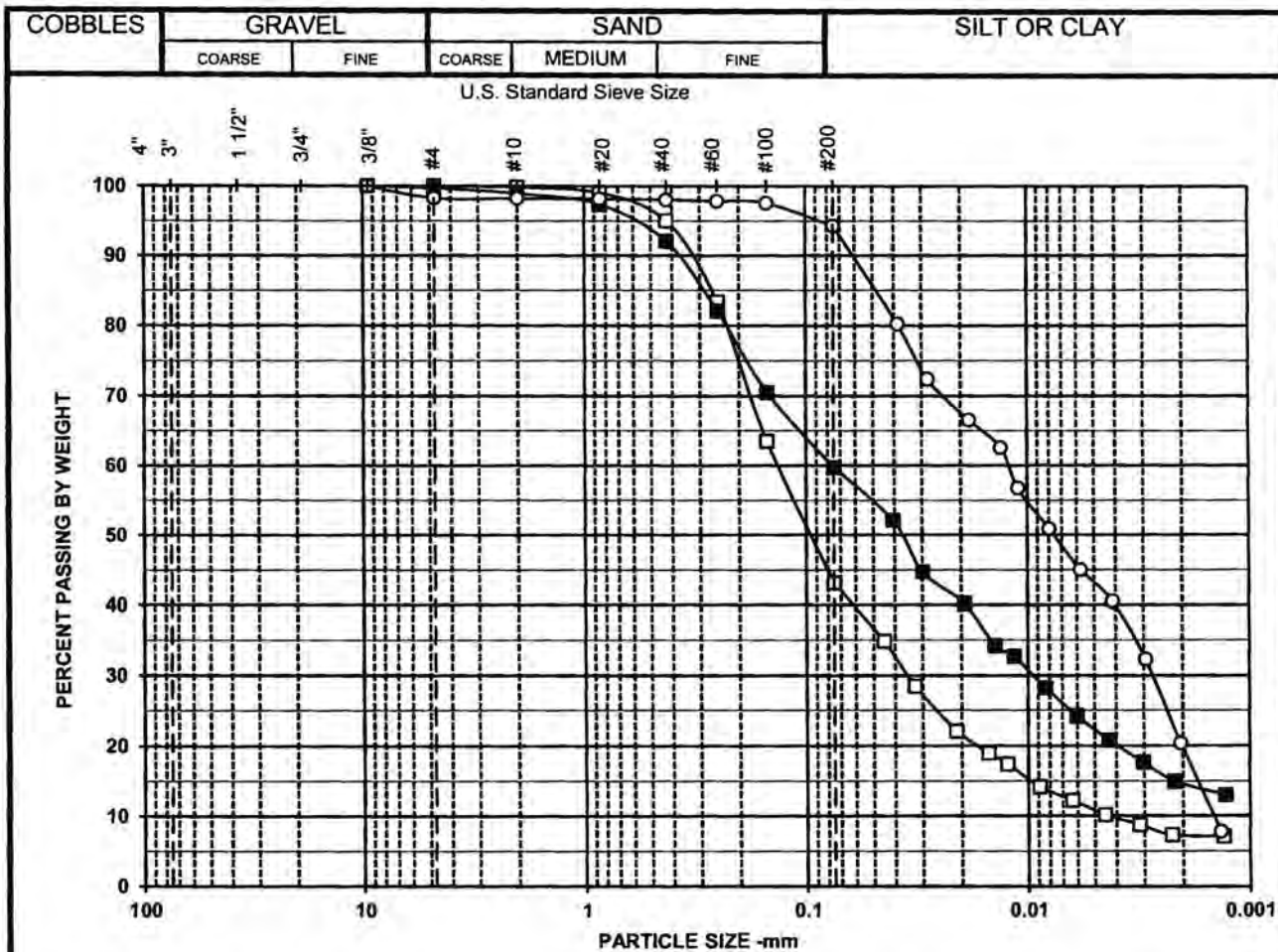
PARTICLE SIZE DISTRIBUTION			
National Grid - Williamsburg Works Former MGP Site			











Symbol	□	■	○
Boring	SB-103	SB-103	SB-103
Sample	S-26,27,28	S-33,34,35	B
Depth	55-61	69-75	75.65
% +3"	0.0	0.0	0.0
% Gravel	0.0	0.3	1.7
% SAND	56.9	40.0	4.0
%C SAND	0.1	0.8	0.0
%M SAND	4.8	6.9	0.2
%F SAND	51.9	32.4	3.8
% FINES	43.1	59.7	94.3
% -2μ	7	15	20
D <sub>100</sub> (mm)	4.75	9.50	9.50
D <sub>60</sub> (mm)	0.14	0.08	0.01
D <sub>30</sub> (mm)	0.04	0.01	0.00
D <sub>10</sub> (mm)			
Cc			
Cu			

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			
3/4"			
3/8"		100.0	100.0
4	100.0	99.7	98.3
10	99.9	98.9	98.2
20	99.0	97.4	98.2
40	95.0	92.1	98.0
60	83.4	82.1	97.8
100	63.5	70.5	97.6
200	43.1	59.7	94.3

SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	24.2	26	17	9	SC	Brown, Clayey sand	5/3/2012
■	24.7	26	15	11	CL	Brown, Sandy lean clay	5/3/2012
○		37	22	15	CL	Gray, Lean clay	5/2/2012

<b>TerraSense, LLC</b>	<b>URS Corporation</b>
T11176638	11176638
<b>PARTICLE SIZE DISTRIBUTION</b>	
National Grid - Williamsburg Works Former MGP Site	



nationalgrid

**Interim Remedial Measure  
Supplemental Pre-Design  
Investigation Report for  
the 50 Kent Avenue Parcel  
Former Williamsburg Works MGP Site  
Site ID No. 224055  
Brooklyn, Kings County, New York**

*Prepared for:*

nationalgrid

One MetroTech Center  
Brooklyn, New York 11201

*Prepared by:*

**URS**

77 Goodell Street  
Buffalo, NY 14203

**July 2013**

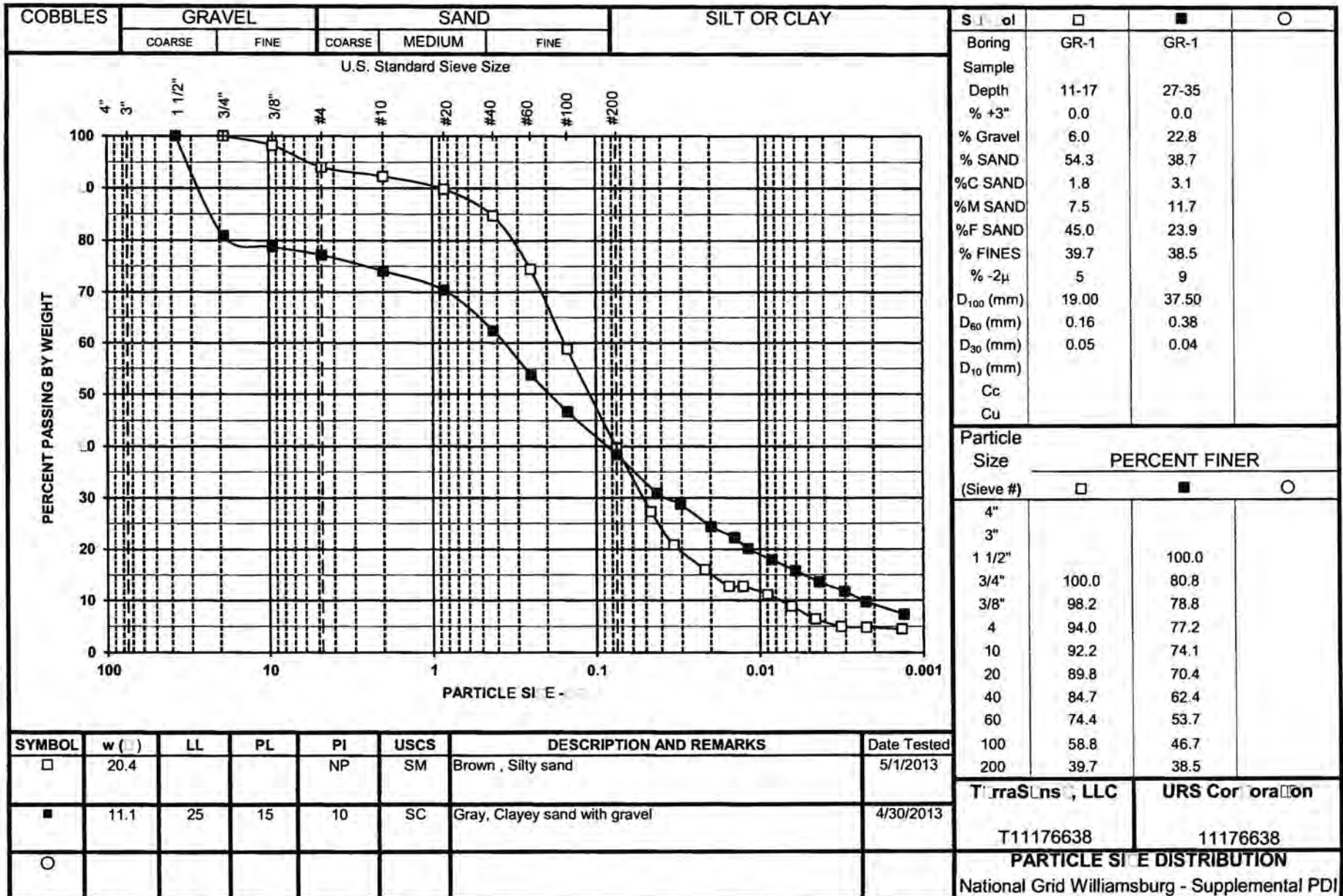
**Appendix B**  
**Supplemental Geotechnical Laboratory Test Reports**

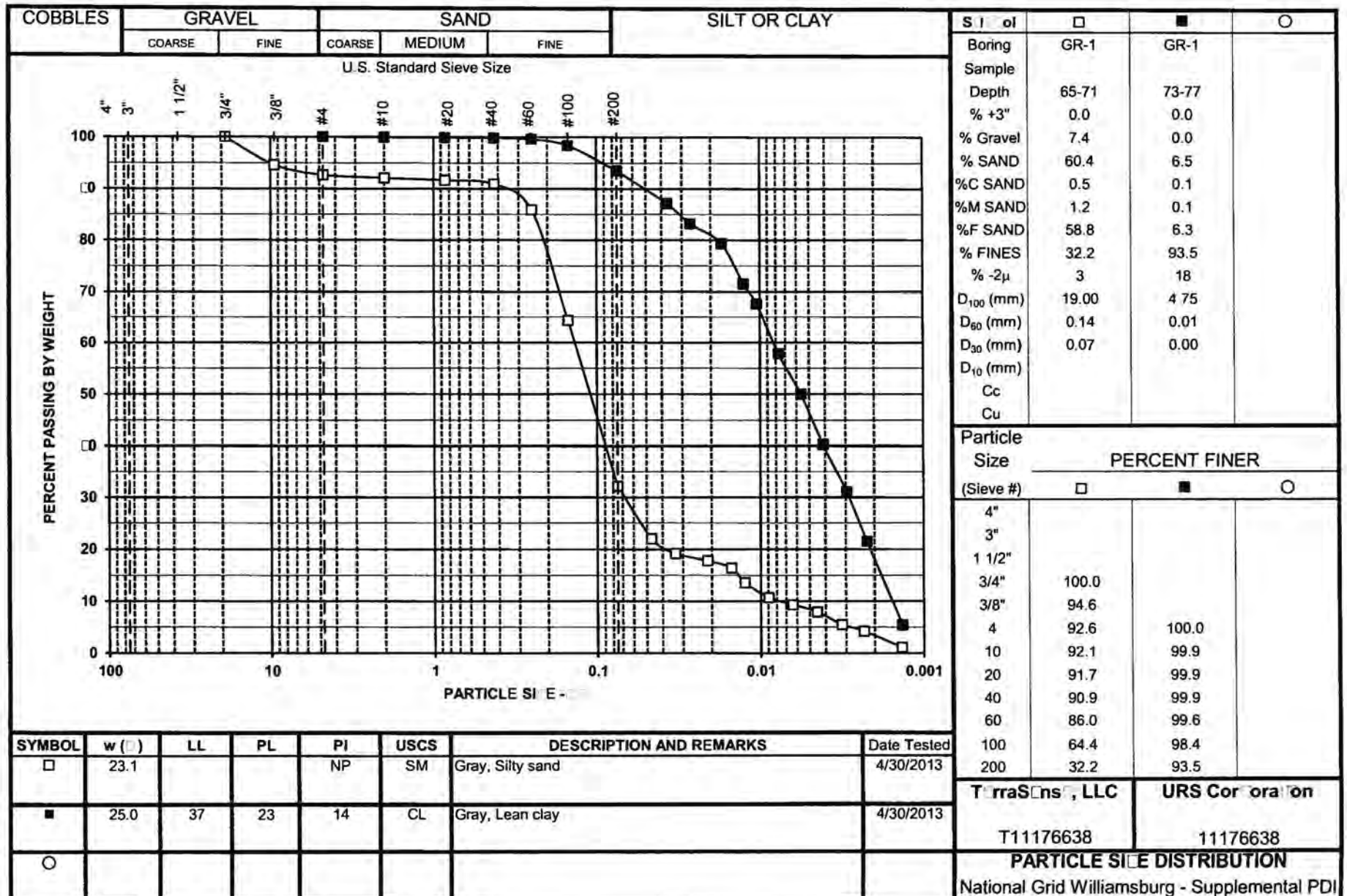
**URS 11176638**  
**National Grid Wells - Sarg - S**  
**LABORATORY TESTING DATA SUMMARY**

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS							REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 $\mu$ m (%)	
GR-1		11-17	20.4			NP	SM	39.7	5	
GR-1		27-35	11.1	25	15	10	SC	38.5	9	
GR-1		65-71	23.1			NP	SM	32.2	3	
GR-1		73-77	25.0	37	23	14	CL	93.5	18	
GR-2		21-25	15.0	27	16	11	SC	38.4	4	
GR-2		31-39	15.3	30	16	14	SC	34.6	7	
GR-2		65-69	25.1	49	24	25	CL	91.6	28	
GR-2		73-77	20.5	32	19	13	CL	70.5	13	
GR-3		13-19	22.4	24	19	5	SC-SM	47.3	7	
GR-3		31-37	24.4			NP	SM	12.5	0	
GR-3		53-57	22.7	43	21	22	CL	87.4	36	
GR-4		7-13	16.5	25	15	10	SC	35.5	6	
GR-4		35-41	13.7	26	16	10	SC	41.2	11	
GR-4		53-57	21.7	40	21	19	CL	82.0	33	
GR-5		17-23	14.0	25	17	8	SC	31.1	4	
GR-5		39-43	20.5			NP	SP-SM	11.9	0	
GR-5		61-65	23.8	51	25	26	CH	87.2	43	
GR-6		13-17	15.0	24	16	8	SC	36.4	8	
GR-6		29-35	15.2	30	15	15	SC	46.2	9	
GR-6		45-49	19.9			NP	SP-SM	11.5	0	
GR-6		65-69	23.9	46	23	23	CL	84.2	25	
GR-7		17-23	19.2	31	17	14	SC	41.2	6	
GR-7		33-39	20.0			NP	SW-SM	10.7	1	
GR-7		61-65	29.6	49	27	22	CL	99.0	31	

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.

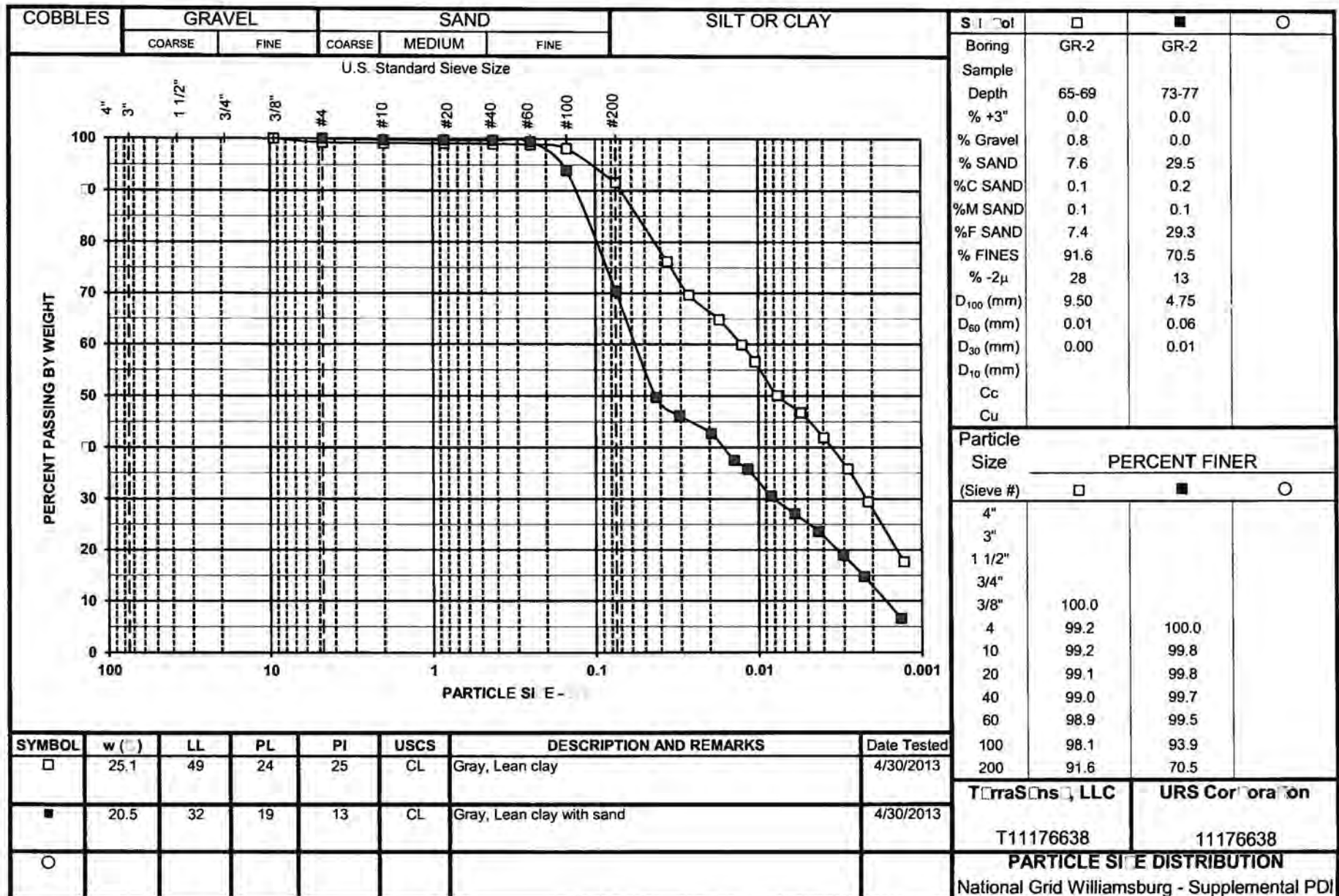
(ML)  
↓

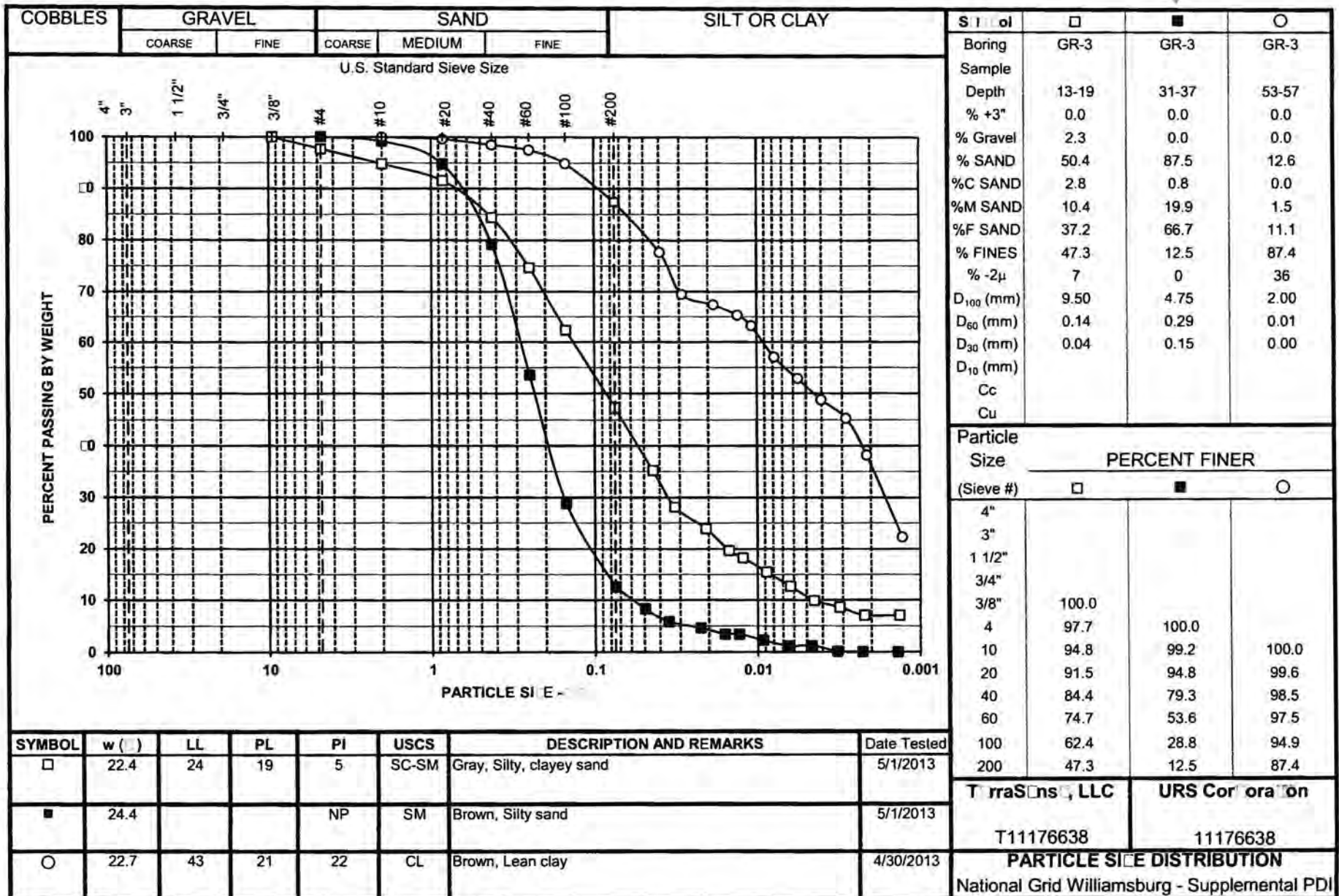




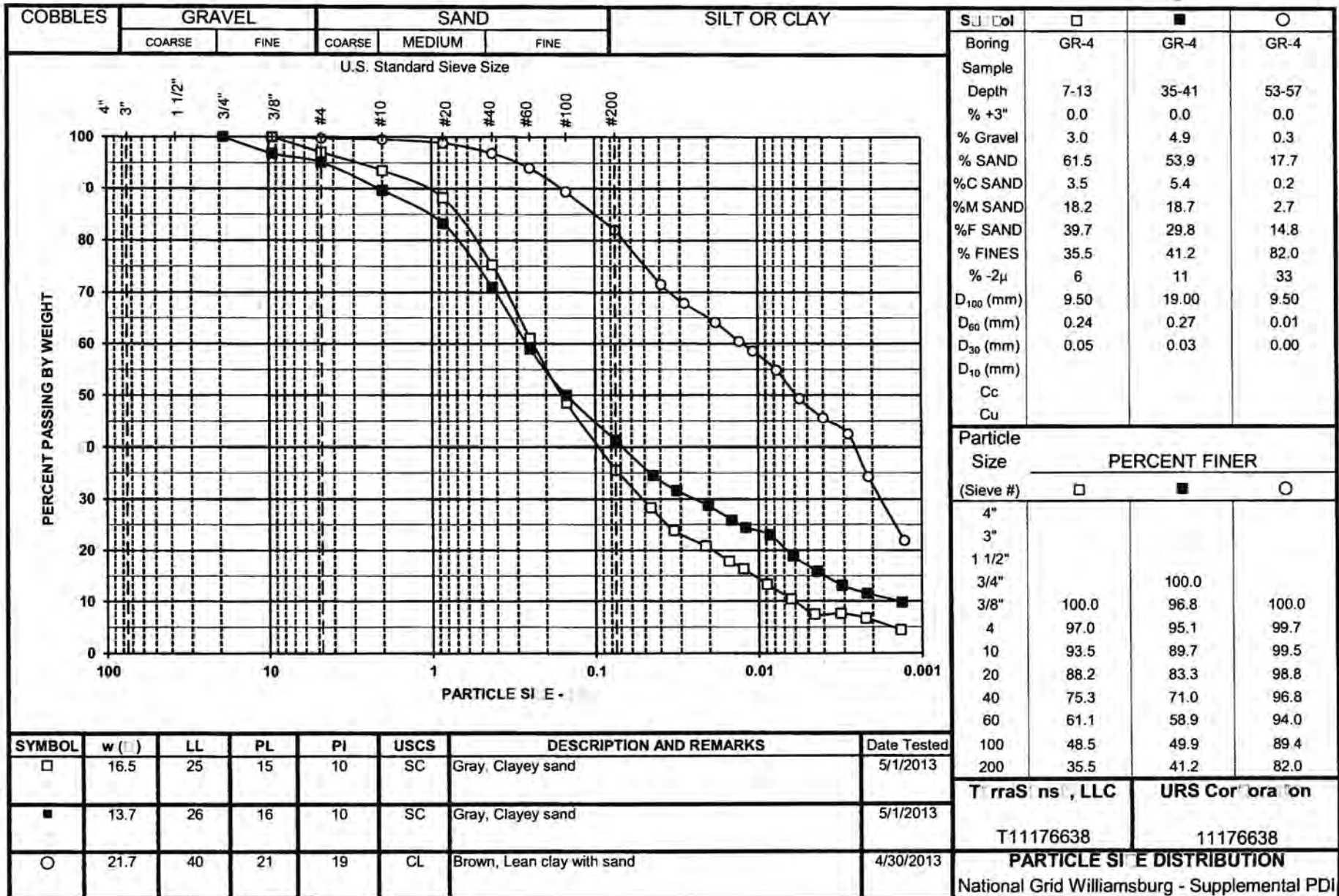




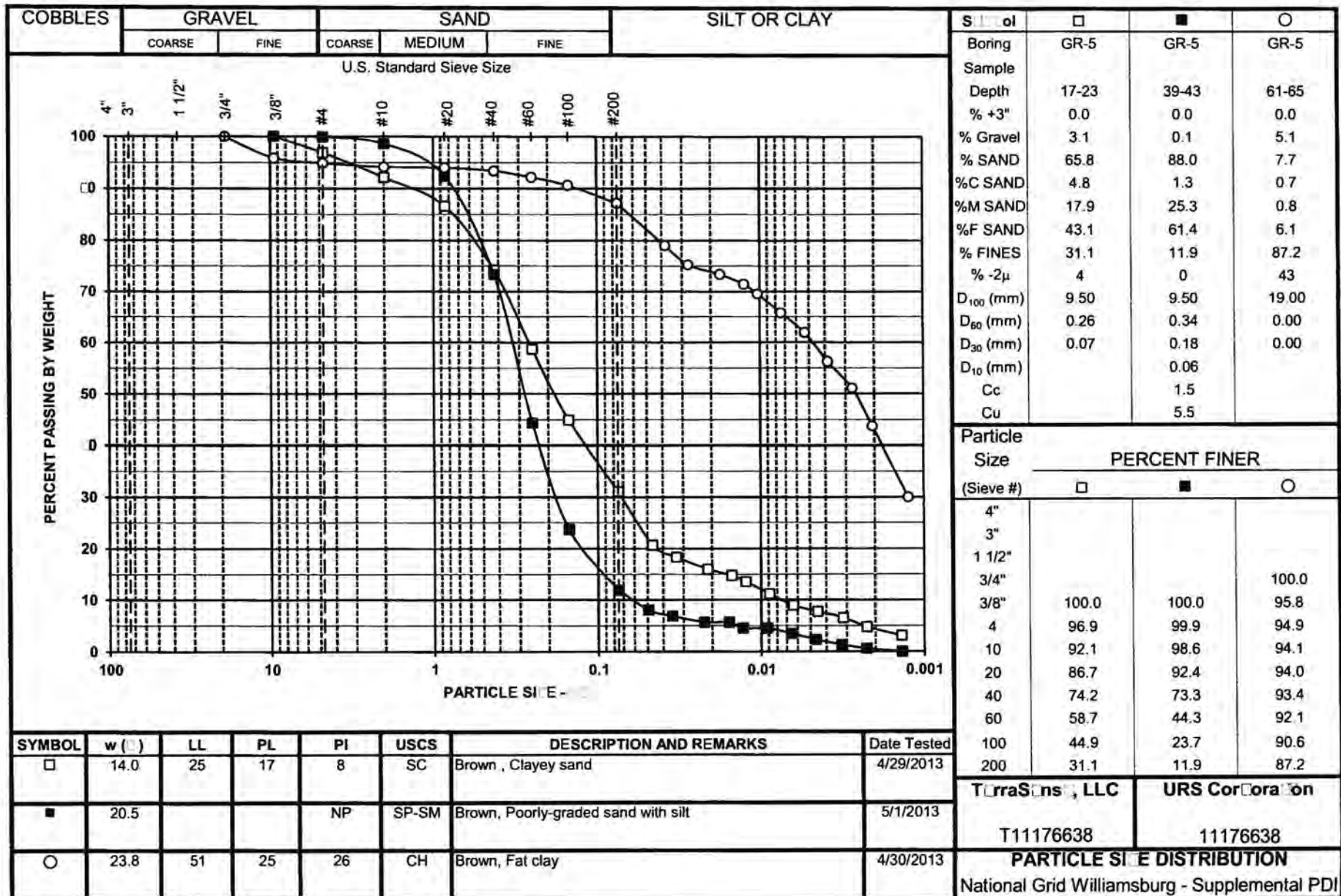




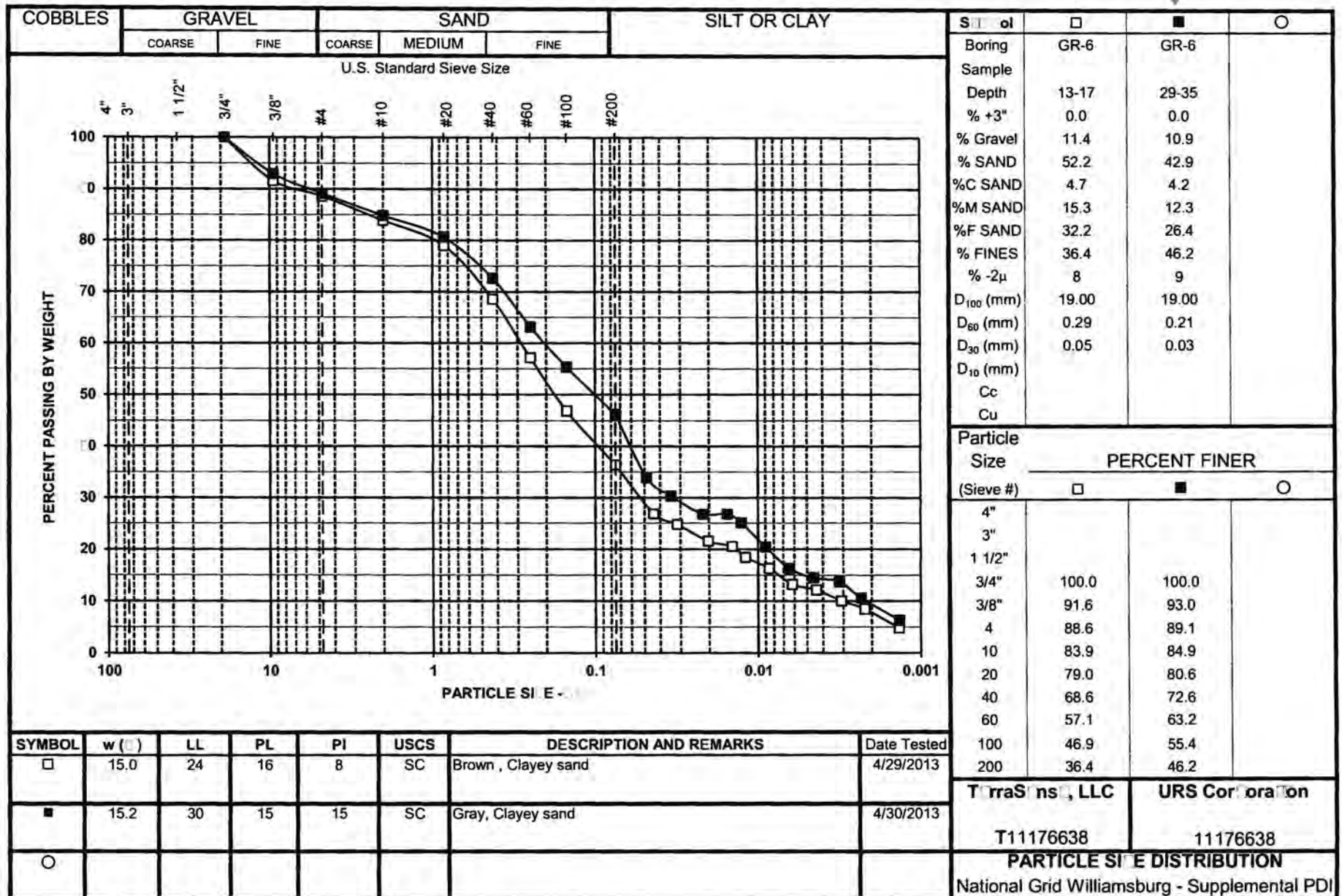


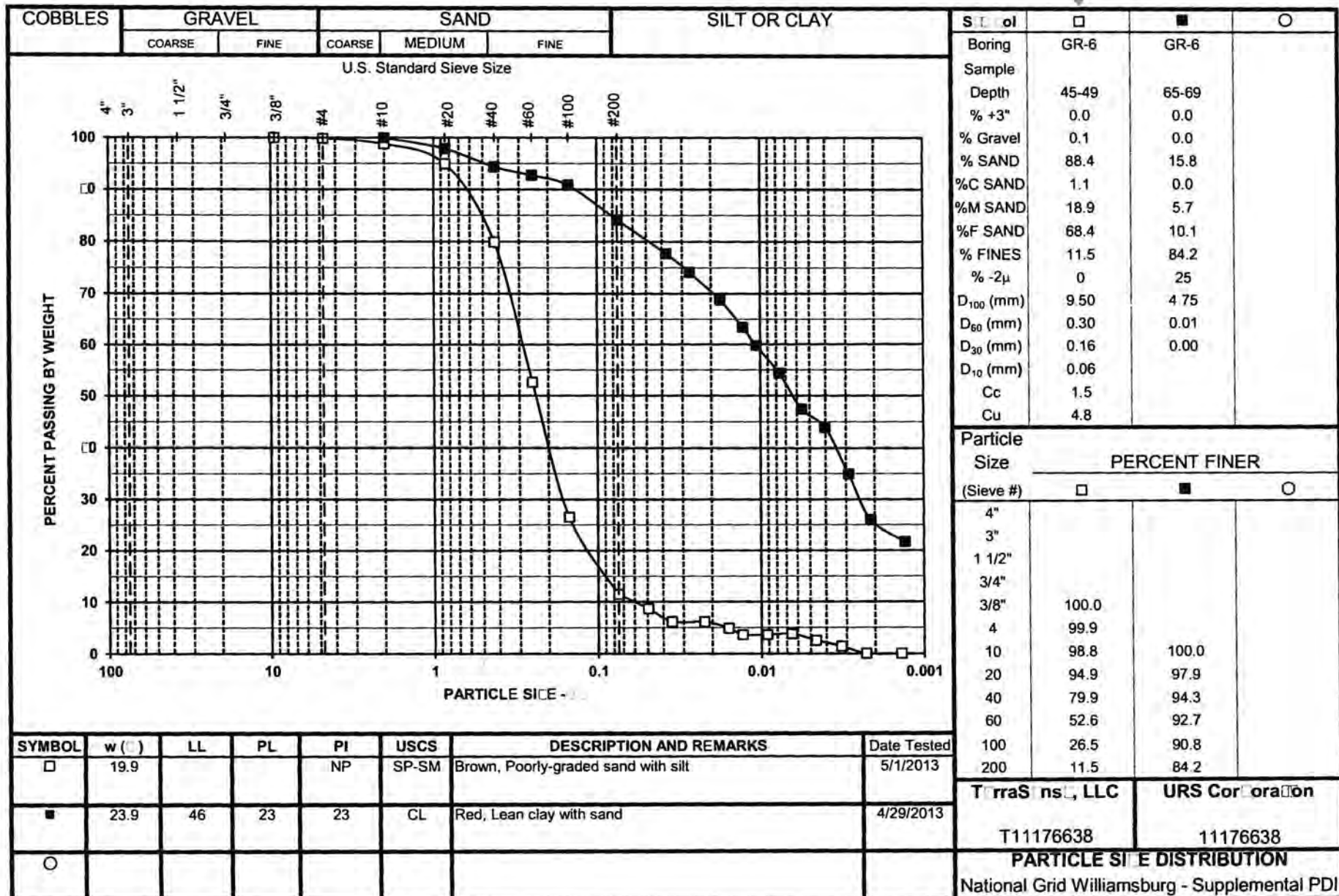


2.9

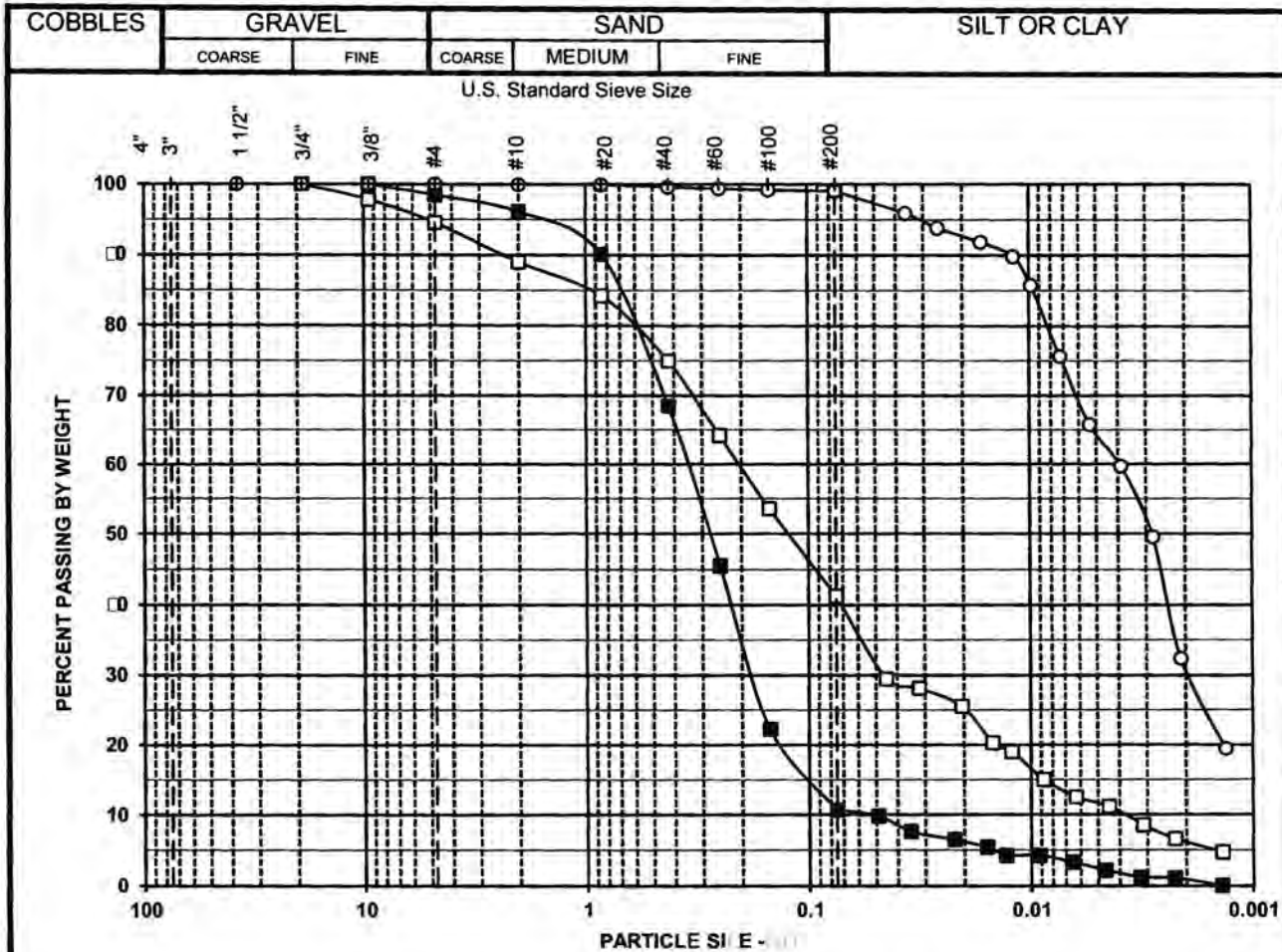


2.10







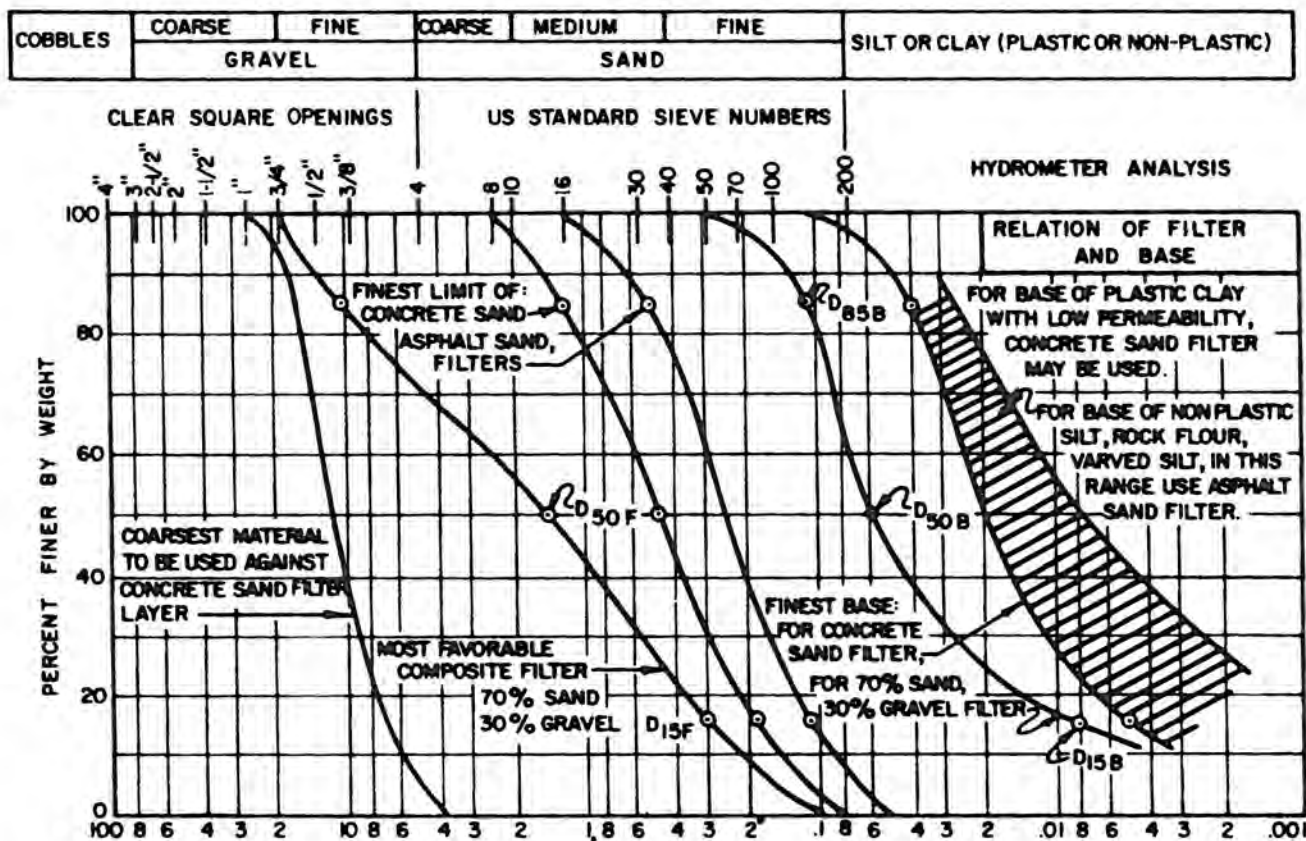


Sieve	□	■	○
Boring	GR-7	GR-7	GR-7
Sample			
Depth	17-23	33-39	61-65
% +3"	0.0	0.0	0.0
% Gravel	5.5	1.5	0.0
% SAND	53.3	87.8	1.0
%C SAND	5.6	2.4	0.1
%M SAND	14.0	27.6	0.3
%F SAND	33.8	57.8	0.6
% FINES	41.2	10.7	99.0
% -2μ	6	1	31
D <sub>100</sub> (mm)	19.00	9.50	4.75
D <sub>60</sub> (mm)	0.21	0.36	0.00
D <sub>30</sub> (mm)	0.05	0.18	0.00
D <sub>10</sub> (mm)		0.05	
Cc		1.7	
Cu		6.7	

Particle Size	PERCENT FINER		
(Sieve #)	□	■	○
4"			
3"			
1 1/2"			100.0
3/4"	100.0		100.0
3/8"	97.8	100.0	100.0
4	94.5	98.5	100.0
10	89.0	96.1	99.9
20	84.3	90.1	99.9
40	75.0	68.5	99.6
60	64.2	45.5	99.4
100	53.6	22.2	99.2
200	41.2	10.7	99.0

SYMBOL	w (%)	LL	PL	PI	USCS	DESCRIPTION AND REMARKS	Date Tested
□	19.2	31	17	14	SC	Brown, Clayey sand	4/29/2013
■	20.0			NP	SW-SM	Brown, Well-graded sand with silt	5/1/2013
○	29.6	49	27	22	CL	Brown, Lean clay	4/29/2013

TerraSens, LLC	URS Corporation
T11176638	11176638
PARTICLE SIZE DISTRIBUTION	
National Grid Williamsburg - Supplemental PDI	



## GENERAL REQUIREMENTS:

1. TO AVOID HEAD LOSS IN FILTER:  $\frac{D_{15F}}{D_{15B}} > 4$ , AND PERMEABILITY OF FILTER MUST BE LARGE ENOUGH TO SUFFICE FOR PARTICULAR DRAINAGE SYSTEM.
2. TO AVOID MOVEMENT OF PARTICLES FROM BASE:  $\frac{D_{15F}}{D_{85B}} < 5$ ,  $\frac{D_{50F}}{D_{50B}} < 25$ ,  $\frac{D_{15F}}{D_{15B}} < 20$   

USE FINEST SOIL
USE COARSEST SOIL

  - FOR VERY UNIFORM BASE MATERIAL ( $C_u < 1.5$ ):  $D_{15F}/D_{85B}$  MAY BE INCREASED TO 6
  - FOR BROADLY GRADED BASE MATERIAL ( $C_u > 4$ ):  $D_{15F}/D_{15B}$  MAY BE INCREASED TO 40
3. TO AVOID MOVEMENT OF FILTER IN DRAIN PIPE PERFORATIONS OR JOINTS:  $D_{85F}/\text{SLOT WIDTH} > (1.2 \text{ TO } 1.4)$ ,  $D_{85F}/\text{HOLE DIAMETER} > (1.0 \text{ TO } 1.2)$
4. TO AVOID SEGREGATION, FILTER SHOULD CONTAIN NO SIZES LARGER THAN 3".
5. TO AVOID INTERNAL MOVEMENT OF FINES, FILTER SHOULD HAVE NO MORE THAN 5% PASSING No. 200 SIEVE.

FIGURE 4 (continued)  
Design Criteria for Protective Filters

REF. 4

4.1

# **Groundwater and Wells**

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**Second Edition**

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Fletcher G. Driscoll, Ph.D.  
Principal Author and Editor

Published by Johnson Division, St. Paul, Minnesota 55112

packed wells, the zone immediately around the well screen is made more permeable by removing some formation material and replacing it with specially graded material. This relatively thin zone separates the screen from the formation material and increases the effective hydraulic diameter of the well. A filter pack is chosen to retain most of the formation material; a well screen opening is then selected to retain about 90 percent of the filter pack after development. Filter pack materials should be well sorted to assure good porosity and hydraulic conductivity of the materials near the screen. Most commercial filter packs have uniformity coefficients of approximately 2. In certain areas, however, filter packs with uniformity coefficients of 4 to 5 are used occasionally with good results.

Filter packing is especially advantageous when the sediments are highly uniform and fine grained, when the sediments are highly laminated, or when all the materials to be used in the well construction must be on site before drilling begins. A filter pack is also advantageous when the small slot size dictated by natural development limits the transmitting capacity of the screen so that the desired yield cannot be obtained. Moreover, the use of certain drilling rigs may require the installation of a filter pack. For example, reverse rotary rigs will rarely complete a borehole that is less than 14 to 16 inches (356 to 406 mm) in diameter. Thus, the borehole diameter may be much larger than required for the installation of a screen.

Some geologic environments in which filter packs should be considered include:

*Fine, uniform sand [glaciofluvial, alluvial, and aeolian (wind blown) aquifers].* In these formations, filter packing should be considered so that larger slot openings can be used to increase the hydraulic efficiency of the well. In general, if a slot opening based on natural development is smaller than 0.010 in (0.25 mm), filter packing may be more desirable because the screen's transmitting capacity may not be great enough to supply the desired yield. If the water is extremely incrusting, a lower limit of 0.015 in (0.38 mm) or 0.020 in (0.51 mm) may be used instead of 0.010. Some deviation from this limit is possible, usually depending on the mineral content of the water. For example, in some areas of the Gulf Coastal Plain of the southern United States, naturally developed wells with screen openings as small as 0.006 in (0.15 mm) are used because experience has shown this to be the best design.

In other situations, filter pack design is dictated by the physical nature of the aquifer. In certain fine-grained, uniformly sorted formations, a naturally developed well may lead either to low yields because screen slot sizes must be reduced, or to high rates of sand pumping. Filter packing of these same wells would generally lead to higher sand-free yields.

Examples of fine-grained formations in which wells are ordinarily filter packed include the Tertiary sands of the Gulf Coastal Plain; the Ogallala Formation in West Texas, Kansas, and Nebraska; the Raritan sand in New Jersey; the Sparta sand in Louisiana; and aquifers of the Indus Plains in West Pakistan.

*Semiconsolidated (friable) sandstone.* Many productive sandstone aquifers are poorly cemented. The Dakota Sandstone in North and South Dakota, the Jordan Sandstone in some areas of Minnesota, and the Garber and Elk City Sandstones in Oklahoma are examples of this type of formation. If a well is finished as an open hole in these aquifers, some sand particles continually slough from the walls of the hole, resulting in a sand-pumping well. The sloughing may begin immediately after the well is completed or after several months have elapsed, depending on the pumping





WRD. 1  
P. O. Box  
Albuquerque, New Mexico 87106

REF. 5

5.1

UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

# FILTER PACK AND WELL SCREEN DESIGN

U.S. GEOLOGICAL SURVEY  
WRD, LIBRARY  
505 MARQUETTE NW, RM 720  
ALBUQUERQUE, N.M. 87102

HYDROLOGIC LABORATORY

Denver, Colorado

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AUG 17 1966  
ALBUQ. N. MEX.



5-2

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

FILTER-PACK AND WELL-SCREEN DESIGN

By A. I. Johnson

U.S. GEOLOGICAL SURVEY  
WRD, LIBRARY  
505 MARQUETTE NW, RM 720  
ALBUQUERQUE, N.M. 87102

U.S. Geological Survey  
Open-File Report

Hydrologic Laboratory  
Denver, Colorado  
1963

Gumpertz (1941) made detailed studies of filter-pack design in connection with the flow of oil in oil wells. He found the effective size ( $D_{10}$ ) of the filter pack should be 11 times as large as the effective size of the aquifer materials.

The U.S. Corps of Engineers (1941, 1942) did considerable research, both in the laboratory and field, on the proper design of filter packs and screens for relief wells. These studies concluded that the particle-size-distribution curves for filter pack and aquifer materials should be approximately parallel in order to minimize washing of the fine aquifer material into the filter pack. The filter pack design was found to depend upon the following criteria for filtering stability:

$$\frac{\text{15-percent finer size of filter pack}}{\text{85-percent finer size of finest aquifer material}} \leq 4$$

and for maximum permeability:

$$\frac{\text{15-percent finer size of filter pack}}{\text{85-percent finer size of coarsest aquifer material}} \geq 4.$$

More recently, laboratory studies by the Corps of Engineers (1948) determined that the following additional criteria were needed for greater stability of filter pack:

$$\frac{\text{15-percent finer size of filter pack}}{\text{15-percent finer size of coarsest aquifer materials}} < 20$$

and 
$$\frac{\text{50-percent finer size of filter pack}}{\text{50-percent finer size of aquifer materials}} < 25.$$

REF. 6

1 of 1

The sand may be determined to be unacceptable for cushion sand if it contains more than 10 percent by volume of loam or silt.

**TEST.** Test methods may be obtained from the Materials Bureau.

**BASIS OF ACCEPTANCE.** The cushion sand is accepted on the basis of gradation tests and visual inspection, unless otherwise specified, at the point of use.

### 703-07 CONCRETE SAND

**SCOPE.** This specification contains the requirements for sand used in portland cement concrete.

**GENERAL.** §703-01, Fine Aggregate, shall apply except as modified herein.

**MATERIAL REQUIREMENTS.** When dry, the fine aggregate for portland cement concrete shall conform to the following gradation requirements:

Sieve Size	Percent Passing By Weight		
	Minimum	Maximum	
3/8" → 0.37" → 9.5 mm	100		
0.19" → 4.75 mm	90	100	
2.36 mm	75	100	2
1.18 mm	50	85	
600 μm	25	60	
300 μm	10	30	
150 μm	1	10	
75 μm (Wet)	0	3	25

Sand manufactured from a carbonate rock, either a limestone or dolomite, by itself will not be permitted in concrete pavement or concrete bridge deck wearing surfaces. However, a blend of manufactured carbonate sand with another sand will be permitted provided that the blended mixture contains at least 40 percent non-carbonate particles in each size fraction coarser than the 600 μm sieve. Non-carbonate particles are defined as these having an acid insoluble content not less than 80 percent

**TEST.** Test methods may be obtained from the Materials Bureau.

**BASIS OF ACCEPTANCE.** The provision of §703-01, Fine Aggregates, shall apply.

### 703-08 MINERAL FILLER

# Product Data



1 of 1

REF. 7

FILPRO

## WELL GRAVELS

PLANT: MAURICETOWN, NEW JERSEY

U. S. Silica's **FilPro Well Gravels** are produced from subround Monocrystalline industrial quartz. Chemically inert and free of organic contaminants, they will not alter the chemistry of water-producing wells, nor distort the analytical results of effluents drawn from monitoring wells. In water-producing wells, **FilPro Well Gravels** are utilized to increase the yield from the aquifer by increasing the permeable zone around the well screen. **FilPro Well Gravels** bridge and filter finer or highly laminated formations at the interface and provide drillers with a media to improve hydraulic transmission and well development. With its permeability, **FilPro Well Gravels** will facilitate hydraulic conductivity through the filter pack. Structural support and placement properties also make them an effective gravel pack in environmental monitoring wells and a provide a permeable media for leachate collection in sanitary landfill or leak detection systems.

All **FilPro** well gravel grades are processed and sized with strict adherence to statistical and quality assurance controls, and meet AWWA B-100, ANSI, and NSF-61 standards for consistently uniform and chemically inert filter media.

4	2.7	-	-	-	-	-	-	-
6	60.7	2.8	-	-	-	-	-	-
8	29.7	47.1	3.2	-	-	-	-	-
10	3.7	30.1	17.7	0.2	-	-	-	-
12	1.8	13.2	29.8	4.3	-	-	-	-
14	0.9	4.9	33.6	29.7	0.1	-	-	-
16	-	0.9	10.3	32.1	1.9	-	-	-
18	-	0.4	3.8	25.7	16.0	-	-	-
20	-	-	0.6	5.2	22.8	0.1	-	-
25	-	-	0.3	1.5	32.7	6.4	0.1	-
30	-	-	-	0.5	19.4	37.2	1.9	0.7
35	-	-	-	0.3	5.7	42.8	31.5	-
40	-	-	-	-	0.9	10.1	36.0	23.0
50	-	-	-	-	-	2.9	26.7	34.1
70	-	-	-	-	-	-	3.0	21.0
100	-	-	-	-	-	-	-	14.1
140	-	-	-	-	-	-	-	5.2
200	-	-	-	-	-	-	-	1.6
270	-	-	-	-	-	-	-	0.2
Pan	0.5	0.6	0.7	0.5	0.5	0.5	0.8	0.1
Rec. Screen Slot Size (In )	0.090	0.060	0.050	0.030	0.025	0.020	0.010	0.005
Effective Size (mm)	2.47	1.76	1.29	1.02	0.61	0.48	0.33	0.16
Uniformity Coefficient	<1.8	1.7	<1.6	<1.6	<1.6	<1.5	<1.6	<2.5
Bulk Density, aerated (lbs/ft <sup>3</sup> )	92-95	ASTM C-29		Specific Gravity	2.65	ASTM C- 28		
Bulk Density, Compacted (lbs/ft <sup>3</sup> )	98-100	ASTM C-29		Grain Shape	Subround	Visual		
Hardness	7.0	Mohs Scale		Acid Solubility	<0.5%	PI RP56		

\*Typical mean percent retained on individual sieves.

June 3, 2004

8490 Progress Drive, Suite 300  
Frederick, MD 21701  
(301) 682-0600 (phone)  
(800) 243-7500 (toll-free)

**DISCLAIMER:** The information set forth in this Product Data Sheet represents typical properties of the product described; the information and the typical values are not specifications. U.S. Silica Company makes no representation or warranty concerning the Products, expressed or implied, by this Product Data Sheet.

**WARNING:** The product contains crystalline silica - quartz, which can cause silicosis (an occupational lung disease) and lung cancer. For detailed information on the potential health effect of crystalline silica - quartz, see the U.S. Silica Company Material Safety Data Sheet.