

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:

URS CORPORATION 77 GOODELL STREET BUFFALO, NEW YORK 14203

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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 12th St., with two wells along North 11th 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. <u>Introduction</u>

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 <u>Site History</u>

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 11th Street, 20 North 12th 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&

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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. <u>Recovery Well Design Basis</u>

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 <u>Well Location Rationale</u>

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 12th 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 12th Street the recovery well locations were biased towards these locations. In total, eight recovery wells are planned for North 12th 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 12th Street side of the Site, since more NAPL has been observed in wells along North 12th Street than along North 11th Street.

Pursuant to the teleconference with NYSDEC on August 2, 2013, records of borings along North 11th 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 11th 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 11th Street and 12th 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 to35 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 WWSB-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 11th 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 <u>Well Construction Details</u>

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. <u>Installation</u>

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

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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 <u>Recovery Well Installation</u>

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 <u>Waste Management</u>

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 <u>Site Restoration</u>

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.

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4. <u>Operation, Maintenance & Monitoring</u>

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. <u>Schedule and Reporting</u>

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. <u>Project Responsibilities</u>

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

- <u>National Grid</u> 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.
- <u>URS</u> 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.
- <u>The Contractor</u> will be retained by National Grid and will install the wells in accordance with the contract documents and the project schedule.
- <u>NYSDEC</u> approves the well installation plan, and monitors National Grid, URS and the Contractor's compliance with this plan.
- <u>NYCPR</u> 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. <u>Summary</u>

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 2-1Proposed NAPL Recovery Well Installation Details

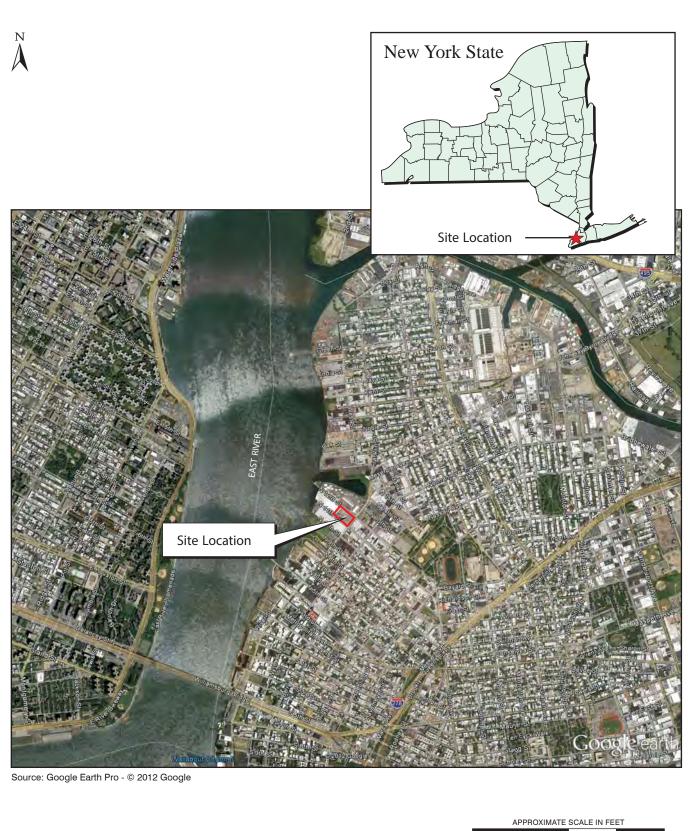
	NRW-01	NRW-02	NRW-03	NRW-04	NRW-05	NRW-06	NRW-07	NRW-08	NRW-09	NRW-10	NRW-11	NRW-12	NRW-13
Upper Screen Interval (feet bgs)	20-30 ¹	20-30 ¹	-	23-28 ¹	-	-	-	-	-	-	-	-	-
Upper Screen Material	Stainless Steel	Stainless Steel	-	Stainless Steel	-	-	-	-	-	-	-	-	-
Lower Screen Interval (feet bgs)	35-60	35-60	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 ²	PVC and Stainless Steel ²	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

¹ if observations support screen installation

² 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

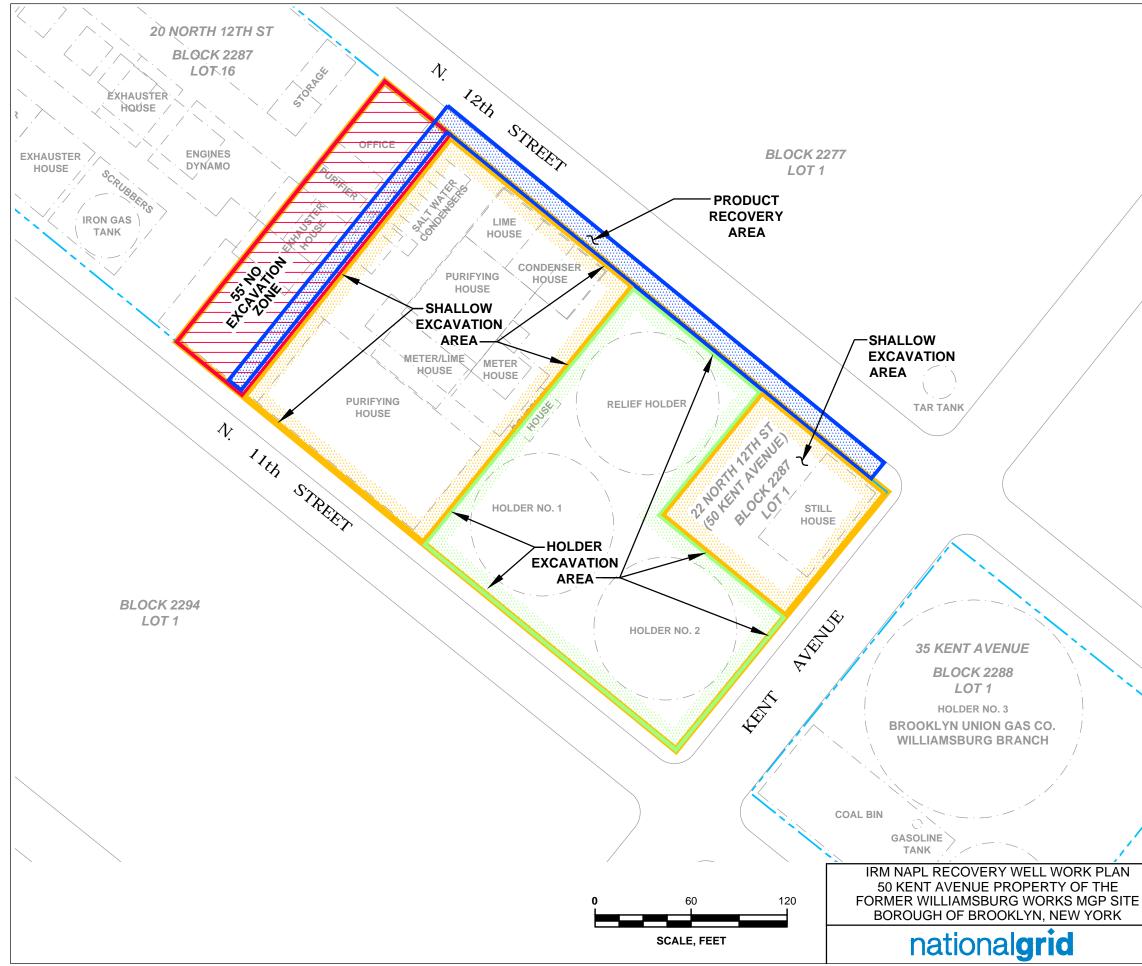
FIGURES





G20745-11176638-071812-GCM

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





LEGEND

APPROXIMATE CURRENT 50 KENT AVENUE PROPERTY BOUNDARY

APPROXIMATE BOUNDARY OF FORMER MANUFACTURED GAS PLANT (MGP) SITE HISTORIC STRUCTURE

HOLDER EXCAVATION AREA

SHALLOW EXCAVATION AREA

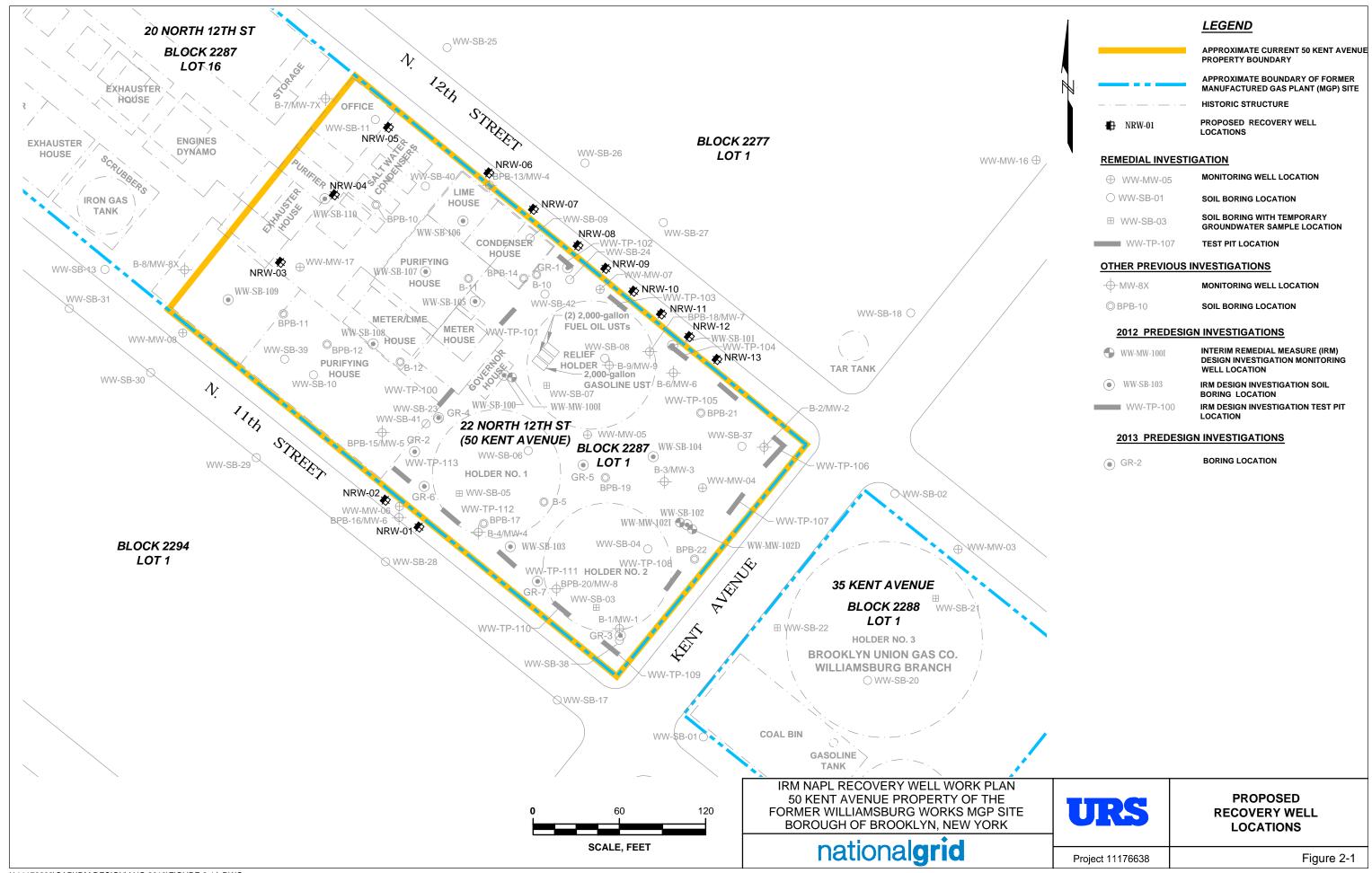
PRODUCT RECOVERY AREA

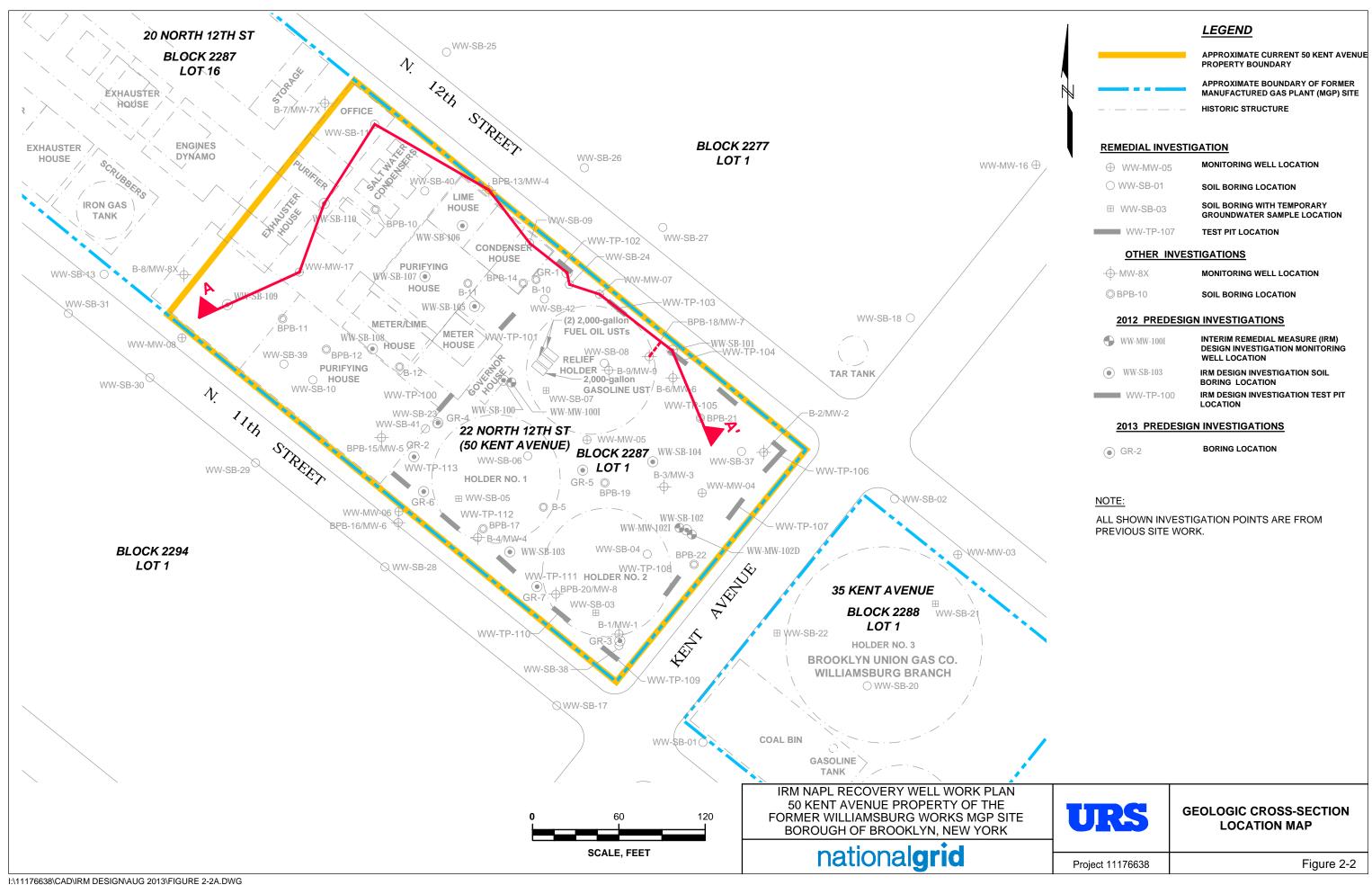
55' BUFFER ZONE

SOURCES:

1. DRAWING PROVIDED BY GEI CONSULTANTS, INC., DATED AUGUST 2011.

URS	LOCATION OF PLANNED IRM ACTIVITIES
Project 11176638	Figure 1-2





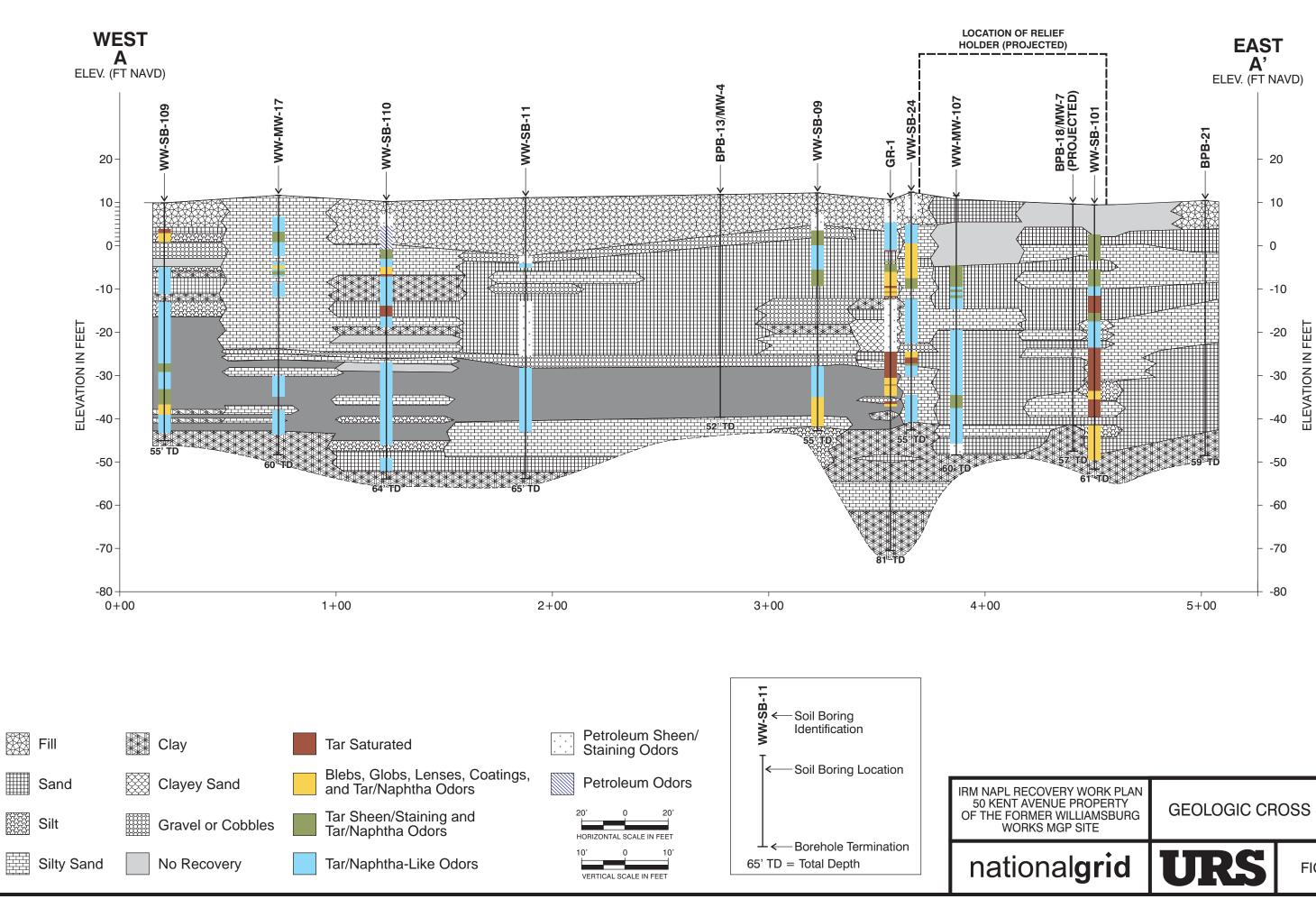
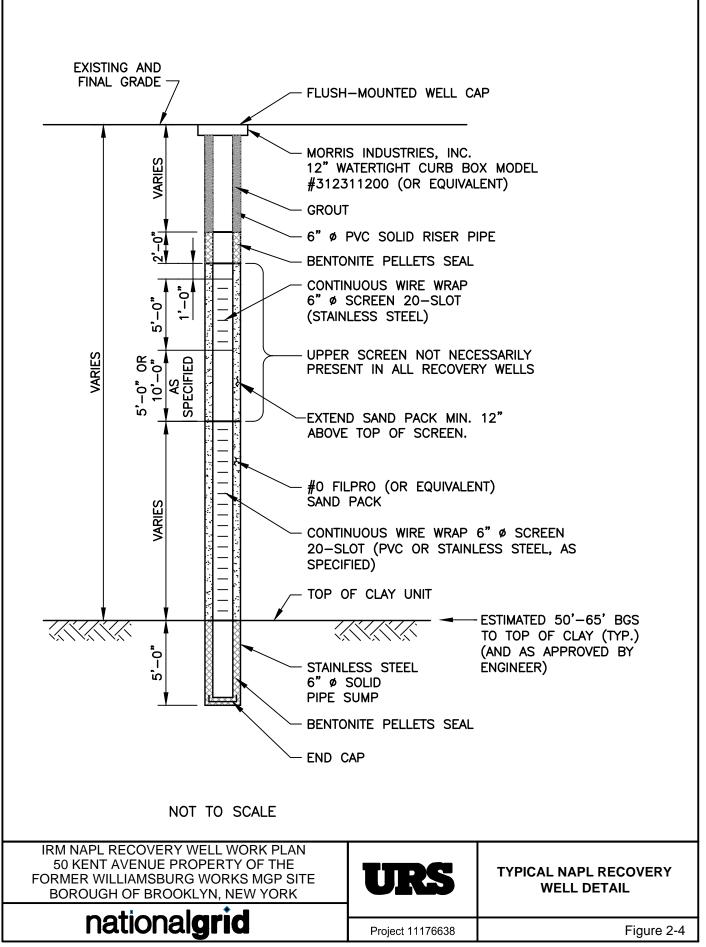




FIGURE 2-3

GEOLOGIC CROSS SECTION



:\11176638\CAD\IRM DESIGN\AUG 2013\FIGURE 2-4.DWG

APPENDIX A

Select Boring Logs

METCALF & EDDY AECOM

PROJE	ECT: BI	odsky Pr	opert	y (DDC)	JOB NO: 60005	392.01	IG NO: BPB-21					
LOCA	TION:				ELEVATION: 10).4'	DEPTH:	H: 59'				
NYDO	DS Yaro	d, Brookly	n NY	,	DATE BEGUN:	05/08/06	DATE F	FINISHED: 05/09/06				
DRILL	CONT	RACTOR	: Aqı	ifer Drilling a	ind Testing	GEOLOGIST: E	ric Acs					
DRILL	ING RI	G: CME-	55 - T	rack Mounte	d	DRILLER: Tony Palanque						
WEAT	HER:	Overcast	60"s			DRILL FLUID: V	Vater	HOL	E SIZE: 6.25"Aug/3" Cas			
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIC	ON	PID Reading	NOTES			
0 — —	-				Borehole Cle	eared to 5 Feet for Utiliti	es					
5 —	S1	5'-7'	3"	2, 3, 3, 2		anular Fine to Coarse S tr Fine to Coarse Grave		0				
	S2	7'-9'	18"	2, 2, 1, 2	Loose Gray Bro	wn Fine Sand, tr to little (SP)	e Silt	0				
10 —	S3	9'-11'	14"	2, 3, 3, 4	Loose Gray Bro	wn Fine Sand, little Silt	(SP)	0				
-	S4	11'-13'	10"	4, 5, 6, 8	Medium Dense (Gray Fine Sand, little Si	lt (SP)	4.3				
	S 5	13'-15'	12"	4, 6, 6, 5	Medium Dense	e Gray Fine Sand, some (SM)	e Silt	10.8				
	S6	15'-17'	14"	8, 6, 10, 12	Medium Dense	e Gray Fine Sand, some (SM)	e Silt	42.3	Coal tar odor			
	S7	17'-19'	8"	10, 15, 12, 14	Medium Dense (Gray Fine Sand, little to Silt (SM)	some	62.2	n n			
20 —	S8	19'-21'	8"	8, 10, 12, 15		Gray Fine to Medium Sine to Medium Gravel (880	Product in sample			
	S9	21'-23'	10"	8, 11, 12, 14	Medium Dense little Silt, tr Fi	Gray Fine to Medium Sine to Medium Sine to Medium Gravel (S	Sand, SP)	946	Sample collected for lab analysis Product in Sample 5/8/2006			
25	S10	23'-25'	8"	13, 9, 8, 10	Medium Dense	e Gray Silty Fine Sand	(SM)	43.6	5/9/06			
	S11	25'-27'	8"	5, 6, 6, 5		Gray Silty Fine Sand, tr lium Gravel (SM)	Fine to	36.2	Coal tar odor			
	S12	27'-29'	10"	5, 5, 8, 7	Medium Dense G Mec	Gray Silty Fine Sand, tr lium Gravel (SM)	Fine to	52.8	и и -			
30	S13	29'-31'	12"	8, 14, 9, 10		Gray Silty Fine Sand, tr arse Gravel (SM)	Fine to	60.6	n n			

METCALF & EDDY AECOM

PROJ	ECT: BI	rodsky Pr	operl	ty (DDC)	JOB NO: 600053	392.01	BORIN	IG NO: BPB-21				
LOCA	TION:			·····	ELEVATION: 10).4'	DEPTH	: 59'				
NYD	OS Yaro	d, Brookly	'n NY	/	DATE BEGUN: (05/08/06 DATE FINISHED: 05/09/06						
DRILL	. CONT	RACTOR	: Aqu	lifer Drilling a	nd Testing	GEOLOGIST: E	ric Acs					
DRILI	ING RI	G: CME-	55 - T	rack Mounte	d	DRILLER: Tony	Palanqu	le				
WEA	THER:	Overcast	60"s			DRILL FLUID: Water HOLE SIZE: 6.25"Aug/3" Ca						
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE		ON	PID Reading	NOTES			
-	- S14	31'-33'	14"	10, 12, 16, 15		iray Silty Fine Sand, tr rse Gravel (SM)	Fine to	34.4	11 11			
35	- S15	33'-35'	12"	10, 12, 12, 14	Medium Dense	Gray/Brown Fine Sand	t (SP)	20.6	u n			
-	- S16	35'-37'	14"	8, 12, 12, 16	Medium Dense (Gray/Brown Fine Sand, (SP)	tr Silt	263. 2	Coal tar staining			
-	S17	37'-39'	12"	12, 14, 18, 20	Dense Gray/B	rown Fine Sand, tr Silt	(SP)	53.6	n n			
40 —	S18	39'-41'	14"	15, 18, 18, 18	Dense Gray/B	rown Fine Sand, tr Silt	(SP)	55.5	u 11			
	S19	41'-43'	14"	20, 22, 24, 26	Dense Gray/Bro	wn Fine to Medium Sa Silt (SP)	and, tr	25	Coal tar odor			
45	S20	43'-45'	10"	9, 15, 20, 22	Dense Gray/B	rown Fine Sand, tr Silt	(SP)	20.6	u u			
-	S21	45'-47'	14"	15, 16, 18, 20	Dense Red/Br	own Fine Sand, tr Silt	(SP)	9.9	n n			
-	S22	47'-49'	12"	12, 16, 18, 22	Dense Red/Br	own Fine Sand, tr Silt	(SP)	10.4	11 11			
50 —	- S23	49'-51'	12"	8, 8, 10, 12	A) Dense Gray Very Stif	Fine Sand, little Silt (S f Gray Silty Clay (CL)	P) B)	12.2	Sand 6", Clay 6"			
_	S24	51'-53'	14"	14, 16, 18, 16	Dense Brov	vn Fine Sand, tr Silt (Si	P)	2.3				
55	S25	53'-55'	10"	8, 10, 11, 14	Very S	Stiff Gray Clay (CL)		2.2				
-	S26	55'-57'	14"	10, 12, 12, 10	Very Stift	Red/White Clay (CL)		2				
-	S27	57'-59'	12"	10, 10, 8, 12		ay to RedWhite Clay (CL)	2	Sample collected for lab analysis			
60					Boring	Terminated @ 59'						
	<u> </u>											

METCALF & EDDY AECOM

PR	OJE	CT: Br	odsky Pr	operty	y (DDC)	JOB NO: 600053	392.01	BORING	NO: I	BPB-1	8/ MW-7			
LO	CAT	FION:			·····	ELEVATION: 9.5	5'							
NY	'DO	S Yaro	l, Brookly	n NY		DATE BEGUN: (05/01/06 DATE FINISHED: 05/02/06							
DR	ILL	CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: Eri	c Acs						
DR	ILLI	NG RI	G: CME-	55			DRILLER: Tony	Palanque						
WE	ΞΑΤ	HER: S	Sunny 60	s			DRILL FLUID: W	ater	H	OLE S	IZE:6.25'	1		
Depth Sample Number Depth Blow Counts				Recovery	Blow Counts	SAMPLE	E DESCRIPTIO	N	Reading	V	nitoring Vell struction	NOTES		
0					Borehole Cleared	to 5 Feet for Utilities				Curb Box Set in Concrete Bentonite Seal 2" Diameter Schedule 40 PVC Riser Pipe			
5	-	S1	5'-7'	12"	1, 2, 2, 1	Very Loose Gray F Silt, tr Fine to Coar	ine to Medium Sand, sor rse Gravel (SP)	me	186			Coal tar odor & staining		
		S2	7'-9'	12"	2, 1, 1, 1	Very Loose Gray F Silt, tr Fine to Coa	Fine to Medium Sand, sor rse Gravel (SP)	me	190		#1 Morie Well Sand	n n,		
10		S3	9'-11'	8"	1, 1/12", 1	Very Loose Gray S Medium Gravel (S	Silty Fine Sand, tr Fine to M)		107		~			
		S4	11'-13'	24"	1, 2, 2, 2	Very Loose Gray F tr Fine Gravel and	Fine Sand, little to some S Brick Fragments (SP)	Silt,	305		2" Diameter 0.010" PVC Well Screen			
15		S 5	13'-15'	3"	1, 1, 1, 1	Very Loose Gray F to Coarse Gravel (Fine Sand, little Silt, tr Fir SP)	ne	80.2		00,001	N 9		
		S6	15'-17'	14"	1/12", 1/12"	Very Loose Gray F Gravel (SM)	Fine Sand, some Silt, tr F	ine	810			Sample collected for lab analysis. Product in Sample		
	Ĺ l	S7	17'-19'	4"	woh, 1, 1, 1	Very Loose Gray F to Medium Gravel	Fine Sand, some Silt, tr F (SM)	ine	95.2					
20		S8	19'-21'	20"	2, 2, 12, 8	Loose Gray Fine S Coarse Gravel (SI	Sand, little Silt, tr Fine to P)		180					
	_	S9	21'-23'	16"	3, 2, 2, 3	Loose Gray Fine S Fine to Medium G	and, little to some Silt, tr ravel (SP)		320			Product in sample		
25		S10	23'-25'	10"	3, 4, 4, 6	Loose Gray Fine S Medium Gravel (S	Sand, little Silt, tr Fine to SP)		350			Boulder @ 26' prevents auger		
25		S11	25'-27'	12"	5, 4, 50/0'	Loose Brown Fine Gravel (SP)	Loose Brown Fine Sand, little Silt, tr Fine Gravel (SP)					advancement move borehole approx. 5' north and		
	_					Auger Through Bo	ulder in Relocated Boreh	ole				continue sampling from 29		
30		S12	29'-31'	12"	15, 10, 11, 13	Medium Dense G Coarse Gravel (Sl	ray Silty Fine Sand, tr Fir M)	ne to	25.6		Portland/ Bentonite Backfill			
	_	S13	31'-33'	10"	6, 8, 12, 14	Medium Dense Gi Fine Gravel (SP)	ray Fine Sand, little Silt, t	r	285			Product in sample		

METCALF&EDDY AECOM

PROJ	ECT: Br	odsky Pro	opert	y (DDC)	JOB NO: 600053	392.01	BORING	NO:	BPB-18	3/ MW-7			
LOCA	TION:	,, .			ELEVATION: 9.5	5'	DEPTH:	57'					
NYD	DS Yard	l, Brookly	'n NY		DATE BEGUN: (05/01/06 DATE FINISHED: 05/02/06							
DRILL	CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: E	ric Acs						
DRILL	ING RI	G: CME-8	55			DRILLER: Tony	Palanque	Э					
WEA	THER: S	Sunny <mark>6</mark> 0'	's			DRILL FLUID: \	Nater	Н	OLE SI	ZE:6.25'	1		
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIO	Л	PID Reading	W	hitoring /ell truction	NOTES		
	S14	33'-35'	12"	9, 10, 27, 20	Dense Gray Silty F gravel (SM)	Fine Sand, tr Fine to Co	barse	143					
	S15	35'-37'	14"	10, 9, 20, 22	Dense Gray Fine to Fine to Coarse Gra	o Medium Sand, little S avel (SP)	Silt, tr	843			Product in sample		
-	S16	37'-39'	2"	100/6"	Very Dense Gray I (SP)	Fine to Medium Sand, 1	tr Silt	343					
40	S17	39'-41'	12"	20, 18, 16, 32	Very Dense Gray I tr Fine to Medium	Fine to Medium Sand, 1 Gravel (SP)	tr Silt,	232					
-	S18	41'-43'	14"	5, 6, 4, 8	Very Dense Gray I tr Fine to Medium	Fine to Medium Sand, t Gravel (SP)	tr Silt,	340			Product in sample 5/1/2006		
-	S19	43'-45'	14"	8, 7, 11, 14	Medium Dense Gr Medium Gravel (S	ay Silty Fine Sand, tr F M)	Fine to	125			5/2/06		
45 —	S20	45'-47'	14"	10, 16, 18, 20	Dense Gray Silty F Gravel (SM)	Fine Sand, tr Fine to M	edium	104					
_	S21	47'-49'	16"	12, 16, 18, 22	Dense Gray/Brown Medium Gravel (S	n Silty Fine Sand, tr Fir M)	ne to	160					
50	S22	49'-51'	16"	15, 16, 18, 22	Dense Gray Fine t	o Medium Sand, tr Silt	(SP)	326			Product in sample		
-	S23	51'-53'	15"	14, 10, 8, 10	Very Stiff Gray Silt	ty Clay (CL)		20.2					
-	S24	53'-55'	16"	10, 12, 12, 14	Very Stiff Gray Silt	ly Clay (CL)		19.2					
55	S2 5	55'-57'	10"	12, 12, 14, 16	Very Stiff Gray Sill	ty Clay (CL)		15.2			Sample collected for lab analysis		
-					Boring	Terminated @ 57'							
60													
-	-												
65 —	_												

			Ü	JR.S	S Cor	por	atic	n			TEST BORING LOG BORING NO.: WW-SB-101					
PROJE	CT/PROJE				National Gr						SHEET: 1 OF 3					
CLIENT					National Gr			20.9			JOB NO. : 11176638.00001					
-	G CONTR				Fenley & Ni								642005.5190			
						TUBE	GROUND ELEVATION: 9.47									
DATE				TYPE	ТҮРЕ	CAS	_	SAMPLER Split Spoon			DATE STARTED: 3/26/2	2012				
DATE					DIA.			2"			DATE FINISHED: 3/28/2					
					WT.		-	- 140 lb				Neade				
					FALL			24"		-	GEOLOGIST: Andre	as Papan	eocleous			
										-	REVIEWED BY: Tim B	urmeier				
				SAI												
DEPTH	STRATA	VISUAL	"S"	1	BLOW	F	REC%	COLOR			MATERIAL DESCRIPTION	PID	REMARKS			
FEET		NO. NO.			COUNT		RQD%				DESCRIPTION					
		I														
0													Boring hand			
-													cleared to 5 ft bgs			
-																
_													_			
_																
-5									No	Recover	у					
-			1	3	2, 1, 2, 1		0									
-	•.•.•.							Brown	Fir	e to med	ium SAND (SW), some silt, trace	9.0	Moist			
-			2	2	1, 1, 1, 2		33		gra	ivel, very	loose	6.2	Strong CT-like odor, slight			
-	••••					_							sheen, moderate			
10 —	····		3	9	2, 3, 6, 5		13		Fir	e SAND :	and SILT (SM), trace clay, loose	9.0	staining			
_	<u>- : - : : - : : - : :</u> : :							-				7.6				
			4	7	2, 3, 4, 3		79					100				
			-	-	_, _, ., .							92.3				
			_				_		No	Recover	у					
			5	11	1, 3, 8, 8		0									
15 —						+			Fir	e to med	ium SAND and SILT (SW/ML),	1.6	Strong CT-like			
-	<u> </u>		6	39	36, 24, 15,	22	100				nd mica, dense	0.5	odor, slight sheen			
						-+			me	dium den	se		Faint CT-like			
-			7	29	8, 10, 19, 2	20	29					10.8	odor			
				_								7.7	Faint CT-like			
20			8	40	12, 22, 18,	18	50			e SAND	(SP), some silt, clay and mica,	4.7	odor			
	<u></u>				, , ,		-					3.1				
					44 44 15						ium SAND (SW), some silt,	900	Wet 100% dark			
1			9	30	11, 14, 16,	17	58		me	dium den	ense 2,238 brown NAPL saturation,					
	•••••								de	nse			strong CT-like odor			
-	•••••		10	31	10, 11, 20,	20	75						PID not working			
25 -	••••••			_	L			1				L	properly			

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

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

BORING NO. : WW-SB-101

									TEST BOR	ING LO	CG
			U		S Corpo	oratic	n		BORING NO. : WW-SB-101		
PROJ	ECT/PROJE	CT LOC	ATION	:	National Grid -	Williams	burg		SHEET: 2 OF 3		
CLIEN	T:				National Grid				JOB NO.: 11176638.00001		
DEPTH		VISUAL		SAI	MPLE	REC%			MATERIAL		
FEET		IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		DESCRIPTION	PID	REMARKS
_			11	71	26, 32, 39, 41	75		trace silt and	mica, very dense		Strong CT-like odor, moderate staining, slight sheen
	- <u>7-7-</u> 7		12	50	50/2, -, -, -	8		Fine to mediu trace silt and	m SAND and CLAY (SW/CL), mica, very dense		Moderate CT- like odor
-30 —			13	125	45, 50, 75/3, -	50		Fine to coarse trace silt, very	e SAND and GRAVEL (SW/GW), dense		-
			14	120	150, 120, -, -	25		Fine SAND (S dense	SP), some gravel, trace silt, very		1
			15	100	80, 100/4, -, -	42		Fine SAND ar dense	nd SILT (SM), trace mica, very		100 % NAPL saturation, strong CT-like odor
-35 —			16	130	40, 50, 80, 100/4	75		some gravel			
			17	150	150/3, -, -, -	13				265	
-40 —			18	94	30, 42, 52, 80	21				600	-
			19	98	35, 42, 56, 48	54	Gray	SILT (ML), so dense	me fine to coarse sand, very	130	Strong CT-like odor, 50-75% NAPL saturation
-			20	56	18, 24, 32, 56	71				531 232	Light coating, strong CT-like odor
-45 —			21	56	18, 24, 32, 52	100	Brown	Fine to coarse mica, very de	e SAND and SILT (SW/ML), trace	914 613	100% NAPL saturation, strong CT-like odor
			22	78	41, 55, 23, 45	92	Brown and	-		82.9 57	100% NAPL saturation, strong CT-like odor
-50 —			23	50	24, 28, 22, 33	0	. Gray	No Recovery			
-	· · · · · ·		24	49	25, 28, 21, 29	38		SILT (ML), so sand and mice	me clay, trace fine to medium a, dense	58.2 73.3	Moderate CT- like odor, light coating
-			25	78	21, 32, 46, 53	42	Brown	Fine SAND (S dense	SP), trace silt and mica, very	15.5	
-55 —			26	94	40, 44, 50, 95	100		Fine to coarse SAND (SW), trace silt and mi very dense			

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

			U	R	Corpo	oratio	n		TES BORING NO. : WW	ST BORI	NG LO	DG
	CT/PROJI	ECT LOC			National Grid -				SHEET: 3 OF 3			
CLIENT	[:			541	National Grid				JOB NO. : 1117663	38.00001		
DEPTH FEET	STRATA	VISUAL IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	REC%	COLOR		MATERIAL DESCRIPTION		PID	REMARKS
1	• • • •									· · · ·		
-								CLAY (CL), tr	race fine sand and mica	, medium	250	
_			27	138	50, 62, 76, 83	71		plasticity, har	d		182	
-60 —			SH1	-	-, -, -, -	-						Shelby Tube collected from 59 to 61 ft bgs
-								End of boring	at 61 ft bgs.			
_												
-65 —												
-05												
-												
_												
-70 —												
-												
_												
_												
-75 —												
-												
-												
-80 —												
_												
-												
-												
-85 —												
-												
-												
		oring adva	anced u	using a (Cantera CT-450) drill rig.						
	Coal Tar . = Non-Aq	ueous Ph	ase Lio	quid								
	9			•						BORING NO.	. \\/	W-SB-101
											. ••	W-3B-1VI

		K	2	GEI C	consultants.	Inc.		CLIEN	T: Nationa	l Gri	id		BORING LOG
	_		\mathcal{D}		/inding Bro onbury, CT			PROJ			lliamsburg MGP RI	PAGE	
(-	iF		~	(860)	368-5300				STATE: ROJECT NUI		Brooklyn, New York R: 093060	1 of 3	WWMW-07
GP					TION (FT):						CATION: North 12th Stree		
	RTHIN			389.72	. ,		i:				TAL DEPTH (FT): 60.00	51	
DR	ILLED	BY:	Zebra	Envir	onmental	/ Lu	ke Ca	baller	0	DAT	TUM VERT. / HORZ.: NAV		
-		BY:								DA	TE START / END: 6/22/20	09 - 6/2	3/2009
		G DETA			orobe `): ⊻4.0	0 6	122/20	09					
DE	РТН		0,111			¥	STS STS	R	ANALYZE	D	03		ROCK
	т.	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	SAMPLE ID			ESCRIP	
 _ _	0	S1	5.0		2.3				WWMW-0	17	(0'- 5') WIDELY GRADED S coarse, ~10% gravel, fine, ~ in., wet, brown, hand cleared	5% fine	SW); ~85% sand, fine to s, non plastic; max. size 0.5
-	5	S2	5.0	0					(4-5)		(5'- 10') no recovery.		
	10	S 3	5.0	0							(10'- 15') no recovery.		
_	15	S4	5.0	5				NLO			medium, ~5% fines, medium odor, wet, gray, sheen.	n plastic	ND (SW); ~95% sand, fine to http://www.sand.com/sand-like
								NLO			(16.8'- 19.1') NARROWLY (fine, ~5% fines, medium pla odor, gray, lense of widely g tar-like staining, moderate p	sticity; r raded s	noderate naphthalene-like and from 17.6 to 17.8 ft,
	20				> 9999			NLO			(19.1'- 20') WIDELY GRAD medium, ~5% fines, medium		ND (SW); ~95% sand, fine to sity; strong naphthalene-like
PEN REC	= REC = PHO	OVERY L	ENGTH	OF SAM	Sampler of NPLE OR READING			ii	pm = PARTS PE J. = INCHES T. = FEET	ER MI	LLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE OD ALO = ASPHALT LIKE OD	ODOR DOR	CrLO= CREOSOTE LIKE ODOR OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

GE	Cons	Ultants	455 W Glasto (860)	consultants /inding Bro onbury, CT 368-5300	ok Ro	ad 33	PROJI CITY/S		illiamsburg MGP RI Brooklyn, New York	PAGE 2 of 3	BORING LOG
DEPTH FT.	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL	ODOR	ANALYZED SAMPLE ID		IL / BED Escrip	
- 20 - - -	S5	5.0	1.67	3372			NLO NLO NLO NLO		medium, ~5% fines, non pla brown, dense. (20.5'- 20.8') WIDELY GRA coarse, ~5% fines, non plas brown, dense, tar-like staini (20.8'- 21.8') WIDELY GRA medium, ~5% fines, non pla brown, dense.	ED SAN astic; mc .DED S/ atic; stroi ng. .DED S/ astic; mc ED SAN	ND [®] (SW); ~95% sand, fine to oderate naphthalene-like odor AND (SW); ~95% sand, fine f ng naphthalene-like odor, AND (SW); ~95% sand, fine f ND (SW); ~95% sand, fine to
- 25	S6	5.0	4.67	784	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •				brown, dense, tar-like staini (22'- 25') WIDELY GRADEI medium, ~5% fines, non pla brown, dense. (25'- 30') WIDELY GRADEI	ng. D SANE astic; mc D SANE fines, m) (SW); ~95% sand, fine to oderate naphthalene-like odo) WITH SILT (SP-SM); ~85% ledium plasticity, ~5% gravel,
- 30	S7	5.0	4.67	1982			NLO		coarse, ~10% fines, mediur 0.5 in., moderate naphthale (31.9'- 35') WIDELY GRAD	n plastic ne-like c ED SAN o coarse	ND (SW); ~85% sand, fine to , ~5% fines, non plastic; may
- 35	S8	5.0		565			NLO		(35'- 45') WIDELY GRADEI coarse, ~5% fines, non plas brown.		0 (SW); ~95% sand, fine to lerate naphthalene-like odor,
– 40 NOTES:	S9	5.0		401							
PEN = PEN REC = REC PID = PHO	OVERY L	ENGTH	OF SAM	SAMPLER O IPLE DR READING			İN	om = PARTS PER M I. = INCHES T. = FEET	IILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OE	ODOR DOR	CrLO= CREOSOTE LIKE ODOF OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

	GEI Consultants, Inc. 455 Winding Brook Road Glastonbury, CT 06033 (860) 368-5300					PROJ		id illiamsburg MGP RI	PAGE	BORING LOG	
GF		ultants			000	55			Brooklyn, New York R: 093060	3 of 3	WWMW-07
	TYPE		PLE IN	NFO	ATA	IAL CTS		ANALYZED		IL / BED	ROCK
FT.	and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	SAMPLE ID		ESCRIP	
- 45					* * * * * * * * * * * * * * * *		NLO				
	S10	5.0	4.42	> 9999			NLO		(45-49.2) WIDELY GRAD coarse, ~5% fines, non plas brown, strong petroleum-lik staining.	stic; stror	
							NI 0	WWMW-07 (48.5-49.5)	(49.2'- 50') WIDELY GRAD	ED SAN	ID (SW); ~95% sand, fine to
- 50	S11	5.0	3.83	1269			NLO NLO		coarse, ~5% fines, non plas brown. (50'- 52.8') WIDELY GRAD coarse, ~5% fines, non plas brown, moderate petroleum	stic; stror ED SAN stic; sligh	ng naphthalene-like odor, ID (SW); ~95% sand, fine to nt naphthalene-like odor,
							NLO		(52.8'- 54.1') SILTY SAND medium plasticity; slight nap petroleum-like odor.	phthalen	e-like odor, brown, slight
- 55	S12	5.0	4	0.0			NLO NLO		(54.1'- 54.3') WIDELY GRA moderate naphthalene-like odor. (54.3'- 55') SILTY SAND (S medium plasticity; slight nap petroleum-like odor. (55'- 57.1') WIDELY GRAD medium, ~5% fines, non pla	odor, bro SM); ~85 phthalen vED SAN	own, moderate petroleum-lik % sand, fine, ~15% fines, e-like odor, brown, slight ID (SW); ~95% sand, fine to
							PLO	WWMW-07	brown, slight pertoleum-like (57.1'- 59.6') WIDELY GRA	odor. DED SA	AND (SW); ~95% sand, fine ht petroleum-like odor, wet,
- 60					***			(59-60)	 (59.6'- 59.8') WIDELY GRA medium, ~5% fines, non pla odor. (59.8'- 60') LEAN CLAY (Cl ~10% sand, fine; red gray. Bottom of borehole at 60.0 	astic; we L); ~90%	
EC = REC ID = PHO	OVERY L	ENGTH	OF SAM	Sampler o NPLE DR READING			IN	om = PARTS PER M I. = INCHES I. = FEET	ILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OD	ODOR	CrLO= CREOSOTE LIKE ODO OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

			U	R9	5 Corp	nora	tic	.				NG L	OG
											BORING NO.: GR-1		
	CT/PROJE	CT LOC	ATION	N:	National Gri		iams	burg			SHEET: 1 OF 3		
CLIEN	Г:				National Gri	d					JOB NO. : 11176638.00011		
	G CONTRA				Associated I		nmen	tal Service	s, Inc.				641932.499
GROUI		: ~5'				CAS.	S	AMPLER	CORE	TUBE		ft amsl	
DATE	TIME	LEVE		TYPE	TYPE		Sp	olit Spoon			DATE STARTED: 4/1/20		
					DIA.			2"			DATE FINISHED: 4/3/20		
					WT.			140				es Blumbe	erg Jr.
					FALL			24"			GEOLOGIST: Tim If		
											REVIEWED BY: Scott	McCabe	
DEPTH		VISUAL		SAM	MPLE .	RE	C%				MATERIAL		
FEET	STRATA	IMPACTS		"N"	BLOW	PC	QD%	COLOR			DESCRIPTION	PID	REMARKS
			NO.	NO.	COUNT		U /0						
0								Brown to Black	As	ohalt			Boring han cleared to 5
-										ncrete	/	0.0	bgs. Moist, fain
-												0.0	petroleum-li odor
-										.L: sand, s d cobbles	ilt, gravel, and brick, some wood		- 0001
_												0.0	_
-5												0.0	
			1	8	5, 3, 5, 4	4	17	Dark Gray	FIL	FILL: sand and gravel, trace wood, loose			Wet, faint C like odor
				0	5, 5, 5, 4		17						
-									Ve	ry fine to n	nedium SAND (SW), little silt, very loose	0.0	
-	•••••		2	3	WOH/12, 3,	5 1	15			•			-
-	•••••							Dark Gray		vel dium dens	Se	0.0	_
0			3	12	4, 8, 4, 4	2	21	to Beige				0.0	
_	•••••							Mad. One	_				_
	•••••		4	8	3, 4, 4, 6		46	Med. Gray to Med.	/ 1/2	" clay sea	m, some silt and fine sand, loose	489	Coal tar NA
			4		3, 4, 4, 0		+0	Brown	1" (clay seam	, some silt and fine sand		saturation mod. CT-lik
		•						Med. Brown	Ve	ry fine to fi	ne SAND (SP), some clay, little	9.8	odor Black stainir
-	<u> </u>		5	7	3, 3, 4, 4	7	71	Diowii	silt	loose	some silt and little very fine sand /	16.7	faint CT-lik
15 —								Dark	_/\			37.8	odor Moist, shee mod. CT-lil
-			6	10	11, 7, 3, 5	8	33	Brown	SIL	.T (ML) wi	th very fine sand, loose		- odor
_									Ve	ry fine SAI	ND (SP), some silt and clay, loose	37.0	Light to hea
			7	21	7, 8, 13, 15	5 9	96	Dark Gray	/ me	dium dens	Se	90.8	coating, mo
					., 0, 10, 10			Med. Brown	Ve	rv fine to n	nedium SAND (SW), some silt	296	CT-like ode Heavy coati
	• • • • •								loo			349	mod. CT-lil odor
20 —			8	10	5, 4, 6, 7	e	65					720	Coal tar NA
-								Dark			85.7	saturation Wet, heav	
-	·····		9	27	23, 12, 15, 1	8 7	71	Brown	bwn trace gravel, medium dense		ļ	coating Coal tar NA	
-	<u>\</u> \							Med.			289	saturation Faint	
		1-1-1-1	10	43	16, 20, 23, 2	27 6	65	Brown to				25.8	petroleum-lil
	I :I:	$\{ [\cdot] : [\cdot] \}$.,,,, _		-	Med. Gray	/ Silt hai		CL), trace fine to medium sand,	44.8	odor

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

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

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

BORING NO. : GR-1

									TEST BOR	ING LO	DG
			U		S Corpo	oratic	on		BORING NO.: GR-1		
	CT/PROJE	ECT LOC	ATION		National Grid -	Williams	burg		SHEET: 2 OF 3		
CLIEN	T:				National Grid				JOB NO.: 11176638.00011		
DEPTH	STRATA	VISUAL		-		REC%	COLOR		MATERIAL	PID	REMARKS
FEET	JIKAIA	IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		DESCRIPTION		REMARKS
							Grayish	N		0.8	
-			11	54	18, 25, 29, 24	17	Brown	some coarse]		
-	·····						Med. Gray	Very fine to fi silt, very dens	ne SAND (SP), some clay and se	0.0	Moist, faint
-			12	33	17, 17, 16, 22	55		Clayey SANE	(SC), some fine sand, hard, little	3.4	petroleum-like odor
-	HEH							gravel trace coarse sand		71.0	
-30 —			13	45	11, 21, 24, 32	35		trace coarse sand			
-									d	0.0	
-			14	19	4, 6, 13, 10	17		trace coarse	sanu		
-								very stiff		0.0	
-			15	53	17, 21, 32, 28	42		little coarse s	and, hard	0.0	
-35 —		· · · · ·					Dark	Von fina ta fi	no SAND (SD) missocous donce	39.0	Coal tar NAPL
_			16	42	10, 19, 23, 19	65	Brown	very line to li	ne SAND (SP), micaceous, dense	7.0	saturation, strong CT-like
_							Reddish	Very fine SAND and SILT (SM), dense		193	odor
-			17	38	7, 16, 22, 17	96	Brown	trace mica	ND and SILT (SM), dense	128	
-	••••						Grayish	Von fing to m	adium CAND (CIM) dance	2,353	
-40 —			18	40	18, 20, 20, 17	75	Brown	very line to n	nedium SAND (SW), dense	184	
_	••••						Dark	Fina ta madiu		17.0	Heavy coating,
_			19	37	10, 19, 18, 20	65	Brown	dense	Im SAND (SW), trace gravel,	783	mod. CT-like odor
_	••••						Brown			8.1	Coal tar NAPL saturation
-			20	34	9, 14, 20, 21	60		Fine SAND (S		30.1	Light coating, mod. CT-like
-45 —		•						Fine to very fi medium dens	ine SAND (SP), trace mica, se	10.9	odor
_			21	27	11, 12, 15, 16	55		Fine to coars	e SAND and GRAVEL (SW/GW),	600	Wet Coal tar NAPL
	<u>0-0-</u>						Brown to	medium dens		1,288	saturation, mod. CT-like
			22	19	7, 9, 10, 11	55	Gray	Fine SAND (S	SP), medium dense	389	odor Heavy coating,
							Gray		1) yory stiff	2.3	faint CT-like odor
-50 —	⊥:⊥:		23	25	9, 10, 15, 17	65		Silty CLAY (C	L), very stim		
							Brown	Fine SAND (S	SP), medium dense	1.1	
			24	22	2, 12, 10, 18	60		1/4" clay sear	m at 52 7'	12.8	
										8.0	Moist
			25	26	7, 11, 15, 21	45	Red	CLAY (CL), Ir	ttle to some silt, very stiff	0.2	
-55 —								gray to light g	ray banding throughout		
	()))))		26	27	10, 15, 12, 17	35			-	0.0	1

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.

BORING NO. : GR-1

			U	R	5 Corpo	oratio	n		TEST BOR BORING NO.: GR-1		
PROJE	CT/PROJI	ECT LOC			- National Grid -				SHEET: 3 OF 3		
CLIENT	:				National Grid				JOB NO.: 11176638.00011		
DEPTH		VISUAL		SAI	MPLE	REC%			MATERIAL		
FEET	STRATA	IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		DESCRIPTION	PID	REMARK
				I							
-			27	29	9, 11, 18, 11	80	Gray to Dark Gray	1/4" silt seam	58' and 58.5'	0.0	
_							Brown	Fine to mediu	ım SAND (SW), medium dense	15.3	
			28	22	8, 9, 13, 12	100	Red to Gray	CLAY (CL), li	ttle silt, very stiff	0.0	
-	±:±:		29	27	7, 12, 15, 14	65	Gray	Silty CLAY (C	CL), very stiff	0.0	
-								hard		0.0	
-			30	64	8, 14, 50/4	25		naru		0.0	
-								Silty SAND (S	SM), medium dense	0.0	
			31	30	11, 15, 15, 14	65			black banding from 65' to 67'	0.0	
-			32	42	10, 17, 25, 34	85		dense interspersed from 68.3' to	gray clay seams (1/16" to 1/2") 69'	0.0	
-								trace gravel,	race gravel, some black silt, medium dense		
-			33	23	10, 12, 11, 10	65		1/16" clay sea	am	0.0	
			34	29	8, 10, 19, 19	95		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		0.0	
	 T : T :	-			-,,,		Dagwar	Silty CLAY (C	CL), very stiff	0.0	
-	 		35	30	9, 12, 18, 23	65	Brown			0.0	
			36	37	10, 16, 21, 25	30		hard		0.0	
-	 							no recovery, s	stone is shoe		
			37	33	13, 15, 18, 22	0					
_			38	54	18, 22, 32, 39	25	Gray	CLAY (CL), h	ard	0.0	
-								Boring comple	eted at 81 ft bgs.		
-											
_											
-											
		ı		I	I	I		I			
COM		oring adva	anced u	using a [Diedrich D-120	truck-mo	unted drill rig	J.			
CT = 0	Coal Tar, N	NAPL = N	on-Aqı	leous P	hase Liquid						

BORING NO. : GR-1

GROUND SURF NORTHING: DRILLED BY: DRILLING DETA WATER LEVEL DEPTH FT. TYPE and NO. DEPTH FT. S2 5 S2 - 5 S2 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5	EL DEPT	SURFA G: BY: _E BY: _S DETAI	ACE EL 68888 Boart L	455 W Glastor (860) 3	onsultants, inding Broc nbury, CT 368-5300	ok Road	PROJI CITY/S		illiamsburg MGP RI	PAGE	
GROUND SURF. NORTHING: DRILLED BY: DRILLING DETA WATER LEVEL DEPTH TYPE and NO.	RFACE E 688 Board Sarat ETAILS: EL DEPT SAN PE Nd D. FT.	SURFA G: BY: _E BY: _S DETAI	ACE EL 68888 Boart L	(860) 3 _EVAT	368-5300			STATE:	B 11 N1 N7 1	FAGE	
GROUND SURF. NORTHING: DRILLED BY: DRILLING DETA WATER LEVEL DEPTH TYPE and NO.	RFACE E 688 Board Sarat ETAILS: EL DEPT SAN PE Nd D. FT.	SURFA G: BY: _E BY: _S DETAI	ACE EL 68888 Boart L						Brooklyn, New York	1 of 3	WWSB-24
NORTHING: DRILLED BY: DRILLING DETA WATER LEVEL DEPTH TYPE TYPE and NO.	EL DEPT	3: BY: <u></u> BY: <u></u> DETAI	68888 Boart L					ROJECT NUMBI			
DRILLED BY: LOGGED BY: DRILLING DETA WATER LEVEL DEPTH FT. TYPE and NO. - 0 S1 - - - - - - - - - - - - -	EL DEPT	BY: <u>E</u> BY: <u>S</u> DETAI	Boart L	03.02	EAST				CATION: <u>50 Kent Ave</u> TAL DEPTH (FT): 55.00		
LOGGED BY: DRILLING DETA WATER LEVEL DEPTH FT. TYPE and NO. - 0 S1 	: Sarah ETAILS: EL DEPT SAW PE PEN D. FT.	BY: S DETAI		Lonav			0413		TUM VERT. / HORZ.: NA	/D 88 / I	NAD83 NY East Zone
WATER LEVEL DEPTH FT. TYPE and NO.	EL DEPT SAW PE PEN Id FT.								TE START / END: 7/16/20		
DEPTH FT. TYPE and NO. 0 S1 - - - - - - - - - - - - -	SAN PE D. PEN FT.	EVEL C									
FT. InFL and NO. - 0 S1 	PE Id D. PEN FT.		DEPTH	IS (FT)): <u>¥</u> 5.0	0 7/16/2	2009				
FT. InFL and NO. - 0 S1 	D. PEN FT.		SAMP	PLE IN	FO	× _ ۲					
- 5 S2 	1 5.0	and		REC FT.	PID (ppm)	STRATA VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		IL / BED ESCRIP	
5 5 10	1 5.0	64	5.0								
- 10 - 10 - 15		51	5.0		5.5		PLO		(0'- 0.5') CONCRETE. (0.5'- 5') WIDELY GRADED (SW-SM); ~75% sand, fine ~10% fines, non plastic; ma moist, brown, FILL, slight or	to coars ix. size 2	e, ~15% gravel, angular, 2 in., slight petroleum-like odor,
10						· · · · · · · · · · · · · · · ·		WWSB-24			
- 10 - 10 	2 10.0	S 2	10.0	6.5		• • • • • • • • •		(4-5)	(5'- 7.6') WIDELY GRADED		WITH SILT AND GRAVEL
	2 10.0	52	10.0	0.0		• • • • • • • •			(SW-SM); ~75% sand, fine	to coars lastic; m	
- - - - - - -							NLO		(7.6'- 12.1') SILTY SAND (S ~25% fines, ~5% gravel, su dark gray to brown, lenses o	bangula	r; slight naphthalene-like odor,
- 15 S3 - -					8959		NLO		(12.1'- 15') SILTY SAND (S ~25% fines, ~5% gravel, su odor, brown, light tar-like sta	bangula	r; moderate naphthalene-like
-	3 10.0	S3	10.0	8	6418		NLO		(15'- 16.7') WIDELY GRAD medium, ~5% gravel, round strong naphthalene-like odd tar-like seam.	led, ~5%	
- 20									(16.7'- 20.2') WIDELY GRA ~80% sand, fine to coarse,	~10% g	
NOTES:		1	I	I				1	1		
PEN = PENETRATIO REC = RECOVERY L PID = PHOTOIONIZ HEADSPACE		VERY LE	ENGTH C	OF SAM	PLE		ίN	pm = PARTS PER M N. = INCHES T. = FEET	IILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE OD ALO = ASPHALT LIKE OD	ODOR DOR	CrLO= CREOSOTE LIKE ODOR OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

	C	GEI Consultants 455 Winding Bro Glastonbury, CT		oad	CLIEN	T: <u>National G</u>			BORING LOG		
CE		Ľ	Glasto						illiamsburg MGP RI Brooklyn, New York	PAGE 2 of 3	WWSB-24
UL	Cons	ultants					GEI PF	ROJECT NUMBE	ER:093060		
DEPTH FT.	TYPE and NO.	SAM PEN FT.	REC FT.	IFO PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		IL / BED ESCRIP	
- 20							NLO			halene-	-like odor, light brown, sheer
				1326					(21.8'- 25') SANDY SILT (N medium, ~5% gravel; moist		% fines, ~35% sand, fine to own to orange, dense.
- 25	S4	10.0	5						(25'- 35') SANDY SILT (ML medium, ~5% gravel; slight brown to orange, very dens	naphtha	alene-like odor, moist, light
- 30							NLO				
- 35	S5	10.0	10		* * * * * * * * * * * * * * * * * * *	>				to coars	ID WITH SILT AND GRAVE se, ~15% gravel, subrounde own, shale fragments, dens
				>9999				WWSB-24 (38-40)	medium, ~5% gravel, subro size 1 in., tar-like staining a	unded, - nd blebs	AND (SW); ~90% sand, fine
- 40							NLO		medium, ~5% gravel, subro size 1 in., tar-like staining.	ounded, [,] IC SILT	AND (SW); ~90% sand, fine ~5% fines, non plastic; max (ML); ~70% fines, ~30% sa 'ay, dense.
									(42'- 47.7') SANDY SILT (M medium; moist, gray, occati odor.		% fines, ~30% sand, fine to nd lenses, slight burnt-like
REC = REC	OVERY L	ENGTH	OF SAM				IN	om = PARTS PER M I. = INCHES T. = FEET	IILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE O	ODOR	Crlo= Creosote like odo Olo = Organic like odor Slo = Sulfur like odor Mlo = Musty like odor

GE	Const		455 W Glasto (860)	onsultants, /inding Bro onbury, CT 368-5300	ok Ro	bad 33	PROJI CITY/S		illiamsburg MGP RI Brooklyn, New York	PAGE 3 of 3	BORING LOG WWSB-24			
DEPTH FT.	TYPE and NO.		PLE IN REC FT.	IFO PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		IL / BED ESCRIP				
- 45 - 	S6	10.0	9.17	31.8					(47.7'- 53.4') WIDELY GRA ~80% sand, fine to coarse, moderate naphthalene-like organic-like odor.	~10% g	ravel, subangular, ~10% fine:			
50 - - - 55							NLO	WWSB-24 (53-55)	(53.4'- 55') LEAN CLAY (Cl small sand lenses.	derate naphthalene-like odor, wet, brown, moderate anic-like odor. .4'- 55') LEAN CLAY (CL); ~95% fines, ~5% sand; re				
									Bottom of borehole at 55.0	feet.				
REC = REC PID = PHO	OVERY L	ENGTH	OF SAM	GAMPLER OI IPLE DR READING			IN	pm = PARTS PER M √. = INCHES T. = FEET	ILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE CO ALO = ASPHALT LIKE OD	ODOR	CrLO= CREOSOTE LIKE ODOR OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR			

		K	2		onsultants			CLIEN	T: National G	irid		BORING LOG				
-			Ľ	Glasto	/inding Bro onbury, CT 368-5300		33	PROJ	ECT: V STATE:	/illiamsburg MGP RI Brooklyn, New York	PAGE					
Ċ	٦E	Cons	ultants	(860)	368-5300				ROJECT NUMB		1 of 3	WW3D-03				
					TION (FT)					OCATION: 50 Kent Ave						
	RTHIN			912.53	EAS /ear / Fre	STING		6419		DTAL DEPTH (FT): <u>55.00</u> ATUM VERT. / HORZ.: NAV	/ 88 /	NAD83 NY Fast Zone				
LO	GGED	BY:	Maura	a MacL	.eod					ATE START / END: 6/25/20						
						00 7	142101	000								
VVA					'): <u>⊻5.</u>		/13/20	109								
	РТН		SAIVI	PLE IN	FU	A	R	ĸ	ANALYZED	60		DOCK				
	₹Т.	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	SAMPLE ID		ESCRIP	DROCK PTION				
	0	S1	5.0							(0'- 1') WIDELY GRADED S sand, fine to coarse, ~40%		VITH GRAVEL (SW); ~55%				
_										~5% fines, non plastic; max	. size 3	in., brown, FILL, fragments of				
_						4 A .				coal, brick, and glass, hand (1'- 2') CONCRETE; FILL.						
					2.1				WWSB-09 (2-4)		o coarse	e, subangular, ~5% fines, non				
_										plastic; max. size 1 in., brow hand cleared.	vn, FILL	, fragments of brick and coal,				
_																
<u>_</u>	5	60	40.0	7 05												
		S2	10.0	7.25	2.2					(SW-SM); ~70% sand, fine	to coars					
-								PLO		coarse, ~10% fines, non pla petroleum-like odor, brown,						
-																
_								PLO		(SW-SM); ~65% sand, fine	ED SAND WITH SILT AND GRAVE to medium, ~20% gravel, fine to					
										coarse, ~10% fines, non pla petroleum-like odor, gray br	astic; ma own.	ax. size 3 in., moderate				
_								NLO		(8.4'- 10.5') WIDELY GRAD (SW-SM); ~65% sand, fine	ED SA	ND WITH SILT AND GRAVEL se. ~20% gravel_fine to				
	10				1805					coarse, ~10% fines, non pla naphthalene-like odor, gray	astic; ma	ax. size 3 in., strong				
_								NLO		(10.5'- 11.8') WIDELY GRA	DED S	AND (SW); ~95% sand, fine to oderate naphthalene-like odor,				
						••••			WWSB-09 (11-12)	brown gray, sheen.						
_										(11.8'- 15') WIDELY GRAD medium, ~5% fines, non pla		ND (SW); ~95% sand, fine to ght naphthalene-like odor,				
_										brown gray.						
_								NLO								
	<i>.</i> –															
	15	S3	10.0	7.25	644					(15'- 17.4') WIDELY GRAD medium, ~5% fines, low pla		ND (SW); ~95% sand, fine to				
_								NLO		odor, gray.	sucity, I	nouerale naprilialere-like				
_																
								NLO		(17.4'- 18.1') WIDELY GRA	DED S	AND (SW); ~95% sand, fine to				
-						**** ****				medium, ~5% fines, low pla odor, gray, sheen, tar-like s	taining.	·				
_								NLO		(18.1'- 19.3') WIDELY GRA	DED S	AND (SW); ~90% sand, fine to ~5% fines, non plastic; max.				
	20							NLO				like odor, gray brown, sheen,				
NO	TES:					•				•						
REC	C = REC = PHO	OVERY L	ENGTH	OF SAM	SAMPLER C IPLE DR READING			۱i ۱i	pm = PARTS PER I J. = INCHES T. = FEET	VILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OD	ODOR DOR	CrLO= CREOSOTE LIKE ODOR OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR				

Cons		455 W Glasto	inding Bro nbury, CT	ok Ro	ad 3	PROJI CITY/S	ECT: W	illiamsburg MGP RI Brooklyn, New York	PAGE 2 of 3	BORING LOG
TYPE and NO.	SAM PEN FT.	REC FT.	IFO PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID			
			1297			NLO		coarse, ~5% gravel, fine to size 2 in., slight naphthaler (20.6'- 25') WIDELY GRAD	coarse, e-like od ED SAN	~5% fines, non plastic; max. lor, brown, sheen. ND (SW); ~90% sand, fine to
S4	5.0	3.83	6.8					(SW-SC); ~80% sand, fine	to media	
S5	5.0	1	0.1					(30'- 32.5') Bolder.		
S6	5.0	4.17	104	• • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
								~75% sand, fine to coarse,	~20% g	ravel, fine to coarse, ~5%
\$7	5.0	5	642			NLO		(40'- 45') WIDELY GRADE medium, ~5% fines, non pl brown.	D SANE astic; slię	0 (SW); ~95% sand, fine to ght naphthalene-like odor,
	TYPE and NO. S4 S5 S5	TYPE and NO.PEN FT.S45.0S55.0S65.0	455 W. Glaster (860)TYPE and NO.PEN FT.REC FT.S45.03.83S45.01S55.01S65.04.17	455 Winding Brc Glastonbury, CT (860) 368-5300SAWPLE INFOTYPE and NO.PEN FT.REC (PID (ppm)TYPE and NO.PEN FT.REC (ppm)S45.03.836.8S45.010.1S55.010.1S65.04.17104	Sample information (see) 368-5300 Alternation (see) 368-5300 Alternation (see) 368-5300 TYPE and NO. PEN FT. REC FT. PID (ppm) Alternation (see) 368-5300 S4 5.0 3.83 6.8 Alternation (see) 368-5300 S4 5.0 3.83 6.8 Alternation (see) 368-5300 S4 5.0 1 0.1 Alternation (see) 368-5300 S5 5.0 1 0.1 Alternation (see) 368-5300 S6 5.0 4.17 104 Alternation (see) 368-5300	455 Winding Brook Road Glastonbury, CT 06033 (860) 368-5300 PID PTYPE and NO. PEN FT. REC FT. PID (ppm) PU FT. PU FT. PID (ppm) PU FT. PU FT. PID (ppm) PU FT. PU FT. PID FT. PU FT. PU FT. PU FT. PID (ppm) PU FT. PU FT.	455 Winding Brook Road Glastonbury, CT 0603 PROJ Set 197 VIE VIE PEN RCJ (CTY/Scient) PROJ (CTY/Scient) TYPE and NO. PEN FT. REC FT. PID (ppm) PL FT. NLO S4 5.0 3.83 6.8 Image: state	Yes Set Winding Brook Read Glasonbury, CT 04033 PROJECT: WCTY/STATE: GEI PROJECT NUMBER TYPE and NO. PEN REC FT. PID (ppm) Yes bis PROJECT: MCTY/STATE: GEI PROJECT NUMBER TYPE and NO. PEN REC FT. PID (ppm) Yes bis PROJECT: MCTY/STATE: GEI PROJECT NUMBER Statistical Statis Statistical Statis Statistical Statistical S	455 Winding Brock Road (Basonbury, CT 06033 (BG) 388-5300 (BG)	455 Winding Brook Read (Basonbury, CT 06033 (BO) 388-5300 PROJECT: Williamsburg MGP Ri Drocktyn, New York EI PROJECT NUMBER: PAGE 2 of 3 TYPE and NO. FT. FC. PID V 100 2 of 3 0 0 ANALYZED SMPLE SOIL J BEL DESCRIP TYPE and NO. FT. FC. PID V 100 2 of 3 0 0 ANALYZED SMPLE SOIL J BEL DESCRIP TYPE and NO. FT. FC. PID V 100 2 of 3 0 0 ANALYZED SMPLE SOIL J BEL DESCRIP TYPE and NO. FT. FT. PID V 100 2 of 3 NLO SOIL J BEL DESCRIP TYPE and NO. FT. RFC. PID NLO SOIL J BEL DESCRIP TYPE and NO. FT. RFC. PID NLO SOIL J BEL DESCRIP TYPE and NO. FT. RFC. PID NLO SOIL J BEL SOIL J BEL S

	C)	455 W	onsultants	ook R		CLIEN PROJI	IT: <u>National G</u> ECT: W	rid illiamsburg MGP RI		BORING LOG
CE		Ð		onbury, CT 368-5300	060	33			Brooklyn, New York	PAGE 3 of 3	WWSB-09
JC	Cons	ultants	-				GEI PI	ROJECT NUMBE	ER: 093060		
		SAM	IPLE IN	IFO	•	്റ					
EPTH FT.	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		l / Bed Escrip	
				592		> > > >	NLO				
- 45	S8	10.0	6.5	3159		> > > >	NLO		(45'- 47.3') WIDELY GRAD coarse, ~5% fines, non plas brown.	ED SAN tic; mode	D (SW); ~95% sand, fine to erate naphthalene-like odor,
						> > > >	NLO		(47.3'- 51.4') WIDELY GRA coarse, ~5% fines, non plas brown, sheen, tar-like staini	tic: stron	ND (SW); ~95% sand, fine to ig naphthalene-like odor, as of tar-like coating.
- 50				2435		> > > > > >			(51.4'- 54') WIDELY GRAD	ED SAN	D WITH SILT (SW-SM):
						> > > > > >	NLO	WWSB-09 (53-54)	~90% sand, fine to medium naphthalene-like odor, gray blebs.	, ~10% f brown, s	ines, non plastic; strong sheen, tar-like staining and
									(54'- 55') SILT (ML); ~80% fine; gray.	fines, me	edium plasticity, ~20% sand,
OTES:								nn - DADTS DED M	IILLION NLO = NAPHTHALENE LI	(5.0000	CrLO= CREOSOTE LIKE ODOR

PR	OJE	ECT: Br	odsky Pr	opert	y (DDC)	JOB NO: 600053	392.01	BORING	NO:	BPB-1	3 / MW-4	<u> </u>
LO	CAT	ΓΙΟΝ:		·······		ELEVATION: 8.3	37'	DEPTH:	52'			
Nor	th 1	2th St	, Brookly	n, NY	,	DATE BEGUN: (06/01/06	DATE FI	NISHI	ED: 06	6/06/06	
DR	ILL	CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: M	ichael Da	vies			
DR		ING RI	G: CME-	75			DRILLER: Jerry	Heller				
WE	AT	HER: I	Hazy, Hui	nid, 8	85 F		DRILL FLUID: W	Vater	н	DLE S	ZE: 3" Ca	asing
	nepili	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIC		ни Reading	\	nitoring Vell struction	NOTES
0						Borehole Cleared t	to 5 Feet for Utilities				Diameter Schedule	
5	1	S1	5'-7'	4"	2, 2, 2, 3	Very Loose Brown Silt/Clay and Brick	Fine to Medium Sand, t Fragments (SP)	tr	0		40 PVC Riser Pipe	
	1	\$2	7'-9'	10"	3, 2, 4, 6	Loose Brown Fine Silt/Clay and Brick	to Medium Sand, tr Fragments (SP)		254		#1 Morie Well Sand	Strong product odor
10		S 3	9'-11'	10"	3, 5, 7, 4	Loose Brown Fine Silt/Clay and Brick	to Medium Sand, tr Fragments (SP)		117		2"	
		S4	11'-13'	6"	4, 3, 6, 4	Loose Brown Fine Silt/Clay (SP)	to Medium Sand, tr		424		Diameter 0.010* PVC Well Screen	Sample collected for lab analysis
15	-	S 5	13'-15'	10"	5, 10, 9, 11	Medium Dense Gr Silt/Clay (SP)	ay Fine to Medium San	ıd, tr	274			
10		S6	15'-17'	8"	2, 4, 5, 6	Loose Gray Fine to (SP)	o Medium Sand, tr Silt/C	Clay	232			
		S 7	17'-19'	6"	17, 22, 50/4'	Dense Gray Fine t (SP)	o Medium Sand, tr Silt/	Clay	217			
20						Roller Bit Through	Boulder					Switch to roller bit and casing drilling
	-	S8	20'-22'	10"	8, 9, 10, 11	Medium Dense Br some Coarse Grav	own to Gray Fine Sand, vel, tr Silt (SP)	,	68.3			
	_	S9	22'-24'	15"	4, 6, 9, 6	Loose Gray/Brown Silt (SP)	Fine to Medium Sand,	tr	16.4			
25		S10	24'-26'	8"	6, 11, 13, 14	Dense Gray/Brow Fine to Medium G	n Fine to Medium Sand, ravel, tr Silt (SP)	, little	0			
		S11	26'-28'	10"	5, 8, 10, 12	Dense Brown Fine (SP)	to Medium Sand, little	Silt	0			
30		S12	28'-30'	12"	7, 14, 16, 15	Dense Brown Fine and Fine Gravel (S	e to Medium Sand, little SP)	Silt	0		Portland/	
30	_	S13	30'-32'	8"	7, 16, 15, 10	Dense Brown Fine Gravel, tr Silt (SP)	e to Medium Sand, little	Fine	0		Bentonite Backfill	

Page 1 of 2

DRILL CONTRACTOR: Aquifer Drilling and Testing GEOLOGIST: Michael Davies DRILLING RIG: CME-75 DRILLER: Jerry Heller WEATHER: Hazy, Humid, 85 F DRILL FLUID: Water	IED: 06/06/06 OLE SIZE: 3" Ca Monitoring	
DRILL CONTRACTOR: Aquifer Drilling and Testing GEOLOGIST: Michael Davies DRILLING RIG: CME-75 DRILLER: Jerry Heller WEATHER: Hazy, Humid, 85 F DRILL FLUID: Water	OLE SIZE: 3" Ca	
DRILLING RIG: CME-75 DRILLER: Jerry Heller WEATHER: Hazy, Humid, 85 F DRILL FLUID: Water		
WEATHER: Hazy, Humid, 85 F DRILL FLUID: Water H		
	Monitoring	asing
tage Sample tage Control tage Control	Well Construction	NOTES
- S14 32'-34' 15" 12, 13, 25, 32 Dense Brown Fine to Medium Sand, little Silt 0 (SP)		
35 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 12.6		
- S17 38'-40' 16" 12, 10, 9, 16 Medium Dense Brown/Black Fine to Medium 72.9		
40		
- S19 42'-44' 18" 11, 10, 9, 4 Medium Dense Brown Fine to Medium Sand, 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 6.5		
- S22 48'-50' 6" 2, 3, 13, 30 Medium Dense Brown Fine to Medium Sand, 416		Sample collected for
50 S23 50'-52' 15" 41, 46, 50/5" Very Dense Brown Fine to Medium Sand, little Silt (SP) 349		lab analysis. Boulder with heavy coal tar encountered,
Boring Terminated @ 52'		boring terminated.
55		
60		

Page 2 of 2

PRO.	JECT: E	Brodsky Pr	oper	ty (DDC)	JOB NO: 600053	392.01	BORING	NO: E	3PB-10
	ATION:				ELEVATION: 9.	9'	DEPTH:	57'	
Insid	le NYD	OS Mainte	enanc	e Garage	DATE BEGUN:	04/28/06	DATE FI	NISHE	ED: 04/28/06
DRIL	LCON	FRACTOR	t: Aqu	ifer Drilling a	and Testing	GEOLOGIST: Er	ic Acs		
DRIL	LING F	IG: CME-	55 - 1	rack Mounte	ed	DRILLER: Tony	Palanque	8	
WEA	THER:	Sunny 60)'s	·····		DRILL FLUID: W	Vater	HOL	E SIZE: 6.25"
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIC	DN (PID Reading	NOTES
0					Borehole Cle	eared to 5 Feet for Utilitie	es		
5 —	- S1	5'-7'	6"	5, 7, 7, 5		Gray/Brown Fine to Med Fine to Coarse Gravel		0.6	Petroleum Odor
	- S2	7'-9'	8"	4, 8, 6, 3	Medium Dense C Silt, tr Fine	Gray Fine to Medium Sa to Coarse Gravel (SP)	and, tr	3	Stained black in places
10 —	\$3	9'-11'	10"	7, 8, 14, 50/3"		Black Silty Fine Sand, tr barse Gravel (SM)	Fine	94	Sample collected for lab analysis
	- S4	11'-13'	12"	Auger/12", 2, 2	A) Concrete B)	Loose Gray silty Fine S (SM)	Sand	18	Petroleum Odor
15 —	- S5	13'-15'	12"	1, 2, 2, 1	Loose Gra	y Silty Fine Sand (SM)		12.8	u u
15 —	- S6	15'-17'	16"	1, 2, 2, 2	Loose Gra	ay Silty Fine Sand (SM)		12.6	и п
	- S7	17'-19'	18"	4, 4, 8, 10	Medium Dense	y Silty Fine Sand (SM) Gray/Brown Fine Sand, to Coarse Gravel (SP)	little	16.2	Silty Sand 12", Fine Sand 12"
20 —	S8	19'-21'	10"	28, 22, 16, 16	Dense Gray/B	rown Fine Sand, tr Silt (SP)	6.2	
	S9	21'-23'	8"	6, 10, 12, 16		Gray/Brown Silty Fine Sa Coarse Gravel (SM)	and, tr	19.2	Coal tar odor
25 —	S10	23'-25'	12"	12, 10, 12, 15	Medium Dense	Gray/Brown Fine Sand, Silt (SP)	little	6.2	
20 -	- S11	25'-27'	12"	5, 6, 7, 7		Gray Silty Fine Sand, tr F lium Gravel (SM)	Fine to	6.2	N 11
		27'-29'	12"	8, 8, 10, 8		Gray Silty Fine Sand, tr F lium Gravel (SM)	ine to	0	
30 —	S13	29'-31'	12"	6, 10, 11, 12	Medium Dense G Med	Gray Silty Fine Sand, tr F lium Gravel (SM)	ine to	3.6	Coal tar odor

PRC	DJE	CT: B	rodsky Pr	oper	ty (DDC)	JOB NO: 60005	392.01	BORIN	g no: E	3PB-10
LOC	CAT	FION:				ELEVATION: 9.	9'	DEPTH	I: 57'	
Ins	ide	NYDC	S Mainte	nanc	e Garage	DATE BEGUN:	04/28/06	DATE F	INISHE	ED: 04/28/06
DRI	LL	CONT	RACTOR	: Aqu	lifer Drilling a	and Testing	GEOLOGIST: E	ric Acs		· · · · · · · · · · · · · · · · · · ·
DRI		ING RI	G: CME-	55 - 7	rack Mounte	d	DRILLER: Tony	Palanq	ue	
WE	AT	HER:	Sunny 60	's			DRILL FLUID: \	Nater	HOL	E SIZE: 6.25"
Denth	- church	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIC	ON	PID Reading	NOTES
		S14	31'-33'	6	5, 5, 50/0"	Medium Dense G Med	Gray Silty Fine Sand, tr lium Gravel (SM)	Fine to	3.2	Boulder @ 31'
35 -		S15	33'-35'	3"	38, 20, 14, 14	Dense Gray Silty	Fine Sand, tr Fine to M Gravel (SM)	ledium	0.5	
		S16	35'-37'	8"	30, 22, 15, 16		Fine Sand, tr Fine to M Gravel (SM)	ledium	2.5	
		S17	37'-39'	4"	50/5"		Fine Sand, tr Fine to M Gravel (SM)	ledium	4.5	Boulder @ 37.5'
40 -		S18	39'-41'	10"	15, 16, 10, 12	Medium Dense (Gray Fine to Medium S Silt (SP)	and, tr	16.2	
		S19	41'-43'	12"	5, 8, 8, 12	Medium Dense	Brown Fine to Medium tr Silt (SP)	Sand,	175	Coal tar odor and staining
45 -	-	S20	43'-45'	12"	12, 18, 26, 24	Dense Brown Fir	ne to Medium Sand, tr S	silt (SP)	283	n u
40 -		S21	45'-47'	14"	30, 32, 30, 28	Very Dense Bro	own Fine to Medium Sa Silt (SP)	ınd, tr	305	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
		S22	47'-49'	20"	8, 9, 12, 14	Very Stif	f Gray Silty Clay (CL)		50.5	
50 -		S23	49'-51'	18"	5, 8, 15, 18	Very S	Stiff Gray Clay (CL)		3.8	
	_	S24	51'-53'	16"	18, 24, 20, 18	Hard	d Gray Clay (CL)		4	
55 -		S25	53'-55'	16"	12, 10, 10, 18	Very Stif	f Red/White Clay (CL)		3.5	
	-	S26	55'-57'	12"	8, 11, 12, 10		f Red/White Clay (CL)		1.3	Sample collected for lab analysis
						Boring	Terminated @ 57'			
60 -										

• • • • • •

CLIENT:	CT/PROJE		U	K S										DG
CLIENT:	CT/PROJE				Cor	oora	ntic	n				BORING NO. : WW-SB-110		
		CT LOC			National Gri							SHEET: 1 OF 3		
PODING	:				National Gri	d						JOB NO.: 11176638.00001		
DUKING	CONTRA	CTOR:			Fenley & Ni	col						NORTHING: 688940.0666 EA	STING: 6	41763.6288
GROUNI	DWATER:	6'			-	CAS.	S	AMPLER	CO	RE	TUBE	GROUND ELEVATION: 10.09		
DATE	TIME	LEVE	EL	TYPE	TYPE		Sp	lit Spoon				DATE STARTED: 2/28/2	012	
					DIA.			2"				DATE FINISHED: 3/1/20	12	
					WT.			140 lb				DRILLER: Mike N	leade	
					FALL			24"				GEOLOGIST: Megar	Dascoli	
												REVIEWED BY: Tim Bu	urmeier	
DEPTH		VISUAL		SAN	IPLE	RE	EC%			-		MATERIAL		
FEET		IMPACTS	"S" NO.	"N" NO.	BLOW COUNT		2D%	COLOR				DESCRIPTION	PID	REMARKS
	I	I		I										I
0	*****							Med Brov	vn	EIII	concret	e, brick, gravel and asphalt, some	0.0	Boring hand
- 8											and silt		0.0	cleared to 5 ft bgs
$ $								Dk Brow	n				0.0	
- 8														Moist
													4.6	Petroleum odor
-5 —										FILL:	sand an	nd silt, trace gravel, loose	100	Moderate
- 8			1	5	1, 3, 2, 1	;	31	Black	_				123	petroleum odor, black staining Wet
- 8													296	Strong
- 8			2	7	3, 3, 4, 5		54							petroleum odor, moderate
													321	coating Moist
-10 —			3	24	3, 4, 20, 40		67	Med Brov				/ fine SAND (SM), trace fine	248	Petroleum odor
	<u> </u>								v'' _ !	grave	el, mediu	m dense	35.5	\\/ot
	••••••		4	46	28, 14, 32, 3	30	63		:	Silty	SAND (S	SM), dense	59.2	Wet Black staining,
	·····				-, ,-,								89.8	CT-like odor
	<u> </u>		F	47	1 6 11 7	,	46					nedium Sandy SILT (ML), medium	60	Faint CT-like odor
	<u></u>		5	17	1, 6, 11, 7		46			dens	se		349	
-15 —								1					108	
	·		6	7	2, 3, 4, 7	1	00		1	trace	gravel, l	oose	35.7	Heavy NAPL coating
								Med Gra	y (CLAY	7 (CL), se	oft	55.5	50% CT
			7	5	2, 2, 3, 5		71					e sand and silt	59	saturation Faint CT-like odor
											c, hard		12.5	
-20 —			8	74	24, 32, 42, 3	39 2	22					medium sand, trace angular	97.1	
									9	grave	9I		70.8	
			9	34	56, 20, 14, 7	16 9	92						10	
									-	Varia	fine to a	odium CAND (CMA) come site	32.4	
	•••••		10	27	8, 12, 15, 1	5	50	Reddish			tine to m um dens	nedium SAND (SW), some silt, e	335	
-25 —	····							Brown						75% NAPL

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

			-		4				TEST BOR	ING LO	DG
			U		Corpo	oratio	n		BORING NO.: WW-SB-110		
PROJE	ECT/PROJE	ECT LOC	ATION	:	National Grid -	Williams	sburg		SHEET: 2 OF 3		
CLIEN	T:				National Grid				JOB NO.: 11176638.00001		
DEPTH		VISUAL		SAI	MPLE	REC%			MATERIAL		
FEET	STRATA	IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		DESCRIPTION	PID	REMARKS
			11	34	4, 13, 21, 22	96	Med Brown		ome very fine to medium sand, nedium subangular gravel,	640	saturation, strong CT-like
	••••						_	medium dens	e	26.5	odor Moderate CT-
_			12	67	8, 12, 55, 30	42		Silty SAND (S	SM), very dense	35.8	like odor
_	····						Med Brown			39.8	No odor
-30 —			13	47	6, 25, 22, 31	29	to Gray		LT (CL/ML), some very fine to , trace very fine to medium el, dense	4.5 6.7	
-			14	49	6, 9, 40, 44	0	-	No Recovery			
	· <u>····</u>		15	48	9, 21, 27, 60	42	Med Gray	Very fine to fin medium grave	ne Sandy SILT (ML), trace el, dense	14.9	
-35 —					5 44 40		-	Coarse angul	ar GRAVEL (GW), some very fine	12.1 3.3	
			16	51	5, 11, 40, 100/3	42			and, silt and clay, very dense	3.9	
			17	100	100/6, -, -, -	0	_		nedium sandy SILT (ML), trace to medium gravel, very dense	11.1	Faint CT-like odor
_	•••••••••••••••••••••••••••••••••••••••						Med Brown	No Recovery		12.5	Moderate CT-
-40 —			18	98	28, 47, 51, 62	67	to Gray	Very fine to find dense	ne SAND (SP), some silt, very		like odor
			19	28	10, 12, 16, 28	58		medium dens	e	76.4 57.9	
-							Med Gray	very dense		48.3	Faint CT-like odor
-			20	65	22, 33, 32, 37	58	Med Gray to Brown	-		68.4	0001
-45 —			04	100	00 40 00 57	50	-	Silty SAND (S	SM), very dense	33.7	
	<u></u>		21	100	26, 40, 60, 57	58		Sandy SILT (I	ML), very dense	63.2	
			22	208	44, 110, 98,	75			oarse SAND (SW), some silt, very	27.7	
					132		Med Brown	dense		15.1	
-50 —			23	119	15, 51, 68, 78	88	Mod Crow			46.2	Eaint OT We
	· ·						Med Gray Med Gray	SILT (ML), ve	-	35.7	Faint CT-like odor
_			24	141	23, 37, 104, 156	96	to Brown	Very fine to m coarse sand,	nedium SAND (SW), trace silt and very dense	27 12	
							-			2.7	
			25	122	6, 22, 100/2, -	67		some elevi		14.7	
-55			26	90	15, 35, 55, 68	100	-	some clay	dy SILT (ML), very dense	17.1	

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

			U	R	Corpo	oratic	on		TE BORING NO. : W	ST BOR	NG LO	DG
PROJE	CT/PROJE	ECT LOC			- National Grid -				SHEET: 3 OF			
CLIENT	:				National Grid				JOB NO. : 11176			
				SA	MPLE	REC%						
DEPTH FEET	STRATA	VISUAL	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		MATERIAL DESCRIPTION		PID	REMARKS
		1						r I				I
_ [<u></u>						Med Brown	trace clay			12.2	
_	····		27	75	5, 16, 59, 91	17	inica Brown	Very fine to m	nedium SAND (SW), s	some silt,	19.4	
_	•••••						Med Gray	very dense			9.4	
-60 —	•••••		28	65	33, 28, 37, 38	38					23.4	Faint CT-like odor
					,,,		Med Brown	trace coarse	sand			
			29	54	50, 54, -, -	100		CLAY (CL), h	ard	/	30.4	
							Med Gray to Brown		ne SAND (SP), some	ailt dansa	2.5	
			30	35	8, 10, 25, 46	50	Lt Gray		. ,		0.0	
-								CLAY (CL), h		/		
-65 —								End of boring	at 64 ft bgs.			
-												
-												
_												
70												
-70 —												
-												
-												
-												
_												
-75 —												
-												
-												
-80 —												
4												
1												
-85 —												
-												
		oring adv	anced	ising of	Cantera CT-450) drill rig						
	Coal Tar	ning auva	anceu l	using a G	Jamera 01-430	, ann ng.						
	= Non-Aq		ase Lir	biuc								
				1414								
										BORING NO).: W	W-SB-110
										-		-

	SURF		Glasto (860)	/inding Bro onbury, CT 368-5300 FION (FT) EAS	0603	33	GEI PF	STATE: ROJECT NUMB	illiamsburg MGP RI Brooklyn, New York ER:093060 CATION: _50 Kent Ave TAL DEPTH (FT):60.00	PAGE 1 of 3	WWMW-17
ORILLED OGGED ORILLING VATER I	BY: G DETA	Maura	a MacL Geop	robe	/ Lu	ke Cal	ballero		TUM VERT. / HORZ.: <u>NA</u> TE START / END: <u>6/8/200</u>		
DEPTH FT.	TYPE and NO.	SAM PEN FT.	PLE IN REC FT.	IFO PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		IL / BEDI ESCRIP1	
- 0	S1	5.0		2.1				WWMW-17 (1-2)	(0'- 0.33') CONCRETE. (0.3'- 5') SILTY SAND (SM) fines, non plastic, ~5% grav); ~80% s /el, fine; t	sand, fine to coarse, ~15% prown, hand cleared.
- 5	S2	5.0	2				NLO	WWMW-17 (7-8)	(5'- 8.3') SILTY SAND (SM) fines, non plastic, ~5% grav slight naphthalene-like odor	el, fine to	
- 10				868			NLO		(8.3'- 10') SILTY SAND (SM fines, non plastic, ~5% grav moderate naphthalene-like	el, fine to	o coarse; max. size 2 in.,
10	S 3	5.0	4.08	349			NLO		(10'- 12.9') SILTY SAND (S fines, non plastic, ~5% grav slight naphthalene-like odor	/el, fine to	o coarse; max. size 2 in.,
									(12.9'- 15') SILTY SAND (S fines, non plastic, ~5% grav brown, sand and gravel lens	/el, fine to	
- 15 - 20	S4	5.0	3.75	1281			NLO NLO NLO NLO		(15'- 15.2') SILTY SAND (S fines, non plastic, ~5% grav slight naphthalene-like odor (15.2'- 15.3') SILTY SAND ~15% fines, non plastic, ~5 in., slight naphthalene-like of (15.3'- 17') SILTY SAND (S plastic, ~5% gravel; max. si black, organics, sandy silt li (17'- 17.6') SILTY SAND (S fines, non plastic, ~5% grav slight naphthalene-like odor	vel, fine to , black, c (SM); ~8 % gravel, bdor, blac SM); ~80% ze 2 in., s ense from SM); ~80% vel, fine to	o coarse; max. size 2 in., organics. 0% sand, fine to coarse, , fine to coarse; max. size 2 ck, organics, tar-like coating % sand, ~15% fines, non slight naphthalene-like odor n 16.3 to 16.7 ft. % sand, fine to coarse, ~15 o coarse; max. size 2 in.,
REC = REC	OVERY L	ENGTH	OF SAM				IN	om = PARTS PER N I. = INCHES T. = FEET	IILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OE	ODOR	CrLO= CREOSOTE LIKE ODO OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

GE	Cons	Ultants	455 W Glasto (860) 3	onsultants /inding Bro onbury, CT 368-5300	ok Roa	d	PROJI CITY/S		illiamsburg MGP RI Brooklyn, New York	PAGE 2 of 3	BORING LOG
DEPTH FT.	TYPE and NO.	PEN FT.	REC FT.	IFO PID (ppm)	STRATA		ODOR	ANALYZED SAMPLE ID		IL / BED ESCRIP	
— 20	S5	5.0	2.92	71.3			NLO		(17.6'- 18.2') SILTY SAND low plasticity; slight naphtha (18.2'- 20') SANDY SILT (M sand, fine; gray, shells from (20'- 23.3') SILTY SAND (S fines, non plastic, ~5% grav slight naphthalene-like odor (23.3'- 25') SANDY SILT (M sand, fine; brown gray.	lene-like IL); ~70' 19.2 to M); ~80 rel, fine t , brown.	e odor, black. % fines, low plasticity, ~30% 20 ft. % sand, fine to coarse, ~15 o coarse; max. size 2 in.,
- 25	S6	5.0	1.58	0					(25'- 30') SILTY SAND (SM fines, non plastic, ~10% gra brown.); ~60% wel, fine	sand, fine to coarse, ~30% to coarse; max. size 2 in.,
- 30	S7	5.0	3.67	0					(30'- 35.3') SILTY SAND (S fines, non plastic, ~10% gra brown, gravel layer from 43	ivel, fine	to coarse; max. size 2 in.,
- 35	S8	5.0	3.92	0					(35.3'- 36.1') WIDELY GRA ~50% gravel, fine to coarse fines, non plastic; max. size (36.1'- 38') SILTY SAND (S fines, non plastic, ~10% gra fine to coarse gravel at 37.9 (38'- 40') WIDELY GRADE	, ~45% : 2 in., gr M); ~70 ivel, fine 9 ft. D SAND	sand, fine to coarse, ~5% ay. % sand, fine to coarse, ~20 to coarse; brown, 1" lense (SW); ~95% sand, fine to
- 40	S 9	5.0	3.42	6.2			OLO		coarse, ~5% fines, non plas (40'- 41.6') SILTY SAND (S ~20% fines, non plastic; mc	M); ~80	% sand, fine to medium,
NOTES:							NLO		(41.6'- 46.8') WIDELY GRA coarse, ~5% fines, non plas lense of brown silty sand fro	stic; sligh	t naphthalene-like odor, bla
PEN = PEN REC = REC PID = PHO	OVERY L	ENGTH	OF SAM			BARI	١١.	pm = PARTS PER M N. = INCHES T. = FEET	ILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE O	ODOR DOR	CrLO= CREOSOTE LIKE ODO OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

~-	. (())	455 W Glasto	onsultants /inding Bro onbury, CT	ook Road	PRO		/illiamsburg MGP RI	PAGE	BORING LOG
٦F	-		(860)	368-5300			(/STATE: PROJECT NUMB	Brooklyn, New York ER: 093060	3 of 3	WWMW-17
	 Cons 	ultants SAM	IPLE IN	IFO		-			I	
DEPTH FT.	TYPE and NO.	PEN FT.		PID (ppm)	STRATA	IMPACTS ODOR	ANALYZED SAMPLE ID		IL / BED ESCRIP	
- 45	S10	5.0	3.25	11.6		NL	0	(46.8'- 49.2') WIDELY GRA medium, ~5% fines, non pla		AND (SW); ~95% sand, fine to
- 50	S11	5.0	3.17	55		NL		(49.2'- 50') SILT (ML); ~80'	% fines,	non plastic, ~20% sand, fine; ID (SW); ~95% sand, fine to
	511	5.0	5.17	55				medium, ~5% fines, non pla brown. (50.3'- 50.7') SILTY SAND non plastic; slight naphthale (50.7'- 51.8') WIDELY GRA medium, ~5% fines, non pla brown. (51.8'- 52.4') SANDY SILT sand, fine; slight naphthaler	astic; slig (SM); ~7 ene-like c \DED SA astic; slig (ML); ~6 ne-like oc \DED SA	ght naphthalene-like odor, 70% sand, fine, ~30% fines, odor, gray. AND (SW); ~95% sand, fine to ght naphthalene-like odor, 60% fines, non plastic, ~40% dor, gray. AND (SW); ~95% sand, fine to
- 55	S12	5.0	1.67	1.4			<u>)</u>	brown (54.7'- 55') LEAN CLAY (C sand, fine; slight naphthalei	- L); ~95% ne-like oo ; ~95% f	6 fines, medium plasticity, ~5% dor, reddish brown. ines, medium plasticity, ~5%
- 60								Bottom of borehole at 60.0	feet.	
EC = RE ID = PH	NETRATIC	ENGTH	OF SAM			BARREL	ppm = PARTS PER N IN. = INCHES FT. = FEET	AILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE O	ODOR	Crlo= Creosote Like Odor Olo = Organic Like Odor Slo = Sulfur Like Odor Mlo = Musty Like Odor

			TI		Corp							TEST BORI	NG LO	DG		
			U									BORING NO.: WW-SB-109				
PROJE	ECT/PROJE	CT LOC	ATION	l:	National Grid	d - Willia	ams	burg				SHEET: 1 OF 2				
CLIEN	T:				National Grid	b						JOB NO.: 11176638.00001				
BORIN		ACTOR:			Fenley & Nic	ol						NORTHING: 688869.7424 EA	STING: 6	641696.3812		
GROUI	NDWATER	: 5'				CAS.	S	AMPLER	со	DRE	TUBE	GROUND ELEVATION: 9.81				
DATE	TIME	LEVE	EL	TYPE	TYPE		Sp	olit Spoon				DATE STARTED: 3/12/2	012			
					DIA.			2"				DATE FINISHED: 3/13/2	012			
					WT.			140, 300				DRILLER: Mike N	leade			
					FALL			24"				GEOLOGIST: Megar	n Dascoli			
												REVIEWED BY: Tim Bu	urmeier			
				SAN	/PLE	REC	~ 0/									
DEPTH FEET	STRATA	VISUAL	"S" NO.	"N" NO.	BLOW COUNT	RQI		COLOR				MATERIAL DESCRIPTION	PID	REMARKS		
														1		
0								Med Brov	vn			ilt, cobbles, concrete and brick	0.0	Boring hand		
-									-	Cond			0.0	cleared to 5 ft bgs		
-												/	0.0	Dry		
-										FILL:	sand, si	ilt, concrete and brick, trace metal	0.0	-		
-													0.0	-		
-5								Dk Gray	, -			it and even of		Wet		
_			1		1, 3, 2, 2	40	6	-	-			ilt and gravel	6.1	30% NAPL		
_								Med Gra				ne SAND (SP)	52.8	saturation, petroleum and		
	· · · ·		2		1, 1, 2, 5	42	2	incu ora	.,	SILT	(ML), so	ome very fine to medium sand	8.4	CT-like odor Moderate NAPL		
	<u>· — · —</u>							-					4.8	odor, blebs, sheen		
-10 —			3		1, 1, 1, 1	0)			COB	BLES (G	GW)		3116611		
			0		., ., ., .											
													0.2	Drilled through cobbles to 13 ft		
_			4		-, -, -, -	0)						0.8	bgs		
_			-							No R	ecovery			-		
			5		1, 1, 1, 1	0	,		/			ome very fine sand, trace coarse				
-15 —								1		sand			0.2	Faint CT-like odor		
			6		1, 1, 1, 1	54	4			CLA	Y (CL), tr	ace fine sand, highly plastic	0.8			
									F	Very	fine to fi	ne SAND (SP), some silt, trace	1.1	Moderate CT- like odor		
-			7		7, 9, 2, 2	33	3				gravel		2.3			
-										some	e cobbles	s from 18 to 19'	2.4	-		
-20 —			8		2, 3, 4, 4	63	3						4.8	-		
									┝	COB	BLES (G	W), some very fine to fine sand	0.8	No odor		
-			9		37, 13, 10, 1	0 1	7					,,		-		
-	· <u> </u>							Lt Gray		SII T	(ML), so	ome very fine to fine and coarse	1.1	Faint CT-like		
-	· <u>· · · · · ·</u>		10		10, 10, 12, 1	6 42	2	Med Brov		sand			3.8	odor		
-25 —	<u> · · -</u>								_/	,				1		
-																

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

			TI		Corpo				TEST BOR	ING LO	DG
			U		Corpo	pratic	n		BORING NO.: WW-SB-109		
	CT/PROJE	ECT LOC	ATION	l:	National Grid -	Williams	burg		SHEET: 2 OF 2		
CLIEN	Г: 				National Grid			1	JOB NO.: 11176638.00001		
DEPTH		VISUAL			MPLE	REC%			MATERIAL		
FEET	STRATA	IMPACTS	"S" NO.	"N" NO.	BLOW COUNT	RQD%	COLOR		DESCRIPTION	PID	REMARKS
				1			1			1	
			11		12, 8, 4, 7	33	Med Gray	COBBLES (G		1.2	
	·····				12, 0, 4, 7	55		SILT (ML), so sand	ome very fine to fine and coarse	5.0	Faint CT-like odor
-			12		13, 11, 12, 11	8		Very fine SAN	ND (SP), some silt	1.2	-
_	· · · · · ·						Med Brown	Very fine to c	oarse SAND (SW), some silt		-
-30 —			13		22, 8, 7, 12	83	to Gray	Very fine to m medium grav	nedium SAND (SW), trace silt and	1.5 10.8	
-							Med Brown	-	ND (SP), trace silt and coarse	15.1	
-			14		16, 15, 13, 17	67		gravel		8.8	
-										6.3	-
-35 —			15		62, 51, 21, 17	100		medium dens	e	3.7	
-35			16	19	3, 8, 11, 13	100				5.6	
_					0, 0, 11, 10					21.5	Moderate CT- like odor Light black
-			17	26	16, 13, 13, 17	50		voru donoo		7.5	staining
-								very dense		18.3 22.1	Faint CT-like
-40 —			18	51	23, 25, 26, 23	100		medium dens	e	16.7	odor
-										8.5	-
			19	15	4, 4, 11, 16	100				22.5	
			20	27	5, 9, 18, 31	100	Med Gray to Brown		ne SAND (SP), trace medium medium dense	18.1	Moderate CT- like odor, sheen
-45 —					0, 0, 10, 01	100		very dense	medium dense	23.5	-
-			21	51	20, 25, 26, 28	100	Med Brown			16	
-								loose		219 16.1	Strong CT-like odor, sheen,
-			22	10	3, 4, 6, 10	100	Med Gray	trace fine gra		122	light coating
-							to Brown Med Brown	CLAY (CL), s	/	128	Moderate CT- like odor
-50 —			23	33	3, 6, 27, 32	38		Very fine to f	ne SAND (SP), trace silt, clay se /	30.7	
			24	59	17, 27, 32, 17	42	1	CLAY (CL), h	ard	25.3]
			27		11, 21, 32, 11	-12	Malia	Very fine SAN	ND (SP), trace silt, very dense	35.8	
_			25	12	4, 4, 8, 11	46	Med Gray to Brown Red	CLAY (CL), s some very fin		0.0	No odor
-55 —							Neu			0.0	
								End of boring	at 55 It bgs.		

CT = Coal Tar

NAPL = Non-Aqueous Phase Liquid

PRO	JECT: Br	odsky Pr	opert	y (DDC)	JOB NO: 600053	392.01	BORING N	IO: BPE	3-18	5 / MW-5]
LOC	ATION:				ELEVATION: 10	.3'	DEPTH: 6	1'				
Insid	e NYDO	S Mainter	nance	Garage	DATE BEGUN: (05/10/06 DATE FINISHED: 05/11/06						
DRIL	L CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: E	ric Acs					
DRIL	LING RI	G: CME-	55 - 1	rack Mounte	ed	DRILLER: Tony	Palanque					
WEA	THER: (Overcast,	60's			DRILL FLUID: V	Vater	HOLE	SI	ZE:6.25"/	Aug /3"	Cas
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIC	DN Ga	adi	V	nitoring Vell truction	NOT	ES
0					Borehole Cleared t	to 5 Feet for Utilities				6" Wellpipe in Concrete Bentonite Seal 2" Diameter Schedule 40 PVC Riser		
5	- S1	5'-7'	10"	2, 3, 4, 3	Loose Gray Silty F Gravel (SM)	ine Sand, tr Fine to Coa	arse 2	32		Pipe	Petroleum stain & oo	n dor
	- S2	7'-9'	14"	5, 8, 10, 12	Medium Dense Gr little Silt, tr Fine Gr	ay Fine to Medium Sar ravel (SP)	nd, 5	.3		#1 Morie Well Sand		•
10 —	S3	9'-11'	12"	8, 6, 6, 10	Medium Dense Gr Fine Gravel (SP)	ay Fine Sand, little Silt,	tr 53	3.8		2" Diameter 0.010" PVC Well		-
	- S4	11'-13'	14"	2, 2, 3, 2	Loose Gray Silty F Gravel (SM)	ine Sand, tr Fine to Me	dium 32	2.6		Screen	н	-
	- S5	13'-15'	12"	2, 4, 3, 3	Loose Gray Fine S Medium Gravel (S	and, little Silt, tr Fine to P)	3	25			Coal tar o & staining	
15 —	- S6	15'-17'	10"	3, 25, 8, 14	Medium Dense Gr Fine to Coarse Gr	ay Fine Sand, little Silt, avel (SP)	tr 9	80			Sample collected lab analys Product in sample.	sis.
	- S7	17'-19'	6"	6, 5, 4, 6	Loose Gray Fine to Fine Gravel (SP)	o Medium Sand, tr Silt,	tr 4	2.2	T		Move borehole approx.6 east due obstructio	to
20 –	S8	19'-21'	10"	4, 6, 6, 8		Gray Fine to Coarse S Dense Gray Silty Fine S		5.2			Switch to roller bit a casing drilling 5/10/2006) and
	S 9	21'-23'	6"	8, 6, 8, 10	Medium Dense Gr Medium Gravel (S	ray Silty Fine Sand, tr F M)	ine to 3	7.2			5/11/06	
0.00	- S10	23'-25'	8"	8, 12, 22, 24	Dense Gray/Black	Fine Sand, tr Silt (SP)	3	4.4			Coaltar o	odor
25 —	- S11	25'-27'	8"	12, 10, 8, 8	Medium Dense Gr (SP)	ray Fine Sand, tr to little	silt 3	4.4			"	-
	- S12	27'-29'	10"	8, 6, 8, 10	Medium Dense Gr (SP)	ray Fine Sand, tr to little	Silt 3	7.5				
30 -	S13	29'-31'	12"	8, 16, 16, 18	Dense Gray Silty I (SM)	Fine Sand, tr Fine Grav	el 3	8.2			N	•
	- S14	31'-33'	2"	12, 18, 18, 16	Dense Gray Silty I Gravel (SM)	Fine Sand, tr Fine to Co	parse 6	6.2		Portland/ Bentonite Backfill	-	•

PROJE	ECT: Br	odsky Pr	opert	y (DDC)	JOB NO: 60005	392.01	BORING	G NO: I	BPB-15 / MW-5	,			
LOCA	TION:				ELEVATION: 10	0.3'	DEPTH	: 61'					
Inside	NYDO	S Mainter	nance	e Garage	DATE BEGUN: (05/10/06	DATE F	E FINISHED: 05/11/06					
DRILL	CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: E	ric Acs						
DRILL	ING RI	G: CME-	55 - 1	Track Mounte	ed	DRILLER: Tony	Palanque	e					
WEAT	HER: O	Overcast,	60's			DRILL FLUID: V	Vater	нс	DLE SIZE:6.25"/	Aug /3" Cas			
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	E DESCRIPTIO	ЛС	PID Reading	Monitoring Well Construction	NOTES			
	S15	33'-35'	10"	8, 6, 6, 8	Medium Dense Gr Medium Gravel (S	ay Silty Fine Sand, tr F M)	ine to	19.8		Coal tar odor			
	S16	35'-37'	8'	6, 8, 6, 8	Medium Dense Gr Medium Gravel (S	ay Silty Fine Sand, tr F M)	ine to	37.7		н н			
	S17	37'-39'	14"	12, 12, 12, 14	Medium Dense Gr (SM)	ay Fine Sand, some Si	lt	128		• •			
40	S18	39'-41'	10"	13, 14, 12, 14	Medium Dense Gr Silt, tr Fine to Coar	ay Fine to Medium Sar se Gravel (SP)	nd, tr	15.2		• •			
_	S19	41'-43'	14"	14, 14, 18, 22	Dense Gray Silty F (SM)	Fine Sand, tr Fine Grav	el	78.2					
45	S20	43'-45'	12"	40, 32, 30, 36	A) Very Dense Gra Gravel (SM) B) Ve Medium Sand (SP	ay Silty Fine Sand, tr F ery Dense Gray Fine to)	ine ,	528		Product in sample Sand 6", Sitty Sand 6"			
45 -	S21	45'-47'	12"	20, 18, 18, 22	Dense Gray Fine S	Sand, tr Silt (SP)		1010		Product in sample			
	S22	47'-49'	14"	26, 32, 34, 32	Very Dense Gray I	Fine Sand, tr Silt (SP)		1220					
50	S23	49'-51'	12"	12, 14, 14, 16	Dense Gray Fine S	Sand, tr Silt (SP)		1105					
	S24	51'-53'	14"	18, 16, 16, 20	Dense Gray Fine S	Sand, tr Silt (SP)		985					
55	S25	53'-55'	12"	20, 18, 16, 16	Hard Red/Brown S	Silty Clay, tr Silt (CL)		20					
	S26	55'-57'	4'	18, 20, 20, 22	Hard Red/White to	Gray Silty Clay (CL)		10.5					
	S2 7	57'-59'	6"	18, 20, 20, 20	Hard Red/White S	ilty Clay (CL)		8.6					
60 —	S28	59'-61'	12"	18, 22, 24, 26	Hard Red/White S			3.2		Sample collected for lab analysis			
_					Boring	Terminated @ 61'							
-													
-													
65 —						and the second							

PROJ	JECT: Br	odsky Pr	opert	y (DDC)	JOB NO: 600053	392.01	BORING	G NO: I	BPB-1	6/ MW-6		
LOCA	ATION:				ELEVATION: 4.7	1'	DEPTH	: 57'				
North	h 11th S	t, Brookly	yn, N'	Y	DATE BEGUN: (: 05/26/06 DATE FINISHED: 06/01/06						
DRILI	L CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: Si	irish Musi	thyala	/ Mich	ael Davie	S	
DRIL	LING RI	G: CME-	75			DRILLER: Jerry	Heller					
WEA	THER: O	Overcast,	60's				Vater	Н	OLE S	IZE: 4"/3"	Casing	
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLI	E DESCRIPTIC	ON	PID Reading	V	nitoring Vell struction	NOTES	
0					Borehole Cleared 1	to 5 Feet for Utilities				2"		
5	— S1	5'-7'	12"	5, 4, 4, 6	some Coarse Grav Fragments (SP)	ay Fine to Medium Sar vel, tr Silt and Brick	nd,	12.8		Diameter Schedule 40 PVC Riser Pipe		
	- S2	7'-9'	16"	8, 11, 13, 13	Sand, some Grave	Black Fine to Medium I, tr Ash (SP) B) Mediu Jium Sand (Ash & Cind It (SW)		86.8		#1 Morie Well Sand	Petroleum odor	
10 —	S3	9'-11'	14"	11, 10, 1, 1	A) Medium Dense & Cinders), som e Medium Dense Gr	Fine to Medium Sand (Gravel, tr Silt (SW) B) ay Fine to Medium Sar		8.6		2"		
-	S4	11'-13'	9"	3, 2, 2, 3	some Coarse grav		/	0.9		Diameter 0.010" PVC Well Screen		
15	- S5	13'-15'	8"	11, 9, 4, 9	Medium Dense Gr	ay Fine Sand, tr Silt (S	P)	90.5			Product in sample	
-	- S6	15'-17'	9"	6, 4, 3, 6	Medium Dense Gr tr Silt (SP)	ay Fine Sand, little Gra	ivel,	210			11 IV	
-	- S7	17'-19'	1"	3, 2, 4, 7	Medium Dense Gr tr Silt (SP)	ay Fine Sand, some G	ravel,	34				
20 —	- S8	19'-21'	0"	50/3"	No Recovery							
-	S9	21'-23'	10"	5, 7, 8, 11	Medium Dense Gr Gravel, tr Silt (SP)	ay to Black Fine Sand,	tr	1313			Sample collected for lab analysis Product in Sample	
25	S10	23'-25'	12"	9, 13, 13, 13	Medium Dense Gr Gravel, tr Silt (SP)	ay Fine Sand, some Co	oarse	1591			Product in sample	
25 —	- S11	25'-27'	4"	2, 5, 10, 13	Medium Dense Gr some Gravel, tr Si	ay Fine to Medium Sar It (SP)	nd,	878			п п	
-	S12	27'-29'	9"	2, 4, 9, 16	Medium Dense Gr some Gravel, tr Si	ay Fine to Medium Sar It (SP)	nd,	702		Portland/ Bentonite	• •	
30					Drill and Case Thr	ough Intervals with Pro	oduct			Backfill		

• • • •

PROJ	ECT: Br	odsky Pro	opert	y (DDC)	JOB NO: 600053	392.01	BORING N	IO: BPE	B-16/ MW-6	
LOCA	TION:				ELEVATION: 4.1	1'	DEPTH: 5	57'		
North	11th St	t, Brookly	yn, N	Y	DATE BEGUN: (05/26/06	DATE FIN	SHED:	06/01/06	
DRILL	CONT	RACTOR	: Aqu	ifer Drilling a	nd Testing	GEOLOGIST: S	irish Musthy	ala / Mi	chael Davie	S
DRILL	ING RI	G: CME-7	75			DRILLER: Jerry	Heller	.	<u> </u>	
WEAT	THER: C	Overcast,	60's			DRILL FLUID: V	Vater	HOLE	E SIZE: 4"/3"	Casing
Depth	Sample Number	Sample Depth	Recovery	Blow Counts	SAMPLE	EDESCRIPTIC	NN 문	adi	Monitoring Well onstruction	NOTES
35 —										
-	S13	35'-37'	8"	41, 30, 19, 27	Very Dense Browr	Fine to Medium Sand	(SP) 4	17		Product odor
	S14	37'-39'	9"	5, 5, 11, 18	Medium Dense Da Sand (SP)	ark Gray Fine to Mediu	m 1	83		19 99
40 —	S15	39'-41'	9"	10, 18, 21, 27	Dense Gray Fine t	o Medium Sand (SP)	3	36		
-	S16	41'-43'	9"	11, 17, 33, 50/5"	Very Dense Gray I	Fine to Medium Sand (SP) 9	94		Product in sample
45 —	S17	43'-45'	8"	11, 13, 12, 19	Medium Dense Gr (SP)	ay Fine to Medium Sar	nd 3	38		
-	S18	45'-47'	8"	11, 22, 33, 50/5"	Very Dense Dark (SP)	Gray Fine to Medium S	Sand 18	334		Product in sample
	S19	47'-49'	9"	5, 18, 25, 33	Dense Gray Fine t	o Medium Sand, tr Silt	(SP) 5	94		W U
50 —	S20	49'-51'	9"	14, 17, 19, 19	Dense Gray Fine t	o Medium Sand, tr Silt	(SP) 5	11		ч и
	S21	51'-53'	8"	11, 20, 21, 25	Dense Gray Fine t	o Medium Sand, tr Silt	(SP) !	58		90 H
55	S22	53'-55'	8"	11, 17, 21, 22	Dense Gray Fine t	o Medium Sand (SP)	4	73		11 11
	S23	55'-57'	8"	5, 11, 16, 22	Very Stiff Brown C	• • •	Ę	5.1		Sample collected for lab analysis
	-				Boring	Terminated @ 57'				
60										
65		<u>,</u>								

Page 2 of 2

no Dr Lo Dr	rthin Illed Gged Illin() SURF/ IG: BY: BY: G DETA	6887 Zebra Maura Maura	(860) ELEVA ⁻ 730.17 Envir MacL Geop	onmenta .eod	: TING / Lu	: ke Cal	GEI PF 12 6418 ballerc	ROJECT NUMBE 2.23 LO 223.66 TO DA	Brooklyn, New York R:093060 CATION: _North 11th Stre TAL DEPTH (FT):65.00 TUM VERT. / HORZ.:NAN TE START / END:6/17/20	/D 88 / I	
			SAM	PLE IN	IFO	4	്റ					
	PTH T.	TYPE and NO.	PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		ROCK TION	
- - <u>7</u> -	0	S1	5.0		0.4				WWMW-06 (0.5-1.5)	(0'- 5') WIDELY GRADED S coarse, ~5% gravel, fine, ~5 brown, hand cleared.		
-	5	S2	5.0	5				NLO		(5'- 6.5') SILTY SAND (SM) fines, non plastic; slight nap (6.5'- 10') WIDELY GRADE coarse, ~10% gravel, fine to size 1 in., moderate naphtha	hthalen D SANI o coarse	e-like odor, brown. D (SW); ~85% sand, fine to , ~5% fines, non plastic; ma
	40				581			NLO		interbeds, lenses of petroleu		
	10	S3	5.0	4.42		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <td></td> <td>NLO NLO</td> <td></td> <td>(10'- 11') WIDELY GRADEI sand, fine to medium, ~10% naphthalene-like odor, brow (11'- 13') WIDELY GRADEI coarse, ~5% fines, non plas brown, sheen, tar-like blebs</td> <td>5 fines, i n, shee D SANE stic; stroi</td> <td>non plastic; moderate n. 0 (SW); ~95% sand, fine to ng naphthalene-like odor,</td>		NLO NLO		(10'- 11') WIDELY GRADEI sand, fine to medium, ~10% naphthalene-like odor, brow (11'- 13') WIDELY GRADEI coarse, ~5% fines, non plas brown, sheen, tar-like blebs	5 fines, i n, shee D SANE stic; stroi	non plastic; moderate n. 0 (SW); ~95% sand, fine to ng naphthalene-like odor,
					1601	•••••••• •••••••• •••••••		NLO		(13'- 14.4') WIDELY GRAD coarse, ~5% fines, non plas brown, tar-like coating.	tic; stro	ng naphthalene-like odor,
-	15	S4	5.0	3				PLO NLO		(14.4'- 15') WIDELY GRAD coarse, ~5% fines, non plas sheen, black petroleum-like	tic; stro	ng petroleum-like odor, blac
					3194	****		NLO		(15'- 15.6') WIDELY GRAD medium, ~5% fines, non pla brown, moderate petroleum (15.6'- 17.1') WIDELY GRA medium, ~5% fines, non pla	ED SAÑ Istic; mo and sul DED S/	ND (SW); ~95% sand, fine to derate naphthalene-like odd fur-like odor. AND (SW); ~95% sand, fine
								NLO		brown, tar-like coating. (17.1'- 18.3') WIDELY GRA	DED S/	AND (SW); ~95% sand, fine
								OLO		medium, ~5% fines, non pla brown, tar-like staining. (18.3'- 19.3') SILTY SAND		0
-	20					····		OLO		non plastic; slight organic-li	ke odor,	brown, slight burnt/sulfur-lil
PEN REC	= REC = PHO	OVERY L	ENGTH	OF SAM				İN	om = PARTS PER M I. = INCHES T. = FEET	ILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OD	ODOR DOR	CrLO= CREOSOTE LIKE ODO OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

GE	Cons		455 W Glasto (860)	ionsultants, /inding Bro onbury, CT 368-5300	ok Ro	oad 33	PROJI CITY/S		illiamsburg MGP RI Brooklyn, New York	PAGE 2 of 3	BORING LOG WWMW-06
DEPTH FT.	TYPE and NO.	SAM PEN FT.	REC FT.	PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		IL / BEI Escrif	DROCK DTION
- 20	S5	5.0	3				SLO				SAND (SP); ~95% sand, fin
							PLO		~5% fines, non plastic; sligh burnt/sulfur-like odor.	0	
							PLO		fine; slight sulfur-like odor, t	prown, s	
				2567			NLO		plastic; slight petroleum-like	odor, b	
						•	NLO		coarse, ~10% gravel, fine to	o coarse	
- 25							NLO		size 1.5 in., slight petroleum		
- 25	S6	5.0	4.42				NLO		orange and reddish brown.		RAVEL (GW); fine to coarse RAVEL (GW); fine to coarse
				2310			NLO		strong naphthalene-like odc coating. (23.1'- 24.2') WIDELY GRA coarse, ~10% gravel, fine to strong naphthalene-like odc	or, orang DED S. D coarse or, brown	ge and reddish brown, tar-lik AND (SW); ~85% sand, fine e, ~5% fines, non plastic; n, tar-like coating.
- 30							NLO		(24.2'- 25') WIDELY GRAD coarse, ~10% gravel, fine to naphthalene-like odor, brow (25'- 25.8') WIDELY GRAD ~90% sand, fine to medium	o coarse n. ED SAI	ND WITH SILT (SW-SM);
	S7	5.0	3.75	2205					coarse, ~5% fines, non plas brown, tar-like coating. (28.1'- 30') SILTY SAND (S fines, medium plasticity; stro	DED S stic; stro P); ~70 ong nap); ~70%	AND (SW); ~95% sand, fine ng naphthalene-like odor, % sand, fine to medium, ~30 hthalene-like odor, brown. sand, fine to medium, ~30%
- 35	S8	5.0	2.25	1300			NLO				
- 40	S9	5.0	1.92	286			NLO		(40'- 45') SILTY SAND (SP fines, medium plasticity; stro		sand, fine to medium, ~30% hthalene-like odor, brown.
REC = REC ID = PHO	OVERY L	ENGTH	OF SAM	Sampler o IPLE DR READING			IN	pm = PARTS PER M I. = INCHES T. = FEET	ILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE O ALO = ASPHALT LIKE OD	ODOR	R CrLO= CREOSOTE LIKE ODO OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR

GE	Cons	ultants	(860)	onbury, CT 368-5300	1	~		STATE: ROJECT NUMBI	Brooklyn, New York ER:093060	PAGE 3 of 3	WWMW-06			
DEPTH FT.	TYPE and NO.	SAM PEN FT.	REC FT.	IFO PID (ppm)	STRATA	VISUAL IMPACTS	ODOR	ANALYZED SAMPLE ID		SOIL / BEDROCK DESCRIPTION				
							NLO							
- 45	S10	5.0	1.33	9316			NLO		(45'- 50') WIDELY GRADE medium, ~5% fines, non pla brown, sheen, tar-like stain	astic; str				
- 50	S11	5.0	4.17	>9999			NLO	WWMW-06 (50-52)	(50'- 54') WIDELY GRADE medium, ~5% fines, non pla brown, sheen, lense of fine coating.	astic; str	ong naphthalene-like odor,			
- 55							NLO		fine; strong naphthalene-like	e odor, l				
	S12	5.0	2.25				NLO		(55'- 57.6') SILT (ML); ~90' fine; moderate naphthalene	% fines, -like odo	medium plasticity, ~10% sand, or, brown.			
				94.9			NLO	WWMW-06 (58-60)	medium, ~5% fines, non pla brown.	astic; mo	AND (SW); ~95% sand, fine to oderate naphthalene-like odor,			
— 60	S13	5.0	2.25	0.0			NLO NLO			nalene-li L); ~90% naphtha	ke odor, brown.			
- 65									Bottom of borehole at 65.0	feet.				
NOTES:														
PEN = PEN REC = REC PID = PHC	OVERY L	ENGTH	OF SAM				١١.	pm = PARTS PER M N. = INCHES T. = FEET	IILLION NLO = NAPHTHALENE LI PLO = PETROLEUM LIKE TLO = TAR LIKE ODOR CLO = CHEMICAL LIKE C	ODOR	R CrLO= CREOSOTE LIKE ODOR OLO = ORGANIC LIKE ODOR SLO = SULFUR LIKE ODOR MLO = MUSTY LIKE ODOR			

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 intallation 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 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 ($\mu g/m^3$), 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 <u>Major Vapor Emission Response Plan</u>

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 <u>Particulate Monitoring, Response Levels and Actions</u>

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 μ g/m³. In addition, fugitive dust migration will be visually assessed during all work activities.

If the downwind PM-10 particulate levels are 100 μ g/m³ 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 μ g/m³ 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 μ g/m³ 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 μ g/m³ 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

	TAGE
JOB NO.	11176638
MADE BY: RUT	DATE: 9-19-13
MADE BY: CHECKED BY: MAR	DATE: 9/19 2013

OF

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.

URS Corporation

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

	PAGE OF
JOB NO.	11176638
MADE BY: RAT	DATE: 9-19-13
CHECKED BY: MAG	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, 2nd 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

		Form	ation Soil (Base)	Max Allow	Native Soi	as "Filter"		Filt	er	
Boring	Depth (feet bgs)	D ₁₅ (mm)	D _{so} (mm)	D ₈₅ (mm)	Slot Size D _{#S} /1.3 (mm) (E)		10 Slot (0.25 mm) NOTE 1)	(A) (D ₁₅) _F must be > (4)(D ₁₅) ₈ (mm)	(B) (D ₁₅) _F must be < (5)(D ₈₅) ₈ USE FINEST (mm)	(C) (D ₅₀) _F must be < (25)(D ₅₀) ₈ (mm)	(D) (D ₁₅) _F must be < (20)(D ₁₅) ₈ USE COARSES (mm)
SB-100	23-29	0.0045	0.12	0.8	0.6	ок	ОК	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	ОК	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	ОК	ОК	0.012	4.3	2.00	0.06
SB-102	35-41	0.09	0.2	0.4	0.3	Not OK	ОК	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	ОК	ОК	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	ОК	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:

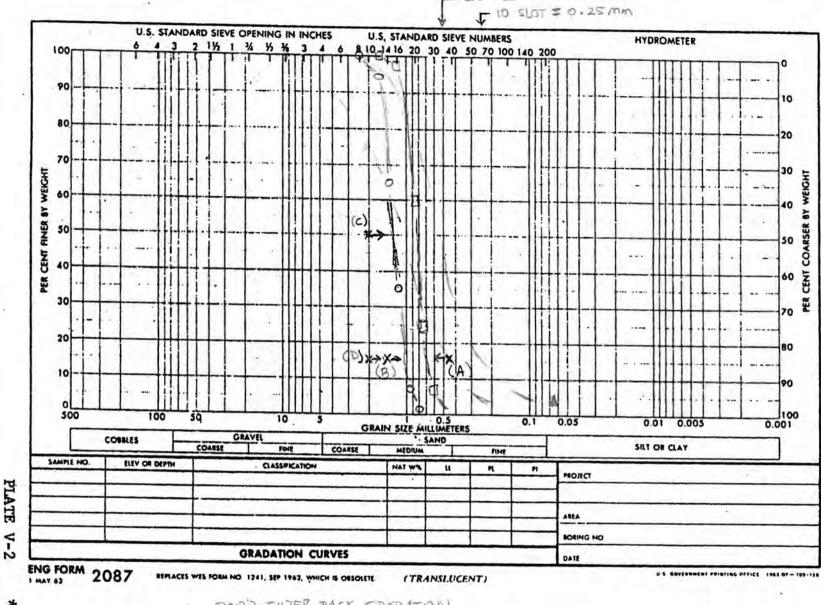
(1) "OK" means natural formation may be acceptable provided minimal fines pass chosen slot size (normally up to 10% may pass slot size per Driscoll Ref.). Inspection of native soil grain size curves show, however, that typically at least 50% passing slot size as small as 10 slot (0.25 mm). Therefore, native soil <u>not</u> 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.

Description	Project No. 11176638 Computed by FJP Checked by MAG	Date	of 9-17-13 9(19(-13) 9(19(-13)
		1	Reference
Following NAVEAC FIGURE 4			
$\frac{(D_{15})_F}{(D_{15})_B} > 4 \implies (D_{15})_F$	> (4 X D15)B	HEAD LOSS CRITERIA	(A)
$(D_{15})_{E} < S \implies (D_{15})_{E}$	< (SYDBS)B		(B)
(Das)e	2 FINEST	soil	
$(D_{50})_F < 25 \implies (D_{50})_F$	< (25 X.Dso)B		(<)
(Dso)B	Luse 40 if C.	1>4 Cu=	60 K
$\frac{(D_{IS})_{F}}{(D_{IS})_{B}}$ < 20 => $(D_{IS})_{F}$	< 20 (Dr.)B 2 COARSE		(2)
(DBS) F/SLOT > (1.2 to 1.4) = WIDTH	> SLOT WIDTH <	(D'85)F 1.3	(€)
Typical Slot Widths 0.010 inch x 25.4 mm/ 0.020 inch	h = 0.25 = 0.50		
First step : Use Equation (E) cap act as "filter" for	to detin if n typical slot widt	ative soil	
screen zone is the 25ft above is Investigate soils at about	top at day the 30 to 60 feet b	t is ~ 60f 50.	ert days.



- 20 SLOT = 0.50 mm

V-28

*

X = RED'D FILTER PACK GRADATIONS MAX. FILTER SIZE 3" PER NAVFIC MAX. % FINES 5% PER NAVFAC

D = FILPRO #1 D = FILPRO #0

= NYSDOT 703-07

CONCRETE SAND

EM 1110-2-1906 Appendix V 30 Nov 70

*

URS Corporation

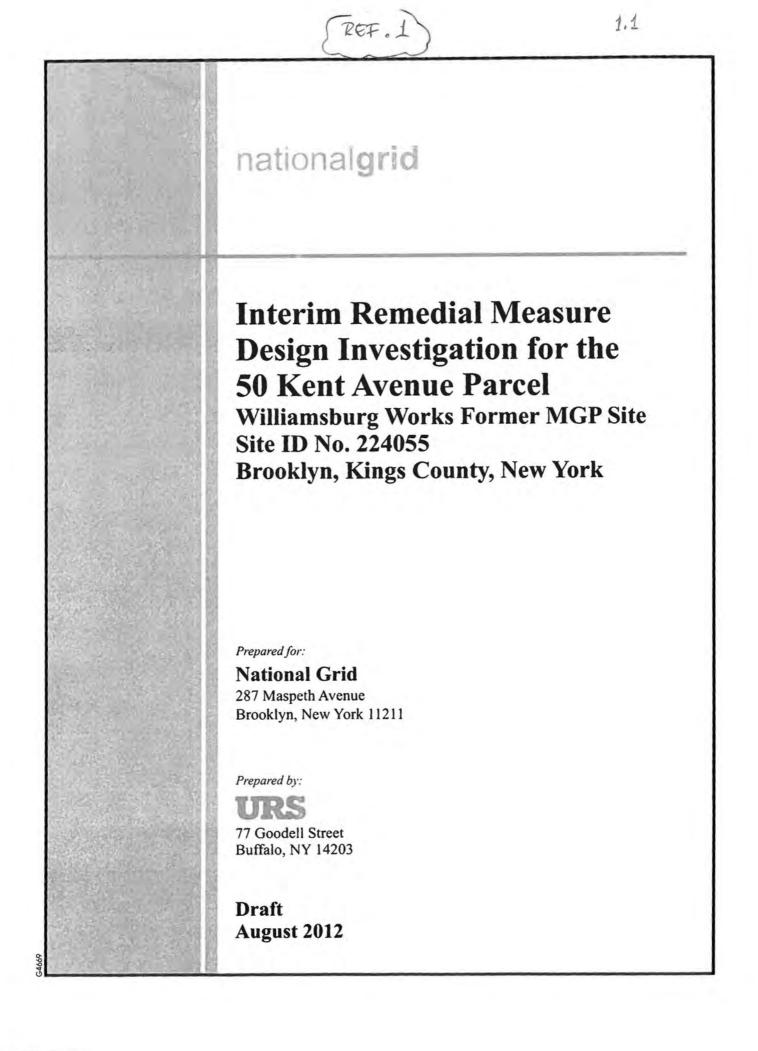
PROJECT: Nat Grid Wmsbrg NAPL Well SUBJECT: Well Screen/Filter

		PAGE		OF
1 m + 1 14	JOB NO.	11176	638	
MADE BY:	RDP	DATE:	9-19	1-13
CHECKED BY:	MAG	DATE:	alia	213

REFERENCES

(Attached)

I:\11176638\Design\Calc_NAPL Well Screen and Filter.doc



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

SAMP	LE IDENTIFICA	TION				NDEX TE	STS		 Control 	12-20-	1		INGINEERI	NG TESTS			REMARKS
BORING NO	SAMPLE NO.	DEPTH	USCS SYMB. (1)	LIQUID	PLASTIC LIMIT	PLAS. INDEX	SIEVE MINUS NO. 200	HYDRO. % MINUS 2 µm	ORGANIC CONTENT (burnoff)	TEST TYPE	WATER CONTENT	TOTAL UNIT WEIGHT	DRY UNIT WEIGHT	HYDRAULIC CONDUCTIVITY	PEAK COMP. STRESS		
		(ft)		(-)	(-)	(-)	(%)	(%)	(%)	1.1	(%)	(pcf)	(pcf)	(cm/sec)	(psi)	(%)	
SB-100	S-3,4,5	9-15	SC-SM	22	17	5	40.0	9	A CONTRACTOR OF	w	17.1	1.12	1.5.3	10 million (1997)	20.0		
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	8 20 2				1000	1
SB-100	· · · · · · · · · · · · · · · · · · ·	59-61		10000			(i			UW	a chadai	126.6	1.00			1.0	1.000-2
SB-100		59.35		1.1.1.1		1	1.000			w	30.1	1		1	12.21		
SB-100	A	59.6	1				1		1.1 MIN	K	24.0	128.4	103.6	2.1E-8	1	1.000	P9395
SB-100		59.9	1 *	1.0.0.0	1.2.25	19.00.00	1	2000	11.12	w	23.6			Prof. Science	10000	1.5	
SB-100	В	60.15	CL	48	23	25	91.5	41		UC	21.8	131.0	107.6		32.6	8.4	UC122t
SB-100		60.45	10000	1.111	100000	10125			1	w	20.2	1.10.23		1			1.1
SB-100	S-31,32,33	67-73	SC-SM	24	18	6	47.2	6	1	w	23.8		1.1.1.1		1000		
SB-100	S-35,36	75-79	SM	27	22	5	47.3	8		w	29.9	1.000	1.000				
SB-101	S-2,3,4	7-13	SM	np	пр	np	27.7	5		w	15.5				-	1922	
SB-101	S-8,9,10	19-25	SM	np	np	np	21.3	5		w	15.7				0.000.0		
SB-101	S-17,18,21	37-47	SC	30	19	11	37.4	11		w	16.0	1.000	D		1.200	12 22 2	
SB-101	S-20	43-45	SC	30	18	12	49.2	12		w	12.0	1	1.1.1.1.1.1.1	10000	5.000	9 m v	1
SB-101		59-61		1.5		12.72		1.1		UW	1. 14 5.	128.7	1.000	1	6.720.		
SB-101	A	59.4	CL	45	25	20	90.0	41	1	w	27.2		2. 6. 19				
SB-101		59.7		10.000						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 N

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

SAMP	LE IDENTIFICA	TION			I.	INDEX TE	ESTS					I	ENGINEER	NG TESTS			REMARKS
BORING NO.	SAMPLE NO.	DEPTH	USCS SYMB. (1)	LIMIT	PLASTIC	INDEX	SIEVE MINUS NO. 200	HYDRO. % MINUS 2 μm	(burnoff)	TEST TYPE		TOTAL UNIT WEIGHT	DRY UNIT WEIGHT		PEAK COMP. STRESS	STRAIN @ PEAK STRESS	
SB-102	S-5,6,7	(ft) 13-19	SM	(-)	(-)	(-)	(%) 15.9	(%) 2	(%)		(%)	(pcf)	(pcf)	(cm/sec)	(psi)	(%)	
				np	np	np				w	19.4						
SB-102	S-9,10,11	21-27	SP-SM	np	np	np	11.5	2		W	23.9	-			10 million (17)		
SB-102	S-16,17,18	35-41	SP-SM	np	np	пр	11.6	2		W	21.3						
SB-102	11	63-65			1.000				· · · · · · · · · · · · · · · · · · ·	UW		111.3			A		
SB-102		63.4				1.20				W	20.4	1.77.1	1.1.1.1			1	
SB-102	B	63.65					Contract	1.5.5.5		K	31.5	122.6	93.2	5.8E-8	10.512	1	P9396
SB-102		63.95		6.003	12.902		10.000	1.27		w	31.5	10.00	1.1.1.1.1		10.00		1.1
SB-102	C	64.2	CL	47	22	25	83.2	41		UC	26.7	126.2	99.6	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	10.3	15.0	UC123e
SB-102	S-33,34,35	71-77	CL	41	23	18	97.9	33		W	29.0			P. S. SARA			
	S-38,39,40	81-87	CL	32	20	12	55.7	32	4.4	w	23.5				1		e 233
SB-103	S-5,6,7	13-19	SM	np	np	np	29.7	4		w	16.4	1000		12223			-
SB-103	S-10,12,13	23-31	CL	33	17	16	64.4	11	1	w	17.0	14 pp. *1	no servi		1		
SB-103	S-20,21,22	43-49	SP-SM	qn	np	np	10.3	2	11000	w	17.9	1.1.1					2.000
SB-103	S-26,27,28	55-61	SC	26	17	9	43.1	7		W	24.2					P	 molocit
SB-103	S-33,34,35		CL	26	15	11	59.7	15		w	24.7	1000	· · · · ·		1000		
SB-103		75-77								UW		125.3	1				
SB-103	A	75.15	-	1						K	26.2	125.9	99.8	2.3E-8	11000		P9394
SB-103		75.4								w	25.8		1. 1			1-2-2-2-2	
SB-103	В	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.

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 2 of 2 E.

¥ 1 SILT OR CLAY COBBLES GRAVEL SAND 0 Symbol COARSE FINE COARSE MEDIUM FINE Boring SB-100 SB-100 SB-100 U.S. Standard Sieve Size S-3,4,5 S-10,11,12 S-18,19,20 Sample 1 1/2 Depth 9-15 23-29 39-45 #200 #100 3/4" 3/8" 4 5 #10 #20 120 09# % +3" 0.0 0.0 Ŧ 0.0 100 % Gravel 6.1 4.6 11.2 % SAND 53.9 53.9 48.5 %C SAND 3.5 5.0 5.1 90 101 %M SAND 12.4 15.4 12.8 jų. %F SAND 37.9 33.5 30.6 80 III ж % FINES 40.0 41.5 40.3 % -24 9 11 10 M 70 PERCENT PASSING BY WEIGHT D100 (mm) 19.00 19.00 19.00 i. Ъ 0.20 0.22 0.24 D₆₀ (mm) IIIII 60 0.03 0.02 D30 (mm) 0.05 D10 (mm) 1 1 50 Cc Cu -Particle 40 Size PERCENT FINER 11111 111 0 1 111 (Sieve #) 30 TM 4" tt 3" 20 1 1/2" 3/4" 100.0 100.0 100.0 I 10 3/8" 97.1 98.7 91.7 Ш ШП 4 93.9 95.4 88.8 1 0 10 90.4 90.4 83.7 10 100 0.1 0.01 0.001 79.2 20 86.2 85.9 PARTICLE SIZE -mm 40 70.9 77.9 75.0 60 61.4 66.5 63.3 SYMBOL w (%) LL PL USCS DESCRIPTION AND REMARKS Date Tested 100 53.0 51.6 PI 54.1 22 SC-SM Brown, Silty, clayey sand 4/30/2012 17.1 17 5 200 41.5 40.3 40.0 **URS** Corporation TerraSense, LLC 14.5 SM Brown, Silty sand 4/30/2012 np np np T11176638 11176638 15.3 26 21 SC-SM Gray, Silty, clayey sand 4/30/2012 PARTICLE SIZE DISTRIBUTION 0 5 National Grid - Williamsburg Works Former MGP Site

Analysis File: 3SV-MasterRev3

siev1a.xls 5/17/2012

COBBLES	G	RAVEL	100	S	AND	SILT OR CLAY		Symbol			0
	COARSE	FINE	COARSE	MEDIU	IM FINE			Boring	SB-100	SB-100	SB-100
			U.S.	Standard S	ieve Size			Sample	в	S-31,32,33	S-35,36
1.1	1/2.	5 6				9		Depth	60.15	67-73	75-79
4	- 0	3/4"	#	#10	#40 #60	#200		% +3"	0.0	0.0	0.0
100 TT	trrt r	1 1	TP		THE WHY I			% Gravel	0.0	0.2	0.0
H			H#1 F					% SAND	8.5	52.6	52.7
90								%C SAND	0.2	2.7	0.1
ų.		- <u> </u>		1 11				%M SAND	0.6	0.4	0.6
80 1								%F SAND	7.7	49.5	52.0
- U		1 11					1	% FINES	91.5	47.2	47.3
							1:0===0)	%-2µ	41	6	8
도 ⁷⁰							1221	D ₁₀₀ (mm)	4.75	9.50	4.75
PERCENT PASSING BY WEIGHT		1 11					1 14- 1	D ₆₀ (mm)	0.01	0.10	0.10
\$ 60		1 11		1 11				D ₃₀ (mm)	0.00	0.03	0.02
8						₩<u>₩</u>₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩₩		D10 (mm)	1.1.1		
Z 50 H	∰┼┼┽┼							Cc			
SS H	∦┼┼┼			1-11				Cu			
a 40 H			444	1 1			-	Particle			
			H i I I					Size	PE	RCENT FIN	
2 30				1 1				(Sieve #)			0
a li				1 1				4"			
20							<u> </u>	3"			
				1		IIIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		1 1/2"			
								3/4"		Contract I	
10			11111				8	3/8"	Augert .	100.0	1000
								4	100.0	99.8	100.0
100		10		- <u>1</u> -1	0.		0.001	10	99.8	97.1	99.9
100		10			ARTICLE SIZE -mm	1 0.01	0.001	20	99.5	97.0	99.8
					ARTICLE SIZE -mm			40	99.2	96.7	99.3
and I		1		L and a			la serie	60	98.5	95.5	96.4
	(%) LI		PI	USCS		IPTION AND REMARKS	Date Tested	100	96.8	81.0	79.5
	48	23	25	CL	Reddish brown, Lean	ciay	5/2/2012	200	91.5	47.2	47.3
_	_	-			A		100000	TerraSe	nse, LLC	URS Cor	poration
- 23	3.8 24	18	6	SC-SM	Gray, Silty, clayey sar	d	4/30/2012		-	47.4	
_			-	-			-	the second second second second second second second second second second second second second second second se	76638		6638
0 29	9.9 27	22	5	SM	Gray, Silty sand		4/30/2012			E DISTRIBL	
20. St. V	- 21 24	a de la companya de l	1	the second second			1	National G	rid - Williamst	ourg Works For	mer MGP

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OBBLES	5	GRA	VEL		5	SAND	SILT	OR CLAY	-	Symbol			0
	12	COARSE	FINE	COARSE	MEDIL	JM FINE		and a start of		Boring	SB-101	SB-101	1
		1.5	100	U.S.	Standard S	Sieve Size				Sample	S-2,3,4	S-8,9,10	
		1 1/2"							1.01	Depth	7-13	19-25	
	4 5		3/8"	#	#10	#40 #60 #100				% +3"	0.0	0.0	
100 -	TT:th	11 191 1	> thr		1 1	reet and a start and	1177-1	DITTTT		% Gravel	23.0	6 1	
	114	HIV			4_4					% SAND	49.3	72.6	
90 -	111	$H \downarrow \Lambda$							14 Aug	%C SAND	2.9	5.3	
	Hil									%M SAND	10.0	25.1	
80 -	Hiji.									%F SAND	36.3	42.2	
00	THE			Her		NIIIIIIII				% FINES	27.7	21.3	
	TH I			UT	9					% -2μ	5	5	
북 ⁷⁰	甘耕	\mathbf{m}			1 1					D ₁₀₀ (mm)	37.50	19.00	
EIG	†廿				1-11					D ₆₀ (mm)	0.36	0.39	
\$ 60 -	卌	++++-			+ -					D ₃₀ (mm)	0.09	0.13	
8	HW	HHH			+ -					D10 (mm)	1.00		
S 50 -	1114	HHH			+ #				_	Cc			
SS	H#				1-1				1	Cu			
a 40 -										Particle		a second	1.0
LN	ЦЩ				1 1				-	Size	PE	RCENT FIN	ER
PERCENT PASSING BY WEIGHT	111									(Sieve #)			0
E .	111								1.1	4"		1 m m	
20 -						N				3"			
20	III									1 1/2"	100.0		
	Th			TITT					1.1	3/4"	79.5	100.0	
10 -	th	$\mathbf{H}\mathbf{H}\mathbf{H}$		HIT	1 1					3/8"	77.9	96.7	
	Htt	11111	111 i	tt t	1 1					4	77.0	93.9	
0	11.00				<u> </u>					10	74.0	88.6	
1	00		10		1	0.1		0.01	0.001	20	70.9	81.1	
						PARTICLE SIZE -mm				40	64.0	63.5	
				-						60	53.7	46.1	
	w (%)	_	PL	PI	USCS		ION AND REMAR	KS	Date Tested	100	40.8	32.2	
	15.5	np	np	np	SM	Black, Silty sand with gra-	vel		5/1/2012	200	27.7	21.3	
-	15.5	-	-		-	D			10000010	ТеггаSe	nse, LLC	URS Co	rporatio
	15.7	np	np	np	SM	Brown, Silty sand			4/30/2012	T111	76638	1117	6638
0	-	-		-	-				1		RTICLE SIZ		
			1 1						1	the second second second second second second second second second second second second second second second se	rid - Williamsbu		

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SC

COBBLES	G	RAVEL		S	AND	SILT OR CLAY		Symbol			0
	COARSE	FINE	COARSE	MEDIU	M FINE			Boring	SB-101	SB-101	SB-101
			U.S.	Standard S	ieve Size			Sample	S-17,18,21	S-20	Α
1.04	112"	5 E			0 0			Depth	37-47	43-45	59.4
4	- m	3/4"	1	#20	#40 #60 #100 #200			% +3"	0.0	0.0	0.0
100 TT	111111			9-10	Treh el r t- unde			% Gravel	9.0	6.0	0.0
4	₩1114			1 - 11	TTO TOL III	┼┼┼┼┼──╢╢┼╽╿ ┼		% SAND	53.6	44.8	10.0
90			The		11 mayo			%C SAND	4.6	5.0	0.1
4	<u> IIIII</u>					Taa		%M SAND	17.4	12,2	2.8
80						III Na IIIIII		%F SAND	31.6	27.7	7.1
								% FINES	37.4	49.2	90.0
					INNI	IIII Nalli		% -2µ	11	12	41
\ ₽ 70				1 11				D ₁₀₀ (mm)	19.00	9.50	4.75
BI I								D ₆₀ (mm)	0.29	0.16	0.00
PERCENT PASSING BY WEIGHT	11111			1 11				D ₃₀ (mm)	0.04	0.01	0.00
	***	+ #		1 11		 		D ₁₀ (mm)	1.1.1.1.1.1		
Z 50	╢┼┼┼┼			+ -		 		Cc			
SS						XIIIII 	\downarrow	Cu	14 Carro Carro Carl	C	0-0-
40	44444	<u>↓</u>					9	Particle		- in the second	
	<u> </u>		444	1 11				Size	PE	RCENT FIN	
2 30		- HI		1 11			-1	(Sieve #)			0
a li								4"			
20								3"			
~ []							0	1 1/2"	200		
								3/4"	100.0	104.5	
10	MILLI						707	3/8"	94.3	100.0	1.000
1		1 11						4	91.0	94.0	100.0
100	<u></u>			1		0.01	0.001	10	86.4	89.0	99.9
100		10			0.1 ARTICLE SIZE -mm	0.01	0.001	20	80.3	84.9	98.9
					ARTICLE SIZE -ININ			40	69.0	76.8	97.1
and a large		1		T			In or and	60	57.2	67.3	94 6
	(%) LL		PI	USCS		ION AND REMARKS	Date Tested	100	47.5	59.3	92.7
1	6.0 30	19	11.	SC	Gray, Clayey sand		4/30/2012	200	37.4	49.2	90.0
		_	- 10				10000040	TerraS	ense, LLC	URS Co	rporation
13	2.0 30	18	12	SC	Brown, Clayey sand		4/30/2012		170000		
-	_	_							176638		76638
0	45	25	20	CL	Red, Lean clay		3/7/2012		RTICLE SIZ		
v		23	20	OL I	rico, Lean day		5/12012		Frid - Williamsb		

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COBBLES	GRA	VEL		5	SAND	SILT OR CLAY		Symbol	D		0
	COARSE	FINE	COARSE	MEDI	UM FINE			Boring	SB-102	SB-102	SB-102
			U.S.	Standard S	Sieve Size			Sample	S-5,6,7	S-9,10,11	S-16,17,1
	112	4						Depth	13-19	21-27	35-41
4	3"	3/8"	1	#10	#40 #60 #100	2		% +3"	0.0	0.0	0.0
100 T	the R. d	- Arres			the second state of the second state of the	http://www.com		% Gravel	33.9	39.2	0.0
								% SAND	50 2	49.3	88.4
90 -				1 1				%C SAND	7.6	9.7	0.5
								%M SAND	18.5	18.2	12.5
80								%F SAND	24.2	21.4	75.4
00 1								% FINES	15.9	11.5	11.6
		R		1 1		<u>9111111111111111111111111111111111111</u>		% -2µ	2	2	2
북 ⁷⁰		N	NLT I	1 11				D100 (mm)	37.50	37.50	4.75
E E				1 1		╬╁┼╅╶╁╴╴╊╫╫┼╿┤╴		D ₆₀ (mm)	2.54	4.53	0.24
3 60			KN					D ₃₀ (mm)	0.24	0.37	0.15
6			HX	1 11				D10 (mm)		0.05	0.06
N 50								Cc		0.6	1.6
SS								Cu		89.6	4.0
a 40 -				1 11				Particle		110.70	
PERCENT PASSING BY WEIGHT			61					Size	PE	RCENT FIN	IER
2 30								(Sieve #)			0
ä		[]]			III XXY II			4"			
20								3"			
								1 1/2"	100.0	100.0	f .
10		— IIII						3/4"	87.8	79.0	
10 1		1111	111	1 1			- C	3/8"	74.0	70.4	1.10
				1 1				4	66.1	60.8	100.0
0 + 10		10		i li	mier p			10	58.5	51.1	99.5
10	0	10		1	0.1	0.01	0.001	20	51.1	44.9	97.2
					PARTICLE SIZE -mm			40	40.0	32,9	87.0
ave at 1								60	30.5	23.3	62.4
	(%) LL	PL	PI	USCS		TION AND REMARKS	Date Tested	100	23.1	16.9	29.3
	9,4 np	np	np	SM	Brown, Silty sand with g	ravel	4/30/2012	200	15.9	11.5	11.6
		-						TerraSe	nse, LLC	URS Co	rporation
. 2	3.9 np	np	np	SP-SM	Brown, Poorly-graded sa	and with silt and gravel	4/30/2012	=	11111		
-				-					76638		76638
0 2	1.3 np	np	np	SP-SM	Brown, Poorly-graded sa	and with silt	4/30/2012	PA	RTICLE SIZ	E DISTRIB	UTION

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COBBLES	GRA		L. I	-	AND	SILT OR CLAY	1.1	Symbol			0
	COARSE	FINE	COARSE		1 1 1 1	have been a set of the second		Boring	SB-102	SB-102	SB-102
			U.S.	Standard S	ieve Size			Sample	С	S-33,34,35	S-38,39,4
÷.,	1/2	3/4"				2		Depth	64.2	71-77	81-87
4	m +	3/4"	#	#10	#40 #100	007		% +3"	0.0	0.0	0.0
100 TT		t fitt	PTT	9 P	THE PARTY OF			% Gravel	0.0	0.0	0.3
t t				1 11				% SAND	16.8	2.1	44.0
90				+ #	HH Rhall			%C SAND	0.1	0.0	0.5
H				1		<u><u>₩</u><u></u></u>		%M SAND	3.2	0.5	2.4
80				1 11				%F SAND	13.4	1.6	41.1
H				1				% FINES	83.2	97.9	55.7
F 70			LLL		11119			%-2μ	41	33	32
B			III.					D ₁₀₀ (mm)	4.75	4.75	9.50
PERCENT PASSING BY WEIGHT					N N			D ₆₀ (mm)	0.01	0.00	0.09
× °				1 11				D ₃₀ (mm)	0.00	0.00	0.00
5				1 11				D ₁₀ (mm)			
N 50 1				1 11		11 0 0 00 00 00 00 00 00 00 00 00 00 00		Cc			
AS T				1 11				Cu			
E 40 H			++++-	+ #			₩a – l	Particle			
				1 11		₩ 		Size		RCENT FIN	
H 30 H				+			11	(Sieve #)			0
□				+			1/2	4"	100 100 100		the second second
20				1 11			10	3"			
4				4				1 1/2"			
10				1 11				3/4"			as also
								3/8"	1000		100.0
ل ا								4	100.0	Sec.	99.7
100		10		1	0,1	0.01	0.001	10	99.9	100.0	99.2
1.125				P	ARTICLE SIZE -mm	0.01	0.001	20	99.0	99.9	99.0
							1.1	40	96.6	99.5	96.9
YMBOL W (%) LL	PL	PI	USCS	DESCOUR	TION AND REMARKS	Data Tanta d	60	92.5	98.9	90.4
	47	22	25	the second second second second second second second second second second second second second second second se	Reddish brown, Lean cla		Date Tested 5/2/2012	100	88.3	98.3 97.9	73.7
			2.0	9°-	Coulon Drown, Lean on	ay with solid	5/2/2012		83.2		55.7
B 29	.0 41	23	18	CL	Gray, Lean clay		5/1/2012	TerraSe	nse, LLC	URS Col	poration
	17 A.		10	UL I	oray, Lean day		5/1/2012	T144	76638		0000
0 23	.5 32	20	12	CL	Gray, Sandy lean clay		5/1/2012				6638
0 20	02	20	14	UL I	Gray, Sandy lean day		5/1/2012	PA	CITCLE SIZ	E DISTRIBU	JION

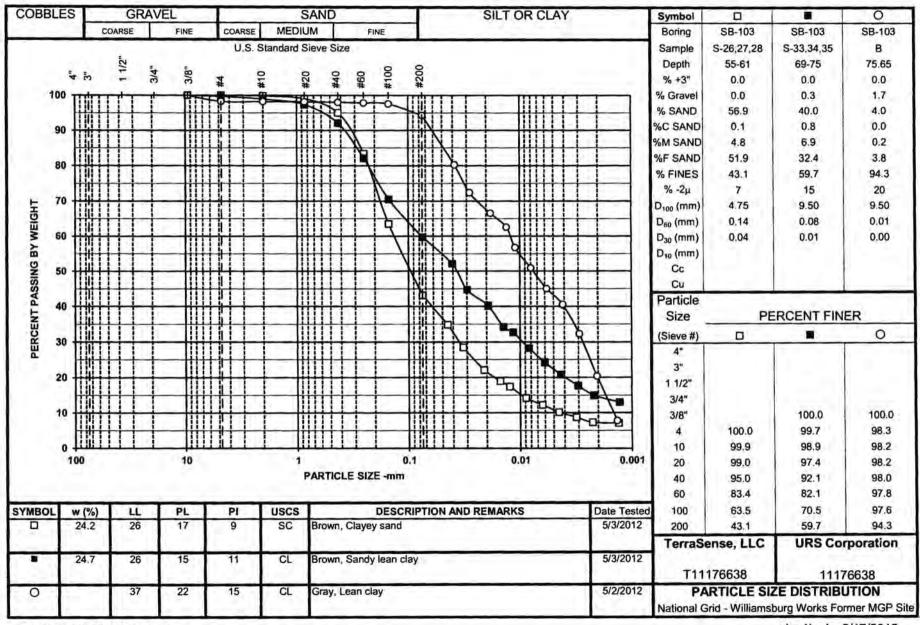
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COBBLES	GRA	VEL		5	SAND	SILT OR CLAY		Symbol	D		0
	COARSE	FINE	COARSE	1				Boring	SB-103	SB-103	SB-103
	1.000		U.S.	Standard S	Sieve Size	Contraction of the local data		Sample	S-5,6,7	S-10,12,13	S-20,21,2
	112							Depth	13-19	23-31	43-49
4 5	2 11 4	3/8"	1	#10	#40 #60 #100 #200			% +3"	0.0	0.0	0.0
100 111	http://t	0	-	* 1	received a long			% Gravel	1.5	2.0	1.0
1								% SAND	68.8	33.6	88.7
90								%C SAND	2.6	4.3	2.1
								%M SAND	14.9	6.7	23.8
80								%F SAND	51.4	22.6	62.9
00 []]				1 1			1.0	% FINES	29,7	64.4	10.3
M	911111				IN VBII			% -2µ	4	11	2
₽ ⁷⁰				1 1				D100 (mm)	9.50	9.50	9.50
PERCENT PASSING BY WEIGHT								D ₆₀ (mm)	0.22	0.07	0.33
≥ 60				1				D ₃₀ (mm)	0.08	0.01	0.18
	$\mathbf{H} + \mathbf{H} + \mathbf{H}$			+ +		N		D10 (mm)			0 07
Z 50 H	<u> </u>			+ +		<u>+Nġ </u>		Cc			1.5
SS H					1111 191 b 110	<u> </u>		Cu			4.9
a 40 11				1 1				Particle		1. (a) 2010 Young	
S H			LLL				· · · · · · · · · · · · · · · · · · ·	Size	PE	RCENT FIN	ER
2 30 H								(Sieve #)			0
a III								4"			
20							12 42 1	3"	3		
[]]								1 1/2"			
10			MIE					3/4"	1000	and the second	1.00
10 111				1 1		Not-of-on MILLING		3/8"	100.0	100.0	100.0
H				1 1		HI	1-0-1	4	98.5	98.0	99.0
0 100				i di			0-0	10	95.9	93.7	97.0
100		10		1	0.1	0.01	0.001	20	92.2	91.8	92.4
					PARTICLE SIZE -mm			40	81.0	87.1	73.2
			-	-				60	65.3	81.3	47.6
YMBOL W (PL	PI	USCS		ON AND REMARKS	Date Tested	100	45.3	74.7	21.2
D 16.	4 np	np	np	SM	Brown, Silty sand		4/30/2012	200	29.7	64.4	10.3
_	_							TerraSe	nse, LLC	URS Co	poration
17.	0 33	17	16	CL	Brown, Sandy lean clay		5/1/2012				
_								1.0	76638		6638
0 17.	9 np	np	np	SP-SM	Brown, Poorly-graded san	d with silt	5/1/2012	PAI	RTICLE SIZ	E DISTRIBU	ITION

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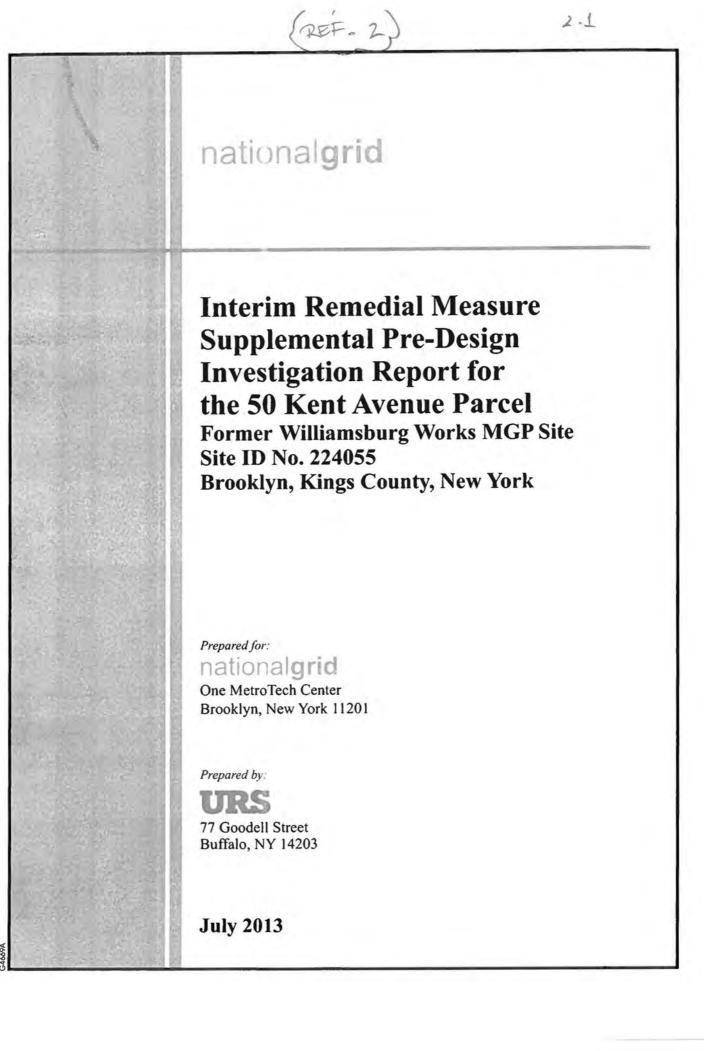
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Appendix B

Supplemental Geotechnical Laboratory Test Reports

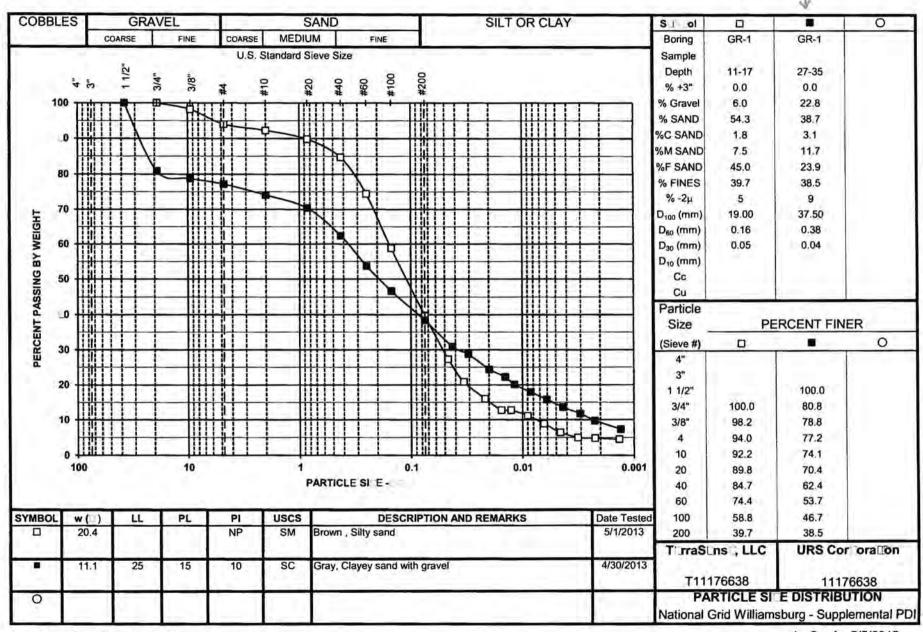
BORING	SAMPLE	DEPTH			IDENTI	FICATIO	N TESTS			REMARKS
NO.	NO.	(ft)	WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	HYDRO. % MINUS 2 μm (%)	
GR-1		11-17	20.4	17	- 17	NP	SM	39.7	5	
GR-1		27-35	11.1	25	15	10	SC	38.5	9	
GR-1		65-71	23.1	20	10	NP	SM	32.2	3	
GR-1		73-77	25.0	37	23	14	CL	93.5	18	
01-1		15-11	20.0	- 31	23	14	UL	33.5	10	
GR-2		21-25	15.0	27	16	11	SC	38.4	4	
GR-2	a	31-39	15.3	30	16	14	SC	34.6	7	_
GR-2		65-69	25.1	49	24	25	CL	91.6	28	200
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	1 P. 14	U. 40-8	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	1.00	35-41	13.7	26	16	10	SC	41.2	11	
GR-4	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	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	1.000
GR-6		45-49	19.9		8-1-1 k	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	I	33-39	20.0			NP	SW-SM	10.7	1	
GR-7	124	61-65	29.6	49	27	22	CL	99.0	31	

URS 11176638 Na onal Gr d W II a s rg - S I n al PDI LABORATORY TESTING DATA SUMMARY

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

Prepared by: TK Reviewed by: GET Date: 5/5/2013 T rraSins , LLC 45H Commerce Way Totowa, NJ 07512 Project No.: T11176638 File: Indx2.xls Page 1 of 1

(mL)

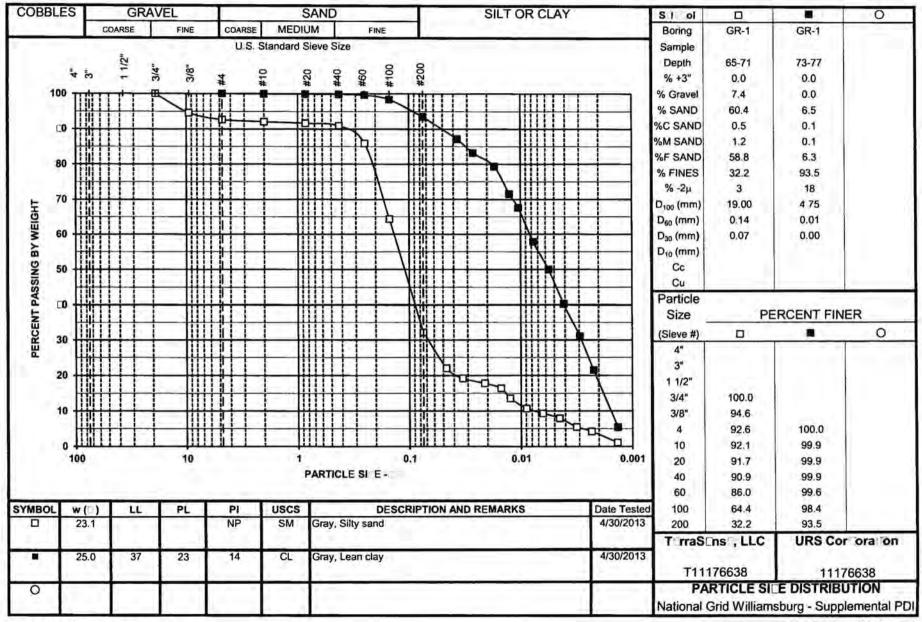


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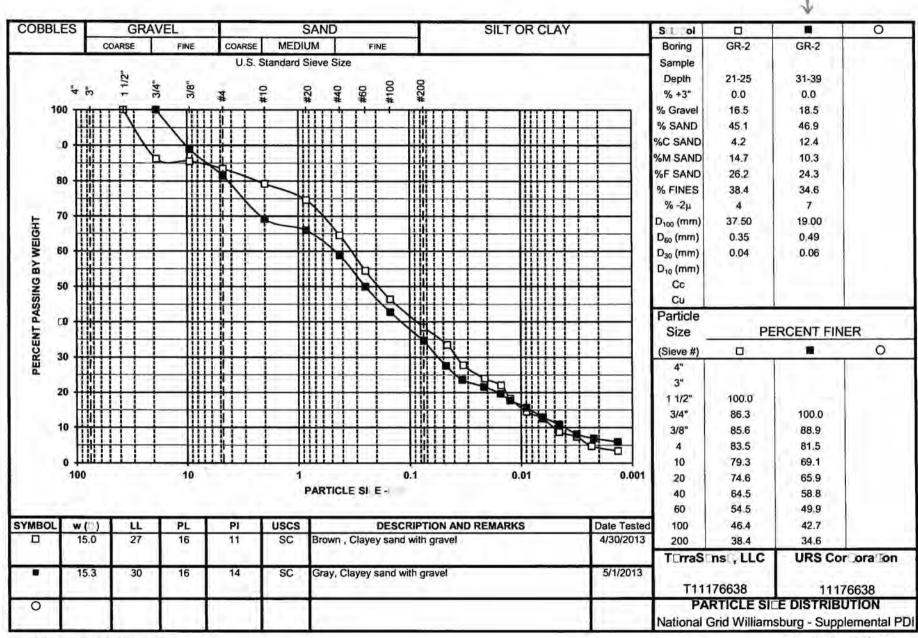


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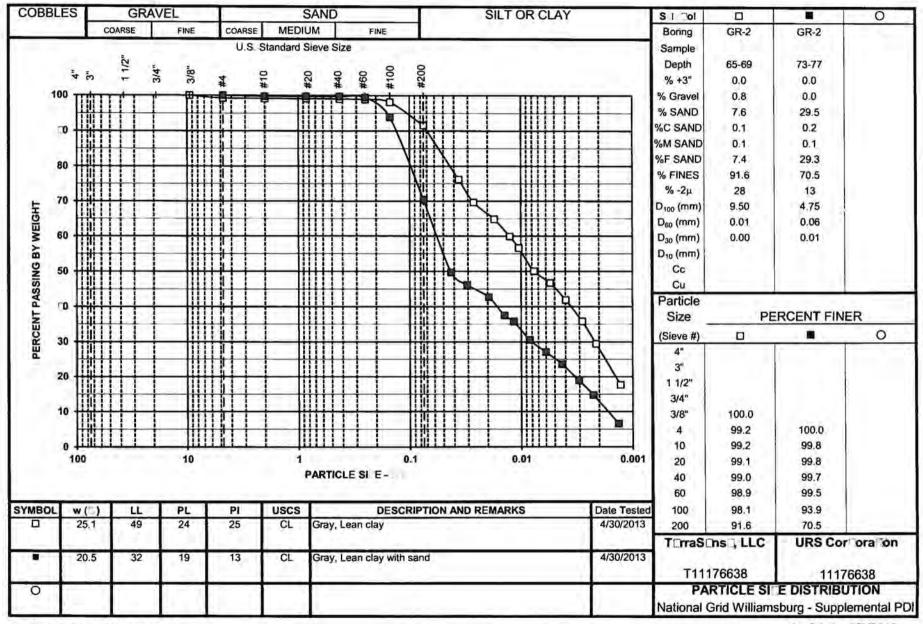
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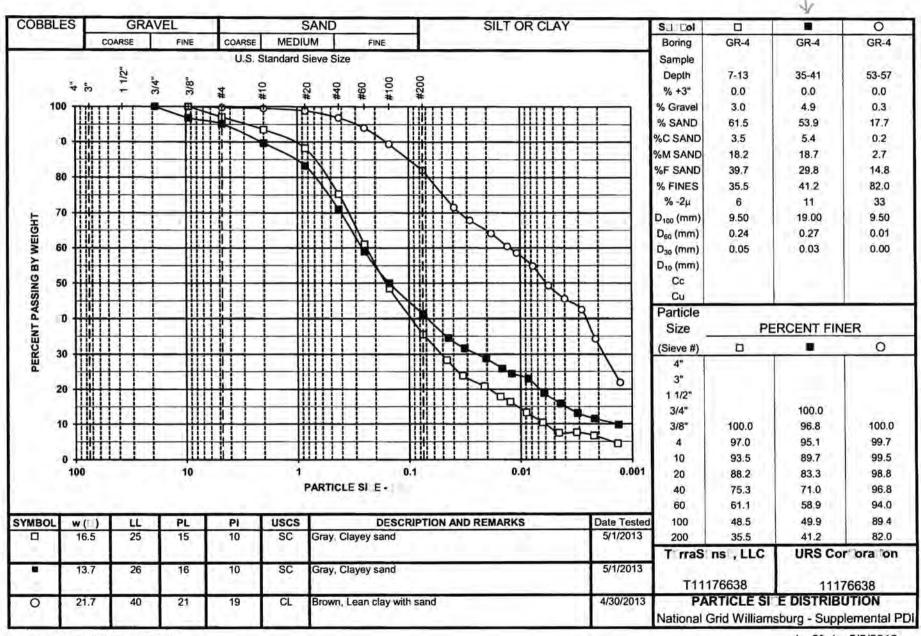
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OBBLES		G	RAV	/EL			S	AND					SI	_T OF	CLA	Y		S	I ol			0
	1	COARSE	201	FINE	CC	DARSE	MEDIL	M	F	INE								В	loring	GR-3	GR-3	GR-3
	1	1.00	10		1.1	U.S. S	tandard S	ieve Si	ze		-							S	ample			
		1 1/2"	•.								0							C	Depth	13-19	31-37	53-57
4	'n	÷	3/4"	3/8	1	#10	00#	#40	09#	#100	#200							9	6 +3"	0.0	0.0	0.0
100 T	T th	TITT	- 1	-		-			ET.	- 1	Tribra	111		- 19	TT	1.1	1	%	Gravel	2.3	0.0	0.0
	Щ	1111		[]				111	To	ha				- 11	Ш	11		%	SAND	50.4	87.5	12.6
E0 -	14	444	+	-	1141		1	XII.	\square			111				11	1	%0	SAND	2.8	0.8	0.0
	Lli							IN			TH		1.1			11		%N	SAND	10.4	19.9	1.5
80	16						11		N									%F	SAND	37.2	66.7	11.1
00	Ш				111				X	1	THE	Q			Ш	TT		%	FINES	47.3	12.5	87.4
	T							TH	119		H		1. 1.			11		9	% -2μ	7	0	36
도 ⁷⁰	til								TH	X			20					D,	(mm)	9.50	4.75	2.00
PERCENT PASSING BY WEIGHT 00 00 00 00 00 00 00 00 00 00 00 00 00	tti	\mathbf{H}	+	- 11		-	- It		1	1			F	201		11		D ₆	o (mm)	0.14	0.29	0.01
\$ 60	H		+			+			1	14				-N		++	+	D ₃	(mm)	0.04	0.15	0.00
No.	Hi	+++	-			+				1					Het I	++		D,	o (mm)			
\$ 50 -	444	444	-		4144	+		444	711	-	Nill	444	\vdash		IB	4+			Cc			
ISS		1111							\square		1 A				Ш	No			Cu		_	
¥ no										1			1.11			Γ		Pa	article		1.007	57.22
5										1		Y					9		Size	PE	RCENT FIN	ER
2 30	16	1111	-4		Шí	1				11		1				11	N	(S	ieve #)	0		0
H 30 1	11	ΠП						III							ШП	TT	\mathbf{T}		4"		10.00	
	1							III	T				K		HH	11	10		3"			
20 -	T!	\mathbf{H}						htt	H	\mathbf{t}	XII		H	ali	IIII	\mathbf{t}			1 1/2"			
	H	+++		- H	H++ # +	+		HH	++	1	N			- 5	NH I	++	1		3/4"			
10 -	Hi			- #	ΗĒ	-			H	-				- #	m	古			3/8"	100.0		6.6
6 - N	H	+++	\vdash					₩₩	++-	1-	111				нн	++		0.0	4	97.7	100.0	
0 -	11	Ш								1	ļi	Ш				He.	al a		10	94.8	99.2	100.
10	00			10			1				0.1			0.01			0.	001	20	91.5	94.8	99.6
							F	ARTIC	LE SI	E-									40	84.4	79.3	98.
																			60	74.7	53.6	97.
MBOL W	v ()	Ĺ.	PL	F	1	USCS	1.0		DESC	RIPTIC	ON AND	REM	ARKS			Date Te	sted	100	62.4	28.8	94.
	22.4		4	19	_	5		Gray,	Silty, c	layey si							5/1/20		200	47.3	12.5	87.4
								11.1									1.1		rraS	ns LLC	URS Co	r ora o
	24.4	111	-	-	N	P	SM	Brown	, Silty s	sand					-		5/1/20					
1		111				1.11											1.55	1	T111	76638	111	76638
0	22.7	4	3	21	2	2	CL	Brown	, Lean	clay	-	-			-	-	4/30/2	013		TICLE SIC		
-			10.1	1.15						1000							1.00				burg - Supp	

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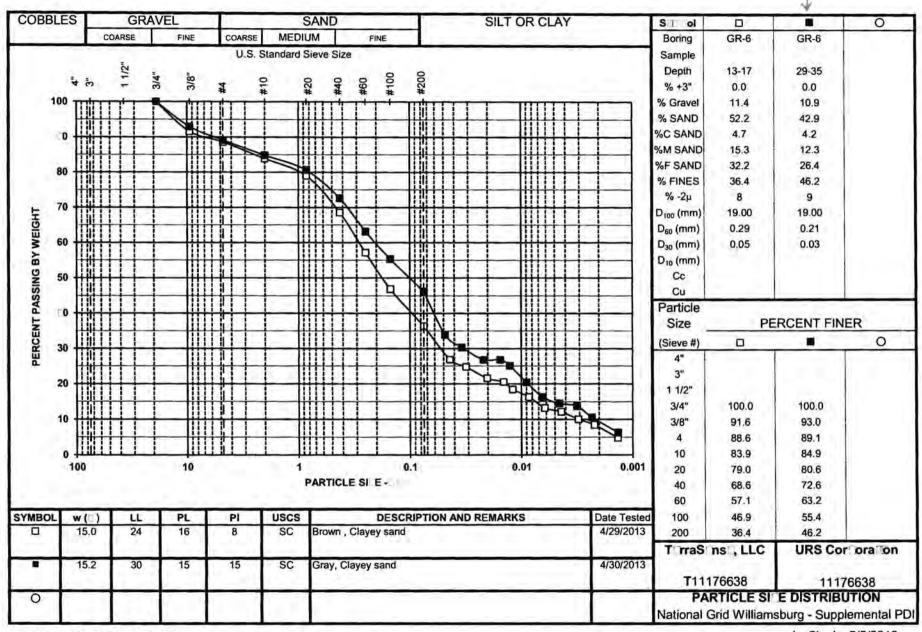
COBBLES	GR	AVEL	1 .	S	AND	SILT OR CLAY	2	S ol			0
107 C C	COARSE	FINE	COARSE	MEDIU	IM FINE			Boring	GR-5	GR-5	GR-5
-			U.S. 1	Standard S	ieve Size			Sample		1.000	
	1/2"							Depth	17-23	39-43	61-65
4	11 3	3/4"	1	#10	#40 #60 #100			% +3"	0.0	0.0	0.0
100 1	terre t				and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s			% Gravel	3.1	0.1	5.1
			Bh					% SAND	65.8	88.0	7.7
C0 -					H19-10-0			%C SAND	4.8	1.3	07
					NIII			%M SAND	17.9	25.3	0.8
80			Hill			INJ I IIIIIIII		%F SAND	43.1	61.4	6.1
° T								% FINES	31.1	11.9	87.2
						11 Page 1111		% -2μ	4	0	43
토 ⁷⁰				1 11				D ₁₀₀ (mm)	9.50	9.50	19.00
5		1 111		1 1				D ₆₀ (mm)	0.26	0.34	0.00
PERCENT PASSING BY WEIGHT		1 111		1 11			1	D ₃₀ (mm)	0.07	0.18	0.00
à H		1		1		HIII HIIIP		D ₁₀ (mm)		0.06	
9 50 -		4 - 1111		4 - 11				Cc		1.5	
SS				I				Cu		5.5	
A D							X	Particle			
LN		1 =					$ \rangle$	Size	PER	RCENT FIN	ER
2 30				1 11				(Sieve #)	D		0
E S						NILL IIIIIII		4"			
		1 111						3"	l l		
20							12.22	1 1/2"			117.5
1		t liit	THI	t ti	N N			3/4"			100.0
10		1 111		1 1				3/8"	100.0	100.0	95.8
H		1	++++-	1 1		<u>╎╎╎╵</u> ┚╝┤╝ _{┲╴╋┼┪╴╽} ╷╵		4	96.9	99.9	94.9
0 +		1 101		1_1	<u>uiii 1</u> 1			10	92.1	98.6	94.1
10	0	10		1	0.1	0.01	0.001	20	86.7	92.4	94.0
				F	PARTICLE SI E -			40	74.2	73.3	93.4
1. A. T. M	152.5			-				60	58.7	44.3	92.1
	() LL	PL	Pi	USCS		TION AND REMARKS	Date Tested	100	44.9	23.7	90.6
	4.0 25	17	8	SC	Brown , Clayey sand		4/29/2013	200	31.1	11.9	87.2
			diameter de					TorraSo	ns , LLC	URS Co	rCora o
• 2	0.5	1	NP	SP-SM	Brown, Poorly-graded sa	nd with silt	5/1/2013	1.7.0	C. J. T		
S. 181		1. L. L.		1			6.2.27	and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se	76638		76638
0 2	3.8 51	25	26	CH	Brown, Fat clay		4/30/2013	PA	RTICLE SI	E DISTRIB	UTION
1	1.1.1	1000		1.1.1.1.1.1.1	a second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second s		1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	National G	Grid Williams	hura - Sunn	Iomontal

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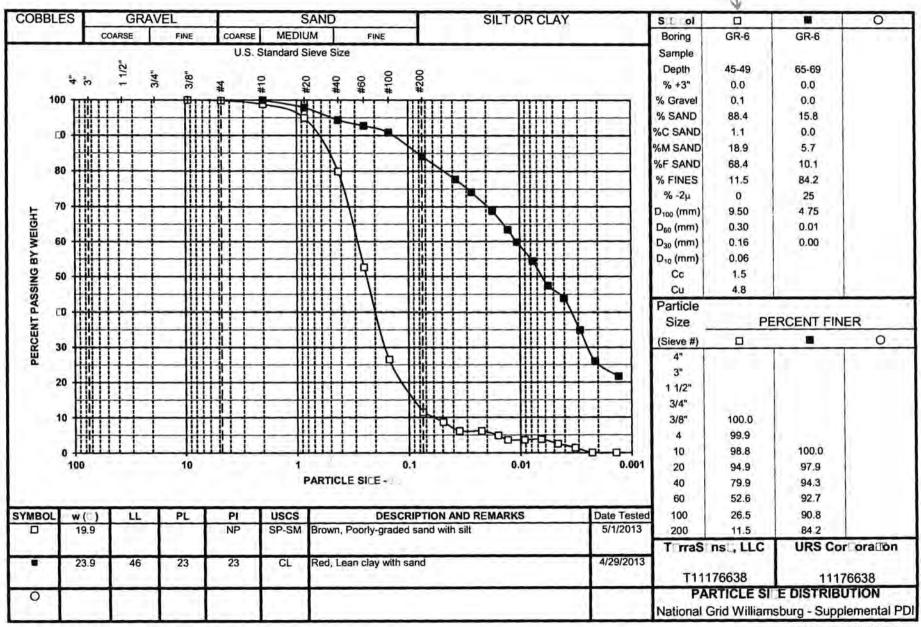
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COBBLES	G	RAVEL		S	AND	SILT OR CLAY	1	ST ol			0
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	COARSE	FINE	COARS	MEDIU	M FINE			Boring	GR-7	GR-7	GR-7
			U.S	Standard Si	eve Size			Sample		1000	
	3"	4. 14						Depth	17-23	33-39	61-65
4	1 3	3/4"	#	#10	#40 #60 #100			% +3"	0.0	0.0	0.0
100 T	mh TI PT			0 10	1110-0-0-110	arri i murri r		% Gravel	5.5	1.5	0.0
								% SAND	53.3	87.8	1.0
C0 -								%C SAND	5.6	2.4	0.1
				T III		1111 NIIIII		%M SAND	14.0	27.6	0.3
80 -								%F SAND	33.8	57.8	0.6
ou T			TITT				A 11 19	% FINES	41.2	10.7	99.0
			THE T					% -2µ	6	1	31
토 ⁷⁰ †			ttt t					D100 (mm)	19.00	9.50	4 75
PERCENT PASSING BY WEIGHT 05 01 09 09 01 01 01 01 01 01 01			****	1 11				D ₆₀ (mm)	0.21	0.36	0.00
\$ 60 -	₩₩₩₩	1 11		+				D ₃₀ (mm)	0.05	0.18	0.00
PY I					HH H H			D10 (mm)		0.05	
9 50 -				1-11				Cc		1.7	
IS I								Cu		6.7	
M ID							$\Lambda I = I$	Particle			
tz u						NIIIIIII		Size	PE	RCENT FIN	ER
2 30	161111	1 11	11611				8	(Sieve #)			0
E SUT			IDIT					4"			
								3"			
20				1 11			10	1 1/2"			100.
		+ 11	╈	+ #				3/4"	100.0		100.
10	╘┋┊╡┊╡╴╡		++++	+				3/8"	97.8	100.0	100.
			++++++				00	4	94.5	98.5	100.
0 +								10	89.0	96 1	99.9
10	0	10		1	0.1	0.01	0.001	20	84.3	90.1	99.9
				P	ARTICLE SI E -		200	40	75.0	68.5	99.6
								60	64.2	45.5	99.4
MBOL W	(I) L	PL	PI	USCS	DESCRIPT	TION AND REMARKS	Date Tested	100	53.6	22.2	99.2
	9.2 3	and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se	14	and the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se	Brown , Clayey sand		4/29/2013	200	41.2	10.7	99.0
			1.1.1					TimaS	ns , LLC	URS Co	orallo
. 2	0.0		NP	SW-SM	Brown, Well-graded sand	I with silt	5/1/2013				
2.11	1. I U L							T111	76638	1117	6638
0 2	9.6 4	27	22	CL	Brown, Lean clay		4/29/2013	the second second second second second second second second second second second second second second second se	RTICLE SI		
10 M H			1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.				1.1.1.2.2.2.2.2.2.1	the second second second	Grid Williams		

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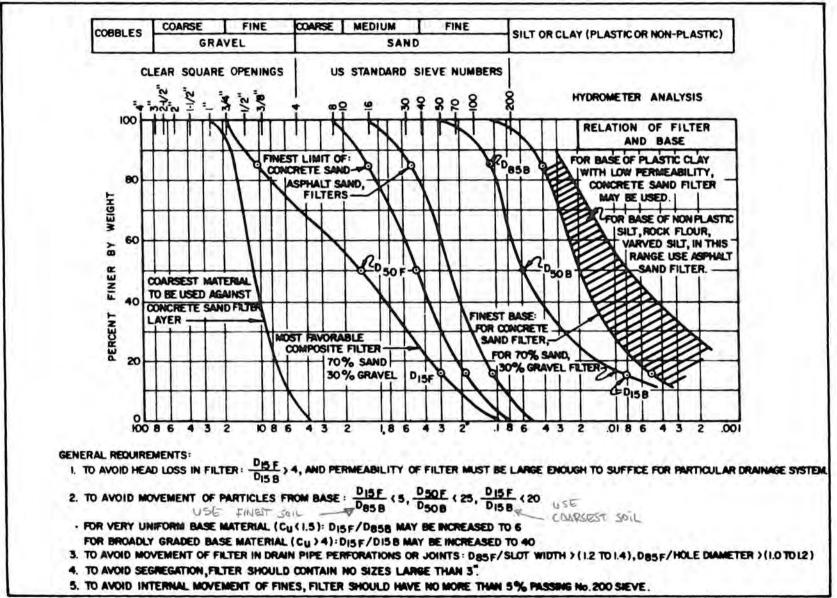


FIGURE 4 (continued) Design Criteria for Protective Filters

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4.1

Groundwater and Wells Second Edition

> 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.

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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.

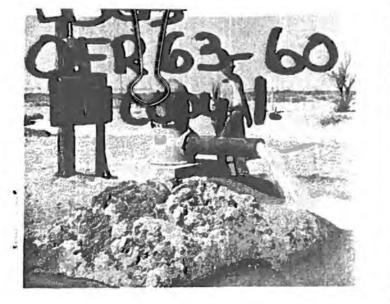
Some geologic environments in which filter packs should be considered include:

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. P. O. Box ico 87106 Albuquerque, New REF. 5 5.1

UNITED STATES

DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

FILTER PACK

AND

WELL SCREEN

DESIGN

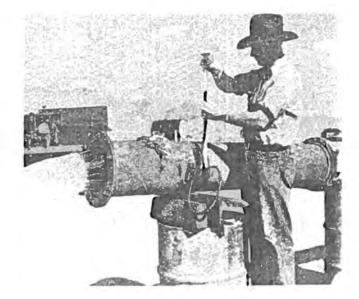
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HYDROLOGIC LABORATORY

Denver, Colorado

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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.

5.3

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:

and for maximum permeability: 15-percent finer size of finest aquifer material ≤ 4

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

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

15-percent finer size of filter pack 15-percent finer size of coarsest aquifer materials 50-percent finer size of filter pack 50-percent finer size of aquifer materials < 25.

and

4



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Product Data



REF

1 of 1

U. S. Silica's FilPro Well Gravels are produced from subround Monocrystelline 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, FIIPro Well Gravels are utilized to increase the yield from the aquifer by increasing the permeable zone around the well screen. FIIPro 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 it's permeability, FIIPro 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.

WELL GRAVELS

FILPRC

PLANT: MAURICETOWN, NEW JERSEY

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All FIIPro 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.

6 8 10 12 14 16 18 20 25 30 35 40 50 70 100 140 200 270 Pan	60.7 29.7 3.7 1.8 0.9 - - - - - - - - - - - - - - - - - - -	2.8 47.1 30.1 13.2 4.9 0.9 0.4 - - - - - - - - - - - - - - - - - - -	3.2 17.7 29.8 33.6 10.3 3.8 0.6 0.3 - - - - - - - - - - - - - - - - - - -	0.2 4.3 29.7 32.1 25.7 5.2 1.5 0.5 0.3	0.1 1.9 16.0 22.8 32.7 19.4 5.7 0.9	0.1 6.4 37.2 42.8 10.1 2.9	0.1 1.9 31.5 36.0 26.7 3.0	0.7 23.0 34.1 21.0 14.1 5.2 1.6 0.2 0.1
tec. Screen Slot Size (In)	0.090	0.060	0.050	0.030	0.025	0.020	0.010	0.005
iffective Size (mm)	2.47	1.76	1.29	1.02	0.61	0.48	0.33	0.16
Iniformity Coefficient	<1.8	1.7	<1.6	<1.6	<1.6	<1.5	<1.6	<2.5

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.

