NRG Energy
8301 Professional Place
Suite 230
Landover, MD 20785

December 23, 2014

Mr. Alex Wardle
Virginia Department of Environmental Quality
13901 Crown Court
Woodbridge, VA 22193

RE: Corrective Action Plan, Potomac River Generating Station, Alexandria, Virginia

Dear Mr. Wardle,
Attached is the Corrective Action Plan – Part 2 for the Potomac River Generating Station in Alexandria, Virginia. If you have any questions regarding this matter or wish to discuss further, please do not hesitate to contact me at (678)641-2503, or by email at: burt.mccullough@nrg.com.

Sincerely,

Burt McCullough
Director, Environmental Remediation

Corrective Action Plan – Part II

Potomac River Generating Station
1400 N. Royal Street
Alexandria, VA

Prepared for:

NRG Potomac River LLC
1400 N. Royal Street
Alexandria, VA 22314

Prepared by:

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December 2014

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
ABS	acrylonitrile butadiene styrene
API	American Petroleum Institute
ASTM	American Society for Testing Materials
bgs	below grade surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
DC	District of Columbia
DDOE	District Department of the Environment
DO	dissolved oxygen
DTP	depth to product
DTW	depth to water
EDB	1,2-Dibromoethane
EDC	ethylene dichloride
EFR	enhanced fluid recovery
EIP	electronic interface probe
EPA	Environmental Protection Agency
Fairway	Fairway Laboratories, Inc.
ft	feet
Geosyntec	Geosyntec Consultants
GES	Groundwater & Environmental Services, Inc.
gpm	gallons per minute
GWMA	Groundwater Management Areas
HSA	hollow stem auger
in. Hg	inches of mercury
ISCO	in-situ chemical oxidation
K	hydraulic conductivity
lbs/day	pounds per day
LGAC	liquid granular activated carbon
LIF	laser-induced fluorescence
LNAPL	light non-aqueous phase liquids
max.	maximum
mg/kg	milligram per kilogram
mg/L	milligrams per liter
mL	milliliter
MNA	monitored natural attenuation
msl	mean sea level
MTBE	methyl tert-butyl ether
mV	millivolts

LIST OF ACRONYMS AND ABBREVIATIONS (CONT.)

NPS	National Park Service
NRG	NRG Potomac River LLC
O&M	operation and maintenance
Odyssey	Odyssey Environmental
ORP	oxidation reduction potential
OSWER	Office of Solid Waste and Emergency Response
P&T	pump and treat
PAH	polynuclear aromatic hydrocarbons
PC	Pollution Complaint
PID	photoionization detector
PRGS	Potomac River Generating Station
psi	pounds per square inch
PTS	PTS Laboratories of Santa Fe Springs, CA
PVC	polyvinyl chloride
ROI	radius of influence
scfm	standard cubic feet per minute
SCM	site conceptual model
SCR	Site Characterization Report
SCRA	Site Characterization Report Addendum
SIM	selective ion monitoring
Site	Potomac River Generating Station
STPT	Storage Tank Program Technical Manual
SVE	soil vapor extraction
SVOC	semi-volatile organic compounds
TBA	tert-butyl alcohol
TDS	total dissolved solids
TFE	total fluids extraction
T_o	transmissivity of LNAPL
TOC	top of casing
TPE	total phase extraction
TPH-DRO	total petroleum hydrocarbons-diesel range organics
TPH-GRO	total petroleum hydrocarbons-gasoline range organics
TSS	total suspended solids
URS	URS Corporation
UST	underground storage tanks
VDEQ	Virginia Department of Environmental Quality
VEGE	vacuum enhanced groundwater extraction
VGAC	vapor granular activated carbon
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 Purpose and Scope

Geosyntec Consultants (Geosyntec) and Groundwater & Environmental Services, Inc. (GES) have been engaged by NRG Potomac River LLC (NRG) to evaluate a release from two 25,000-gallon heating oil underground storage tanks (USTs) and address the resulting presence of petroleum hydrocarbons in soil and groundwater at the Potomac River Generating Station (PRGS) (Site). The address of the Site is 1400 North Royal Avenue, Alexandria, Virginia, 22314. A Site Location Map is included as **Figure 1**, a Site Layout Map is included as **Figure 2**, a Study Area Map is included as **Figure 3**, and a Site Map is included as **Figure 4**.

The development of the initial Corrective Action Plan (submitted September 5, 2014 and herein referred to as Corrective Action Plan – Part I (CAP-I)) and this Corrective Action Plan - Part II (CAP-II) for the PRGS have progressed under direction of the Virginia Department of Environmental Quality (VDEQ) within the regulatory framework outlined in the VDEQ Storage Tank Program Technical Manual (STPT) and associated STPT Appendix document. However, the investigation and remediation work at the site is being coordinated between multiple parties including the VDEQ, the District Department of the Environment (DDOE), and the National Park Service (NPS).

This CAP-II contains a summary of recent site investigative work at the PRGS including feasibility testing well installation, groundwater sampling and gauging events, feasibility study activities, light non-aqueous phase liquids (LNAPL) baildown testing, and interim LNAPL recovery events. Various remediation technologies have been evaluated, and a multistep approach to corrective action is proposed. The remedial proposal presented in this CAP-II also includes schedule and costing projections. Ultimately, this CAP-II endeavors to fulfill VDEQ corrective action requirements per STPT guidelines and to transition the case from the CAP development phase to CAP implementation phase.

1.2 Project Background

Pollution Complaint (PC) #2013-3154 was opened by the VDEQ in correspondence dated April 2, 2013, following the detection of petroleum hydrocarbons during the closure activities associated with the two 25,000-gallon heating oil USTs. In this correspondence, VDEQ requested that a Site Characterization Report (SCR) be prepared to describe and characterize the type and extent of the contamination stemming from the two USTs. This report was submitted to the VDEQ on June 28, 2013, in the form of a Site Conceptual Model (SCM) Update by URS Corporation (URS). The SCM included a discussion of the initial detection of petroleum hydrocarbons during the closure activities associated with the two heating oil USTs, as well as descriptions of the various subsurface utilities in the vicinity of the USTs.

The VDEQ subsequently requested the submittal of a Site Characterization Report Addendum (SCRA) as stated in a directive letter dated July 10, 2013. This SCRA was submitted on February 14, 2014 by URS and described the activities associated with a subsurface characterization of the Site using laser-induced fluorescence (LIF), as well as the advancement of soil borings for soil sampling at the Site, and the installation of fourteen monitoring wells. The

Site history, recent field activities, laboratory analytical results, a preliminary risk assessment, and an assessment of remedial options were also discussed in the SCRA.

After review of the SCRA, the VDEQ, in correspondence date March 4, 2014, requested that a CAP be developed for the referenced Site pertaining to case #2013-3154. On September 5, 2014, the CAP-I was submitted to the VDEQ by the collaborative team of Geosyntec and GES, on behalf of NRG. This CAP-I document summarized the site characterization data and evaluation performed to date, presented an updated SCM, and provided a presentation, assessment, and evaluation of the viable remedial technologies that can be employed at the Site. The CAP-I also presented preliminary data and evaluation from additional site characterization completed in response to the March 4, 2014 VDEQ correspondence.

This document herein provides additional information requested by the VDEQ to satisfy the requirements of a CAP including: the specific remedial strategy proposed for the Site; an estimate of the amount of hydrocarbons present in the subsurface; an estimate of the amount of recoverable hydrocarbons by the selected remedial technology(ies); a time frame to achieve the remedial goals; and an estimate of the cost to achieve the remedial goals.

2.0 ADDITIONAL SITE ASSESSMENT AND INTERIM ACTIONS DURING CAP DEVELOPMENT

2.1 Introduction

Following the submission of the CAP-I, multiple, additional investigation tasks and interim remedial measures have been performed at the Site. The following sections present a summary of the activities completed by the Geosyntec and GES consulting team since the submittal of the CAP-I in September 2014. These actions follow subsequent VDEQ directives and response related to the initial CAP-I submission.

2.2 Ongoing Liquid Level Monitoring

Beginning on March 7, 2014, weekly groundwater and LNAPL gauging has been conducted for groundwater wells at the PRGS established in the VDEQ directive letter dated March 4, 2014. Weekly groundwater gauging and LNAPL recovery efforts continue to date. Depth to groundwater (DTW) and depth to product (DTP) are measured to the nearest one-hundredth of a foot (0.01 ft) with an electronic interface probe (EIP) in each monitoring well to a marked reference point (datum) at the top of the inner well casing. Historically, LNAPL has been detected in eight initial or existing wells at the Site and include: TW-01/MW-05, TW-09S/MW-08S, MW-10S, TW-13/MW-14, MW-25S, MW-25, TW-11/MW-31, and MW-51. Among these wells with noted detections, TW-01/MW-05, MW-25S, MW-25, and MW-51 have recently exceeded thicknesses of 0.01 ft. Since December 2013, product thickness has ranged from 0.01 ft to 1.15 ft (max. occurring at MW-25 on September 19, 2014).

Groundwater gauging data is summarized in **Table 1**. Hydrographs and product thickness time-series graphs are included as **Appendix A**. It should be noted that a comprehensive, professional survey of the existing well network and pertinent facility structures including the sheet-pile bulkhead was completed by Dewberry. During the August 2014 survey event, several new and pre-existing wells, including SP-1 SP-2, RW-1 TW-02 and TW-12S were not surveyed. Subsequently, GES surveyed the remaining wells and sparge points in reference to existing wells on September 21 and 23, 2014. The revised top of casing (TOC) elevations for select pre-existing or modified wells are reflected in changes beginning with the August 25, 2014 gauging event presented in **Table 1**.

Attempts to recover all detectable LNAPL have occurred during gauging events conducted since the inception of the monitoring program at the Site beginning in December 2013. To date, approximately 4.5 gallons of LNAPL has been recovered via manual bailing of the monitoring wells at the PRGS.

Weekly fluid level monitoring and LNAPL recovery from select monitoring wells with historical LNAPL detections or high dissolved phase total petroleum hydrocarbons-diesel range organics (TPH-DRO) concentrations will continue until otherwise directed by the VDEQ.

2.3 Additional Soil Delineation and RW/ SP Installation

As proposed in the CAP-I, Odyssey Environmental (Odyssey), under the direct supervision of GES, attempted the installation of two new recovery wells and two new sparge wells. Recovery well RW-1 was installed on October 2, 2014, and the sparge wells, SP-1 and SP-2, were installed on September 30, 2014 and October 2, 2014, respectively. The second planned recovery well, RW-2, was not installed due to auger refusal encountered at 21 feet (ft) below grade surface (bgs). Construction debris or concrete washout cuttings were found lodged in the bottom of the auger upon removal. Recovery well RW-1 was completed with a 4-inch diameter polyvinyl chloride (PVC) 0.020-slot screen interval installed between 26 to 41 ft bgs, and finished with a flush-mounted bolting well cover. The sparge wells were constructed with a 2-inch diameter PVC 0.020-slot screened casing, a 2-inch diameter Schedule 40 PVC solid riser casing, and finished with a flush mounted bolting well cover. The screen intervals for sparge wells SP-1 and SP-2 were 32 to 35 ft bgs and 33 to 36 ft bgs, respectively.

The development of the two sparge wells (SP-1 and SP-2) and the one recovery well (RW-1) occurred following their installation and completion. During development, the recovery well and sparge points were pumped to “clear” i.e, no visible suspended solids detected in the purge stream. Development water was temporarily stored in 55-gallon steel drums and ultimately pumped-out by a qualified waste disposal contractor. Approximately 100 gallons of development water was removed from RW-1 while approximately 50 gallons was removed from each of the sparge wells (SP-1 and SP-2).

The locations of the recovery well and sparge wells are illustrated on **Figure 4**. Updated well construction details for the PRGS are summarized in **Table 2**. A compilation of boring logs for the two recovery wells and two sparge wells containing lithological information, volatile organic compound (VOC) screening levels and well completion information is provided as **Appendix B**.

Prior to sparge and recover well installations, continuous vertical soil profiles, beginning at 20 ft bgs through terminal depth, were attempted using 5-foot length acetate sleeves driven by a Geoprobe 7822DT direct-push drilling rig. This drill rig was also equipped with 10-inch outer diameter hollow stem augers (HSA) to facilitate installation of 2-inch and 4-inch diameter wells. The soil boring profiles for the recovery and sparge wells were collected to terminal depths ranging from 21 to 41 ft bgs. Each length of the collection interval was screened and recorded for volatile organic compounds with a calibrated photoionization detector (PID) meter at approximately every foot.

The highest PID reading recorded during the installation event was 435 ppm at 29 ft bgs for recovery well RW-1. Based on that elevated PID response, a soil sample was collected at RW-1 at 28 ft bgs. The soil sample was placed

in a laboratory supplied glass jar, packed in ice and couriered to Fairway Laboratories, Inc. (Fairway) in Altoona, Pennsylvania, for analysis. The soil sample was analyzed for total petroleum hydrocarbons-diesel range organics in accordance with Environmental Protection Agency (EPA) Method 8015B. The concentration of TPH-DRO determined for the RW-1 sample collected October 30, 2014 was 2,713 milligrams per kilogram (mg/kg). The soil sample results are presented in the Soil Analytical Data Summary as **Table 3**, the laboratory analytical results and chain of custody documentation are attached as **Appendix C**, and the manifest for disposal of the soil cuttings is attached as **Appendix D**.

2.4 Additional Groundwater Sampling and Delineation

GES conducted a comprehensive groundwater sampling event between October 20, 2014 and October 24, 2014 for all monitoring wells at the PRGS. Liquid levels were gauged and recorded at each well on October 20, 2014. Prior to sampling, all wells were purged three-well volumes via conventional hand bailing techniques. Upon completion of bailing, the wells were allowed to recharge to within 90% of the initial groundwater level prior to sampling. Sample collection was performed via use of a dedicated and disposable polyethylene bailer and bailer string assembly. Groundwater samples were immediately packed on ice in cooler chests and ultimately transported, via courier, to Eurofins Lancaster Laboratories and analyzed for TPH-DRO. All purge water generated during the sampling event was temporarily contained in a 5,000 gallon holding tank that had been used during recent remedial feasibility testing. The manifest for disposal of the monitoring event purge water is attached as **Appendix D**. The associated laboratory analytical results and chain of custody documentation for the October 2014 sampling event are attached as **Appendix E**. Analytical results for TPH-DRO collected during the October 2014 groundwater monitoring event are summarized in the Groundwater Analytical Data Summary as **Table 4**.

In addition to TPH-DRO, select wells were sampled and analyzed for additional parameters, as requested by the District of Columbia (DC) District Department of the Environment (DDOE), which included: (i) polynuclear aromatic hydrocarbons (PAHs) with fingerprinting analysis in for PAHs in water; (ii) select VOCs, including: benzene, toluene, ethylbenzene and xylenes (BTEX), methyl tert-butyl ether (MTBE), tert-butyl alcohol (TBA), ethylene dichloride (EDC), and 1,2-Dibromoethane (EDB); (iii) semi-volatile organic compounds (SVOCs); (iv) oil and grease, total petroleum hydrocarbons-gasoline range organics (TPH-GRO), and TPH with fingerprinting analysis. Results from the DDOE requested select VOC analysis are included in **Table 4**. Results from the DDOE requested SVOC and PAH analyses are presented in **Table 5**. Results from the DDOE requested TPH Fingerprinting analysis are summarized in **Table 6**. Please note that not all requested analytes were tested due to a limited available water volume at certain wells, which are shown in the tables referenced above. Further discussion of the DDOE requested analytes will be presented in a report submitted to the DDOE as separate correspondence.

Groundwater quality parameters and gas headspace screenings were also collected from select wells using a calibrated YSI multi-parameter meter and Lantec GEM 2000 Landfill Gas Meter (respectively), prior to purge and sample activities. The landfill gas meter was used to monitor indications of natural attenuation. The groundwater quality and headspace field data are summarized in the Groundwater Field Parameters Data Summary as **Table 7**. Monitored natural attenuation parameters were also sampled for select wells, as proposed to the VDEQ in the September 2014 CAP, and the results are presented in the Groundwater Monitored Natural Attenuation Analytical Data Summary as **Table 8**.

For the shallow zone wells gauged and sampled during this event, a potentiometric surface map and a groundwater TPH-DRO concentration map are presented as **Figure 5** and **Figure 6**, respectively. For the deep zone monitoring wells gauged and sampled this event, a potentiometric surface map and groundwater TPH-DRO concentration map are presented as **Figure 7** and **Figure 8**, respectively. Dissolved oxygen (DO) and oxidation reduction potential (ORP) maps for the shallow and deep zone wells are presented as **Figure 9** and **Figure 10**, respectively.

2.5 Interim Recovery Actions

Per CAP objectives set forth in the June 19, 2014 *Interim Activities CAP Development Work Plan Part I* (Work Plan-1) and the CAP-I, several interim remedial measures, including LNAPL baildown testing, Enhanced Fluid Recovery (EFR) events and manual bailing of LNAPL have been implemented to characterize and mitigate the occurrence of detectable LNAPL in monitoring wells MW-05, MW-10S, MW-14 MW-25, MW-25S and MW-51. A summary of the LNAPL baildown testing performed at wells MW-05 and MW-25 on September 19, 2014, is presented in Section 2.6 of this report.

On September 24, 2014 and October 27, 2014, EFR events were conducted for monitoring wells demonstrating measurable product thickness, which included monitoring wells MW-25, MW-05, and MW-10S. A summary of the LNAPL EFR events occurring September 24, 2014 and October 27, 2014 was submitted to the VDEQ on November 24, 2014 as the correspondence titled *EFR Event Summary.* During the course of the two EFR fluid recovery events conducted to date, 23 gallons of mixed groundwater and LNAPL have been recovered from MW-05, 21 gallons have been recovered from MW-10S and 666 gallons have been recovered from MW-25. Due to the EFR equipment configuration, volume of recovered LNAPL cannot be accurately quantified during EFR events.

Through the remaining phase of CAP development for this project, future EFR events will be planned for wells where baildown test analyses demonstrates that LNAPL transmissivity values are within the practical range of recoverability (e.g., 0.1 to 0.8 square feet per day [ft^2/day] per ITRC guidance) and/or a measurable LNAPL thickness of 0.5 ft or greater is observed. This interim action will halt when the project transitions to the CAP Implementation Phase to occur with the startup of the proposed LNAPL recovery and remediation system.

To date, LNAPL abatement measures, in the form of manual bailing, have yielded a total of the following cumulative product volumes:

- 0.61 gallon at MW-05,
- trace product at MW-10S,
- trace product at MW-14,
- 0.04 gallon at MW-25S, and
- 2.74 gallons at MW-25.

In addition, baildown activities occurring September 15, 2014 LNAPL (**Section 2.6**) generated approximately 0.92 gallons and 0.17 gallons of LNAPL from monitoring wells MW-25 and MW-05, respectively. It is also noted that free phase LNAPL was recovered during the August 2014 pumping test and the November 2014 feasibility test events, however, due to similar equipment constraints encountered with EFR technology, exact volumes of LNAPL recovered with groundwater could not be differentiated and/or quantified.

In summary, a total recorded volume of approximately 4.5 gallons of LNAPL has been removed from wells during interim manual bailing and baildown testing events occurring at the Site since December 2013. Additional, unquantifiable volumes of LNAPL have been observed removed during remedial and EFR events conducted through this period, but volumes recovered through these methods are estimated to be in the tens of gallons.

2.6 LNAPL Baildown Testing

Per CAP objectives set forth in the *Work Plan-1* and the CAP-I, LNAPL baildown tests were performed on wells MW-25 and MW-51 on September 19, 2014. During the September 15, 2014 weekly gauging event, LNAPL thicknesses for MW-05 and MW-25 were 0.50 and 0.82 ft, respectively. The measured thicknesses at MW-05 and MW-25 exceeded the criteria set forth in the Work Plan-1 and the CAP-I documents, which specified that wells containing LNAPL thickness equaling or exceeding the borehole diameter of the well shall be tested. A summary of the LNAPL baildown field tests and subsequent data analysis are presented in the following report sections.

<u>LNAPL Baildown Summary for MW-25</u>

On September 19, 2014, monitoring well MW-25 had a measured product thickness of 1.15 ft prior to initiation of LNAPL baildown activities. LNAPL baildown testing performed at MW-25 this day occurred as two concurrent tests and followed the GES Standard Operating Procedures for the task. The DTP measured prior to the first baildown test performed at well MW-25 was 26.95 ft from TOC. The corrected DTW measured prior to the first baildown test performed at the well was 27.21 ft from TOC. Total depth of well MW-25 was measured this day at 36.03 ft from TOC. This amounts to a total fluid column of 9.1 ft existing in the well prior to baildown activities.

During the first MW-25 LNAPL baildown test, approximately 0.43 gallons (1.65 liters) of presumed #2 Fuel Oil was removed via a disposable bailer. The multiple-bailer withdraw performed at the well reduced the thickness to 0.48 ft or approximately 42% of the initial static product thickness. During the recovery period, DTP and DTW measurements, from TOC datum, were recorded. At the conclusion of the first test at MW-25 (elapsed time 134 minutes), the product thickness had recovered to 0.82 ft (or 71% of original thickness). A field log sheet generated for the MW-25 LNAPL baildown test is provided with the baildown analysis package as **Appendix F**.

Upon recovery of the first baildown test to 71% initial product thickness, a second test was performed. During the second MW-25 LNAPL baildown test, approximately 0.49 gallons of product (1.85 liters) of presumed # 2 Fuel Oil was removed via a disposable bailer. The multiple-bailer withdraw performed at the well reduced the thickness to 0.35 ft or approximately 42% of the initial static product thickness. During the recovery period, DTP and DTW measurements, from the TOC datum, were recorded. At the conclusion of the second test at MW-25 (elapsed time 84 minutes), the product thickness had recovered to 0.40 ft (or 48% of original thickness). A field log sheet generated for the second MW-25 LNAPL baildown test is provided with the baildown analysis package as **Appendix F**.

<u>LNAPL Baildown Summary for MW-05</u>

On September 19, 2014, monitoring well MW-05 had a measured product thickness of 0.54 ft prior to initiation of LNAPL baildown activities. The DTP measured prior to the baildown test performed at well MW-05 was 23.18 ft from TOC. The corrected DTW measured prior to the baildown test performed was 23.25 ft TOC. Total depth of

well MW-05 was measured this day at 32.15 ft from TOC. This amounts to a total fluid column of 9.0 ft existing in the well prior to baildown activities.

During the MW-05 test, approximately 0.17 gallons (0.64 liters) of presumed #2 Fuel Oil was removed via a disposable bailer. The multiple-bailer withdraw performed at the well reduced the thickness to 0.30 ft or approximately 56% of the initial static product thickness. During the recovery period, DTP and DTW measurements, from the TOC datum, were recorded. At the conclusion of the first test at MW-25 (elapsed time 282 minutes), the product thickness had remained at 0.30 ft (or 56% of original thickness). A field log sheet generated for the MW-05 LNAPL baildown test is provided with the baildown analysis package as **Appendix F**.

LNAPL Baildown Test Analysis

The LNAPL and groundwater recovery data collected from the two baildown tests performed at MW-25 and the single test performed at MW-05 were evaluated using a modified Bouwer and Rice analysis method (Lundy and Zimmerman 1996; ES&T, 2002). A printout of baildown test inputs, analysis and output using proprietary software is provided as **Appendix F**.

Several fluid property parameters were analyzed from LNAPL collected at each well during the baildown testing. LNAPL samples from both wells were submitted under chain of custody to PTS Laboratories of Santa Fe Springs, CA (PTS). Requested analysis included viscosity, density, specific gravity and interfacial/ surface tension (Methodology: ASTM D445, ASTM D1481, API RP40 DuNuoy Method, ASTM D971). The copy of the PTS LNAPL analytical report and chain of custody documentation is attached as **Appendix G**. Values obtained from the PTS analysis, including specific density and interfacial tension, were used as inputs to the LNAPL baildown solution software.

The table below provides a summary of the three baildown test results performed at wells MW-05 and MW-25. The oil transmissivity (T_o), hydraulic conductivity, residual water saturation, van Genuchten-alpha, and van Genuchten-n values were determined by calculating the Bouwer and Rice T_o value using parametric analysis and limiting the solution with two national databases for hydraulic and capillary properties. The parameter values are consistent with either the Carsel and Parrish (1988) database for agricultural soils, or the API (2004) database for geologic media (Lundy, 2006).

Summary of Hydraulic and Capillary Parameters Derived from LNAPL Baildown Testing

Hydraulic/Capillary Parameters	Well MW-05		Well MW-25 - Test 1		Well MW-25 - Test 2	
	Carsel & Parrish Database	API Database	Carsel & Parrish Database	API Database	Carsel & Parrish Database	API Database
LNAPL Conductivity (ft/day):	1.20E-01	1.20E-01	6.28E-02	6.29E-02	6.29E-02	6.35E-02
LNAPL Transmissivity (ft^2/day):	9.73E-02	9.72E-02	1.08E-01	1.08E-01	7.74E-02	7.82E-02
Hydraulic Conductivity (ft/day):	1.01E+01	3.05E+03	3.19E+00	1.47E+02	4.55E+00	4.49E+02
van Genuchten - *alpha* (1/ft):	3.41	0.72	2.18	0.56	2.50	0.61
van Genuchten – *n* (dimensionless):	2.38	2.54	1.94	2.32	2.08	2.40
Residual Water Saturation:	0.18	0.24	0.25	0.25	0.22	0.25
Hydraulic Conductivity of the underlying groundwater zone (ft/day):	2.53E-01	2.53E-01	2.16E+00	2.16E+00	1.28E+00	1.28E+00

In summary, the calculated averages for T_o or LNAPL transmissivity at MW-05 and for the two tests occurring at MW-25 is 0.10 ft^2/day.

As noted in the ITRC guidance document (ITRC 2009), the range of practical LNALP recovery begins from 0.1 to 0.8 ft^2/day. Thus, future LNAPL recovery volumes from MW-25 and MW-05 are anticipated to be limited. In addition, the observed lack of recovery to pre-test LNAPL thickness measurements also suggest that mobile LNAPL available to these wells is localized and not connected to a more continuous free phase body of LNAPL in the formation.

A selection of results from the PTS fluid property analysis performed from MW-05 and MW-25 can be summarized as follows:

Sample ID	Matrix	Temperature °F	Specific Gravity	Density, g/cc	Viscosity	
					centistokes	centipoise
MW-05	LNAPL	70	0.8730	0.8713	4.490	3.910
MW-25	LNAPL	70	0.8755	0.8737	4.980	4.350

For comparative purposes, several fluid property values for MW-05 and MW-25 were extrapolated to predict values which would occur at 59°F (15°C). EPA provides un-weathered (0%) and artificially weathered (7.2%, 14.2% and 22%) values of density and dynamic viscosity (15°C) of #2 Fuel Oil in a 2003 EPA publication titled *Characteristics of Spilled Oils, Fuels and Petroleum Products*.

Sample ID	Matrix	Temperature °F	Specific Gravity	Density, g/cc	Viscosity	
					centistokes	centipoise
MW-05	LNAPL	59	0.878	0.8776	NA	4.87
MW-25	LNAPL	59	0.880	0.8825	NA	5.48
#2 Fuel Oil (0%)	LNAPL	59	NA	0.8310	NA	2.76
#2 Fuel Oil (7.2%)	LNAPL	59	NA	0.8350	NA	3.27
#2 Fuel Oil (14.2%)	LNAPL	59	NA	0.8383	NA	3.42
#2 Fuel Oil (22%)	LNAPL	59	NA	0.8416	NA	4.18

In summary, both the MW-05 and MW-25 LNAPL samples indicate a greater than 22% weathering profile in comparison to EPA artificially-determined weathered fluid properties values for a #2 Fuel Oil. In addition, the higher density and viscosity values determined for the MW-05 and MW-25 LNAPL samples indicate a fluid with reduced ability for flow through finer grained lithologies.

2.7 Interim Recovery Actions / Pumping Study Analysis

An Interim Recovery Actions / Pumping Study was completed from August 11 to 15, 2014, and a discussion of performance data was presented in the September 2014 CAP-I document. Liquid level data from eight wells including pumping wells MW-25 and MW-51 were monitored and logged via In Situ LevelTroll water level transducers during this event. An attempt was made to analyze the well pumping and recharge data generated during the event with Aqtesolv 4.5 software. However, severe changes in weather pattern, corresponding tidal and river-stage effects and the staged nature of the pumping test itself inhibited the completion of a representative aquifer analysis.

While specific aquifer parameters including hydraulic conductivity could not be determined from the Interim Recovery Actions / Pumping Study data, the Pumping Study did provide valuable LNAPL recovery, radius-of-influence determinations, flow rates and influent dissolved hydrocarbon concentrations. In addition, other aquifer characteristics including recharge performance from MW-25 and MW-51 were observed and can be summarized as follows:

- The recovery period for MW-25 to reach 75% of the total drawdown/displacement achieved prior to shutdown (4.9 ft) occurred at 5:30 AM (elapsed time 12 minutes). Recharge continued to be monitored for approximately 72-hours after the 75% water level recovery.
- The recovery period for MW-51 to reach 75% of the total drawdown/displacement achieved prior to shutdown (3.8 ft) occurred at 5:32 AM (elapsed time 14.8 minutes). Recharge continued to be monitored for approximately 72-hours after the 75% water level recovery.

A determination of hydraulic conductivity (K) for groundwater was solved concurrently with the analysis of LNAPL baildown recovery tests. These LNAPL baildown tests performed at MW-05 and MW-25 on September 19, 2014 are summarized in Section 2.3.

2.8 Seep Sampling

On October 21, 2014 groundwater samples were collected from the existing seeps along the sheet pile bulkhead. Sampling was conducted in general accordance with the work plan submitted to the DDOE. During the seep evaluation, Mr. David Pilat of the DDOE accompanied the GES field team and oversaw the sampling activities.

Sampling commenced at low tide, which was 1:21 PM on October 21, 2014. An attempt was made to sample each of the six seep locations (Seeps A through F, see **Figure 2**) previously identified onsite; however, there was only sufficient flow at two of the seeps to collect a sample. The estimated flow rates were approximately 0.04 gallon/min and 0.026 gallon/min at Seeps B and D, respectively. Samples were obtained by inserting polyethylene tubing inside the opening in the bulkhead at each seep location and using a peristaltic pump to pump the seep water into laboratory supplied bottles. In addition, field measurements of temperature, DO, ORP, specific conductivity, pH, and salinity were collected from Seep B, Seep D, and from the surface water in the Potomac River.

Samples collected from the seeps were immediately placed on ice, added to the chain of custody, and were transported to Eurofins Lancaster Laboratories via laboratory courier for analysis. Per the DDOE directive letter dated June 5, 2014 and DDOE correspondence email dated September 19, 2014, seep samples were analyzed for the following: (i) TPH-DRO and TPH-GRO with TPH fingerprinting via method SW-846 8015B; (ii) BTEX, MTBE, TBA, EDC, EDB via method SW-846 8260B; (iii) SVOC, PAHs, fingerprinting (alkylated PAHs) via method SW-846 8270C selective ion monitoring (SIM); and (iv) Oil and Grease via method EPA 1664A.

The analytical results for TPH-DRO and field parameters collected from Seep B and Seep D are included with **Table 9**. Field parameters collected during the seep sampling event are also presented in **Table 9**. The laboratory analytical results and chain of custody documentation are attached as **Appendix H**. As presented in **Table 9**, TPH-DRO was detected at a concentration of 240 micrograms per liter (µg/L), which is less than the VDEQ groundwater reporting standard (1,000 µg/L) and is lower than the last two sampling events (i.e., 989 µg/L and 320 µg/L, respectively). Discussion of the additional data collected will be provided in a separate report to the DDOE and will be provided to VDEQ.

3.0 HYDROGEOLOGY / CONCEPTUAL SITE MODEL

3.1 Groundwater Hydrostratigraphy and Flow Regimes

According to local geologic mapping (Fleming, 2008), the Site is underlain by Quaternary terrace (upland) and floodplain (lowland) deposits of the Potomac River. The terrace deposits are described as a broadly fining upward sequence that is gravelly at its base and grading up through sand to finer grained material at higher elevations. Above an elevation of about 30 to 35 ft, the terrace is composed primarily of silt and clay and below those elevations, which constitute most of the study area, the soils have been described as muddy sand. The terrace deposits beneath Old Town Alexandria and the Del Ray area approach a thickness of 125 ft in places. The terrace deposits are underlain by the Cretaceous age Potomac Formation.

The site specific subsurface data collected during prior site investigations indicate the upper 20 ft of soil surrounding the UST cavity is comprised of clayey soil matrix containing rubble material within, including broken

brick, river gravel, and concrete fragments. The presence of this soil type indicates use of non-native and/or highly-disturbed backfill soils utilized during the construction of the PRGS facility. Below approximately 20 ft bgs, a transition to native fluvial soil intervals is noted. The native soils are comprised of gravel, sandy clays to clayey sands and sand zones and correlate to the associated Shirley Formation mapped for the Site. Both the LIF soil conductivity data and field description of borings indicate the presence of a consistent fine grained lithologic feature beginning at approximately 25 ft bgs (or 7 ft mean sea level [msl]) with a thickness ranging from 2 to 6 ft. This feature, typically described as lean clay, exists within several feet above the observed top of water table. The clay layer appears to be continuous across the Site, except in areas to the north of the screen and pump house, where construction activities and backfill have likely reworked those soils. Beneath the clay layer, a saturated zone of sand, silty sand, and sand and gravel zones were encountered.

As summarized in the CAP-I, the PRGS study area is defined and delineated into two distinct hydrostratigraphic zones; the "shallow zone" and the "deep zone". The shallow zone is considered a perched groundwater interval that is subject to the effects of localized recharge conditions and does not appear to be tidally influenced. The shallow zone ranges in saturated thickness from 0 to up to 8 ft in the study area. The lateral extent of the perched zone has not been fully delineated, but appears to be limited in extent to the north and west hydraulic heads in the first encountered groundwater correlate with the underlying water table aquifer, or deep zone.

The deep groundwater zone is located beneath the bottom of the aforementioned clay layer in and is reportedly tidally influenced in portions of the study area near the river. As indicated in the cross sectional plots (**Figure 11.A** through **Figure 11.D**), hydraulic heads in the deep zone typically remain within or below the perched clay feature. Accordingly, the deep zone is generally an unconfined aquifer with, perhaps, some locally semi-confined areas where the hydraulic head exceeds the bottom of the clay layer.

Potentiometric Surface maps for both the shallow zone and the deep zone are presented in **Figure 5** and **Figure 7**, respectively. The potentiometric surface of the shallow zone is generally several feet higher than the deep zone providing further evidence of a hydraulic separation between the zones. Groundwater flow in the shallow zone is toward the east. As described in prior sections it appears that the clay layer separating the shallow zone from the deep zone is either absent or has been reworked and either discharges to or combines with the deep zone in the areas north of the screen house. Groundwater flow in the deep zone also appears to flow toward the east and is apparently discharging to the Potomac River. The gradient along the Site is relatively flat (average hydraulic gradient of 0.03 ft/ft), accordingly it would be expected that groundwater velocity, and therefore contaminant migration, in the deep zone would be relatively low, except where preferential pathways may exist.

Further, it appears that some mounding of the water table occurs behind the bulkhead in the northeastern corner of the Site resulting in a component of groundwater flow in that area toward the northeast, discharging around the northern boundary of the bulkhead. Although similar data are not available in the southern portion of the Site, it would be expected that localized discharge may be occurring around the southern side of the bulkhead, as well.

As described in the CAP-I, in addition to geologic controls, the groundwater flow regimes at the Site are influenced by constructed features that were once part of the operating plant and stormwater and wastewater management system outfalls and the associated disturbance of natural deposits that resulted from construction of those features and site grading activities. The existing structures serve as either localized groundwater flow barriers/diversions (e.g., the pump house and perimeter sheet pile bulkhead) or preferential pathways (e.g., former outfall pipes and rip

rap zone behind the bulkhead). The interaction between the hydrostratigraphic units and hydraulic barriers is also evident in the distribution of hydrocarbon constituents in the groundwater, as described in the following sections.

3.2 LNAPL Occurrence

The expanded monitoring well network currently consists of 47 monitoring wells (the MW and TW series), two sparge point wells (SP-1, SP-2) and one recovery well (RW-1) (X wells per acre). Based on the current evaluation of potentiometric head relationships, the monitoring well group can be further divided as 18 shallow wells and 29 deep wells. The zone classification for each well in the network, as most recently interpreted, is noted in **Table 2**. These interpretations regarding zone classification are subject to change as the gauging record for the network increases over time. Weekly fluid level gauging events have continued since July 2014 when the majority of the well network additions and modifications had been completed. During this period, the detection of LNAPL can be summarized as follows:

Well	Zone	# of Events Gauged	# Events with Detection	Min Thickness (Date)	Max Thickness (Date)
MW-05	Deep	16	12	0.01 ft (10/10 & 10/27/14)	0.55 (9/2/14)
MW-25S	Shallow	15	4	0.01 ft (10/20, 10/27, 11/7/14)	0.02 ft (10/13/14)
MW-25	Deep	16	16	0.06 ft (8/16/14)	1.15 ft (9/19/14)
MW-51	Deep	17	8	0.02 ft (10/20/14)	0.07 ft (10/13/14)

As previously noted in the CAP-I, many of the TW-Series wells installed in December 2013 have been replaced or modified as MW-series wells during field investigation activities occurring between July 23 and August 22, 2014. A summary of the historic well monitoring network is presented in **Table 2** – Well Construction Details Summary. Prior to the July to August 2014 well modifications period, the last detection of LNAPL at a historic TW- series well was an occurrence of 0.01 ft of product in TW-11 on June 16, 2014. Since that period, none of the remaining, unmodified wells in the TW-series have had LNAPL detections. A summary of historic well LNAPL detections occurring from December 2013 to June 2014 are as follows:

Prior Well ID	Current Replacement Well ID	Zone	# of Events Gauged	# Events with Detection	Min Thickness (Date)	Max Thickness (Date)
TW-01	MW-05	Deep	22	1	0.01 ft (1/18/14)	-
TW-09S	MW-08S	Shallow	21	10	0.01 ft (5/19/14)	1.07 ft (3/13/14)
TW-11	MW-31	Deep	23	5	0.01 ft (5/19/14, 6/2/14, 6/16/14)	0.02 ft (4/3/2014, 5/5/14)

Hydrographs have been prepared for the current and historic LNAPL bearing wells and are presented in **Appendix A**.

In summary, the position of historic LNAPL-bearing wells including MW-05 (TW-01), MW-09S (TW- 08S), MW-25, MW-25S and MW-51 are located in the area immediate to the former 25,000 gallon fuel oil USTs. One exception is the periodic, low-level occurrence of LNAPL at well MW-31 (TW-11) which is located along the west wall of the Screen/Pump House complex. It is postulated that the migration of LNAPL sourcing from the UST area flowed along a preferential pathway associated to piping structures to the base of the Screen/Pump House. Such a

migration path appears delineated in a map of LIF Response Intensities presented as Figure 9 in the February 14, 2014 SCRA submitted by URS. This LIF map demonstrates strong LIF response in the B-30 and B-32 boring areas, which were adjacent to the B-31/TW-11/MW-31 location when the area was investigated with the tool in December 2013.

3.3 LNAPL Mobility and Recovery

Interim LNAPL recovery and LNAPL recovery characterization events were discussed in **Section 2.5** (Interim Remedial Measures) and **Section 2.6** (Baildown Analysis) respectively. In summary, all manual bailing efforts to recover LNAPL occurring since December 2013 have yielded less than approximately 4.5 gallons of product. As presented in **Section 3.1**, product recovery has occurred from four wells (TW-01/MW-05, MW-25S, MW-25, MW-51) of the total 47 wells to date. It is acknowledged (**Section 2.5**) that additional LNAPL volumes were removed during two EFR events and during the pumping and feasibility studies conducted at the PRGS, however, these LNAPL recovery quantities are estimated in the tens-of-gallons. This implies that the availability of free product for recovery, either in the presumed perched (shallow) zone or the water table aquifer (deep zone) is limited.

While the LIF survey performed at the facility in December 2013 noted a rather broad area of elevated response within the shallow zone, it is understood by practitioners that elevated LIF response is not necessarily indicative of mobile product and/or recovery potential. LIF technology relies on a relative-range measurement of PAH hydrocarbons fluoresce response. LIF analysis cannot typically discern between mobile free phase or residual-state LNAPL present in the formation. It is by inference that higher LIF response levels may indicate a degree of higher oil saturation for a given interval or area, which in turn may be used to predict recovery potential.

Other characterization methods, including baildown tests, LNAPL fluid property analysis and review of recovery records can also be used to formulate an appropriate LNAPL management plan for a site. Recent guidance published by the American Petroleum Institute (API) the Interstate Technology Regulatory Council and the American Society for Testing Materials (ASTM) promote LNAPL characterization through a framework in which multiple “lines-of-evidence” are presented to support determinations on practical and achievable LNAPL management goals for a site.

As such, remedial/pump testing, fluid levels gauging, historic LNAPL recovery records and laboratory analysis of LNAPL collected at the PRGS support a conceptual model which indicates that much of the LNAPL mass existing at the Site is primarily in a residual saturation state. Residual LNAPL is defined as immobile free-phase hydrocarbon mass that is bound in the formation by capillary or interstitial forces of the formation’s pore space. In order for LNAPL to flow as a mobile fluid in the formation, the driving head pressure of the hydrogeologic gradient must exceed the interstitial pressures of the pore space that the LNAPL is trying to occupy. Such mobile flow of an LNAPL body can occur when the “product strength” (quantified as oil saturation) is in a greater proportion to other fluids, including air and water, within the pore space and that the connections of the LNAPL body are continuous among the pore spaces. LNAPL, in the presence of water, is inhibited to occupy pore space as water is the “preferential wetting fluid” in comparison to LNAPL, which is considered a non-wetting fluid. When the LNAPL to water ratio is high (i.e. higher oil saturation), the LNAPL competes favorably for pore space. However, when oil saturation is reduced in the presence of water in pore space, water will take precedence by preferential coating the available pore surface, effectively constricting the pore throats to LNAPL migration. In addition, other factors,

included reduced formation grain size, high LNAPL viscosity and specific density (which increase over time through weathering), further inhibit the migration of LNAPL.

Fluctuations of free or mobile LNAPL over a vertical interval such as those induced by seasonal or tidal changes to the fluid levels in a formation may also reduce mobile LNAPL to a residual saturation state by "smearing". Smear zones have long been recognized by groundwater professionals as those vertical intervals in the formation which define the extent of historic groundwater level fluctuation while the zone has been impacted. Typically, remediation efforts target such zones to either treat in-situ soil impacts and/or remediate source area zones of high dissolved containment constituents. In regard to LNAPL mobility, the smearing process takes some volume of mobile oil (with a higher oil saturation) from a relatively discrete transmissive interval and "spreads" it across a larger vertical interval in the formation, effectively reducing the oil saturation of the fluid mass and, consequently, reducing the LNAPL's ability to vie for pore space as a mobile fluid.

As discussed, LNAPL mobility is dependent on the grain-size of the impacted soil formation. Due to the extreme heterogeneity of the Site imparted by both the native fluvial deposition history, the considerable zones of disturbed, fine-grained fill-material and the highly dynamic vertical fluctuations imparted for wells within reaches of the tidal cycle, LNAPL mobility potential, through native or anthropogenic fill materials found at the Site would be considered limited.

LNAPL that finds preferential pathways, as along existing piping routes or man-made structures features of the Site, has the potential to migrate greater distances than LNAPL constrained to movement in soil matrices. Such patterns have been associated to LNAPL detections at MW-31 (**Section 3.2**) and elevated TPH-DRO concentrations in wells TW-4 to TW-7 located along piping and the sheet pile wall downgradient of the PRGS facility (**Section 3.4**).

3.4 Dissolved-Phase and Adsorbed-Phase/Residual-Phase Hydrocarbon Delineation

As noted in **Section 2.4**, and presented in **Figure 6** and **Figure 8**, groundwater TPH-DRO concentration maps of the shallow and deep groundwater monitoring zones have been prepared from the October 20-24, 2014 comprehensive groundwater sampling event.

<u>Shallow Well Dissolved Phase Delineation and Trends</u>

As noted in **Table 4**, TPH-DRO concentrations obtained during the October 2014 groundwater sampling event ranged from non-detect (<45 µg/L) to 100,000 µg/L (100 milligrams per liter [mg/L]) from the 14 (of 47) wells comprising the PRGS shallow monitoring well network. It is noted that significant increases have occurred in several shallow wells in comparison to the comprehensive groundwater monitoring event performed in August 2014 (as reported in the CAP-I). Specifically, wells MW-01S, MW-08S, and MW-10S, increased by an order of magnitude between the August 2014 and October 2014 sampling events. Well MW-25S was not sampled due to the presence of product. The TPH-DRO concentration in these wells exceeds effective solubility values associated to the diesel organic hydrocarbon range (0.073 mg/L for weathered #2 Fuel Oil and 3.2 mg/L for un-weathered #2 Fuel Oil - Shiu 1990). Thus, the concentrations of TPH-DRO in these wells indicate close proximity to free phase LNAPL in the formation.

The presence of relatively high TPH-DRO concentrations found in MW-01S, MW-08S and MW-10S correlate to the detections of LNAPL thickness for shallow wells summarized in **Section 3.2** and the occurrence of elevated LIF response presented in the February 2014 SCRA. It is expected that future periodic detections of LNAPL will occur among this subset of wells located proximal to the historical UST area if left un-remediated. The increases in dissolved TPH-DRO concentrations and the development of product in several wells over the last few months (MW-25S), occurring between August 2014 and November 2014, are likely related to the time required for these new wells to become equilibrated in the formation. These elevated TPH-DRO concentrations are more in-line with the conceptual model presented in **Sections 3.1** to **3.3**, where the highest relative response intervals were noted in the lithologic profile now considered the shallow or perched zone.

As distances increase from the UST area, concentrations of TPH-DRO reduce, as does the range of variation between concentrations measured in these wells (MW-30S and MW-72) between the two events. Several exceptions to this observation should be discussed, however. Monitoring well MW-51S which is in proximity to the UST area, (25 ft east-southeast), has had a relatively modest increase between the two events (1,590 µg/L to 8,400 µg/L). Well MW-51S would be expected to have a much greater concentration based on: (1) its proximity to the USTs and the elevated TPH-DRO shallow well group (MW-01S, MW-08S, MW-10S) and (2) that the LIF signature corresponding to its initial borehole location (B-51) was elevated. In addition, monitoring well MW-16S was 1,720 µg/L during the August 16, 2014 event but has been measured dry in six events since August 25, 2014.

Other wells in the shallow network demonstrated concentrations more consistent to concentrations obtained from the same wells during the previous groundwater sampling event. This stability, identified for shallow wells located at the periphery of the "zone of impact," indicates a more equilibrated state of communication with the formation.

<u>Deep Well Dissolved Phase Delineation and Trends</u>

As noted in **Table 4**, TPH-DRO concentrations for the deep monitoring well network range from non-detect (<45 µg/L) to 30,000 µg/L (30 mg/L) among 26 of 30 wells comprising the PRGS deep monitoring well network sampled during the October 2014 event. (Deep wells MW-5, MW-25 and MW-51 were not sampled due to the presence of product and well MW-108 was dry.) In contrast to TPH-DRO increases in the elevated TPH-DRO shallow well subset near the USTs, several wells in the deep zone including MW-31, MW-106, MW-107, TW-04, TW-05, TW-06 and TW-07 have reduced in concentration by an order of magnitude since the last comprehensive monitoring event of August 2014. These reductions may be related to: (1) effects of a more dynamic tidal/fluvial environment due to closer proximity to river and (2) effects of a structural preferential pathway (TW-series.)

The analytical results obtained for the deep wells during the October 2014 events are more in-line with the December 2013 LIF delineation in which LIF response noted in the deep zone was significantly less pronounced than the LIF response found in the shallow, perched zone located above the clay feature.

As noted, wells MW-05, MW-25 and MW-51 are deep wells with recurrent detections of LNAPL, with MW-05 and MW-25 demonstrating measurable thicknesses and MW-51 typically detected as trace. The presence of LNAPL in these wells, in light of the reduced LIF signature in the deep zone for MW-05 and MW-25 and the relatively lower concentrations of TPH-DRO in the deep zone monitoring wells stand in contrast to the similar correlations made for the conceptual model presented for the shallow zone. It is possible that vertical LNAPL migration from shallow to deep has occurred either: (1) across thinner, less-confining intervals of the identified clay feature straddling the two zones and/or (2) that soil boring and monitoring well installations have created breaches

between the shallow and deep zones allowing for the "drainage" of LNAPL. Because the deep wells (e.g., MW-05 and MW-25) may allow LNAPL to enter from the overlying shallow zone, the LNAPL thickness measurements may not be a representative indicator of the presence of LNAPL in the deep zone. It should be noted however, that any vertically drained LNAPL to the deep zone would encounter the same restrictive conditions in the deeper zone lithology as discussed in **Section 3.3**. Horizontal mobility of LNAPL in the deep zone is expected to be constrained and likely to remain local to any such breach or vertical migration pathway existing between the two hydrostratigraphic zones. As discussed earlier in this and previous sections, the high TPH-DRO concentrations approaching the effective solubility of TPH-DRO are a clear indicator denoting the presence or nearby presence of an LNAPL source zone. Geosyntec/GES will continue to monitor those deep wells in the vicinity of recurrent product bearing wells for increases in TPH-DRO with respect to potential LNAPL migration.

Common to the deep wells, both from the August 2014 and October 2014 groundwater monitoring analytical results, was that the TW-series, (along the water front), represented the highest dissolved TPH-DRO concentrations in the PRGS study area. As previously noted, the concentrations reduced significantly from August to October 2014, but this corresponded to an overall, general reduction in TPH-DRO trend for the deep zone. It is postulated that elevated concentrations in the TW-series wells along the waterfront relate to one or more preferential pathways existing along the outfall piping that run from the topographically-high PRGS facility to the downgradient Potomac River. The distribution of the elevated concentrations, particularly among wells TW-4 through TW-6, is possibly related to migration along Outfall 3 and/or Outfall 9, as shown on **Figure 11.D**.

3.5 Hydrocarbon Mass Estimate

The mass of hydrocarbons was estimated by calculating the approximate quantity of residual LNAPL and hydrocarbons, as TPH-DRO, in groundwater and in soil using the available data and various measurements and assumptions derived based on the conceptual site model and LNAPL and dissolved phase distribution described in **Section 3.4**. The following paragraphs summarize the methodology, assumptions, and mass estimates.

An estimate of the free phase LNAPL was made by approximating the volume of LNAPL in the pore space of the oil saturated soil matrix in the area where free product was observed in both the shallow and deep groundwater zones. The total volume was equivalent to the lateral extent of the LNAPL as on **Figures 6** and **8** for the shallow and deep zones respectively, an average product thickness of 0.01 feet and 0.62 feet, and an assumed effective porosity of 35 percent.

To estimate the TPH-DRO mass in the soil outside of the LNAPL saturated zone and directly under the USTs (where no soil data exists), we assumed (i) the soil in the vadose zone directly beneath the UST (an area of 1,742 ft^2) had a TPH-DRO concentration equivalent to the estimated saturation constant of 11,666 mg/kg (Ohio EPA, 2010); (ii) the soil was impacted for the entire footprint of both USTs from the elevation directly beneath the tanks to the perched water table.

For the remainder of the soil, we evaluated existing data and noted that the majority of hydrocarbon mass was located within 5 feet from the top of the perched water zone and 5 feet below the deep zone water table (i.e., a smear zone). Assuming that the intervening clay layer was three feet thick, the total thickness of the zone was 13-feet. Based on the available soils data, the extent of soil contamination was generally limited to an area of approximately 2,830 ft^2 surrounding the tanks. The average TPH-DRO soil concentration from the existing data in

that area was 1,592 mg/kg, excluding samples that in the LNAPL saturated zone. To calculate the soil mass in each area, the volume of soil in the bounded area and the volume of the soil beneath the UST were multiplied by the soil bulk density (38 kg/ft^3) and their respective concentrations.

To estimate TPH-DRO mass in groundwater the mass of the perched shallow zone and the deep zone water table were calculated separately. The aerial extent of each TPH-DRO isopleth (e.g. 1mg/l, 10mg/l) shown on **Figure 6 and 8** was calculated. An aquifer of 8 feet and 40 feet for the shallow and deep was assumed for the shallow zone and the deep zone, respectively. An effective porosity of 35 percent was assumed for the aquifer bearing soil.

The total TPH-DRO mass present in the vicinity of the former USTs as estimated from the above methods is approximately 17,409 gallons or 54,679 kg of TPH-DRO present at the Site. The breakdown of mass present by media is as follows:

(i) soil – 24,444 kg or 7,772 gallons of TPH-DRO;
(ii) groundwater –95 kg or 31 gallons of TPH-DRO (shallow Groundwater – 52 kg or 17 gallons of TPH-DRO and deep groundwater – 43 kg or 14 gallons of TPH-DRO); and
(iii) residual LNAPL – 30,139 kg or 9,606 gallons of TPH-DRO (shallow free phase LNAPL – 275 kg or 87 gallons of TPH-DRO and deep free phase LNAPL – 29,864 kg or 9,518 gallons of TPH-DRO)..

Supporting calculations for the values above are provided in **Appendix I**.

3.6 Natural Attenuation

Natural attenuation relies upon natural subsurface processes to reduce contaminant concentrations to acceptable levels. As stated in Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites (Office of Solid Waste and Emergency Response [OSWER] Directive 9200.4-17P, 1999), "the natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in-situ processes include biodegradation; dispersion; dilution; sorption; volatilization; radioactive decay; and chemical or biological stabilization, transformation, or destruction of contaminants." (p. 3)

Groundwater DO and ORP measurements are important indicators of biodegradation. DO is consumed as aerobic biodegradation occurs and DO concentrations and ORP typically reduce as a result. DO and ORP measurements throughout the shallow and deep zones are depicted on **Figure 9** and **Figure 10**, respectively. Positive ORP indicates oxidizing conditions exist in the subsurface and negative ORP indicates reducing conditions exist. As DO and ORP decrease, electron acceptors other than oxygen are used as part of the biodegradation process. The following parameters have been monitored to study biodegradation at the Site:

Parameter	Purpose
Dissolved Oxygen (DO)	Primary electron acceptor for aerobic microbial respiration
Oxidation Reduction Potential (ORP)	ORP influences and is influenced by biological processes
pH	Biological processes are pH-sensitive
Temperature	Metabolism rates for microorganisms depend on temperature
Conductivity	Water quality parameter used to verify groundwater is representative of the larger groundwater system
Headspace VOC concentration	Indicator of the soil gas VOC concentration or methane production from anaerobic processes
Headspace CO_2 concentration	Indicator of aerobic biodegradation processes
Nitrate (NO_3^{-1})	Secondary electron acceptor for microbial respiration if oxygen is depleted
Ferrous Iron (Fe^{2+})	Indicator of anaerobic biodegradation processes
Sulfate (SO_4^{2-})	Substrate for anaerobic microbial respiration
Methane (CH_4)	Indicator of anaerobic biodegradation processes

DO and ORP measurements throughout the shallow and deep zones from October 10 and 13, 2014 are depicted on **Figure 9** and **Figure 10**, respectively. A Groundwater Field Parameters Data Summary is included as **Table 7** and Monitored Natural Attenuation Analytical Data Summary is included as **Table 8**.

As shown in **Table 7**, DO concentrations have been below 1 mg/L and ORP readings have been negative at each of the shallow zone monitoring wells in the precipitator shed area (i.e., all shallow wells excluding the wells near the terminus of the sheet pile bulkhead structure and the wells in the basement). DO readings below 1 mg/L and negative ORP readings are generally considered to indicate anaerobic conditions exist. Other observed electron acceptor trends, including low nitrate concentrations, elevated dissolved iron concentrations, low sulfate concentrations, elevated methane concentrations, and elevated alkalinity, further demonstrate anaerobic conditions exist and biodegradation is occurring. Away from the most elevated hydrocarbon concentrations, DO and ORP are higher. At monitoring well MW-112S, a short distance from the elevated hydrocarbon concentrations, the DO concentration reached 2.5 mg/L and the ORP reached +172.9 millivolts (mV).

In the deep zone, DO levels are low where the highest hydrocarbon concentrations exist and increase at farther distances. While DO and ORP readings were not collected at monitoring wells with LNAPL present, readings were taken from nearby monitoring wells with high hydrocarbon concentrations. At monitoring wells MW-27 and MW-31, DO concentrations were 0.28 and 0.39 mg/L, respectively, and ORP readings were negative at both wells prior to the feasibility testing. This suggests significant biodegradation is occurring in the deep zone and anaerobic conditions exist where the highest hydrocarbon concentrations exist. At monitoring wells with impacts farther from the source area, DO concentrations are generally below 2 mg/L and ORP readings are positive, suggesting aerobic biodegradation is occurring. In addition, headspace monitoring suggested aerobic respiration had been occurring, as low oxygen and high carbon dioxide readings were observed. In contrast at monitoring well MW-113, where minimal hydrocarbon impact exists, the DO concentration was 6.17 mg/L and the ORP was 83.2 mV. Monitoring at select deep wells of other electron acceptors and indicators of anaerobic biodegradation further suggest

conditions are anaerobic near the source area and progress toward aerobic conditions as hydrocarbon concentrations decrease.

Given the historical groundwater monitoring data, which demonstrates clear indications of biological activity, the Site is likely to be significantly affected by natural attenuation processes. This suggests that monitored natural attenuation and enhanced biodegradation could be a viable part of the remedial strategy for the Site.

4.0 REMEDIATION ASSESSMENT

Various remediation technologies were screened to determine the potentially viable methods to remediate the liquid-phase, dissolved-phase and adsorbed-phase hydrocarbons that exist in the subsurface. The potential remedial technologies and site-specific factors associated with each were discussed in Section 6.0 of the CAP-I submitted September 5, 2014. Of the screened technologies presented, soil vapor extraction (SVE), pump and treat/total fluid (groundwater and LNAPL) extraction, vacuum enhanced groundwater extraction (VEGE), air sparge/soil vapor extraction (AS/SVE), biosparge/aerobic bioremediation, bioslurping/TPE, in addition to bulkhead seep sealing were retained for further evaluation. Each of these technologies, except bulkhead seep sealing, was evaluated during the four day feasibility test conducted from October 13 to 16, 2014.

4.1 Feasibility Testing

In the shallow, perched water zone, where sparging and groundwater pumping are not feasible, feasibility testing included SVE and total phase extraction (TPE) testing. In the deep zone, testing included biosparge, AS/SVE, total fluids pumping, VEGE testing, and TPE testing. The individual tests performed are presented in the table below.

Test Day	Extraction Well or Sparge Well	Type of Test
Day 1 Oct 13th	MW-51	SVE
	SP-1	Air Sparge
	MW-51S	SVE
Day 2 Oct 14th	RW-1	SVE
		Total Fluids Pumping
		VEGE
	MW-51	Total Fluids Pumping
		VEGE
	MW-51 / SP-1	AS & VEGE
Day 3 Oct 15th	MW-27	SVE
	SP-2	Biosparge
		Air Sparge
	MW-25S	TPE
Day 4 Oct 16th	MW-25	TPE
	MW-10S	TPE
	MW-27	Total Fluids Pumping
		VEGE

A mobile feasibility testing unit equipped with pumps, vacuum blowers, sensors, gauges, flow meters, and hardware, was used for the testing activities. An on-board computer allowed for real-time evaluation of the effects on the water table level and design parameters such as the radius of influence, vacuums, pressures, and flow rates for each technology being tested. During testing, the applied vacuums, vapor recovery flow rates, sparge pressures and flow rates, groundwater extraction flow rates, and influent VOC concentrations were monitored. Induced vacuum responses and groundwater level fluctuations were collected at designated observation wells surrounding the extraction wells using transducers and wireless transmitters. Additional groundwater parameters and headspace vapor concentrations were collected from observation and extraction wells during testing using a multi-parameter water quality meter, PID, and multi-gas detector. During total fluids pumping and VEGE testing, groundwater was extracted from a groundwater monitoring well utilizing a top loading pneumatic pump. During biosparge testing, helium was injected with the sparged air and a helium detector was used to monitor helium levels in the headspace of observation wells.

Recovered vapor samples were collected for laboratory analysis during SVE, TPE, and VEGE testing from the recovered vapor stream and submitted to Eurofins Lancaster Laboratory. Samples were analyzed for BTEX, TPH C_1 to C_4 hydrocarbons, and TPH $>C_4$ to C_{10} hydrocarbons via EPA method 18/25. Water samples for laboratory analysis were collected during VEGE testing from the recovered groundwater and submitted to Eurofins Lancaster Laboratory. Water samples were analyzed for BTEX via EPA method 8260 and TPH-GRO and TPH-DRO via EPA method 8015. Metal constituents (total/dissolved calcium, total/dissolved iron, total/dissolved magnesium, total/dissolved manganese and total lead) were analyzed via EPA method 6010. Oil & grease were analyzed via EPA method 1664, and total dissolved solids (TDS) and total suspended solids (TSS) were analyzed via EPA method 2540. Vapor and groundwater laboratory reports for samples collected during the feasibility test are included in **Appendix J**.

Recovered LNAPL and groundwater from the feasibility test were containerized in a 5,000 gallon holding tank. The fluids were later evacuated from the tank and hauled for disposal offsite. A waste manifest is attached in **Appendix D**. Recovered vapors were discharged to the atmosphere.

The primary objective of remedial feasibility testing activities was to determine the site-specific feasibility of the different remedial technologies. Other feasibility testing objectives included determination of the following for the remediation system design:

- Optimal extraction and injection flow rates;
- Optimal applied vacuums and pressures;
- Radius of influence (ROI); and,
- Mass recovery rates.

The results of the feasibility testing are summarized below. A Feasibility Test Vapor Phase Recovery Data Summary is included as **Table 10**, a Feasibility Test Air Sparge Data Summary is included as **Table 11**, a Feasibility Test Groundwater Data Summary is included as **Table 12**, and a Feasibility Test Total Hardness Determination is included as **Table 13**. Individual feasibility test summaries, including data, graphs, and ROI determinations, are included as **Appendix K**.

4.1.1 Shallow Zone Testing

TPE Testing on MW-25S and MW-10S:

- Applied vacuum was 17 inches of mercury (in. Hg) at monitoring well MW-25S and 20 in. Hg at monitoring well MW-10S.
- The average groundwater recovery rates were 0.2 and 0.3 gallons per minute (gpm) at MW-25S and MW-10S, respectively, but the flow rate was initially high while evacuating the well and then the flow rate was zero gpm.
- Vapor flow rates were 74 and 52 standard cubic ft per minute (scfm) at MW-25S and MW-10S, respectively.
- Vacuum influence was measurable and consistent during TPE testing, yielding ROIs greater than 69 ft during both tests (assuming 0.10 inches of water [i.w.] to be effective vacuum). Significant vacuum was present at all observation wells within 65 ft during both tests, with influence as high as 6.1 i.w.
- The vapor phase >C4-C10 hydrocarbon recovery rates were 8.0 pounds per day (lbs/day) at MW-25S and 4.7 lbs/day at MW-10S, while the vapor phase C1-C4 hydrocarbon recovery rates were 240 lbs/day at MW-25S and 94 lbs/day at MW-10S. The high C1-C4 hydrocarbon recovery rates could be methane production from biological activity.
- Drawdown was observed in surrounding shallow zone observation wells, with groundwater ROIs extending 25 and 27 ft, assuming 0.10 ft to be the minimum effective influence.
- Drawdown to the bottom of the well occurred almost immediately during testing, creating approximately 2.5 ft of drawdown at both MW-25S and MW-10S.
- Vacuum influence and liquid level influence were not observed in deep zone monitoring wells.

SVE Testing on MW-51S:

- Applied vacuum ranged from 28 to 103 i.w. (2 to 8 in. Hg) during three vacuum steps;
- Vapor flow rates ranged from 37 to 95 scfm;
- Vacuum influence was measurable at all seven shallow observation wells within 61 ft during all three vacuum steps, yielding ROIs between 72 and 80 ft (assuming 0.10 i.w. to be effective vacuum).
- The vapor phase >C4-C10 hydrocarbon recovery rates ranged from 1.7 to 5.6 lbs/day, while the vapor phase C1-C4 hydrocarbon recovery rates ranged from 54 to 466 lbs/day.
- Minimal upwelling was observed in surrounding shallow zone observation wells, with immeasurable groundwater ROIs.
- Upwelling in the extraction well reached 2.7 ft during the third vacuum step.

4.1.2 Deep Zone Testing

Vapor Extraction during SVE and VEGE Testing on MW-51, MW-27, and RW-1:

- Deep well SVE testing at monitoring wells MW-51, MW-27 and RW-1 was unsuccessful due to upwelling covering the limited exposed screen interval.
- During VEGE testing at monitoring wells MW-51, MW-27 and RW-1, low vapor flow rates were observed, ranging from 4 to 8 scfm, despite the applied vacuum ranging from 42 to 328 i.w. (3 to 24 in. Hg).

- Minimal vapor phase hydrocarbon recovery rates were observed, with >C4-C10 hydrocarbon recovery ranging from 0.0 to 0.1 lbs/day and C1-C4 hydrocarbon recovery ranging from 0.0 to 3 lbs/day.
- Minimal vacuum influence was observed at surrounding observation wells, with the ROIs being immeasurable during deep zone SVE and VEGE testing.
- Influence in the shallow zone was not observed during testing in the deep zone.

Total Fluids Pumping during GW Pumping and VEGE Testing on MW-51, MW-27, and RW-1:

- At recovery well RW-1, testing was unsuccessful with groundwater recovery rates of only 0.1 gpm during pumping only and 0.2 gpm during VEGE testing, so testing on the well was stopped and testing was initiated at monitoring well MW-51.
- The groundwater recovery rate at monitoring well MW-51 ranged from 3.0 to 3.6 gpm, and drawdown remained near the pump intake between 4 and 5 ft below the static groundwater level until the highest vacuum step was applied.
- The groundwater recovery rate at monitoring well MW-27 ranged from 2.1 to 3.6 gpm, and drawdown remained near the pump intake at approximately 3 ft below the static groundwater level until the highest vacuum step was applied.
- Drawdown was observed at surrounding deep well observation wells, with groundwater ROIs reaching 63 ft during testing at MW-51 and reaching 38 ft during testing at MW-27, assuming 0.10 ft to be effective influence.
- In the recovered groundwater, TPH DRO concentrations (88,600 µg/L at MW-51 and 3,100 µg/L at MW-27) were similar to existing data, and the total hardness was 273 mg/L as $CaCO_3$ at MW-51 and 351 mg/L as $CaCO_3$ at MW-27.

Biosparge and Air Sparge Testing on SP-1 and SP-2:

- At sparge well SP-1, four steps were conducted with sparge flow rates that ranged from 0.7 scfm to 5.8 scfm. The corresponding pressures ranged from 6.0 to 9.9 pounds per square inch (psi).
- At sparge well SP-2, three steps were conducted with sparge flow rates that ranged from 1.2 scfm to 3.1 scfm. The corresponding pressures ranged from 6.0 to 7.0 psi.
- Liquid level influence was measurable and consistent during biosparge and air sparge testing, yielding ROIs that ranged from 82 to 120 ft at SP-1 and from greater than 115 ft during all three steps at SP-2, assuming 0.10 ft to be effective influence. Liquid level influence was observed at all deep zone observation wells within 60 ft during SP-1 testing at all wells within 115 ft during SP-2 testing.
- Pressure influence was observed only at deep zone observation wells within 14 ft during SP-2 testing, with ROIs ranging from 19 ft during biosparge testing to 27 ft during air sparge testing.
- Helium was added to the sparged air during biosparge testing at SP-2. A helium detector was then used to monitor the presence of helium in the headspace of the observation wells. Helium was observed in 13 observation wells ranging from 13 to 115 ft from SP-2. Helium concentrations ranged from 23% to 56% in three observation wells within 17 ft, with lower concentrations being observed at greater distances.
- During biosparge testing at SP-2, liquid level mounding and helium were observed at monitoring well TW-05, which suggests sparging on the PRGS property will increase DO levels on the NPS property.
- Monitoring wells close to the sparge wells (e.g., MW-27, MW-31, and MW-72) showed increases in DO immediately after testing, with levels decreasing again by the following week. At monitoring well MW-27,

for example, DO increased from 0.2 mg/L to 1.67 mg/L during injection at sparge well SP-2, and decreased to 0.54 mg/L one week following the event.

- Testing at sparge well SP-2 did result in modest shallow zone influence in the immediate area, with helium being detected in 4 shallow wells (MW-10S, MW-25S, MW-51S, and MW-72S), and pressure and increases in DO being observed at monitoring well MW-72S.

4.2 Remedial Technology Feasibility Evaluation

The feasibility of the technologies retained for further evaluation has been determined based on feasibility testing results and is described in the sections below.

4.2.1 Bioslurping / Total Phase Extraction

Bioslurping or TPE involves the simultaneous application of vacuum enhanced fluid extraction/recovery, vapor extraction, and bioventing to address hydrocarbon impact. Fluid (LNAPL and groundwater) and vapors are removed from the well through a single "drop tube" and are sent to a vapor/liquid separator, and then the fluid is transferred to an oil/water separator. The vacuum-induced negative pressure zone in the well promotes LNAPL flow toward the well and also draws LNAPL trapped in small pore spaces above the water table. When the fluid level declines in response to fluid extraction or water level fluctuations, the drop tube begins to draw in and extract vapors. This vapor extraction is used to remove volatile hydrocarbons from the vadose zone and enhance aerobic biodegradation in the vadose zone and capillary fringe through air movement increasing oxygen content (bioventing).

Based on the feasibility testing results, TPE is an effective technology in the shallow zone for removal of LNAPL and groundwater and the remediation of unsaturated or occasionally saturated soils. Sufficient vacuum can be achieved in the extraction wells for fluid extraction, and the fluid extraction rate was low enough that vapor extraction can also be maintained. However, the vapor flow rate is moderately high, which could present challenges when designing a TPE system. Reducing the screen interval of the shallow zone wells from 10 ft to 5 ft would reduce the vapor flow rate so that TPE can be effectively implemented. Because the water column thickness in the shallow monitoring wells is too low for a groundwater pump to be used to extract fluid, TPE is one of the only feasible technologies for fluid extraction from the shallow zone. Significant LNAPL recovery is not anticipated from the shallow zone. However, evacuating the fluid will provide some LNAPL and groundwater recovery, and it will also create a cone of depression around each extraction well and allow vapor extraction to occur from previously saturated soils. In the deep zone, TPE was not effective due to the excessive amount of groundwater recovered and the minimal vapor recovery achieved.

4.2.2 Soil Vapor Extraction (SVE)

SVE systems allow for the recovery of soil vapors from unsaturated soils, which can be effective in removing volatile constituents from the vadose zone and promoting aerobic bioremediation as soil gas from outside the impacted area with greater oxygen content is introduced. SVE in the shallow zone did allow for the recovery of adsorbed phase hydrocarbons and large vacuum ROIs were achieved. However, due to groundwater mounding and the inability to recover LNAPL and groundwater, SVE is not considered a viable stand-alone technology for the shallow zone. In the deep zone, SVE was not feasible due to the limited amount of exposed screen above the water table and low vapor recovery rates achieved.

4.2.3 Pump & Treat (P&T) or Total Fluids Extraction (TFE)

P&T is a practical remedial technology which can be implemented in the deep zone to recover mobile LNAPL, recover dissolved-phase hydrocarbons, and retard downgradient migration of liquid-phase and dissolved-phase hydrocarbons. Feasibility testing revealed groundwater recovery rates between 2.3 and 3.6 gpm with large ROIs of liquid level influence. Feasibility testing, in addition to the pump testing previously conducted, has shown P&T to be an effective technology for the initial phases of remediation to recover impacted groundwater and any mobile LNAPL from the deep zone in the source area. However, P&T as a stand-alone remediation technology for the deep zone would likely be less efficient than other technologies considering the large area and the high groundwater flow rate that would be required to make the technology effective, and may require several years of system operation and maintenance to achieve cleanup. Therefore, P&T is better suited as a technology used prior to or along with implementation of a separate long term remedial strategy.

4.2.4 Vacuum Enhanced Groundwater Extraction (VEGE)

VEGE, which combines SVE and TFE, had been considered a potentially viable technology for the Site to recover LNAPL, dissolved-phase hydrocarbons, and adsorbed-phase hydrocarbons above and below the water table. However, feasibility testing revealed that when VEGE was tested on monitoring wells screened only in the deep zone, very limited vapor recovery was achieved. The limited recovery is likely due to a limited vadose zone present in the deep zone and the confining layer. Significant dewatering would likely have to occur before enough unsaturated soil is available for significant vapor movement to occur. The induced vacuum from the SVE blowers moderately increased the groundwater recovery rate, but because the vapor phase flow rate and hydrocarbon recovery rate were minimal, the benefits of VEGE over groundwater pumping in the deep zone are minimal.

VEGE could be an effective technology to remediate the shallow and deep zones if recovery wells were installed across both zones to allow groundwater and vapor extraction from both zones simultaneously using one remediation system. However, recovery wells constructed in this manner may allow fluid from the shallow zone to enter the deep zone, which could potentially cause hydrocarbon migration when the remedial system is not in operation.

4.2.5 Air Sparge / Soil Vapor Extraction (AS/SVE)

AS/SVE involves the delivery of compressed air into wells that are screened below the water table that travels upward and outward in the aquifer, resulting in the mass transfer of adsorbed-phase and dissolved-phase hydrocarbons into the vapor stream and the enhancement of aerobic biodegradation through increased DO concentrations. Volatilized compounds are then removed from the vadose zone by an SVE system. During feasibility testing, it was determined that recovery of sparged vapors is not feasible due to the limited amount of exposed screen above the water table in the deep wells, the low vapor recovery rates achieved, and the inability to achieve vacuum influence. Therefore, AS/SVE is not a viable remedial strategy. However, the ability to inject up to 5.8 scfm at less than 10 psi suggests that deep zone injection of air or fluid is feasible. This suggests that in addition to biosparge, in-situ chemical oxidation (ISCO) could be a viable technology in the deep zone to address specific areas of the Site as remedial optimization occurs.

4.2.6 Biosparge / Aerobic Bioremediation

Biosparge relies on indigenous microorganisms to reduce contaminant levels and involves the delivery of compressed air into wells screened below the water table and at a low flow rate (i.e., compared with air sparging). Air bubbles travel upward and outward in the aquifer, resulting in increased DO levels for microorganisms. Based on feasibility testing results, compressed air can be delivered into the deep zone at low to moderate pressure and the soil conditions appear to allow for effective transport of oxygen throughout the onsite area of impact. The helium observed at observation wells up to 115 ft from SP-2 during biosparge testing with helium demonstrates an effective distribution of sparged air can be achieved.

As discussed in Section 3.6, analysis of the groundwater quality parameters, headspace vapor concentrations, and monitored natural attenuation groundwater sampling parameters indicate both that significant biological activity is occurring in the subsurface and that DO is depleted. In addition, increases in DO were observed following biosparge feasibility testing and the DO had reduced by the following week.

Biosparge is a viable technology to address dissolved phase hydrocarbons in the deep zone, particularly away from the source area (e.g., along the river in the vicinity of monitoring well TW-05) or in the source area once LNAPL has been reduced. Biosparge is an efficient and sustainable remedial strategy that does not have the drop in efficiency associated with other technologies during later phases of remediation.

5.0 REMEDIAL GOALS

Remedial goals for the Site which will satisfy the requirements of the VDEQ Petroleum Storage Tank Program are detailed below:

- Eliminate observed discharges of hydrocarbon impacted groundwater to the river (i.e., Seep B and Seep D);
- Reduce the presence of LNAPL to a 0.01 ft or less (i.e., the requirement described in Section 9 VAC 25-580-270 of the UST Technical Regulation);
- Reduce naphthalene groundwater concentrations to below 10 µg/L (i.e., the maximum discharge level stated in Table 6-2 of the Storage Tank Program Technical Manual); and
- Reduce TPH-DRO groundwater concentrations to below 15 mg/L (i.e., the maximum discharge level stated in Table 6-2 of the Storage Tank Program Technical Manual).

6.0 PROPOSED REMEDIAL STRATEGY

Based on the Site characterization activities conducted to date and the remedial feasibility evaluation, the Consulting Team recommends a comprehensive approach to corrective action involving multiple technologies and phases of remediation for both the shallow and deep zones and the source and non-source areas. The proposed remedial strategy has been developed based on its effectiveness in addressing the goals presented above in an efficient and sustainable manner.

6.1 Shallow Zone Strategy

The recommended approach for the remediation of LNAPL and dissolved-phase and adsorbed-phase hydrocarbon impacts in the shallow zone is to aggressively extract LNAPL, groundwater, and soil vapor from shallow monitoring wells. To accomplish this, it is proposed that a TPE remediation system be installed. The favorable TPE results during feasibility testing at monitoring wells MW-25S and MW-10S suggest TPE can be effectively implemented in the shallow zone.

TPE is the most appropriate technology available to extract fluids from a perched water zone where the water column thickness is limited and vacuum extraction can be successfully achieved. In addition to fluid extraction, the application of vacuum creates pressure gradients that enhance LNAPL and groundwater recovery and serves to remediate unsaturated and previously-saturated (i.e., prior to fluids recovery) soil impacts. The venting associated with vapor extraction will also help to elevate the low DO and headspace oxygen concentrations observed in the shallow zone, which will enhance aerobic biodegradation. Shallow zone impacts likely ultimately contribute to deep zone impacts, so remediation of the shallow zone impacts is a critical part of any remedial approach for the Site. Installation of a permanent system to remediate this zone will more efficiently reduce impacts compared with the implementation of EFR events or another technology.

The primary area of concern, based upon the current soil and groundwater quality, as well as investigations and assessments completed to date, is the area encompassing shallow zone monitoring wells MW-01S, MW-30S, MW-72S, and MW-110S. In this area, the shallow zone adsorbed-phase impacts occur in the vadose, smear, and saturated zones primarily from 22 to 25 ft bgs in the precipitator shed (12 to 9 feet msl).

Once significant hydrocarbon mass has been recovered from the shallow zone and TPE becomes less efficient and effective, monitored natural attenuation can be implemented. Biological activity has been demonstrated to be occurring in the shallow zone. Also, given the extent of the shallow zone, the potential for unacceptable risks to human health or environmental resources will be mitigated through the ongoing deep zone remediation that will address any impacts that may migrate into the deep zone.

6.2 Deep Zone Strategy

The recommended approach for the remediation of the LNAPL and dissolved-phase and adsorbed-phase hydrocarbon impacts in the deep zone is to eliminate LNAPL to the maximum extent practical and reduce the dissolved-phase hydrocarbon impacts close to the source area through aggressive fluid extraction, and to address the dissolved-phase hydrocarbon plume that extends to the NPS property through a longer term in-situ approach. Based on the remedial feasibility evaluation, total fluids extraction or P&T is the most effective way to eliminate LNAPL in the deep zone within the source area. As discussed in Section 3.0 above, mobile LNAPL is limited at the Site, so significant LNAPL recovery is not anticipated, but P&T will also serve to reduce dissolve-phase hydrocarbon concentrations. P&T would become less efficient if used to address the entire dissolved-phase hydrocarbon plume, given the amount of pumping that would be required and the drop in effectiveness associated with P&T systems once hydrocarbon concentrations are initially reduced. Therefore, a P&T system will be utilized for initial remediation of the area from monitoring well MW-05 extending to monitoring wells MW-72 and MW-31.

To address the larger dissolved-phase hydrocarbon plume and to achieve the long-term remedial goals, the most effective approach is to enhance the existing microbial activity at the Site through enhanced aerobic bioremediation (i.e., biosparge), followed by monitored natural attenuation. Evidence of significant biological activity has been observed, low DO concentrations exist, and feasibility testing has demonstrated that oxygen injection and distribution is feasible. Biosparge will be used to address hydrocarbon impacts that extend onto the NPS property as well as impacts closer to the source area. In the area of P&T system operation, the biosparge system operation will occur simultaneously with P&T system operation. The area of concern for the biosparge system, based upon the current soil and groundwater quality, as well as investigations and assessments completed to date, is the area encompassing monitoring wells MW-05, MW-11, MW-31, TW-04 and TW-07.

Once hydrocarbon concentrations are significantly reduced or moderate DO concentrations can be maintained without biosparge, a transition to monitored natural attenuation can occur. As discussed above, the successful air sparge injection during feasibility testing demonstrated that deep zone injection of air or fluid is feasible, so nutrient amendments or ISCO could be evaluated as remedial optimization occurs to address specific areas of the Site.

6.3 Remedial Endpoints

As described above, the comprehensive remedial strategy for the Site involves different phases of remediation for both the shallow and deep zones. For the shallow zone, the strategy involves a transition from TPE to monitored natural attenuation, and for the deep zone, the strategy involves a transition from P&T and biosparge to biosparge only, followed by a transition to monitored natural attenuation. Presented in the table below are the remedial endpoints for the transitions from one remedial technology to the next.

For the shutdown of either the TPE system, P&T system, or biosparge system, once the conditions stated are met, a three month trial system shutdown (i.e., one quarter) will occur. If significant rebound does not occur and the conditions stated continue to be satisfied during the trial shutdown, the system will not be restarted.

In the deep zone, three remedial compliance monitoring wells will be installed in the immediate vicinities of monitoring wells MW-05, MW-25, and MW-51 to be used to evaluate attainment of remedial endpoints. These three monitoring wells will be installed so that the filter pack begins a minimum of one foot below the top of the observed clay layer to decrease the likelihood that impacts from the shallow zone enter the wells.

Shallow Zone:	
TPE System	• LNAPL has been removed to the maximum extend practical, • No significant quantity of LNAPL is being recovered by the remediation system, and • Dissolved-phase concentrations are sufficiently low that it can be demonstrated natural attenuation will cause naphthalene and TPH-DRO concentrations to fall below 10 µg/L and 15 mg/L, respectively, within two years.
Monitored Natural Attenuation	• Groundwater concentrations of naphthalene and TPH-DRO are below 10 µg/L for and 15 mg/L, respectively, for six months (i.e., two consecutive quarters).

Deep Zone:	
P&T System	• LNAPL has been removed to the maximum extent practical, • No significant quantity of LNAPL is being recovered by the remediation system, and • The remedial compliance wells exhibit LNAPL thicknesses below 0.01 feet for a minimum of two consecutive quarters.
Biosparge System	• Groundwater concentrations are sufficiently low that it can be demonstrated that natural attenuation will cause naphthalene and TPH-DRO concentrations to fall below 10 µg/L and 15 mg/L, respectively, within two years.
Monitored Natural Attenuation	• Groundwater concentrations of naphthalene and TPH-DRO are below 10 µg/L for and 15 mg/L, respectively, for six months (i.e., two consecutive quarters).

6.4 Proposed Recovery Well Network

The proposed recovery well networks for the TPE, P&T, and biosparge systems are described below. This preliminary design may be adjusted during the formal design process based on all available data at the time of design, and the depth of the screen interval for all recovery and sparge wells will be determined based upon field observations. The biosparge system well network has been designed to span the areas of high dissolved concentration, while the TPE and P&T well networks have a spatial configuration covering the source area where the constituents of concern and LNAPL have been determined to be the most highly concentrated. Utilizing a dense group of wells will maximize effectiveness, reduce potential dead zones, and minimize the life cycle of the remediation system. The systems will also be designed with the flexibility to accommodate changes in site conditions. This will be accomplished by designing the systems with extra capacity to handle extra flow to/from additional wells and by installing fittings and spare piping where necessary to easily connect to additional wells.

<u>TPE System:</u>

Based on feasibility testing, the vacuum ROIs during TPE were greater than 69 ft and the groundwater ROIs were at least 25 ft. The ROI used to determine the extraction well network was conservatively designed at 25 ft to ensure influence is maintained around the extraction well network, to aggressively remediate the area, and to address any anisotropic conditions. The extraction well network is to consist of the seven existing monitoring wells that exhibit the highest levels of impact (MW-01S, MW-10S, MW-25S, MW-30S, MW-51S, MW-72S, and MW-109S), as well as three additional extraction wells. The TPE well network and the anticipated ROI for each well are shown as **Figure 12**. Because the impacts in the shallow zone exist primarily below 22 feet bgs in the precipitator shed (12 ft msl) and the existing monitoring wells have 10 ft of screen that extend up to a depth of approximately 15 to 17 feet bgs in the precipitator shed (19 to 17 feet msl), the existing wells are to be modified so that extraction occurs only below 20 feet bgs in the precipitator shed (14 feet msl). The new recovery wells are to be installed with 5 ft of 4-inch diameter, schedule 40 PVC screen extending up from the top of the observed clay layer (i.e., an approximate screen interval of 20 to 25 ft bgs).

P&T System:

The groundwater pumping ROIs during feasibility testing and the pump test reached greater than 60 ft. However, the ROI used to determine the P&T extraction well network was conservatively designed at 30 ft to aggressively remediate the area and to address any anisotropic conditions. The extraction well network is to consist of the five existing monitoring wells in the area that exhibit the highest levels of impact (MW-05, MW-25, MW-31, MW-51, and MW-72). The P&T extraction well network and the anticipated ROI for each well are shown as **Figure 13**. The new recovery wells are to be installed with 10 ft of 4-inch diameter, schedule 40 PVC screen that starts approximately 2 ft above the observed high water level in surrounding monitoring wells, but so that the screen or the sand pack does not extend above the top of the observed clay layer.

Biosparge System:

During biosparge feasibility testing at SP-2, although pressure influence was only observed at immediate wells with a pressure ROI of just under 20 ft, groundwater mounding and helium were observed at monitoring wells over 100 ft away. Because the distribution of the DO downgradient of the sparge wells is expected to be greater than the distribution in the side-gradient directions, the ROI used to determine the biosparge well network was conservatively designed at 20 ft. This will also serve to aggressively remediate the area and address anisotropic conditions. The well network was also designed with a cross-gradient row of sparge wells near the leading edge of the plume, just before the NPS property, that have a 25 foot well spacing. This dense row of five sparge wells is anticipated to supply DO along the river front, including at monitoring wells TW-04 through TW-07. However, an additional two sparge wells are proposed for the NPS property (in proximity to monitoring wells TW-05 and TW-07) to more aggressively treat this area. The biosparge well network includes sparge wells that overlap the area of the P&T system, which will allow the P&T system to be shut down while the biosparge system continues to remediate the source area. The biosparge well network consists of 15 sparge wells and the proposed location and anticipated ROI for each well are shown as **Figure 14**. The sparge wells are to be constructed with 3 ft of 2-inch diameter, schedule 40 PVC screen and starts approximately 7 ft below the anticipated water level or below the impacted soil.

6.5 Conceptual System Design

Below is the conceptual design of the TPE system, the P&T system, and the biosparge system. Final design specifications and engineering calculations for the treatment system will be completed during CAP implementation.

The TPE system is to be comprised of a vacuum pump (for the recovery of LNAPL, groundwater, and soil vapor), a vapor/liquid separator, individual piping to each recovery well, and an adjustable length drop tube and well seal at each recovery well, along with a piping manifold, flow meters, pressure gauges, and associated controls. The system will be designed to extract a combined system flow rate of up to 350 scfm at an anticipated vacuum of 15 to 20 in. Hg. The LNAPL and groundwater will be transferred from the vapor/liquid separator to the P&T system treatment equipment. Treatment of the vapor stream is anticipated to be required. If required, it will consist of a catalytic oxidizer to achieve discharge requirements. If a catalytic oxidizer is used, vapor treatment may be changed at a later time to vapor granular activated carbon (VGAC) vessels as mass removal rates change.

The P&T system will use top-loading, pneumatic, total fluids pumps for the recovery of LNAPL and groundwater. The system is to be comprised of an air compressor that supplies air to the pumps, compressed air and total fluids

piping to each recovery well, a piping manifold, pressure regulators, pump cycle counters, flow meters, and associated controls. Treatment equipment will be designed to meet discharge or pre-treatment requirements, but is anticipated to include an oil/water separator and LNAPL holding tank, an air stripper for primary water treatment, solids filtration equipment, and liquid granular activated carbon (LGAC) vessels for secondary water treatment. Treatment of the air stripper off-gas is not anticipated to be required. If required, it will consist of VGAC vessels to achieve discharge requirements.

The biosparge system is to be comprised of an air compressor capable of injecting 1 to 2 scfm into each sparge well at pressures between 5 and 10 psi. The system will be separate from the TPE and P&T system equipment and include a piping manifold, flow meters, pressure gauges, and associated controls.

The system will also include a telemetry system that will make notifications in the event of an alarm condition or system shut-down. The TPE lines will be constructed of schedule 40 PVC below grade and schedule 80 PVC above grade. Total fluids piping will be constructed of schedule 80 PVC above and below grade. Biosparge and compressed air piping for the total fluids pumps will be constructed of acrylonitrile butadiene styrene (ABS) pipe below grade and steel above grade at the remediation system. Where trenching is required, subgrade piping will be installed no greater than 36 inches below grade, and piping will be bedded in pea gravel, sand, or other bedding material. Trenches will then be backfilled with suitable material and will be resurfaced to meet existing conditions. The proposed piping and equipment locations are depicted on **Figure 15** – Proposed Remediation System Layout. The equipment will require installation of a dedicated power drop. A Conceptual Process Flow Diagram for the system components is presented as **Figure 16**. These components are representative and revisions may be required during the final design process.

The following permits and/or approvals will be obtained to the extent necessary:

- Authorization to discharge into the sanitary sewer from Alexandria Renew Enterprises for the groundwater treatment equipment discharge;
- An air discharge permit for off-gas from the TPE system blower and the P&T system air-stripper;
- Building, construction, and electrical permits required by the City of Alexandria;
- National Park Service Special Use Permit.

Note that a Groundwater Withdrawal Permit is not required because the Site does not fall within one of Virginia's Groundwater Management Areas (GWMA).

6.6 Operation and Maintenance

For the source area remediation with the TPE and P&T systems, it is anticipated that the equipment will operate for 18 to 24 months. Duration calculations for remedial system operation are included in **Appendix L**. During this system operation period, GES will conduct routine operation and maintenance (O&M) of the systems on a twice per month basis. During each O&M visit, the following data will be measured and/or recorded:

TPE system:

- Extracted vapor flow rate and discharge rate;
- Groundwater recovery rate and cumulative recovery;
- System operation and equipment runtime hours;
- Applied blower vacuum and individual recovery well vacuum;
- Influent PID reading from vacuum pump; and
- Effluent PID reading from treatment equipment (as required).

P&T system:

- Groundwater recovery rate and cumulative recovery;
- Cumulative LNAPL recovery;
- System operation and equipment runtime hours;
- Compressed air pressures;
- Pneumatic pump cycle counter readings;
- Pressures and flow rates through the treatment equipment; and
- Air stripper off-gas flow rate and PID reading.

Once per month, the following additional data will be recorded/collected:

TPE system:

- Recovery well depth to water;
- Recovery well head vacuum;
- Influent vapor samples to be analyzed for BTEX, naphthalene, TPH C_1 to C_4 hydrocarbons, and TPH $>C_4$ to C_{10} hydrocarbons via EPA method 18/25; and
- Recovered groundwater sample to be analyzed for benzene, naphthalene, and TPH-DRO via EPA methods 8260 and 8015.

P&T system:

- Recovery well depth to water;
- Air stripper off-gas samples to be analyzed for BTEX, naphthalene, TPH C_1 to C_4 hydrocarbons, and TPH $>C_4$ to C_{10} hydrocarbons via EPA method 18/25.
- Influent samples of benzene, naphthalene, and TPH-DRO via EPA methods 8260 and 8015; and
- Effluent samples as required.

For the biosparge system, it is anticipated that the equipment will operate for approximately 3 years to achieve VDEQ endpoints. Duration calculations for remedial system operation are included in **Appendix L**. However, the system may be utilized beyond that point to achieve further contaminant reductions offsite. During this system operation period, GES will conduct routine system O&M once per month. In addition to the groundwater quality and headspace monitoring conducted during routine groundwater sampling activities, the following data will be measured and/or recorded during each monthly O&M visit:

Biosparge system:

- Individual sparge well pressures;
- Individual sparge well flow rates; and
- System operation and equipment runtime hours.

Wastes generated by the treatment system may include various non-hazardous wastes from the treatment system, which include recovered LNAPL, spent filter bags, LGAC, and liquid and/or sludge from system cleanings. All wastes will be transported offsite for proper disposal.

6.7 Bulkhead Seep Sealing

As described in prior sections, up to six potential seep areas, or holes in the bulkhead, were identified during visual reconnaissance and infrared camera surveys of the site. In general, the discharge from the seeps was very low with only sufficient flow at two seeps, Seeps B and D, to collect a sample. The results of the analysis from those seeps indicated that detectable TPH-DRO and other organic constituents were present Seep B.

Although the flow rates observed from the seep locations were very low and organic constituents were only measured in one seep, the holes at each of the six previously identified potential seeps in the bulkhead will be physically sealed to reduce the potential for direct discharge of groundwater through the bulkhead and into the Potomac River. The specific methodology for sealing will be presented in a report to DDOE, which will be provided to VDEQ under separate cover; but, in general, the seep sealing method will include either capping the holes with welded plates or cutting out deteriorated areas and welding in a new steel section.

6.8 Public Notice

Section 300 of the *Underground Storage Tank (UST) Technical Regulation* requires public notice for all releases where the VADEQ has requested a CAP. An announcement will be posted in the Alexandria Times to run from December 30, 2014 until January 14, 2015. A copy of the announcement can be found in **Appendix M**.

Additionally, a copy of this report will be provided to the Alexandria Library - Beatley Central Library Branch located at 5005 Duke Street, Alexandria, VA 22304 for public viewing through January 31, 2015.

6.9 Green Remediation

This CAP-II has been developed with consideration of green remediation techniques. EPA defines green remediation as the practice of considering all environmental effects of remedy implementation and incorporating options to minimize the environmental footprints of cleanup actions. The use of monitored natural attenuation and biosparge in the remedial strategy help to address all of the “five core elements” of green remediation identified by OSWER (energy, air and atmosphere, water, land and ecosystems, and materials and waste). Monitored natural attenuation and biosparge are less energy intensive technologies, produce fewer emissions of greenhouse gases, reduce water consumption compared with groundwater extraction, minimize harm to the surrounding ecosystem by addressing the contamination and increasing the dissolved oxygen concentration of the water, and generate less waste while requiring fewer raw materials.

In addition to the remedial strategy, more efficient, streamlined approaches will be employed during implementation that minimize field mobilizations, materials and natural resource consumption, and waste generation. These approaches include the following:

- Minimizing travel to and from the Site by combining different scopes of work into one mobilizations, such as system O&M, routine gauge and bail activities, and contractor waste removal oversight;
- Use of above ground piping to limit heavy machinery usage;
- Use of remedial system telemetry to reduce the number of site visits required to check system operation;
- Use of regenerated GAC to reduce consumption of virgin materials; and
- Recycle waste materials such as GAC, concrete, and recovered LNAPL.
- Use of dedicated bailers for monitoring well sampling.

Additional green remediation techniques will be applied as identified and available throughout the implementation of this corrective action.

7.0 CORRECTIVE ACTION IMPLEMENTATION

The approach to corrective action described above will be implemented upon approval of this CAP-II as described below.

7.1 Groundwater Monitoring and Reporting

The Consulting Team proposes that groundwater sampling activities be conducted once per quarter and the following data be collected during each event:

- Groundwater depth to water and depth to LNAPL;
- Groundwater samples analyzed for naphthalene via EPA Method 8260 or 8270 and TPH-DRO via EPA Method 8015;
- Headspace PID, oxygen, and carbon dioxide readings at surrounding monitoring wells; and
- Groundwater temperature, DO, ORP, conductivity and pH at surrounding monitoring wells;
- Well pressure/vacuum (during system operation).

It is proposed that the additional parameters be monitored from select wells during routine monitoring well sampling events to monitor biodegradation occurring at the Site. Approximately 16 monitoring wells will be analyzed for alkalinity, nitrate (NO_3^{-1}), manganese (Mn^{2+}), ferrous iron (Fe^{2+}), sulfate (SO_4^{2-}), and methane (CH_4). The 16 monitoring wells will include the three proposed remedial compliance wells.

It is proposed that groundwater monitoring and remedial system operational data be submitted quarterly, with the fourth quarterly report (October through December) including an annual remedial progress evaluation.

7.2 Remedial Schedule

The following schedule will be implemented upon CAP-II approval:

Activity/Milestones	Anticipated Date of Completion	Estimate Timeframe
VDEQ approval of CAP following public notice period	Week 0	Feb 2015
Full design and permitting of remediation systems	Week 1-5	Feb-Mar 2015
Procurement and bid process	Week 6-8	April 2015
Recovery and biosparge well installation activities	Week 10-13	May-June 2015
Construction of remediation system (trenching, equipment install)	Week 15-18	June-July 2015
Electrical Power supply installed	Week 20	July 2015
System activation and shakedown	Week 21	July-Aug 2015
Full System Activation	Week 22	July-Aug 2015
TPE / P&T system operation (after system activation)	18-24 Months	Aug 2015-Aug 2017
Biosparge system operation (after system activation)	36 months	Aug 2015-Aug 2018
Post system operation monitoring (after system shutdown)	12 months	2019
Closure and well abandonment	3 months	2019

7.3 Projected Costs

To achieve remedial endpoints, the following will be completed: system design, procurement, installation, TPE, P&T and biosparge system operation, quarterly groundwater sampling and reporting, post system operation monitoring, case closure request and abandonment of all monitoring and recovery wells. The projected costs associated with this work are approximately $1,020,000. A summary of these projected costs is provided below:

Task / Activity	Projected Costs
System Design / Permitting / Procurement	$200,000
Recovery and Biosparge Well Installation / Grading	$110,000
System Installation / Start-up	$140,000
System Power Supply	$100,000
Permanent Sealing of Bulkhead Seeps	$10,000
System O&M, GWS, Reporting - Year 1	$150,000
System O&M, GWS, Reporting - Year 2	$150,000
System O&M, GWS, Reporting - Year 3	$85,000
Post System GWS Reporting	$25,000
Case Closure & System and MW abandonment	$50,000
TOTAL	**$1,020,000**

8.0 REFERENCES

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USEPA July 2003. *Characteristics of Spilled Oils, Fuels, and Petroleum Products:1. Composition and Properties of Selected Oils* Zhendi Wang, B.P. Hollebone, M. Fingas, B. Fieldhouse, L. Sigouin, M. Landriault, P. Smith, J. Noonan, and G. Thouin Emergencies Science and Technology Division Environmental Technology Centre Environment Canada 335 River Road, Ottawa, Ontario James W. Weaver Project Officer Ecosystems Research Division Athens, Georgia 30605 http://www.epa.gov/athens/publications/reports/EPA-600-R03-072-OilComposition.pdf

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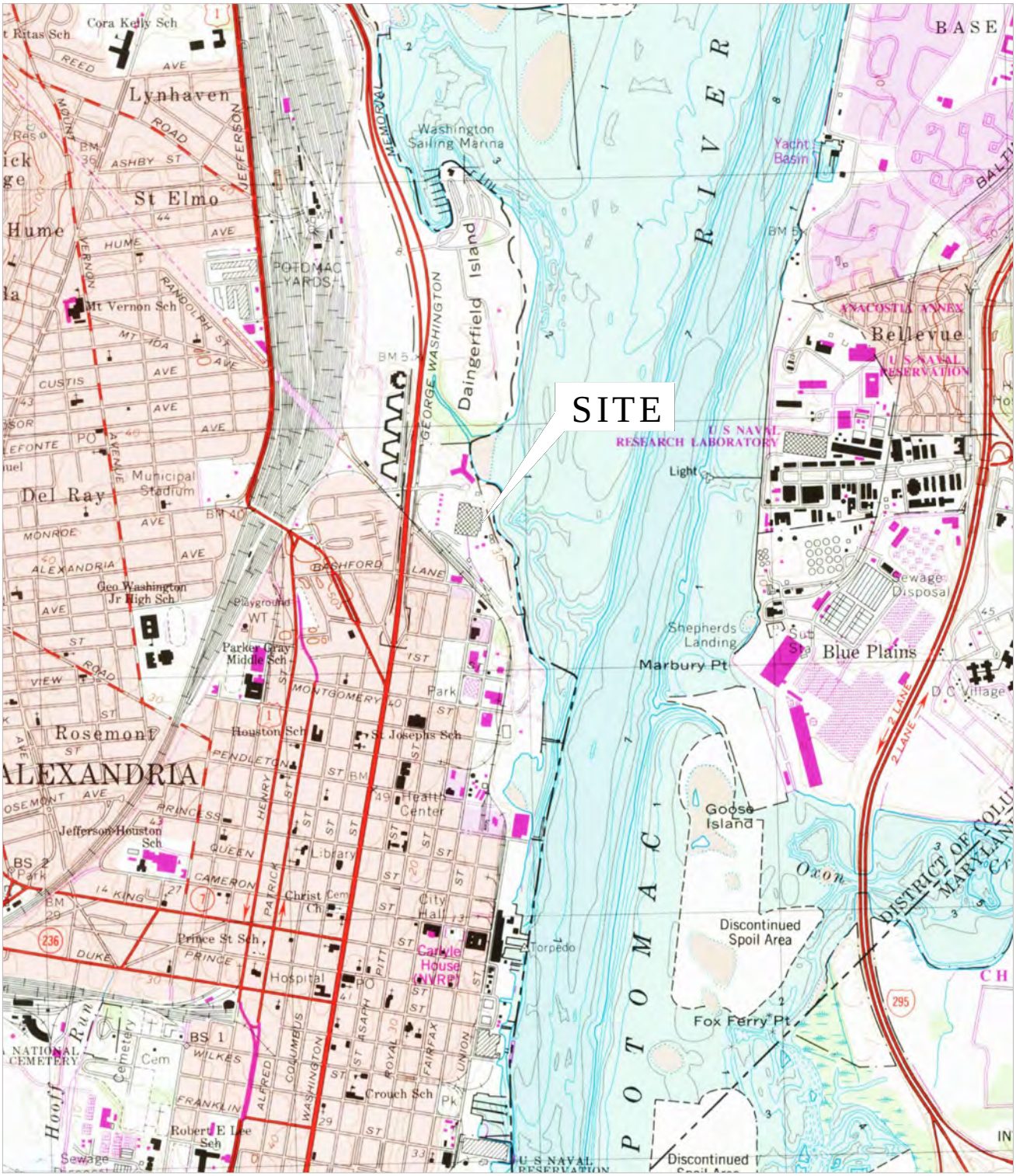
FIGURES



REFERENCE: "ALEXANDRIA, VIRGINIA"
7.5' QUADRANGLE, USGS, (1965,
PHOTOREVISED 1983, BATHYMETRY 1982).

2000 1000 0 2000

APPROXIMATE SCALE: 1" = 2000'

SITE LOCATION MAP

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

QUADRANGLE LOCATION
NO SCALE

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 1

N

LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL) (1 FOOT CONTOUR INTERVAL)
- EXISTING BUILDING / STRUCTURE
- EXISTING UNDERGROUND POTABLE WATER LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN INLET
- EXISTING SANITARY MANHOLE
- EXISTING CONCRETE PAVING
- EXISTING GRAVEL DRIVE
- EXISTING SHALLOW MONITORING WELL (NOTE 2)
- EXISTING DEEP MONITORING WELL (NOTE 2)
- SOIL BORING APPROXIMATE LOCATION
- UST B-# SB-# FORMER URS SOIL BORING IDENTIFICATION (NOTE 3)
- SEEP LOCATION

NOTE:

1. THIS DRAWING IS CONCEPTUAL - FOR INFORMATION PURPOSES ONLY - BASED ON
   a. EXISTING CONDITIONS FROM AN UNSIGNED ALTA SURVEY BY DEWBERRY & DAVIS, INC. (D&D) OBTAINED ON 18 AUGUST 2014, AS AMENDED BY FILE RECEIVED ON 9 SEPTEMBER 2014 BASED ON FIELD-RUN SURVEYS; AND
   b. REVIEW OF SELECTED DESIGN DRAWINGS PROVIDED BY NRG AND PREPARED BY STONE AND WEBSTER ENGINEERING CO., BECHTEL, AND POTOMAC ELECTRIC POWER COMPANY.
2. EXISTING WELLS DIGITIZED FROM PDF (CS-001 Monitoring Wells Data Sheet.pdf) LISTING WELL DATA BASED ON FIELD-RUN SURVEYS CONDUCTED BY D&D; FILE OBTAINED ON 28 AUGUST 2014.
3. PRIOR URS SOIL BORING APPROXIMATE LOCATIONS DIGITIZED FROM SCRA REPORT.

0 30' 60'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND GES

FOR: nrg The power to change life.

TITLE: SITE LAYOUT MAP

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

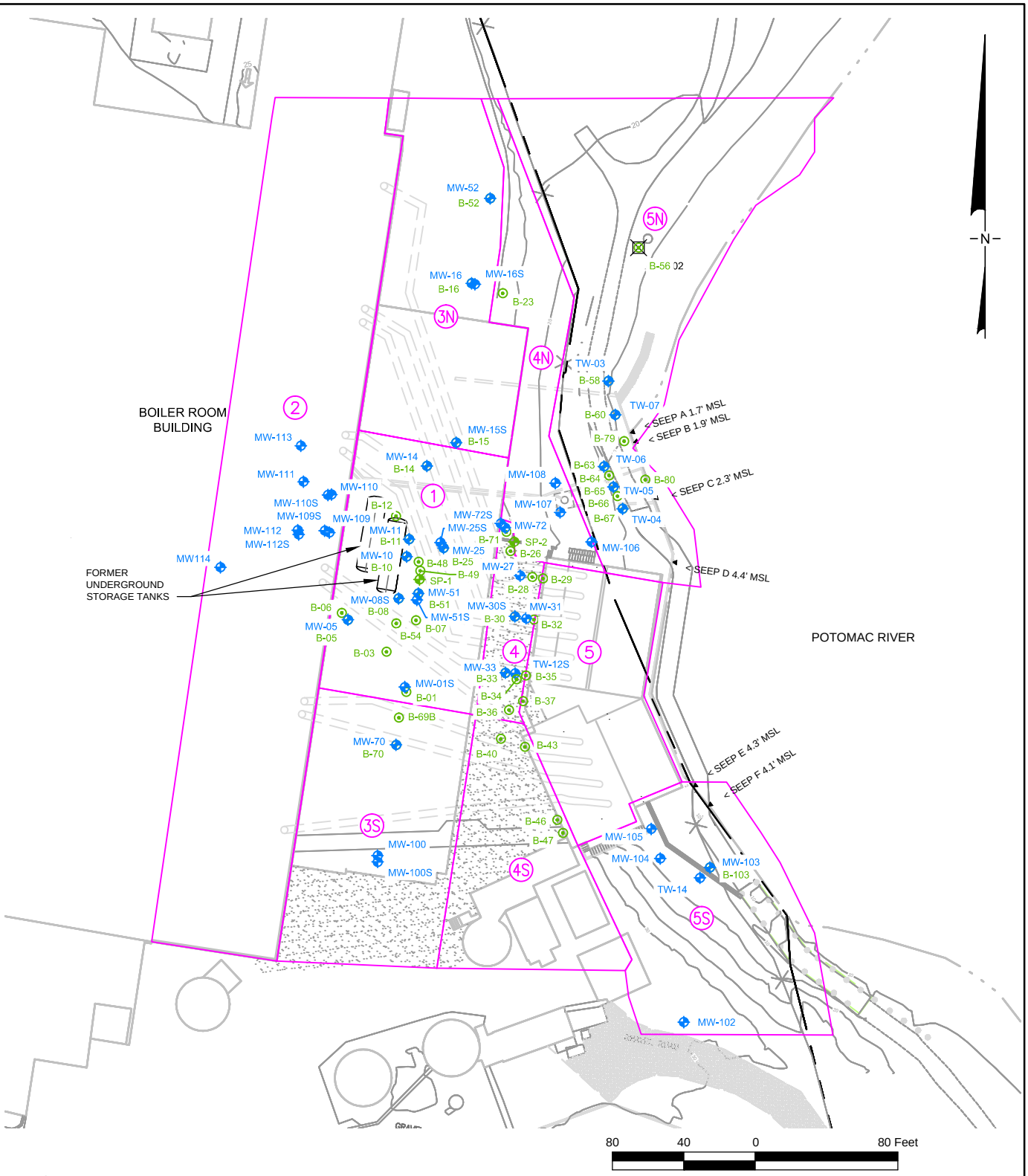
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	JOC	DATE:	SEPTEMBER 2014
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:	MAH	FILE:	1108-502
REVIEWED BY:	MAJ	FIGURE NO.:	2
APPROVED BY:			

FOR INFORMATION ONLY



LEGEND

- Property Boundary
- Waterline (river)
- Monitoring Well
- LIF Location
- (1) Study Area Zone Boundary and ID

STUDY AREA MAP

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

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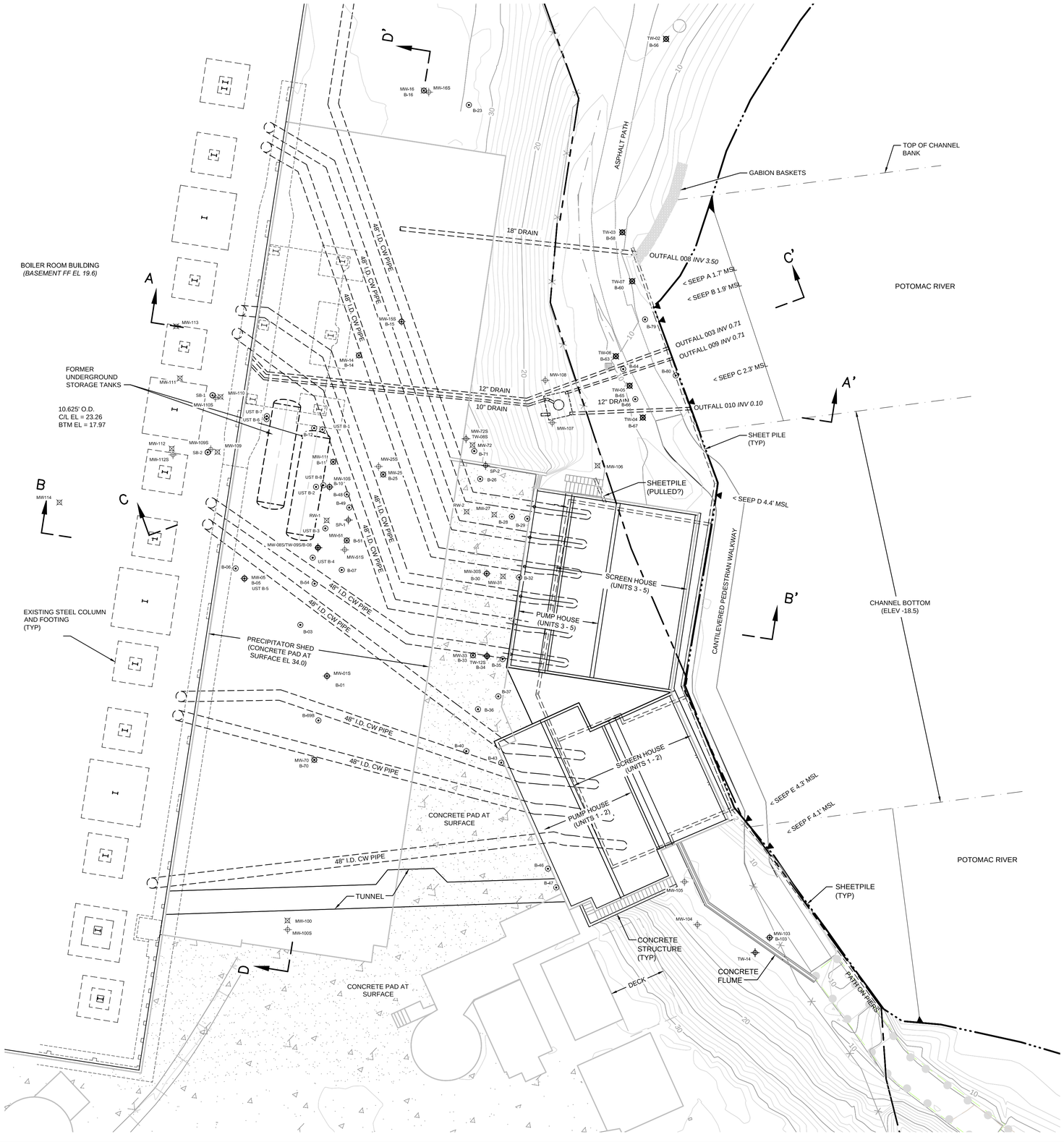
DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 3



LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL)
- EXISTING BUILDING / STRUCTURE
- EXISTING UNDERGROUND POTABLE WATER LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING STORM DRAIN LINE
- EXISTING STORM DRAIN INLET
- EXISTING SHALLOW MONITORING WELL
- EXISTING DEEP MONITORING WELL
- SOIL BORING APPROXIMATE LOCATION
- UST B-# SB-# — FORMER URS SOIL BORING IDENTIFICATION (NOTE 3)
- SEEP LOCATION
- EXISTING FOOTING, APPROXIMATE LOCATION, ELEVATIONS UNKNOWN

GENERAL NOTES:

1. THIS DRAWING IS CONCEPTUAL - FOR INFORMATION PURPOSES ONLY - BASED ON:
   a. EXISTING CONDITIONS FROM AN UNSIGNED ALTA SURVEY (NRG ALTA.dwg) BY DEWBERRY & DAVIS, INC. (D&D) OBTAINED ON 18 AUGUST 2014, AS AMENDED BY FILE (NRG Potomac Topo.dwg) RECEIVED ON 9 SEPTEMBER 2014 BASED ON FIELD-RUN SURVEYS; AND
   b. REVIEW OF SELECTED DESIGN DRAWINGS PROVIDED BY NRG AND PREPARED BY STONE AND WEBSTER ENGINEERING CO., BECHTEL, AND POTOMAC ELECTRIC POWER COMPANY.
2. HORIZONTAL LOCATIONS ARE AS-BUILT EXCEPT BELOW GRADE FEATURES. DATA SHOWN IN ITALICS IS AS-BUILT DATA (SEE NOTE 1a ABOVE); DATA NOT IN ITALICS IS DESIGN DATA (SEE NOTE 1b ABOVE).
3. EXISTING WELLS DIGITIZED FROM PDF (CS-001 Monitoring Wells Data Sheet.pdf) LISTING WELL DATA BASED ON FIELD-RUN SURVEYS CONDUCTED BY D&D; FILE OBTAINED ON 28 AUGUST 2014.
4. PRIOR URS SOIL BORING APPROXIMATE LOCATIONS DIGITIZED FROM SCRA REPORT.
5. SEE FIGURES 11A THROUGH 11D FOR SITE CROSS SECTIONS.

0 20' 40'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND GES

FOR: nrg The power to change life.

TITLE: SITE MAP

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

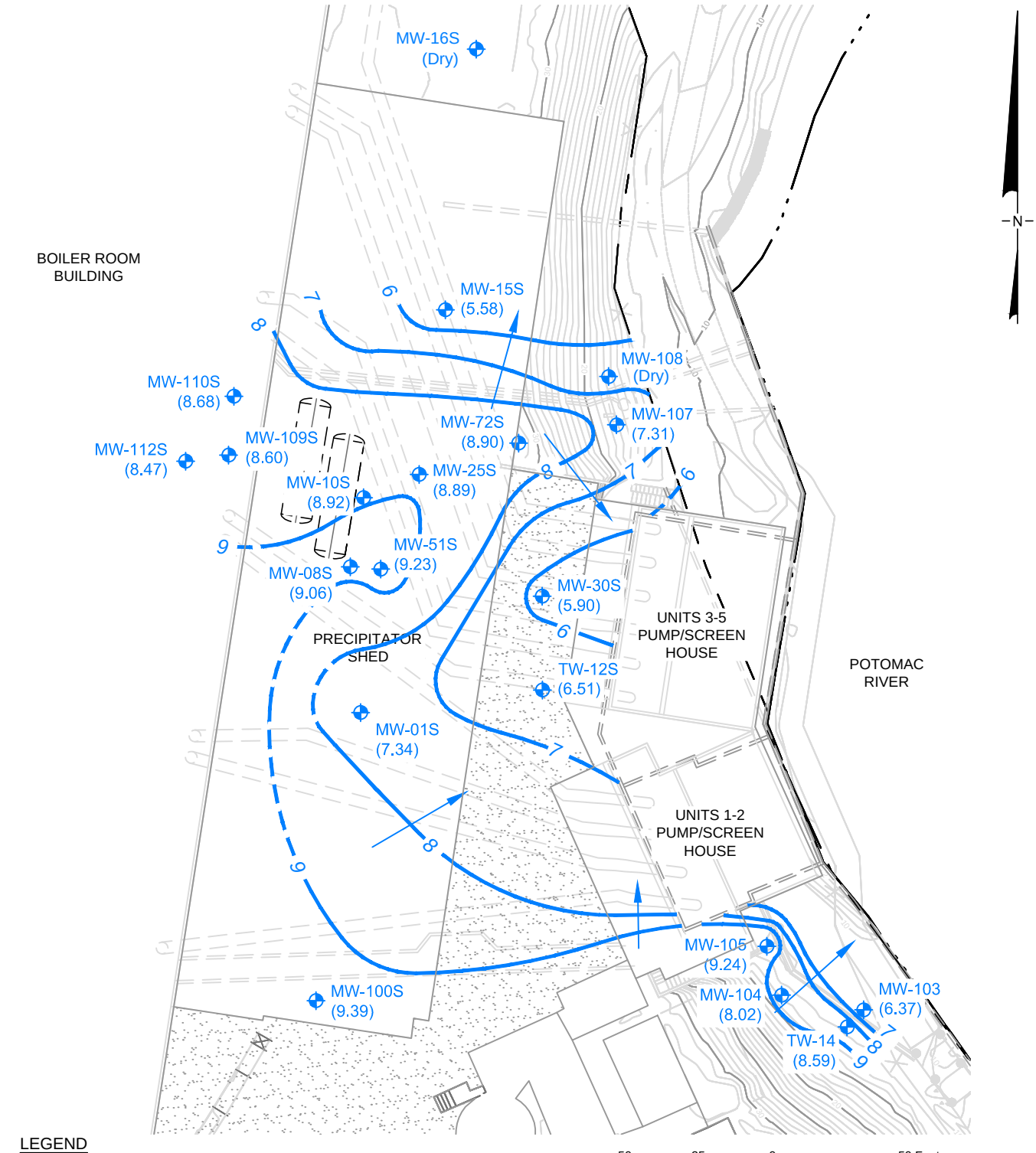
THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:	JOC	DATE:	SEPTEMBER 2014
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:	MAH	FILE:	1108-504
REVIEWED BY:	MAJ	FIGURE NO.:	4
APPROVED BY:			

FOR INFORMATION ONLY



LEGEND

Property Boundary

Waterline (river)

Monitoring Well — Well ID (Water Elevation Above Mean Sea Level)

Inferred Potentiometric Contour

Groundwater Flow Direction

50 25 0 50 Feet

NOTES:
Depth to water gauged on 20 October 2014.

POTENTIOMETRIC SURFACE – SHALLOW ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

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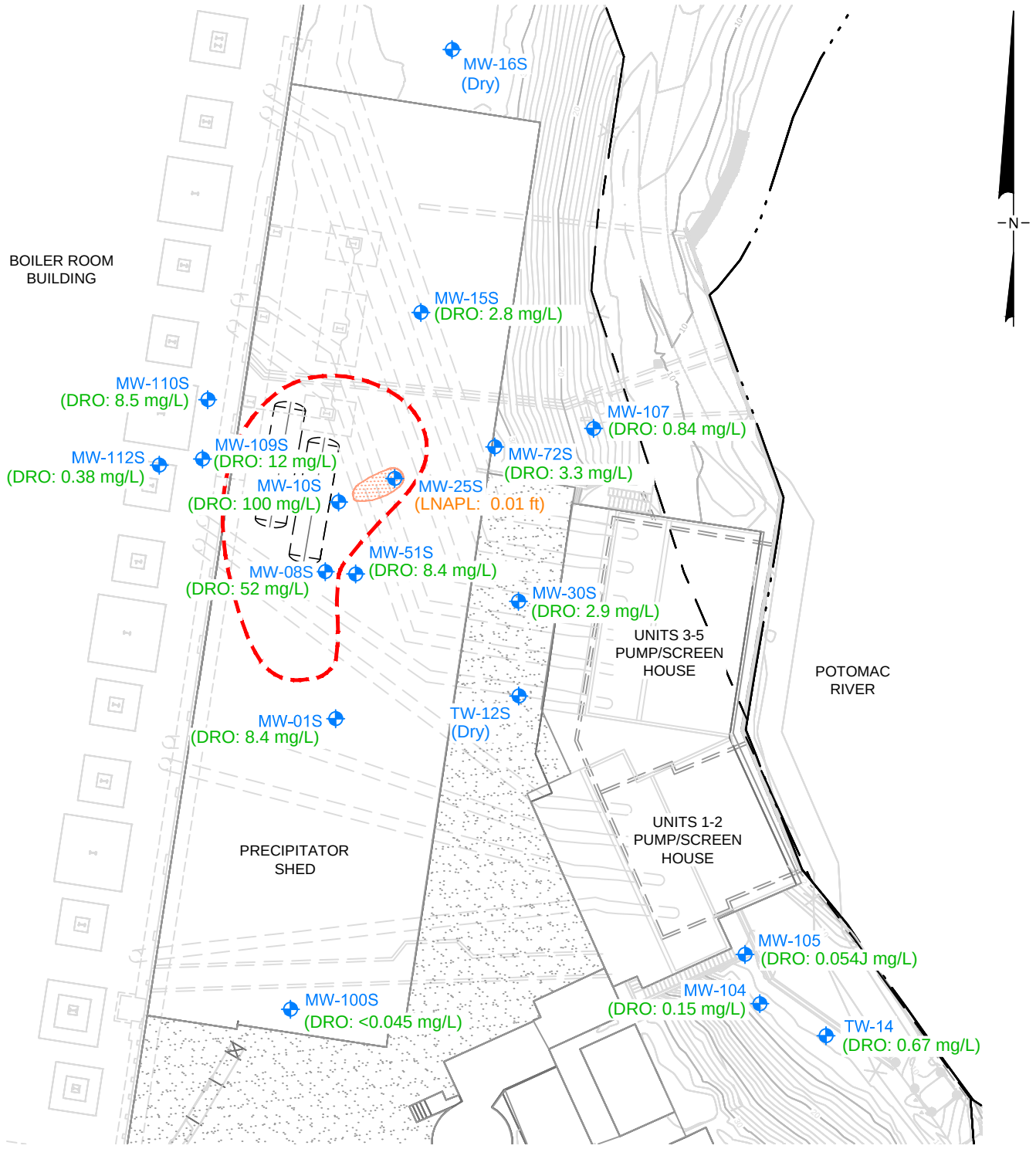
DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 5



LEGEND

Property Boundary

Waterline (river)

Monitoring Well

DRO CONCENTRATION

15 mg/L

LNAPL THICKNESS

0.01 ft

NOTES:

DRO - Diesel Range Organics

LNAPL - Light Non-Aqueous Phase Liquid (thickness)

ug/L - micrograms per liter

Samples and measurements taken between 20 October 2014 and 22 October 2014. Data are shown only where samples were collected or LNAPL was observed.

DRO CONCENTRATIONS AND LNAPL THICKNESS – SHALLOW ZONE

FORMER POTOMAC RIVER GENERATING STATION

ALEXANDRIA, VIRGINIA

Geosyntec consultants

COLUMBIA, MARYLAND

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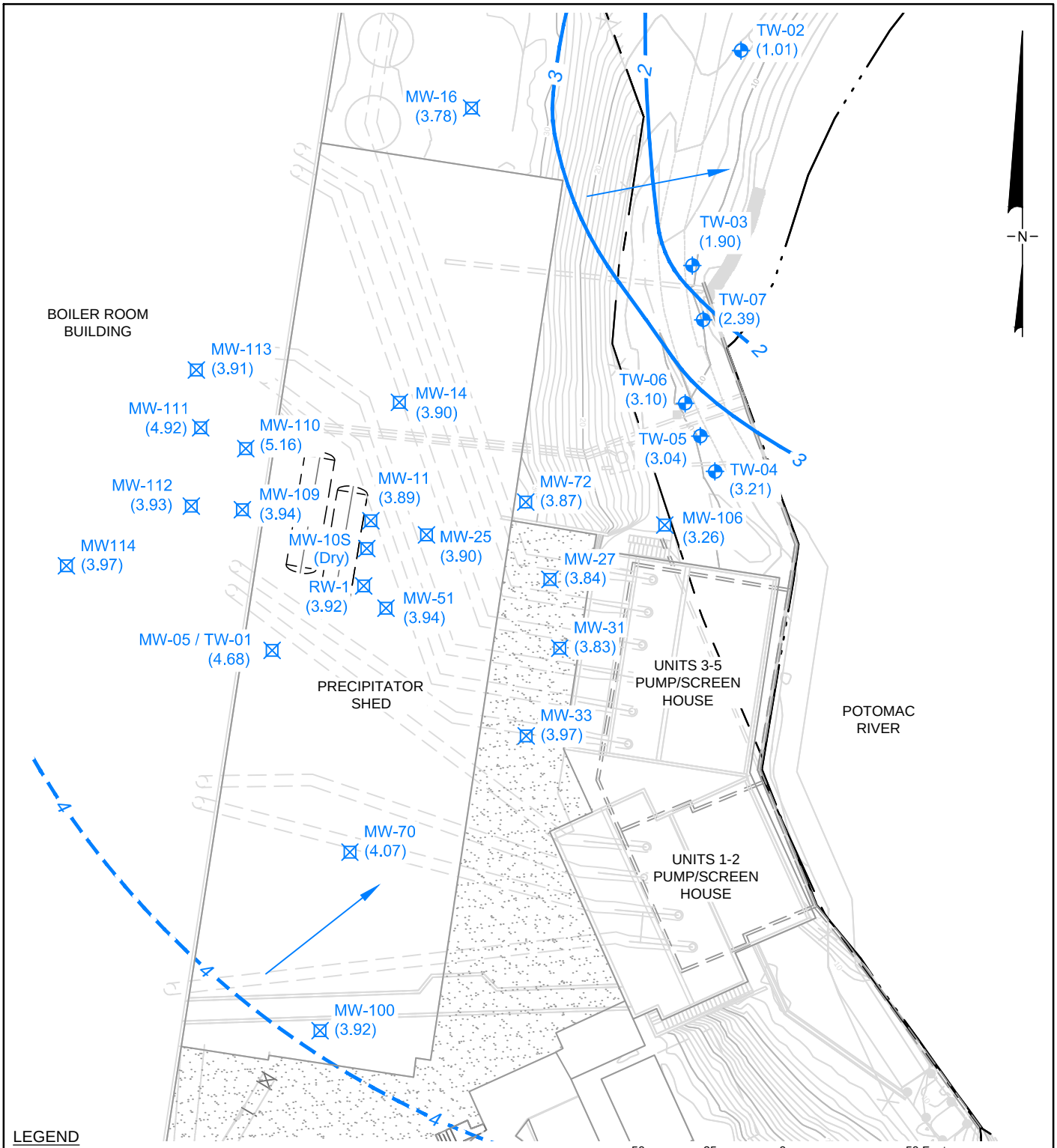
DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 6



LEGEND

- Property Boundary
- Waterline (river)
- Monitoring Well — Well ID (Water Elevation)
- Groundwater Flow Direction
- Inferred Potentiometric Contour
- Inferred Potentiometric Contour

NOTES:
Depth to water gauged on 20 October 2014.

MW-05, MW-70, MW-110, and MW-111 were not used to generate the potentiometric surface because they appear to be screened across both shallow and deep zones.

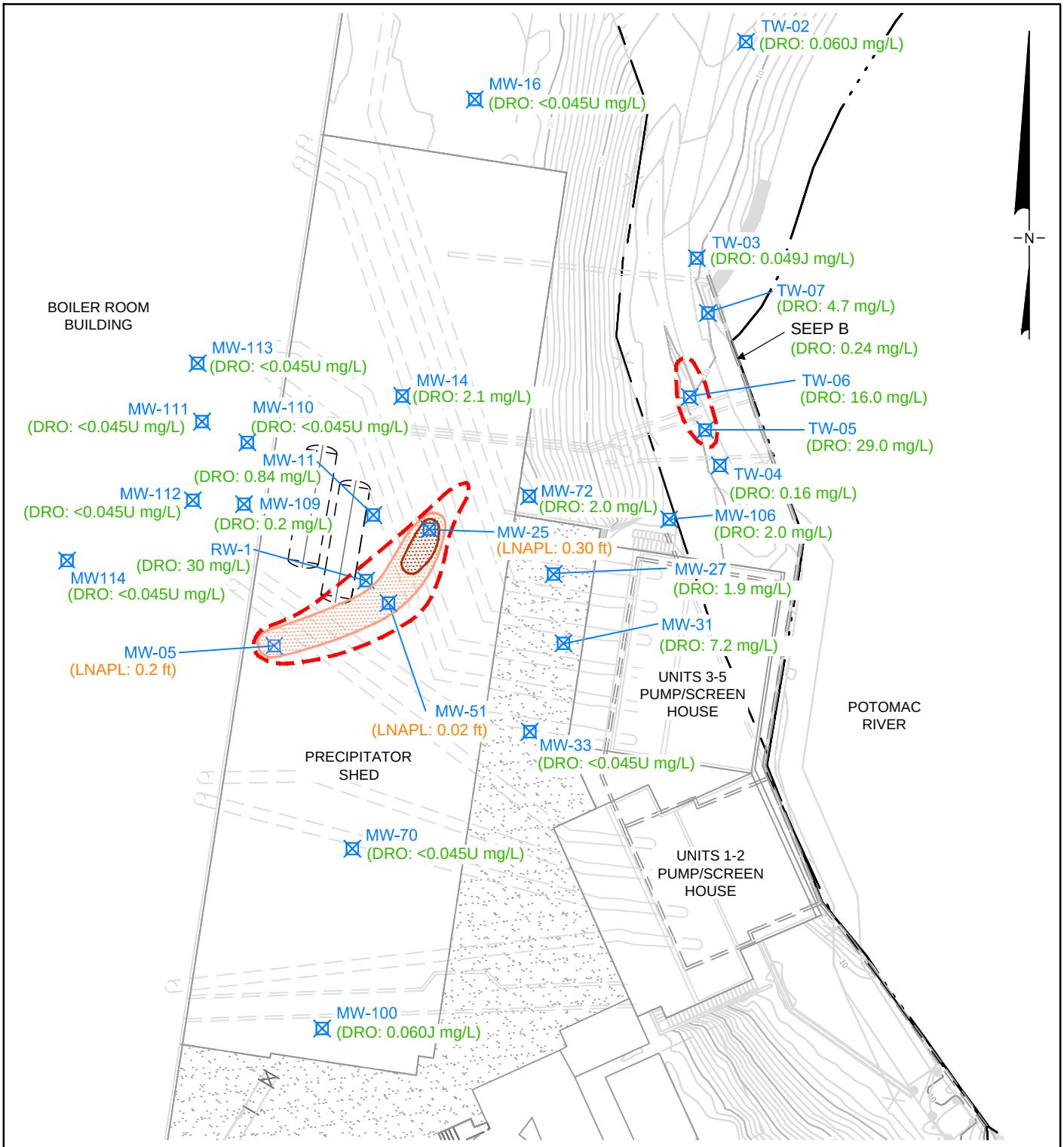
POTENTIOMETRIC SURFACE – DEEP ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 7



LEGEND

- Property Boundary
- Waterline (river)
- Monitoring Well
- Seep

DRO CONCENTRATION

- 15 mg/L

LNAPL THICKNESS

- 0.10 ft
- 0.01 ft

NOTES:
DRO - Diesel Range Organics (in ppb)
LNAPL - Light Non-Aqueous Phase Liquid (thickness, in feet)
ug/L - micrograms per liter

Samples and measurements taken between 20 October 2014 and 22 October 2014. Data are shown only where samples were collected or LNAPL was observed.

DRO CONCENTRATIONS AND LNAPL THICKNESS – DEEP ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

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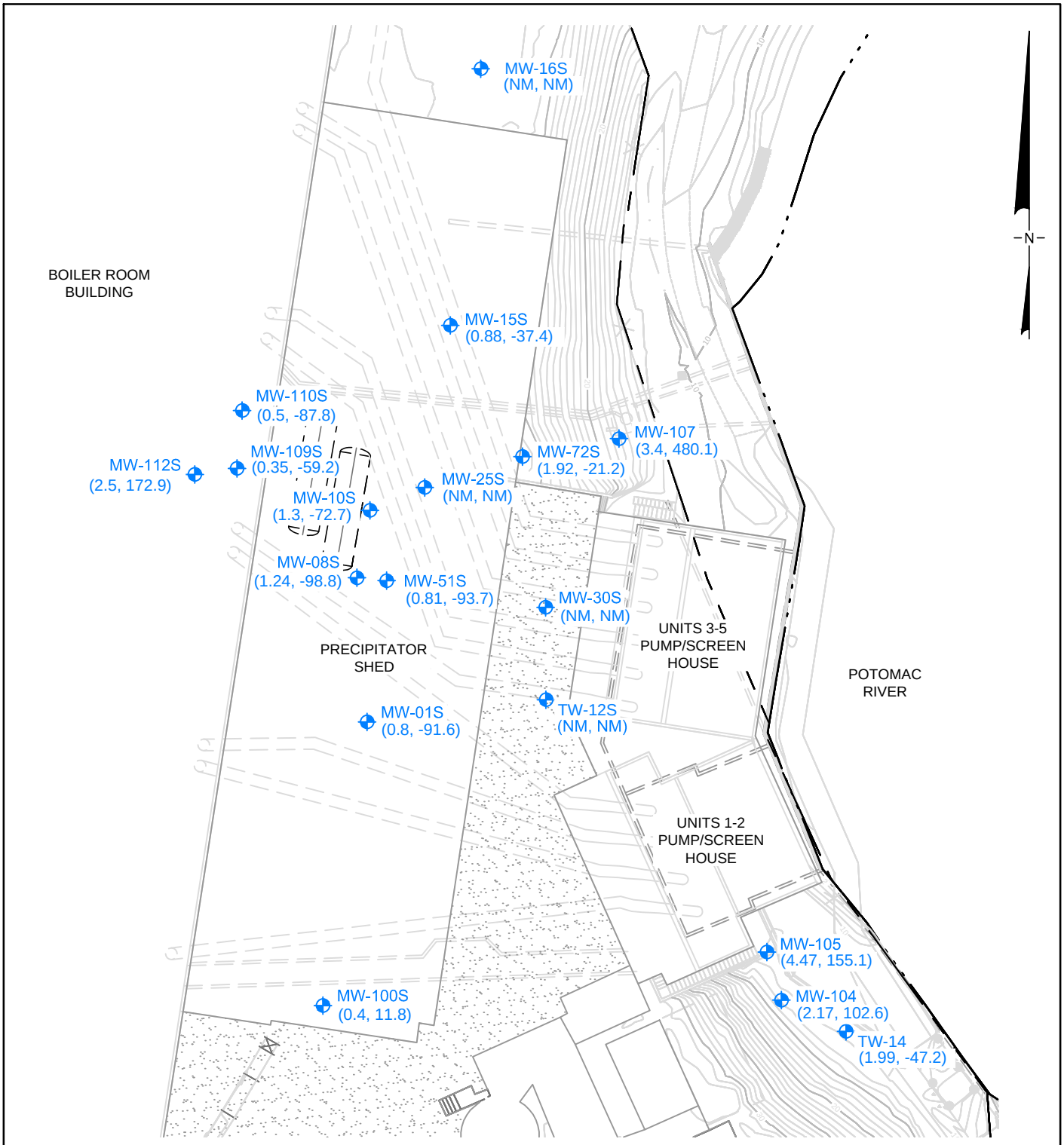
COLUMBIA, MARYLAND

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 8



LEGEND

Property Boundary

Waterline (river)

Monitoring Well (DO,ORP)

50 25 0 50 Feet

NOTES:

DO - Dissolved Oxygen in mg/L
ORP - Oxidation-Reduction Potential in mV
NM - Not Measured

Samples and measurements taken between 20 October 2014 and 22 October 2014. Data are shown only where samples were collected or LNAPL was observed.

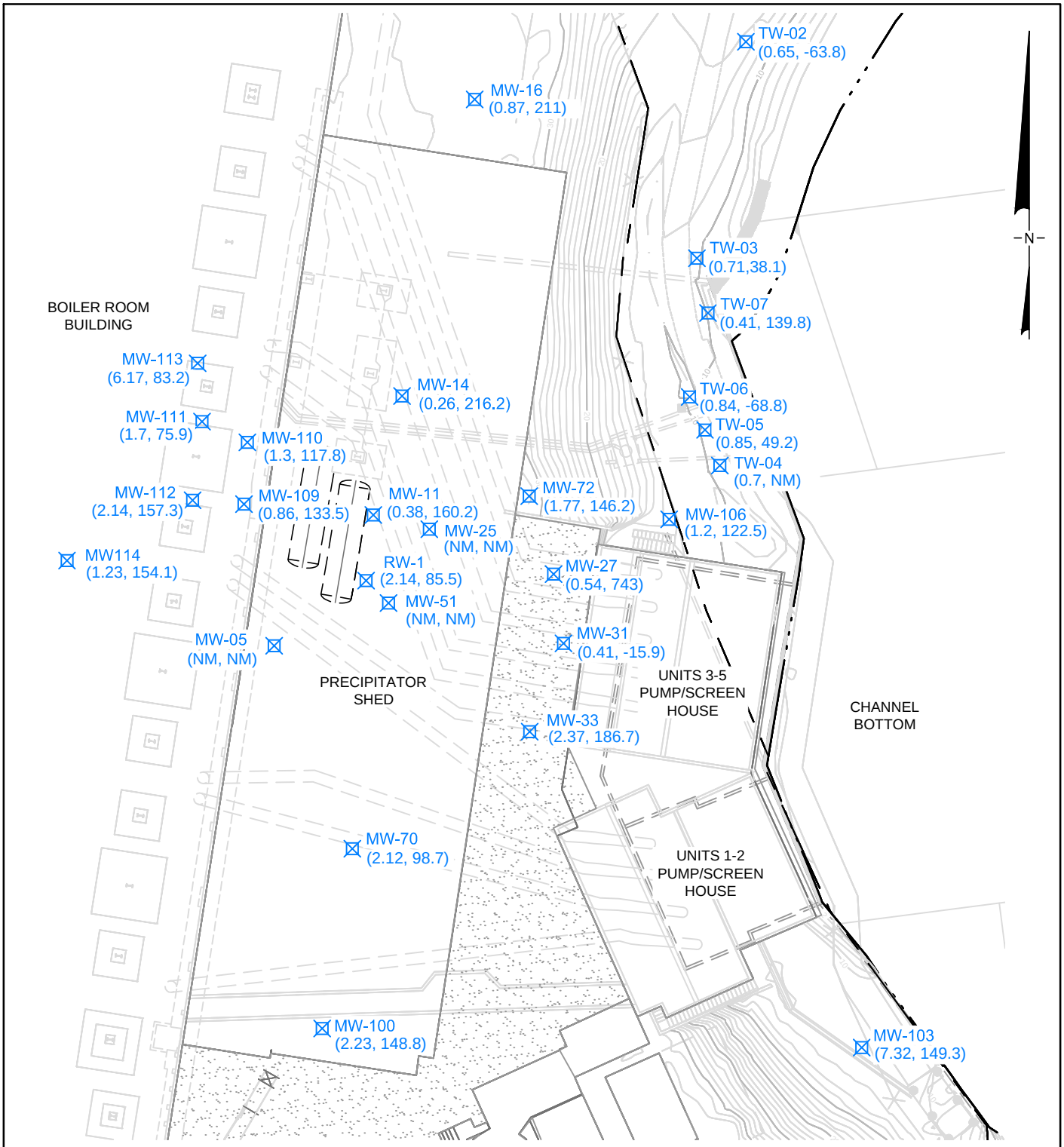
DO AND ORP CONCENTRATIONS – SHALLOW ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 9



LEGEND

Property Boundary

Waterline (river)

Monitoring Well (DO, ORP)

50 25 0 50 Feet

NOTES:

DO - Dissolved Oxygen in mg/L
OPR - Oxidation-Reduction Potential in mV
NM - Not Measured

Samples and measurements taken between 20 October 2014 and 23 October 2014. Data are shown only where samples were collected or LNAPL was observed.

DO AND ORP CONCENTRATIONS – DEEP ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 10

BOILER ROOM BUILDING

PRECIPITATOR SHED

48" I.D. CW PIPES

MW-14

MW-15S

PROPERTY LINE

APPROXIMATE FOOTING (ELEVATION UNKNOWN)

EL +34.0

CISTERN EXCAVATION

4'Ø CISTERN

MW-113

MW-108

MW-107

ASPHALT PATH

FENCE

EL +19.6

OUTFALL 003

TW-04

OUTFALL 009

SHEET PILE

POTOMAC RIVER

ELEVATION (FEET-MSL)

40

30

20

10

0

-10

-20

-50

SHALLOW ZONE

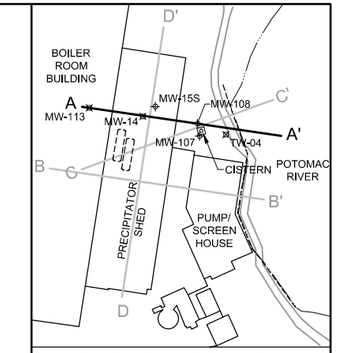
DEEP ZONE

DEEP ZONE

RIVER EL 0.0 = MEAN LOW WATER

EL -18.5 CHANNEL BOTTOM

EL -50.0



SECTION LOCATION
SCALE: 1" = 200'

LEGEND

- FILL
- CONCRETE
- SHALLOW ZONE: INTERBEDDED SILT, SAND, GRAVEL, AND CLAY
- SAND AND GRAVEL
- CLAY
- DEEP ZONE: SANDY CLAY
- SHALLOW GROUNDWATER TABLE
- DEEP POTENTIOMETRIC SURFACE
- Well and Well Screen

0 20'
HORIZONTAL SCALE IN FEET

0 10'
VERTICAL SCALE IN FEET

VERTICAL EXAGGERATION: 2x

NOTE:
GROUNDWATER ELEVATIONS MEASURED BY GES ON 20 OCTOBER 2014.

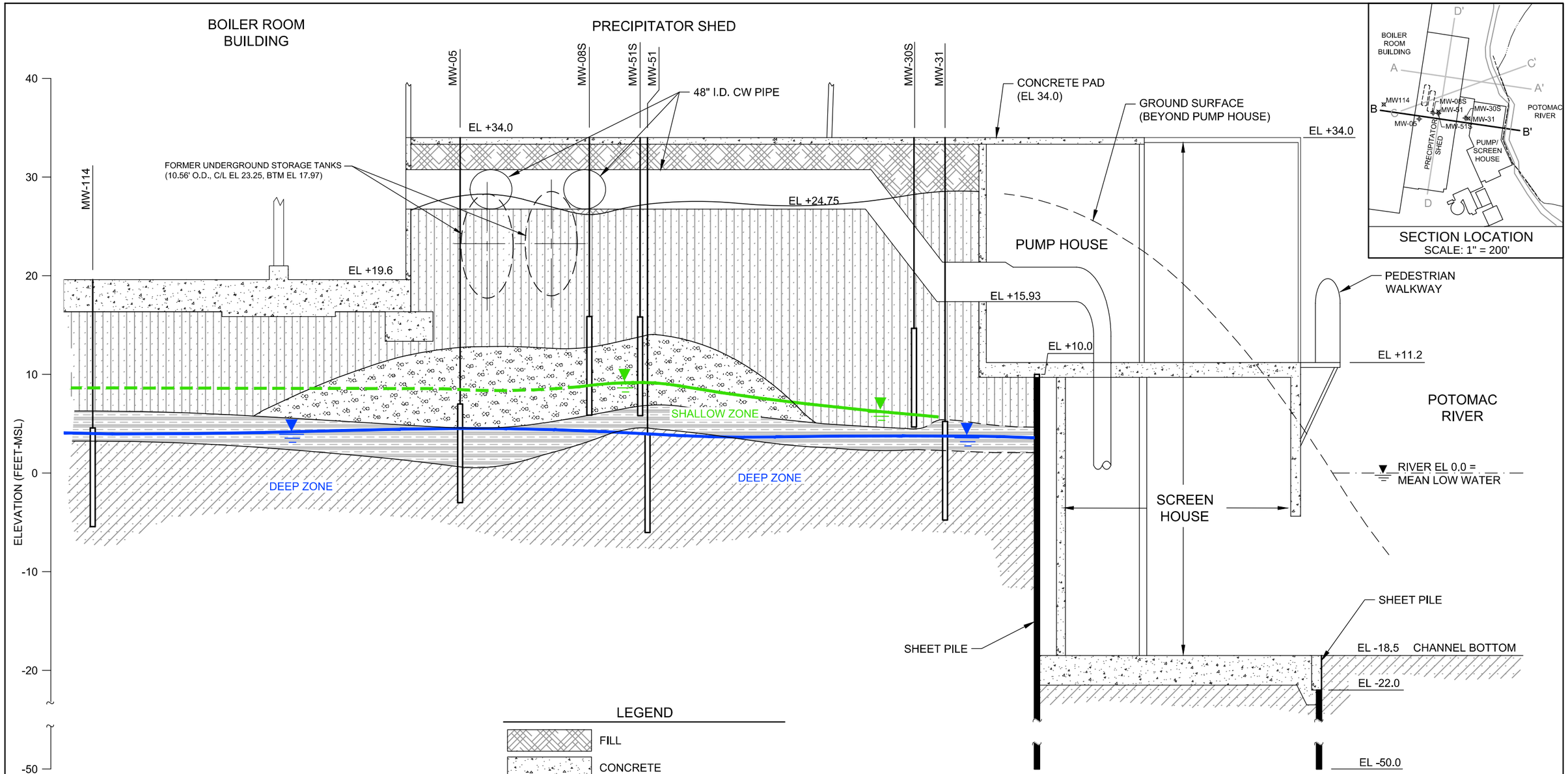
SECTION A–A'

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE:	DECEMBER 2014	DOCUMENT NO.	
PROJECT NO.	MEM1108	FIGURE NO.	11A



LEGEND

- FILL
- CONCRETE
- SHALLOW ZONE: INTERBEDDED SILT, SAND, GRAVEL, AND CLAY
- SAND AND GRAVEL
- CLAY
- DEEP ZONE: SANDY CLAY
- SHALLOW GROUNDWATER TABLE
- DEEP POTENTIOMETRIC SURFACE
- Well and Well Screen

0 20'
HORIZONTAL SCALE IN FEET

0 10'
VERTICAL SCALE IN FEET

VERTICAL EXAGGERATION: 2x

NOTE:
GROUNDWATER ELEVATIONS MEASURED BY GES ON 20 OCTOBER 2014.

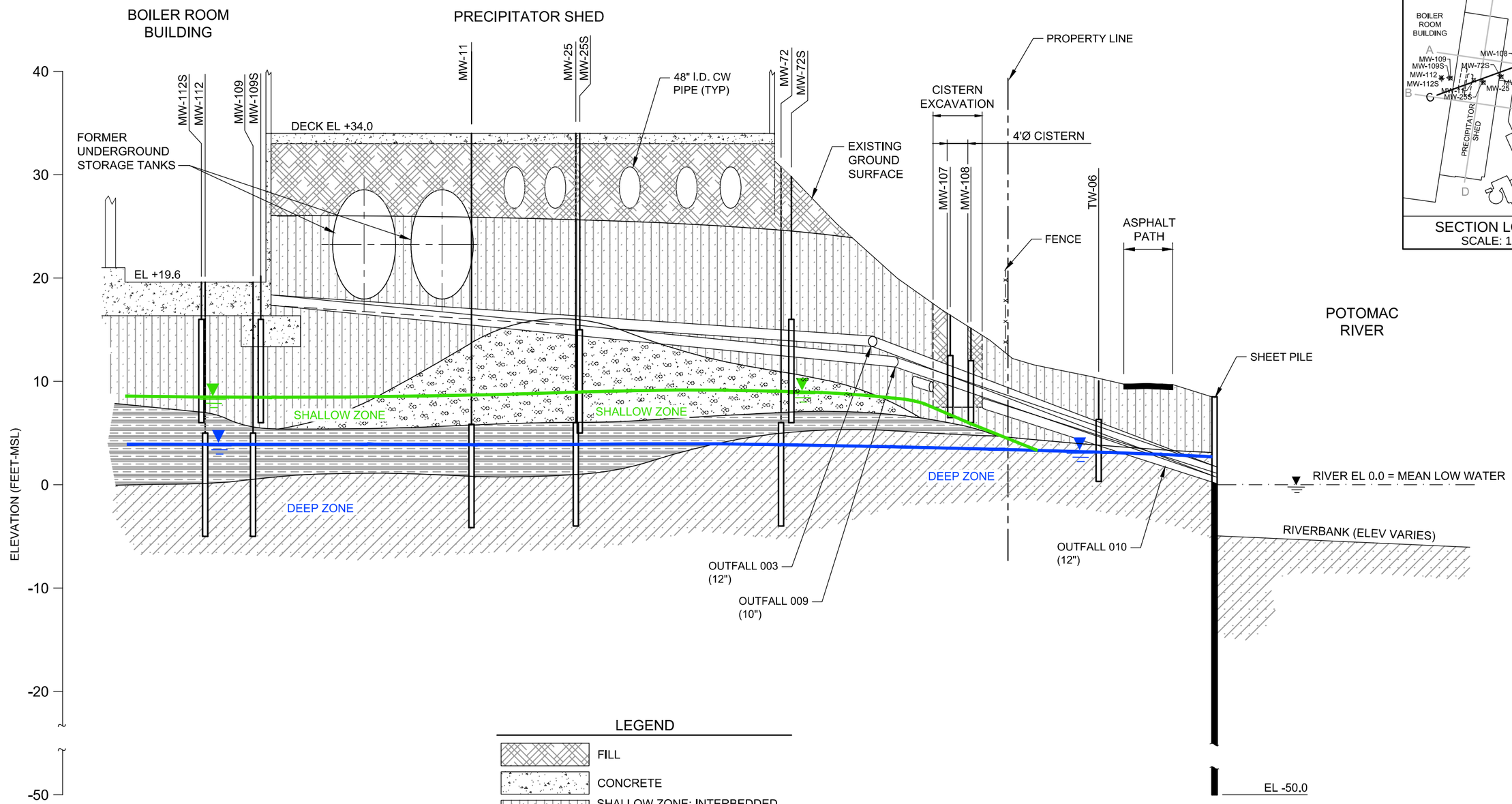
SECTION B–B'

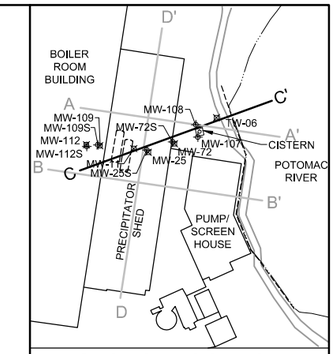
FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE:	DECEMBER 2014	DOCUMENT NO.	
PROJECT NO.	MEM1108	FIGURE NO.	11B





SECTION LOCATION
SCALE: 1" = 200'

LEGEND

- FILL
- CONCRETE
- SHALLOW ZONE: INTERBEDDED SILT, SAND, GRAVEL, AND CLAY
- SAND AND GRAVEL
- CLAY
- DEEP ZONE: SANDY CLAY
- SHALLOW GROUNDWATER TABLE
- DEEP POTENTIOMETRIC SURFACE
- Well and Well Screen

0 20'
HORIZONTAL SCALE IN FEET

0 10'
VERTICAL SCALE IN FEET

VERTICAL EXAGGERATION: 2x

NOTE:
GROUNDWATER ELEVATIONS MEASURED BY GES ON 20 OCTOBER 2014.

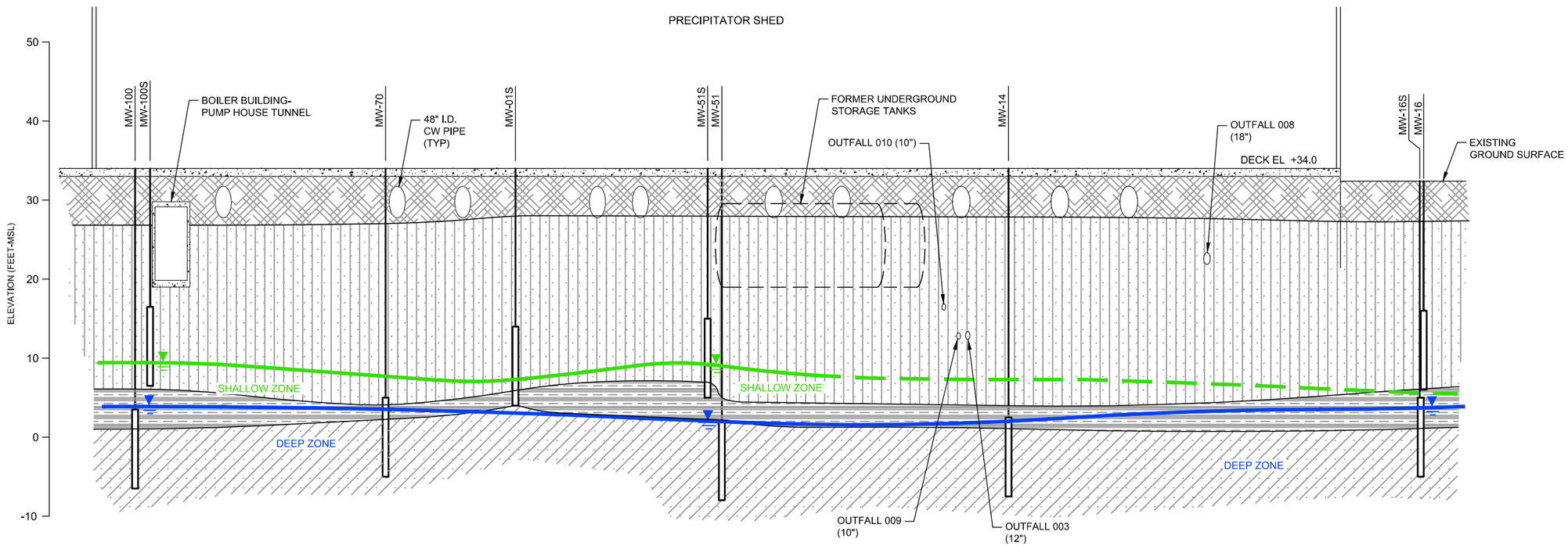
SECTION C–C'

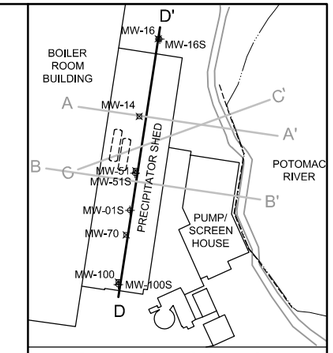
FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE:	DECEMBER 2014	DOCUMENT NO.	
PROJECT NO.	MEM1108	FIGURE NO.	11C





SECTION LOCATION
SCALE: 1" = 200'

LEGEND

- FILL
- CONCRETE
- SHALLOW ZONE: INTERBEDDED SILT, SAND, GRAVEL, AND CLAY
- CLAY
- DEEP ZONE: SANDY CLAY
- SHALLOW GROUNDWATER TABLE
- DEEP POTENTIOMETRIC SURFACE
- Well and Well Screen

0 20'
HORIZONTAL SCALE
IN FEET

0 10'
VERTICAL SCALE
IN FEET

VERTICAL EXAGGERATION: 2x

NOTE:
GROUNDWATER ELEVATIONS MEASURED BY GES ON 20 OCTOBER 2014.

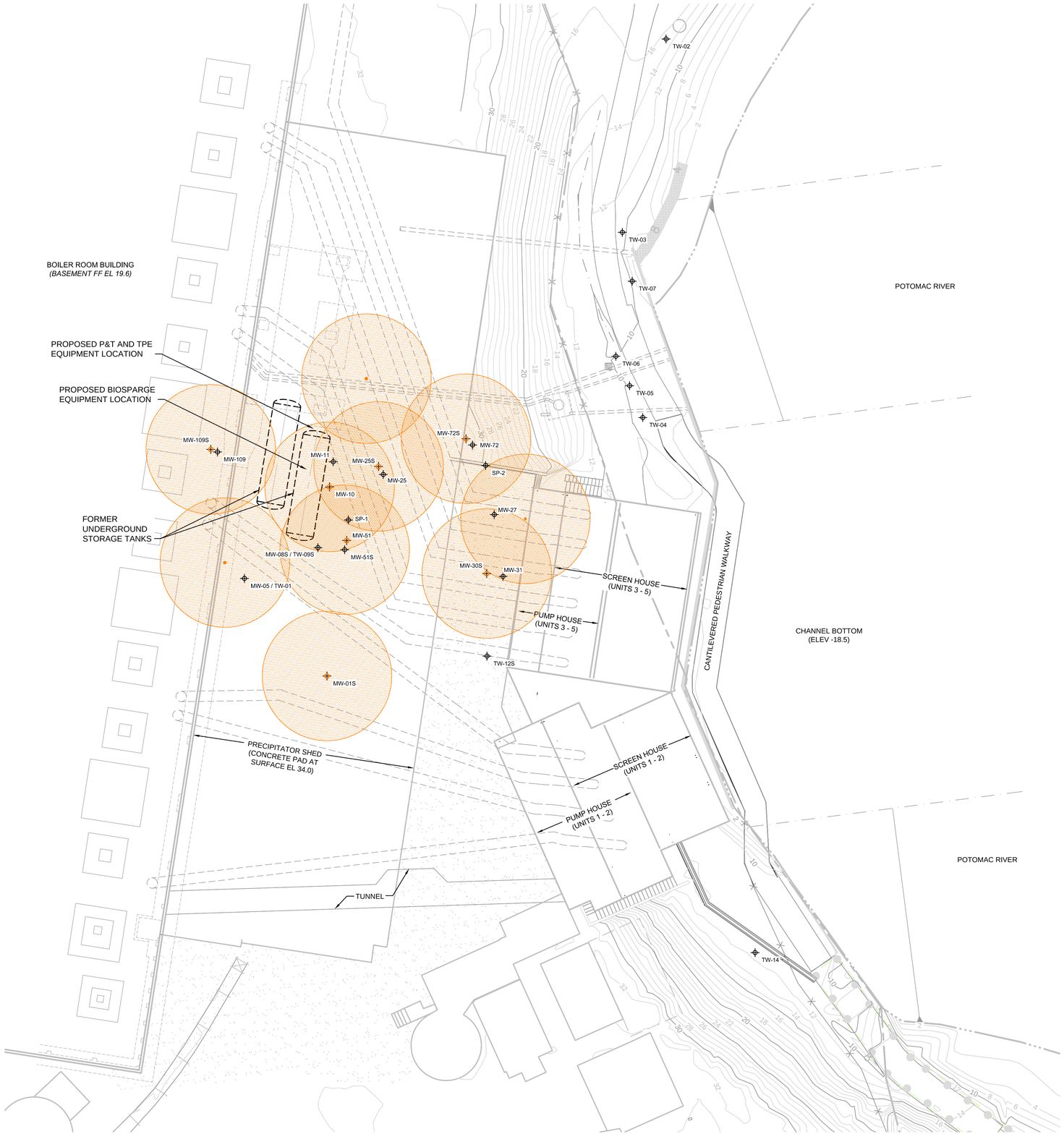
SECTION D–D'

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 11D



N

LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL)
- EXISTING BUILDING / STRUCTURE
- EXISTING GROUNDWATER MONITORING WELL AND TW WELL (NOTE 2)
- EXISTING FOOTING, APPROXIMATE LOCATION, ELEVATIONS UNKNOWN
- PROPOSED NEW TOTAL PHASE EXTRACTION SYSTEM NODE
- PROPOSED TOTAL PHASE EXTRACTION SYSTEM NODE AT EXISTING FEATURE
- LIMIT OF RADII OF INFLUENCE (WELL ROI EQUALS 25')

NOTE:

1. SEE FIGURE 4 FOR GENERAL NOTES.

0 20' 40'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND GES

FOR: nrg The power to change life.

TITLE: TOTAL PHASE EXTRACTION CONCEPTUAL REMEDY

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:		DATE:	DECEMBER 2013
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:		FILE:	1108-512-15
REVIEWED BY:		FIGURE NO.:	12
APPROVED BY:			

FOR INFORMATION ONLY

N

LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL)
- EXISTING BUILDING / STRUCTURE
- EXISTING GROUNDWATER MONITORING WELL AND TW WELL (NOTE 2)
- EXISTING FOOTING, APPROXIMATE LOCATION, ELEVATIONS UNKNOWN
- PROPOSED NEW PUMP AND TREAT SYSTEM NODE
- PROPOSED PUMP AND TREAT SYSTEM NODE AT EXISTING FEATURE
- LIMIT OF RADII OF INFLUENCE (WELL ROI EQUALS 25')

NOTE:

1. SEE FIGURE 4 FOR GENERAL NOTES.

0 20' 40'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND: GES

FOR: nrg The power to change life.

TITLE: PUMP AND TREAT CONCEPTUAL REMEDY

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:		DATE:	DECEMBER 2013
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:		FILE:	1108-512-15
REVIEWED BY:		FIGURE NO.:	13
APPROVED BY:			

FOR INFORMATION ONLY

BOILER ROOM BUILDING
(BASEMENT FF EL 19.6)

PROPOSED P&T AND TPE EQUIPMENT LOCATION

PROPOSED BIOSPARGE EQUIPMENT LOCATION

FORMER UNDERGROUND STORAGE TANKS

POTOMAC RIVER

CHANNEL BOTTOM (ELEV -18.5)

CANTILEVERED PEDESTRIAN WALKWAY

SCREEN HOUSE (UNITS 3 - 5)

PUMP HOUSE (UNITS 3 - 5)

SCREEN HOUSE (UNITS 1 - 2)

PUMP HOUSE (UNITS 1 - 2)

PRECIPITATOR SHED (CONCRETE PAD AT SURFACE EL 34.0)

TUNNEL

TW-02, TW-03, TW-07, TW-06, TW-05, TW-04, TW-14, TW-12S, MW-01S, MW-05 / TW-01, MW-08S / TW-09S, MW-51S, MW-51, SP-1, MW-10, MW-11, MW-25S, MW-25, MW-109S, MW-109, MW-72S, MW-72, SP-2, MW-27, MW-30S, MW-31

N

LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL)
- EXISTING BUILDING / STRUCTURE
- EXISTING GROUNDWATER MONITORING WELL AND TW WELL (NOTE 2)
- EXISTING FOOTING, APPROXIMATE LOCATION, ELEVATIONS UNKNOWN
- PROPOSED NEW BIOSPARGE SYSTEM NODE
- LIMIT OF RADII OF INFLUENCE (WELL ROI EQUALS 20')

NOTE:

1. SEE FIGURE 4 FOR GENERAL NOTES.

0 20' 40'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND GES

FOR: nrg The power to change life.

TITLE: BIOSPARGE CONCEPTUAL REMEDY

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE

DATE

DESIGN BY:		DATE:	DECEMBER 2013
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:		FILE:	1108-512-15
REVIEWED BY:		FIGURE NO.:	14
APPROVED BY:			

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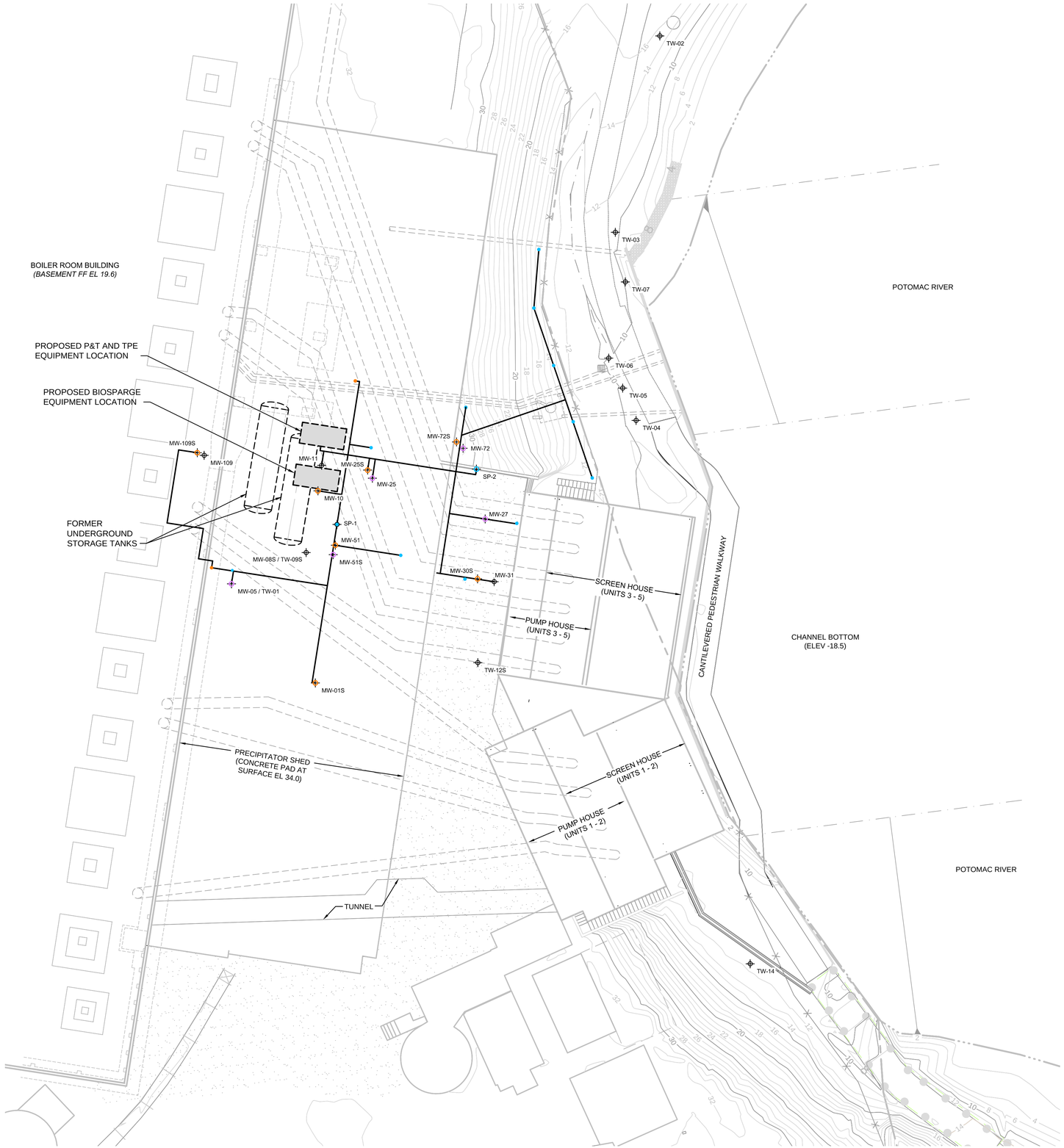


N

LEGEND

- PROPERTY BOUNDARY
- WATERLINE (RIVER)
- EXISTING GRADE CONTOUR (FEET-MSL)
- EXISTING BUILDING / STRUCTURE
- EXISTING GROUNDWATER MONITORING WELL AND TW WELL (NOTE 2)
- EXISTING FOOTING, APPROXIMATE LOCATION, ELEVATIONS UNKNOWN
- PROPOSED SYSTEM PIPING
- PROPOSED NEW SYSTEM NODE (TPE / P&T / SPARGE)
- PROPOSED SYSTEM NODE AT EXISTING FEATURE (TPE / P&T)

NOTE:

1. SEE FIGURE 4 FOR GENERAL NOTES.

0 20' 40'
SCALE IN FEET

REV	DATE	DESCRIPTION	DRN	APP

BY: Geosyntec consultants
10220 OLD COLUMBIA ROAD, SUITE A
COLUMBIA, MARYLAND 21046 USA
PHONE: 410.381.4333

AND GES

FOR: nrg The power to change life.

TITLE: SYSTEM CONCEPTUAL REMEDY

PROJECT: SITE INVESTIGATION

SITE: POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

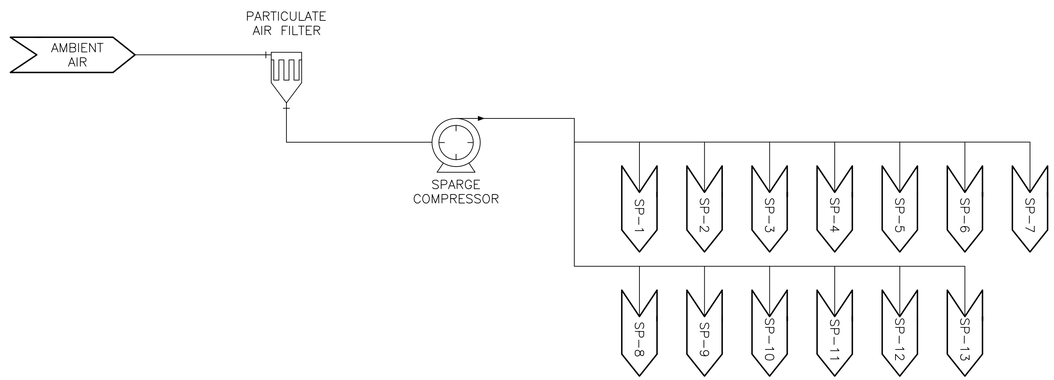
SIGNATURE

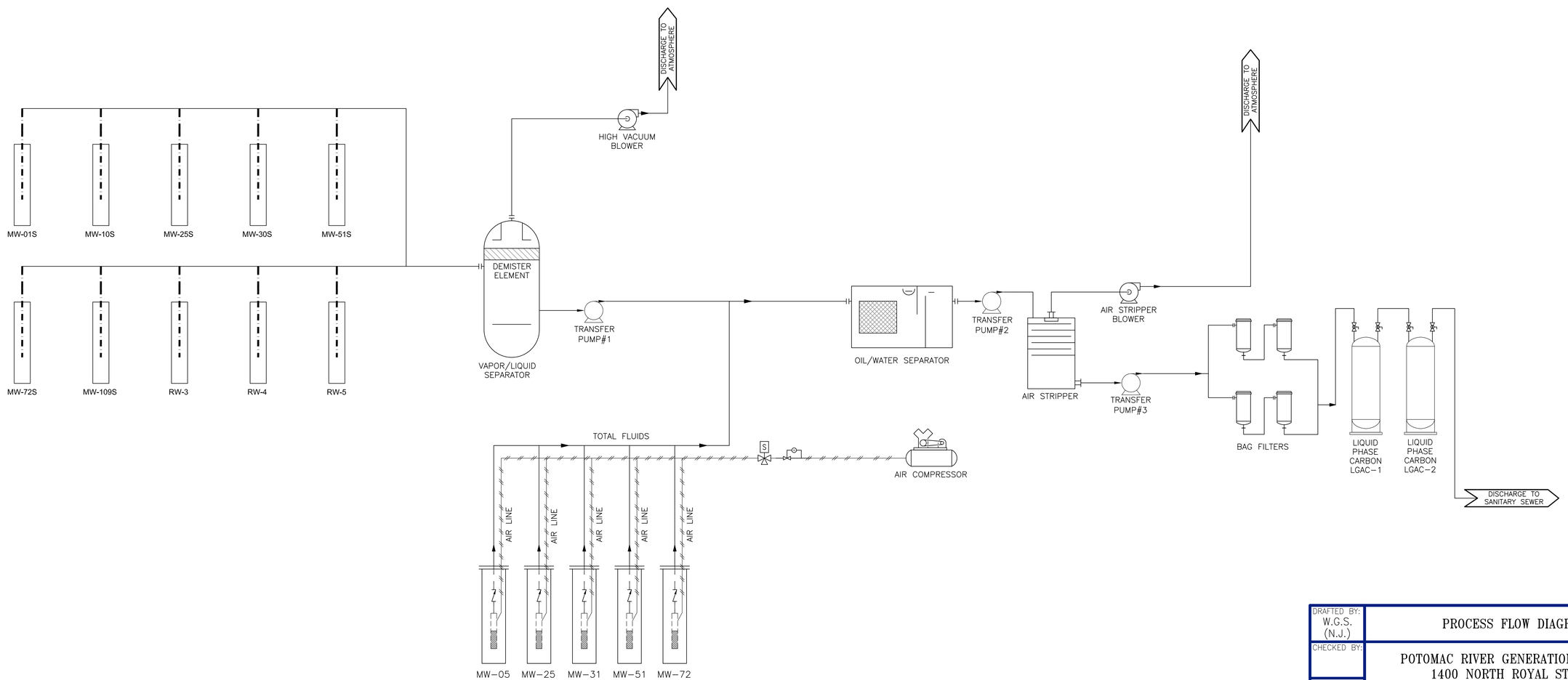
DATE

DESIGN BY:		DATE:	DECEMBER 2013
DRAWN BY:	JOC	PROJECT NO.:	MEM1108
CHECKED BY:		FILE:	1108-512-15
REVIEWED BY:		FIGURE NO.:	15
APPROVED BY:			

FOR INFORMATION ONLY

BIOSPARGE SYSTEM





PUMP AND TREAT AND TOTAL PHASE EXTRACTION SYSTEM

DRAFTED BY: W.G.S. (N.J.)	PROCESS FLOW DIAGRAM		
CHECKED BY:	POTOMAC RIVER GENERATION STATION 1400 NORTH ROYAL STREET ALEXANDRIA, VIRGINIA		
REVIEWED BY:	Groundwater & Environmental Services, Inc. 1350 BLAIR DRIVE, SUITE A, ODENTON, MD 21113		
	NOT TO SCALE	DATE 12-4-14	FIGURE 16

TABLES

Table 1

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-01S	08/08/2014		22.67	-	-	-	26.58	-	
MW-01S	08/11/2014		22.62	-	-	-	-	-	
MW-01S	08/15/2014		22.60	-	-	-	-	-	
MW-01S	08/18/2014		22.88	-	-	-	-	-	
MW-01S	08/25/2014	30.87	22.27	-	-	-	-	8.60	
MW-01S	09/02/2014	30.87	22.28	-	-	-	-	8.59	
MW-01S	09/15/2014	30.87	22.61	-	-	-	-	8.26	
MW-01S	09/22/2014	30.87	22.75	-	-	-	-	8.12	
MW-01S	09/24/2014	30.87	22.95	-	-	-	-	7.92	
MW-01S	10/01/2014	30.87	22.94	-	-	-	26.59	7.93	
MW-01S	10/10/2014	30.87	23.06	-	-	-	-	7.81	
MW-01S	10/20/2014	30.87	23.53	-	-	-	26.58	7.34	
TW-01	12/18/2013	38.31	31.38	-	-	-	-	6.93	
TW-01	01/08/2014	38.31	31.80	31.79	0.01	-	-	6.52	
TW-01	03/07/2014	38.31	30.41	-	-	-	-	7.90	
TW-01	03/13/2014	38.31	31.13	-	-	-	-	7.18	
TW-01	03/20/2014	38.31	30.36	-	-	-	-	7.95	
TW-01	03/27/2014	38.31	31.22	-	-	-	-	7.09	
TW-01	04/03/2014	38.31	30.36	-	-	-	-	7.95	
TW-01	04/08/2014	38.31	30.21	-	-	-	-	8.10	
TW-01	04/17/2014	38.31	31.02	-	-	-	-	7.29	
TW-01	04/22/2014	38.31	30.18	-	-	-	-	8.13	
TW-01	04/29/2014	38.31	30.22	-	-	-	-	8.09	
TW-01	05/05/2014	38.31	30.29	-	-	-	-	8.02	
TW-01	05/12/2014	38.31	30.28	-	-	-	-	8.03	
TW-01	05/19/2014	38.31	30.16	-	-	-	-	8.15	
TW-01	06/02/2014	38.31	30.17	-	-	-	-	8.14	
TW-01	06/09/2014	38.31	30.08	-	-	-	-	8.23	
TW-01	06/16/2014	38.31	30.23	-	-	-	-	8.08	
TW-01	06/23/2014	38.31	30.02	-	-	-	-	8.29	
TW-01	07/02/2014	38.31	29.98	-	-	-	-	8.33	
TW-01	07/07/2014	38.31	30.16	-	-	-	34.52	8.15	
TW-01	07/14/2014	38.31	29.89	-	-	-	-	8.42	
TW-01	07/31/2014	38.31	30.26	-	-	-	34.50	8.05	
TW-01	08/01/2014	Overdrilled and replaced with MW-05							
MW-05	08/08/2014		25.41	-	-	-	33.94	-	
MW-05	08/11/2014		25.16	-	-	-	-	-	
MW-05	08/15/2014		24.98	-	-	-	-	-	
MW-05	08/16/2014		24.84	24.80	0.04	NR	-	-	Transducers in well for pump test
MW-05	08/18/2014		24.88	24.80	0.08	NR	-	-	Transducers in well for pump test
MW-05	08/25/2014	31.57	23.27	22.99	0.28	0.06	-	8.54	
MW-05	09/02/2014	31.57	23.62	23.07	0.55	0.31	-	8.43	
MW-05	09/15/2014	31.57	23.63	23.13	0.50	NR	-	8.38	
MW-05	09/19/2014	31.57	23.72	23.18	0.54	0.17	-	8.32	
MW-05	09/22/2014	31.57	23.25	22.97	0.28	0.06	-	8.56	
MW-05	09/24/2014	31.57	23.33	23.13	0.20	NR	-	8.41	
MW-05	10/01/2014	31.57	26.67	TRACE	TRACE	TRACE	31.94	4.90	
MW-05	10/10/2014	31.57	26.58	26.57	0.01	TRACE	-	4.99	
MW-05	10/13/2014	31.57	26.73	26.71	0.02	TRACE	-	4.86	
MW-05	10/20/2014	31.57	26.91	26.89	0.02	TRACE	-	4.68	
MW-05	10/27/2014	31.57	27.07	27.06	0.01	TRACE	-	4.51	
TW-09S	12/18/2013	36.65	DRY	-	-	-	-	-	
TW-09S	01/08/2014	36.65	DRY	25.54	0.46	0.10	-	-	
TW-09S	03/07/2014	36.65	24.71	24.70	0.01	-	-	11.95	
TW-09S	03/13/2014	36.65	25.78	24.71	1.07	0.10	-	11.80	
TW-09S	03/20/2014	36.65	DRY	25.65	0.50	0.10	-	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-09S	03/27/2014	36.65	DRY	25.58	0.54	0.10	-	-	
TW-09S	04/03/2014	36.65	23.37	23.18	0.19	0.10	-	13.45	
TW-09S	04/08/2014	36.65	23.39	23.23	0.16	0.10	-	13.40	
TW-09S	04/17/2014	36.65	23.72	23.66	0.06	-	-	12.98	
TW-09S	04/22/2014	36.65	23.53	23.40	0.13	0.10	-	13.23	
TW-09S	04/29/2014	36.65	23.76	23.68	0.08	-	-	12.96	
TW-09S	05/05/2014	36.65	23.23	23.17	0.06	-	-	13.47	
TW-09S	05/12/2014	36.65	23.25	23.23	0.02	-	-	13.42	
TW-09S	05/19/2014	36.65	23.17	23.16	0.01	-	-	13.49	
TW-09S	06/02/2014	36.65	23.19	-	-	-	-	13.46	
TW-09S	06/09/2014	36.65	23.17	-	-	-	-	13.48	
TW-09S	06/16/2014	36.65	23.13	-	-	-	-	13.52	
TW-09S	06/23/2014	36.65	23.11	-	-	-	-	13.54	
TW-09S	07/02/2014	36.65	23.03	TRACE	TRACE	-	-	13.62	
TW-09S	07/07/2014	36.65	23.01	-	-	-	26.15	13.64	
TW-09S	07/14/2014	36.65	23.02	-	-	-	-	13.63	
TW-09S	07/23/2014	Overdrilled and replaced with MW-08S							
MW-08S	07/24/2014		26.59	-	-	-	-	-	
MW-08S	07/31/2014		22.08	-	-	-	24.35	-	
MW-08S	08/08/2014		21.33	-	-	-	24.64	-	
MW-08S	08/11/2014		21.42	-	-	-	-	-	
MW-08S	08/15/2014		21.41	-	-	-	-	-	
MW-08S	08/18/2014		21.46	-	-	-	-	-	
MW-08S	08/25/2014	30.86	21.49	-	-	-	-	9.37	
MW-08S	09/02/2014	30.86	21.45	-	-	-	-	9.41	
MW-08S	09/15/2014	30.86	21.58	-	-	-	-	9.28	
MW-08S	09/22/2014	30.86	21.67	-	-	-	-	9.19	
MW-08S	09/24/2014	30.86	21.68	-	-	-	-	9.18	
MW-08S	10/01/2014	30.86	21.67	-	-	-	24.66	9.19	
MW-08S	10/10/2014	30.86	21.71	-	-	-	-	9.15	
MW-08S	10/13/2014	30.86	21.72	-	-	-	-	9.14	
MW-08S	10/20/2014	30.86	21.80	-	-	-	24.65	9.06	
MW-08S	10/27/2014	30.86	21.88	-	-	-	-	8.98	
MW-10S	08/08/2014		22.40	-	-	-	26.51	-	
MW-10S	08/11/2014		22.41	-	-	-	-	-	
MW-10S	08/15/2014		22.02	-	-	-	-	-	
MW-10S	08/18/2014		22.03	-	-	-	-	-	
MW-10S	08/25/2014	31.24	22.06	-	-	-	-	9.18	
MW-10S	09/02/2014	31.24	22.11	-	-	-	-	9.13	
MW-10S	09/15/2014	31.24	22.15	-	-	-	-	9.09	
MW-10S	09/22/2014	31.24	22.18	-	-	-	-	9.06	
MW-10S	09/24/2014	31.24	22.19	-	-	-	-	9.05	
MW-10S	10/01/2014	31.24	22.22	-	-	-	26.09	9.02	
MW-10S	10/10/2014	31.24	22.18	TRACE	TRACE	-	-	9.06	
MW-10S	10/13/2014	31.24	22.21	-	-	-	-	9.03	
MW-10S	10/20/2014	31.24	22.35	-	-	-	26.10	8.89	
MW-10S	10/27/2014	31.24	22.32	-	-	-	-	8.92	
MW-11	07/25/2014		26.90	-	-	-	33.40	-	
MW-11	08/08/2014		26.76	-	-	-	34.00	-	
MW-11	08/11/2014		26.57	-	-	-	-	-	
MW-11	08/15/2014		27.15	-	-	-	-	-	
MW-11	08/16/2014		26.81	-	-	-	34.00	-	
MW-11	08/18/2014		26.77	-	-	-	-	-	
MW-11	08/25/2014	30.85	26.43	-	-	-	-	4.42	
MW-11	09/02/2014	30.85	26.83	-	-	-	-	4.02	
MW-11	09/15/2014	30.85	26.75	-	-	-	-	4.10	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-11	09/22/2014	30.85	26.64	-	-	-	-	4.21	
MW-11	09/24/2014	30.85	27.08	-	-	-	-	3.77	
MW-11	10/01/2014	30.85	26.87	-	-	-	34.02	3.98	
MW-11	10/13/2014	30.85	26.86	-	-	-	-	3.99	
MW-11	10/20/2014	30.85	26.96	-	-	-	33.99	3.89	
TW-13	12/18/2013	36.99	30.09	-	-	-	-	6.90	
TW-13	01/08/2014	36.99	30.45	-	-	-	-	6.54	
TW-13	03/07/2014	36.99	29.11	-	-	-	-	7.88	
TW-13	03/13/2014	36.99	29.91	-	-	-	-	7.08	
TW-13	03/20/2014	36.99	29.09	-	-	-	-	7.90	
TW-13	03/27/2014	36.99	29.98	-	-	-	-	7.01	
TW-13	04/03/2014	36.99	29.05	-	-	-	-	7.94	
TW-13	04/08/2014	36.99	29.98	-	-	-	-	7.01	
TW-13	04/17/2014	36.99	29.62	-	-	-	-	7.37	
TW-13	04/22/2014	36.99	28.93	-	-	-	-	8.06	
TW-13	04/29/2014	36.99	28.90	-	-	-	-	8.09	
TW-13	05/05/2014	36.99	29.95	-	-	-	-	7.04	
TW-13	05/12/2014	36.99	28.91	-	-	-	-	8.08	
TW-13	05/19/2014	36.99	28.87	-	-	-	-	8.12	
TW-13	06/02/2014	36.99	28.86	-	-	-	-	8.13	
TW-13	06/09/2014	36.99	28.73	-	-	-	-	8.26	
TW-13	06/16/2014	36.99	28.88	-	-	-	-	8.11	
TW-13	06/23/2014	36.99	28.65	-	-	-	-	8.34	
TW-13	07/02/2014	36.99	28.69	-	-	-	-	8.30	
TW-13	07/07/2014	36.99	28.91	-	-	-	35.02	8.08	
TW-13	07/14/2014	36.99	28.58	-	-	-	-	8.41	
TW-13	07/29/2014	Overdrilled and replaced with MW-14							
MW-14	07/31/2014		28.04	-	-	-	38.15	-	
MW-14	08/08/2014		28.21	-	-	-	38.14	-	
MW-14	08/11/2014		27.81	-	-	-	-	-	
MW-14	08/15/2014		27.43	-	-	-	-	-	
MW-14	08/18/2014		27.17	-	-	-	-	-	
MW-14	08/25/2014	31.22	26.83	-	-	-	-	4.39	
MW-14	09/02/2014	31.22	27.25	-	-	-	-	3.97	
MW-14	09/15/2014	31.22	27.15	-	-	-	-	4.07	
MW-14	09/22/2014	31.22	27.04	-	-	-	-	4.18	
MW-14	10/01/2014	31.22	27.23	-	-	-	37.28	3.99	
MW-14	10/13/2014	31.22	27.25	TRACE	TRACE	-	-	3.97	
MW-14	10/20/2014	31.22	27.32	-	-	-	37.30	3.90	
MW-15S	08/08/2014		26.11	-	-	-	26.20	-	
MW-15S	08/11/2014		26.11	-	-	-	-	-	
MW-15S	08/15/2014		24.00	-	-	-	-	-	
MW-15S	08/18/2014		24.67	-	-	-	-	-	
MW-15S	08/25/2014	31.03	24.82	-	-	-	-	6.21	
MW-15S	09/02/2014	31.03	24.82	-	-	-	-	6.21	
MW-15S	09/15/2014	31.03	24.96	-	-	-	-	6.07	
MW-15S	09/22/2014	31.03	25.06	-	-	-	-	5.97	
MW-15S	10/01/2014	31.03	25.20	-	-	-	25.88	5.83	
MW-15S	10/13/2014	31.03	26.37	-	-	-	-	4.66	
MW-15S	10/20/2014	31.03	25.45	-	-	-	25.90	5.58	
MW-16S	08/15/2014	31.03	24.13	-	-	-	24.61	-	
MW-16S	08/16/2014	31.03	24.12	-	-	-	24.48	-	
MW-16S	08/18/2014	31.03	24.13	-	-	-	-	-	
MW-16S	08/25/2014	31.03	24.24	-	-	-	-	6.79	
MW-16S	09/02/2014	31.03	DRY	-	-	-	24.65	-	
MW-16S	09/15/2014	31.03	DRY	-	-	-	24.64	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
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Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-16S	09/22/2014	31.03	DRY	-	-	-	-	-	
MW-16S	10/01/2014	31.03	DRY	-	-	-	24.64	-	
MW-16S	10/10/2014	31.03	DRY	-	-	-	-	-	
MW-16S	10/20/2014	31.03	DRY	-	-	-	24.64	-	
MW-16	08/15/2014		26.78	-	-	-	35.74	-	
MW-16	08/18/2014		26.73	-	-	-	-	-	
MW-16	08/25/2014	30.97	26.55	-	-	-	-	4.42	
MW-16	09/02/2014	30.97	26.91	-	-	-	-	4.06	
MW-16	09/15/2014	30.97	26.76	-	-	-	-	4.21	
MW-16	09/22/2014	30.97	26.80	-	-	-	-	4.17	
MW-16	10/01/2014	30.97	26.95	-	-	-	35.53	4.02	
MW-16	10/10/2014	30.97	26.85	-	-	-	-	4.12	
MW-16	10/20/2014	30.97	27.19	-	-	-	35.61	3.78	
MW-25S	08/08/2014		23.64	-	-	-	25.80	-	
MW-25S	08/11/2014		22.35	-	-	-	-	-	
MW-25S	08/15/2014		21.94	-	-	-	-	-	
MW-25S	08/18/2014		21.95	-	-	-	-	-	
MW-25S	08/25/2014	31.07	21.98	-	-	-	-	9.09	
MW-25S	09/02/2014	31.07	21.99	-	-	-	-	9.08	
MW-25S	09/15/2014	31.07	22.04	-	-	-	-	9.03	
MW-25S	09/22/2014	31.07	22.50	-	-	-	-	8.57	
MW-25S	09/24/2014	31.07	22.12	TRACE	TRACE	-	-	8.95	
MW-25S	10/01/2014	31.07	22.07	-	-	-	25.47	9.00	
MW-25S	10/10/2014	31.07	22.09	TRACE	TRACE	-	-	8.98	
MW-25S	10/13/2014	31.07	22.13	22.11	0.02	TRACE	-	8.96	
MW-25S	10/20/2014	31.07	22.19	22.18	0.01	TRACE	-	8.89	
MW-25S	10/27/2014	31.07	22.10	22.09	0.01	TRACE	-	8.98	
MW-25	08/08/2014		27.97	27.60	0.37	0.08	36.69	-	
MW-25	08/11/2014		27.61	27.37	0.24	NR	-	-	Transducers in well for pump test
MW-25	08/15/2014		28.11	28.05	0.06	NR	-	-	Transducers in well for pump test
MW-25	08/16/2014		27.81	27.75	0.06	NR	-	-	Transducers in well for pump test
MW-25	08/18/2014		27.94	27.71	0.23	NR	-	-	Transducers in well for pump test
MW-25	08/25/2014	31.13	26.89	26.74	0.15	0.05	-	4.37	
MW-25	09/02/2014	31.13	27.77	27.03	0.74	0.50	-	4.00	
MW-25	09/15/2014	31.13	27.69	26.87	0.82	NR	-	4.15	
MW-25	09/19/2014	31.13	28.10	26.95	1.15	0.93	-	4.03	
MW-25	09/22/2014	31.13	27.53	26.91	0.62	0.38	-	4.14	
MW-25	09/24/2014	31.13	27.73	27.23	0.50	NR	-	3.84	
MW-25	10/01/2014	31.13	27.47	27.02	0.45	0.19	35.90	4.05	
MW-25	10/10/2014	31.13	27.65	26.91	0.74	0.50	-	4.12	
MW-25	10/13/2014	31.13	27.60	27.03	0.57	NR	-	4.03	
MW-25	10/20/2014	31.13	27.49	27.19	0.30	0.13	-	3.90	
MW-25	10/27/2014	31.13	27.87	27.25	0.62	NR	-	3.80	
TW-10	12/18/2013	37.28	30.31	-	-	-	-	6.97	
TW-10	01/08/2014	37.28	30.56	-	-	-	-	6.72	
TW-10	03/07/2014	37.28	29.70	-	-	-	-	7.58	
TW-10	03/13/2014	37.28	30.08	-	-	-	-	7.20	
TW-10	03/20/2014	37.28	29.22	-	-	-	-	8.06	
TW-10	03/27/2014	37.28	30.13	-	-	-	-	7.15	
TW-10	04/03/2014	37.28	29.08	-	-	-	-	8.20	
TW-10	04/08/2014	37.28	29.14	-	-	-	-	8.14	
TW-10	04/17/2014	37.28	29.66	-	-	-	-	7.62	
TW-10	04/22/2014	37.28	29.12	-	-	-	-	8.16	
TW-10	04/29/2014	37.28	28.96	-	-	-	-	8.32	
TW-10	05/05/2014	37.28	29.22	-	-	-	-	8.06	
TW-10	05/12/2014	37.28	29.06	-	-	-	-	8.22	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-10	05/19/2014	37.28	29.02	-	-	-	-	8.26	
TW-10	06/02/2014	37.28	28.99	-	-	-	-	8.29	
TW-10	06/09/2014	37.28	28.89	-	-	-	-	8.39	
TW-10	06/16/2014	37.28	29.02	-	-	-	-	8.26	
TW-10	06/23/2014	37.28	28.86	-	-	-	-	8.42	
TW-10	07/02/2014	37.28	28.87	-	-	-	-	8.41	
TW-10	07/07/2014	37.28	29.12	-	-	-	36.47	8.16	
TW-10	07/14/2014	37.28	28.68	-	-	-	-	8.60	
TW-10	07/21/2014	Overdrilled and replaced with MW-27							
MW-27	07/24/2014		27.59	-	-	-	-	-	
MW-27	07/31/2014		27.58	-	-	-	34.47	-	
MW-27	08/08/2014		27.69	-	-	-	34.46	-	
MW-27	08/11/2014		27.33	-	-	-	-	-	
MW-27	08/15/2014		27.90	-	-	-	-	-	
MW-27	08/16/2014		27.65	-	-	-	34.48	-	
MW-27	08/18/2014		27.62	-	-	-	-	-	
MW-27	08/25/2014	31.43	27.09	-	-	-	-	4.34	
MW-27	09/02/2014	31.43	27.52	-	-	-	-	3.91	
MW-27	09/15/2014	31.43	27.38	-	-	-	-	4.05	
MW-27	09/22/2014	31.43	27.24	-	-	-	-	4.19	
MW-27	10/01/2014	31.43	27.44	-	-	-	34.27	3.99	
MW-27	10/10/2014	31.43	27.24	-	-	-	-	4.19	
MW-27	10/20/2014	31.43	27.59	-	-	-	34.13	3.84	
MW-27	10/27/2014	31.43	27.66	-	-	-	-	3.77	
MW-30S	08/08/2014		23.31	-	-	-	25.28	-	
MW-30S	08/11/2014		23.33	-	-	-	-	-	
MW-30S	08/15/2014		24.84	-	-	-	-	-	
MW-30S	08/18/2014		24.84	-	-	-	-	-	
MW-30S	08/25/2014	30.67	24.79	-	-	-	-	5.88	
MW-30S	09/02/2014	30.67	24.83	-	-	-	-	5.84	
MW-30S	09/15/2014	30.67	24.85	-	-	-	-	5.82	
MW-30S	09/22/2014	30.67	24.88	-	-	-	-	5.79	
MW-30S	10/01/2014	30.67	24.88	-	-	-	25.28	5.79	
MW-30S	10/10/2014	30.67	24.87	-	-	-	-	5.80	
MW-30S	10/20/2014	30.67	24.77	-	-	-	25.29	5.90	
MW-30S	10/27/2014	30.67	24.78	-	-	-	-	5.89	
TW-11	12/18/2013	37.39	26.40	-	-	-	-	10.99	
TW-11	01/08/2014	37.39	27.73	-	-	-	-	9.66	
TW-11	03/07/2014	37.39	29.17	-	-	-	-	8.22	
TW-11	03/13/2014	37.39	27.56	-	-	-	-	9.83	
TW-11	03/20/2014	37.39	27.15	-	-	-	-	10.24	
TW-11	03/27/2014	37.39	27.40	-	-	-	-	9.99	
TW-11	04/03/2014	37.39	26.28	26.26	0.02	0.10	-	11.12	
TW-11	04/08/2014	37.39	26.52	-	-	-	-	10.87	
TW-11	04/17/2014	37.39	26.85	-	-	-	-	10.54	
TW-11	04/22/2014	37.39	27.09	-	-	-	-	10.30	
TW-11	04/29/2014	37.39	27.39	-	-	-	-	10.00	
TW-11	05/05/2014	37.39	26.26	26.24	0.02	-	-	11.15	
TW-11	05/12/2014	37.39	26.97	-	-	-	-	10.42	
TW-11	05/19/2014	37.39	25.91	25.90	0.01	-	-	11.49	
TW-11	06/02/2014	37.39	26.32	26.31	0.01	-	-	11.08	
TW-11	06/09/2014	37.39	25.23	-	-	-	-	12.16	
TW-11	06/16/2014	37.39	25.35	25.36	0.01	-	-	12.05	
TW-11	06/23/2014	37.39	26.55	-	-	-	-	10.84	
TW-11	07/02/2014	37.39	26.91	TRACE	TRACE	-	-	10.48	
TW-11	07/07/2014	37.39	27.08	-	-	-	37.10	10.31	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-11	07/14/2014	37.39	26.95	TRACE	TRACE	-	-	10.44	
TW-11	07/24/2014	37.39	26.88	-	-	-	-	10.51	
TW-11	07/31/2014	37.39	27.10	-	-	-	37.02	10.29	
TW-11	08/05/2014	Overdrilled and replaced with MW-31							
MW-31	08/08/2014		27.31	-	-	-	36.35	-	
MW-31	08/11/2014		26.88	-	-	-	-	-	
MW-31	08/15/2014		27.00	-	-	-	-	-	
MW-31	08/16/2014		26.92	-	-	-	35.00	-	
MW-31	08/18/2014		27.11	-	-	-	-	-	
MW-31	08/25/2014	31.23	26.90	-	-	-	-	4.33	
MW-31	09/02/2014	31.23	27.31	-	-	-	-	3.92	
MW-31	09/15/2014	31.23	27.18	-	-	-	-	4.05	
MW-31	09/22/2014	31.23	27.05	-	-	-	-	4.18	
MW-31	10/01/2014	31.23	27.21	-	-	-	35.50	4.02	
MW-31	10/10/2014	31.23	27.02	-	-	-	-	4.21	
MW-31	10/20/2014	31.23	27.40	-	-	-	35.50	3.83	
MW-31	10/27/2014	31.23	27.43	-	-	-	-	3.80	
MW-33	08/08/2014		27.91	-	-	-	35.41	-	
MW-33	08/11/2014		27.41	-	-	-	-	-	
MW-33	08/15/2014		26.98	-	-	-	34.45	-	
MW-33	08/18/2014		26.76	-	-	-	-	-	
MW-33	08/25/2014	30.93	26.47	-	-	-	-	4.46	
MW-33	09/02/2014	30.93	26.87	-	-	-	-	4.06	
MW-33	09/15/2014	30.93	26.73	-	-	-	-	4.20	
MW-33	09/22/2014	30.93	26.59	-	-	-	-	4.34	
MW-33	10/01/2014	30.93	26.79	-	-	-	34.47	4.14	
MW-33	10/10/2014	30.93	26.60	-	-	-	-	4.33	
MW-33	10/20/2014	30.93	26.96	-	-	-	34.47	3.97	
MW-51S	08/08/2014		21.15	-	-	-	25.27	-	
MW-51S	08/11/2014		21.27	-	-	-	-	-	
MW-51S	08/15/2014		21.17	-	-	-	25.30	-	
MW-51S	08/18/2014		21.23	-	-	-	-	-	
MW-51S	08/25/2014	30.81	21.34	-	-	-	-	9.47	
MW-51S	09/02/2014	30.81	21.38	-	-	-	-	9.43	
MW-51S	09/15/2014	30.81	21.46	-	-	-	-	9.35	
MW-51S	09/22/2014	30.81	21.48	-	-	-	-	9.33	
MW-51S	09/24/2014	30.81	21.49	-	-	-	-	9.32	
MW-51S	10/01/2014	30.81	21.32	TRACE	TRACE	-	25.30	9.49	
MW-51S	10/10/2014	30.81	21.53	-	-	-	-	9.28	
MW-51S	10/13/2014	30.81	21.52	-	-	-	-	9.29	
MW-51S	10/20/2014	30.81	21.58	-	-	-	25.33	9.23	
MW-51S	10/27/2014	30.81	21.64	-	-	-	-	9.17	
MW-51	07/25/2014		27.25	-	-	-	35.95	-	
MW-51	08/08/2014		27.00	TRACE	TRACE	-	36.48	-	
MW-51	08/11/2014		26.70	-	-	-	-	-	
MW-51	08/15/2014		27.30	-	-	-	-	-	
MW-51	08/16/2014		26.99	TRACE	TRACE	-	34.65	-	
MW-51	08/18/2014		26.94	TRACE	TRACE	-	-	-	
MW-51	08/25/2014	30.97	26.59	TRACE	TRACE	-	-	4.38	
MW-51	09/02/2014	30.97	26.93	TRACE	TRACE	-	-	4.04	
MW-51	09/15/2014	30.97	26.88	26.85	0.03	TRACE	-	4.12	
MW-51	09/22/2014	30.97	26.83	26.80	0.03	TRACE	-	4.17	
MW-51	09/24/2014	30.97	27.19	27.15	0.04	-	-	3.81	
MW-51	10/01/2014	30.97	26.93	TRACE	TRACE	-	36.15	4.04	
MW-51	10/10/2014	30.97	26.84	26.81	0.03	-	-	4.16	
MW-51	10/13/2014	30.97	27.01	26.94	0.07	-	-	4.02	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-51	10/20/2014	30.97	27.05	27.03	0.02	TRACE	-	3.94	
MW-51	10/27/2014	30.97	27.16	27.12	0.04	TRACE	-	3.84	
MW-52	08/15/2014		28.11	-	-	-	35.78	-	
MW-52	08/18/2014		26.07	-	-	-	-	-	
MW-52	08/25/2014	30.17	25.76	-	-	-	-	4.41	
MW-52	09/02/2014	30.17	26.15	-	-	-	-	4.02	
MW-52	09/15/2014	30.17	25.99	-	-	-	-	4.18	
MW-52	09/22/2014	30.17	26.00	-	-	-	-	4.17	
MW-52	10/01/2014	30.17	26.03	-	-	-	35.65	4.14	
MW-52	10/10/2014	30.17	26.07	-	-	-	-	4.10	
MW-52	10/20/2014	30.17	26.24	-	-	-	35.64	3.93	
MW-70	08/15/2014		26.63	-	-	-	34.95	-	
MW-70	08/18/2014		26.61	-	-	-	-	-	
MW-70	08/25/2014	30.86	26.25	-	-	-	-	4.61	
MW-70	09/02/2014	30.86	26.68	-	-	-	-	4.18	
MW-70	09/15/2014	30.86	26.63	-	-	-	-	4.23	
MW-70	09/22/2014	30.86	26.47	-	-	-	-	4.39	
MW-70	10/01/2014	30.86	26.66	-	-	-	34.88	4.20	
MW-70	10/10/2014	30.86	26.57	-	-	-	-	4.29	
MW-70	10/20/2014	30.86	26.79	-	-	-	34.90	4.07	
TW-08S	12/18/2013	36.75	DRY	-	-	-	-	-	
TW-08S	01/08/2014	36.75	DRY	-	-	-	-	-	
TW-08S	03/07/2014	36.75	24.14	-	-	-	-	12.61	
TW-08S	03/13/2014	36.75	24.06	-	-	-	-	12.69	
TW-08S	03/20/2014	36.75	24.37	-	-	-	-	12.38	
TW-08S	03/27/2014	36.75	24.54	-	-	-	-	12.21	
TW-08S	04/03/2014	36.75	24.26	-	-	-	-	12.49	
TW-08S	04/08/2014	36.75	23.85	-	-	-	-	12.90	
TW-08S	04/17/2014	36.75	24.13	-	-	-	-	12.62	
TW-08S	04/22/2014	36.75	23.92	-	-	-	-	12.83	
TW-08S	04/29/2014	36.75	23.91	-	-	-	-	12.84	
TW-08S	05/05/2014	36.75	22.89	-	-	-	-	13.86	
TW-08S	05/12/2014	36.75	23.02	-	-	-	-	13.73	
TW-08S	05/19/2014	36.75	22.90	-	-	-	-	13.85	
TW-08S	06/02/2014	36.75	23.24	-	-	-	-	13.51	
TW-08S	06/09/2014	36.75	23.21	-	-	-	-	13.54	
TW-08S	06/16/2014	36.75	22.40	-	-	-	-	14.35	
TW-08S	06/23/2014	36.75	22.41	-	-	-	-	14.34	
TW-08S	07/02/2014	36.75	22.40	-	-	-	-	14.35	
TW-08S	07/07/2014	36.75	22.65	-	-	-	25.85	14.10	
TW-08S	07/14/2014	36.75	23.23	-	-	-	-	13.52	
TW-08S	07/24/2014	36.75	23.09	-	-	-	-	13.66	
TW-08S	07/31/2014	36.75	23.26	-	-	-	25.82	13.49	
TW-08S	08/07/2014	Overdrilled and replaced with MW-72S							
MW-72S	08/08/2014		23.33	-	-	-	25.30	-	
MW-72S	08/11/2014		22.85	-	-	-	-	-	
MW-72S	08/15/2014		21.35	-	-	-	23.90	-	
MW-72S	08/18/2014		21.34	-	-	-	-	-	
MW-72S	08/25/2014	30.63	21.41	-	-	-	-	9.22	
MW-72S	09/02/2014	30.63	21.45	-	-	-	-	9.18	
MW-72S	09/15/2014	30.63	21.54	-	-	-	-	9.09	
MW-72S	09/22/2014	30.63	21.56	-	-	-	-	9.07	
MW-72S	10/01/2014	30.63	21.63	-	-	-	23.90	9.00	
MW-72S	10/10/2014	30.63	21.69	-	-	-	-	8.94	
MW-72S	10/20/2014	30.63	21.73	-	-	-	23.88	8.90	
MW-72S	10/27/2014	30.63	21.80	-	-	-	-	8.83	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-72	08/08/2014		26.97	-	-	-	34.55	-	
MW-72	08/11/2014		26.85	-	-	-	-	-	
MW-72	08/15/2014		27.43	-	-	-	-	-	
MW-72	08/16/2014		27.05	-	-	-	34.43	-	
MW-72	08/18/2014		27.00	-	-	-	-	-	
MW-72	08/25/2014	31.06	26.66	-	-	-	-	4.40	
MW-72	09/02/2014	31.06	27.11	-	-	-	-	3.95	
MW-72	09/15/2014	31.06	27.02	-	-	-	-	4.04	
MW-72	09/22/2014	31.06	26.88	-	-	-	-	4.18	
MW-72	10/01/2014	31.06	27.10	-	-	-	34.48	3.96	
MW-72	10/10/2014	31.06	26.94	-	-	-	-	4.12	
MW-72	10/20/2014	31.06	27.19	-	-	-	34.43	3.87	
MW-72	10/27/2014	31.06	27.34	-	-	-	-	3.72	
MW-100S	08/15/2014		21.32	-	-	-	24.22	-	
MW-100S	08/18/2014		21.28	-	-	-	-	-	
MW-100S	08/25/2014	31.06	21.31	-	-	-	-	9.75	
MW-100S	09/02/2014	31.06	21.39	-	-	-	-	9.67	
MW-100S	09/15/2014	31.06	21.39	-	-	-	-	9.67	
MW-100S	09/22/2014	31.06	21.52	-	-	-	-	9.54	
MW-100S	10/01/2014	31.06	21.62	-	-	-	24.16	9.44	
MW-100S	10/10/2014	31.06	21.61	-	-	-	-	9.45	
MW-100S	10/20/2014	31.06	21.67	-	-	-	24.17	9.39	
MW-100	08/15/2014		26.80	-	-	-	36.90	-	
MW-100	08/18/2014		26.66	-	-	-	-	-	
MW-100	08/25/2014	30.78	26.26	-	-	-	-	4.52	
MW-100	09/02/2014	30.78	26.70	-	-	-	-	4.08	
MW-100	09/15/2014	30.78	26.65	-	-	-	-	4.13	
MW-100	09/22/2014	30.78	26.48	-	-	-	-	4.30	
MW-100	10/01/2014	30.78	26.69	-	-	-	36.68	4.09	
MW-100	10/10/2014	30.78	26.60	-	-	-	-	4.18	
MW-100	10/20/2014	30.78	26.86	-	-	-	36.58	3.92	
MW-102	08/15/2014		29.91	-	-	-	36.64	-	
MW-102	08/18/2014		29.81	-	-	-	-	-	
MW-102	08/25/2014	29.72	28.40	-	-	-	-	1.32	
MW-102	09/02/2014	29.72	27.23	-	-	-	-	2.49	
MW-102	09/15/2014	29.72	24.97	-	-	-	-	4.75	
MW-102	09/22/2014	29.72	24.83	-	-	-	-	4.89	
MW-102	10/01/2014	29.72	24.73	-	-	-	36.45	4.99	
MW-102	10/10/2014	29.72	24.66	-	-	-	-	5.06	
MW-102	10/20/2014	29.72	24.78	-	-	-	36.44	4.94	
MW-103	07/24/2014		7.87	-	-	-	-	-	
MW-103	08/08/2014		4.61	-	-	-	15.06	-	
MW-103	08/11/2014		4.63	-	-	-	-	-	
MW-103	08/15/2014		4.26	-	-	-	14.95	-	
MW-103	08/18/2014		4.48	-	-	-	-	-	
MW-103	08/25/2014	11.07	4.45	-	-	-	-	6.62	
MW-103	09/02/2014	11.07	4.50	-	-	-	-	6.57	
MW-103	09/15/2014	11.07	4.63	-	-	-	-	6.44	
MW-103	09/22/2014	11.07	4.76	-	-	-	-	6.31	
MW-103	10/01/2014	11.07	4.85	-	-	-	14.88	6.22	
MW-103	10/10/2014	11.07	4.93	-	-	-	-	6.14	
MW-103	10/20/2014	11.07	4.70	-	-	-	14.88	6.37	
MW-104	07/24/2014		5.24	-	-	-	-	-	
MW-104	08/08/2014		4.28	-	-	-	12.05	-	
MW-104	08/11/2014		4.40	-	-	-	-	-	
MW-104	08/15/2014		3.95	-	-	-	12.20	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-104	08/18/2014		4.22	-	-	-	-	-	
MW-104	08/25/2014	12.00	4.29	-	-	-	-	7.71	
MW-104	09/02/2014	12.00	4.38	-	-	-	-	7.62	
MW-104	09/15/2014	12.00	4.52	-	-	-	-	7.48	
MW-104	09/22/2014	12.00	4.73	-	-	-	-	7.27	
MW-104	10/01/2014	12.00	4.73	-	-	-	11.98	7.27	
MW-104	10/10/2014	12.00	4.77	-	-	-	-	7.23	
MW-104	10/20/2014	12.00	3.98	-	-	-	12.07	8.02	
MW-105	07/24/2014		2.34	-	-	-	-	-	
MW-105	08/08/2014		2.15	-	-	-	10.06	-	
MW-105	08/11/2014		2.39	-	-	-	-	-	
MW-105	08/15/2014		1.67	-	-	-	9.95	-	
MW-105	08/18/2014		2.06	-	-	-	-	-	
MW-105	08/25/2014	10.94	2.25	-	-	-	-	8.69	
MW-105	09/02/2014	10.94	2.24	-	-	-	-	8.70	
MW-105	09/15/2014	10.94	2.32	-	-	-	-	8.62	
MW-105	09/22/2014	10.94	2.71	-	-	-	-	8.23	
MW-105	10/01/2014	10.94	2.57	-	-	-	9.88	8.37	
MW-105	10/10/2014	10.94	2.70	-	-	-	-	8.24	
MW-105	10/20/2014	10.94	1.70	-	-	-	9.93	9.24	
MW-106	08/08/2014		8.30	-	-	-	10.27	-	
MW-106	08/11/2014		8.27	-	-	-	-	-	
MW-106	08/15/2014		7.63	-	-	-	9.88	-	
MW-106	08/18/2014		7.58	-	-	-	-	-	
MW-106	08/25/2014	11.12	7.52	-	-	-	-	3.60	
MW-106	09/02/2014	11.12	7.79	-	-	-	-	3.33	
MW-106	09/15/2014	11.12	7.90	-	-	-	-	3.22	
MW-106	09/22/2014	11.12	7.87	-	-	-	-	3.25	
MW-106	10/01/2014	11.12	7.93	-	-	-	9.88	3.19	
MW-106	10/10/2014	11.12	7.71	-	-	-	-	3.41	
MW-106	10/13/2014	11.12	7.92	-	-	-	-	3.20	
MW-106	10/20/2014	11.12	7.86	-	-	-	9.88	3.26	
MW-106	10/27/2014	11.12	7.77	-	-	-	-	3.35	
MW-107	08/08/2014		10.62	-	-	-	11.57	-	
MW-107	08/11/2014		9.02	-	-	-	-	-	
MW-107	08/15/2014		8.94	-	-	-	-	-	
MW-107	08/16/2014		8.93	-	-	-	11.57	-	
MW-107	08/18/2014		8.89	-	-	-	-	-	
MW-107	08/25/2014	15.74	8.38	-	-	-	-	7.36	
MW-107	09/02/2014	15.74	8.43	-	-	-	-	7.31	
MW-107	09/15/2014	15.74	9.39	-	-	-	-	6.35	
MW-107	09/22/2014	15.74	9.92	-	-	-	-	5.82	
MW-107	10/01/2014	15.74	10.32	-	-	-	11.03	5.42	
MW-107	10/10/2014	15.74	10.53	-	-	-	-	5.21	
MW-107	10/13/2014	15.74	10.67	-	-	-	-	5.07	
MW-107	10/20/2014	15.74	8.43	-	-	-	11.04	7.31	
MW-107	10/27/2014	15.74	7.97	-	-	-	-	7.77	
MW-108	08/08/2014		DRY	-	-	-	9.49	-	
MW-108	08/11/2014		DRY	-	-	-	9.52	-	
MW-108	08/15/2014		9.01	-	-	-	9.22	-	
MW-108	08/18/2014		9.07	-	-	-	-	-	
MW-108	08/25/2014	15.61	DRY	-	-	-	9.23	-	
MW-108	09/02/2014	15.61	DRY	-	-	-	9.23	-	
MW-108	09/15/2014	15.61	DRY	-	-	-	9.22	-	
MW-108	09/22/2014	15.61	DRY	-	-	-	-	-	
MW-108	10/01/2014	15.61	DRY	-	-	-	10.48	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-108	10/10/2014	15.61	DRY	-	-	-	-	-	
MW-108	10/20/2014	15.61	DRY	-	-	-	10.48	-	
MW-109S	08/25/2014	19.27	10.06	-	-	-	-	9.21	
MW-109S	09/02/2014	19.27	NR	-	-	-	-	-	Well inaccessible
MW-109S	09/15/2014	19.27	10.19	-	-	-	-	9.08	
MW-109S	09/22/2014	19.27	10.24	-	-	-	-	9.03	
MW-109S	10/01/2014	19.27	10.33	-	-	-	13.20	8.94	
MW-109S	10/10/2014	19.27	10.47	-	-	-	-	8.80	
MW-109S	10/13/2014	19.27	10.58	-	-	-	-	8.69	
MW-109S	10/20/2014	19.27	10.67	-	-	-	13.20	8.60	
MW-109S	10/27/2014	19.27	10.83	-	-	-	-	8.44	
MW-109	08/25/2014	19.16	14.59	-	-	-	-	4.57	
MW-109	09/02/2014	19.16	NR	-	-	-	-	-	Well inaccessible
MW-109	09/15/2014	19.16	14.98	-	-	-	-	4.18	
MW-109	09/22/2014	19.16	14.88	-	-	-	-	4.28	
MW-109	10/01/2014	19.16	15.07	-	-	-	22.79	4.09	
MW-109	10/10/2014	19.16	14.96	-	-	-	-	4.20	
MW-109	10/13/2014	19.16	15.09	-	-	-	-	4.07	
MW-109	10/20/2014	19.16	15.22	-	-	-	22.72	3.94	
MW-109	10/27/2014	19.16	15.27	-	-	-	-	3.89	
MW-110S	08/25/2014	19.13	10.05	-	-	-	12.70	9.08	
MW-110S	09/02/2014	19.13	NR	-	-	-	-	-	Well inaccessible
MW-110S	09/15/2014	19.13	10.23	-	-	-	-	8.90	
MW-110S	09/22/2014	19.13	10.28	-	-	-	-	8.85	
MW-110S	10/01/2014	19.13	10.33	-	-	-	12.65	8.80	
MW-110S	10/10/2014	19.13	10.41	-	-	-	-	8.72	
MW-110S	10/20/2014	19.13	10.45	-	-	-	12.66	8.68	
MW-110S	10/27/2014	19.13	10.48	-	-	-	-	8.65	
MW-110	08/25/2014	19.51	14.70	-	-	-	24.40	4.81	
MW-110	09/02/2014	19.51	NR	-	-	-	-	-	Well inaccessible
MW-110	09/15/2014	19.51	15.11	-	-	-	-	4.40	
MW-110	09/22/2014	19.51	14.98	-	-	-	-	4.53	
MW-110	10/01/2014	19.51	15.18	-	-	-	23.33	4.33	
MW-110	10/10/2014	19.51	15.07	-	-	-	-	4.44	
MW-110	10/20/2014	19.51	14.35	-	-	-	23.34	5.16	
MW-110	10/27/2014	19.51	14.39	-	-	-	-	5.12	
MW-111	08/25/2014	19.17	14.62	-	-	-	-	4.55	
MW-111	09/02/2014	19.17	NR	-	-	-	-	-	Well inaccessible
MW-111	09/15/2014	19.17	14.98	-	-	-	-	4.19	
MW-111	09/22/2014	19.17	14.89	-	-	-	-	4.28	
MW-111	10/01/2014	19.17	15.06	-	-	-	21.98	4.11	
MW-111	10/10/2014	19.17	14.97	-	-	-	-	4.20	
MW-111	10/20/2014	19.17	14.25	-	-	-	21.97	4.92	
MW-112S	08/15/2014		10.31	-	-	-	12.40	-	
MW-112S	08/18/2014		10.22	-	-	-	12.45	-	
MW-112S	08/25/2014	19.22	10.29	-	-	-	-	8.93	
MW-112S	09/02/2014	19.22	NR	-	-	-	-	-	Well inaccessible
MW-112S	09/15/2014	19.22	10.43	-	-	-	-	8.79	
MW-112S	09/22/2014	19.22	10.56	-	-	-	-	8.66	
MW-112S	10/01/2014	19.22	10.58	-	-	-	12.46	8.64	
MW-112S	10/10/2014	19.22	10.64	-	-	-	-	8.58	
MW-112S	10/20/2014	19.22	10.75	-	-	-	12.47	8.47	
MW-112	08/15/2014		15.11	-	-	-	22.55	-	
MW-112	08/18/2014		14.43	-	-	-	22.31	-	
MW-112	08/25/2014	19.08	14.53	-	-	-	-	4.55	
MW-112	09/02/2014	19.08	NR[3]	-	-	-	-	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
MW-112	09/15/2014	19.08	14.85	-	-	-	-	4.23	
MW-112	09/22/2014	19.08	14.77	-	-	-	-	4.31	
MW-112	10/01/2014	19.08	14.92	-	-	-	22.83	4.16	
MW-112	10/10/2014	19.08	14.87	-	-	-	-	4.21	
MW-112	10/20/2014	19.08	15.15	-	-	-	22.83	3.93	
MW-113	08/25/2014	19.11	14.49	-	-	-	-	4.62	
MW-113	09/02/2014	19.11	NR	-	-	-	-	-	Well inaccessible
MW-113	09/15/2014	19.11	14.96	-	-	-	-	4.15	
MW-113	09/22/2014	19.11	14.83	-	-	-	-	4.28	
MW-113	10/01/2014	19.11	15.04	-	-	-	22.95	4.07	
MW-113	10/10/2014	19.11	14.84	-	-	-	-	4.27	
MW-113	10/20/2014	19.11	15.20	-	-	-	22.95	3.91	
MW-114	08/25/2014	19.26	14.62	-	-	-	22.78	4.64	
MW-114	09/02/2014	19.26	NR	-	-	-	-	-	Well inaccessible
MW-114	09/15/2014	19.26	14.89	-	-	-	-	4.37	
MW-114	09/22/2014	19.26	14.87	-	-	-	-	4.39	
MW-114	10/01/2014	19.26	14.96	-	-	-	22.77	4.30	
MW-114	10/10/2014	19.26	15.01	-	-	-	-	4.25	
MW-114	10/20/2014	19.26	15.29	-	-	-	22.77	3.97	
RW-1	10/10/2014	NR	26.93	-	-	-	-	-	
RW-1	10/13/2014		27.09	-	-	-	-	-	
RW-1	10/20/2014		27.27	-	-	-	40.65	-	
RW-1	10/27/2014	31.19	27.35	-	-	-	-	3.84	
SP-2	10/01/2014	NR	27.23	-	-	-	35.45	-	
SP-2	10/10/2014		27.10	-	-	-	-	-	
TW-02	12/18/2013	20.60	15.52	-	-	-	-	5.08	
TW-02	01/08/2014	20.60	15.08	-	-	-	-	5.52	
TW-02	03/07/2014	20.60	14.81	-	-	-	-	5.79	
TW-02	03/13/2014	20.60	14.22	-	-	-	-	6.38	
TW-02	03/20/2014	20.60	13.39	-	-	-	-	7.21	
TW-02	03/27/2014	20.60	14.31	-	-	-	-	6.29	
TW-02	04/03/2014	20.60	13.25	-	-	-	-	7.35	
TW-02	04/08/2014	20.60	13.74	-	-	-	-	6.86	
TW-02	04/17/2014	20.60	13.70	-	-	-	-	6.90	
TW-02	04/22/2014	20.60	13.62	-	-	-	-	6.98	
TW-02	04/29/2014	20.60	13.96	-	-	-	-	6.64	
TW-02	05/05/2014	20.60	13.55	-	-	-	-	7.05	
TW-02	05/12/2014	20.60	14.25	-	-	-	-	6.35	
TW-02	05/19/2014	20.60	13.63	-	-	-	-	6.97	
TW-02	05/27/2014	20.60	14.31	-	-	-	-	6.29	
TW-02	06/02/2014	20.60	14.34	-	-	-	-	6.26	
TW-02	06/09/2014	20.60	14.71	-	-	-	-	5.89	
TW-02	06/16/2014	20.60	14.30	-	-	-	-	6.30	
TW-02	06/23/2014	20.60	14.48	-	-	-	-	6.12	
TW-02	07/02/2014	20.60	14.77	-	-	-	-	5.83	
TW-02	07/07/2014	20.60	15.08	-	-	-	21.28	5.52	
TW-02	07/14/2014	20.60	15.02	-	-	-	-	5.58	
TW-02	07/31/2014	20.60	15.40	-	-	-	21.22	5.20	
TW-02	08/08/2014	20.60	15.40	-	-	-	-	5.20	
TW-02	08/11/2014	20.60	15.28	-	-	-	-	5.32	
TW-02	08/15/2014	20.60	14.84	-	-	-	21.15	5.76	
TW-02	08/18/2014	20.60	15.06	-	-	-	-	5.54	
TW-02	08/25/2014	NR	14.71	-	-	-	-	-	
TW-02	09/02/2014	NR	15.18	-	-	-	-	-	
TW-02	09/15/2014	NR	14.90	-	-	-	-	-	
TW-02	09/22/2014	NR	15.00	-	-	-	-	-	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
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Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-02	10/01/2014	NR	15.22	-	-	-	21.12	-	
TW-02	10/13/2014	NR	14.92	-	-	-	-	-	
TW-02	10/20/2014	NR	15.10	-	-	-	20.99	-	
TW-03	12/18/2013	14.87	9.08	-	-	-	-	5.79	
TW-03	01/08/2014	14.87	9.42	-	-	-	-	5.45	
TW-03	03/07/2014	14.87	7.66	-	-	-	-	7.21	
TW-03	03/13/2014	14.87	8.09	-	-	-	-	6.78	
TW-03	03/20/2014	14.87	7.50	-	-	-	-	7.37	
TW-03	03/27/2014	14.87	8.47	-	-	-	-	6.40	
TW-03	04/03/2014	14.87	6.99	-	-	-	-	7.88	
TW-03	04/08/2014	14.87	7.64	-	-	-	-	7.23	
TW-03	04/17/2014	14.87	7.33	-	-	-	-	7.54	
TW-03	04/22/2014	14.87	7.64	-	-	-	-	7.23	
TW-03	04/29/2014	14.87	7.36	-	-	-	-	7.51	
TW-03	05/05/2014	14.87	7.58	-	-	-	-	7.29	
TW-03	05/12/2014	14.87	7.93	-	-	-	-	6.94	
TW-03	05/19/2014	14.87	8.42	-	-	-	-	6.45	
TW-03	05/27/2014	14.87	7.69	-	-	-	-	7.18	
TW-03	06/02/2014	14.87	8.00	-	-	-	-	6.87	
TW-03	06/09/2014	14.87	7.77	-	-	-	-	7.10	
TW-03	06/16/2014	14.87	7.60	-	-	-	-	7.27	
TW-03	06/23/2014	14.87	7.68	-	-	-	-	7.19	
TW-03	07/02/2014	14.87	7.97	-	-	-	-	6.90	
TW-03	07/07/2014	14.87	8.31	-	-	-	13.45	6.56	
TW-03	07/14/2014	14.87	7.55	-	-	-	-	7.32	
TW-03	07/25/2014	14.87	8.45	-	-	-	13.30	6.42	
TW-03	07/31/2014	14.87	8.14	-	-	-	13.35	6.73	
TW-03	08/08/2014	14.87	8.39	-	-	-	-	6.48	
TW-03	08/11/2014	14.87	8.12	-	-	-	-	6.75	
TW-03	08/15/2014	14.87	8.10	-	-	-	13.40	6.77	
TW-03	08/18/2014	14.87	8.25	-	-	-	-	6.62	
TW-03	08/25/2014	10.40	7.85	-	-	-	-	2.55	
TW-03	09/02/2014	10.40	8.52	-	-	-	-	1.88	
TW-03	09/15/2014	10.40	8.33	-	-	-	-	2.07	
TW-03	09/22/2014	10.40	8.26	-	-	-	-	2.14	
TW-03	10/01/2014	10.40	8.35	-	-	-	13.15	2.05	
TW-03	10/13/2014	10.40	8.18	-	-	-	-	2.22	
TW-03	10/20/2014	10.40	8.50	-	-	-	13.14	1.90	
TW-04	12/18/2013	13.26	6.25	-	-	-	-	7.01	
TW-04	01/08/2014	13.26	6.71	-	-	-	-	6.55	
TW-04	03/07/2014	13.26	6.06	-	-	-	-	7.20	
TW-04	03/13/2014	13.26	6.26	-	-	-	-	7.00	
TW-04	03/20/2014	13.26	6.17	-	-	-	-	7.09	
TW-04	03/27/2014	13.26	6.55	-	-	-	-	6.71	
TW-04	04/03/2014	13.26	4.64	-	-	-	-	8.62	
TW-04	04/08/2014	13.26	5.38	-	-	-	-	7.88	
TW-04	04/17/2014	13.26	5.60	-	-	-	-	7.66	
TW-04	04/22/2014	13.26	5.56	-	-	-	-	7.70	
TW-04	04/29/2014	13.26	5.91	-	-	-	-	7.35	
TW-04	05/05/2014	13.26	5.06	-	-	-	-	8.20	
TW-04	05/12/2014	13.26	5.82	-	-	-	-	7.44	
TW-04	05/19/2014	13.26	4.61	-	-	-	-	8.65	
TW-04	05/27/2014	13.26	5.66	-	-	-	-	7.60	
TW-04	06/02/2014	13.26	5.83	-	-	-	-	7.43	
TW-04	06/09/2014	13.26	5.87	-	-	-	-	7.39	
TW-04	06/16/2014	13.26	5.21	-	-	-	-	8.05	

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1400 North Royal St
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Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-04	06/23/2014	13.26	5.68	-	-	-	-	7.58	
TW-04	07/02/2014	13.26	5.96	-	-	-	-	7.30	
TW-04	07/07/2014	13.26	6.18	-	-	-	13.77	7.08	
TW-04	07/14/2014	13.26	5.80	-	-	-	-	7.46	
TW-04	07/25/2014	13.26	6.20	-	-	-	13.70	7.06	
TW-04	07/31/2014	13.26	6.08	-	-	-	13.76	7.18	
TW-04	08/08/2014	13.26	6.21	-	-	-	-	7.05	
TW-04	08/11/2014	13.26	6.19	-	-	-	-	7.07	
TW-04	08/15/2014	13.26	5.99	-	-	-	13.75	7.27	
TW-04	08/18/2014	13.26	5.92	-	-	-	-	7.34	
TW-04	08/25/2014	9.49	5.87	-	-	-	-	3.62	
TW-04	09/02/2014	9.49	6.25	-	-	-	-	3.24	
TW-04	09/15/2014	9.49	6.17	-	-	-	-	3.32	
TW-04	09/22/2014	9.49	6.20	-	-	-	-	3.29	
TW-04	10/01/2014	9.49	6.23	-	-	-	13.55	3.26	
TW-04	10/10/2014	9.49	6.18	-	-	-	-	3.31	
TW-04	10/13/2014	9.49	6.19	-	-	-	-	3.30	
TW-04	10/20/2014	9.49	6.28	-	-	-	13.40	3.21	
TW-04	10/27/2014	9.49	6.04	-	-	-	-	3.45	
TW-05	12/18/2013	13.73	6.45	-	-	-	-	7.28	
TW-05	01/08/2014	13.73	6.98	-	-	-	-	6.75	
TW-05	03/07/2014	13.73	6.34	-	-	-	-	7.39	
TW-05	03/13/2014	13.73	6.49	-	-	-	-	7.24	
TW-05	03/20/2014	13.73	6.04	-	-	-	-	7.69	
TW-05	03/27/2014	13.73	6.68	-	-	-	-	7.05	
TW-05	04/03/2014	13.73	4.29	-	-	-	-	9.44	
TW-05	04/08/2014	13.73	5.36	-	-	-	-	8.37	
TW-05	04/17/2014	13.73	5.33	-	-	-	-	8.40	
TW-05	04/22/2014	13.73	5.65	-	-	-	-	8.08	
TW-05	04/29/2014	13.73	6.06	-	-	-	-	7.67	
TW-05	05/05/2014	13.73	4.91	-	-	-	-	8.82	
TW-05	05/12/2014	13.73	6.01	-	-	-	-	7.72	
TW-05	05/19/2014	13.73	4.65	-	-	-	-	9.08	
TW-05	05/27/2014	13.73	5.91	-	-	-	-	7.82	
TW-05	06/02/2014	13.73	6.07	-	-	-	-	7.66	
TW-05	06/09/2014	13.73	6.11	-	-	-	-	7.62	
TW-05	06/16/2014	13.73	5.28	-	-	-	-	8.45	
TW-05	06/23/2014	13.73	5.95	-	-	-	-	7.78	
TW-05	07/02/2014	13.73	6.28	-	-	-	-	7.45	
TW-05	07/07/2014	13.73	6.49	-	-	-	12.06	7.24	
TW-05	07/14/2014	13.73	6.06	-	-	-	-	7.67	
TW-05	07/25/2014	13.73	5.43	-	-	-	12.08	8.30	
TW-05	07/31/2014	13.73	6.50	-	-	-	12.10	7.23	
TW-05	08/08/2014	13.73	6.56	-	-	-	-	7.17	
TW-05	08/11/2014	13.73	6.51	-	-	-	-	7.22	
TW-05	08/15/2014	13.73	5.91	-	-	-	11.95	7.82	
TW-05	08/18/2014	13.73	6.14	-	-	-	-	7.59	
TW-05	08/25/2014	9.64	6.13	-	-	-	-	3.51	
TW-05	09/02/2014	9.64	6.59	-	-	-	-	3.05	
TW-05	09/15/2014	9.64	6.57	-	-	-	-	3.07	
TW-05	09/22/2014	9.64	6.58	-	-	-	-	3.06	
TW-05	10/01/2014	9.64	6.63	-	-	-	11.74	3.01	
TW-05	10/10/2014	9.64	6.52	-	-	-	-	3.12	
TW-05	10/13/2014	9.64	6.58	-	-	-	-	3.06	
TW-05	10/20/2014	9.64	6.60	-	-	-	12.63	3.04	
TW-05	10/27/2014	9.64	6.23	-	-	-	-	3.41	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
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Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-06	12/18/2013	13.97	6.21	-	-	-	-	7.76	
TW-06	01/08/2014	13.97	6.98	-	-	-	-	6.99	
TW-06	03/07/2014	13.97	6.40	-	-	-	-	7.57	
TW-06	03/13/2014	13.97	6.62	-	-	-	-	7.35	
TW-06	03/20/2014	13.97	6.26	-	-	-	-	7.71	
TW-06	03/27/2014	13.97	6.88	-	-	-	-	7.09	
TW-06	04/03/2014	13.97	4.81	-	-	-	-	9.16	
TW-06	04/08/2014	13.97	5.82	-	-	-	-	8.15	
TW-06	04/17/2014	13.97	5.41	-	-	-	-	8.56	
TW-06	04/22/2014	13.97	5.90	-	-	-	-	8.07	
TW-06	04/29/2014	13.97	6.30	-	-	-	-	7.67	
TW-06	05/05/2014	13.97	4.98	-	-	-	-	8.99	
TW-06	05/12/2014	13.97	6.18	-	-	-	-	7.79	
TW-06	05/19/2014	13.97	4.63	-	-	-	-	9.34	
TW-06	05/27/2014	13.97	6.79	-	-	-	-	7.18	
TW-06	06/02/2014	13.97	6.24	-	-	-	-	7.73	
TW-06	06/09/2014	13.97	6.31	-	-	-	-	7.66	
TW-06	06/16/2014	13.97	5.33	-	-	-	-	8.64	
TW-06	06/23/2014	13.97	6.12	-	-	-	-	7.85	
TW-06	07/02/2014	13.97	6.52	-	-	-	-	7.45	
TW-06	07/07/2014	13.97	6.70	-	-	-	12.60	7.27	
TW-06	07/14/2014	13.97	6.24	-	-	-	-	7.73	
TW-06	07/25/2014	13.97	6.65	-	-	-	12.60	7.32	
TW-06	08/08/2014	13.97	6.81	-	-	-	-	7.16	
TW-06	08/11/2014	13.97	6.71	-	-	-	-	7.26	
TW-06	08/15/2014	13.97	6.01	-	-	-	12.70	7.96	
TW-06	08/18/2014	13.97	6.33	-	-	-	-	7.64	
TW-06	08/25/2014	9.86	6.37	-	-	-	-	3.49	
TW-06	09/02/2014	9.86	6.80	-	-	-	-	3.06	
TW-06	09/15/2014	9.86	6.79	-	-	-	-	3.07	
TW-06	09/22/2014	9.86	6.77	-	-	-	-	3.09	
TW-06	10/01/2014	9.86	6.88	-	-	-	12.60	2.98	
TW-06	10/10/2014	9.86	6.77	-	-	-	-	3.09	
TW-06	10/13/2014	9.86	6.85	-	-	-	-	3.01	
TW-06	10/20/2014	9.86	6.76	-	-	-	12.63	3.10	
TW-06	10/27/2014	9.86	6.39	-	-	-	-	3.47	
TW-07	12/18/2013	14.00	7.56	-	-	-	-	6.44	
TW-07	01/08/2014	14.00	7.91	-	-	-	-	6.09	
TW-07	03/07/2014	14.00	6.91	-	-	-	-	7.09	
TW-07	03/13/2014	14.00	7.40	-	-	-	-	6.60	
TW-07	03/20/2014	14.00	6.78	-	-	-	-	7.22	
TW-07	03/27/2014	14.00	7.56	-	-	-	-	6.44	
TW-07	04/03/2014	14.00	5.67	-	-	-	-	8.33	
TW-07	04/08/2014	14.00	6.77	-	-	-	-	7.23	
TW-07	04/17/2014	14.00	5.51	-	-	-	-	8.49	
TW-07	04/22/2014	14.00	6.75	-	-	-	-	7.25	
TW-07	04/29/2014	14.00	6.60	-	-	-	-	7.40	
TW-07	05/05/2014	14.00	5.41	-	-	-	-	8.59	
TW-07	05/12/2014	14.00	6.89	-	-	-	-	7.11	
TW-07	05/19/2014	14.00	6.16	-	-	-	-	7.84	
TW-07	05/27/2014	14.00	6.70	-	-	-	-	7.30	
TW-07	06/02/2014	14.00	6.94	-	-	-	-	7.06	
TW-07	06/09/2014	14.00	7.81	-	-	-	-	6.19	
TW-07	06/16/2014	14.00	6.47	-	-	-	-	7.53	
TW-07	06/23/2014	14.00	6.69	-	-	-	-	7.31	
TW-07	07/02/2014	14.00	7.00	-	-	-	-	7.00	

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-07	07/07/2014	14.00	7.27	-	-	-	13.42	6.73	
TW-07	07/14/2014	14.00	6.70	-	-	-	-	7.30	
TW-07	07/25/2014	14.00	7.33	-	-	-	13.30	6.67	
TW-07	07/31/2014	14.00	7.22	-	-	-	13.30	6.78	
TW-07	08/08/2014	14.00	7.39	-	-	-	-	6.61	
TW-07	08/11/2014	14.00	7.17	-	-	-	13.20	6.83	
TW-07	08/15/2014	14.00	7.05	-	-	-	-	6.95	
TW-07	08/18/2014	14.00	7.14	-	-	-	-	6.86	
TW-07	08/25/2014	9.88	6.87	-	-	-	-	3.01	
TW-07	09/02/2014	9.88	7.43	-	-	-	-	2.45	
TW-07	09/15/2014	9.88	7.33	-	-	-	-	2.55	
TW-07	09/22/2014	9.88	7.28	-	-	-	-	2.60	
TW-07	10/01/2014	9.88	7.38	-	-	-	12.98	2.50	
TW-07	10/13/2014	9.88	7.30	-	-	-	-	2.58	
TW-07	10/20/2014	9.88	7.49	-	-	-	12.97	2.39	
TW-12S	12/18/2013	38.01	DRY	-	-	-	-	-	
TW-12S	01/08/2014	38.01	DRY	-	-	-	-	-	
TW-12S	03/07/2014	38.01	DRY	-	-	-	-	-	
TW-12S	03/13/2014	38.01	DRY	-	-	-	-	-	
TW-12S	03/20/2014	38.01	DRY	-	-	-	-	-	
TW-12S	03/27/2014	38.01	DRY	-	-	-	-	-	
TW-12S	04/03/2014	38.01	DRY	-	-	-	-	-	
TW-12S	04/08/2014	38.01	DRY	-	-	-	-	-	
TW-12S	04/17/2014	38.01	DRY	-	-	-	-	-	
TW-12S	04/22/2014	38.01	DRY	-	-	-	-	-	
TW-12S	04/29/2014	38.01	DRY	-	-	-	-	-	
TW-12S	05/05/2014	38.01	DRY	-	-	-	-	-	
TW-12S	05/12/2014	38.01	DRY	-	-	-	-	-	
TW-12S	05/19/2014	38.01	DRY	-	-	-	-	-	
TW-12S	06/02/2014	38.01	DRY	-	-	-	-	-	
TW-12S	06/09/2014	38.01	DRY	-	-	-	-	-	
TW-12S	06/16/2014	38.01	26.37	-	-	-	-	11.64	
TW-12S	06/23/2014	38.01	26.37	-	-	-	-	11.64	
TW-12S	07/02/2014	38.01	26.40	-	-	-	-	11.61	
TW-12S	07/07/2014	38.01	26.40	-	-	-	26.60	11.61	
TW-12S	07/14/2014	38.01	26.48	-	-	-	-	11.53	
TW-12S	07/24/2014	38.01	26.48	-	-	-	-	11.53	
TW-12S	07/31/2014	38.01	26.48	-	-	-	26.56	11.53	
TW-12S	08/08/2014	38.01	26.49	-	-	-	26.60	11.52	
TW-12S	08/11/2014	38.01	26.47	-	-	-	-	11.54	
TW-12S	08/15/2014	38.01	26.47	-	-	-	26.58	11.54	
TW-12S	08/18/2014	38.01	26.47	-	-	-	-	11.54	
TW-12S	08/25/2014	NR	26.47	-	-	-	-	-	
TW-12S	09/02/2014	NR	24.84	-	-	-	24.97	-	
TW-12S	09/15/2014	NR	24.82	-	-	-	-	-	
TW-12S	09/22/2014	NR	24.83	-	-	-	-	-	
TW-12S	10/01/2014	NR	24.81	-	-	-	24.91	-	
TW-12S	10/10/2014	NR	24.82	-	-	-	-	-	
TW-12S	10/20/2014	NR	24.82	-	-	-	24.92	-	
TW-14	01/17/2014	15.55	2.48	-	-	-	-	13.07	
TW-14	03/07/2014	15.55	2.29	-	-	-	-	13.26	
TW-14	03/13/2014	15.55	2.55	-	-	-	-	13.00	
TW-14	03/20/2014	15.55	2.25	-	-	-	-	13.30	
TW-14	03/27/2014	15.55	2.42	-	-	-	-	13.13	
TW-14	04/03/2014	15.55	2.31	-	-	-	-	13.24	
TW-14	04/08/2014	15.55	2.27	-	-	-	-	13.28	

Table 1

GROUNDWATER GAUGING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Date	Top of Casing (ft)	Depth to Water (ft)	Depth to LNAPL (ft)	LNAPL Thickness (ft)	Volume of LNAPL Recovered (gal)	Depth to Bottom - Measured Depth (ft)	Adj. GW Elevation (ft)	Comments
TW-14	04/17/2014	15.55	2.26	-	-	-	-	13.29	
TW-14	04/22/2014	15.55	2.48	-	-	-	-	13.07	
TW-14	04/29/2014	15.55	2.66	-	-	-	-	12.89	
TW-14	05/05/2014	15.55	2.56	-	-	-	-	12.99	
TW-14	05/12/2014	15.55	2.58	-	-	-	-	12.97	
TW-14	05/19/2014	15.55	2.38	-	-	-	-	13.17	
TW-14	06/02/2014	15.55	2.52	-	-	-	-	13.03	
TW-14	06/09/2014	15.55	2.50	-	-	-	-	13.05	
TW-14	06/16/2014	15.55	2.31	-	-	-	-	13.24	
TW-14	06/23/2014	15.55	2.44	-	-	-	-	13.11	
TW-14	07/02/2014	15.55	4.63	-	-	-	-	10.92	
TW-14	07/07/2014	15.55	4.65	-	-	-	7.27	10.90	
TW-14	07/14/2014	15.55	4.40	-	-	-	-	11.15	
TW-14	07/24/2014	15.55	4.46	-	-	-	-	11.09	
TW-14	07/31/2014	15.55	4.63	-	-	-	7.39	10.92	
TW-14	08/08/2014	15.55	4.43	-	-	-	7.39	11.12	
TW-14	08/11/2014	15.55	4.57	-	-	-	-	10.98	
TW-14	08/15/2014	15.55	4.36	-	-	-	7.39	11.19	
TW-14	08/18/2014	15.55	4.49	-	-	-	-	11.06	
TW-14	08/25/2014	11.61	3.01	-	-	-	-	8.60	
TW-14	09/02/2014	11.61	3.03	-	-	-	-	8.58	
TW-14	09/15/2014	11.61	3.19	-	-	-	-	8.42	
TW-14	09/22/2014	11.61	3.38	-	-	-	-	8.23	
TW-14	10/01/2014	11.61	3.50	-	-	-	5.90	8.11	
TW-14	10/10/2014	11.61	3.67	-	-	-	-	7.94	
TW-14	10/20/2014	11.61	3.02	-	-	-	5.90	8.59	

Note: Specific gravity was tested from MW-05 and MW-25, and the average specific gravity was used.

- = Not available
ft = Feet
DRY = No / Insufficent water
NR = Not recorded
LNAPL = Non-Aqueous Petroleum Liquid
TRACE = LNAPL thickness is less than 0.01 feet

Table 2

WELL CONSTRUCTION DETAILS SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Aquifer Zone Designation	Date Installed	Former URS Well	Former URS Boring Location	Well Diameter (in)	Total Depth of Well from Ground Surface (ft)	Length of Casing (ft)	Length of Screen (ft)
MW-01S	Shallow	7/29/2014	-	B-01	4	27	17	10
MW-05	Deep	8/1/2014	TW-01	B-05	4	35	25	10
MW-08S	Shallow	7/23/2014	TW-09S	B-08	4	25	15	10
MW-10S	Shallow	7/28/2014	-	B-10	4	27	17	10
MW-11	Deep	7/24/2014	-	B-11	4	35	25	10
MW-14	Deep	7/29/2014	TW-13	B-14	4	38.5	28.5	10
MW-15S	Shallow	7/31/2014	-	B-15	4	26	16	10
MW-16S	Shallow	8/13/2014	-	-	2	25	15	10
MW-16	Deep	8/14/2014	-	B-16	2	36	26	10
MW-25S	Shallow	8/5/2014	-	-	4	26	16	10
MW-25	Deep	7/24/2014	-	B-25	4	35	25	10
MW-27	Deep	7/21/2014	TW-10	B-27	4	35	25	10
MW-30S	Shallow	8/7/2014	-	B-30	4	26	16	10
MW-31	Deep	8/5/2014	TW-11	B-31	4	36	26	10
MW-33	Deep	8/5/2014	-	B-33	4	35	25	10
MW-51S	Shallow	8/6/2014	-	-	4	25.5	15.5	10
MW-51	Deep	7/22/2014	-	B-51	4	37	27	10
MW-52	Deep	8/14/2014	-	B-52	2	36	26	10
MW-70	Deep	8/13/2014	-	B-70	2	36	26	10
MW-72S	Shallow	8/7/2014	TW-08S	B-72	4	25	15	10
MW-72	Deep	7/30/2014	-	B-71	4	35	25	10
MW-100S	Shallow	8/12/2014	-	-	2	24.5	14.5	10
MW-100	Deep	8/12/2014	-	-	2	37.5	27.5	10
MW-102	Deep	8/11/2014	-	-	2	37	27	10
MW-103	Shallow	7/23/2014	-	-	2	15	5	10
MW-104	Shallow	7/24/2014	-	-	2	12	2	10
MW-105	Shallow	7/24/2014	-	-	2	10	1	9
MW-106	Deep	7/22/2014	-	-	2	10	3	7

Table 2

WELL CONSTRUCTION DETAILS SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well	Aquifer Zone Designation	Date Installed	Former URS Well	Former URS Boring Location	Well Diameter (in)	Total Depth of Well from Ground Surface (ft)	Length of Casing (ft)	Length of Screen (ft)
MW-107	Deep	7/22/2014	-	-	2	11	3	8
MW-108	Deep	7/23/2014	-	-	2	10	4	6
MW-109S	Shallow	8/20/2014	-	-	4	13.5	3.5	10
MW-109	Deep	8/19/2014	-	SB-2	4	24	14	10
MW-110S	Shallow	8/20/2014	-	-	4	13	3	10
MW-110	Deep	8/20/2014	-	SB-1	4	24	14	10
MW-111	Deep	8/18/2014	-	-	2	22	12	10
MW-112S	Shallow	8/12/2014	-	-	4	13	3	10
MW-112	Deep	8/12/2014	-	-	4	24	14	10
MW-113	Deep	8/19/2014	-	-	2	23	13	10
MW-114	Deep	8/21/2014	-	-	2	23	13	10
TW-02	Deep	12/12/2013	TW-02	B-56	1	24	14	10
TW-03	Deep	12/12/2013	TW-03	B-58	1	15	5	10
TW-04	Deep	12/13/2013	TW-04	B-67	1	15	5	10
TW-05	Deep	12/13/2013	TW-05	B-65	1	10	0	10
TW-06	Deep	12/13/2013	TW-06	B-63	1	15	5	10
TW-07	Deep	12/13/2013	TW-07	B-60	1	15	5	10
TW-12S	Shallow	12/18/2013	TW-12S	B-34	1	25	15	10
TW-14	Shallow	1/15/2014	TW-14	B-73	1	5.5	0.5	5
RW-1	Deep	10/2/2014	-	-	4	41	15	26
SP-1	Deep	10/2/2014	-	-	2	35	3	32
SP-2	Deep	9/30/2014	-	-	2	36	3	33

- = Not available
ft = Feet
in = Inches

Table 3

SOIL ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well / Boring	Sample Depth (ft)	Date	TPH-DRO (mg/kg)
MW-01S (B-01)	16.0 - 16.5	07/28/2014	266.5
	23.0 - 23.5	07/28/2014	4,079
MW-05 (B-05)	10.5 - 19	08/01/2014	<28.02
	23.5 - 24	08/01/2014	2,025
MW-08S (B-08S)	22.5 - 23.25	07/23/2014	6,730
MW-10S (B-10)	19.25 - 19.75	07/25/2014	114.4
	23.5 - 24.0	07/25/2014	3,748
MW-11 (B-11)	25.5 - 26.5	07/23/2014	<29.21
	30 - 31	07/23/2014	<29.81
MW-14 (B-14)	22 - 23	12/18/2013	1,510
	28 - 29	12/18/2013	2,490
	28.75 - 29.0	07/29/2014	2,696
	32 - 32.5	07/29/2014	<30.52
MW-15S (B-15)	24.3 - 24.6	07/31/2014	7,849
MW-16S (B-16)	23	08/13/2014	<30.18
MW-16 (B-16)	32	08/13/2014	<30.19
MW-25 (B-25)	29 - 30	07/24/2014	3,202
	31.5 - 32.5	07/24/2014	3,325
	24.5 - 25	08/04/2014	6,899
MW-27 (B-27)	23 - 24	12/17/2013	572
	29 - 30	12/17/2013	ND
	23.5 - 24	07/21/2014	3,286
	30 - 31.5	07/21/2014	<29.02
MW-30S (B-30)	19 - 20	08/07/2014	<27.97
MW-31 (B-31)	25 - 26	12/17/2013	ND
	35 - 36	12/17/2013	ND
MW-33 (B-33)	26.5 - 27.5	08/05/2014	<29.86
MW-34 (B-34)	26 - 27	12/18/2013	ND
MW-51S (B-51S)	22 - 22.75	08/06/2014	3,612
MW-51 (B-51)	23.0 - 23.5	07/22/2014	9,871
	29.5 - 29.9	07/22/2014	92,180
MW-52 (B-52)	32	08/13/2014	<30.97
MW-70 (B-70)	32	08/11/2014	<30.08
MW-72S (B-72)	22 - 23	12/17/2013	2,340
	31 - 32	12/17/2013	10.4
	23 - 23.5	08/06/2014	2,389
MW-72 (B-26R/B-72D)	26.5 - 26.75	07/30/2014	2,426
	32 - 33	07/30/2014	<29.76
MW-100 (B-100)	24	08/11/2014	<28.33
MW-102 (B-102)	28 - 29	08/07/2014	<30.5
MW-103 (B-103)	7 - 8	07/23/2014	53.29
	9 - 10	07/23/2014	<31.01
MW-104 (B-104)	4 - 5	07/24/2014	<29.14
	5 - 6	07/24/2014	782.9
MW-105 (B-105)	0 - 1	07/23/2014	<32.91
	7 - 8	07/24/2014	<30.96
MW-106 (B-106)	7 - 8	07/22/2014	<28.73
	9 - 10	07/22/2014	692.1

Table 3

SOIL ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Monitoring Well / Boring	Sample Depth (ft)	Date	TPH-DRO (mg/kg)
MW-107 (B-107)	8 - 9	07/22/2014	<29.39
	9 - 10	07/22/2014	92.35
MW-108 (B-108)	7 - 8	07/23/2014	<26.78
	9 - 10	07/23/2014	<27.47
MW-109S	12.5 - 13	08/19/2014	<27.31
MW-109	17 - 17.5	08/19/2014	430
	23 - 23.5	08/19/2014	<29.7
MW-110S	12.5 - 13	08/20/2014	13,160
MW-110	17 - 17.5	08/20/2014	1,419
	21 - 21.5	08/20/2014	308.7
MW-111 (B-111)	9 - 10	08/13/2014	<26.53
	16 - 16.5	08/18/2014	3,286
MW-112S (B-112)	12 - 12.5	08/11/2014	1,162
MW-112 (B-112)	16 - 16.5	08/11/2014	686.4
MW-113 (B-113)	14 - 15	08/18/2014	<27.9
MW-114	12 - 12.5	08/21/2014	<27.07
	16.5 - 17	08/21/2014	328.7
RW-1	28	09/30/2014	2,713
SB-1	5 - 7	07/19/2013	29.1
	9 - 11	07/19/2013	ND
	14 - 16	07/19/2013	41.4
	19 - 21	07/19/2013	9.56
	24 - 26	07/19/2013	ND
	28 - 30	07/19/2013	ND
SB-2	5 - 7	07/19/2013	ND
	9 - 11	07/19/2013	80.7
	14 - 16	07/19/2013	193
	19 - 21	07/19/2013	12.1
	23 - 25	07/19/2013	ND
UST B-1	21	03/07/2013	624
	33	03/07/2013	<5.80
UST B-3	31	03/07/2013	2,050
	32	03/07/2013	12.4
UST B-4	24	03/07/2013	5,950
	32	03/07/2013	2,500
UST B-5	24	03/08/2013	4,420
	31	03/08/2013	143
UST B-7	8	03/11/2013	<5.54
	12	03/11/2013	226

ft = Feet
mg/kg = Milligrams per kilogram
ND = Non-detect

Table 4

GROUNDWATER ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes, Total µg/L)	Methyl tert-butyl ether (µg/L)	tert-Butyl alcohol (µg/L)	1,2-Dibromoethane (µg/L)	1,2-Dichloroethane (µg/L)	Naphthalene	Total Petroleum Hydrocarbons, Gasoline Range Organics C6-C10 (µg/L)	Total Petroleum Hydrocarbons, Diesel Range Organics C10-C28 (µg/L)	Oil and Grease (µg/L)
MW-01S	8/15/2014	-	-	-	-	-	-	-	-	-	-	2,670	-
MW-01S	10/22/2014	-	-	-	-	-	-	-	-	-	-	23,000	-
MW-08S	8/15/2014	-	-	-	-	-	-	-	-	-	-	7,540	-
MW-08S	10/22/2014	-	-	-	-	-	-	-	-	-	-	52,000	-
MW-10S	8/15/2014	-	-	-	-	-	-	-	-	-	-	36,000	-
MW-10S	10/22/2014	-	-	-	-	-	-	-	-	-	-	100,000	-
MW-11	8/16/2014	-	-	-	-	-	-	-	-	-	-	423	-
MW-11	10/22/2014	-	-	-	-	-	-	-	-	-	-	840	-
MW-14	8/15/2014	-	-	-	-	-	-	-	-	-	-	305	-
MW-14	10/22/2014	-	-	-	-	-	-	-	-	-	-	2,100	-
MW-15S	8/15/2014	-	-	-	-	-	-	-	-	-	-	909	-
MW-15S	10/22/2014	-	-	-	-	-	-	-	-	-	-	2,800	-
MW-16S	8/16/2014	-	-	-	-	-	-	-	-	-	-	1,720	-
MW-16	8/15/2014	-	-	-	-	-	-	-	-	-	-	<300	-
MW-16	10/22/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.02	<20	<45	1,700
MW-25S	8/15/2014	-	-	-	-	-	-	-	-	-	-	49,000	-
MW-25	8/13/2014	-	-	-	-	-	-	-	-	-	-	1,280	-
MW-27	8/16/2014	-	-	-	-	-	-	-	-	-	-	1,490	-
MW-27	10/16/2014	<2.00	<2.00	<2.00	<4.00	-	-	-	-	-	<100	3,100	23,100
MW-27	10/23/2014	0.5	<0.5	2	2	<0.5	2	<0.5	<0.5	6	100	1,900	<1,400
MW-30S	8/15/2014	-	-	-	-	-	-	-	-	-	-	7,040	-
MW-30S	10/23/2014	<0.5	<0.5	<0.5	<0.5	<0.5	3	<0.5	<0.5	-	25	2,900	-
MW-31	8/16/2014	-	-	-	-	-	-	-	-	-	-	27,200	-
MW-31	10/23/2014	<0.5	<0.5	0.6	0.6	<0.5	<2	<0.5	<0.5	4	140	7,200	<1,400
MW-33	8/15/2014	-	-	-	-	-	-	-	-	-	-	440	-
MW-33	10/23/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.02	<20	<45	<1,400
MW-51S	8/15/2014	-	-	-	-	-	-	-	-	-	-	1,590	-
MW-51S	10/22/2014	-	-	-	-	-	-	-	-	-	-	8,400	-
MW-51	8/11/2014	-	-	-	-	-	-	-	-	-	-	1,180	-
MW-51	8/13/2014	-	-	-	-	-	-	-	-	-	-	1,650	-
MW-51	8/16/2014	-	-	-	-	-	-	-	-	-	-	281,000	-
MW-51	10/14/2014	<5.00	<5.00	5.15	10.8	-	-	-	-	-	168	88,600 2a2b	<6,250
MW-52	8/15/2014	-	-	-	-	-	-	-	-	-	-	<600	-
MW-52	10/22/2014	-	-	-	-	-	-	-	-	-	-	120	-
MW-70	8/15/2014	-	-	-	-	-	-	-	-	-	-	<153	-
MW-70	10/21/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-72S	8/15/2014	-	-	-	-	-	-	-	-	-	-	5,980	-
MW-72S	10/22/2014	-	-	-	-	-	-	-	-	-	-	3,300	-
MW-72	8/11/2014	-	-	-	-	-	-	-	-	-	-	<300	-
MW-72	8/13/2014	-	-	-	-	-	-	-	-	-	-	1,100	-
MW-72	8/16/2014	-	-	-	-	-	-	-	-	-	-	1,340	-
MW-72	10/22/2014	41	<0.5	1	66	0.6	2	<0.5	<0.5	61	480	2,000	1,800
MW-100S	8/15/2014	-	-	-	-	-	-	-	-	-	-	<300	-
MW-100S	10/21/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-100	8/15/2014	-	-	-	-	-	-	-	-	-	-	<152	-
MW-100	10/21/2014	-	-	-	-	-	-	-	-	-	-	60	-
MW-102	8/15/2014	-	-	-	-	-	-	-	-	-	-	<1500	-
MW-102	10/21/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-103	8/15/2014	-	-	-	-	-	-	-	-	-	-	479	-
MW-103	10/21/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.02	26	54	-
MW-104	8/15/2014	-	-	-	-	-	-	-	-	-	-	1,630	-

Table 4

GROUNDWATER ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes, Total µg/L)	Methyl tert-butyl ether (µg/L)	tert-Butyl alcohol (µg/L)	1,2-Dibromoethane (µg/L)	1,2-Dichloroethane (µg/L)	Naphthalene	Total Petroleum Hydrocarbons, Gasoline Range Organics C6-C10 (µg/L)	Total Petroleum Hydrocarbons, Diesel Range Organics C10-C28 (µg/L)	Oil and Grease (µg/L)
MW-104	10/21/2014	<0.5	<0.5	0.7	2	<0.5	<2	<0.5	<0.5	1	59	150	<1,400
MW-105	8/15/2014	-	-	-	-	-	-	-	-	-	-	<1,500	-
MW-105	10/21/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	0.06	<20	<45	<1,400
MW-106	8/15/2014	-	-	-	-	-	-	-	-	-	-	89,200	-
MW-106	10/22/2014	<0.5	<0.5	1	<0.5	<0.5	<2	<0.5	<0.5	23	230	2,000	-
MW-107	8/16/2014	-	-	-	-	-	-	-	-	-	-	8,540	-
MW-107	10/22/2014	<0.5	<0.5	2	2	<0.5	<2	<0.5	<0.5	0.9	49	840	-
MW-109S	8/21/2014	-	-	-	-	-	-	-	-	-	-	7,500	-
MW-109S	10/20/2014	-	-	-	-	-	-	-	-	-	-	12,000	-
MW-109	8/21/2014	-	-	-	-	-	-	-	-	-	-	<600	-
MW-109	10/20/2014	-	-	-	-	-	-	-	-	-	-	200	-
MW-110S	8/25/2014	-	-	-	-	-	-	-	-	-	-	6,630	-
MW-110S	10/20/2014	-	-	-	-	-	-	-	-	-	-	8,500	-
MW-110	8/25/2014	-	-	-	-	-	-	-	-	-	-	<153	-
MW-110	10/20/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-111	8/21/2014	-	-	-	-	-	-	-	-	-	-	<600	-
MW-111	10/20/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-112S	8/15/2014	-	-	-	-	-	-	-	-	-	-	<1,500	-
MW-112S	10/20/2014	-	-	-	-	-	-	-	-	-	-	380	-
MW-112	8/15/2014	-	-	-	-	-	-	-	-	-	-	<1,500	-
MW-112	10/20/2014	-	-	-	-	-	-	-	-	-	-	<45	-
MW-113	8/21/2014	-	-	-	-	-	-	-	-	-	-	<600	-
MW-113	10/20/2014	-	-	-	-	-	-	-	-	-	-	61	-
MW-114	8/25/2014	-	-	-	-	-	-	-	-	-	-	<600	-
MW-114	10/20/2014	-	-	-	-	-	-	-	-	-	-	<45	-
RW-1	10/22/2014	-	-	-	-	-	-	-	-	-	-	30,000	-
TW-01	12/16/2013	14.3	ND	13.1	63.5	1.55	-	-	-	119	-	14,100	-
TW-01	7/7/2014	-	-	-	-	-	-	-	-	-	-	27,400	-
TW-02	12/16/2013	ND	ND	ND	ND	0.791	-	-	-	ND	-	584	-
TW-02	7/7/2014	-	-	-	-	-	-	-	-	-	-	<1,160	-
TW-02	8/15/2014	-	-	-	-	-	-	-	-	-	-	<600	-
TW-02	10/23/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	-	<20	60	-
TW-03	12/16/2013	ND	ND	ND	ND	ND	-	-	-	ND	-	351	-
TW-03	7/7/2014	-	-	-	-	-	-	-	-	-	-	<1,160	-
TW-03	8/15/2014	-	-	-	-	-	-	-	-	-	-	<1,500	-
TW-03	10/23/2014	0.7	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	-	<20	49	-
TW-04	12/16/2013	2.2	ND	3.45	7.11	ND	-	-	-	27.7	-	2,000	-
TW-04	7/7/2014	-	-	-	-	-	-	-	-	-	-	1,270	-
TW-04	8/15/2014	-	-	-	-	-	-	-	-	-	-	1,610	-
TW-04	10/23/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	0.3	<20	160	-
TW-05	12/16/2013	7.68	ND	62.8	40.3	ND	-	-	-	240	-	136,000	-
TW-05	7/7/2014	-	-	-	-	-	-	-	-	-	-	66,300	-
TW-05	8/15/2014	-	-	-	-	-	-	-	-	-	-	271,000	-
TW-05	10/23/2014	4	<0.5	14	<0.5	<0.5	<2	<0.5	<0.5	21	140	29,000	-
TW-06	12/16/2013	1.09	ND	20.3	7.86	ND	-	-	-	174	-	47,000	-
TW-06	7/7/2014	-	-	-	-	-	-	-	-	-	-	113,000	-
TW-06	8/15/2014	-	-	-	-	-	-	-	-	-	-	147,000	-
TW-06	10/23/2014	0.8	<0.5	11	1	<0.5	<2	<0.5	<0.5	5	230	16,000	-
TW-07	12/16/2013	2.38	ND	0.969	ND	ND	-	-	-	34	-	3,290	-
TW-07	7/7/2014	-	-	-	-	-	-	-	-	-	-	41,500	-
TW-07	8/15/2014	-	-	-	-	-	-	-	-	-	-	19,600	-

Table 4

GROUNDWATER ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes, Total µg/L)	Methyl tert-butyl ether (µg/L)	tert-Butyl alcohol (µg/L)	1,2-Dibromoethane (µg/L)	1,2-Dichloroethane (µg/L)	Naphthalene	Total Petroleum Hydrocarbons, Gasoline Range Organics C6-C10 (µg/L)	Total Petroleum Hydrocarbons, Diesel Range Organics C10-C28 (µg/L)	Oil and Grease (µg/L)
TW-07	10/23/2014	2	<0.5	0.6	<0.5	<0.5	<2	<0.5	<0.5	6	29	4,700	-
TW-08S	7/7/2014	-	-	-	-	-	-	-	-	-	-	29,500	-
TW-09S	7/7/2014	-	-	-	-	-	-	-	-	-	-	2,330,000	-
TW-10	12/18/2013	2.51	ND	19.7	4.99	ND	-	-	-	131	-	3,040	-
TW-10	7/7/2014	-	-	-	-	-	-	-	-	-	-	23,400	-
TW-11	12/18/2013	1.55	0.664	8.3	9.67	0.578	-	-	-	263	-	170,000	-
TW-11	7/7/2014	-	-	-	-	-	-	-	-	-	-	117,000	-
TW-13	12/18/2013	6.06	ND	44.5	137	ND	-	-	-	239	-	3,580	-
TW-13	7/7/2014	-	-	-	-	-	-	-	-	-	-	17,500	-
TW-14	1/17/2014	ND	ND	ND	ND	0.536	-	-	-	ND	-	2,290	-
TW-14	7/7/2014	-	-	-	-	-	-	-	-	-	-	16,000	-
TW-14	8/15/2014	-	-	-	-	-	-	-	-	-	-	3,900	-
TW-14	10/21/2014	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	-	100	670	-
UST B-1	3/7/2013	1.69	8.66	1.45	4.12	<1.00	-	-	-	-	<100	-	-
UST B-3	3/7/2013	2.11	2.77	10.80	42.60	<1.00	-	-	-	-	634	3,830	-
UST B-4	3/7/2013	3.95	1.35	3.54	4.81	<1.00	-	-	-	-	1,280	112,000	-
UST B-5	3/8/2013	4.16	<1.00	7.31	30.10	<1.00	-	-	-	-	770	43,600	-

Note: MW-16 was not analyzed for VOCs or oil and grease, MW-106 and MW-107 were not analyzed for oil and grease, and MW-108 and TW-12S were not analzed for TPH-DRO, VOCs, or oil and grease due to an insufficient volume of water.

- = Not available
µg/L = Micrograms per Liter
ND = Non-detect

Table 5

GROUNDWATER SVOCS AND PAHS ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Analyte	Units	MW-16	MW-27	MW-31	MW-33	MW-72	MW-103	MW-104	MW-105	MW-106	MW-107	TW-04	TW-05	TW-06	TW-07
Date		10/22/14	10/23/14	10/23/14	10/23/14	10/22/14	10/21/14	10/21/14	10/21/14	10/22/14	10/22/14	10/23/14	10/23/14	10/23/14	10/23/14
1,1'-Biphenyl	µg/L	<0.02	3	4	<0.02	3	0.4	0.1	0.02	14	0.4	0.4	12	10	2
1-Methylnaphthalene	µg/L	<0.02	12	24	<0.02	34	0.2	1	0.05	30	0.4	0.9	33	59	6
2-Methylnaphthalene	µg/L	<0.02	5	6	<0.02	35	0.3	1	0.05	31	0.7	0.2	15	<0.2	7
Acenaphthene	µg/L	<0.02	0.7	4	<0.02	0.3	<0.02	0.1	0.03	3	0.07	1	3	4	0.4
Acenaphthylene	µg/L	<0.02	0.2	0.5	<0.02	<0.2	0.03	0.02	<0.02	<0.2	0.03	0.03	0.9	1	<0.02
Anthracene	µg/L	<0.02	0.2	0.7	<0.02	<0.2	0.06	0.02	0.04	3	0.07	0.4	2	1	0.04
Benzo(b)fluoranthene	µg/L	<0.02	0.3	0.5	<0.02	<0.2	0.4	0.08	0.3	1	0.06	0.2	0.4	0.6	0.06
Benzo[a]anthracene	µg/L	<0.02	0.3	0.8	<0.02	<0.2	0.2	0.04	0.1	2	0.03	0.1	0.5	0.6	0.04
Benzo[a]pyrene	µg/L	<0.02	0.2	0.4	<0.02	<0.2	0.2	0.03	0.2	0.7	<0.02	0.08	0.2	0.4	0.04
Benzo[e]pyrene	µg/L	<0.02	0.2	0.3	<0.02	<0.2	0.2	0.03	0.1	0.7	0.03	0.1	0.3	0.4	0.06
Benzo[g,h,i]perylene	µg/L	<0.02	0.08	<0.2	<0.02	<0.2	0.2	0.03	0.1	0.6	<0.02	0.05	0.2	0.3	0.03
Benzo[k]fluoranthene	µg/L	<0.02	0.2	0.3	<0.02	<0.2	0.2	0.08	0.1	0.6	0.05	0.1	0.2	0.3	0.04
C1-Benzanthrene/chrysenes	µg/L	<0.02	0.2	0.6	<0.02	<0.2	0.1	0.03	0.07	2	0.06	0.07	0.9	1	0.1
C1-DIBENZOTHIOPHENE	µg/L	<0.02	2	4	<0.02	0.7	0.09	0.1	<0.02	16	<0.02	<0.02	9	10	0.3
C1-Fluoranthrenes/pyrenes	µg/L	<0.02	1	4	<0.02	0.3	0.2	0.06	0.1	16	0.6	0.3	7	11	0.7
C1-FLUORENE	µg/L	<0.02	4	14	<0.02	3	<0.02	0.2	<0.02	34	<0.02	0.4	22	25	0.8
C1-NAPHTHALENE	µg/L	<0.02	11	21	<0.02	42	0.4	2	0.06	43	0.6	0.7	29	38	8
C1-Naphthobenzothiophenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	0.08	<0.02	0.02	<0.2	<0.02	<0.02	<0.2	<0.2	<0.02
C1-Phenanthrenes/anthracenes	µg/L	<0.02	6	22	<0.02	3	0.4	0.2	0.09	75	0.5	0.5	53	59	0.9
C2-Benzanthrene/chrysenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	0.09	<0.02	0.03	1	<0.02	<0.02	0.6	<0.2	0.07
C2-DIBENZOTHIOPHENE	µg/L	<0.02	3	8	<0.02	<0.2	<0.02	<0.02	<0.02	36	<0.02	<0.02	22	23	<0.02
C2-Fluoranthrenes/pyrenes	µg/L	<0.02	1	2	<0.02	<0.2	<0.02	0.07	<0.02	11	0.4	0.1	6	9	0.6
C2-FLUORENE	µg/L	<0.02	4	15	<0.02	3	<0.02	0.08	<0.02	51	1	<0.02	34	32	0.7
C2-NAPHTHALENE	µg/L	<0.02	25	42	<0.02	19	0.4	2	0.06	120	1	0.9	99	92	8
C2-Naphthobenzothiophenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	0.06	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	<0.2	<0.02
C2-Phenanthrenes/anthracenes	µg/L	<0.02	8	24	<0.02	2	0.4	0.2	0.09	110	3	0.2	66	69	1
C3-Benzanthrene/chrysenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	0.4	0.05
C3-DIBENZOTHIOPHENE	µg/L	<0.02	2	5	<0.02	<0.2	<0.02	<0.02	<0.02	27	<0.02	<0.02	15	24	<0.02
C3-Fluoranthrenes/pyrenes	µg/L	<0.02	0.3	1	<0.02	<0.2	0.1	0.03	0.03	5	0.1	<0.02	3	4	0.4
C3-FLUORENE	µg/L	<0.02	4	17	<0.02	<0.2	<0.02	<0.02	<0.02	65	3	<0.02	44	42	1
C3-NAPHTHALENE	µg/L	<0.02	26	64	<0.02	11	<0.02	1	<0.02	210	2	<0.02	150	160	5
C3-Naphthobenzothiophenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	0.1	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	<0.2	<0.02
C3-Phenanthrenes/anthracenes	µg/L	<0.02	5	13	<0.02	1	0.3	0.2	<0.02	67	2	<0.02	38	48	2
C4-Benzanthrene/chrysenes	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	<0.2	<0.2	<0.02
C4-Dibenzothiophene	µg/L	<0.02	<0.02	<0.2	<0.02	<0.2	<0.02	<0.02	<0.02	<0.2	<0.02	<0.02	11	<0.2	<0.02
C4-Fluoranthrenes/pyrenes	µg/L	<0.02	<0.02	0.4	<0.02	<0.2	<0.02	<0.02	<0.02	2	0.05	<0.02	1	2	0.1
C4-NAPHTHALENE	µg/L	<0.02	19	52	<0.02	7	0.3	0.5	<0.02	220	5	<0.02	140	140	6
C4-Phenanthrenes/anthracenes	µg/L	<0.02	2	6	<0.02	<0.2	<0.02	<0.02	<0.02	29	<0.02	<0.02	18	24	2
Chrysene	µg/L	<0.02	0.3	0.7	<0.02	<0.2	0.3	0.06	0.2	2	0.06	0.2	0.7	0.8	0.08
Dibenz[a,h]anthracene	µg/L	<0.02	0.02	<0.2	<0.02	<0.2	0.05	<0.02	0.04	<0.2	<0.02	<0.02	<0.2	<0.2	<0.02
Dibenzofuran	µg/L	<0.02	0.5	2	<0.02	0.5	0.06	0.1	0.03	<0.2	0.09	0.6	0.9	1	0.07
Dibenzothiophene	µg/L	<0.02	0.5	1	<0.02	0.3	0.06	0.1	<0.02	2	0.09	0.3	2	2	0.08
Fluoranthene	µg/L	<0.02	1	4	<0.02	<0.2	0.5	0.1	0.4	7	0.05	1	1	2	0.1
Fluorene	µg/L	<0.02	1	6	<0.02	2	0.1	0.2	0.02	6	0.2	1	5	8	0.4
Indeno[1,2,3-cd]pyrene	µg/L	<0.02	0.07	<0.2	<0.02	<0.2	0.2	0.03	0.1	0.5	<0.02	0.05	<0.2	0.2	0.03

Note: MW-16S, MW-30S, MW-108, TW-02, TW-03, TW-12S, and TW-14 were not analyzed for SVOCs and PAHs due to an insufficient volume of water.
µg/L = Micrograms per liter

Table 6

GROUNDWATER TPH FINGERPRINTING DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Analyte	**Units**	**MW-16**	**MW-27**	**MW-31**	**MW-33**	**MW-72**	**MW-104**	**MW-105**	**TW-05**	**TW-06**	**SEEP-B**	**SEEP-D**
Date		10/22/14	10/23/14	10/23/14	10/23/14	10/22/14	10/21/14	10/21/14	10/23/14	10/23/14	10/21/14	10/21/14
Fuel Oil #4 (C11-C24)	mg/L	<1.0	<2.0	<2.0	<0.20	<2.0	<0.20	<0.20	<10	<10	<0.20	<0.20
Creosote	mg/L	<1.0	<2.0	<2.0	<0.20	<2.0	<0.20	<0.20	<10	<10	<0.20	<0.20
PHC as Diesel	mg/L	<1.0	11	13	<0.20	3.4	0.34	<0.20	60	75	0.55	<0.20
Fuel Oil #6 (C11-C26)	mg/L	<5.0	<10	<10	<1.0	<10	<1.0	<1.0	<50	<50	<1.0	<1.0
TPH-gasoline range organics C4-C12	mg/L	<1.0	<2.0	<2.0	<0.20	<2.0	<0.20	<0.20	<10	<10	<0.20	<0.20
Jet Fuel JP-5	mg/L	<1.0	<2.0	<2.0	<0.20	<2.0	<0.20	<0.20	<10	<10	<0.20	<0.20
Mineral Spirits (C9-C12)	mg/L	<1.0	<2.0	<2.0	<0.20	<2.0	<0.20	<0.20	<10	<10	<0.20	<0.20
Motor Oils	mg/L	<5.0	<10	<10	<1.0	<10	<1.0	<1.0	<50	<50	<1.0	<1.0

Note: MW-16S, MW-30S, MW-103, MW-106, MW-107, MW-108, TW-02, TW-03, TW-04, TW-07, TW-12S, and TW-14 were not analyzed for TPH fingerprinting due to an insufficient volume of water.

mg/L = Milligrams per Liter

Table 7

GROUNDWATER FIELD PARAMETERS DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Percent Oxygen (Head Space) (%)	Percent Carbon Dioxide (%)	Photo Ionization Detector (ppm)	Methane (%)	Dissolved Oxygen (mg/L)	Well pH (pH)	Well Temperature (deg C)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
MW-01S	10/10/2014	6.3	-	10.2	-	0.53	6.68	17.69	-95	880	-
MW-01S	10/20/2014	6.3	10.1	1	10.3	-	-	-	-	-	-
MW-01S	10/22/2014	-	-	-	-	0.8	6.63	17.81	-91.6	369	-
MW-05	10/13/2014	13	-	15.9	-	-	-	-	-	-	-
MW-05	10/15/2014	9.6	-	137	-	-	-	-	-	-	-
MW-08S	10/13/2014	14.5	-	21	-	0.89	6.68	18.18	-123.6	1,488	-
MW-08S	10/13/2014	-	-	-	-	0.81	6.7	18.26	-108	1,386	-
MW-08S	10/14/2014	-	-	-	-	0.16	6.77	18.18	-129	1,424	-
MW-08S	10/15/2014	20.4	-	8.7	-	0.83	6.68	18.29	-105.8	1,325	-
MW-08S	10/15/2014	-	-	-	-	0.28	6.66	18.23	-113.1	1,408	-
MW-08S	10/20/2014	10.9	6.2	15.9	1.9	-	-	-	-	-	-
MW-08S	10/22/2014	-	-	-	-	1.24	6.59	18.27	-98.8	1,276	-
MW-10S	10/13/2014	17	-	23.1	-	0.75	6.59	18.17	-117.6	1,202	-
MW-10S	10/13/2014	-	-	-	-	0.6	6.6	18.2	-113	1,185	-
MW-10S	10/15/2014	20.4	-	8.3	-	0.41	6.54	18.23	-118.5	1,185	-
MW-10S	10/15/2014	-	-	-	-	0.6	6.56	18.3	-104.5	1,189	-
MW-10S	10/16/2014	20.9	-	18.5	-	-	-	-	-	-	-
MW-10S	10/20/2014	15.2	3.7	25.2	0.2	-	-	-	-	-	-
MW-10S	10/22/2014	-	-	-	-	1.3	6.48	18.44	-72.7	1,002	-
MW-11	10/13/2014	19	-	5.4	-	2.3	6.27	18.16	56.2	324	-
MW-11	10/13/2014	-	-	-	-	3.23	6.14	18.29	48.6	349	-
MW-11	10/15/2014	15.3	-	23.6	-	-	-	-	-	-	-
MW-11	10/20/2014	11.6	6.3	22	1.9	-	-	-	-	-	-
MW-11	10/22/2014	-	-	-	-	0.38	5.73	18.38	160.2	323	-
MW-14	10/13/2014	17.2	-	15.9	-	2.79	6	18.13	68	368	-
MW-14	10/20/2014	14.4	3.7	82.4	1.3	-	-	-	-	-	-
MW-14	10/22/2014	-	-	-	-	0.26	5.79	18.43	216.2	310	-
MW-15S	10/13/2014	12.4	-	34	-	0.84	6.32	18.03	-17.1	647	-
MW-15S	10/20/2014	2.2	11.6	18.2	0	-	-	-	-	-	-
MW-15S	10/22/2014	-	-	-	-	0.88	6.48	17.61	-37.4	989	-
MW-16S	10/10/2014	7.2	-	9	-	-	-	-	-	-	-
MW-16	10/10/2014	6.9	-	11.1	-	0.46	5.88	17.5	162.4	707	-
MW-16	10/22/2014	-	-	-	-	0.87	5.79	17.75	211	681	30,200
MW-25S	10/13/2014	-	-	-	-	0.96	6.46	18.51	-84	914	-
MW-25S	10/13/2014	20.3	-	13	-	-	-	-	-	-	-
MW-25S	10/15/2014	19.3	-	192	-	-	-	-	-	-	-
MW-25S	10/16/2014	20.9	-	34.4	-	-	-	-	-	-	-
MW-25S	10/20/2014	16.6	3.4	30.2	0.3	-	-	-	-	-	-
MW-25	10/13/2014	19.2	-	139	-	-	-	-	-	-	-
MW-25	10/14/2014	17.5	-	79	-	-	-	-	-	-	-
MW-25	10/15/2014	20.9	-	8.4	-	-	-	-	-	-	-
MW-25	10/16/2014	14.3	-	28.2	-	-	-	-	-	-	-
MW-27	10/10/2014	17.7	-	41.5	-	0.28	6.55	17.74	-79.8	1,075	-
MW-27	10/15/2014	20.9	-	7.3	-	0.02	6.51	17.97	-36.3	1,057	-
MW-27	10/15/2014	16.1	-	21.9	-	1.67	6.37	18.18	44.5	831	-
MW-27	10/16/2014	16.1	-	21.9	-	-	-	-	-	-	-
MW-27	10/20/2014	14.3	6.5	25.3	8.6	-	-	-	-	-	-
MW-27	10/23/2014	-	-	-	-	0.54	6.46	17.97	743	153	1,540
MW-30S	10/10/2014	7.6	-	6.8	-	0.31	6.64	18.5	-59.9	1,155	-
MW-30S	10/15/2014	17.2	-	15.5	-	-0.01	6.69	19.02	-114.8	1,084	-
MW-30S	10/15/2014	10.5	-	74.4	-	0.69	6.61	19.43	-60	1,030	-
MW-30S	10/20/2014	11.5	4	2.8	0	-	-	-	-	-	-
MW-31	10/10/2014	6.2	-	120.5	-	0.39	6.97	18.62	-119.7	899	-
MW-31	10/15/2014	15	-	62.5	-	0.59	6.83	19.04	-119.9	848	-
MW-31	10/15/2014	20.9	-	0	-	0.9	6.61	19.57	-47.6	541	-

Table 7

GROUNDWATER FIELD PARAMETERS DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Percent Oxygen (Head Space) (%)	Percent Carbon Dioxide (%)	Photo Ionization Detector (ppm)	Methane (%)	Dissolved Oxygen (mg/L)	Well pH (pH)	Well Temperature (deg C)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
MW-31	10/20/2014	17.4	1.1	11.8	0.3	-	-	-	-	-	-
MW-31	10/23/2014	-	-	-	-	0.41	6.98	18.69	-15.9	791	728
MW-33	10/10/2014	9.7	-	1.4	-	0.68	5.81	17.97	157.4	654	-
MW-33	10/15/2014	19	-	0.5	-	0.09	5.84	18.3	64.9	633	-
MW-33	10/15/2014	20.9	-	0	-	0.42	5.86	18.3	92.6	658	-
MW-33	10/20/2014	12	5.4	1	0	-	-	-	-	-	-
MW-33	10/23/2014	-	-	-	-	2.37	6.05	18.24	186.7	698	1,120
MW-51S	10/13/2014	5.7	-	23	-	0.64	6.72	18.32	-120	1,457	-
MW-51S	10/13/2014	-	-	1	-	0.75	6.65	18.35	-78.8	1,000	-
MW-51S	10/14/2014	-	-	-	-	0.33	6.64	18.46	-71.8	1,047	-
MW-51S	10/15/2014	20	-	1.2	-	1.62	6.6	18.43	1.5	566	-
MW-51S	10/15/2014	-	-	-	-	0.74	6.62	18.45	-84.6	1,122	-
MW-51S	10/20/2014	10.6	6.3	22.3	1.5	-	-	-	-	-	-
MW-51S	10/22/2014	-	-	-	-	0.81	6.67	18.47	-93.7	1,153	-
MW-51	10/13/2014	18	-	135	-	-	-	-	-	-	-
MW-51	10/15/2014	14	-	100.8	-	0.33	6.6	18.57	-86.9	1,014	-
MW-51	10/20/2014	11.6	4.9	31.5	3.2	-	-	-	-	-	-
MW-52	10/10/2014	16.3	-	5.4	-	1.15	5.87	17.51	45.9	465	-
MW-70	10/10/2014	16.2	-	0.3	-	2.12	5.76	17.3	98.7	843	-
MW-72S	10/10/2014	5.8	-	21.7	-	0.55	6.42	18.41	-98.2	1,331	-
MW-72S	10/15/2014	14	-	14.5	-	0.04	6.4	18.56	-85.4	1,340	-
MW-72S	10/15/2014	-	-	-	-	1.7	6.47	18.7	-53	1,246	-
MW-72S	10/16/2014	7.8	-	95	-	-	-	-	-	-	-
MW-72S	10/20/2014	9.3	7.4	38.8	4.2	-	-	-	-	-	-
MW-72S	10/22/2014	-	-	-	-	1.92	6.39	17.99	-21.2	904	-
MW-72	10/10/2014	6.6	-	12.2	-	0.48	5.47	17.86	32.6	743	-
MW-72	10/15/2014	16.8	-	14.8	-	0.14	5.41	18.04	110.3	733	-
MW-72	10/15/2014	-	-	-	-	2.99	5.75	18.09	108.9	739	-
MW-72	10/16/2014	5.2	-	6.9	-	-	-	-	-	-	-
MW-72	10/20/2014	2	16.8	10.5	13	-	-	-	-	-	-
MW-72	10/22/2014	-	-	-	-	1.77	5.86	17.73	146.2	533	29,800
MW-100S	10/10/2014	6.8	-	6.5	-	0.4	5.62	18.36	11.8	915	-
MW-100	10/10/2014	20.4	-	0.3	-	2.23	5.38	17.6	148.8	531	-
MW-102	10/10/2014	17.7	-	0.6	-	2.44	6.1	17.15	68.2	295	-
MW-103	10/10/2014	19.4	-	8.5	-	1.72	6.41	19.9	71.6	610	-
MW-103	10/23/2014	-	-	-	-	7.32	6.15	19.14	149.3	598	-
MW-104	10/10/2014	18.9	-	5.8	-	1.98	6.9	19.47	6.1	452	-
MW-104	10/21/2014	-	-	-	-	2.17	6.93	18.83	102.6	526	3,250
MW-105	10/10/2014	19	-	11.5	-	3.96	6.9	19.03	56.8	427	-
MW-105	10/21/2014	-	-	-	-	4.47	6.89	19.2	155.1	393	2,520
MW-106	10/10/2014	17.1	-	9.2	-	1.2	4.66	18.99	122.5	2,231	-
MW-106	10/14/2014	18.3	-	4.3	-	-	-	-	-	-	-
MW-106	10/20/2014	15.5	3.8	0.2	0	-	-	-	-	-	-
MW-106	10/23/2014	-	-	-	-	1.29	5.2	18.35	97.7	1,529	-
MW-107	10/10/2014	11.8	-	10.5	-	0.62	3.51	18.9	348.4	2,063	-
MW-107	10/15/2014	13.7	-	7.3	-	1.51	3.63	19.54	393	1,047	-
MW-107	10/15/2014	-	-	-	-	2.52	3.76	19.36	428.9	1,117	-
MW-107	10/20/2014	7.3	9.4	0.3	0	-	-	-	-	-	-
MW-107	10/23/2014	-	-	-	-	3.4	2.9	19.05	480.1	1,462	-
MW-108	10/10/2014	11.6	-	9.5	-	-	-	-	-	-	-
MW-109S	10/10/2014	11.3	-	50	-	1.43	6.35	18.2	-83.5	827	-
MW-109S	10/20/2014	3.9	13.2	13.8	0	-	-	-	-	-	-
MW-109S	10/21/2014	-	-	-	-	0.35	6.03	18.29	59.2	769	-
MW-109	10/10/2014	19.1	-	11.8	-	1.65	6.03	17.98	35	247	-
MW-109	10/20/2014	20.8	0.6	0.2	0	-	-	-	-	-	-

Table 7

GROUNDWATER FIELD PARAMETERS DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Well ID	Sample Date	Percent Oxygen (Head Space) (%)	Percent Carbon Dioxide (%)	Photo Ionization Detector (ppm)	Methane (%)	Dissolved Oxygen (mg/L)	Well pH (pH)	Well Temperature (deg C)	ORP (mV)	Specific Conductance (µS/cm)	Turbidity (NTU)
MW-109	10/21/2014	-	-	-	-	0.86	5.81	18.04	133.5	261	-
MW-110S	10/10/2014	14.4	-	9.9	-	0.5	6.32	18.38	-87.8	651	-
MW-110	10/10/2014	16.4	-	13.1	-	1.3	5.39	17.98	117.8	215	-
MW-111	10/10/2014	16.9	-	7.3	-	1.7	5.82	17.98	75.9	247	-
MW-112S	10/10/2014	14.7	-	25	-	1.95	5.46	18.26	148.5	369	-
MW-112S	10/20/2014	12	7.9	0	0	-	-	-	-	-	-
MW-112S	10/21/2014	-	-	-	-	2.5	5.38	18.27	172.9	333	-
MW-112	10/10/2014	16.3	-	14.8	-	2.14	5.56	17.93	157.3	162	-
MW-113	10/10/2014	19.2	-	6.3	-	6.17	6.35	17.97	83.2	352	-
MW-114	10/10/2014	6.3	-	9	-	1.5	5.83	17.65	78	310	-
MW-114	10/20/2014	16	2.1	0.1	0.1	-	-	-	-	-	-
MW-114	10/21/2014	-	-	-	-	1.23	6.04	17.81	154.1	262	-
RW-1	10/13/2014	19	-	130	-	1.34	6.92	18.45	136.4	495	-
RW-1	10/13/2014	18.9	-	79	-	3.41	6.41	18.31	158	473	-
RW-1	10/14/2014	18.9	-	55	-	0.53	6.49	18.46	129.6	475	-
RW-1	10/15/2014	19.3	-	80.7	-	1.99	6.29	18.43	60.4	292	-
RW-1	10/15/2014	-	-	-	-	1.06	6.31	18.49	96.9	314	-
RW-1	10/20/2014	16.4	3.2	29.2	2.4	-	-	-	-	-	-
RW-1	10/22/2014	-	-	-	-	2.14	6.5	18.07	85.5	311	-
TW-02	10/13/2014	17.4	-	0.3	-	1.01	6.43	18.32	-	523	-
TW-02	10/23/2014	-	-	-	-	0.65	6.7	17.24	-63.8	1,189	-
TW-03	10/13/2014	19.5	-	0.3	-	1.86	5.73	19.23	-	503	-
TW-03	10/23/2014	-	-	-	-	0.71	6.12	18.54	38.1	489	-
TW-04	10/13/2014	19.2	-	2	-	1.67	5.73	19.08	-	1,344	-
TW-04	10/23/2014	-	-	-	-	0.7	5.76	18.95	35	1,232	-
TW-05	10/13/2014	17	-	129.3	-	1.26	5.23	18.64	61.2	1,204	-
TW-05	10/15/2014	20.5	-	8.7	-	-	-	-	-	-	-
TW-05	10/20/2014	20.6	0.1	16	0	-	-	-	-	-	-
TW-05	10/23/2014	-	-	-	-	0.85	5.73	19.04	49.2	1,121	-
TW-06	10/13/2014	14.4	-	39.8	-	1.31	6.42	18.99	-	983	-
TW-06	10/15/2014	11	-	78.9	-	1.33	6.54	21.65	-65	873	-
TW-06	10/15/2014	-	-	-	-	0.31	6.28	19.79	-46.8	986	-
TW-06	10/20/2014	5.4	12	0.8	0	-	-	-	-	-	-
TW-06	10/23/2014	-	-	-	-	0.84	6.51	18.95	-68.8	823	-
TW-07	10/13/2014	16.4	-	33.5	-	1.4	4.96	19.08	-	580	-
TW-07	10/15/2014	15.4	-	15.6	-	0.4	4.94	20.81	97.9	569	-
TW-07	10/20/2014	14.6	5	0	0	-	-	-	-	-	-
TW-07	10/23/2014	-	-	-	-	0.41	4.99	19.04	139.5	415	-
TW-12S	10/10/2014	18.5	-	0.8	-	-	-	-	-	-	-
TW-14	10/10/2014	19.5	-	2.3	-	-	-	-	-	-	-
TW-14	10/20/2014	20	0.7	0	0	-	-	-	-	-	-
TW-14	10/23/2014	-	-	-	-	1.99	7.48	19.13	-47.2	562	-

- = Not available
% = Percent
µS/cm = Microsiemens per centimeter
deg C = Degrees Celsius
mg/L = Milligrams per liter
mV = Millivolts
ppm = Parts per million

Table 8

GROUNDWATER MONITORED NATURAL ATTENUATION ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, V**A**

Well ID	Sample Date	Methane (µg/L)	Sulfate as SO4 (mg/L)	Nitrate (mg/L)	Nitrite Nitrogen (mg/L)	Alkalinity, Carbonate (as caco3) (mg/L)	Ferrous Iron (mg/L)
MW-01S	10/22/2014	4,200	130	0.044	0.037	306	31.4
MW-10S	10/22/2014	1,100	33.1	<0.040	0.037	461	62.8
MW-11	10/22/2014	120	71.9	<0.040	<0.015	55	0.059
MW-31	10/23/2014	4,300	57.2	<0.040	<0.015	416	2.6
MW-33	10/23/2014	43	253	1.9	<0.015	119	0.068
MW-51S	10/22/2014	7,100	36.3	0.047	<0.015	564	28.7
MW-72S	10/22/2014	4,400	80.3	0.093	0.019	328	9.1
MW-72	10/22/2014	2,200	389	<0.040	<0.015	65.5	0.33
MW-109S	10/20/2014	1,000	18.8	<0.040	0.037	368	-
MW-112S	10/20/2014	4	99	0.71	<0.015	25	-
MW-114	10/20/2014	16	40.5	1.5	0.16	66.7	-

Note: MW-105, TW-06, TW-07, and TW-14 were not sampled for MNA parameters, and MW-109S, MW-112S, and MW-114 were not analyzed for ferrous iron due to an insufficient amount of water.

- = Not available
µg/L = Micograms
mg/L = Milligrams

Table 9

SEEP ANALYTICAL DATA SUMMARY

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

Analyte Date	**Units**	**SEEP-B** 12/18/13	**SEEP-B** 8/13/14	**SEEP-B** 10/21/14	**SEEP-D** 8/13/14	**SEEP-D** 10/21/14	**RIVER WATER** 10/21/14
Benzene	µg/L	2.09	-	4	-	<0.5	-
Toluene	µg/L	ND	-	<0.5	-	<0.5	-
Ethylbenzene	µg/L	1.07	-	<0.5	-	<0.5	-
Xylenes, Total	µg/L	3	-	<0.5	-	<0.5	-
Methyl tert-butyl ether	µg/L	ND	-	<0.5	-	<0.5	-
tert-Butyl alcohol	µg/L	-	-	<2	-	<2	-
1,2-Dibromoethane	µg/L	-	-	<0.5	-	<0.5	-
1,2-Dichloroethane	µg/L	-	-	<0.5	-	<0.5	-
1,1'-Biphenyl	µg/L	-	-	0.3	-	<0.02	-
1-Methylnaphthalene	µg/L	-	-	0.04	-	<0.02	-
2-Methylnaphthalene	µg/L	-	-	0.06	-	<0.02	-
Acenaphthene	µg/L	-	-	<0.02	-	<0.02	-
Acenaphthylene	µg/L	-	-	<0.02	-	<0.02	-
Anthracene	µg/L	-	-	0.07	-	<0.02	-
Benzo(b)fluoranthene	µg/L	-	-	<0.02	-	0.03	-
Benzo[a]anthracene	µg/L	-	-	<0.02	-	<0.02	-
Benzo[a]pyrene	µg/L	-	-	<0.02	-	0.02	-
Benzo[e]pyrene	µg/L	-	-	<0.02	-	0.02	-
Benzo[g,h,i]perylene	µg/L	-	-	<0.02	-	0.02	-
Benzo[k]fluoranthene	µg/L	-	-	<0.02	-	0.02	-
C1-Benzanthrene/chrysenes	µg/L	-	-	<0.02	-	<0.02	-
C1-DIBENZOTHIOPHENE	µg/L	-	-	<0.02	-	<0.02	-
C1-Fluoranthrenes/pyrenes	µg/L	-	-	<0.02	-	<0.02	-
C1-FLUORENE	µg/L	-	-	<0.02	-	<0.02	-
C1-NAPHTHALENE	µg/L	-	-	0.09	-	<0.02	-
C1-Naphthobenzothiophenes	µg/L	-	-	<0.02	-	<0.02	-
C1-Phenanthrenes/anthracenes	µg/L	-	-	<0.02	-	<0.02	-
C2-Benzanthrene/chrysenes	µg/L	-	-	<0.02	-	<0.02	-
C2-DIBENZOTHIOPHENE	µg/L	-	-	<0.02	-	<0.02	-
C2-Fluoranthrenes/pyrenes	µg/L	-	-	<0.02	-	<0.02	-
C2-FLUORENE	µg/L	-	-	<0.02	-	<0.02	-
C2-NAPHTHALENE	µg/L	-	-	<0.02	-	<0.02	-
C2-Naphthobenzothiophenes	µg/L	-	-	<0.02	-	<0.02	-
C2-Phenanthrenes/anthracenes	µg/L	-	-	<0.02	-	<0.02	-
C3-Benzanthrene/chrysenes	µg/L	-	-	<0.02	-	<0.02	-
C3-DIBENZOTHIOPHENE	µg/L	-	-	<0.02	-	<0.02	-
C3-Fluoranthrenes/pyrenes	µg/L	-	-	<0.02	-	<0.02	-
C3-FLUORENE	µg/L	-	-	<0.02	-	<0.02	-
C3-NAPHTHALENE	µg/L	-	-	<0.02	-	<0.02	-
C3-Naphthobenzothiophenes	µg/L	-	-	<0.02	-	<0.02	-
C3-Phenanthrenes/anthracenes	µg/L	-	-	<0.02	-	<0.02	-
C4-Benzanthrene/chrysenes	µg/L	-	-	<0.02	-	<0.02	-
C4-Dibenzothiophene	µg/L	-	-	<0.02	-	<0.02	-
C4-Fluoranthrenes/pyrenes	µg/L	-	-	<0.02	-	<0.02	-
C4-NAPHTHALENE	µg/L	-	-	<0.02	-	<0.02	-
C4-Phenanthrenes/anthracenes	µg/L	-	-	<0.02	-	<0.02	-
Chrysene	µg/L	-	-	<0.02	-	0.03	-
Dibenz[a,h]anthracene	µg/L	-	-	<0.02	-	<0.02	-
Dibenzofuran	µg/L	-	-	0.07	-	<0.02	-
Dibenzothiophene	µg/L	-	-	<0.02	-	<0.02	-
Fluoranthene	µg/L	-	-	0.03	-	0.04	-
Fluorene	µg/L	-	-	0.2	-	<0.02	-
Indeno[1,2,3-cd]pyrene	µg/L	-	-	<0.02	-	<0.02	-
Naphthalene	µg/L	19.9	-	<0.02	-	<0.02	-
Naphthobenzothiophene	µg/L	-	-	<0.02	-	<0.02	-
Perylene	µg/L	-	-	<0.02	-	<0.02	-
Phenanthrene	µg/L	-	-	0.06	-	<0.02	-
Pyrene	µg/L	-	-	<0.02	-	0.03	-
TPH, Diesel Range Organics C10-C28	µg/L	989	320	240	<42	<45	-
TPH, Gasoline Range Organics C6-C10	µg/L	-	-	<20	-	<20	-
OIL and GREASE, TOTAL REC	mg/L	-	-	<1.4	-	<1.4	-
Fuel Oil #4 (C11-C24)	mg/L	-	-	<0.20	-	<0.20	-
creosote	mg/L	-	-	<0.20	-	<0.20	-
PHC as diesel	mg/L	-	-	0.55	-	<0.20	-
Fuel Oil #6 (C11-C26)	mg/L	-	-	<1.0	-	<1.0	-
TPH-gasoline range organics C4-C12	mg/L	-	-	<0.20	-	<0.20	-
jet fuel JP-5	mg/L	-	-	<0.20	-	<0.20	-
Mineral Spirits (C9-C12)	mg/L	-	-	<0.20	-	<0.20	-
MOTOR OILS	mg/L	-	-	<1.0	-	<1.0	-
ORP	mV	-	-	247.3	-	-57.8	43.0
Specific Conductance	µS/cm	-	822	867.3	769	884	374.5
Well pH	pH	-	-	4.75	-	6.73	7.89
Well Temperature	deg c	-	-	18.5	-	18.99	18.24
Dissolved Oxygen	mg/L	-	-	8.6	-	3.51	8.66

- = Not available
µg/L = Micrograms per liter
µS/cm = Microsiemens per centimeter
deg C = Degrees Celsius
mg/L = Milligrams per liter
mV = Millivolts

Geosyntec consultants

Table 10

FEASIBILITY TEST VAPOR PHASE RECOVERY DATA SUMMARY

Potomac River Generating Station
1400 North Royal Street
Alexandria, VA

Test Zone	Extraction Well	Type of Test	Duration (min)	Vacuum On Well (i.w.)	Vacuum On Well ("Hg)	Vapor Flowrate (scfm)	Groundwater Recovery Rate (gpm)	Maximum Groundwater Drawdown (-) or Upwelling (+) (feet)	PID Reading (ppmv)	Percent Oxygen	BTEX Conc. (mg/m^3)	C1-C4 Hydrocarbon Conc. (mg/m^3)	>C4-C10 Hydrocarbon Conc. (mg/m^3)	BTEX Recovery (lb/day)	C1-C4 Hydrocarbon Recovery (lb/day)	>C4-C10 Hydrocarbon Recovery (lb/day)
Shallow Zone	MW-51S	SVE - Step 1	38	28	2.1	37	-	0.8	18.1	13%	<20	140,000	520	0	466	1.7
		SVE - Step 2	33	54	4.0	65	-	1.6	14.9	15%	<20	9,200	520	0	54	3.0
		SVE - Step 3	29	129	9.5	95	-	2.7	34.2	14%	5	51,000	650	0.0	436	5.6
	MW-25S	TPE	53	235	17.3	74	0.2	-2.5	153.5	12%	37	36,000	1,200	0.2	240	8.0
	MW-10S	TPE	38	274	20.2	52	0.3	-2.5	144	12%	37	20,000	1,000	0.2	94	4.7
Deep Zone	MW-51	SVE - Step 1	36	15	1.1	8	-	0.9	NS	NS	NS	NS	NS	-	-	-
	RW-1	SVE - Step 1	31	11	0.8	4	-	1.0	5	21%	<20	71	<35	0	0.0	0.0
		GW Pumping	16	-	-	-	0.1	-6.8	-	-	-	-	-	-	-	-
		VEGE - Step 1	16	59	4.3	4	0.2	-6.8	15.5	21%	<20	22	<35	0	0	0.0
	MW-51	GW Pumping	68	-	-	-	3.6	-4.8	-	-	-	-	-	-	-	-
		VEGE - Step 1	39	44	3.2	4	3.6	-4.0	15	21%	<20	66	<35	0	0	0.0
		VEGE - Step 2	36	70	5.2	8	3.6	-3.9	27	21%	<20	120	70	0	0	0.1
		VEGE - Step 3	40	328	24.1	6	3.0	-2.3	29	21%	<21	49	<35	0	0	0.0
		AS & VEGE	51	327	24.1	7	3.0	-2.1	129	21%	<20	180	99	0	0	0.1
	MW-27	SVE - Step 1	32	10	0.7	1	-	0.8	43	15%	<20	6,100	70	0	0	0.0
	MW-25	TPE	28	311	22.9	2	3.5	-0.2	NS	NS	NS	NS	NS	-	-	-
	MW-27	GW Pumping	34	-	-	-	2.1	-3.2	-	-	-	-	-	-	-	-
		VEGE - Step 1	48	42	3.1	5	2.6	-3.2	25.4	17%	<20	3,000	55	0.0	1	0.0
		VEGE - Step 2	19	73	5.4	8	2.3	-3.3	36.4	16%	<20	4,400	81	0.0	3	0.1
		VEGE - Step 3	5	328	24.1	6	3.6	0.6	NA	NA	-	-	-	-	-	-

Notes:

min = minute
i.w. = inches of water
"Hg = inches of Mercury
scfm = standard cubic feet per minute

gpm = gallons per minute
ppmv = parts per million (volume)
mg/m3 = milligrams per cubic meter
Conc. = Concentration

lb/day = pounds per day
SVE = Soil Vapor Extraction
AS = Air Sparge
GW = Groundwater

VEGE = Vacuum Enhanced Groundwater Extraction
TPE = Total Phase Extraction
recovery (lb/day) = conc. (mg/m^3) x flow (scfm) x 1lb/454,000mg x $0.0283m^3/ft^3$ x 1440 min/day
NS = Not sampled due to upwelling covering well screen, preventing air flow.

Table 11

FEASIBILITY TEST AIR SPARGE DATA SUMMARY

Potomac River Generating Station
1400 North Royal Street
Alexandria, VA

Test Day	Sparge Well	Type of Test	Duration (min)	Sparge Pressure (psi)	Sparge Flow (scfm)
Day 1 Oct 13th	SP-1	Sparge - Step 1	33	6.0	0.7
		Sparge - Step 2	50	6.6	2.1
		Sparge - Step 3	27	7.7	3.9
		Sparge - Step 4	26	9.9	5.8
Day 2 Oct 14th	SP-1	Sparge & VEGE	51	9.5	4.7
Day 3 Oct 15th	SP-2	Sparge w/ Helium	265	6.0	1.2
		Sparge - Step 2	8	6.5	2.5
		Sparge - Step 3	9	7.0	3.1

Notes:
min = minute
psi = pounds per square inch
scfm = standard cubic feet per minute
SP - Sparge point
AS = Air Sparge

Table 12

FEASIBILITY TEST GROUNDWATER DATA SUMMARY

Potomac River Generating Station
1400 North Royal Street
Alexandria, VA

Parameter (units)	MW-27	MW-51
Date	10/16/2014	10/14/2014
Benzene (µg/L)	<2.00	<5.00
Toluene (µg/L)	<2.00	<5.00
Ethylbenzene (µg/L)	<2.00	5.15
Xylenes (µg/L)	<4.00	10.8
BTEX (µg/L)	<10.00	15.23
TPH-GRO (µg/l)	<100	168
TPH-DRO (µg/l)	3,100	88,600
Total Calcium (mg/l)	79.4	51.7
Total Iron (mg/l)	0.111	4.45
Total Lead (mg/l)	<0.00400	0.00744
Total Magnesium (mg/l)	35.1	28.1
Total Manganese (mg/l)	4.55	11.1
Dissolved Calcium (mg/l)	75.9	48.1
Dissolved Iron (mg/l)	<0.0200	0.163
Dissolved Magnesium (mg/l)	34.3	26.7
Dissolved Manganese (mg/l)	4.22	9.52
Oil and Grease (mg/l)	23.1	<6.25
Total Dissolved Solids (TDS) (mg/l)	420	450
Total Suspended Solids (TSS) (mg/l)	792	928

Notes:

NA= Not analyzed

µg/l= micrograms per liter

mg/l= milligrams per liter

BTEX= Sum of benzene, toluene, ethylbenzene and total xylenes

MTBE= methyl tert butyl ether

TPH-GRO= Total petroleum hydrocarbons-gasoline range organics

TPH-DRO= Total petroleum hydrocarbons-diesel range organics

Table 13

FEASIBILITY TEST HARDNESS DETERMINATION

Potomac River Generating Station
1400 N. Royal St
Alexandria, VA

Monitoring Well MW-27				
Hardness-causing cation	**Molecular weight**	**Equivalent weight**	**Concentration (mg/L)**	**Hardness as CaCO3 (mg/L)**
Calcium	40.08	20.04	79.4	198
Iron	55.85	27.93	0.1	0
Lead	207.19	103.60	<0.00400	0
Magnesium	24.31	12.16	35.1	144
Manganese	54.94	27.47	4.55	8
			Total Hardness as $CaCO_3$ =	**351**

Monitoring Well MW-51				
Hardness-causing cation	**Molecular weight**	**Equivalent weight**	**Concentration (mg/L)**	**Hardness as CaCO3 (mg/L)**
Calcium	40.08	20.04	51.7	129
Iron	55.85	27.93	4.5	8
Lead	207.19	103.60	0.0074	0
Magnesium	24.31	12.16	28.1	116
Manganese	54.94	27.47	11.10	20
			Total Hardness as $CaCO_3$ =	**273**

Notes:

Samples were collected from monitoring well MW-27 on October 16, 2014 and from MW-51 on October 14, 2014.

mg/L - milligrams per liter

$CaCO_3$ - calcium carbonate

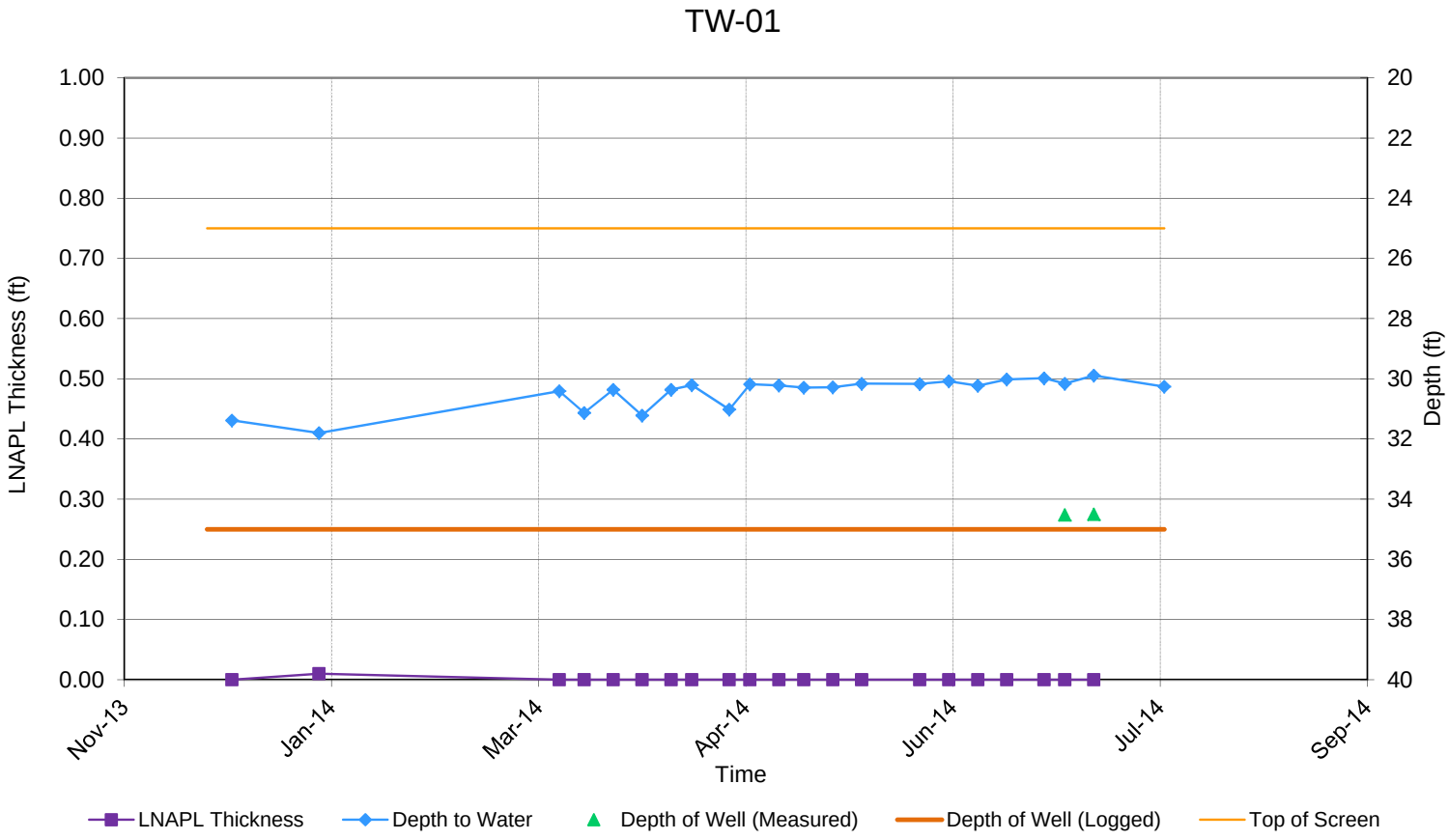
Hardness (as $CaCO_3$) = Conc. (mg/l) x 50 / (equivalent weight)

APPENDIX A

Water Level Hydrographs

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA



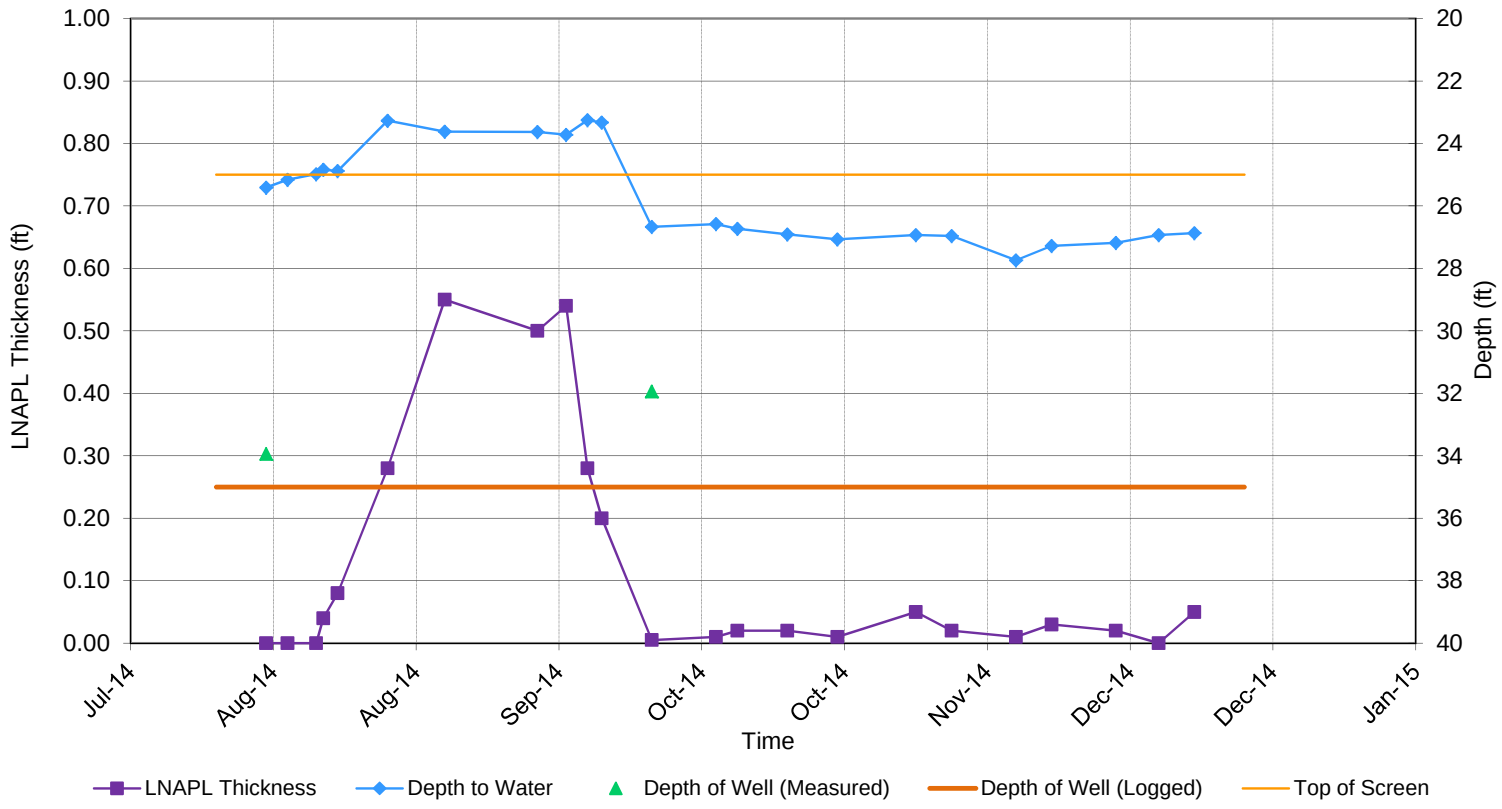
Monitoring well status: Destroyed **Diameter (in):** 1 **Depth (ft):** 35.00 **Top of Screen (ft):** 25.00

Note: TW-01 was replaced by MW-05

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

MW-05



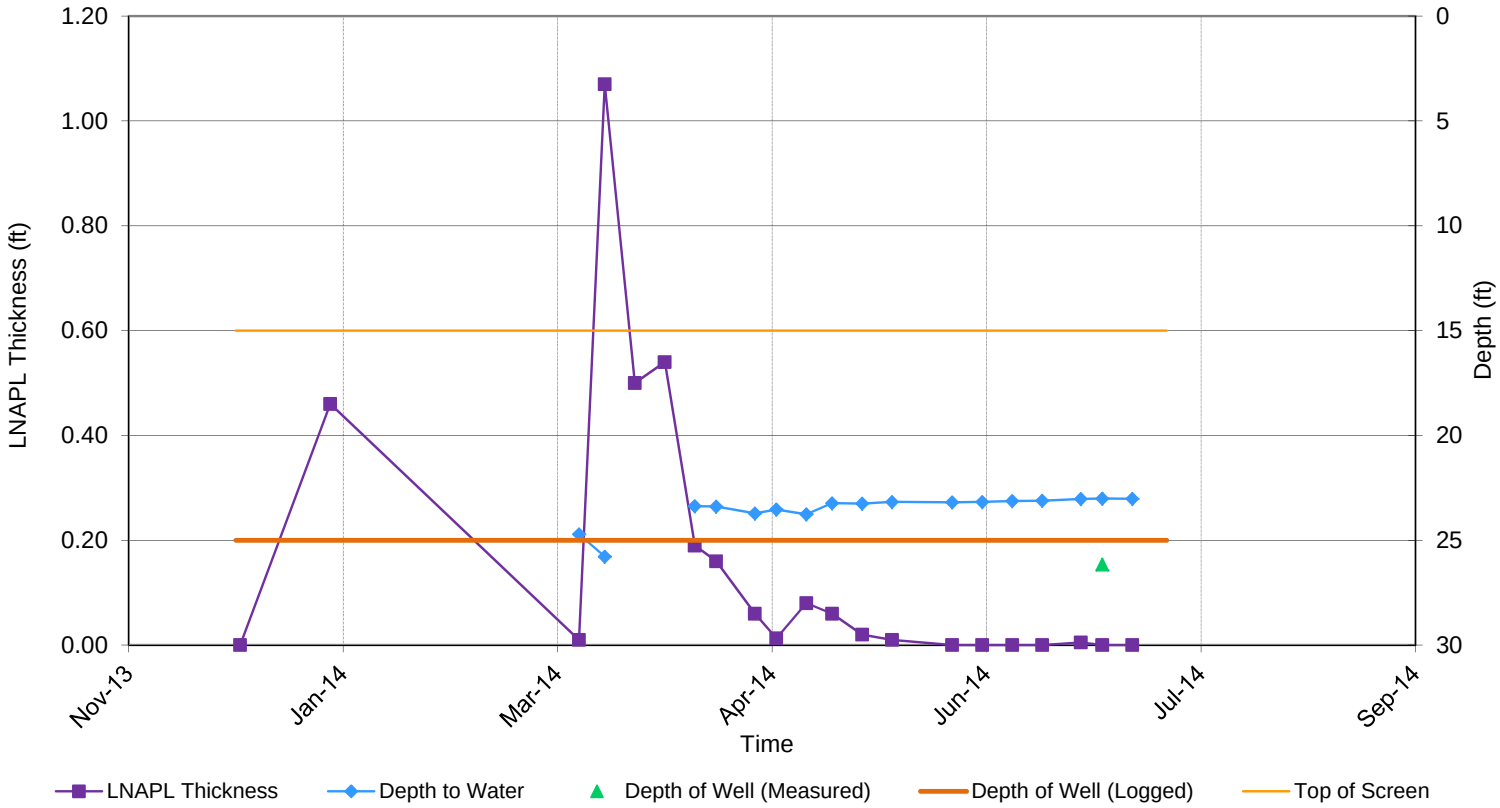
Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 35.00 **Top of Screen (ft):** 25.00

Note: MW-05 is the replacement well for TW-01

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

TW-09S



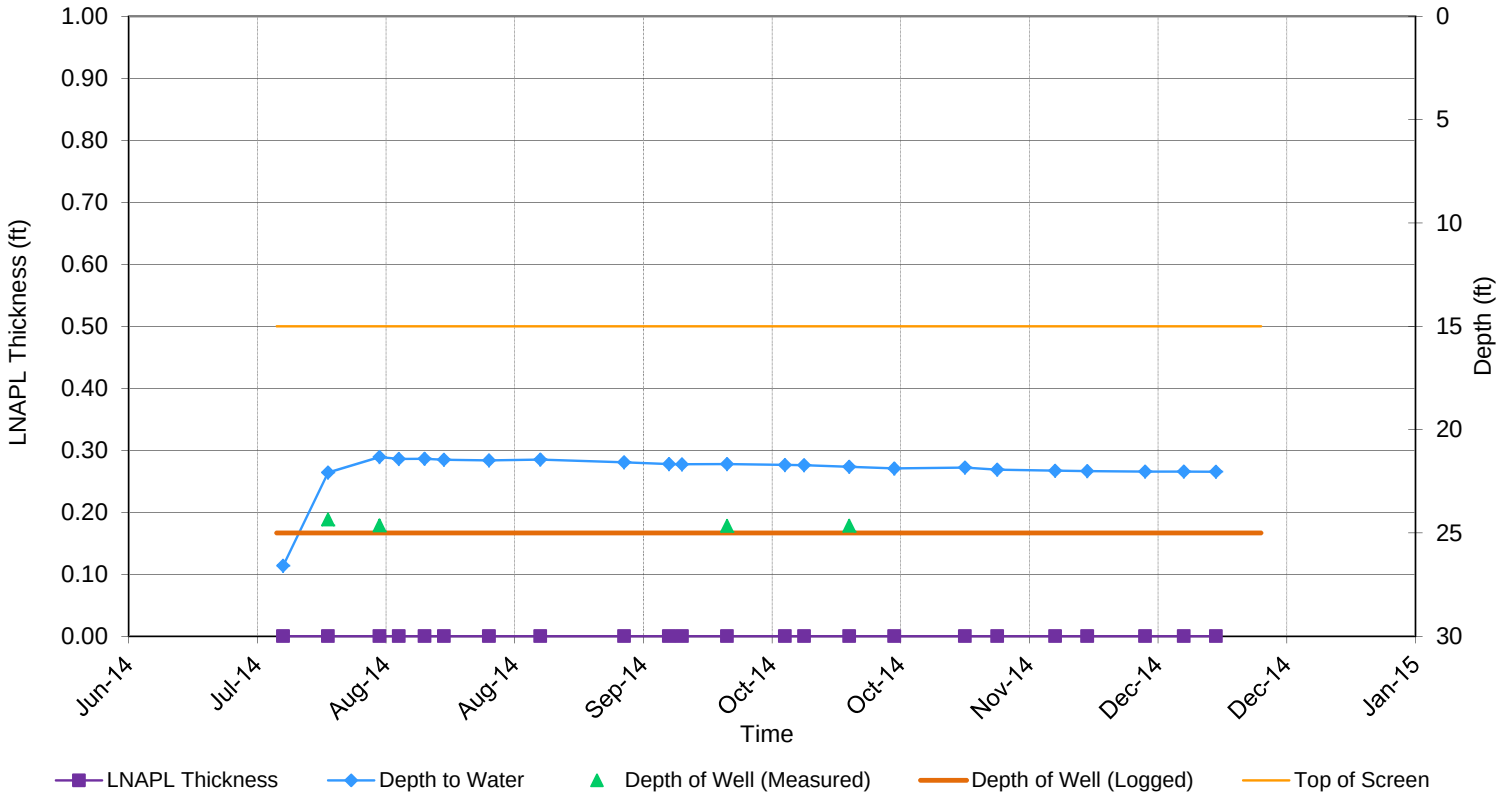
Monitoring well status: Destroyed **Diameter (in):** 1 **Depth (ft):** 25.00 **Top of Screen (ft):** 15.00

Note: TW-09S was replaced by MW-08S

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

MW-08S



Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 25.00 **Top of Screen (ft):** 15.00

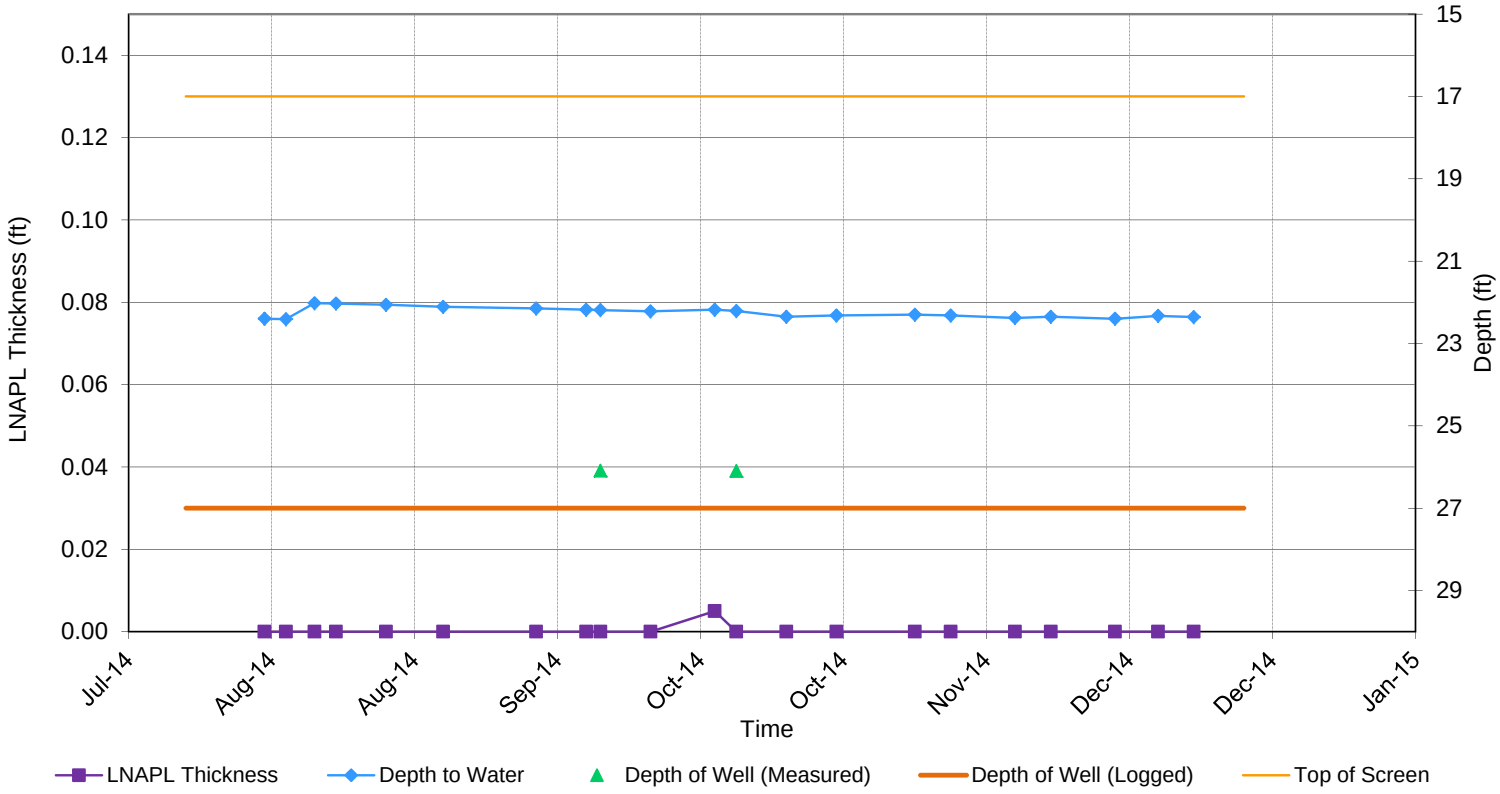
Note: MW-08S is the replacement well for TW-09S

Appendix A

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

MW-10S

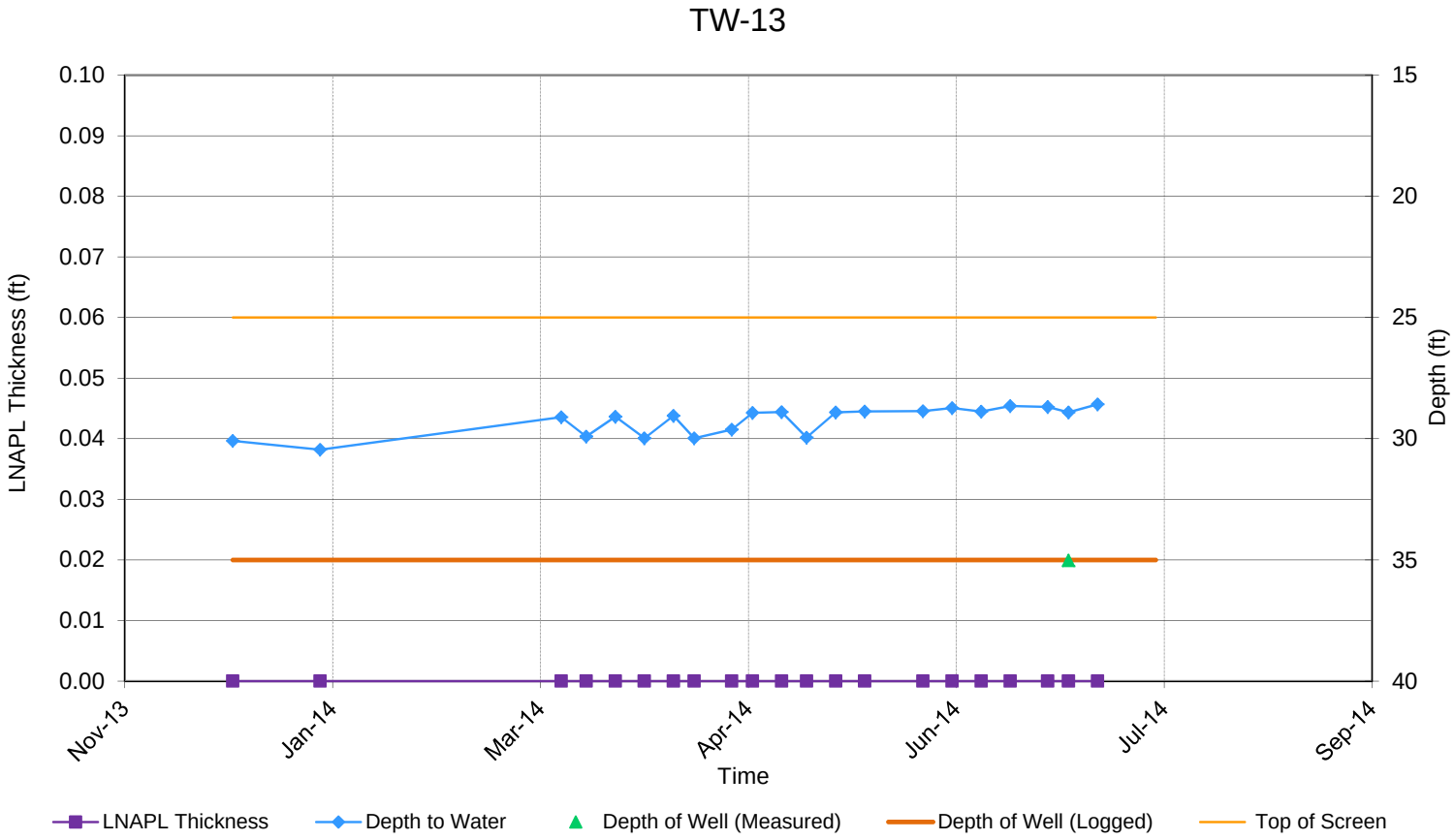


Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 27.00 **Top of Screen (ft):** 17.00

Appendix A

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

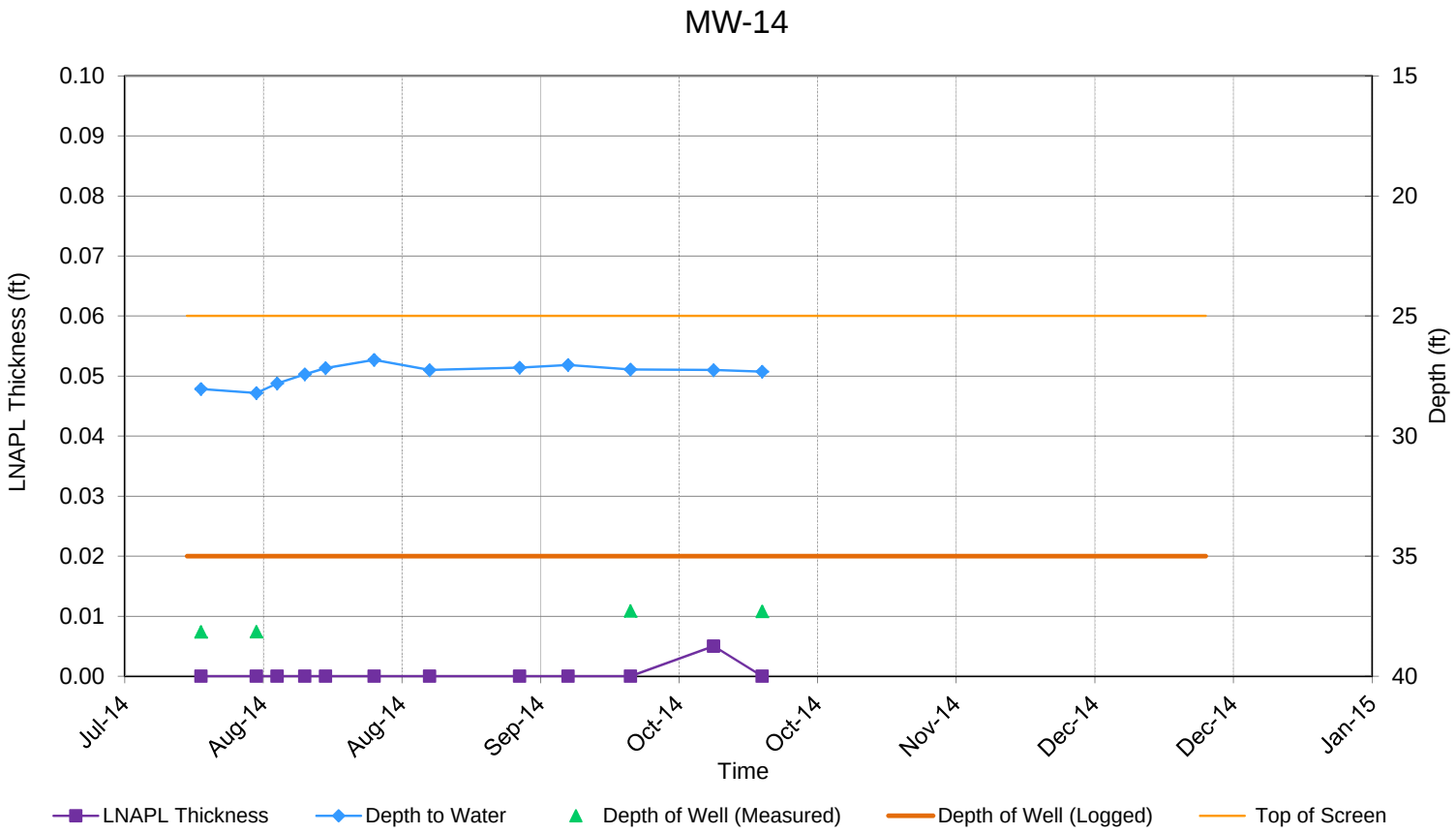


Monitoring well status: Active **Diameter (in):** 1 **Depth (ft):** 35.00 **Top of Screen (ft):** 25.00

Note: TW-13 was replaced by MW-14

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA



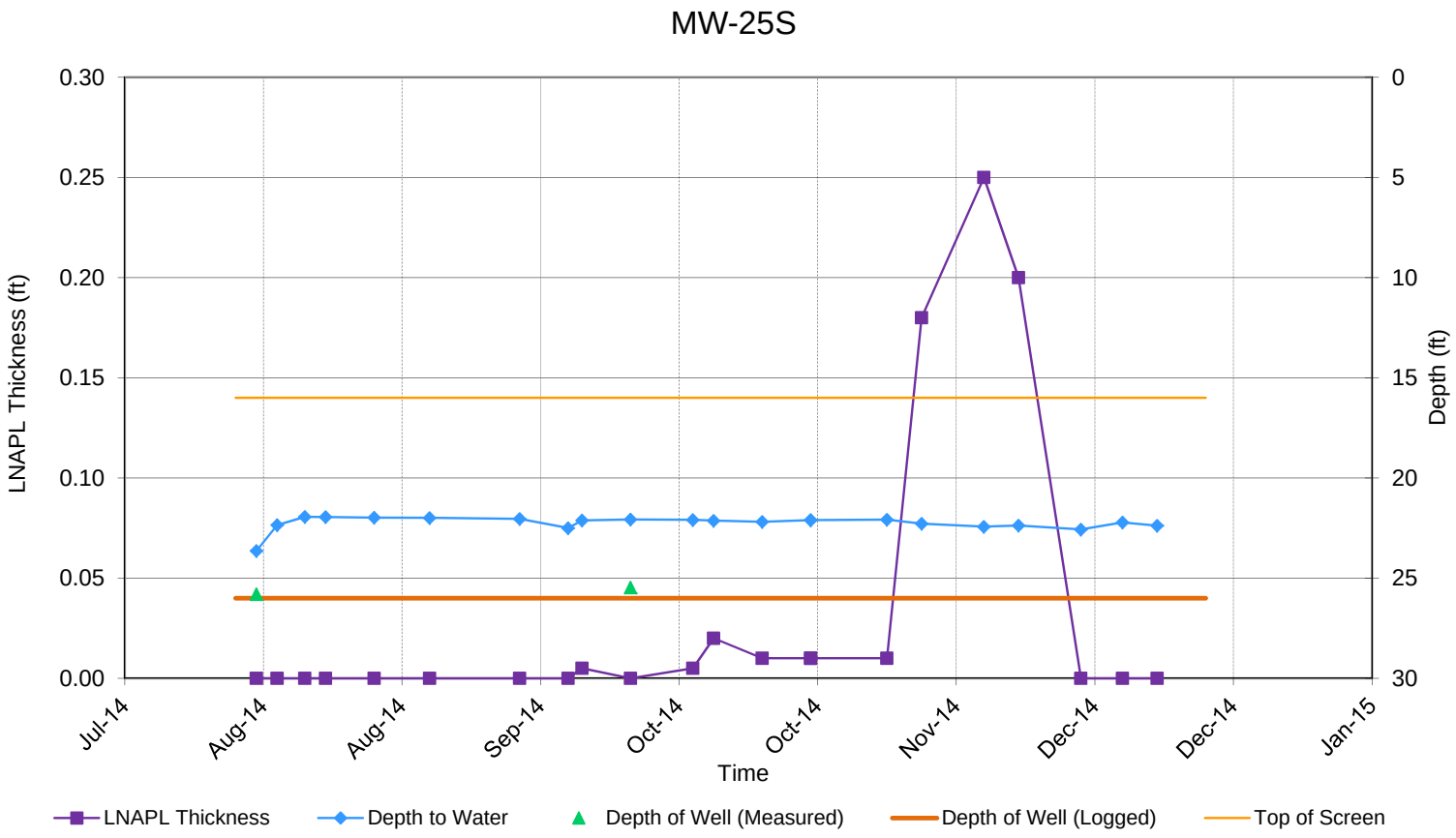
Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 35.00 **Top of Screen (ft):** 25.00

Note: MW-14 is the replacement well for TW-13

Appendix A

WATER LEVEL HYDROGRAPHS

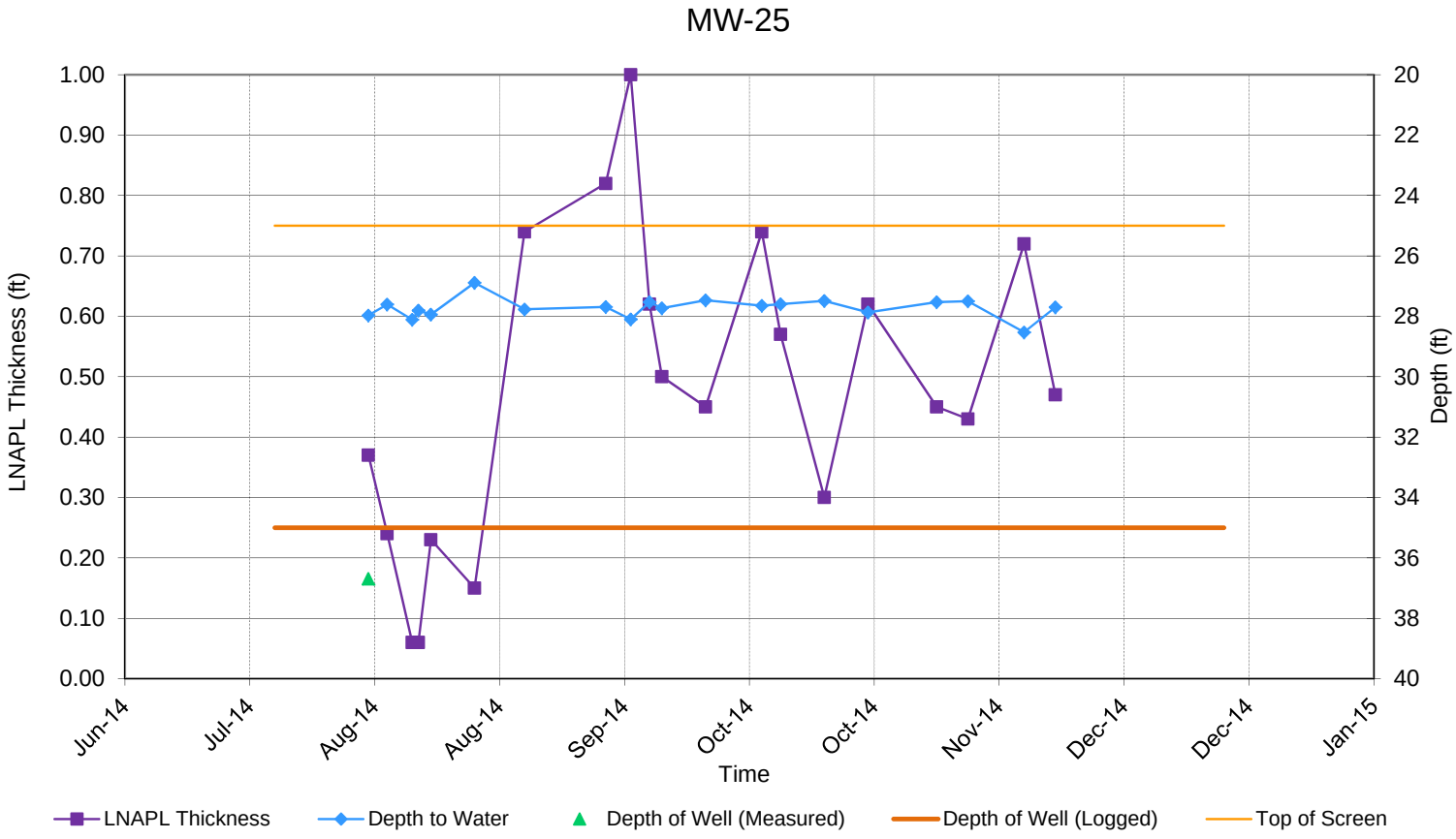
Potomac River Generating Station
1400 North Royal St
Alexandria, VA



Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 26.00 **Top of Screen (ft):** 16.00

WATER LEVEL HYDROGRAPHS

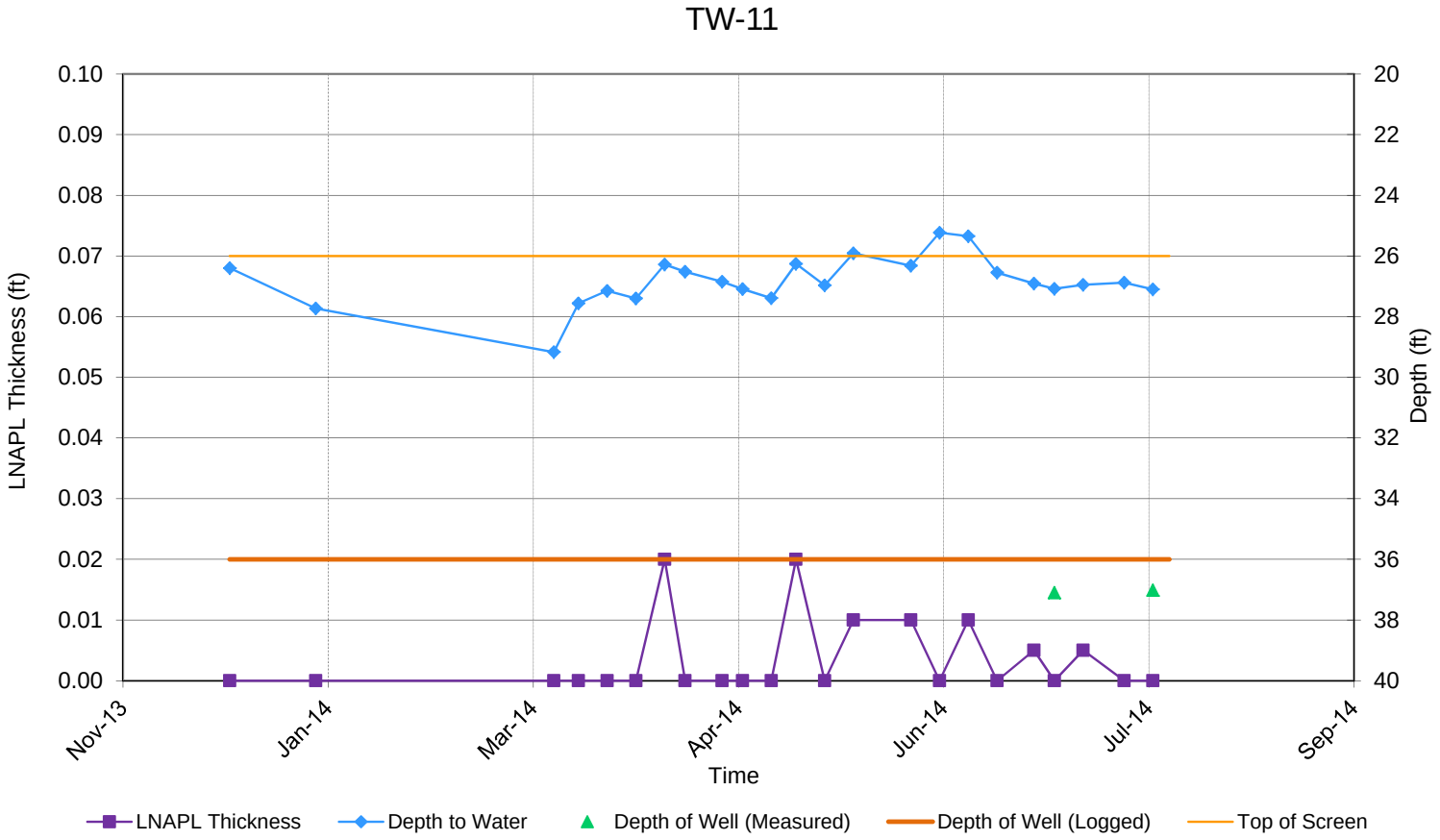
Potomac River Generating Station
1400 North Royal St
Alexandria, VA



Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 35.00 **Top of Screen (ft):** 25.00

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

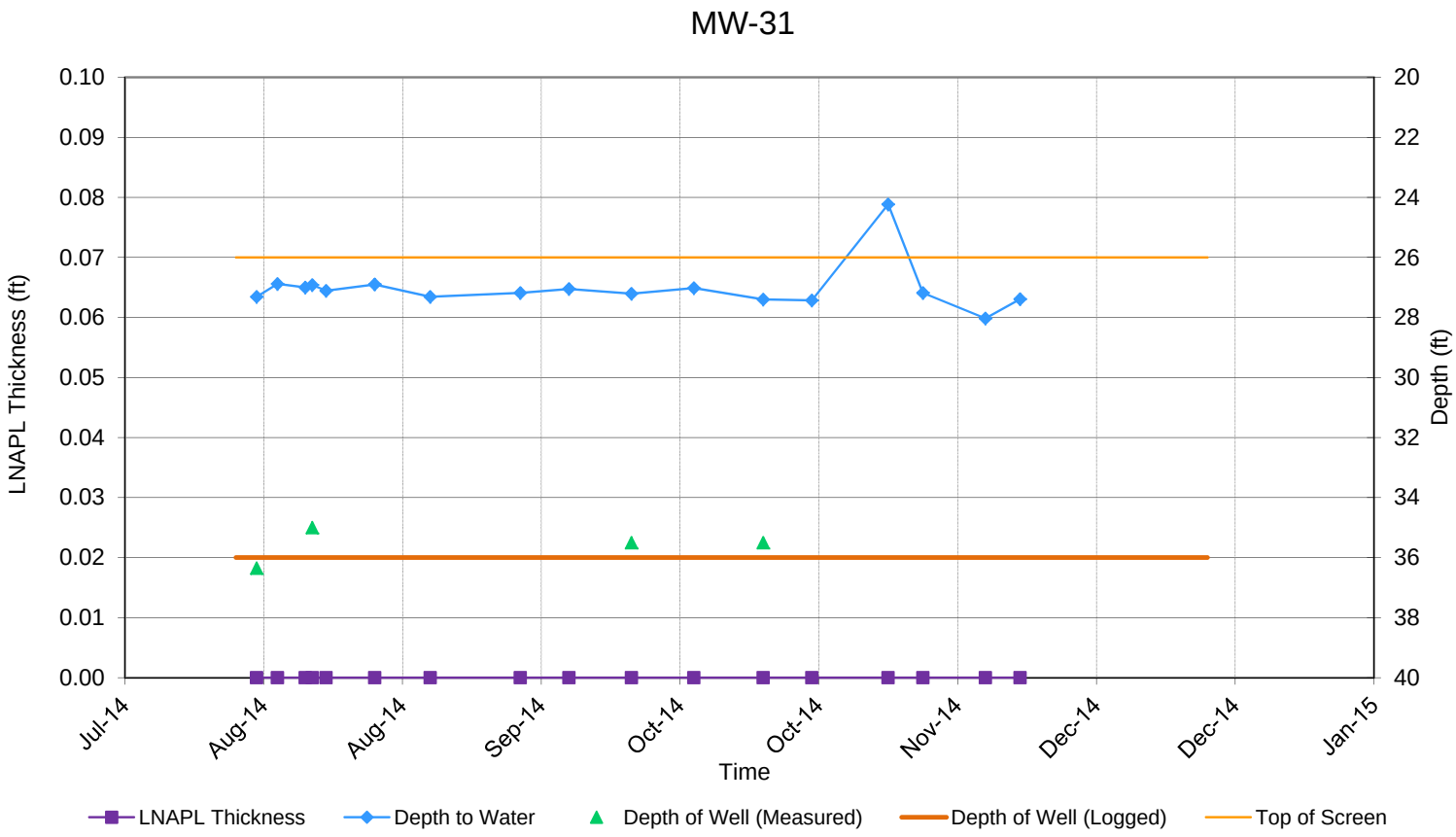


Monitoring well status: Active **Diameter (in):** 1 **Depth (ft):** 36.00 **Top of Screen (ft):** 26.00

Note: TW-11 was replaced by MW-31

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA

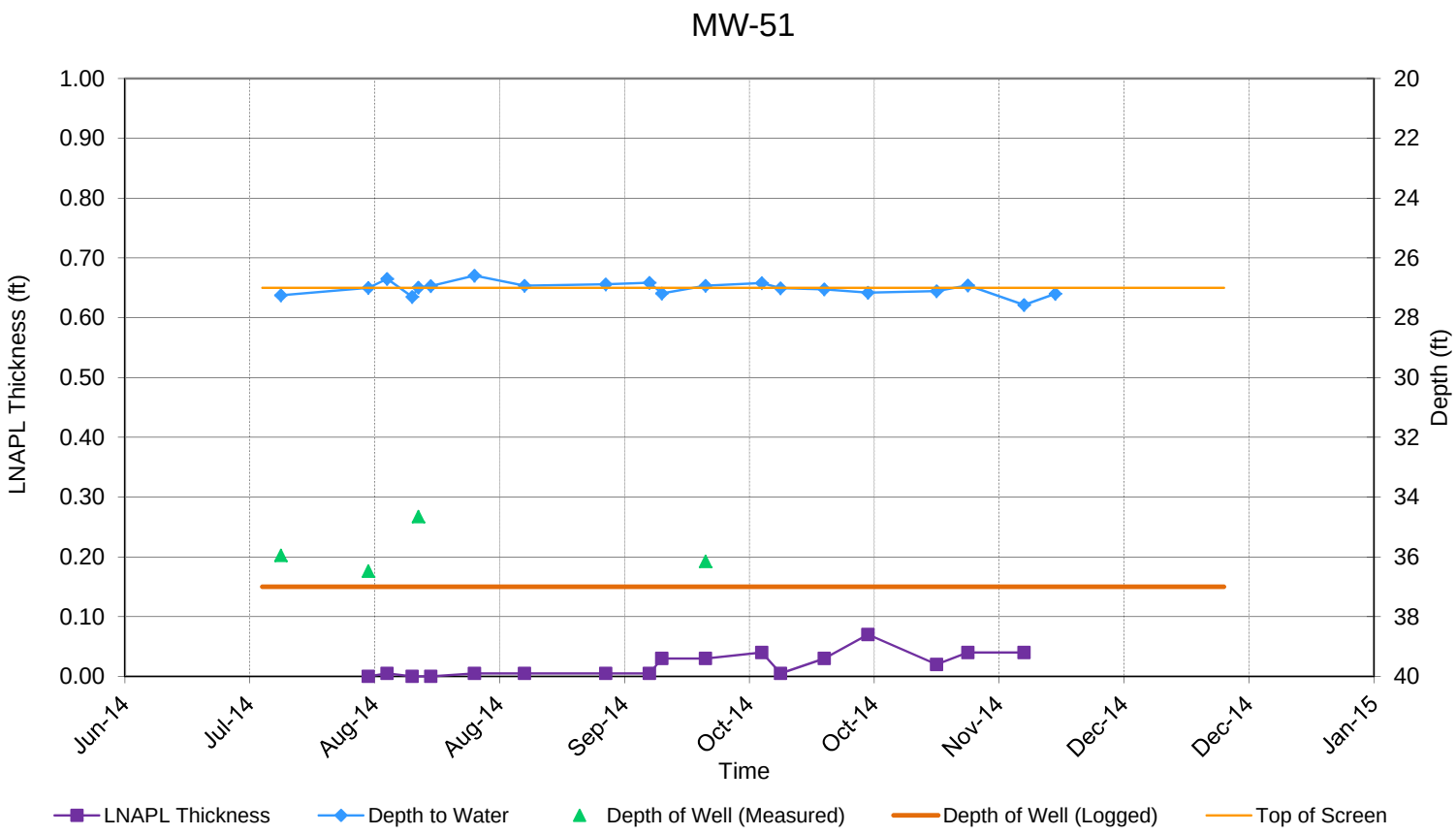


Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 36.00 **Top of Screen (ft):** 26.00

Note: MW-31 is the replacement well for TW-11

WATER LEVEL HYDROGRAPHS

Potomac River Generating Station
1400 North Royal St
Alexandria, VA



Monitoring well status: Active **Diameter (in):** 4 **Depth (ft):** 37.00 **Top of Screen (ft):** 27.00

APPENDIX B

Soil Boring Logs

BORING AND WELL COMPLETION LOG ID NO. RW-1

Groundwater & Environmental Services, Inc.

PROJECT: **Potomac River Generating Station**
ADDRESS: **1400 N Royal St, Alexandria, VA**
0402859

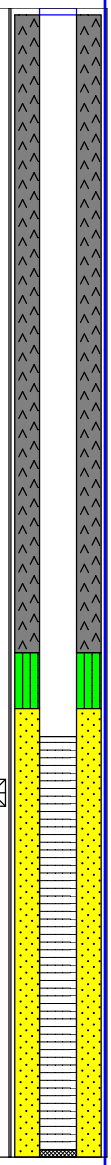
WATER DEPTH:
BOREHOLE DIA.: **10.5"**

TOTAL DEPTH: **41'**
CASING EL.:
WELL DIA.: **4"**

Logged By: **S. Christman**
Dates Drilled: **10/2/2014**
Drilling Company: **Odyssey**
Well Permit #:

Drilling Method: **Geoprobe 7822DT**
Sampling Method: **5' Acetate Sleeve**
Soil Class. System: **Unified Soil Classification System**
Field Screening: **PID, 10.6 eV Lamp**

Depth (feet)	Sample Interval (feet)	Field Screen: Total Organic Volatiles (ppm) 0–600	Recovery (feet)	Sample Lithology	Stratigraphy	Comments	Completion Details
0						Hand cleared from 0'-6'	Concrete 0'-1.0' with 10" Flush Mount Lid
5							Grout 1'-23'
10							4" Schedule 40 PVC Riser 0'-26'
15	15'-20'	0.0, 6.0, 1.8, 3.5		Tan SANDY SILT with gravel, moist to dry.	Sandy Silt		
20	20'-25'	2.7, 1.6, 10.8, 18.5	48"	Tan to grey SANDY SILT with angular gravel, fine to course grain, nonplastic, dry to moist.	Sandy Silt		Bentonite 23'-25'
25	25'-30'	388, 311, 18.7, 122	48"	Tan to brown SAND with sillt and angular and smooth gravel, moist to wet, odor.	Sand	Sample collected from 28'	
30	30'-35'	371, 435, 392, 10.8	36"	Tan SAND with angular to rounded gravel, moist, odor.	Sand		#2 Sand Pack 25'-41'
35	35'-40'	9.2, 138, 179, 115	48"				4" Schedule 40 PVC 0.02" Slot Screen 26'-41'
40	40'-41'	188, 115, 103, 30	36"				



LEGEND

Proportion Descriptions:
Trace = <10% Some = <50%
Little = <25% And = 50%

Symbol Key:
Water Level
Sample Location

" = inches
' = feet
ppm = parts per million
eV = electron volt

Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A, Odenton, Maryland 800.220.3606 Fax 410.721.3733

BORING AND WELL COMPLETION LOG ID NO. RW-2

Groundwater & Environmental Services, Inc.

PROJECT: **Potomac River Generating Station**
ADDRESS: **1400 N Royal St, Alexandria, VA**
0402859

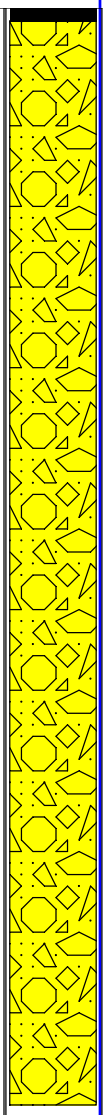
WATER DEPTH:
BOREHOLE DIA.: **10.5"**

TOTAL DEPTH: **21'**
CASING EL.:
WELL DIA.: **NA**

Logged By: **S. Christman**
Dates Drilled: **9/30/2014**
Drilling Company: **Odyssey**
Well Permit #:

Drilling Method: **Geoprobe 7822DT**
Sampling Method: **5' Acetate Sleeve**
Soil Class. System: **Unified Soil Classification System**
Field Screening: **PID, 10.6 eV Lamp**

Depth (feet)	Sample Interval (feet)	Field Screen: Total Organic Volatiles (ppm) 0 – 600	Recovery (feet)	Sample Lithology	Stratigraphy	Comments	Completion Details
0						Hand cleared from 0'-6'	Hole backfilled with native soils
5	6'-10'					No sample collection due to early refusal	
10	10'-15'						
15	15'-16.2					Sample refusal at 16.2'	
20						Auger refusal at 21' due to concrete	



LEGEND

Proportion Descriptions:
Trace = <10% Some = <50%
Little = <25% And = 50%

Symbol Key:
Water Level
Sample Location

" = inches
' = feet
ppm = parts per million
eV = electron volt

Well ID: RW-2

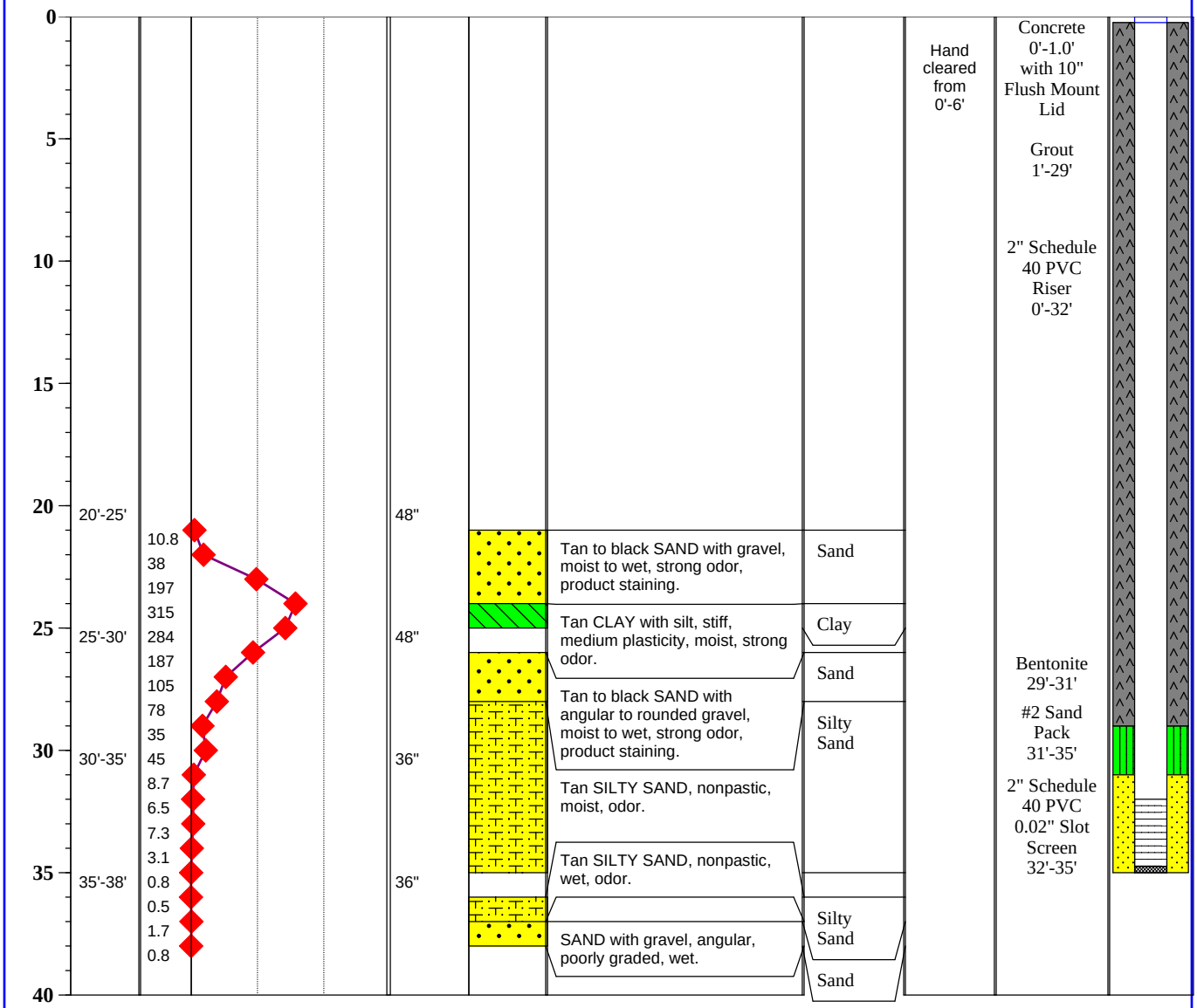
Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A, Odenton, Maryland 800.220.3606 Fax 410.721.3733

BORING AND WELL COMPLETION LOG ID NO. SP-1

Groundwater & Environmental Services, Inc.

PROJECT:	**Potomac River Generating Station**	WATER DEPTH:	TOTAL DEPTH: **35'**
ADDRESS:	**1400 N Royal St, Alexandria, VA**		CASING EL.:
0402859		BOREHOLE DIA.: **8.5"**	WELL DIA.: **2"**

Logged By:	**S. Christman**	Drilling Method:	**Geoprobe 7822DT**
Dates Drilled:	**10/2/2014**	Sampling Method:	**5' Acetate Sleeve**
Drilling Company:	**Odyssey**	Soil Class. System:	**Unified Soil Classification System**
Well Permit #:		Field Screening:	**PID, 10.6 eV Lamp**



LEGEND

Proportion Descriptions:

Trace = <10% Some = <50%

Little = <25% And = 50%

Symbol Key:

Water Level

Sample Location

" = inches

' = feet

ppm = parts per million

eV = electron volt

Well ID: SP-1

Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A, Odenton, Maryland 800.220.3606 Fax 410.721.3733

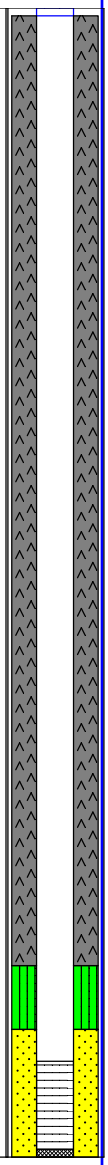
BORING AND WELL COMPLETION LOG ID NO. SP-2

Groundwater & Environmental Services, Inc.

PROJECT:	**Potomac River Generating Station**	WATER DEPTH:	TOTAL DEPTH: **36'**
ADDRESS:	**1400 N Royal St, Alexandria, VA**		CASING EL.:
0402859		BOREHOLE DIA.: **8.5"**	WELL DIA.: **2"**

Logged By:	**S. Christman**	Drilling Method:	**Geoprobe 7822DT**
Dates Drilled:	**9/30/2014**	Sampling Method:	**5' Acetate Sleeve**
Drilling Company:	**Odyssey**	Soil Class. System:	**Unified Soil Classification System**
Well Permit #:		Field Screening:	**PID, 10.6 eV Lamp**

Depth (feet)	Sample Interval (feet)	Field Screen: Total Organic Volatiles (ppm)	Recovery (feet)	Sample Lithology	Stratigraphy	Comments	Completion Details
0						Hand cleared from 0'-6'	Concrete 0'-1.0' with 10" Flush Mount Lid
5							Grout 1'-30'
10							2" Schedule 40 PVC Riser 0'-33'
15							
20	20'-25'	0, 0, 0, 18	60"	Tan SILT with clay and trace sand, moist.	Silt		
				Black SILT, stained with product, strong odor.			
25	25'-30'	195, 194, 85, 33, 10	48"	Tan CLAY with silt and trace gravel, medium plasticity, moist, odor.	Clay		Bentonite 30'-32'
				Tan SILT with trace clay, moist to wet, odor.	Silt		#2 Sand Pack 32'-36'
30	30'-35'	3.7, 18, 10, 9.2, 1.0, 0.8	48"	Tan to brown SILT with sand and gravel, moist.	Silt		2" Schedule 40 PVC 0.02" Slot Screen 33'-36'
				Tan SILT with sand, wet.	Silt		
35							



LEGEND

Proportion Descriptions:

Trace = <10% Some = <50%

Little = <25% And = 50%

Symbol Key:

Water Level

Sample Location

" = inches

' = feet

ppm = parts per million

eV = electron volt

Groundwater & Environmental Services, Inc.
1350 Blair Drive, Suite A, Odenton, Maryland 800.220.3606 Fax 410.721.3733

APPENDIX C

Laboratory Data – Soil

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

GES Maryland	Project:	NRG-PRGS	
1350 Blair Drive, Suite A	Project Number:	0402859-03-3202	**Reported:**
Odenton MD, 21113	Collector:	CLIENT	10/16/14 15:41
Project Manager: Greg Reichart	Number of Containers:	1	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Sample Type	Date Sampled	Date Received
RW-1-20140930	4J06044-01	Solid	Grab	09/30/14 17:45	10/06/14 15:30

Sample temperature exceeded the acceptable level, refer to receiving document. CB

Client Sample ID: **RW-1-20140930** **Date/Time Sampled:** 09/30/14 17:45

Laboratory Sample ID: **4J06044-01 (Solid/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Method	* Analyst	Note
Diesel Range Organics by EPA 8015								AA
Diesel Range Organics	2713		2684	mg/kg dry	10/08/14 09:53	EPA 8015D mod	rsr	
Conventional Chemistry Parameters by SM/EPA Methods								
% Solids	93.0		0.100	%	10/07/14 15:29	SM20-2540G	arr	

Fairway Laboratories, Inc.

Reviewed and Submitted by:

Michael P. Tyler
Laboratory Director

Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

2019 Ninth Avenue
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Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
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State Certifications: MD 275, WV 364

www.fairwaylaboratories.com

GES Maryland		Project:	NRG-PRGS	
1350 Blair Drive, Suite A		Project Number:	0402859-03-3202	**Reported:**
Odenton MD, 21113		Collector:	CLIENT	10/16/14 15:41
Project Manager:	Greg Reichart	Number of Containers:	1	

Notes

AA Due to the dilution required by the concentration of the target analyte, the surrogate is not recoverable for this sample.

Definitions

If surrogate values are not within the indicated range, then the results are considered to be estimated.

Reporting limits are adjusted accordingly when samples are analyzed at a dilution due to the matrix.

The following analyses are to be performed immediately upon sampling: pH, sulfite, chlorine residual, dissolved oxygen, filtration for ortho phosphorus, and ferrous iron. The date and time reported reflect the time the samples were analyzed at the laboratory.

MBAS, calculated as LAS, mol wt 348

If the solid sample weight for VOC analysis does not fall within the 3.5-6.5 gram range, the results are considered estimated values.

Samples collected by Fairway Laboratories' personnel are done so in accordance with Standard Operating Procedures established by Fairway Laboratories.

* P indicates analysis performed by Fairway Laboratories, Inc. at the Pennsdale location. This location is PaDEP Chapter 252 certified.

< Represents "less than" - indicates that the result was less than the reporting limit.

MDL Method Detection Limit - is the lowest or minimum level that provides 99% confidence level that the analyte is detected. Any reported result values that are less than the RL are considered estimated values.

RL Reporting Limit - is the lowest or minimum level at which the analyte can be quantified.

[CALC] Indicates a calculated result. Calculations use results from other analyses performed under accredited methods.

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The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

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FAIRWAY LABORATORIES
www.fairwaylaboratories.com

GES Maryland		Project:	NRG-PRGS	
1350 Blair Drive, Suite A		Project Number:	0402859-03-3202	**Reported:**
Odenton MD, 21113		Collector:	CLIENT	10/16/14 15:41
Project Manager:	Greg Reichart	Number of Containers:	1	

Terms & Conditions

Services provided by Fairway Laboratories Inc. are limited to the terms and conditions stated herein, unless otherwise agreed to in a formal contract.

CHAIN OF CUSTODY Fairway Laboratories Inc. ("Fairway," "us" or "we") will initiate a chain-of-custody/request for analysis upon sample receipt unless the client includes a completed form with the received sample(s). Upon request, Fairway will provide chain-of-custody forms for use.

CONFIDENTIALITY Fairway maintains confidentiality in all of our client interactions. The client's consent will be required before releasing information about the services provided.

CONTRACTS All contracts are subject to review and approval by Fairway's legal council. Each contract must be signed by a corporate officer.

PAYMENT/BILLING Unless otherwise set forth in a signed contract or purchase order, terms of payment are "NET 30 Days." The time allowed for payment shall begin based on the invoice date. A 1.5% per month service charge may be added to all unpaid balances beyond the initial 30 days. In its sole discretion, Fairway reserves the right to request payment before services and hold sample results for payment of due balances. We will not bill a third party without prior agreement among all parties acknowledging and accepting responsibility for payment.

SAMPLE COLLECTION AND SUBMISSION Clients not requesting collection services from Fairway are responsible for proper collection, preservation, packaging, and delivery of samples to the laboratory in accordance with current law and commercial practice. Fairway shall have no responsibility for sample integrity prior to the receipt of the sample(s) and/or for any inaccuracy in test or analyses results as a result of the failure of the client or any third party to maintain the integrity of samples prior to delivery to Fairway. All samples submitted must be accompanied by a completed chain of custody or similar document clearly noting the requested analyses, dates/time sampled, client contact information, and trail of custody.

SUBCONTRACTING Some analyses may require subcontracting to another laboratory. Unless the client indicates otherwise, this decision will be made by Fairway. Subcontracted work will be identified on the final report in accordance with NELAC requirements.

RETURN OF RESULTS Fairway routinely provides faxed or verbal results within 10 working days of receipt of sample(s) and a hard copy of the data results is routinely received via US Postal Service within 15 working days. At the request of the client, Fairway may offer expedited return of sample results. Surcharges may apply to rush requests. All rush requests must be pre-approved by Fairway. We reserve the right to charge an archive retrieval fee for results older than one (1) year from the date of the request. All records will be maintained by Fairway for 5 years, after which, they will be destroyed.

SAMPLE DISPOSAL Fairway will maintain samples for four (4) weeks after the sample receipt date. Fairway will dispose of samples which are not and/or do not contain hazardous wastes (as such term is defined by applicable federal or state law), unless prior arrangements have been made for long-term storage. Fairway reserves the right to charge a disposal fee for the proper disposal of samples found or suspected to contain hazardous waste. A return shipping charge will be invoiced for samples returned to the client at their request.

HAZARD COMMUNICATION The client has the responsibility to inform the laboratory of any hazardous characteristics known or suspected about the sample, and to provide information on hazard prevention and personal protection as necessary or otherwise required by applicable law.

WARRANTY AND LIMITATION OF LIABILITY For services rendered, Fairway warrants that it will apply its best scientific knowledge and judgment and to employ its best level of effort consistent with professional standards within the environmental testing industry in performing the analytical services requested by its clients. We disclaim any other warranties, expressed or implied by law. Fairway does not accept any legal responsibility for the purposes for which client uses the test results.

LITIGATION All costs associated with compliance to any subpoena for documents, for testimony in a court of law, or for any other purpose relating to work performed by Fairway Laboratories, Inc. shall be invoiced by Fairway and paid by client. These costs shall include, but are not limited to, hourly charges for the persons involved, travel, mileage, and accommodations and for any and all other expenses associated with said litigation.

Fairway Laboratories, Inc.

Fairway Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

Please print. See back of COC for instructions/terms and conditions.

2019 9th Ave.
P.O. Box 1925
Altoona, PA 16602
Phone: (814) 946-4306
Fax: (814) 946-8791

FAIRWAY LABORATORIES *Environmental Laboratory*

89 Kristi Rd
Pennsdale, PA 17756
Phone: (570) 494-6380

COC # 4J06044 #1

Page 1 of 2

Client Name: GES
Address: 1350 Blair Dr. Odenton MD 21113
Contact: Greg Reichart
Phone #: 800-220-3606 x 3717
Fax #:
Project Name: NRG-PRGS
Quote/PO #: 0402859-03-202

TAT: Normal ☒ Rush ☐
Rush TAT subject to pre-approval and surcharge.
Date Required: ___/___/___

Received on ice? Y N
Sample Temp: 11.2

Reportable to PADEP? Yes ☐
PWSID #

LAB USE ONLY
FedEx USPS
UPS Other
Tracking #

Sample Description/Location	GRAB	Composite	Composite Start: Start Date	Composite Start: Start Time	GRAB -or- Composite End: End Date	GRAB -or- Composite End: End Time	Matrix: Solid	Matrix: Water	Matrix: Other	# of Containers	Analyses Requested: TPH-DRO (8015B)							Bottle Type/Comments
RW-1	✓		~~9/30/14~~	~~1745~~ DW	9-30-14	1745	✓			1	✓							Sample Collected @ 28'

	Date	Time		Date	Time
Sampled by:	9/30/14	1745	Received by: Denise Woodring	10-3-14	1415
Relinquished by: Denise Woodring	10/6/14	1200	Received by: Justy R. Tate	10/6/14	12:00
Relinquished by: Justy R. Tate	10/6/14	15:30	Received by:		
Relinquished by:			Received by:	10/6/14	15:30

Remarks

Project Address: 1400 N Royal St. Alexandria VA
send results to: mdlabs@gesonline.com and ges@equisonline.com
EQEDD File Name: NRG-PRGS-Lab Report Number. 25800. EQEDD.zip

By relinquishing my sample to Fairway Laboratories, Inc., I hereby agree to the terms and conditions printed on the reverse.

White Original - FLI File Canary - FLI Copy Pink - Customer Receipt Copy

SOP FLI0601-002 Revision 18 Date: August 11, 2014 Page of

Chain of Custody Receiving Document

Page 2 of 2

Receiver: CA

Date/Time of this check: 10/6/14 15:45 Client: GES Lab # 1506044 #2

Received on ICE? Y ☐ * **Sample Temperature when delivered to the Lab:** 16.2 **Acceptable?** Y ☐ * **or In cool down process?** ☐ *

Custody Seals? Y Intact? Y

COC/Labels on bottles agree? Y ☐* Correct containers for all the analysis requested? Y ☐ * Matrix: Solid

COC #	Number and Type of BOTTLES										Comments
	Poly Non-Pres.	Poly H2SO4	Poly HNO3	Amber H2SO4	Amber Non-Pres.	Poly NaOH	VOCS (Head space?)	Other ☐ *	Properly Preserved ☐ *	Bacti	
RW-1								Y 0.2 g			

* DEVIATION PRESENT:	CLIENT CALLED:	CLIENT RESPONSE:
☹ No Ice ( )	YES ( ) E MAIL	Proceed with analysis; qualify data (X)
☹ Not at Proper Temperature ( )	By Whom: GREG	Will Resample ( )
☹ Wrong Container ( )		Provided Information ( )
☹ Missing Information: ( )	CINDY Date: 10/7	No Response; Proceed and qualified ( )
		Client Contact: GREG Date: 10/7

* Comments: High Temp

This is a date sensitive document and may not be current after October 6, 2014.

APPENDIX D

Waste Disposal Manifests

TRIUMVIRATE ENVIRONMENTAL BILL OF LADING

STRAIGHT BILL OF LADING
ORIGINAL - NOT NEGOTIABLE

BOL Document Number: BOL322947

TRANSPORTER:	**US EPA ID Number:**	**Phone:**
1 Triumvirate Environmental, Inc. 2	MAC300016672	617-628-8098
GENERATOR:	**US EPA ID Number:**	**Phone:**
NRG PO River 1400 North Royal Street Alexandria, VA 22314	VAD000731588	(800) 220-3606 x3708
FACILITY:	**US EPA ID Number:**	**Phone:**
Spirit Services, Inc. 16232 Elliott Parkway Williamsport, MD 21795	MDR000507863	(704) 568-1290

Received: _____ (Print Name) _____ (Signature) _____ (Date)

HM	Description of Articles or Proper Shipping Name	Containers No.	Containers Size	Containers Type	Weight	Unit Wt/Vol.
	Non-RCRA, Non-DOT Regulated Materials - Liquids (Petroleum Impacted Water) T-7011 SR 0" B 38" H	001 x	Tanker	TT	1889	G
		x				
		x				
		x				

This is to certify that the above-named materials are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation:

	Print Name	Signature	Date
GENERATOR: NRG PO River	ON BEHALF OF NRG X JEFF PLUMMER	X Jeff Plummer	10/27/14
TRANSPORTER: 1 Triumvirate Environmental, Inc. 2	Ron Kawecki	Ron Kawecki	10/27/14

ER #: (800) 966-9282
ERIP: Triumvirate Environmental, Inc.

Monitored at all times the Hazardous Materials is in transportation including storage to transportation. (172.604)

CLEANEARTH

Manifest # 1106301

GLOBAL JOB NUMBER: 134336 **FACILITY APPROVAL NUMBER:** 143190087

Please Check One:

- ☐ Clean Earth of Carteret, 24 Middlesex Avenue, Carteret, NJ 07008, Ph: 732-541-8909
- ☐ Clean Earth of Maryland, 1469 Oak Ridge Place, Hagerstown, MD 21740, Ph: 301-791-6220
- ☐ Clean Earth of New Castle, 94 Pyles Lane, New Castle, DE 19720, Ph: 302-427-6633
- ☒ Clean Earth of Greater Washington, 6250 Dower House Road, Upper Marlboro, MD 20772, Ph: 301-599-0939
- ☐ Clean Earth of Philadelphia, 3201 S. 61st Street, Philadelphia, PA 19153, Ph: 215-724-5520
- ☐ Clean Earth of North Jersey, 115 Jacobus Avenue, Kearny, NJ 07032, Ph: 973-344-4004
- ☐ Clean Earth of Southeast Pennsylvania, 7 Steel Road East, Morrisville, PA 19067, Ph: 215-428-1700
- ☐ Other _____

Non-Hazardous Material Manifest

(Type or Print Clearly)

GENERATOR'S NAME & SITE ADDRESS: NRG Potomac River Generating Station LLC	GROSS WEIGHT: ☐Tons ☐Yards	
1400 North Royal St	TARE WEIGHT: ☐Tons ☐Yards	
Alexandria VA		
GENERATOR'S PHONE: 703-859-5740	NET WEIGHT: ☐Tons ☐Yards	

DESCRIPTION OF MATERIAL/SAMPLE ID AND LOCATION

Hydrocarbon Impacted Soil from Drilling Monitoring Wells

~~14~~ 13 55 gallon Steel Drums

GENERATOR'S CERTIFICATION – Incomplete and/or unsigned manifests will cause the load to be delayed and/or rejected.

I hereby certify that the above named material does not contain free liquid as defined by 40 CFR Part 260.10 or any applicable state law, is not a hazardous waste as defined by 40 CFR Part 261 or any applicable state law, is not a DOT hazardous substance as defined by 49 CFR Part 172 or any applicable state law, has been fully and accurately described above, classified, packaged and is in proper condition for transportation according to all applicable state and federal regulations.

Name: Scott Andreasini on behalf of NRG PRGS LLC. Title: Environmental Scientist

Signature: [signature] Date and Time: 11/4/14 950

TRANSPORTER

Company: Clean Venture INC. Phone Number: 410 368-9170

Address: 2971 Whittington Ave. Truck # and License Plate: AM7891 NJ.

Driver: Balt MD. 21230 SW Haulers Permit #: 033553

(Type or Print Clearly) (applicable state permit #)

I hereby certify that the above named material was picked up at the site listed above.

Driver Signature: Jose Pagan Date and Time: 11/4/14 10:00

DESTINATION

I hereby certify that the above named material was delivered without incident to the facility noted above.

Driver Signature: _____ Date and Time: _____

I hereby certify that the above named material has been accepted at the above referenced facility.

Authorized Signature: _____ Date and Time: _____

GENERATOR

APPENDIX E

Laboratory Data – Groundwater

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 31, 2014

Project: NRG PRGS

Submittal Date: 10/21/2014
Group Number: 1512614
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-112S Grab Groundwater	7645187
MW-110S Grab Groundwater	7645188
MW-109S Grab Groundwater	7645189
MW-114 Grab Groundwater	7645190
MW-113 Grab Groundwater	7645191
MW-111 Grab Groundwater	7645192
MW-110 Grab Groundwater	7645193
MW-109 Grab Groundwater	7645194
MW-112 Grab Groundwater	7645195

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-112S Grab Groundwater
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645187
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 11:35 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

N112S

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	4.1 J	3.0	1
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	380	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	99.0	3.0	10
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	0.71	0.040	1
00219	Nitrite Nitrogen		14797-65-0	N.D.	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	25.0	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	0.13	0.010	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143010036A	10/28/2014 22:34	Elizabeth J Marin	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 13:59	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14295347601A	10/22/2014 12:08	Sandra J Miller	10
00220	Nitrate Nitrogen	EPA 353.2	1	14299106102B	10/26/2014 13:44	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14294105103A	10/21/2014 22:55	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14302002202A	10/29/2014 17:40	Michele L Graham	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14297834401A	10/24/2014 20:20	Daniel S Smith	1

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: **MW-110S Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645188
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 12:10 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

N110S

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	8,500	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 14:22	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-109S Grab Groundwater
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645189
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 12:20 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

N109S

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	1,000	15	5
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	12,000	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	18.8	1.5	5
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	N.D.	0.040	1
00219	Nitrite Nitrogen		14797-65-0	0.037 J	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	368	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	8.0	0.50	50

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143010036A	10/29/2014 19:59	Elizabeth J Marin	5
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 14:45	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14295347601A	10/22/2014 10:47	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106102B	10/26/2014 13:46	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14294105103A	10/21/2014 22:56	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002104A	10/25/2014 23:15	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14297834401A	10/24/2014 20:20	Daniel S Smith	50

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: **MW-114 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645190
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 13:00 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR114

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	16	3.0	1
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	N.D.	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	40.5	1.5	5
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	1.5	0.040	1
00219	Nitrite Nitrogen		14797-65-0	0.16	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	66.7	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	0.066	0.010	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143010036A	10/28/2014 23:08	Elizabeth J Marin	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 15:08	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14295347601A	10/22/2014 11:03	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106102B	10/26/2014 13:47	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14294105103A	10/21/2014 22:57	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002104A	10/25/2014 22:55	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14297834401A	10/24/2014 20:20	Daniel S Smith	1

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Analysis Report

Sample Description: **MW-113 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645191
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 14:25 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR113

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	61	J	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 15:31	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: **MW-111 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645192
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 14:35 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR111

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 15:54	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

Sample Description: **MW-110 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645193
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 14:40 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR110

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 16:18	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: **MW-109 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645194
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 14:50 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR109

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	200	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 16:41	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: **MW-112 Grab Groundwater**
1400 North Royal St - Alexandria, VA
NRG PRGS

LL Sample # WW 7645195
LL Group # 1512614
Account # 08390

Project Name: NRG PRGS

Collected: 10/20/2014 14:55 by NG

Submitted: 10/21/2014 17:40
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NR112

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 17:50	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512614
Reported: 10/31/14 at 03:56 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 143010036A	Sample number(s): 7645187,7645189-7645190							
Methane	N.D.	3.0	ug/l	93		85-115		
Batch number: 143010008A	Sample number(s): 7645187-7645195							
DRO C10-C28	N.D.	45.	ug/l	83	87	69-115	4	20
Batch number: 14294105103A	Sample number(s): 7645187,7645189-7645190							
Nitrite Nitrogen	N.D.	0.015	mg/l	101		90-110		
Batch number: 14295347601A	Sample number(s): 7645187,7645189-7645190							
Sulfate	N.D.	0.30	mg/l	101	101	90-110	0	20
Batch number: 14299106102B	Sample number(s): 7645187,7645189-7645190							
Nitrate Nitrogen	N.D.	0.040	mg/l	103		90-110		
Batch number: 14297834401A	Sample number(s): 7645187,7645189-7645190							
Ferrous Iron	N.D.	0.010	mg/l	100		93-105		
Batch number: 14298002104A	Sample number(s): 7645189-7645190							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	96		90-110		
Batch number: 14302002202A	Sample number(s): 7645187							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	98		90-110		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 143010036A	Sample number(s): 7645187,7645189-7645190 UNSPK: P644519								
Methane	75	85	46-129	14	20				
Batch number: 14294105103A	Sample number(s): 7645187,7645189-7645190 UNSPK: 7645190 BKG: 7645190								
Nitrite Nitrogen	102		90-110			0.16	0.16	3 (1)	20
Batch number: 14295347601A	Sample number(s): 7645187,7645189-7645190 UNSPK: 7645187 BKG: 7645187								
Sulfate	104		90-110			99.0	101	2	20

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512614
Reported: 10/31/14 at 03:56 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14299106102B	Sample number(s): 7645187,7645189-7645190 UNSPK: P644391 BKG: P644391								
Nitrate Nitrogen	96		90-110			0.63	0.64	2	2
Batch number: 14297834401A	Sample number(s): 7645187,7645189-7645190 UNSPK: P641729 BKG: P641729								
Ferrous Iron	98	101	73-111	2	6	9.3	9.6	3 (1)	5
Batch number: 14298002104A	Sample number(s): 7645189-7645190 UNSPK: P646469 BKG: P646469								
Total Alkalinity	83 (2)		17-146			1,090	1,090	0	5
Batch number: 14302002202A	Sample number(s): 7645187 UNSPK: P652729 BKG: P652729								
Total Alkalinity	57		17-146			513	515	0	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: DRO micro-ext 8015B
Batch number: 143010008A

	Orthoterphenyl
7645187	127
7645188	78
7645189	52
7645190	117
7645191	125
7645192	118
7645193	116
7645194	122
7645195	119
Blank	127
LCS	122
LCSD	125
Limits:	42-160

Analysis Name: Methane
Batch number: 143010036A

	Propene
7645187	86
7645189	87
7645190	85
Blank	103
LCS	101
MS	75
MSD	85
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512614
Reported: 10/31/14 at 03:56 PM

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Acct. # 8390 Group # 1512614 Sample # 7645187-95

Client: **Groundwater & Env. Services, Inc.**

Project Name/#: NRG PRGS | Site ID #: NRG PRGS

Project Manager: Gregory Reichart | P.O. #: 0402859

Sampler: Nick Guglielmi | PWSID #:

Phone #: 800-220-3606 x 3717 | Quote #: 212032A

State where sample(s) were collected: 1400 North Royal St., Alexandria, VA

For Lab Use Only

SF #: _____

SCR #: _____

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Sediment (Ground / Surface / Potable / NPDES)	Matrix: Water	Matrix: Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ ~~(EPA 353.2)~~ SM 3500 *	Sulfate SO42- ~~(SM 4500-F-B modified-1997)~~ 300.0*	Methane (RSKSOP-175 modified)	* LF 10/22/14	Remarks
										H							—	S	H	—	H	—	
MW-112S	10-20-14	1135	X				X		10	X							X	X	X	X	X		
MW-110S		1210							2														
MW-109S		1220							10								X	X	X	X	X		
MW-114		1300							10								X	X	X	X	X		
MW-113		1425							2														
MW-111		1435							2														
MW-110		1440							2														
MW-109		1450							2														
MW-112	10-20-14	1455	X				X		2	X													

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐

(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
Nick Guglielmi	10-20-14	1515	Jeff Plummer	10-20-14	1515
Jeff Plummer	10-20-14	1650	Denise Woodring	10-21-14	10:20
Denise Woodring	10-21-14	12:30	[illegible]	10/21/14	11:30
[illegible]	10/21/14	17:40	—		
—			[illegible]	10/21/14	1740

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 1.3 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35682

Group Number(s): 1512614

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/21/2014 17:40
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	Yes	VOA Vial Headspace ≥ 6mm:	No
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 18:17 on 10/21/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT131	1.3	DT	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17605-2425

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 03, 2014

Project: NRG PRGS

Submittal Date: 10/22/2014
Group Number: 1512948
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-105 Grab Groundwater	7646755
MW-104 Grab Groundwater	7646756
Trip Blank Water	7646757

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-105 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646755
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 11:50 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

105M-

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	N.D.		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.03	J	0.02	1
10262	Acenaphthylene	208-96-8	N.D.		0.02	1
10262	Anthracene	120-12-7	0.04	J	0.02	1
10262	Benzo(a)anthracene	56-55-3	0.1		0.02	1
10262	Benzo(a)pyrene	50-32-8	0.2		0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.3		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.1		0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.1		0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.1		0.02	1
10262	Biphenyl	92-52-4	0.02	J	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.07		0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.1		0.02	1
10262	C1-Fluorenes	n.a.	N.D.		0.02	1
10262	C1-Naphthalenes	n.a.	0.06		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	0.02	J	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.09		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	0.03	J	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C2-Fluorenes	n.a.	N.D.		0.02	1
10262	C2-Naphthalenes	n.a.	0.06		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	0.09		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.03	J	0.02	1
10262	C3-Fluorenes	n.a.	N.D.		0.02	1
10262	C3-Naphthalenes	n.a.	N.D.		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C4-Naphthalenes	n.a.	N.D.		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	Chrysene	218-01-9	0.2		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	0.04	J	0.02	1
10262	Dibenzofuran	132-64-9	0.03	J	0.02	1
10262	Dibenzothiophene	132-65-0	N.D.		0.02	1

Sample Description: MW-105 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646755
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 11:50 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

105M-

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Fluoranthene	206-44-0	0.4		0.02	1
10262	Fluorene	86-73-7	0.02	J	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.1		0.02	1
10262	1-Methylnaphthalene	90-12-0	0.05	J	0.02	1
10262	2-Methylnaphthalene	91-57-6	0.05	J	0.02	1
10262	Naphthalene	91-20-3	0.06		0.02	1
10262	Naphthobenzothiophene	224-10-2	0.04	J	0.02	1
10262	Perylene	198-55-0	0.04	J	0.02	1
10262	Phenanthrene	85-01-8	0.2		0.02	1
10262	Pyrene	129-00-0	0.3		0.02	1

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:

The sample was re-extracted outside the method required holding time and the QC is again outside acceptance limits. All results are reported from the first trial. Similar results were obtained in both trials.

GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.		20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	N.D.		45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**		**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.		0.20	1
05260	Coal Tar Oil	8001-58-9	N.D.		0.20	1
05260	Diesel/#2 Fuel	68334-30-5	N.D.		0.20	1
05260	#6 Fuel Oil	68553-00-4	N.D.		1.0	1
05260	Gasoline	8006-61-9	N.D.		0.20	1
05260	Kerosene	8008-20-6	N.D.		0.20	1
05260	Mineral Spirits	8030-30-6	N.D.		0.20	1
05260	Motor Oil	n.a.	N.D.		1.0	1
Wet Chemistry	**EPA 1664A**		**mg/l**		**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.		1.4	1
	SM 2130 B-2001		**N T U**		**N T U**	
12145	Turbidity	n.a.	2,520		14.0	100

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Analysis Report

Sample Description: MW-105 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646755
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 11:50 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

105M-

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 14:22	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 14:22	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 12:50	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297B94A	10/25/2014 17:47	Miranda P Tillinghast	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297B94A	10/25/2014 17:47	Miranda P Tillinghast	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 18:13	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/27/2014 21:19	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807901A	10/28/2014 08:30	Yolunder Y Bunch	1
12145	Turbidity	SM 2130 B-2001	1	14295121451A	10/22/2014 21:50	Luz M Groff	100

Sample Description: MW-104 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646756
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:20 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

104M-

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	0.7	J	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	2		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.1		0.02	1
10262	Acenaphthylene	208-96-8	0.02	J	0.02	1
10262	Anthracene	120-12-7	0.02	J	0.02	1
10262	Benzo(a)anthracene	56-55-3	0.04	J	0.02	1
10262	Benzo(a)pyrene	50-32-8	0.03	J	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.08		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.03	J	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.03	J	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.08		0.02	1
10262	Biphenyl	92-52-4	0.1		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.03	J	0.02	1
10262	C1-Dibenzothiophene	n.a.	0.1		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.06		0.02	1
10262	C1-Fluorenes	n.a.	0.2		0.02	1
10262	C1-Naphthalenes	n.a.	2		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.2		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	0.07		0.02	1
10262	C2-Fluorenes	n.a.	0.08		0.02	1
10262	C2-Naphthalenes	n.a.	2		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	0.2		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.03	J	0.02	1
10262	C3-Fluorenes	n.a.	N.D.		0.02	1
10262	C3-Naphthalenes	n.a.	1		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	0.2		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C4-Naphthalenes	n.a.	0.5		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	Chrysene	218-01-9	0.06		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.02	1
10262	Dibenzofuran	132-64-9	0.1		0.02	1
10262	Dibenzothiophene	132-65-0	0.1		0.02	1

Sample Description: MW-104 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646756
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:20 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

104M-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	0.1	0.02	1
10262	Fluorene	86-73-7	0.2	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.03 J	0.02	1
10262	1-Methylnaphthalene	90-12-0	1	0.02	1
10262	2-Methylnaphthalene	91-57-6	1	0.02	1
10262	Naphthalene	91-20-3	1	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	0.2	0.02	1
10262	Pyrene	129-00-0	0.08	0.02	1

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:

The sample was re-extracted outside the method required holding time and the QC is again outside of the acceptance limits. All results are reported from the first trial. Similar results were obtained in both trials.

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	59	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	150	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	0.20	1
05260	Coal Tar Oil	8001-58-9	N.D.	0.20	1
05260	Diesel/#2 Fuel	68334-30-5	0.34 J	0.20	1
05260	#6 Fuel Oil	68553-00-4	N.D.	1.0	1
05260	Gasoline	8006-61-9	N.D.	0.20	1
05260	Kerosene	8008-20-6	N.D.	0.20	1
05260	Mineral Spirits	8030-30-6	N.D.	0.20	1
05260	Motor Oil	n.a.	N.D.	1.0	1
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.	1.4	1
	SM 2130 B-2001		**N T U**	**N T U**	
12145	Turbidity	n.a.	3,250	14.0	100

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Analysis Report

Sample Description: MW-104 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646756
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:20 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

104M-

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 14:51	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 14:51	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 13:33	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297B94A	10/25/2014 18:13	Miranda P Tillinghast	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297B94A	10/25/2014 18:13	Miranda P Tillinghast	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 18:36	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/27/2014 22:08	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807901A	10/28/2014 08:30	Yolunder Y Bunch	1
12145	Turbidity	SM 2130 B-2001	1	14295121451B	10/22/2014 21:50	Luz M Groff	100

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Analysis Report

Sample Description: Trip Blank Water
NRG - PRGS

LL Sample # WW 7646757
LL Group # 1512948
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:19

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRGTB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 15:20	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 15:20	Anita M Dale	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512948
Reported: 11/03/14 at 09:19 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P142972AA	Sample number(s): 7646755-7646757							
Benzene	N.D.	0.5	ug/l	101		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	101		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	107		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	102		65-135		
Ethylbenzene	N.D.	0.5	ug/l	99		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	105		75-120		
Toluene	N.D.	0.5	ug/l	101		80-120		
Xylene (Total)	N.D.	0.5	ug/l	103		80-120		
Batch number: 14297WAE026	Sample number(s): 7646755-7646756							
Acenaphthene	N.D.	0.02	ug/l	79*	75*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	79	75	72-124	6	30
Anthracene	N.D.	0.02	ug/l	79	77	70-117	2	30
Benzo(a)anthracene	N.D.	0.02	ug/l	80	77	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	76	73	72-126	4	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	78	76	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	91	87	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	81	79	59-137	3	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	77	74	74-118	5	30
Biphenyl	N.D.	0.02	ug/l	90	86	74-101	4	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512948
Reported: 11/03/14 at 09:19 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	75*	72*	77-122	5	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	84	81	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	81	79	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	91	88	76-121	3	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	82	79	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	76	72*	75-117	5	30
2-Methylnaphthalene	N.D.	0.02	ug/l	77	73	68-124	5	30
Naphthalene	N.D.	0.02	ug/l	68*	76*	78-117	12	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	85	75	61-123	12	30
Phenanthrene	N.D.	0.02	ug/l	84	80	72-109	5	30
Pyrene	N.D.	0.02	ug/l	67*	69*	70-124	3	30
Batch number: 14297B94A	Sample number(s): 7646755-7646756							
TPH-GRO water C6-C10	N.D.	20.	ug/l	100	100	80-129	0	30
Batch number: 142980016A	Sample number(s): 7646755-7646756							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143010008A	Sample number(s): 7646755-7646756							
DRO C10-C28	N.D.	45.	ug/l	83	87	69-115	4	20
Batch number: 14295121451A	Sample number(s): 7646755							
Turbidity	0.15 J	0.14	N T U	93		90-110		
Batch number: 14295121451B	Sample number(s): 7646756							
Turbidity	0.15 J	0.14	N T U	93		90-110		
Batch number: 14301807901A	Sample number(s): 7646755-7646756							
HEM (oil & grease)	N.D.	1.4	mg/l	95	96	78-114	1	16

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: P142972AA	Sample number(s): 7646755-7646757 UNSPK: P647654								
Benzene	107	104	72-134	3	30				
t-Butyl alcohol	70 (2)	89 (2)	67-119	2	30				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512948
Reported: 11/03/14 at 09:19 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
1,2-Dibromoethane	102	102	77-116	0	30				
1,2-Dichloroethane	102	102	63-142	1	30				
Ethylbenzene	100	99	71-134	0	30				
Methyl Tertiary Butyl Ether	103	101	72-126	2	30				
Toluene	102	102	80-125	0	30				
Xylene (Total)	103	102	79-125	1	30				
Batch number: 14295121451A	Sample number(s): 7646755 BKG: P645676								
Turbidity						9.3	9.2	1	8
Batch number: 14295121451B	Sample number(s): 7646756 BKG: P646956								
Turbidity						0.59 J	0.59 J	1 (1)	8
Batch number: 14301807901A	Sample number(s): 7646755-7646756 UNSPK: P646167								
HEM (oil & grease)	86		78-114						

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: P142972AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7646755	102	100	100	100
7646756	101	97	99	100
7646757	101	98	98	99
Blank	100	97	99	99
LCS	100	101	100	100
MS	101	102	99	100
MSD	101	100	100	99
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14297WAE026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7646755	90	45	90
7646756	90	67	87
Blank	115	114	100
LCS	101	105	94
LCSD	97	100	90
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14297B94A

	Trifluorotoluene-F
7646755	98

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/03/14 at 09:19 AM

Group Number: 1512948

Surrogate Quality Control

7646756	84
Blank	84
LCS	102
LCSD	100
Limits:	63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7646755 1ST	66	70
7646756 1ST	69	68
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143010008A

	Orthoterphenyl
7646755	121
7646756	126
Blank	127
LCS	122
LCSD	125
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler # 13

Acct. # 8390 Group # 1512948 Sample # 7646755-57

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Nick Guglielmi	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

Matrix: Sediment ☐ Ground ☒ Surface ☐; Soil ☐ Potable ☐ NPDES ☐ Water; Other:

Preservation Codes: H = HCl; N = HNO_3; S = H_2SO_4; O = Other; T = Thiosulfate; B = NaOH; P = H_3PO_4

Sample Identification	Collection Date	Collection Time	Grab	Composite	Soil	Water	Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (EPA 353.2)	Sulfate SO42- (SM 3500-Fe B modified-1997)	Methane (RSKSOP-175 modified)	Remarks
Preservation Codes									H	H	H		H								
MW-105	10/21	1150	X			X		13	X	X	X	X	X	X	X						
MW-104	10/21	1220	X			X		13	X	X	X	X	X	X	X						
Trip Blank	10/16	—	X			X		2		X											

For Lab Use Only: SF #: ____ SCR #: ____

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report* #.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[illegible]	10-21-14	1535	Jeff Plummer	10-21-14	1535
Jeff Plummer	10-21-14	1745	Denise Woodring	10-22-14	0810
Denise Woodring	10-22-14	11:40	[illegible]	10/22/14	11:40
[illegible]	10/22/14	16:05	—		
—			[illegible]	10/22/14	1605

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35899

Group Number(s): 1512948

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/22/2014 16:05
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:10 on 10/22/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.6	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 31, 2014

Project: NRG PRGS

Submittal Date: 10/22/2014
Group Number: 1512950
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-102 Grab Groundwater	7646761
MW-100 Grab Groundwater	7646762
MW-100S Grab Groundwater	7646763
MW-70 Grab Groundwater	7646764

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: MW-102 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646761
LL Group # 1512950
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 11:55 by JP

Submitted: 10/22/2014 16:05
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGS1

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 19:46	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-100 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646762
LL Group # 1512950
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:00 by JP

Submitted: 10/22/2014 16:05
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGS2

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	60	J	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 20:09	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-100S Grab Groundwater
NRG - PRGS

LL Sample # WW 7646763
LL Group # 1512950
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:05 by JP

Submitted: 10/22/2014 16:05
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGS3

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 20:32	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-70 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646764
LL Group # 1512950
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 12:10 by JP

Submitted: 10/22/2014 16:05
Reported: 10/31/2014 15:56

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGS4

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 20:55	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512950
Reported: 10/31/14 at 03:56 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 143010008A	Sample number(s): 7646761-7646764							
DRO C10-C28	N.D.	45.	ug/l	83	87	69-115	4	20

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: DRO micro-ext 8015B
Batch number: 143010008A

	Orthoterphenyl
7646761	125
7646762	123
7646763	122
7646764	123
Blank	127
LCS	122
LCSD	125
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler #9

Acct. # 8390 Group # 1512950 Sample # 7646761-64

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Jeff Plummer	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

Matrix: Sediment ☐ Soil ☐ Ground ☒ Potable ☐ Surface ☐ NPDES ☐ Other:

Analyses Requested / Preservation Codes

Sample Identification	Collection Date	Collection Time	Grab	Composite	Soil	Water	Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (EPA 353.2)	Sulfate SO42- (SM 3500-Fe B modified-1997)	Methane (RSKSOP-175 modified)	Remarks
									H												
MW-102	10-21-14	1155	X			X		2	X												
MW-100	10-21-14	1200	X			X		2	X												
MW-100S	10-21-14	1205	X			X		2	X												
MW-70	10-21-14	1210	X			X		2	X												

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type VI (Raw Data Only) ☐ TX TRRP-13 ☐
NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD
EQEDD Name: NRG PRGS.*Lab report* #.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
Jeff Plummer	10-21-14	1745	Denise Woodring	10-22-14	0810
Denise Woodring	10-22-14	11:40	[illegible]	10/22/14	11:40
[illegible]	10/22/14	16:00			
			[illegible]		

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.2 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35902

Group Number(s): 1512950

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/22/2014 16:05
Number of Packages:	1	Number of Projects:	2
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:39 on 10/22/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.2	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 03, 2014

Project: NRG PRGS

Submittal Date: 10/22/2014
Group Number: 1512951
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-103 Grab Groundwater	7646765
TW-14 Grab Groundwater	7646766
Rinsate Blank Grab Water	7646767
Trip Blank Water	7646768

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-103 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646765
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:30 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

M-103

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	N.D.		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	N.D.		0.02	1
10262	Acenaphthylene	208-96-8	0.03	J	0.02	1
10262	Anthracene	120-12-7	0.06		0.02	1
10262	Benzo(a)anthracene	56-55-3	0.2		0.02	1
10262	Benzo(a)pyrene	50-32-8	0.2		0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.4		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.2		0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.2		0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.2		0.02	1
10262	Biphenyl	92-52-4	0.4		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.1		0.02	1
10262	C1-Dibenzothiophene	n.a.	0.09		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.2		0.02	1
10262	C1-Fluorenes	n.a.	N.D.		0.02	1
10262	C1-Naphthalenes	n.a.	0.4		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	0.08		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.4		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	0.09		0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C2-Fluorenes	n.a.	N.D.		0.02	1
10262	C2-Naphthalenes	n.a.	0.4		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	0.06		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	0.4		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.1		0.02	1
10262	C3-Fluorenes	n.a.	N.D.		0.02	1
10262	C3-Naphthalenes	n.a.	N.D.		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	0.1		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	0.3		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C4-Naphthalenes	n.a.	0.3		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	Chrysene	218-01-9	0.3		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	0.05	J	0.02	1
10262	Dibenzofuran	132-64-9	0.06		0.02	1
10262	Dibenzothiophene	132-65-0	0.06		0.02	1

Sample Description: MW-103 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646765
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:30 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

M-103

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Fluoranthene	206-44-0	0.5		0.02	1
10262	Fluorene	86-73-7	0.1		0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.2		0.02	1
10262	1-Methylnaphthalene	90-12-0	0.2		0.02	1
10262	2-Methylnaphthalene	91-57-6	0.3		0.02	1
10262	Naphthalene	91-20-3	N.D.		0.02	1
10262	Naphthobenzothiophene	224-10-2	0.06		0.02	1
10262	Perylene	198-55-0	0.06		0.02	1
10262	Phenanthrene	85-01-8	0.4		0.02	1
10262	Pyrene	129-00-0	0.3		0.02	1
	The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. Sufficient sample was not available to repeat the analysis.					
GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	26	J	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	54	J	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 17:14	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 17:14	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 15:44	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297C94A	10/26/2014 20:23	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297C94A	10/26/2014 20:23	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 21:18	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: TW-14 Grab Groundwater
NRG - PRGS

LL Sample # WW 7646766
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:55 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

TW-14

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	100	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	670	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 17:44	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 17:44	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297C94A	10/26/2014 20:49	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297C94A	10/26/2014 20:49	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 18:37	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: Rinsate Blank Grab Water
NRG - PRGS

LL Sample # WW 7646767
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGRB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	N.D.	0.02	1
10262	Acenaphthylene	208-96-8	0.06	0.02	1
10262	Anthracene	120-12-7	N.D.	0.02	1
10262	Benzo(a)anthracene	56-55-3	N.D.	0.02	1
10262	Benzo(a)pyrene	50-32-8	N.D.	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	N.D.	0.02	1
10262	Benzo(e)pyrene	192-97-2	N.D.	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	N.D.	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	N.D.	0.02	1
10262	Biphenyl	92-52-4	N.D.	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C1-Fluorenes	n.a.	N.D.	0.02	1
10262	C1-Naphthalenes	n.a.	N.D.	0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C2-Fluorenes	n.a.	N.D.	0.02	1
10262	C2-Naphthalenes	n.a.	N.D.	0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C3-Fluorenes	n.a.	N.D.	0.02	1
10262	C3-Naphthalenes	n.a.	N.D.	0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C4-Naphthalenes	n.a.	N.D.	0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	Chrysene	218-01-9	N.D.	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.02	1
10262	Dibenzofuran	132-64-9	N.D.	0.02	1
10262	Dibenzothiophene	132-65-0	N.D.	0.02	1

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Analysis Report

Sample Description: Rinsate Blank Grab Water
NRG - PRGS

LL Sample # WW 7646767
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGRB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	N.D.	0.02	1
10262	Fluorene	86-73-7	N.D.	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.02	1
10262	1-Methylnaphthalene	90-12-0	N.D.	0.02	1
10262	2-Methylnaphthalene	91-57-6	N.D.	0.02	1
10262	Naphthalene	91-20-3	N.D.	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	N.D.	0.02	1
10262	Pyrene	129-00-0	N.D.	0.02	1

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:

The sample was re-extracted outside the method required holding time and the QC is again outside acceptance limits.All results are reported from the first trial. Similar results were obtained in both trials.

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	1.5 J	1.4	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 18:13	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 18:13	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 16:28	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297C94A	10/26/2014 17:24	Marie D Beamenderfer	1

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Analysis Report

Sample Description: Rinsate Blank Grab Water
NRG - PRGS

LL Sample # WW 7646767
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by NG

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGRB

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01146	GC VOA Water Prep	SW-846 5030B	1	14297C94A	10/26/2014 17:24	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 19:00	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807901A	10/28/2014 08:30	Yolunder Y Bunch	1

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Analysis Report

Sample Description: Trip Blank Water
NRG - PRGS

LL Sample # WW 7646768
LL Group # 1512951
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 15:23

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PRGTB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 18:41	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 18:41	Anita M Dale	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512951
Reported: 11/03/14 at 03:23 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P142972AA	Sample number(s): 7646765-7646768							
Benzene	N.D.	0.5	ug/l	101		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	101		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	107		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	102		65-135		
Ethylbenzene	N.D.	0.5	ug/l	99		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	105		75-120		
Toluene	N.D.	0.5	ug/l	101		80-120		
Xylene (Total)	N.D.	0.5	ug/l	103		80-120		
Batch number: 14297WAE026	Sample number(s): 7646765,7646767							
Acenaphthene	N.D.	0.02	ug/l	79*	75*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	79	75	72-124	6	30
Anthracene	N.D.	0.02	ug/l	79	77	70-117	2	30
Benzo(a)anthracene	N.D.	0.02	ug/l	80	77	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	76	73	72-126	4	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	78	76	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	91	87	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	81	79	59-137	3	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	77	74	74-118	5	30
Biphenyl	N.D.	0.02	ug/l	90	86	74-101	4	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512951
Reported: 11/03/14 at 03:23 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	75*	72*	77-122	5	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	84	81	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	81	79	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	91	88	76-121	3	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	82	79	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	76	72*	75-117	5	30
2-Methylnaphthalene	N.D.	0.02	ug/l	77	73	68-124	5	30
Naphthalene	N.D.	0.02	ug/l	68*	76*	78-117	12	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	85	75	61-123	12	30
Phenanthrene	N.D.	0.02	ug/l	84	80	72-109	5	30
Pyrene	N.D.	0.02	ug/l	67*	69*	70-124	3	30
Batch number: 14297C94A	Sample number(s): 7646765-7646767							
TPH-GRO water C6-C10	N.D.	20.	ug/l	111		80-129		
Batch number: 143010008A	Sample number(s): 7646765							
DRO C10-C28	N.D.	45.	ug/l	83	87	69-115	4	20
Batch number: 143020003A	Sample number(s): 7646766-7646767							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14301807901A	Sample number(s): 7646767							
HEM (oil & grease)	N.D.	1.4	mg/l	95	96	78-114	1	16

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: P142972AA	Sample number(s): 7646765-7646768 UNSPK: P647654								
Benzene	107	104	72-134	3	30				
t-Butyl alcohol	70 (2)	89 (2)	67-119	2	30				
1,2-Dibromoethane	102	102	77-116	0	30				
1,2-Dichloroethane	102	102	63-142	1	30				
Ethylbenzene	100	99	71-134	0	30				
Methyl Tertiary Butyl Ether	103	101	72-126	2	30				
Toluene	102	102	80-125	0	30				
Xylene (Total)	103	102	79-125	1	30				
Batch number: 14297C94A	Sample number(s): 7646765-7646767 UNSPK: P647907								
TPH-GRO water C6-C10	122	126	75-135	3	30				
Batch number: 143020003A	Sample number(s): 7646766-7646767 UNSPK: P650761								
DRO C10-C28	98	94	47-129	1	20				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512951
Reported: 11/03/14 at 03:23 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14301807901A	Sample number(s): 7646767 UNSPK: P646167								
HEM (oil & grease)	86		78-114						

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: P142972AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7646765	102	97	99	100
7646766	100	97	100	102
7646767	100	99	99	99
7646768	102	100	99	98
Blank	100	97	99	99
LCS	100	101	100	100
MS	101	102	99	100
MSD	101	100	100	99
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14297WAE026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7646765	80	55	94
7646767	101	99	91
Blank	115	114	100
LCS	101	105	94
LCSD	97	100	90
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14297C94A

	Trifluorotoluene-F
7646765	83
7646766	81
7646767	80
Blank	96
LCS	96
MS	102
MSD	98
Limits:	63-135

Analysis Name: DRO micro-ext 8015B
Batch number: 143010008A

	Orthoterphenyl
7646765	125

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512951
Reported: 11/03/14 at 03:23 PM

Surrogate Quality Control

Blank	127
LCS	122
LCSD	125
Limits:	42-160

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7646766	126
7646767	122
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler # 9

Acct. # 8390 Group # 1512951 Sample # 7646765-68

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Nick Guglielmo	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Sediment	Matrix: Potable Water (Ground / Surface / NPDES)	Matrix: Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (EPA 353.2)	Sulfate SO42- (SM 3500-Fe B modified-1997)	Methane (RSKSOP-175 modified)	Remarks
Preservation Codes										H	H	H		H								
MW-103	10/21	1330	X	~~X~~			X		8	X	X	X	X									only 1 PAH bottle (low water volume)
TW-14	10/21	1355	X	~~X~~			X		7	X	X	X										
Rinsate Blank	10/21	1440	X				X		11	X	X	X	X	X								
Trip blank	10/16	—	X				X		2		X											

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
Nick Guglielmo	10-21-14	1535	Jeff Plummer	10-21-14	1535
Jeff Plummer	10-21-14	1745	Denise Woodring	10-22-14	0810
Denise Woodring	10-22-14	11:40	[illegible]	10/22/14	11:40
[illegible]	10/22/14	16:01	—		
—			[illegible]	10/22/14	1605

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.2 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35902

Group Number(s): 1512951

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/22/2014 16:05
Number of Packages:	1	Number of Projects:	2
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:39 on 10/22/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.2	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 04, 2014

Project: NRG PRGS

Submittal Date: 10/23/2014
Group Number: 1513323
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-106 Grab Groundwater	7648419
MW-107 Grab Groundwater	7648420
MW-14 Grab Groundwater	7648421
MW-15S Grab Groundwater	7648422
MW-11 Grab Groundwater	7648423
MW-10S Grab Groundwater	7648424
Trip Blank Water	7648425

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-106 Grab Groundwater
NRG PRGS

LL Sample # WW 7648419
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 08:40 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

106MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	1	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	3	0.2	10
10262	Acenaphthylene	208-96-8	N.D.	0.2	10
10262	Anthracene	120-12-7	3	0.2	10
10262	Benzo(a)anthracene	56-55-3	2	0.2	10
10262	Benzo(a)pyrene	50-32-8	0.7	0.2	10
10262	Benzo(b)fluoranthene	205-99-2	1	0.2	10
10262	Benzo(e)pyrene	192-97-2	0.7	0.2	10
10262	Benzo(g,h,i)perylene	191-24-2	0.6	0.2	10
10262	Benzo(k)fluoranthene	207-08-9	0.6	0.2	10
10262	Biphenyl	92-52-4	14	0.2	10
10262	C1-Benzanthrene/chrysenes	n.a.	2	0.2	10
10262	C1-Dibenzothiophene	n.a.	16	0.2	10
10262	C1-Fluoranthrenes/pyrenes	n.a.	16	0.2	10
10262	C1-Fluorenes	n.a.	34	0.2	10
10262	C1-Naphthalenes	n.a.	43	0.2	10
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.2	10
10262	C1-Phenanthrenes/anthracenes	n.a.	75	0.2	10
10262	C2-Benzanthrene/chrysenes	n.a.	1	0.2	10
10262	C2-Dibenzothiophene	n.a.	36	0.2	10
10262	C2-Fluoranthrenes/pyrenes	n.a.	11	0.2	10
10262	C2-Fluorenes	n.a.	51	0.2	10
10262	C2-Naphthalenes	n.a.	120	0.2	10
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.2	10
10262	C2-Phenanthrenes/anthracenes	n.a.	110	0.2	10
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.2	10
10262	C3-Dibenzothiophene	n.a.	27	0.2	10
10262	C3-Fluoranthrenes/pyrenes	n.a.	5	0.2	10
10262	C3-Fluorenes	n.a.	65	0.2	10
10262	C3-Naphthalenes	n.a.	210	0.2	10
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.2	10
10262	C3-Phenanthrenes/anthracenes	n.a.	67	0.2	10
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.2	10
10262	C4-Dibenzothiophene	n.a.	N.D.	0.2	10
10262	C4-Fluoranthrenes/pyrenes	n.a.	2	0.2	10
10262	C4-Naphthalenes	n.a.	220	0.2	10
10262	C4-Phenanthrenes/anthracenes	n.a.	29	0.2	10
10262	Chrysene	218-01-9	2	0.2	10
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.2	10
10262	Dibenzofuran	132-64-9	N.D.	0.2	10
10262	Dibenzothiophene	132-65-0	2	0.2	10

Sample Description: MW-106 Grab Groundwater
NRG PRGS

LL Sample # WW 7648419
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 08:40 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

106MW

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Fluoranthene	206-44-0	7		0.2	10
10262	Fluorene	86-73-7	6		0.2	10
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.5	J	0.2	10
10262	1-Methylnaphthalene	90-12-0	30		0.2	10
10262	2-Methylnaphthalene	91-57-6	31		0.2	10
10262	Naphthalene	91-20-3	23		0.2	10
10262	Naphthobenzothiophene	224-10-2	0.5	J	0.2	10
10262	Perylene	198-55-0	N.D.		0.2	10
10262	Phenanthrene	85-01-8	12		0.2	10
10262	Pyrene	129-00-0	11		0.2	10

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:
The sample was re-extracted and the QC is again outside of the acceptance limits. The data is reported from the initial trial.

GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	230		20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	2,000		45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time		Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014	10:54	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014	10:54	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/28/2014	10:54	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014	16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14298B20A	10/27/2014	19:44	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14298B20A	10/27/2014	19:44	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014	19:23	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014	13:00	Wanda F Oswald	1

Sample Description: MW-107 Grab Groundwater
NRG PRGS

LL Sample # WW 7648420
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 09:05 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

107MW

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	2		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	2		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.07		0.02	1
10262	Acenaphthylene	208-96-8	0.03	J	0.02	1
10262	Anthracene	120-12-7	0.07		0.02	1
10262	Benzo(a)anthracene	56-55-3	0.03	J	0.02	1
10262	Benzo(a)pyrene	50-32-8	N.D.		0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.06		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.03	J	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	N.D.		0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.05	J	0.02	1
10262	Biphenyl	92-52-4	0.4		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.06		0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.6		0.02	1
10262	C1-Fluorenes	n.a.	N.D.		0.02	1
10262	C1-Naphthalenes	n.a.	0.6		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.5		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	0.4		0.02	1
10262	C2-Fluorenes	n.a.	1		0.02	1
10262	C2-Naphthalenes	n.a.	1		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	3		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.1		0.02	1
10262	C3-Fluorenes	n.a.	3		0.02	1
10262	C3-Naphthalenes	n.a.	2		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	2		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	0.05		0.02	1
10262	C4-Naphthalenes	n.a.	5		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	Chrysene	218-01-9	0.06		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.02	1
10262	Dibenzofuran	132-64-9	0.09		0.02	1
10262	Dibenzothiophene	132-65-0	0.09		0.02	1

Sample Description: MW-107 Grab Groundwater
NRG PRGS

LL Sample # WW 7648420
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 09:05 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

107MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	0.05 J	0.02	1
10262	Fluorene	86-73-7	0.2	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.02	1
10262	1-Methylnaphthalene	90-12-0	0.4	0.02	1
10262	2-Methylnaphthalene	91-57-6	0.7	0.02	1
10262	Naphthalene	91-20-3	0.9	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	0.1	0.02	1
10262	Pyrene	129-00-0	0.3	0.02	1
	The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. Sufficient sample was not available to repeat the analysis.				
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	49 J	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	840	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 11:16	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 11:16	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 17:56	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14298B20A	10/27/2014 18:22	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14298B20A	10/27/2014 18:22	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 19:46	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-14 Grab Groundwater
NRG PRGS

LL Sample # WW 7648421
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 10:30 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

14-M-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,100	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 20:09	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-15S Grab Groundwater
NRG PRGS

LL Sample # WW 7648422
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 10:45 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

15SMW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,800	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 21:42	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-11 Grab Groundwater
NRG PRGS

LL Sample # WW 7648423
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:00 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

11-MW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	120	3.0	1
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	840	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	71.9	1.5	5
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	N.D.	0.040	1
00219	Nitrite Nitrogen		14797-65-0	N.D.	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	55.0	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	0.059	0.010	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 01:19	Elizabeth J Marin	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 22:05	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/25/2014 02:57	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:11	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:31	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002105A	10/26/2014 02:57	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	1

Sample Description: MW-10S Grab Groundwater NRG PRGS

LL Sample # WW 7648424
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:25 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

10SMW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	1,100	15	5
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	100,000	45	2
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	33.1	1.5	5
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	N.D.	0.040	1
00219	Nitrite Nitrogen		14797-65-0	0.037 J	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	461	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	62.8	1.0	100

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 21:07	Elizabeth J Marin	5
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 08:17	Christine E Dolman	2
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/25/2014 03:13	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:13	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:35	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002105A	10/26/2014 03:03	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	100

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7648425
LL Group # 1513323
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:35

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

PR-TB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	D143012AA	10/28/2014 16:41	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D143012AA	10/28/2014 16:41	Daniel H Heller	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513323
Reported: 11/04/14 at 11:35 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D143012AA	Sample number(s): 7648425							
Benzene	N.D.	0.5	ug/l	109	107	78-120	2	30
t-Butyl alcohol	N.D.	2.	ug/l	92	93	75-120	0	30
1,2-Dibromoethane	N.D.	0.5	ug/l	102	100	80-120	3	30
1,2-Dichloroethane	N.D.	0.5	ug/l	103	101	65-135	2	30
Ethylbenzene	N.D.	0.5	ug/l	100	98	79-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	108	106	75-120	2	30
Toluene	N.D.	0.5	ug/l	102	99	80-120	3	30
Xylene (Total)	N.D.	0.5	ug/l	103	100	80-120	3	30
Batch number: F143021AA	Sample number(s): 7648419-7648420							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14297WAE026	Sample number(s): 7648419-7648420							
Acenaphthene	N.D.	0.02	ug/l	79*	75*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	79	75	72-124	6	30
Anthracene	N.D.	0.02	ug/l	79	77	70-117	2	30
Benzo(a)anthracene	N.D.	0.02	ug/l	80	77	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	76	73	72-126	4	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	78	76	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	91	87	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	81	79	59-137	3	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	77	74	74-118	5	30
Biphenyl	N.D.	0.02	ug/l	90	86	74-101	4	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513323
Reported: 11/04/14 at 11:35 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	75*	72*	77-122	5	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	84	81	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	81	79	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	91	88	76-121	3	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	82	79	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	76	72*	75-117	5	30
2-Methylnaphthalene	N.D.	0.02	ug/l	77	73	68-124	5	30
Naphthalene	N.D.	0.02	ug/l	68*	76*	78-117	12	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	85	75	61-123	12	30
Phenanthrene	N.D.	0.02	ug/l	84	80	72-109	5	30
Pyrene	N.D.	0.02	ug/l	67*	69*	70-124	3	30
Batch number: 14298B20A	Sample number(s): 7648419-7648420							
TPH-GRO water C6-C10	N.D.	20.	ug/l	105	103	80-129	2	30
Batch number: 143020018A	Sample number(s): 7648423-7648424							
Methane	N.D.	3.0	ug/l	105		85-115		
Batch number: 143020003A	Sample number(s): 7648419-7648424							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14296105103A	Sample number(s): 7648423-7648424							
Nitrite Nitrogen	N.D.	0.015	mg/l	98		90-110		
Batch number: 14297347902A	Sample number(s): 7648423-7648424							
Sulfate	N.D.	0.30	mg/l	94		90-110		
Batch number: 14299106104B	Sample number(s): 7648423-7648424							
Nitrate Nitrogen	N.D.	0.040	mg/l	100		90-110		
Batch number: 14298002105A	Sample number(s): 7648423-7648424							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	94		90-110		
Batch number: 14302834401A	Sample number(s): 7648423-7648424							
Ferrous Iron	N.D.	0.010	mg/l	97		93-105		

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513323
Reported: 11/04/14 at 11:35 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7648419-7648420 UNSPK: P650761								
Benzene	91	89	72-134	3	30				
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 143020018A	Sample number(s): 7648423-7648424 UNSPK: P647543								
Methane	68	91	46-129	6	20				
Batch number: 143020003A	Sample number(s): 7648419-7648424 UNSPK: P650761								
DRO C10-C28	98	94	47-129	1	20				
Batch number: 14296105103A	Sample number(s): 7648423-7648424 UNSPK: 7648423 BKG: 7648423								
Nitrite Nitrogen	101		90-110			N.D.	N.D.	0 (1)	20
Batch number: 14297347902A	Sample number(s): 7648423-7648424 UNSPK: P648430 BKG: P648430								
Sulfate	122*		90-110			80.3	84.7	5	20
Batch number: 14299106104B	Sample number(s): 7648423-7648424 UNSPK: P647559 BKG: P647559								
Nitrate Nitrogen	108		90-110			N.D.	N.D.	0 (1)	2
Batch number: 14298002105A	Sample number(s): 7648423-7648424 UNSPK: P645309 BKG: P645309								
Total Alkalinity	89		17-146			91.3	90.9	0	5
Batch number: 14302834401A	Sample number(s): 7648423-7648424 UNSPK: P646102 BKG: P646102								
Ferrous Iron	92	98	73-111	4	6	11.0	11.3	2 (1)	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: D143012AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7648425	108	97	91	97
Blank	104	96	93	97
LCS	103	98	93	103
LCSD	103	96	92	102
Limits:	80-116	77-113	80-113	78-113

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513323
Reported: 11/04/14 at 11:35 AM

Surrogate Quality Control

7648419	103	100	98	98
7648420	102	101	97	96
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14297WAE026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7648419	112	55	0*
7648420	102	71	102
Blank	115	114	100
LCS	101	105	94
LCSD	97	100	90
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14298B20A

	Trifluorotoluene-F
7648419	102
7648420	99
Blank	90
LCS	96
LCSD	95
Limits:	63-135

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7648419	128
7648420	117
7648421	123
7648422	81
7648423	123
7648424	361*
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

Analysis Name: Methane
Batch number: 143020018A

	Propene
7648423	80
7648424	88
Blank	105
LCS	107
MS	81
MSD	89
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/04/14 at 11:35 AM

Group Number: 1513323

Surrogate Quality Control

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler # 23

Acct. # 8390 Group # 1513323 Sample # 7646419-25

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Nick Guglielmo	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A

State where sample(s) were collected: 1400 North Royal St., Alexandria, VA

Matrix: Sediment ☐ Soil ☐ Ground ☒ Surface ☐ Potable ☐ NPDES ☐ Water ☒ Other:

Analyses Requested / Preservation Codes

Sample Identification	Collection Date	Collection Time	Grab	Composite	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (EPA 6332) (SM 3500)	Sulfate SO42- (SM 3500-Fe B modified 1997) (EPA 300.0)	Methane (RSKSOP-175 modified)	
Preservation Codes						H	H	H		H				S	H		H	
MW-106	10-22	0840	X		9	X	X	X	X									
MW-107	10-22	0905	X		8	X	X	X	X									
MW-14	10-22	1030	X		2	X												
MW-15S	10-22	1045	X		2	X												
MW-11	10-22	1100	X		10	X							X	X	X	X	X	
MW-10S	10-22	1125	X		10	X							X	X	X	X	X	
Trip blank	10-16	—			2		X											

For Lab Use Only
SF #:
SCR #:

Preservation Codes: H = HCl, T = Thiosulfate, N = HNO_3, B = NaOH, S = H_2SO_4, P = H_3PO_4, O = Other

Remarks: only 1 PAH bottle collected

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type VI (Raw Data Only) ☐ TX TRRP-13 ☐
NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD
EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-22-14	1405	[signature]	10-22-14	1405
[signature]	10-22-14	1545	[signature]	10-22-14	1615
[signature]	10-23-14	15:30	[signature]	10/23/14	15:30
[signature]	10/23/14	16:25	—		
—			[signature]	10/23/14	1625

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 36199

Group Number(s): 1513323

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/23/2014 16:25
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:09 on 10/23/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.6	DT	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 03, 2014

Project: NRG PRGS

Submittal Date: 10/23/2014
Group Number: 1513324
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-08S Grab Groundwater	7648426
RW-1 Grab Groundwater	7648427
MW-01S Grab Groundwater	7648428
MW-51S Grab Groundwater	7648429
MW-72S Grab Groundwater	7648430
MW-52 Grab Groundwater	7648431

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: MW-08S Grab Groundwater
NRG PRGS

LL Sample # WW 7648426
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 10:50

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW08S

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	52,000	45	1

The surrogate data is outside the QC limits due to unresolvable matrix problems evident in the sample chromatogram.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 22:51	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: RW-1 Grab Groundwater
NRG PRGS

LL Sample # WW 7648427
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:00

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRRW1

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	30,000	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 23:14	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-01S Grab Groundwater
NRG PRGS

LL Sample # WW 7648428
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:10

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

01SMW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	4,200	150	50
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	23,000	45	1
	The surrogate data is outside the QC limits due to unresolvable matrix problems evident in the sample chromatogram.					
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	130	6.0	20
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	0.044 J	0.040	1
00219	Nitrite Nitrogen		14797-65-0	0.037 J	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	306	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	31.4	1.0	100

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 21:25	Elizabeth J Marin	50
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 23:38	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/27/2014 09:29	Sandra J Miller	20
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:14	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:36	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002105A	10/26/2014 01:45	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	100

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Analysis Report

Sample Description: MW-51S Grab Groundwater NRG PRGS

LL Sample # WW 7648429
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:25

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

51SMW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	7,100	150	50
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	8,400	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	36.3	1.5	5
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	0.047 J	0.040	1
00219	Nitrite Nitrogen		14797-65-0	N.D.	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	564	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	28.7	0.50	50

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 21:44	Elizabeth J Marin	50
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 00:01	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/25/2014 03:45	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:15	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:37	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002104A	10/25/2014 23:22	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	50

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Analysis Report

Sample Description: MW-72S Grab Groundwater NRG PRGS

LL Sample # WW 7648430
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 11:40

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

72SMW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Miscellaneous		**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane		74-82-8	4,400	60	20
GC Petroleum Hydrocarbons		**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28		n.a.	3,300	45	1
Wet Chemistry		**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate		14808-79-8	80.3	3.0	10
		EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	0.093 J	0.040	1
00219	Nitrite Nitrogen		14797-65-0	0.019 J	0.015	1
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	328	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	9.1	0.50	50

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 22:03	Elizabeth J Marin	20
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 00:24	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/25/2014 09:42	Sandra J Miller	10
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:16	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:38	James S Mathiot	1
12150	Total Alkalinity	SM 2320 B-1997	1	14298002105A	10/26/2014 02:21	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	50

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Analysis Report

Sample Description: MW-52 Grab Groundwater
NRG PRGS

LL Sample # WW 7648431
LL Group # 1513324
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 13:40

Submitted: 10/23/2014 16:25
Reported: 11/03/2014 15:27

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

52-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	120	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 00:47	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513324
Reported: 11/03/14 at 03:27 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 143020018A	Sample number(s): 7648428-7648430							
Methane	N.D.	3.0	ug/l	105		85-115		
Batch number: 143020003A	Sample number(s): 7648426-7648431							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14296105103A	Sample number(s): 7648428-7648430							
Nitrite Nitrogen	N.D.	0.015	mg/l	98		90-110		
Batch number: 14297347902A	Sample number(s): 7648428-7648430							
Sulfate	N.D.	0.30	mg/l	94		90-110		
Batch number: 14299106104B	Sample number(s): 7648428-7648430							
Nitrate Nitrogen	N.D.	0.040	mg/l	100		90-110		
Batch number: 14298002104A	Sample number(s): 7648429							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	96		90-110		
Batch number: 14298002105A	Sample number(s): 7648428,7648430							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	94		90-110		
Batch number: 14302834401A	Sample number(s): 7648428-7648430							
Ferrous Iron	N.D.	0.010	mg/l	97		93-105		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 143020018A	Sample number(s): 7648428-7648430 UNSPK: P647543								
Methane	68	91	46-129	6	20				
Batch number: 143020003A	Sample number(s): 7648426-7648431 UNSPK: P650761								
DRO C10-C28	98	94	47-129	1	20				
Batch number: 14296105103A	Sample number(s): 7648428-7648430 UNSPK: P648423 BKG: P648423								
Nitrite Nitrogen	101		90-110			N.D.	N.D.	0 (1)	20

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513324
Reported: 11/03/14 at 03:27 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14297347902A	Sample number(s): 7648428-7648430 UNSPK: 7648430 BKG: 7648430								
Sulfate	122*		90-110			80.3	84.7	5	20
Batch number: 14299106104B	Sample number(s): 7648428-7648430 UNSPK: P647559 BKG: P647559								
Nitrate Nitrogen	108		90-110			N.D.	N.D.	0 (1)	2
Batch number: 14298002104A	Sample number(s): 7648429 UNSPK: P646469 BKG: P646469								
Total Alkalinity	83 (2)		17-146			1,090	1,090	0	5
Batch number: 14298002105A	Sample number(s): 7648428,7648430 UNSPK: P645309 BKG: P645309								
Total Alkalinity	89		17-146			91.3	90.9	0	5
Batch number: 14302834401A	Sample number(s): 7648428-7648430 UNSPK: P646102 BKG: P646102								
Ferrous Iron	92	98	73-111	4	6	11.0	11.3	2 (1)	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7648426	190*
7648427	157
7648428	188*
7648429	146
7648430	120
7648431	125
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

Analysis Name: Methane
Batch number: 143020018A

	Propene
7648428	105
7648429	103
7648430	102
Blank	105
LCS	107
MS	81
MSD	89
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/03/14 at 03:27 PM

Group Number: 1513324

Surrogate Quality Control

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

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Environmental Analysis Request/Chain of Custody

GW-10/23/14 Cooler #2

Acct. # X8390 Group # 1513324 Sample # 7648426-31

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler:	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

For Lab Use Only
SF #:
SCR #:

Preservation Codes: H = HCl; N = HNO_3; S = H_2SO_4; O = Other; T = Thiosulfate; B = NaOH; P = H_3PO_4

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Sediment	Matrix: Water (Ground / Potable / Surface / NPDES)	Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE, TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (~~EPA 353.2~~) (SM3500)	Sulfate SO42- (~~SM 3500 Fe B modified 1997~~) (EPA 300.0)	Methane (RSKSOP-175 modified)	Remarks
										H							—	S	H		H	
MW-08S	10-22-14	1050	X				X		2	X												
RW-1	↓	1100	↓				↓		2	X												
MW-01S		1110							10	X							X	X	X	X	X	
MW-51S		1125							10	X							X	X	X	X	X	
MW-72S	↓	1140	↓				↓		10	X							X	X	X	X	X	
MW-52	10-22-14	1340	X				X		2	X												

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type VI (Raw Data Only) ☐ TX TRRP-13 ☐
NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD
EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-22-14	1545	Denise Woodring	10-22-14	1615
Denise Woodring	10-23-14	1130	[signature]	10/23/14	1330
[signature]	10/23/14	16:0			
			[signature]	10/27/14	1625

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 1.1 °C

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7045 0614

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Sample Administration Receipt Documentation Log

Doc Log ID: 36202

Group Number(s): 1S13324

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/23/2014 16:25
Number of Packages:	1	Number of Projects:	2
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	0
Paperwork Enclosed:	Yes	Air Quality Samples Present:	No
Samples Intact:	Yes		
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:19 on 10/23/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	1.1	DT	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 04, 2014

Project: NRG PRGS

Submittal Date: 10/23/2014
Group Number: 1513325
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-72 Grab Groundwater	7648432
MW-16 Grab Groundwater	7648433
Trip Blank Water	7648434

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-72 Grab Groundwater
NRG PRGS

LL Sample # WW 7648432
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 12:40 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

72-MW

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	41		0.5	1
10945	t-Butyl alcohol	75-65-0	2	J	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	1		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	0.6	J	0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	66		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.3	J	0.2	10
10262	Acenaphthylene	208-96-8	N.D.		0.2	10
10262	Anthracene	120-12-7	N.D.		0.2	10
10262	Benzo(a)anthracene	56-55-3	N.D.		0.2	10
10262	Benzo(a)pyrene	50-32-8	N.D.		0.2	10
10262	Benzo(b)fluoranthene	205-99-2	N.D.		0.2	10
10262	Benzo(e)pyrene	192-97-2	N.D.		0.2	10
10262	Benzo(g,h,i)perylene	191-24-2	N.D.		0.2	10
10262	Benzo(k)fluoranthene	207-08-9	N.D.		0.2	10
10262	Biphenyl	92-52-4	3		0.2	10
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C1-Dibenzothiophene	n.a.	0.7		0.2	10
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.3	J	0.2	10
10262	C1-Fluorenes	n.a.	3		0.2	10
10262	C1-Naphthalenes	n.a.	42		0.2	10
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C1-Phenanthrenes/anthracenes	n.a.	3		0.2	10
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C2-Dibenzothiophene	n.a.	N.D.		0.2	10
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.		0.2	10
10262	C2-Fluorenes	n.a.	3		0.2	10
10262	C2-Naphthalenes	n.a.	19		0.2	10
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C2-Phenanthrenes/anthracenes	n.a.	2		0.2	10
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C3-Dibenzothiophene	n.a.	N.D.		0.2	10
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.		0.2	10
10262	C3-Fluorenes	n.a.	N.D.		0.2	10
10262	C3-Naphthalenes	n.a.	11		0.2	10
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C3-Phenanthrenes/anthracenes	n.a.	1		0.2	10
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C4-Dibenzothiophene	n.a.	N.D.		0.2	10
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.2	10
10262	C4-Naphthalenes	n.a.	7		0.2	10
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.2	10
10262	Chrysene	218-01-9	N.D.		0.2	10
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.2	10
10262	Dibenzofuran	132-64-9	0.5	J	0.2	10
10262	Dibenzothiophene	132-65-0	0.3	J	0.2	10

Sample Description: MW-72 Grab Groundwater
NRG PRGS

LL Sample # WW 7648432
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 12:40 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

72-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	N.D.	0.2	10
10262	Fluorene	86-73-7	2	0.2	10
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.2	10
10262	1-Methylnaphthalene	90-12-0	34	0.2	10
10262	2-Methylnaphthalene	91-57-6	35	0.2	10
10262	Naphthalene	91-20-3	61	0.2	10
10262	Naphthobenzothiophene	224-10-2	N.D.	0.2	10
10262	Perylene	198-55-0	N.D.	0.2	10
10262	Phenanthrene	85-01-8	1	0.2	10
10262	Pyrene	129-00-0	N.D.	0.2	10

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:
The sample was re-extracted and the QC is again outside of the acceptance limits. The data is reported from the initial trial.

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	480	20	1
GC Miscellaneous	**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane	74-82-8	2,200	60	20
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,000	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	2.0	1
05260	Coal Tar Oil	8001-58-9	N.D.	2.0	1
05260	Diesel/#2 Fuel	68334-30-5	3.4 J	2.0	1
05260	#6 Fuel Oil	68553-00-4	N.D.	10	1
05260	Gasoline	8006-61-9	N.D.	2.0	1
05260	Kerosene	8008-20-6	N.D.	2.0	1
05260	Mineral Spirits	8030-30-6	N.D.	2.0	1
05260	Motor Oil	n.a.	N.D.	10	1

Reporting limits were raised due to interference from the sample matrix.

Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate	14808-79-8	389	15.0	50
	EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen	14797-55-8	N.D.	0.040	1
00219	Nitrite Nitrogen	14797-65-0	N.D.	0.015	1
	EPA 1664A		**mg/l**	**mg/l**	

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Analysis Report

Sample Description: MW-72 Grab Groundwater
NRG PRGS

LL Sample # WW 7648432
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 12:40 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

72-MW

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry		**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)		n.a.	1.8 J	1.4	1
		SM 2130 B-2001		**N T U**	**N T U**	
12145	Turbidity		n.a.	29,800	140	1000
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	65.5	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	0.33	0.040	4

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 11:38	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 11:38	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/28/2014 11:38	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14298B20A	10/27/2014 20:11	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14298B20A	10/27/2014 20:11	Marie D Beamenderfer	1
07105	Methane	RSKSOP-175 modified	1	143020018A	10/30/2014 22:21	Elizabeth J Marin	20
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 01:10	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 01:23	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14297347902A	10/27/2014 09:45	Sandra J Miller	50
00220	Nitrate Nitrogen	EPA 353.2	1	14299106104B	10/26/2014 19:18	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14296105103A	10/23/2014 23:40	James S Mathiot	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807902A	10/28/2014 11:30	Yolunder Y Bunch	1
12145	Turbidity	SM 2130 B-2001	1	14296121451B	10/23/2014 23:30	Luz M Groff	1000
12150	Total Alkalinity	SM 2320 B-1997	1	14298002105A	10/26/2014 02:51	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14302834401A	10/29/2014 20:05	Daniel S Smith	4

Sample Description: MW-16 Grab Groundwater
NRG PRGS

LL Sample # WW 7648433
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 13:30 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

16-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	N.D.	0.02	1
10262	Acenaphthylene	208-96-8	N.D.	0.02	1
10262	Anthracene	120-12-7	N.D.	0.02	1
10262	Benzo(a)anthracene	56-55-3	N.D.	0.02	1
10262	Benzo(a)pyrene	50-32-8	N.D.	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	N.D.	0.02	1
10262	Benzo(e)pyrene	192-97-2	N.D.	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	N.D.	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	N.D.	0.02	1
10262	Biphenyl	92-52-4	N.D.	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C1-Fluorenes	n.a.	N.D.	0.02	1
10262	C1-Naphthalenes	n.a.	N.D.	0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C2-Fluorenes	n.a.	N.D.	0.02	1
10262	C2-Naphthalenes	n.a.	N.D.	0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C3-Fluorenes	n.a.	N.D.	0.02	1
10262	C3-Naphthalenes	n.a.	N.D.	0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C4-Naphthalenes	n.a.	N.D.	0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	Chrysene	218-01-9	N.D.	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.02	1
10262	Dibenzofuran	132-64-9	N.D.	0.02	1
10262	Dibenzothiophene	132-65-0	N.D.	0.02	1

Sample Description: MW-16 Grab Groundwater
NRG PRGS

LL Sample # WW 7648433
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 13:30 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

16-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	N.D.	0.02	1
10262	Fluorene	86-73-7	N.D.	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.02	1
10262	1-Methylnaphthalene	90-12-0	N.D.	0.02	1
10262	2-Methylnaphthalene	91-57-6	N.D.	0.02	1
10262	Naphthalene	91-20-3	N.D.	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	N.D.	0.02	1
10262	Pyrene	129-00-0	N.D.	0.02	1
	The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken: The sample was re-extracted and the QC is again outside of the acceptance limits. The data is reported from the initial trial.				
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	1.0	1
05260	Coal Tar Oil	8001-58-9	N.D.	1.0	1
05260	Diesel/#2 Fuel	68334-30-5	N.D.	1.0	1
05260	#6 Fuel Oil	68553-00-4	N.D.	5.0	1
05260	Gasoline	8006-61-9	N.D.	1.0	1
05260	Kerosene	8008-20-6	N.D.	1.0	1
05260	Mineral Spirits	8030-30-6	N.D.	1.0	1
05260	Motor Oil	n.a.	N.D.	5.0	1
	Reporting limits were raised due to interference from the sample matrix.				
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	1.7 J	1.4	1
	SM 2130 B-2001		**N T U**	**N T U**	
12145	Turbidity	n.a.	30,200	140	1000

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

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Analysis Report

Sample Description: MW-16 Grab Groundwater
NRG PRGS

LL Sample # WW 7648433
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/22/2014 13:30 by NG

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

16-MW

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 12:00	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 12:00	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 19:23	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14298B20A	10/27/2014 18:49	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14298B20A	10/27/2014 18:49	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 02:42	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 02:11	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807902A	10/28/2014 11:30	Yolunder Y Bunch	1
12145	Turbidity	SM 2130 B-2001	1	14296121451B	10/23/2014 23:30	Luz M Groff	1000

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7648434
LL Group # 1513325
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/23/2014 16:25
Reported: 11/04/2014 11:37

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

TBPRG

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	D143012AA	10/28/2014 17:04	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D143012AA	10/28/2014 17:04	Daniel H Heller	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513325
Reported: 11/04/14 at 11:37 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D143012AA	Sample number(s): 7648434							
Benzene	N.D.	0.5	ug/l	109	107	78-120	2	30
t-Butyl alcohol	N.D.	2.	ug/l	92	93	75-120	0	30
1,2-Dibromoethane	N.D.	0.5	ug/l	102	100	80-120	3	30
1,2-Dichloroethane	N.D.	0.5	ug/l	103	101	65-135	2	30
Ethylbenzene	N.D.	0.5	ug/l	100	98	79-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	108	106	75-120	2	30
Toluene	N.D.	0.5	ug/l	102	99	80-120	3	30
Xylene (Total)	N.D.	0.5	ug/l	103	100	80-120	3	30
Batch number: F143021AA	Sample number(s): 7648432-7648433							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14297WAE026	Sample number(s): 7648432-7648433							
Acenaphthene	N.D.	0.02	ug/l	79*	75*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	79	75	72-124	6	30
Anthracene	N.D.	0.02	ug/l	79	77	70-117	2	30
Benzo(a)anthracene	N.D.	0.02	ug/l	80	77	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	76	73	72-126	4	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	78	76	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	91	87	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	81	79	59-137	3	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	77	74	74-118	5	30
Biphenyl	N.D.	0.02	ug/l	90	86	74-101	4	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513325
Reported: 11/04/14 at 11:37 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	75*	72*	77-122	5	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	84	81	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	81	79	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	91	88	76-121	3	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	82	79	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	76	72*	75-117	5	30
2-Methylnaphthalene	N.D.	0.02	ug/l	77	73	68-124	5	30
Naphthalene	N.D.	0.02	ug/l	68*	76*	78-117	12	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	85	75	61-123	12	30
Phenanthrene	N.D.	0.02	ug/l	84	80	72-109	5	30
Pyrene	N.D.	0.02	ug/l	67*	69*	70-124	3	30
Batch number: 14298B20A	Sample number(s): 7648432-7648433							
TPH-GRO water C6-C10	N.D.	20.	ug/l	105	103	80-129	2	30
Batch number: 143020018A	Sample number(s): 7648432							
Methane	N.D.	3.0	ug/l	105		85-115		
Batch number: 142980016A	Sample number(s): 7648432-7648433							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143020003A	Sample number(s): 7648432-7648433							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14296105103A	Sample number(s): 7648432							
Nitrite Nitrogen	N.D.	0.015	mg/l	98		90-110		
Batch number: 14297347902A	Sample number(s): 7648432							
Sulfate	N.D.	0.30	mg/l	94		90-110		
Batch number: 14299106104B	Sample number(s): 7648432							
Nitrate Nitrogen	N.D.	0.040	mg/l	100		90-110		

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513325
Reported: 11/04/14 at 11:37 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 14296121451B	Sample number(s): 7648432-7648433							
Turbidity	0.15 J	0.14	N T U	96	96	90-110	1	3
Batch number: 14298002105A	Sample number(s): 7648432							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	94		90-110		
Batch number: 14301807902A	Sample number(s): 7648432-7648433							
HEM (oil & grease)	1.5 J	1.4	mg/l	88	88	78-114	1	16
Batch number: 14302834401A	Sample number(s): 7648432							
Ferrous Iron	N.D.	0.010	mg/l	97		93-105		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7648432-7648433 UNSPK: P650761								
Benzene	91	89	72-134	3	30				
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 143020018A	Sample number(s): 7648432 UNSPK: P647543								
Methane	68	91	46-129	6	20				
Batch number: 143020003A	Sample number(s): 7648432-7648433 UNSPK: P650761								
DRO C10-C28	98	94	47-129	1	20				
Batch number: 14296105103A	Sample number(s): 7648432 UNSPK: P648423 BKG: P648423								
Nitrite Nitrogen	101		90-110			N.D.	N.D.	0 (1)	20
Batch number: 14297347902A	Sample number(s): 7648432 UNSPK: P648430 BKG: P648430								
Sulfate	122*		90-110			80.3	84.7	5	20
Batch number: 14299106104B	Sample number(s): 7648432 UNSPK: P647559 BKG: P647559								
Nitrate Nitrogen	108		90-110			N.D.	N.D.	0 (1)	2
Batch number: 14296121451B	Sample number(s): 7648432-7648433 BKG: P647594								
Turbidity						16.3	15.9	2	8
Batch number: 14298002105A	Sample number(s): 7648432 UNSPK: P645309 BKG: P645309								
Total Alkalinity	89		17-146			91.3	90.9	0	5
Batch number: 14301807902A	Sample number(s): 7648432-7648433 UNSPK: P646209								
HEM (oil & grease)	96		78-114						

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513325
Reported: 11/04/14 at 11:37 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14302834401A	Sample number(s): 7648432 UNSPK: P646102 BKG: P646102								
Ferrous Iron	92	98	73-111	4	6	11.0	11.3	2 (1)	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: D143012AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7648434	106	97	89	99
Blank	104	96	93	97
LCS	103	98	93	103
LCSD	103	96	92	102
Limits:	80-116	77-113	80-113	78-113

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7648432	103	99	101	99
7648433	102	101	98	97
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14297WAE026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7648432	81	5*	88
7648433	88	52	87
Blank	115	114	100
LCS	101	105	94
LCSD	97	100	90
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14298B20A

	Trifluorotoluene-F
7648432	103
7648433	94
Blank	90
LCS	96
LCSD	95

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/04/14 at 11:37 AM

Group Number: 1513325

Surrogate Quality Control

Limits: 63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7648432 1ST	72	73
7648433 1ST	78	79
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7648432	91
7648433	111
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

Analysis Name: Methane
Batch number: 143020018A

	Propene
7648432	104
Blank	105
LCS	107
MS	81
MSD	89
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

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Environmental Analysis Request/Chain of Custody

Cooler #20

Acct. # 8390 Group # 1513325 Sample # 7648432-34

Client: Groundwater & Env. Services, Inc.

Project Name/#: NRG PRGS | Site ID #: NRG PRGS

Project Manager: Gregory Reichart | P.O. #: 0402859

Sampler: Nick Ceyglielmi | PWSID #:

Phone #: 800-220-3606 x 3717 | Quote #: 212032A

State where sample(s) were collected: 1400 North Royal St., Alexandria, VA

For Lab Use Only: SF #: ____ SCR #: ____

Matrix: Sediment ☐ Ground ☒ Surface ☐ Soil ☐ Potable ☐ NPDES ☐ Water Other:

Analyses Requested / Preservation Codes

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE, TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (~~EPA 353.2~~) (SM 3500)	Sulfate SO42- (~~SM 0500-Fe B modified 1997~~ EPA 300.0)	Methane (RSKSOP-175 modified)	Remarks
							H	H	H		H				S	H		H	
MW-72	10/22	1240	X		Water	21	X	X	X	X	X	X	X	X	X	X	X	X	
MW-16	10/22	1336	X		Water	13	X	X	X	X	X	X	X						
Trip blank	10-16	—	X		Water	2		X											

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-22-14	1405	[signature]	10-22-14	1405
[signature]	10-22-14	1545	[signature]	10-22-14	1615
Denise Woodring	10-23-14	1538	[signature]	10/23/14	1330
[signature]	10/23/14	1600	—		
—			[signature]	10/23/14	1625

Relinquished by Commercial Carrier:

UPS ____ FedEx ____ Other ____

Temperature upon receipt 0.8 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 36203

Group Number(s): 1513325

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/23/2014 16:25
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:28 on 10/23/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.8	DT	Wet	Y	Loose/Bag	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 06, 2014

Project: NRG PRGS

Submittal Date: 10/24/2014
Group Number: 1513699
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-33 Grab Groundwater	7650761
MW-33 MS Grab Groundwater	7650762
MW-33 MSD Grab Groundwater	7650763
Trip Blank Water	7650764

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-33 Grab Groundwater
NRG PRGS

LL Sample # WW 7650761
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	N.D.	0.02	1
10262	Acenaphthylene	208-96-8	N.D.	0.02	1
10262	Anthracene	120-12-7	N.D.	0.02	1
10262	Benzo(a)anthracene	56-55-3	N.D.	0.02	1
10262	Benzo(a)pyrene	50-32-8	N.D.	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	N.D.	0.02	1
10262	Benzo(e)pyrene	192-97-2	N.D.	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	N.D.	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	N.D.	0.02	1
10262	Biphenyl	92-52-4	N.D.	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C1-Fluorenes	n.a.	N.D.	0.02	1
10262	C1-Naphthalenes	n.a.	N.D.	0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C2-Fluorenes	n.a.	N.D.	0.02	1
10262	C2-Naphthalenes	n.a.	N.D.	0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C3-Fluorenes	n.a.	N.D.	0.02	1
10262	C3-Naphthalenes	n.a.	N.D.	0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C4-Naphthalenes	n.a.	N.D.	0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	Chrysene	218-01-9	N.D.	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.02	1
10262	Dibenzofuran	132-64-9	N.D.	0.02	1
10262	Dibenzothiophene	132-65-0	N.D.	0.02	1

Sample Description: MW-33 Grab Groundwater
NRG PRGS

LL Sample # WW 7650761
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	N.D.	0.02	1
10262	Fluorene	86-73-7	N.D.	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.02	1
10262	1-Methylnaphthalene	90-12-0	N.D.	0.02	1
10262	2-Methylnaphthalene	91-57-6	N.D.	0.02	1
10262	Naphthalene	91-20-3	N.D.	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	N.D.	0.02	1
10262	Pyrene	129-00-0	0.05 J	0.02	1

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

The recovery for the sample surrogate(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:
The sample was re-extracted outside the method required holding time and the QC is compliant. All results are reported from the first trial. Similar results were obtained in both trials.

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Miscellaneous	**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane	74-82-8	43	3.0	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	0.20	1
05260	Coal Tar Oil	8001-58-9	N.D.	0.20	1
05260	Diesel/#2 Fuel	68334-30-5	N.D.	0.20	1
05260	#6 Fuel Oil	68553-00-4	N.D.	1.0	1
05260	Gasoline	8006-61-9	N.D.	0.20	1
05260	Kerosene	8008-20-6	N.D.	0.20	1
05260	Mineral Spirits	8030-30-6	N.D.	0.20	1
05260	Motor Oil	n.a.	N.D.	1.0	1
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate	14808-79-8	253	15.0	50

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Analysis Report

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Sample Description: MW-33 Grab Groundwater
NRG PRGS

LL Sample # WW 7650761
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

CAT No.	Analysis Name		CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry		**EPA 353.2**		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen		14797-55-8	1.9	0.040	1
00219	Nitrite Nitrogen		14797-65-0	N.D.	0.015	1
		EPA 1664A		**mg/l**	**mg/l**	
08079	HEM (oil & grease)		n.a.	N.D.	1.4	1
		SM 2130 B-2001		**N T U**	**N T U**	
12145	Turbidity		n.a.	1,120	7.0	50
		SM 2320 B-1997		**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity		n.a.	119	0.70	1
		SM 3500-Fe B modified-1997		**mg/l**	**mg/l**	
08344	Ferrous Iron		n.a.	0.068	0.010	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 09:05	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 09:05	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/29/2014 13:39	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 14:34	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 14:34	Marie D Beamenderfer	1
07105	Methane	RSKSOP-175 modified	1	143080011A	11/04/2014 13:22	Nicholas R Rossi	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 17:27	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 03:00	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14298347602B	10/27/2014 05:59	Sandra J Miller	50
00220	Nitrate Nitrogen	EPA 353.2	1	14299106105B	10/26/2014 19:41	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14298105101A	10/25/2014 10:21	Drew M Gerhart	1

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Analysis Report

Sample Description: MW-33 Grab Groundwater
NRG PRGS

LL Sample # WW 7650761
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
08079	HEM (oil & grease)	EPA 1664A	1	14301807903A	10/28/2014 18:24	Michelle L Lalli	1
12145	Turbidity	SM 2130 B-2001	1	14297121451B	10/24/2014 23:00	Luz M Groff	50
12150	Total Alkalinity	SM 2320 B-1997	1	14298002104A	10/25/2014 23:01	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14303834401A	10/30/2014 19:20	Daniel S Smith	1

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Analysis Report

Sample Description: MW-33 MS Grab Groundwater NRG PRGS

LL Sample # WW 7650762
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	18	0.5	1
10945	t-Butyl alcohol	75-65-0	190	2	1
10945	1,2-Dibromoethane	106-93-4	19	0.5	1
10945	1,2-Dichloroethane	107-06-2	18	0.5	1
10945	Ethylbenzene	100-41-4	18	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	18	0.5	1
10945	Toluene	108-88-3	18	0.5	1
10945	Xylene (Total)	1330-20-7	56	0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	1,300	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,600	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 09:27	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 09:27	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 15:01	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 15:01	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 17:50	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: MW-33 MSD Grab Groundwater NRG PRGS

LL Sample # WW 7650763
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:50 by NG

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33-

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	18	0.5	1
10945	t-Butyl alcohol	75-65-0	190	2	1
10945	1,2-Dibromoethane	106-93-4	18	0.5	1
10945	1,2-Dichloroethane	107-06-2	17	0.5	1
10945	Ethylbenzene	100-41-4	18	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	18	0.5	1
10945	Toluene	108-88-3	18	0.5	1
10945	Xylene (Total)	1330-20-7	54	0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	1,300	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,600	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 09:48	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 09:48	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 15:28	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 15:28	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/30/2014 18:14	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7650764
LL Group # 1513699
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/24/2014 15:27
Reported: 11/06/2014 10:24

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MW33T

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	D143012AA	10/28/2014 17:27	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D143012AA	10/28/2014 17:27	Daniel H Heller	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513699
Reported: 11/06/14 at 10:24 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D143012AA	Sample number(s): 7650764							
Benzene	N.D.	0.5	ug/l	109	107	78-120	2	30
t-Butyl alcohol	N.D.	2.	ug/l	92	93	75-120	0	30
1,2-Dibromoethane	N.D.	0.5	ug/l	102	100	80-120	3	30
1,2-Dichloroethane	N.D.	0.5	ug/l	103	101	65-135	2	30
Ethylbenzene	N.D.	0.5	ug/l	100	98	79-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	108	106	75-120	2	30
Toluene	N.D.	0.5	ug/l	102	99	80-120	3	30
Xylene (Total)	N.D.	0.5	ug/l	103	100	80-120	3	30
Batch number: F143021AA	Sample number(s): 7650761-7650763							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14299WAF026	Sample number(s): 7650761							
Acenaphthene	N.D.	0.02	ug/l	78*	74*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	77	74	72-124	5	30
Anthracene	N.D.	0.02	ug/l	79	76	70-117	4	30
Benzo(a)anthracene	N.D.	0.02	ug/l	85	82	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	79	77	72-126	3	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	85	83	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	93	89	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	75	72	59-137	4	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	79	76	74-118	4	30
Biphenyl	N.D.	0.02	ug/l	97	90	74-101	7	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513699
Reported: 11/06/14 at 10:24 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	80	78	77-122	3	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	73	69	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	84	83	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	83	90	76-121	9	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	76	73	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	88	88	75-117	1	30
2-Methylnaphthalene	N.D.	0.02	ug/l	82	79	68-124	4	30
Naphthalene	N.D.	0.02	ug/l	86	83	78-117	4	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	90	86	61-123	4	30
Phenanthrene	N.D.	0.02	ug/l	89	87	72-109	2	30
Pyrene	N.D.	0.02	ug/l	72	79	70-124	9	30
Batch number: 14301B20A	Sample number(s): 7650761-7650763							
TPH-GRO water C6-C10	N.D.	20.	ug/l	107		80-129		
Batch number: 143080011A	Sample number(s): 7650761							
Methane	N.D.	3.0	ug/l	110		85-115		
Batch number: 142980016A	Sample number(s): 7650761							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143020003A	Sample number(s): 7650761-7650763							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14298105101A	Sample number(s): 7650761							
Nitrite Nitrogen	N.D.	0.015	mg/l	98		90-110		
Batch number: 14298347602B	Sample number(s): 7650761							
Sulfate	N.D.	0.30	mg/l	101		90-110		
Batch number: 14299106105B	Sample number(s): 7650761							
Nitrate Nitrogen	N.D.	0.040	mg/l	101		90-110		

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513699
Reported: 11/06/14 at 10:24 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 14297121451B	Sample number(s): 7650761							
Turbidity	0.15 J	0.14	N T U	96	96	90-110	1	3
Batch number: 14298002104A	Sample number(s): 7650761							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	96		90-110		
Batch number: 14301807903A	Sample number(s): 7650761							
HEM (oil & grease)	N.D.	1.4	mg/l	88	90	78-114	3	16
Batch number: 14303834401A	Sample number(s): 7650761							
Ferrous Iron	N.D.	0.010	mg/l	99		93-105		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7650761-7650763 UNSPK: 7650761								
Benzene	91	89	72-134	3	30				
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 14301B20A	Sample number(s): 7650761-7650763 UNSPK: 7650761								
TPH-GRO water C6-C10	119	121	75-135	1	30				
Batch number: 143080011A	Sample number(s): 7650761 UNSPK: 7650761								
Methane	93	85	46-129	5	20				
Batch number: 143020003A	Sample number(s): 7650761-7650763 UNSPK: 7650761								
DRO C10-C28	98	94	47-129	1	20				
Batch number: 14298105101A	Sample number(s): 7650761 UNSPK: 7650761 BKG: 7650761								
Nitrite Nitrogen	104		90-110			N.D.	N.D.	0 (1)	20
Batch number: 14298347602B	Sample number(s): 7650761 UNSPK: 7650761 BKG: 7650761								
Sulfate	99		90-110			253	251	1	20
Batch number: 14299106105B	Sample number(s): 7650761 UNSPK: 7650761 BKG: 7650761								
Nitrate Nitrogen	90		90-110			1.9	1.8	5*	2
Batch number: 14297121451B	Sample number(s): 7650761 BKG: 7650761								
Turbidity						1,120	1,150	2	8
Batch number: 14298002104A	Sample number(s): 7650761 UNSPK: P646469 BKG: P646469								
Total Alkalinity	83 (2)		17-146			1,090	1,090	0	5

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513699
Reported: 11/06/14 at 10:24 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14301807903A	Sample number(s): 7650761 UNSPK: P651299								
HEM (oil & grease)	95		78-114						
Batch number: 14303834401A	Sample number(s): 7650761 UNSPK: P651432 BKG: P651432								
Ferrous Iron	101	84	73-111	12*	6	0.20	0.20	0 (1)	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: D143012AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650764	106	98	90	98
Blank	104	96	93	97
LCS	103	98	93	103
LCSD	103	96	92	102
Limits:	80-116	77-113	80-113	78-113

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650761	103	101	97	96
7650762	104	102	98	99
7650763	101	101	98	100
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14299WAF026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7650761	73	24*	61
Blank	114	112	102
LCS	96	108	100
LCSD	93	103	92
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14301B20A

	Trifluorotoluene-F
7650761	91
7650762	98

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/06/14 at 10:24 AM

Group Number: 1513699

Surrogate Quality Control

7650763	97
Blank	92
LCS	97
MS	98
MSD	97
Limits:	63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7650761	74	86
1ST		
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7650761	128
7650762	121
7650763	118
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

Analysis Name: Methane
Batch number: 143080011A

	Propene
7650761	88
Blank	104
LCS	103
MS	88
MSD	86
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Cooler # 1

Acct. # 8390 Group # 1513699 Sample # 7650761-64

| | | |

eurofins | Lancaster Laboratories Environmental

Sample Administration Receipt Documentation Log

Doc Log ID: 36493

Group Number(s): 1513699

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/24/2014 15:27
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:36 on 10/24/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.2	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

eurofins | Lancaster Laboratories Environmental

Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 03, 2014

Project: NRG PRGS

Submittal Date: 10/24/2014
Group Number: 1513701
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-27 Grab Groundwater	7650768
Field Duplicate Grab Groundwater	7650769
Trip Blank Water	7650770

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: MW-27 Grab Groundwater
NRG PRGS

LL Sample # WW 7650768
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 12:20 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMW27

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	0.5	J	0.5	1
10945	t-Butyl alcohol	75-65-0	2	J	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	2		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	2		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.7		0.02	1
10262	Acenaphthylene	208-96-8	0.2		0.02	1
10262	Anthracene	120-12-7	0.2		0.02	1
10262	Benzo(a)anthracene	56-55-3	0.3		0.02	1
10262	Benzo(a)pyrene	50-32-8	0.2		0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.3		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.2		0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.08		0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.2		0.02	1
10262	Biphenyl	92-52-4	3		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.2		0.02	1
10262	C1-Dibenzothiophene	n.a.	2		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	1		0.02	1
10262	C1-Fluorenes	n.a.	4		0.02	1
10262	C1-Naphthalenes	n.a.	11		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	6		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C2-Dibenzothiophene	n.a.	3		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	1		0.02	1
10262	C2-Fluorenes	n.a.	4		0.02	1
10262	C2-Naphthalenes	n.a.	25		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	8		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	2		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.3		0.02	1
10262	C3-Fluorenes	n.a.	4		0.02	1
10262	C3-Naphthalenes	n.a.	26		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	5		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C4-Naphthalenes	n.a.	19		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	2		0.02	1
10262	Chrysene	218-01-9	0.3		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	0.02	J	0.02	1
10262	Dibenzofuran	132-64-9	0.5		0.02	1
10262	Dibenzothiophene	132-65-0	0.5		0.02	1

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Analysis Report

Sample Description: MW-27 Grab Groundwater
NRG PRGS

LL Sample # WW 7650768
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 12:20 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMW27

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	1	0.02	1
10262	Fluorene	86-73-7	1	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.07	0.02	1
10262	1-Methylnaphthalene	90-12-0	12	0.2	10
10262	2-Methylnaphthalene	91-57-6	5	0.02	1
10262	Naphthalene	91-20-3	6	0.02	1
10262	Naphthobenzothiophene	224-10-2	0.07	0.02	1
10262	Perylene	198-55-0	0.03 J	0.02	1
10262	Phenanthrene	85-01-8	2	0.02	1
10262	Pyrene	129-00-0	1	0.02	1

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	100	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	1,900	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	2.0	10
05260	Coal Tar Oil	8001-58-9	N.D.	2.0	10
05260	Diesel/#2 Fuel	68334-30-5	11	2.0	10
05260	#6 Fuel Oil	68553-00-4	N.D.	10	10
05260	Gasoline	8006-61-9	N.D.	2.0	10
05260	Kerosene	8008-20-6	N.D.	2.0	10
05260	Mineral Spirits	8030-30-6	N.D.	2.0	10
05260	Motor Oil	n.a.	N.D.	10	10
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.	1.4	1
	SM 2130 B-2001		**N T U**	**N T U**	
12145	Turbidity	n.a.	1,540	7.0	50

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

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Analysis Report

Sample Description: MW-27 Grab Groundwater
NRG PRGS

LL Sample # WW 7650768
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 12:20 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMW27

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time		Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014	12:22	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014	12:22	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/29/2014	14:23	Joseph M Gambler	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/30/2014	13:29	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014	09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014	13:13	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014	13:13	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014	03:29	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014	18:41	Heather E Williams	10
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014	06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014	13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807903A	10/28/2014	18:24	Michelle L Lalli	1
12145	Turbidity	SM 2130 B-2001	1	14297121451A	10/24/2014	23:00	Luz M Groff	50

Sample Description: Field Duplicate Grab Groundwater
NRG PRGS

LL Sample # WW 7650769
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMWFD

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	0.8	J	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	0.9	J	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	2		0.02	1
10262	Acenaphthylene	208-96-8	0.5		0.02	1
10262	Anthracene	120-12-7	1		0.02	1
10262	Benzo(a)anthracene	56-55-3	0.5		0.02	1
10262	Benzo(a)pyrene	50-32-8	0.3		0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.4		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.2		0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.09		0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.2		0.02	1
10262	Biphenyl	92-52-4	4		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.4		0.02	1
10262	C1-Dibenzothiophene	n.a.	4		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	3		0.02	1
10262	C1-Fluorenes	n.a.	7		0.02	1
10262	C1-Naphthalenes	n.a.	17		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	21		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	0.2		0.02	1
10262	C2-Dibenzothiophene	n.a.	7		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	2		0.02	1
10262	C2-Fluorenes	n.a.	8		0.02	1
10262	C2-Naphthalenes	n.a.	35		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	0.08		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	22		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	0.09		0.02	1
10262	C3-Dibenzothiophene	n.a.	4		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.8		0.02	1
10262	C3-Fluorenes	n.a.	9		0.02	1
10262	C3-Naphthalenes	n.a.	49		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	0.06		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	12		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	0.3		0.02	1
10262	C4-Naphthalenes	n.a.	36		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	4		0.02	1
10262	Chrysene	218-01-9	0.5		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	0.03	J	0.02	1
10262	Dibenzofuran	132-64-9	1		0.02	1
10262	Dibenzothiophene	132-65-0	2		0.02	1

Sample Description: Field Duplicate Grab Groundwater NRG PRGS

LL Sample # WW 7650769
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMWFD

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	4	0.02	1
10262	Fluorene	86-73-7	3	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.08	0.02	1
10262	1-Methylnaphthalene	90-12-0	20	0.2	10
10262	2-Methylnaphthalene	91-57-6	4	0.02	1
10262	Naphthalene	91-20-3	4	0.02	1
10262	Naphthobenzothiophene	224-10-2	0.1	0.02	1
10262	Perylene	198-55-0	0.04 J	0.02	1
10262	Phenanthrene	85-01-8	6	0.02	1
10262	Pyrene	129-00-0	4	0.02	1

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	130	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	1,600	45	1
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.	1.4	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 12:44	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 12:44	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/29/2014 15:06	Joseph M Gambler	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/30/2014 14:12	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 13:40	Marie D Beamenderfer	1

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Analysis Report

Sample Description: Field Duplicate Grab Groundwater
NRG PRGS

LL Sample # WW 7650769
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 by NG

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NMWFD

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 13:40	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020003A	10/31/2014 03:52	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020003A	10/29/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807903A	10/28/2014 18:24	Michelle L Lalli	1

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7650770
LL Group # 1513701
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/24/2014 15:27
Reported: 11/03/2014 15:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

MNWTB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 13:05	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 13:05	Anita M Dale	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513701
Reported: 11/03/14 at 03:29 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: F143021AA	Sample number(s): 7650768-7650770							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14299WAF026	Sample number(s): 7650768-7650769							
Acenaphthene	N.D.	0.02	ug/l	78*	74*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	77	74	72-124	5	30
Anthracene	N.D.	0.02	ug/l	79	76	70-117	4	30
Benzo(a)anthracene	N.D.	0.02	ug/l	85	82	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	79	77	72-126	3	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	85	83	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	93	89	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	75	72	59-137	4	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	79	76	74-118	4	30
Biphenyl	N.D.	0.02	ug/l	97	90	74-101	7	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513701
Reported: 11/03/14 at 03:29 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	80	78	77-122	3	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	73	69	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	84	83	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	83	90	76-121	9	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	76	73	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	88	88	75-117	1	30
2-Methylnaphthalene	N.D.	0.02	ug/l	82	79	68-124	4	30
Naphthalene	N.D.	0.02	ug/l	86	83	78-117	4	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	90	86	61-123	4	30
Phenanthrene	N.D.	0.02	ug/l	89	87	72-109	2	30
Pyrene	N.D.	0.02	ug/l	72	79	70-124	9	30
Batch number: 14301B20A	Sample number(s): 7650768-7650769							
TPH-GRO water C6-C10	N.D.	20.	ug/l	107		80-129		
Batch number: 142980016A	Sample number(s): 7650768							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143020003A	Sample number(s): 7650768-7650769							
DRO C10-C28	N.D.	45.	ug/l	107		69-115		
Batch number: 14297121451A	Sample number(s): 7650768							
Turbidity	0.15 J	0.14	N T U	96	96	90-110	1	3
Batch number: 14301807903A	Sample number(s): 7650768-7650769							
HEM (oil & grease)	N.D.	1.4	mg/l	88	90	78-114	3	16

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7650768-7650770 UNSPK: P650761								
Benzene	91	89	72-134	3	30				
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513701
Reported: 11/03/14 at 03:29 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 14301B20A	Sample number(s): 7650768-7650769 UNSPK: P650761								
TPH-GRO water C6-C10	119	121	75-135	1	30				
Batch number: 143020003A	Sample number(s): 7650768-7650769 UNSPK: P650761								
DRO C10-C28	98	94	47-129	1	20				
Batch number: 14297121451A	Sample number(s): 7650768 BKG: P649151								
Turbidity						58.2	59.4	2	8
Batch number: 14301807903A	Sample number(s): 7650768-7650769 UNSPK: P651299								
HEM (oil & grease)	95		78-114						

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650768	102	102	99	98
7650769	103	99	99	99
7650770	100	100	98	97
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14299WAF026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7650768	129	90	109
7650769	139*	75	87
Blank	114	112	102
LCS	96	108	100
LCSD	93	103	92
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14301B20A

	Trifluorotoluene-F
7650768	104

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/03/14 at 03:29 PM

Group Number: 1513701

Surrogate Quality Control

7650769	96
Blank	92
LCS	97
MS	98
MSD	97
Limits:	63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7650768 1ST	91	220*
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143020003A

	Orthoterphenyl
7650768	131
7650769	132
Blank	123
LCS	129
MS	121
MSD	118
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler # 15

Acct. # 8390 Group # 1513701 Sample # 7650768-70

Client:	Groundwater & Env. Services, Inc.
Project Name/#:	NRG PRGS
Site ID #:	NRG PRGS
Project Manager:	Gregory Reichart
P.O. #:	0402859
Sampler:	Nick Guglielmo
PWSID #:	
Phone #:	800-220-3606 x 3717
Quote #:	212032A
State where sample(s) were collected:	1400 North Royal St., Alexandria, VA

For Lab Use Only: SF #: ____ SCR #: ____

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Sediment	Matrix: Water (Potable / Ground / NPDES / Surface)	Matrix: Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (SM 3500-Fe B modified-1997)	Sulfate SO42- (EPA 300.0)	Methane (RSKSOP-175 modified)	Remarks
MW-27	10-23	1220	X				X		13	X	X	X	X	X	X	X						
Field Duplicate	10-23	—	X				X		11	X	X	X	X	X								
trip blank	10-16	—	X				X		2		X											

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report #*.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
Nick Guglielmo	10-23-14	1340	Jeff Plummer	10-23-14	1340
Jeff Plummer	10-23-14	1545	Donna Marple	10/23/14	1545
Donna Marple	10/24/14	1240	[illegible]	10-24-14	12:42
[illegible]	10-24-14	1527	—		
—			[illegible]	10/24/14	1527

Relinquished by Commercial Carrier:

UPS ____ FedEx ____ Other ____

Temperature upon receipt 3.2 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 36489

Group Number(s): 1513701

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/24/2014 15:27
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:02 on 10/24/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	3.2	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 05, 2014

Project: NRG PRGS

Submittal Date: 10/24/2014
Group Number: 1513702
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
TW-02 Grab Groundwater	7650771
TW-03 Grab Groundwater	7650772
TW-07 Grab Groundwater	7650773
TW-04 Grab Groundwater	7650774
TW-06 Grab Groundwater	7650775
TW-05 Grab Groundwater	7650776
Trip Blank Water	7650777

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: TW-02 Grab Groundwater
NRG PRGS

LL Sample # WW 7650771
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 08:50 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW2

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	60 J	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 13:27	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 13:27	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 14:07	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 14:07	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 12:24	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: TW-03 Grab Groundwater
NRG PRGS

LL Sample # WW 7650772
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 09:10 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW3

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	0.7	J	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	N.D.		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.		20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	49	J	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 13:49	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 13:49	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 16:23	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 16:23	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 12:47	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: TW-07 Grab Groundwater
NRG PRGS

LL Sample # WW 7650773
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 09:30 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW7

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	2		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	0.6	J	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	0.4		0.02	1
10262	Acenaphthylene	208-96-8	N.D.		0.02	1
10262	Anthracene	120-12-7	0.04	J	0.02	1
10262	Benzo(a)anthracene	56-55-3	0.04	J	0.02	1
10262	Benzo(a)pyrene	50-32-8	0.04	J	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.06		0.02	1
10262	Benzo(e)pyrene	192-97-2	0.06		0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.03	J	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.04	J	0.02	1
10262	Biphenyl	92-52-4	2		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.1		0.02	1
10262	C1-Dibenzothiophene	n.a.	0.3		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.7		0.02	1
10262	C1-Fluorenes	n.a.	0.8		0.02	1
10262	C1-Naphthalenes	n.a.	8		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.9		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	0.07		0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	0.6		0.02	1
10262	C2-Fluorenes	n.a.	0.7		0.02	1
10262	C2-Naphthalenes	n.a.	8		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	1		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	0.05	J	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	0.4		0.02	1
10262	C3-Fluorenes	n.a.	1		0.02	1
10262	C3-Naphthalenes	n.a.	5		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	2		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	0.1		0.02	1
10262	C4-Naphthalenes	n.a.	6		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	2		0.02	1
10262	Chrysene	218-01-9	0.08		0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.02	1
10262	Dibenzofuran	132-64-9	0.07		0.02	1
10262	Dibenzothiophene	132-65-0	0.08		0.02	1

Sample Description: TW-07 Grab Groundwater
NRG PRGS

LL Sample # WW 7650773
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 09:30 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW7

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	0.1	0.02	1
10262	Fluorene	86-73-7	0.4	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.03 J	0.02	1
10262	1-Methylnaphthalene	90-12-0	6	0.02	1
10262	2-Methylnaphthalene	91-57-6	7	0.02	1
10262	Naphthalene	91-20-3	6	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	0.5	0.02	1
10262	Pyrene	129-00-0	0.6	0.02	1

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	29 J	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	4,700	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 14:11	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 14:11	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/29/2014 15:50	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 17:44	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 17:44	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 13:11	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: TW-04 Grab Groundwater
NRG PRGS

LL Sample # WW 7650774
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:00 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW4

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	1	0.02	1
10262	Acenaphthylene	208-96-8	0.03 J	0.02	1
10262	Anthracene	120-12-7	0.4	0.02	1
10262	Benzo(a)anthracene	56-55-3	0.1	0.02	1
10262	Benzo(a)pyrene	50-32-8	0.08	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.2	0.02	1
10262	Benzo(e)pyrene	192-97-2	0.1	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.05	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.1	0.02	1
10262	Biphenyl	92-52-4	0.4	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	0.07	0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	0.3	0.02	1
10262	C1-Fluorenes	n.a.	0.4	0.02	1
10262	C1-Naphthalenes	n.a.	0.7	0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	0.5	0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	0.1	0.02	1
10262	C2-Fluorenes	n.a.	N.D.	0.02	1
10262	C2-Naphthalenes	n.a.	0.9	0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	0.2	0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C3-Fluorenes	n.a.	N.D.	0.02	1
10262	C3-Naphthalenes	n.a.	N.D.	0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C4-Naphthalenes	n.a.	N.D.	0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	Chrysene	218-01-9	0.2	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.02	1
10262	Dibenzofuran	132-64-9	0.6	0.02	1
10262	Dibenzothiophene	132-65-0	0.3	0.02	1

Sample Description: TW-04 Grab Groundwater
NRG PRGS

LL Sample # WW 7650774
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:00 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW4

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	1	0.02	1
10262	Fluorene	86-73-7	1	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.05	0.02	1
10262	1-Methylnaphthalene	90-12-0	0.9	0.02	1
10262	2-Methylnaphthalene	91-57-6	0.2	0.02	1
10262	Naphthalene	91-20-3	0.3	0.02	1
10262	Naphthobenzothiophene	224-10-2	0.05 J	0.02	1
10262	Perylene	198-55-0	0.02 J	0.02	1
10262	Phenanthrene	85-01-8	3	0.02	1
10262	Pyrene	129-00-0	0.7	0.02	1
	The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance: acenaphthene				
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	160	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 14:33	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 14:33	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/29/2014 16:34	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 18:11	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 18:11	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 13:34	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: TW-06 Grab Groundwater
NRG PRGS

LL Sample # WW 7650775
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:30 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW6

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	0.8	J	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	11		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	1		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	4		0.2	10
10262	Acenaphthylene	208-96-8	1		0.2	10
10262	Anthracene	120-12-7	1		0.2	10
10262	Benzo(a)anthracene	56-55-3	0.6		0.2	10
10262	Benzo(a)pyrene	50-32-8	0.4	J	0.2	10
10262	Benzo(b)fluoranthene	205-99-2	0.6		0.2	10
10262	Benzo(e)pyrene	192-97-2	0.4	J	0.2	10
10262	Benzo(g,h,i)perylene	191-24-2	0.3	J	0.2	10
10262	Benzo(k)fluoranthene	207-08-9	0.3	J	0.2	10
10262	Biphenyl	92-52-4	10		0.2	10
10262	C1-Benzanthrene/chrysenes	n.a.	1		0.2	10
10262	C1-Dibenzothiophene	n.a.	10		0.2	10
10262	C1-Fluoranthrenes/pyrenes	n.a.	11		0.2	10
10262	C1-Fluorenes	n.a.	25		0.2	10
10262	C1-Naphthalenes	n.a.	38		0.2	10
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C1-Phenanthrenes/anthracenes	n.a.	59		0.2	10
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C2-Dibenzothiophene	n.a.	23		0.2	10
10262	C2-Fluoranthrenes/pyrenes	n.a.	9		0.2	10
10262	C2-Fluorenes	n.a.	32		0.2	10
10262	C2-Naphthalenes	n.a.	92		0.2	10
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C2-Phenanthrenes/anthracenes	n.a.	69		0.2	10
10262	C3-Benzanthrene/chrysenes	n.a.	0.4	J	0.2	10
10262	C3-Dibenzothiophene	n.a.	24		0.2	10
10262	C3-Fluoranthrenes/pyrenes	n.a.	4		0.2	10
10262	C3-Fluorenes	n.a.	42		0.2	10
10262	C3-Naphthalenes	n.a.	160		0.2	10
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C3-Phenanthrenes/anthracenes	n.a.	48		0.2	10
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C4-Dibenzothiophene	n.a.	N.D.		0.2	10
10262	C4-Fluoranthrenes/pyrenes	n.a.	2		0.2	10
10262	C4-Naphthalenes	n.a.	140		0.2	10
10262	C4-Phenanthrenes/anthracenes	n.a.	24		0.2	10
10262	Chrysene	218-01-9	0.8		0.2	10
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.2	10
10262	Dibenzofuran	132-64-9	1		0.2	10
10262	Dibenzothiophene	132-65-0	2		0.2	10

Sample Description: TW-06 Grab Groundwater
NRG PRGS

LL Sample # WW 7650775
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:30 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW6

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Fluoranthene	206-44-0	2		0.2	10
10262	Fluorene	86-73-7	8		0.2	10
10262	Indeno(1,2,3-cd)pyrene	193-39-5	0.2	J	0.2	10
10262	1-Methylnaphthalene	90-12-0	59		0.2	10
10262	2-Methylnaphthalene	91-57-6	N.D.		0.2	10
10262	Naphthalene	91-20-3	5		0.2	10
10262	Naphthobenzothiophene	224-10-2	0.2	J	0.2	10
10262	Perylene	198-55-0	N.D.		0.2	10
10262	Phenanthrene	85-01-8	16		0.2	10
10262	Pyrene	129-00-0	6		0.2	10

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	230		20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	16,000		45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**		**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.		10	50
05260	Coal Tar Oil	8001-58-9	N.D.		10	50
05260	Diesel/#2 Fuel	68334-30-5	75		10	50
05260	#6 Fuel Oil	68553-00-4	N.D.		50	50
05260	Gasoline	8006-61-9	N.D.		10	50
05260	Kerosene	8008-20-6	N.D.		10	50
05260	Mineral Spirits	8030-30-6	N.D.		10	50
05260	Motor Oil	n.a.	N.D.		50	50

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 14:54	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 14:54	Anita M Dale	1

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Analysis Report

Sample Description: TW-06 Grab Groundwater
NRG PRGS

LL Sample # WW 7650775
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:30 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW6

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/30/2014 14:56	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 18:38	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 18:38	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 13:58	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 19:30	Heather E Williams	50
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: TW-05 Grab Groundwater
NRG PRGS

LL Sample # WW 7650776
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW5

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	4		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	14		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	3		0.2	10
10262	Acenaphthylene	208-96-8	0.9		0.2	10
10262	Anthracene	120-12-7	2		0.2	10
10262	Benzo(a)anthracene	56-55-3	0.5	J	0.2	10
10262	Benzo(a)pyrene	50-32-8	0.2	J	0.2	10
10262	Benzo(b)fluoranthene	205-99-2	0.4	J	0.2	10
10262	Benzo(e)pyrene	192-97-2	0.3	J	0.2	10
10262	Benzo(g,h,i)perylene	191-24-2	0.2	J	0.2	10
10262	Benzo(k)fluoranthene	207-08-9	0.2	J	0.2	10
10262	Biphenyl	92-52-4	12		0.2	10
10262	C1-Benzanthrene/chrysenes	n.a.	0.9		0.2	10
10262	C1-Dibenzothiophene	n.a.	9		0.2	10
10262	C1-Fluoranthrenes/pyrenes	n.a.	7		0.2	10
10262	C1-Fluorenes	n.a.	22		0.2	10
10262	C1-Naphthalenes	n.a.	29		0.2	10
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C1-Phenanthrenes/anthracenes	n.a.	53		0.2	10
10262	C2-Benzanthrene/chrysenes	n.a.	0.6		0.2	10
10262	C2-Dibenzothiophene	n.a.	22		0.2	10
10262	C2-Fluoranthrenes/pyrenes	n.a.	6		0.2	10
10262	C2-Fluorenes	n.a.	34		0.2	10
10262	C2-Naphthalenes	n.a.	99		0.2	10
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C2-Phenanthrenes/anthracenes	n.a.	66		0.2	10
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C3-Dibenzothiophene	n.a.	15		0.2	10
10262	C3-Fluoranthrenes/pyrenes	n.a.	3		0.2	10
10262	C3-Fluorenes	n.a.	44		0.2	10
10262	C3-Naphthalenes	n.a.	150		0.2	10
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C3-Phenanthrenes/anthracenes	n.a.	38		0.2	10
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C4-Dibenzothiophene	n.a.	11		0.2	10
10262	C4-Fluoranthrenes/pyrenes	n.a.	1		0.2	10
10262	C4-Naphthalenes	n.a.	140		0.2	10
10262	C4-Phenanthrenes/anthracenes	n.a.	18		0.2	10
10262	Chrysene	218-01-9	0.7		0.2	10
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.2	10
10262	Dibenzofuran	132-64-9	0.9		0.2	10
10262	Dibenzothiophene	132-65-0	2		0.2	10

Sample Description: TW-05 Grab Groundwater
NRG PRGS

LL Sample # WW 7650776
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW5

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	1	0.2	10
10262	Fluorene	86-73-7	5	0.2	10
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.2	10
10262	1-Methylnaphthalene	90-12-0	33	0.2	10
10262	2-Methylnaphthalene	91-57-6	15	0.2	10
10262	Naphthalene	91-20-3	21	0.2	10
10262	Naphthobenzothiophene	224-10-2	N.D.	0.2	10
10262	Perylene	198-55-0	N.D.	0.2	10
10262	Phenanthrene	85-01-8	10	0.2	10
10262	Pyrene	129-00-0	5	0.2	10

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	140	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	29,000	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	10	5
05260	Coal Tar Oil	8001-58-9	N.D.	10	5
05260	Diesel/#2 Fuel	68334-30-5	60	10	5
05260	#6 Fuel Oil	68553-00-4	N.D.	50	5
05260	Gasoline	8006-61-9	N.D.	10	5
05260	Kerosene	8008-20-6	N.D.	10	5
05260	Mineral Spirits	8030-30-6	N.D.	10	5
05260	Motor Oil	n.a.	N.D.	50	5

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 15:16	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 15:16	Anita M Dale	1

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Analysis Report

Sample Description: TW-05 Grab Groundwater
NRG PRGS

LL Sample # WW 7650776
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by JP

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTW5

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/30/2014 15:40	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 19:05	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 19:05	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 14:21	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 20:19	Heather E Williams	5
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7650777
LL Group # 1513702
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 12:42

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

NRTWT

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	D143012AA	10/28/2014 17:50	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D143012AA	10/28/2014 17:50	Daniel H Heller	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513702
Reported: 11/05/14 at 12:42 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D143012AA	Sample number(s): 7650777							
Benzene	N.D.	0.5	ug/l	109	107	78-120	2	30
t-Butyl alcohol	N.D.	2.	ug/l	92	93	75-120	0	30
1,2-Dibromoethane	N.D.	0.5	ug/l	102	100	80-120	3	30
1,2-Dichloroethane	N.D.	0.5	ug/l	103	101	65-135	2	30
Ethylbenzene	N.D.	0.5	ug/l	100	98	79-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	108	106	75-120	2	30
Toluene	N.D.	0.5	ug/l	102	99	80-120	3	30
Xylene (Total)	N.D.	0.5	ug/l	103	100	80-120	3	30
Batch number: F143021AA	Sample number(s): 7650771-7650776							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14299WAF026	Sample number(s): 7650773-7650776							
Acenaphthene	N.D.	0.02	ug/l	78*	74*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	77	74	72-124	5	30
Anthracene	N.D.	0.02	ug/l	79	76	70-117	4	30
Benzo(a)anthracene	N.D.	0.02	ug/l	85	82	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	79	77	72-126	3	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	85	83	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	93	89	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	75	72	59-137	4	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	79	76	74-118	4	30
Biphenyl	N.D.	0.02	ug/l	97	90	74-101	7	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513702
Reported: 11/05/14 at 12:42 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	80	78	77-122	3	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	73	69	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	84	83	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	83	90	76-121	9	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	76	73	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	88	88	75-117	1	30
2-Methylnaphthalene	N.D.	0.02	ug/l	82	79	68-124	4	30
Naphthalene	N.D.	0.02	ug/l	86	83	78-117	4	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	90	86	61-123	4	30
Phenanthrene	N.D.	0.02	ug/l	89	87	72-109	2	30
Pyrene	N.D.	0.02	ug/l	72	79	70-124	9	30
Batch number: 14301B20A	Sample number(s): 7650771-7650776							
TPH-GRO water C6-C10	N.D.	20.	ug/l	107		80-129		
Batch number: 142980016A	Sample number(s): 7650775-7650776							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143020004A	Sample number(s): 7650771-7650776							
DRO C10-C28	N.D.	45.	ug/l	97	97	69-115	0	20

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7650771-7650776 UNSPK: P650761								
Benzene	91	89	72-134	3	30				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513702
Reported: 11/05/14 at 12:42 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 14301B20A	Sample number(s): 7650771-7650776 UNSPK: P650761								
TPH-GRO water C6-C10	119	121	75-135	1	30				

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: D143012AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650777	107	95	90	98
Blank	104	96	93	97
LCS	103	98	93	103
LCSD	103	96	92	102
Limits:	80-116	77-113	80-113	78-113

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650771	100	98	99	98
7650772	101	101	100	98
7650773	102	99	100	99
7650774	101	101	97	97
7650775	101	97	98	98
7650776	103	102	97	98
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14299WAF026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7650773	86	83	102
7650774	85	73	92
7650775	168*	83	38*
7650776	124	62	0*

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513702
Reported: 11/05/14 at 12:42 PM

Surrogate Quality Control

Blank	114	112	102
LCS	96	108	100
LCSD	93	103	92
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14301B20A

	Trifluorotoluene-F
7650771	180*
7650772	93
7650773	93
7650774	95
7650775	92
7650776	129
Blank	92
LCS	97
MS	98
MSD	97
Limits:	63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7650775 1ST	0*	1042*
7650776 1ST	99	179*
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143020004A

	Orthoterphenyl
7650771	74
7650772	98
7650773	25*
7650774	119
7650775	156
7650776	96
Blank	119
LCS	126
LCSD	125
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler #6

Acct. # 8390 Group # 1513702 Sample # 7650771-77

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Jeff Plummer	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

Matrix: Sediment ☐ Ground ☒ Surface ☐ Potable ☐ NPDES ☐ Soil ☐ Water Other:

Analyses Requested / Preservation Codes

For Lab Use Only: SF #: _____ SCR #: _____

Preservation Codes: H = HCl, T = Thiosulfate, N = HNO_3, B = NaOH, S = H_2SO_4, P = H_3PO_4, O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Soil	Water	Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (SM 3500-Fe B modified-1997)	Sulfate SO42- (EPA 300.0)	Methane (RSKSOP-175 modified)	Remarks
TW-02	10-23-14	0850	X			X		7	X	X	X										
TW-03	↓	0910	↓			↓		7	↓	↓	↓										
TW-07	↓	0930	↓			↓		8	↓	↓	↓	X									
TW-04	↓	1000	↓			↓		8	↓	↓	↓	X									
TW-06	↓	1030	↓			↓		9	↓	↓	↓	X		X							
TW-05	10-23-14	1100	↓			↓		9	X	↓	X	X		X							
Trip blank	10-16-14	—	X			X		2		X											

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report* #.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
Jeff Plummer	10-23-14	1545	Donna Marple	10/23/14	1545
Donna Marple	10/24/14	1240	Mark Haskman	10-24-14	1240
Mark Haskman	10-24-14	1527			
			Pat G	10/24/14	1527

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.5 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 36492

Group Number(s): 1513702

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/24/2014 15:27
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:14 on 10/24/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	0.5	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425

T | 717-656-2300
F | 717-656-2681
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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 05, 2014

Project: NRG PRGS

Submittal Date: 10/24/2014
Group Number: 1513703
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-30S Grab Groundwater	7650778
MW-31 Grab Groundwater	7650779
Trip Blank Water	7650780

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: MW-30S Grab Groundwater
NRG PRGS

LL Sample # WW 7650778
LL Group # 1513703
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 10:45 by NG

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 14:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

30SMW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	3 J	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	25 J	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	2,900	45	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 15:38	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 15:38	Anita M Dale	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 19:32	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 19:32	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 14:45	Christine E Dolman	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1

Sample Description: MW-31 Grab Groundwater
NRG PRGS

LL Sample # WW 7650779
LL Group # 1513703
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by NG

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 14:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

31-MW

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	0.6	J	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	0.6	J	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	4		0.2	10
10262	Acenaphthylene	208-96-8	0.5		0.2	10
10262	Anthracene	120-12-7	0.7		0.2	10
10262	Benzo(a)anthracene	56-55-3	0.8		0.2	10
10262	Benzo(a)pyrene	50-32-8	0.4	J	0.2	10
10262	Benzo(b)fluoranthene	205-99-2	0.5	J	0.2	10
10262	Benzo(e)pyrene	192-97-2	0.3	J	0.2	10
10262	Benzo(g,h,i)perylene	191-24-2	N.D.		0.2	10
10262	Benzo(k)fluoranthene	207-08-9	0.3	J	0.2	10
10262	Biphenyl	92-52-4	4		0.2	10
10262	C1-Benzanthrene/chrysenes	n.a.	0.6		0.2	10
10262	C1-Dibenzothiophene	n.a.	4		0.2	10
10262	C1-Fluoranthrenes/pyrenes	n.a.	4		0.2	10
10262	C1-Fluorenes	n.a.	14		0.2	10
10262	C1-Naphthalenes	n.a.	21		0.2	10
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C1-Phenanthrenes/anthracenes	n.a.	22		0.2	10
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C2-Dibenzothiophene	n.a.	8		0.2	10
10262	C2-Fluoranthrenes/pyrenes	n.a.	2		0.2	10
10262	C2-Fluorenes	n.a.	15		0.2	10
10262	C2-Naphthalenes	n.a.	42		0.2	10
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C2-Phenanthrenes/anthracenes	n.a.	24		0.2	10
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C3-Dibenzothiophene	n.a.	5		0.2	10
10262	C3-Fluoranthrenes/pyrenes	n.a.	1		0.2	10
10262	C3-Fluorenes	n.a.	17		0.2	10
10262	C3-Naphthalenes	n.a.	64		0.2	10
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.2	10
10262	C3-Phenanthrenes/anthracenes	n.a.	13		0.2	10
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.2	10
10262	C4-Dibenzothiophene	n.a.	N.D.		0.2	10
10262	C4-Fluoranthrenes/pyrenes	n.a.	0.4	J	0.2	10
10262	C4-Naphthalenes	n.a.	52		0.2	10
10262	C4-Phenanthrenes/anthracenes	n.a.	6		0.2	10
10262	Chrysene	218-01-9	0.7		0.2	10
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.2	10
10262	Dibenzofuran	132-64-9	2		0.2	10
10262	Dibenzothiophene	132-65-0	1		0.2	10

Sample Description: MW-31 Grab Groundwater
NRG PRGS

LL Sample # WW 7650779
LL Group # 1513703
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by NG

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 14:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

31-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	4	0.2	10
10262	Fluorene	86-73-7	6	0.2	10
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.2	10
10262	1-Methylnaphthalene	90-12-0	24	0.2	10
10262	2-Methylnaphthalene	91-57-6	6	0.2	10
10262	Naphthalene	91-20-3	4	0.2	10
10262	Naphthobenzothiophene	224-10-2	N.D.	0.2	10
10262	Perylene	198-55-0	N.D.	0.2	10
10262	Phenanthrene	85-01-8	7	0.2	10
10262	Pyrene	129-00-0	5	0.2	10

The LCS and/or LCSD recoveries are outside the stated QC window but within the marginal exceedance allowance of +/- 4 standard deviations as defined in the NELAC Standards. The following analytes are accepted based on this allowance:
acenaphthene

GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	140	20	1
GC Miscellaneous	**RSKSOP-175 modified**		**ug/l**	**ug/l**	
07105	Methane	74-82-8	4,300	60	20
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	7,200	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	2.0	10
05260	Coal Tar Oil	8001-58-9	N.D.	2.0	10
05260	Diesel/#2 Fuel	68334-30-5	13	2.0	10
05260	#6 Fuel Oil	68553-00-4	N.D.	10	10
05260	Gasoline	8006-61-9	N.D.	2.0	10
05260	Kerosene	8008-20-6	N.D.	2.0	10
05260	Mineral Spirits	8030-30-6	N.D.	2.0	10
05260	Motor Oil	n.a.	N.D.	10	10
Wet Chemistry	**EPA 300.0**		**mg/l**	**mg/l**	
00228	Sulfate	14808-79-8	57.2	1.5	5
	EPA 353.2		**mg/l**	**mg/l**	
00220	Nitrate Nitrogen	14797-55-8	N.D.	0.040	1
00219	Nitrite Nitrogen	14797-65-0	N.D.	0.015	1
	EPA 1664A		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.	1.4	1

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Analysis Report

Sample Description: MW-31 Grab Groundwater
NRG PRGS

LL Sample # WW 7650779
LL Group # 1513703
Account # 08390

Project Name: NRG PRGS

Collected: 10/23/2014 11:00 by NG

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 14:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

31-MW

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry		**SM 2130 B-2001**	**N T U**	**N T U**	
12145	Turbidity	n.a.	728	2.8	20
		SM 2320 B-1997	**mg/l as CaCO3**	**mg/l as CaCO3**	
12150	Total Alkalinity	n.a.	416	0.70	1
		SM 3500-Fe B modified-1997	**mg/l**	**mg/l**	
08344	Ferrous Iron	n.a.	2.6	0.050	5

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	F143021AA	10/29/2014 16:00	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	F143021AA	10/29/2014 16:00	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14299WAF026	10/30/2014 16:23	Joseph M Gambler	10
11012	Alkyl PAH Extract	SW-846 3510C	1	14299WAF026	10/28/2014 09:10	Katheryne V Sponheimer	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14301B20A	10/29/2014 20:00	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14301B20A	10/29/2014 20:00	Marie D Beamenderfer	1
07105	Methane	RSKSOP-175 modified	1	143080011A	11/05/2014 10:10	Nicholas R Rossi	20
12858	DRO micro-ext 8015B	SW-846 8015B	1	143020004A	10/30/2014 15:08	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 21:07	Heather E Williams	10
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143020004A	10/29/2014 13:00	Wanda F Oswald	1
00228	Sulfate	EPA 300.0	1	14298347602B	10/26/2014 04:19	Sandra J Miller	5
00220	Nitrate Nitrogen	EPA 353.2	1	14299106105B	10/26/2014 19:45	Joseph E McKenzie	1
00219	Nitrite Nitrogen	EPA 353.2	1	14298105101A	10/25/2014 10:24	Drew M Gerhart	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807903A	10/28/2014 18:24	Michelle L Lalli	1
12145	Turbidity	SM 2130 B-2001	1	14297121451B	10/24/2014 23:00	Luz M Groff	20
12150	Total Alkalinity	SM 2320 B-1997	1	14298002104A	10/25/2014 23:29	Kenneth A Bell	1
08344	Ferrous Iron	SM 3500-Fe B modified-1997	1	14303834401A	10/30/2014 19:20	Daniel S Smith	5

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Analysis Report

Sample Description: Trip Blank Water
NRG PRGS

LL Sample # WW 7650780
LL Group # 1513703
Account # 08390

Project Name: NRG PRGS

Collected: 10/16/2014

Submitted: 10/24/2014 15:27
Reported: 11/05/2014 14:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

3031S

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	D143012AA	10/28/2014 18:13	Daniel H Heller	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	D143012AA	10/28/2014 18:13	Daniel H Heller	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513703
Reported: 11/05/14 at 02:29 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: D143012AA	Sample number(s): 7650780							
Benzene	N.D.	0.5	ug/l	109	107	78-120	2	30
t-Butyl alcohol	N.D.	2.	ug/l	92	93	75-120	0	30
1,2-Dibromoethane	N.D.	0.5	ug/l	102	100	80-120	3	30
1,2-Dichloroethane	N.D.	0.5	ug/l	103	101	65-135	2	30
Ethylbenzene	N.D.	0.5	ug/l	100	98	79-120	3	30
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	108	106	75-120	2	30
Toluene	N.D.	0.5	ug/l	102	99	80-120	3	30
Xylene (Total)	N.D.	0.5	ug/l	103	100	80-120	3	30
Batch number: F143021AA	Sample number(s): 7650778-7650779							
Benzene	N.D.	0.5	ug/l	85		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	96		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	92		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	84		65-135		
Ethylbenzene	N.D.	0.5	ug/l	86		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	92		75-120		
Toluene	N.D.	0.5	ug/l	87		80-120		
Xylene (Total)	N.D.	0.5	ug/l	89		80-120		
Batch number: 14299WAF026	Sample number(s): 7650779							
Acenaphthene	N.D.	0.02	ug/l	78*	74*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	77	74	72-124	5	30
Anthracene	N.D.	0.02	ug/l	79	76	70-117	4	30
Benzo(a)anthracene	N.D.	0.02	ug/l	85	82	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	79	77	72-126	3	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	85	83	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	93	89	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	75	72	59-137	4	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	79	76	74-118	4	30
Biphenyl	N.D.	0.02	ug/l	97	90	74-101	7	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513703
Reported: 11/05/14 at 02:29 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	80	78	77-122	3	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	73	69	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	84	83	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	83	90	76-121	9	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	76	73	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	88	88	75-117	1	30
2-Methylnaphthalene	N.D.	0.02	ug/l	82	79	68-124	4	30
Naphthalene	N.D.	0.02	ug/l	86	83	78-117	4	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	90	86	61-123	4	30
Phenanthrene	N.D.	0.02	ug/l	89	87	72-109	2	30
Pyrene	N.D.	0.02	ug/l	72	79	70-124	9	30
Batch number: 14301B20A	Sample number(s): 7650778-7650779							
TPH-GRO water C6-C10	N.D.	20.	ug/l	107		80-129		
Batch number: 143080011A	Sample number(s): 7650779							
Methane	N.D.	3.0	ug/l	110		85-115		
Batch number: 142980016A	Sample number(s): 7650779							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143020004A	Sample number(s): 7650778-7650779							
DRO C10-C28	N.D.	45.	ug/l	97	97	69-115	0	20
Batch number: 14298105101A	Sample number(s): 7650779							
Nitrite Nitrogen	N.D.	0.015	mg/l	98		90-110		
Batch number: 14298347602B	Sample number(s): 7650779							
Sulfate	N.D.	0.30	mg/l	101		90-110		
Batch number: 14299106105B	Sample number(s): 7650779							
Nitrate Nitrogen	N.D.	0.040	mg/l	101		90-110		

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513703
Reported: 11/05/14 at 02:29 PM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 14297121451B	Sample number(s): 7650779							
Turbidity	0.15 J	0.14	N T U	96	96	90-110	1	3
Batch number: 14298002104A	Sample number(s): 7650779							
Total Alkalinity	N.D.	0.70	mg/l as CaCO3	96		90-110		
Batch number: 14301807903A	Sample number(s): 7650779							
HEM (oil & grease)	N.D.	1.4	mg/l	88	90	78-114	3	16
Batch number: 14303834401A	Sample number(s): 7650779							
Ferrous Iron	N.D.	0.010	mg/l	99		93-105		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: F143021AA	Sample number(s): 7650778-7650779 UNSPK: P650761								
Benzene	91	89	72-134	3	30				
t-Butyl alcohol	95	93	67-119	3	30				
1,2-Dibromoethane	93	92	77-116	1	30				
1,2-Dichloroethane	88	87	63-142	1	30				
Ethylbenzene	89	88	71-134	1	30				
Methyl Tertiary Butyl Ether	92	89	72-126	3	30				
Toluene	90	89	80-125	1	30				
Xylene (Total)	93	90	79-125	3	30				
Batch number: 14301B20A	Sample number(s): 7650778-7650779 UNSPK: P650761								
TPH-GRO water C6-C10	119	121	75-135	1	30				
Batch number: 143080011A	Sample number(s): 7650779 UNSPK: P650761								
Methane	93	85	46-129	5	20				
Batch number: 14298105101A	Sample number(s): 7650779 UNSPK: P650761 BKG: P650761								
Nitrite Nitrogen	104		90-110			N.D.	N.D.	0 (1)	20
Batch number: 14298347602B	Sample number(s): 7650779 UNSPK: P650761 BKG: P650761								
Sulfate	99		90-110			253	251	1	20
Batch number: 14299106105B	Sample number(s): 7650779 UNSPK: P650761 BKG: P650761								
Nitrate Nitrogen	90		90-110			1.9	1.8	5*	2
Batch number: 14297121451B	Sample number(s): 7650779 BKG: P650761								
Turbidity						1,120	1,150	2	8
Batch number: 14298002104A	Sample number(s): 7650779 UNSPK: P646469 BKG: P646469								
Total Alkalinity	83 (2)		17-146			1,090	1,090	0	5
Batch number: 14301807903A	Sample number(s): 7650779 UNSPK: P651299								
HEM (oil & grease)	95		78-114						

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(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1513703
Reported: 11/05/14 at 02:29 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14303834401A	Sample number(s): 7650779 UNSPK: P651432 BKG: P651432								
Ferrous Iron	101	84	73-111	12*	6	0.20	0.20	0 (1)	5

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: D143012AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650780	106	97	90	98
Blank	104	96	93	97
LCS	103	98	93	103
LCSD	103	96	92	102
Limits:	80-116	77-113	80-113	78-113

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: F143021AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7650778	102	101	100	97
7650779	103	101	99	98
Blank	103	99	98	98
LCS	102	104	99	100
MS	104	102	98	99
MSD	101	101	98	100
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14299WAF026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7650779	112	67	87
Blank	114	112	102
LCS	96	108	100
LCSD	93	103	92
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14301B20A

	Trifluorotoluene-F
7650778	96
7650779	94
Blank	92
LCS	97
MS	98
MSD	97

*- Outside of specification
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(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc.
Reported: 11/05/14 at 02:29 PM

Group Number: 1513703

Surrogate Quality Control

Limits: 63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7650779	182*	290*
1ST Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143020004A

	Orthoterphenyl
7650778	101
7650779	120
Blank	119
LCS	126
LCSD	125
Limits:	42-160

Analysis Name: Methane
Batch number: 143080011A

	Propene
7650779	101
Blank	104
LCS	103
MS	88
MSD	86
Limits:	47-116

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Cooler #11

Acct. # 8390 Group # 1513703 Sample # 7650778-80

Client: Groundwater & Env. Services, Inc.	
Project Name/#: NRG PRGS	Site ID #: NRG PRGS
Project Manager: Gregory Reichart	P.O. #: 0402859
Sampler: Nick Ceglielm	PWSID #:
Phone #: 800-220-3606 x 3717	Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA	

For Lab Use Only
SF #: _____
SCR #: _____

Preservation Codes: H = HCl; T = Thiosulfate; N = HNO_3; B = NaOH; S = H_2SO_4; P = H_3PO_4; O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Sediment	Ground	Surface	Soil	Potable	NPDES	Water	Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (SM 3500-Fe B modified-1997)	Sulfate SO42- (EPA 300.0)	Methane (RSKSOP-175 modified)	Remarks
MW-30S	10-23	1045	X			X					X		7	X	X	X										
MW-31	10-23	1100	X			X					X		26	X	X	X	X	X	X	X	X	X	X	X	X	
Trip blank	10-16	—				X					X		2		X											

Analyses Requested / **Preservation Codes**

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:

Rush results requested by (please check): E-Mail ☐ Phone ☐

E-mail Address: mdlabs@gesonline.com & ges@equisonline.com

Phone:

Data Package Options (please check if required)

Type I (Validation/non-CLP) ☐ MA MCP ☐

Type III (Reduced non-CLP) ☐ CT RCP ☐

Type VI (Raw Data Only) ☐ TX TRRP-13 ☐

NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD

EQEDD Name: NRG PRGS.*Lab report* #.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-23-14	1340	[signature]	10-23-14	1340
[signature]	10-23-14	1545	Donna Marple	10/23/14	1545
Donna Marple	10/24/14	1240	[signature]	10-24-14	1240
[signature]	10-24-14	1527	—		
—			[signature]	10/24/14	1527

Relinquished by Commercial Carrier:

UPS _____ FedEx _____ Other _____

Temperature upon receipt 0.5 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 36491

Group Number(s): 1513703

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/24/2014 15:27
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:06 on 10/24/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	DT121	~~3.2~~ 0.5 per P. Engle LF 10/27/14	DT	Wet	Y	Loose	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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APPENDIX F

LNAPL Baildown Field Data and Analysis

GES LNAPL BAILDOWN TEST FIELD LOG

SITE: 1400 N. Royal St., Alexandria, VA
PROJECT: NRG - Potomac River Generating Station (PRGS)
WELL ID: MW-05 **DATE:** 9/19/14 **TIME:** 8:58
PERSONNEL: P. Reichardt, D. Rice

Air Temperature: 60 °F Groundwater Temperature: 62 °F
Current Precipitation: None
Esti. Wind Speed: light

STATIC DEPTH TO LNAPL		(A)	23.18	ft btoc	7.07	m btoc
STATIC DEPTH TO WATER		(B)	23.72	ft btoc	7.235	m btoc
LNAPL THICKNESS	(B - A)	(C)	0.54	ft	0.165	m
80% of LNAPL THICKNESS	(C *.80)	(D)	0.432	ft	0.132	m
SPECIFIC GRAVITY OF LNAPL	(at 62 °F)	(E)	0.877			
CORRECTED DEPTH TO WATER	(B - (C x E))	(F)	23.25	ft btoc	7.09	m btoc
MEASURED WELL DEPTH			32.15	ft btoc	9.806	m btoc
DEPTH TO TOP OF SCREEN		(G)	25	ft btoc	7.625	m btoc
DEPTH TO BASE OF SCREEN		(H)	35	ft btoc	10.68	m btoc

★ (A) Must be between (G) and (H). If not, discontinue test. ⇨ SUBMERGED

WELL CASING INNER DIAMETER		(I)	0.3333	ft	0.102	m
WELL BORE DIAMETER		(J)	0.875	ft	0.267	m

★ (C) Must be > (J)/2. If not, discontinue test. ⇨ OK

WELL CASING SPECIFIC VOLUME		(K)	0.6528	gals/ft	8.1049	liters/m
BAILER TYPE:			HDPE - 1 gal			
BAILER INNER RADIUS		(L)	0.1875	ft		m
BAILER LENGTH		(M)	2.5208	ft		m
NUMBER OF BAILS REMOVED (LNAPL AND GROUNDWATER)		(N)	2	bails		

PRESSURE TRANSDUCER TYPE/MODEL: N/A
PRESSURE TRANSDUCER SETTING IN LNAPL OR WATER?: ft btoc m btoc
DATA LOGGER TYPE/MODEL:
PRESSURE READINGS RECORDED IN _____ SECOND INTERVALS

CALCULATE VOLUME OF BAILER and FRACTION OF LENGTH FILLED WITH EACH FLUID:
Volume = Fraction of Full Bailer x 3.142 x $(L)^2$ x (M) x 7.48 gals/ft OR USE CONTAINER VOLS.

VOLUME REMOVED = (N) X NUMBER OF BAILS REMOVED			0.17	gals	0.65	liters
L OF LNAPL REMOVED	_____	VOL OF WATER REMOVED	0.36	gals	1.4	liters

TEST DISCONTINUED AFTER LNAPL THICKNESS = (D) ft 0 m
TEST DISCONTINUED AFTER 3 HOURS HAD ELAPSED
9/19/2014 8:58:00 AM STARTING TIME 1:45:00 PM END TIME

Conversion Factors: 1 foot = 0.305 m 1 gal = 3.785 liters 2-inch screen = 0.163 gal/ft 4-inch screen = 0.653 gal/ft
1 m = 3.28 feet 1 liter = 0.264 gals 2-inch screen = 2.03 liters/m 4-inch screen = 8.11 liters/m

GES/ES&T LNAPL BAILDOWN TEST FIELD LOG

NOTE: Enter measurements -- change units to metric if necessary

SITE: 1400 N. Royal St., Alexandria, VA
PROJECT: NRG - Potomac River Generating Station (PRGS)
WELL ID: MW-05 **DATE:** 9/19/2014 **TIME:** 8:58
PERSONNEL:

CLOCK TIME	ELAPSED TIME (min)	DEPTH TO LNAPL (ft btoc)	DEPTH TO WATER (ft btoc)	LNAPL THICKNESS (feet)	COMMENTS / OBSERVATIONS
8:58:00		23.18	23.72	0.54	PRETEST MEASUREMENTS
9:03:30	0.5	23.88	24.18	0.3	LAST BAIL REMOVED FROM WELL
9:04:00	1	23.81	24.07	0.26	
9:06:00	3	23.71	24	0.29	
9:08:00	5	23.65	23.93	0.28	
9:13:00	10	23.53	23.83	0.3	
9:23:00	20	23.39	23.7	0.31	
9:33:00	30	23.32	23.63	0.31	
9:43:00	40	23.29	23.59	0.3	
10:03:00	60	23.25	23.54	0.29	
10:33:00	90	23.21	23.52	0.31	
11:03:00	120	23.2	23.5	0.3	
13:45:00	282	23.16	23.46	0.3	Final measurement

Basic Input Data for Slug Withdrawal - Baildown Test Analysis

Location and Timing of Baildown Test					Comments About Data	
Well Name:	MW-05					
Site Name:	1400 N. Royal St., Alexandria, VA					
Database:	Carsel & Parrish (1988) and API (2006)					
Start Date:	9/19/2014				Date of bailing the well.	
Clock time of start of bailing:	9:00				Known starting time	
Clock time of end of bailing:	9:03				two bailer withdrawals	
Time spend Bailing well:	0:02:45	(hr:min:sec)			Calculated value based on transducer.	
Time of last fluid measurement:	13:45	9/19/2014			Clock time of last measurement.	
End Date:	9/19/2014	(m/d/yr)			Date of last fluid level measurement.	
Test Well Characteristics						
Borehole Diam.	10.00	(inches)	0.254	(meters)	Data from well log.	0.833 (feet)
Casing ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Casing OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Screen ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Screen OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Measuring Point stickup above ground	0.00	(feet)	0.000	(meters)	Data from well log.	
Oil-wet screen length -- pretest:	0.54	(feet)	0.165	(meters)	Data from pretest fluid levels.	
Wtr-wet screen length -- pretest:	11.28	(feet)	3.439	(meters)		
Aquifer thickness:	35.00	(feet)	10.671	(meters)	Estimated	
Specific oil yield of filter pack sand:	0.137	(dimensionless)				
Specific water yield of filter pack sand:	0.03	(dimensionless)				
Oil and Water Volumes Bailed						
Volume of free LNAPL bailed:	0.17	(gallons)	0.64	(liters)	Measured in field after bailing.	heating/ #2 fue
Volume of groundwater bailed:	0.36	(gallons)	1.36	(liters)	Measured in field after bailing.	
Fluid Properties						
Specific gravity of oil:	0.877	(dimensionless)			Measured, addjusted for temp.	
Dynamic viscosity of oil:	4.58	(centipoise)			Measured, addjusted for temp.	
Air-water surface tension:	74.1	(dynes/cm)			Measured at room temp.	
Air-oil surface tension:	32.6	(dynes/cm)			Measured at room temp.	
Oil-water interfacial tension:	17.2	(dynes/cm)			Measured at room temp.	
Groundwater Temperature	62.0	degrees F	16.67	deg C	Assumed value	
Soil Properties--Filter Pack Sand						
Hydraulic conductivity:	800	(ft/day)	Assumed values		Value based on laboratory measurement.	
Effective Porosity:	0.3	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.1	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	4.2	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	2.1	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.52	(dimensionless)			Initial estimate based on soil texture.	
Soil Properties--Formation			Preliminary Estimates			
Hydraulic conductivity:	1	(ft/day)			Use if different from that calculated.	
Effective Porosity:	0.35	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.25	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	2.5	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	1.50	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.33	(dimensionless)			Initial estimate based on soil texture.	

* NB : The surface and interfacial tensions are estimated from other data.

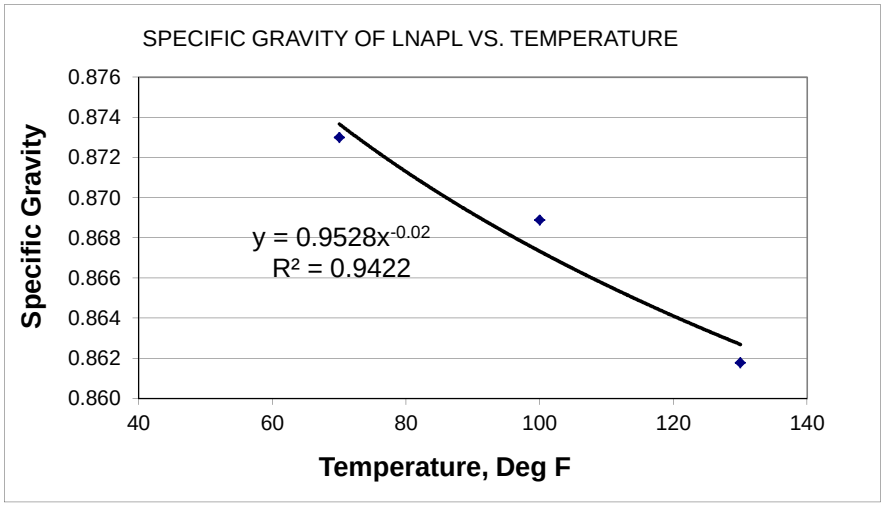
Laboratory Fluid Properties (PTS Lab report)

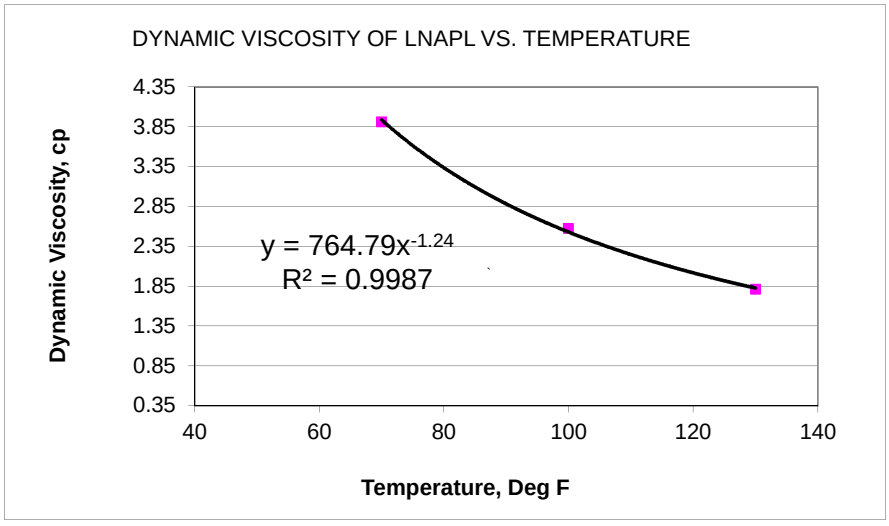
SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY centistokes	VISCOSITY centipoise
MW-05	Water	70	1.001	0.9990	1.030	1.030
		100	1.004	0.9967	0.707	0.705
		130	1.005	0.9910	0.524	0.519
MW-05	NAPL	70	0.8730	0.8713	4.490	3.910
		100	0.8689	0.8629	2.980	2.570
		130	0.8618	0.8497	2.130	1.810

GW Temperatures during GES Sampling

Well ID	Temp, °C
Average	#DIV/0!

PHASE PAIR SAMPLE ID / PHASE	PHASE	TEMPERATURE, °F	INTERFACIAL TENSION, Dynes/centimeter
MW-05 / Water	Air	75	74.1
MW-05 / NAPL	Air	76	32.6
MW-05 / Water	NAPL	76	17.2





Fluid Levels Measured Prior to and After Bailing

Well Name: **MW-05** **Site:** **1400 N. Royal St., Alexandria, VA**

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments	Depth to Zaw from Grd (feet)	Depth to Zao from Grd (feet)	Depth to Zow from Grd (feet)
9:00	pretest	23.18	23.72	**0.54**	**23.25**	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table.	19.05	18.98	19.52

Measurements After Bailing

9:03:30	0.01	23.440	23.72	0.28	23.47	First measurement assumed to be static. The first depth-to-fluids measurement after bailer is raised above air-oil interface.
9:04:00	1.00	23.81	24.07	0.26	23.84	
9:06:00	3.00	23.71	24	0.29	23.75	
9:08:00	5.00	23.65	23.93	0.28	23.68	
9:13:00	10.00	23.53	23.83	0.30	23.57	
9:23:00	20.00	23.39	23.7	0.31	23.43	
9:33:00	30.00	23.32	23.63	0.31	23.36	
9:43:00	40.00	23.29	23.59	0.30	23.33	
10:03:00	60.00	23.25	23.54	0.29	23.29	
10:33:00	90.00	23.21	23.52	0.31	23.25	
11:03:00	120.00	23.2	23.5	0.30	23.24	
13:45:00	282.00	23.16	23.46	0.30	23.20	

23.43 Calculated DT Wtr Table at time zero for a single bail.

0.28 Calculated initial oil thickness at t-zero.

0 Early change in oil thickness -- negative due to rising WT

Sceen ID assumed is: 4.00 inches (read from Basic Input Data)

0.087	ft^3/ft	
0.653	gal/ft	
2.471	Liter/ft	
0.405	ft/Liter	vertical fluid level change with removal of 1 liter
643.45	ml	Volume of oil = 1/7th of total volume removed
0.643		Volume LANPL in Liters
1.36		Volume groundwater in liters
0.260	ft	Change in fluid level at time zero

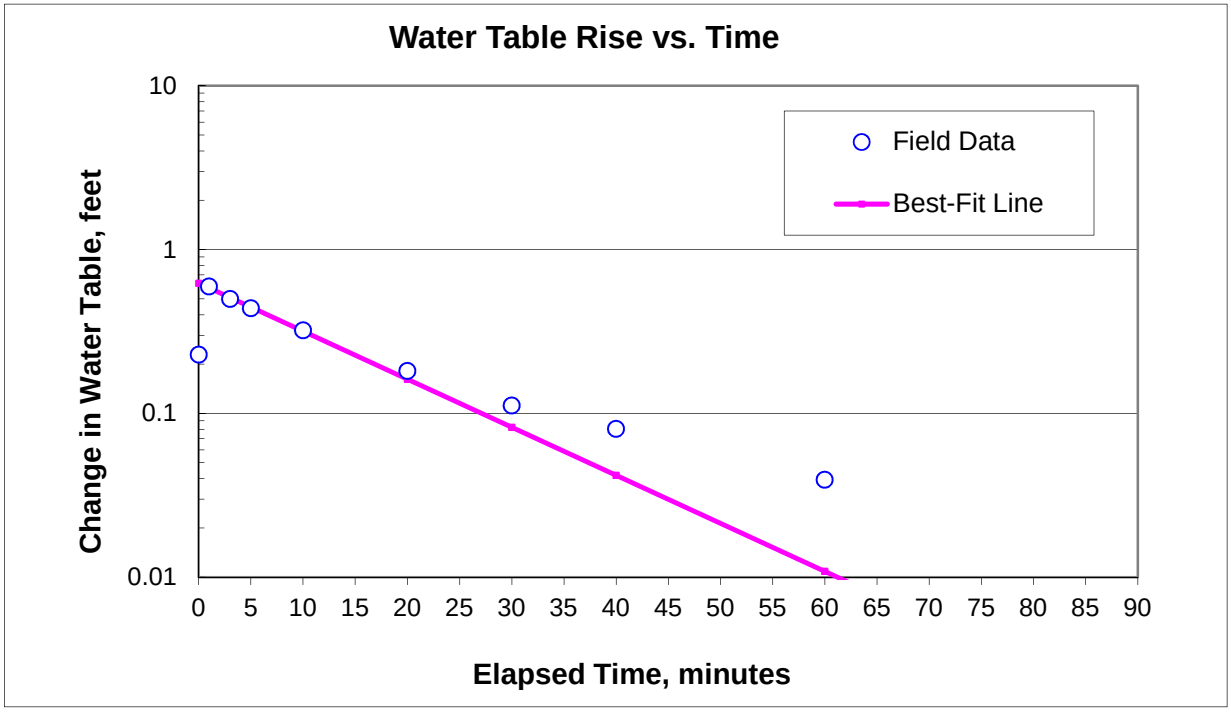
Change assumes instantaneous removal

Semi-Log Plots of Fluid Level Changes with Time and Calculated Slopes of Best-fit Lines and Y-Axis Intercepts

Well Name: MW-05
Site: 1400 N. Royal St., Alexandria, VA

Elapsed Time (minutes)	Change in Free Oil Thickness (feet)	Change in Corrected Wtr Table (feet)	Log_{10} of Change in Oil Thick.	Log_{10} of Change in Wtr. Table	Calculated Data For Best-Fit Straight Line	
					Delta Oil	Delta Water
0.010	0.2604	0.228	-0.584	-0.641	0.269	6.23E-01
1.000	0.28	0.596	-0.553	-0.225	0.267	5.82E-01
3.000	0.25	0.499	-0.602	-0.302	0.262	5.09E-01
5.000	0.26	0.438	-0.585	-0.358	0.258	4.45E-01
10.000	0.24	0.321	-0.620	-0.494	0.247	3.17E-01
20.000	0.23	0.182	-0.638	-0.740	0.226	1.61E-01
30.000	0.23	0.112	-0.638	-0.952	0.208	8.22E-02
40.000	0.24	0.081	-0.620	-1.094	0.191	4.19E-02
60.000	0.25	0.039	-0.602	-1.405	0.160	1.08E-02
90.000	0.23	0.002	-0.638	-2.749	0.124	1.43E-03
120.000	0.24	-0.009	-0.620	#NUM!	0.096	1.89E-04
282.000	0.24	-0.049	-0.620	#NUM!	0.024	3.36E-09

Well ID: **MW-05**



Linear Regression Best Fit for Water Table Rise

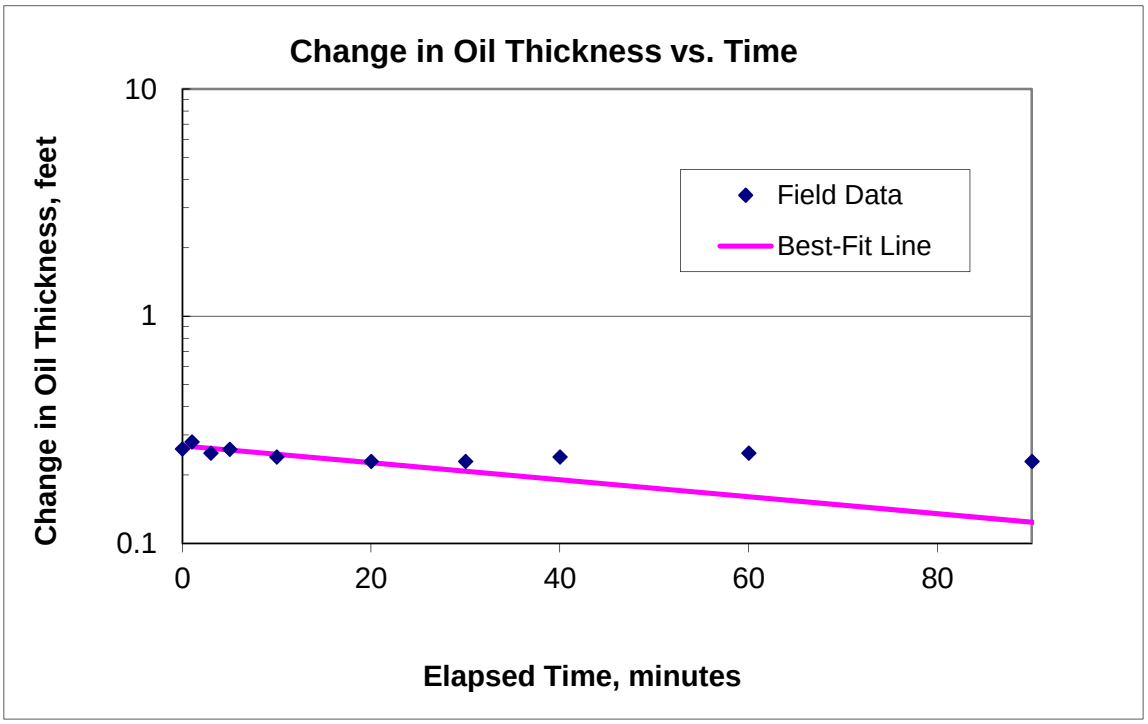
Select cell ranges for the log(water table change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-0.0293
Y-intercept of best-fit line:	0.6230
Elpased time to reach 90% of y-intercept:	34.1 minutes

Data for Plotting Best-Fit Straight Line for Water Table Recovery

	Time, min	Displacement, ft
Yo	0	0.623
Ymin	0.0	6.23E-01

Well ID: **MW-05**



Linear Regression Best Fit for Oil Thickness Changes

Select cell ranges for the log(oil thickness change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-3.7E-03
Y-intercept of best-fit line:	2.69E-01
Elpased time to reach 90% of y-intercept:	267.4 minutes

Data for Plotting Best-Fit Straight Line for Oil Thickness Recovery

	Time, min	Displacement, ft
Yo	0	0.269
Ymin	0.0	2.69E-01

Bouwer and Rice Solution Adapted to Estimating the Oil Conductivity

Well Name: MW-05 **Site: 1400 N. Royal St., Alexandria, VA**

Modified after Lundy and Zimmerman (1966) by including effect of filter pack resaturation.

Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.0	inches	0.42	feet
Initial thickness of oil in well screen:	0.54	feet		
Fluid Dynamic Viscosity, centipoise:	4.581	cp		
Estimate of the y-intercept value (only used when a <u>single bail</u> of oil is removed)				
Free Oil Volume Bailed:	0.17	gallons	0.02	cubic feet
Initial equiv. thickness change in well:	0.26	feet		
Filter pack specific yield for oil:	0.137			
Max. potential drainable oil volume:	0.090	gallons	0.01	cubic feet
Percent of Oil Slug Vol. Drained	53.09	percent		
Lower Bound Y-o Estimate	0.20	<u>feet</u>		
Estimate of oil conductivity averaged over the initial thickness of free oil zone.				
Screen length to csg + filter pack radius:	1.30			
Bouwer and Rice model parameter A:	1.562			
Bouwer and Rice model parameter B:	0.231			
Bouwer and Rice model parameter C:	0.428			
Effective well radius with filter pack effect:	2.62	inches	0.22	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius:	0.22			
Time for recovery to 90% of y-intercept value:	267.4	minutes		
Oil Conductivity averaged over free oil zone:	**1.20E-01**	**ft/day**	**4.23E-05**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Bouwer and Rice Solution to Estimating the Hydraulic Conductivity

Well Name: MW-05 **Site: 1400 N. Royal St., Alexandria, VA**

Based on the rate of water table recovery after bailing a well with free oil and groundwater.
Method includes the effect of filter pack resaturation.
Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.0	inches	0.42	feet
Initial thickness of water column in well screen:	11.3	feet		
Aquifer thickness (for partial pentration):	35	feet		
Fluid Dynamic Viscosity, centipoise:	4.58	cp	Oil Specific Gravity =	0.877
Estimate of the y-intercept value (only used when a single bail of oil is removed)				
Equivalent volume of groundwater bailed:	0.51	gallons	0.07	ft^3 equivalent to LNAPL + water
Initial equiv. thickness change in well:	0.78	feet	0.02	ft^3 equivalent water as LNAPL
Filter pack specific yield for water, EARLY TIME:	0.000		Filter pack specific yield--LATE TIME:	0.03
Max. potential drainable water volume:	0.00E+00	gallons	0.00E+00	ft^3
Percent of Initial Slug Vol. Drained	0.00	percent		
Lower Bound Y-o Estimate	0.17	feet		

Estimate of hydraulic conductivity averaged over the initial thickness of free oil zone and underlying groundwater zone.

Screen length to csg + filter pack radius:	27.07			
Bouwer and Rice model parameter A:	2.283			
Bouwer and Rice model parameter B:	0.371			
Bouwer and Rice model parameter C:	1.941			
Effective well radius with filter pack effect:	2.00	inches	0.17	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius (partial penetration):	2.11			
Time for recovery to 90% of y-intercept value:	34.1	minutes		
Water Conductivity averaged over groundwater zone:	**2.53E-01**	**ft/day**	**8.92E-05**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Filter Pack

Well ID : MW-05

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.87731	(dimensionless)
Dynamic viscosity of free oil:	4.58117	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	

Soil Properties of Filter Pack Sand

Hydraulic conductivity:	800	ft/day	2.82E-01 cm/sec
Effective Porosity:	0.3	(dimensionless)	
Irreducible water saturation:	1.00E-01	(dimensionless)	
van Genuchten alpha:	8.000	1/feet	
van Genuchten n:	3.00	(dimensionless)	
van Genuchten m:	0.67	(dimensionless)	

Free Oil Thickness in Well: 0.54 feet

Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.027	feet

Calculated Results

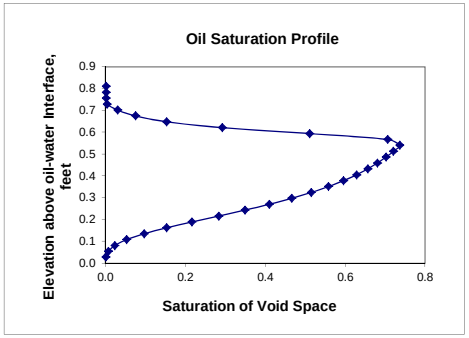
Geometric mean Oil Conductivity (above-below oil table)	9.24E-01 ft/day	5.76E+01 ft/day	
Oil Transmissivity of oil layer (above-below oil table):	3.40E+01 ft2/day		
Geometric mean oil saturation within free oil layer:	1.01E-01		
Geometric mean water sat'n within free oil layer:	3.96E-01		
Specific Volume of Oil (above-below oil table):	7.79E-02 ft		
Specific Volume of Water (above & below oil table):	1.15E-01 ft		
Estimate of oil storativity:	1.51E-02		
LNAPL Volume in filter pack + well at time zero	6.14E-02 ft^3	4.59E-01 gallons	1.74E+00 liters
Volume in filter pack at time zero	1.43E-02 ft^3	1.07E-01 gallons	4.05E-01 liters
Volume in well at time zero	4.71E-02 ft^3	3.52E-01 gallons	1.33E+00 liters

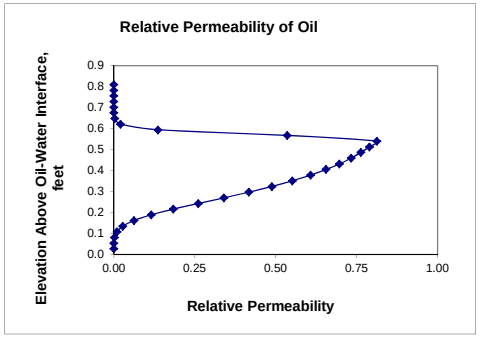
Table of Calculations:

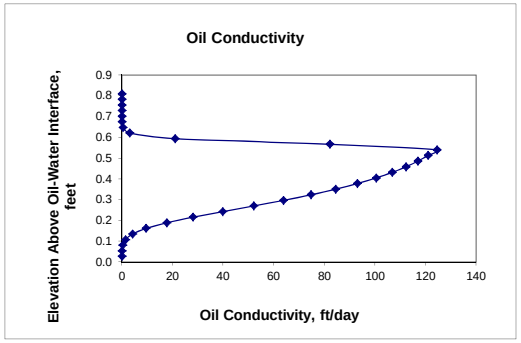
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	0.81	0.237	0.099	0.148	0.175	1.00E-03	7.65E-05	3.53E-09	6.12E-02	5.41E-07	1.46E-08	1.42E-03	8.10E-06	2.90E-01	2.64E-04	3.33E-02	9.84E-01	9.83E-01	-0.756	-6.267	-3.000
29	0.78	0.213	0.096	0.159	0.181	1.00E-03	9.65E-05	3.78E-09	7.72E-02	5.79E-07	1.56E-08	1.46E-03	8.10E-06	2.99E-01	3.22E-04	3.33E-02	9.82E-01	9.82E-01	-0.743	-6.237	-3.000
28	0.76	0.189	0.093	0.175	0.186	1.00E-03	1.23E-04	4.05E-09	9.81E-02	6.21E-07	1.68E-08	1.51E-03	8.10E-06	3.10E-01	3.96E-04	3.33E-02	9.80E-01	9.80E-01	-0.730	-6.207	-3.000
27	0.73	0.166	0.089	0.197	0.193	4.04E-03	1.57E-04	1.46E-07	1.26E-01	2.23E-05	6.02E-07	1.56E-03	3.27E-05	3.21E-01	4.90E-04	6.70E-02	9.78E-01	9.76E-01	-0.715	-4.652	-2.393
26	0.70	0.142	0.086	0.230	0.200	3.02E-02	2.03E-04	2.70E-05	1.62E-01	4.14E-03	1.12E-04	1.62E-03	2.44E-04	3.33E-01	6.10E-04	1.83E-01	9.75E-01	9.63E-01	-0.700	-2.383	-1.520
25	0.67	0.118	0.083	0.282	0.207	7.47E-02	2.65E-04	3.32E-04	2.12E-01	5.08E-02	1.37E-03	1.68E-03	6.05E-04	3.45E-01	7.66E-04	2.88E-01	9.72E-01	9.38E-01	-0.683	-1.294	-1.127
24	0.65	0.095	0.080	0.369	0.216	1.53E-01	3.49E-04	2.71E-03	2.79E-01	4.15E-01	1.12E-02	1.75E-03	1.24E-03	3.59E-01	9.70E-04	4.12E-01	9.69E-01	8.88E-01	-0.665	-0.382	-0.815
23	0.62	0.071	0.076	0.518	0.226	2.92E-01	4.64E-04	2.04E-02	3.71E-01	3.12E+00	8.42E-02	1.83E-03	2.37E-03	3.74E-01	1.24E-03	5.70E-01	9.65E-01	7.76E-01	-0.646	0.494	-0.534
22	0.59	0.047	0.073	0.747	0.237	5.10E-01	6.23E-04	1.37E-01	4.99E-01	2.10E+01	5.66E-01	1.92E-03	4.13E-03	3.90E-01	1.60E-03	7.53E-01	9.60E-01	5.34E-01	-0.625	1.321	-0.292
21	0.57	0.024	0.070	0.955	0.249	7.06E-01	8.48E-04	5.36E-01	6.79E-01	8.21E+01	2.22E+00	2.02E-03	5.72E-03	4.07E-01	2.08E-03	8.85E-01	9.54E-01	1.76E-01	-0.603	1.915	-0.151
20	0.54	0.0	0.066	1.0	0.264	0.736	1.17E-03	8.12E-01	9.35E-01	1.24E+02	3.36E+00	2.14E-03	5.96E-03	4.26E-01	2.74E-03	9.05E-01	9.48E-01	0.00E+00	-0.579	2.095	-0.133
19	0.51	0.0	0.063	1.0	0.280	0.720	1.63E-03	7.90E-01	1.30E+00	1.21E+02	3.27E+00	2.27E-03	5.83E-03	4.47E-01	3.65E-03	8.95E-01	9.40E-01	0.00E+00	-0.553	2.083	-0.142
18	0.49	0.0	0.060	1.0	0.298	0.702	2.31E-03	7.64E-01	1.85E+00	1.17E+02	3.16E+00	2.42E-03	5.68E-03	4.69E-01	4.92E-03	8.83E-01	9.30E-01	0.00E+00	-0.526	2.068	-0.154
17	0.46	0.0	0.056	1.0	0.319	0.681	3.31E-03	7.33E-01	2.65E+00	1.12E+02	3.03E+00	2.59E-03	5.51E-03	4.94E-01	6.71E-03	8.70E-01	9.18E-01	0.00E+00	-0.496	2.050	-0.167
16	0.43	0.0	0.053	1.0	0.344	0.656	4.83E-03	6.97E-01	3.86E+00	1.07E+02	2.88E+00	2.78E-03	5.32E-03	5.20E-01	9.28E-03	8.54E-01	9.04E-01	0.00E+00	-0.464	2.029	-0.183
15	0.40	0.0	0.050	1.0	0.372	0.628	7.14E-03	6.56E-01	5.72E+00	1.00E+02	2.71E+00	3.01E-03	5.09E-03	5.50E-01	1.30E-02	8.35E-01	8.86E-01	0.00E+00	-0.430	2.002	-0.202
14	0.38	0.0	0.046	1.0	0.404	0.596	1.07E-02	6.07E-01	8.59E+00	9.31E+01	2.51E+00	3.28E-03	4.82E-03	5.82E-01	1.85E-02	8.13E-01	8.64E-01	0.00E+00	-0.393	1.969	-0.225
13	0.35	0.0	0.043	1.0	0.442	0.558	1.64E-02	5.52E-01	1.31E+01	8.45E+01	2.28E+00	3.58E-03	4.52E-03	6.16E-01	2.66E-02	7.87E-01	8.37E-01	0.00E+00	-0.355	1.927	-0.253
12	0.32	0.0	0.040	1.0	0.485	0.515	2.53E-02	4.88E-01	2.02E+01	7.48E+01	2.02E+00	3.93E-03	4.17E-03	6.54E-01	3.87E-02	7.56E-01	8.03E-01	0.00E+00	-0.314	1.874	-0.288
11	0.30	0.0	0.036	1.0	0.535	0.465	3.95E-02	4.17E-01	3.16E+01	6.39E+01	1.72E+00	4.33E-03	3.77E-03	6.95E-01	5.69E-02	7.19E-01	7.61E-01	0.00E+00	-0.272	1.805	-0.332
10	0.27	0.0	0.033	1.0	0.590	0.410	6.21E-02	3.40E-01	4.97E+01	5.21E+01	1.41E+00	4.78E-03	3.32E-03	7.38E-01	8.42E-02	6.75E-01	7.10E-01	0.00E+00	-0.229	1.717	-0.387
9	0.24	0.0	0.030	1.0	0.651	0.349	9.76E-02	2.60E-01	7.81E+01	3.99E+01	1.08E+00	5.28E-03	2.82E-03	7.83E-01	1.25E-01	6.22E-01	6.47E-01	0.00E+00	-0.186	1.601	-0.458
8	0.22	0.0	0.027	1.0	0.717	0.283	1.52E-01	1.83E-01	1.21E+02	2.81E+01	7.59E-01	5.81E-03	2.29E-03	8.28E-01	1.83E-01	5.61E-01	5.72E-01	0.00E+00	-0.145	1.449	-0.548
7	0.19	0.0	0.023	1.0	0.784	0.216	2.31E-01	1.15E-01	1.85E+02	1.77E+01	4.77E-01	6.35E-03	1.75E-03	8.72E-01	2.65E-01	4.90E-01	4.85E-01	0.00E+00	-0.106	1.247	-0.665
6	0.16	0.0	0.020	1.0	0.847	0.153	3.39E-01	6.25E-02	2.72E+02	9.58E+00	2.59E-01	6.86E-03	1.24E-03	9.11E-01	3.73E-01	4.12E-01	3.90E-01	0.00E+00	-0.072	0.981	-0.816
5	0.14	0.0	0.017	1.0	0.903	0.097	4.75E-01	2.77E-02	3.80E+02	4.25E+00	1.15E-01	7.32E-03	7.84E-04	9.45E-01	5.03E-01	3.28E-01	2.91E-01	0.00E+00	-0.044	0.628	-1.014
4	0.11	0.0	0.013	1.0	0.947	0.053	6.27E-01	9.35E-03	5.01E+02	1.43E+00	3.87E-02	7.67E-03	4.29E-04	9.70E-01	6.46E-01	2.43E-01	1.96E-01	0.00E+00	-0.024	0.156	-1.276
3	0.08	0.0	0.010	1.0	0.977	0.023	7.74E-01	2.10E-03	6.19E+02	3.22E-01	8.70E-03	7.91E-03	1.89E-04	9.87E-01	7.85E-01	1.61E-01	1.14E-01	0.00E+00	-0.010	-0.492	-1.632
2	0.05	0.0	0.007	1.0	0.993	0.007	8.96E-01	2.37E-04	7.17E+02	3.63E-02	9.81E-04	8.04E-03	5.73E-05	9.96E-01	8.99E-01	8.86E-02	5.17E-02	0.00E+00	-0.003	-1.440	-2.150
1	0.03	0.0	0.003	1.0	0.999	0.001	9.74E-01	5.34E-06	7.79E+02	8.18E-04	2.21E-05	8.09E-03	7.22E-06	1.00E+00	9.74E-01	3.15E-02	1.30E-02	0.00E+00	0.000	-3.087	-3.050

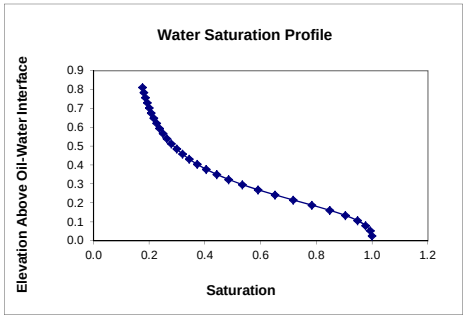
Fluid Saturation and LNAPL Mobility Parameter Plots

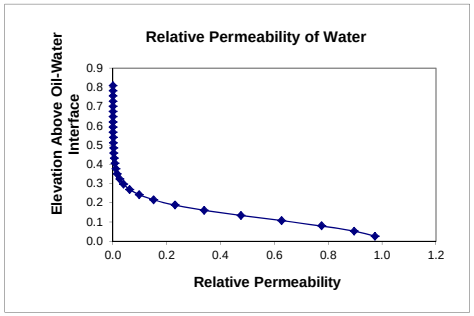
Well ID: MW-05

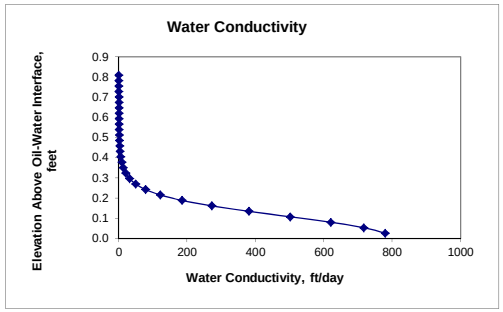












Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-05

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the Carsel and Parrish (1988) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.877	(dimensionless)
Dynamic viscosity of free oil:	4.581	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	
Free Oil Thickness in Well:	0.54	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.027	feet

Soil Properties of Formation

Hydraulic conductivity:	1.01E+01	ft/day	3.55E-03 cm/sec
Effective Porosity:	0.35	(dimensionless)	
Irreducible water saturation:	1.84E-01	(dimensionless)	
van Genuchten alpha:	3.414	1/feet	
van Genuchten n:	2.38	(dimensionless)	
van Genuchten m:	0.58	(dimensionless)	

Calculated Results

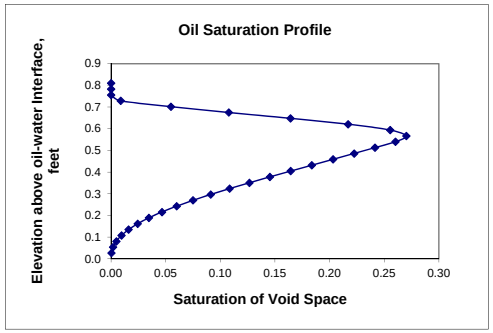
Geometric mean Oil Conductivity (above-below o	3.60E-03	ft/day	**1.20E-01 ft/day =**
Oil Transmissivity of oil layer (above-below oil tat	9.73E-02	ft2/day	**Arithmetic mean K_o**
Geometric mean oil saturation within free oil layer	2.99E-02		
Geometric mean water sat'n within free oil layer:	8.03E-01		
Specific Volume of Oil (above-below oil table):	2.93E-02	ft	8.93E-01 cm
Specific Volume of Water (above & below oil tabl	2.31E-01	ft	7.04E+00 cm
Estimate of oil storativity:	5.23E-03		
Bouwer-Rice Oil Conductivity (below oil table):	1.20E-01	ft/day	4.23E-05 cm/sec

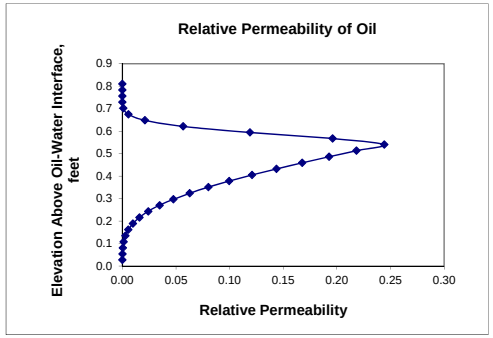
Table of Calculations:

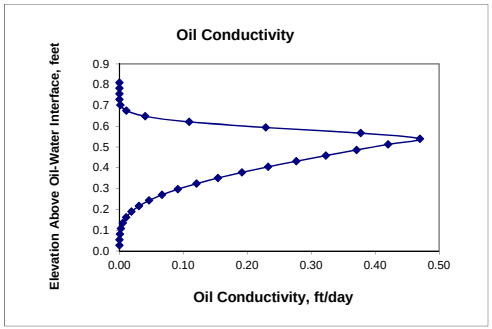
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	0.81	0.237	0.099	0.496	0.581	1.00E-04	2.24E-02	7.77E-11	2.25E-01	1.50E-10	4.04E-12	5.49E-03	9.45E-07	6.98E-01	3.20E-02	1.11E-02	8.21E-01	8.21E-01	-0.236	-9.825	-4.000
29	0.78	0.213	0.096	0.534	0.594	1.00E-04	2.57E-02	8.32E-11	2.58E-01	1.60E-10	4.33E-12	5.62E-03	9.45E-07	7.09E-01	3.62E-02	1.11E-02	8.10E-01	8.10E-01	-0.226	-9.795	-4.000
28	0.76	0.189	0.093	0.579	0.608	1.00E-04	2.96E-02	8.92E-11	2.97E-01	1.72E-10	4.64E-12	5.75E-03	9.45E-07	7.21E-01	4.10E-02	1.11E-02	7.98E-01	7.97E-01	-0.216	-9.765	-4.000
27	0.73	0.166	0.089	0.631	0.623	8.79E-03	3.41E-02	7.10E-06	3.43E-01	1.37E-05	3.69E-07	5.88E-03	8.30E-05	7.33E-01	4.65E-02	1.04E-01	7.84E-01	7.76E-01	-0.206	-4.864	-2.056
26	0.70	0.142	0.086	0.692	0.638	5.48E-02	3.94E-02	8.36E-04	3.96E-01	1.61E-03	4.35E-05	6.03E-03	5.18E-04	7.46E-01	5.28E-02	2.59E-01	7.70E-01	7.13E-01	-0.195	-2.793	-1.261
25	0.67	0.118	0.083	0.761	0.653	1.08E-01	4.56E-02	5.66E-03	4.59E-01	1.09E-02	2.94E-04	6.17E-03	1.02E-03	7.58E-01	6.01E-02	3.63E-01	7.55E-01	6.30E-01	-0.185	-1.962	-0.968
24	0.65	0.095	0.080	0.834	0.669	1.64E-01	5.29E-02	2.10E-02	5.32E-01	4.04E-02	1.09E-03	6.33E-03	1.55E-03	7.71E-01	6.86E-02	4.49E-01	7.38E-01	5.22E-01	-0.174	-1.393	-0.784
23	0.62	0.071	0.076	0.903	0.686	2.17E-01	6.14E-02	5.66E-02	6.18E-01	1.09E-01	2.94E-03	6.49E-03	2.05E-03	7.85E-01	7.83E-02	5.16E-01	7.20E-01	3.89E-01	-0.164	-0.962	-0.663
22	0.59	0.047	0.073	0.959	0.704	2.56E-01	7.14E-02	1.19E-01	7.18E-01	2.29E-01	6.18E-03	6.65E-03	2.41E-03	7.98E-01	8.95E-02	5.59E-01	7.01E-01	2.40E-01	-0.153	-0.640	-0.593
21	0.57	0.024	0.070	0.992	0.721	2.70E-01	8.31E-02	1.96E-01	8.36E-01	3.77E-01	1.02E-02	6.82E-03	2.55E-03	8.12E-01	1.02E-01	5.75E-01	6.80E-01	9.63E-02	-0.142	-0.423	-0.568
20	0.54	0.0	0.066	1.0	0.740	0.260	9.68E-02	2.44E-01	9.74E-01	4.70E-01	1.27E-02	6.99E-03	2.46E-03	8.25E-01	1.17E-01	5.65E-01	6.57E-01	0.00E+00	-0.131	-0.328	-0.585
19	0.51	0.0	0.063	1.0	0.758	0.242	1.13E-01	2.18E-01	1.13E+00	4.20E-01	1.13E-02	7.17E-03	2.28E-03	8.39E-01	1.34E-01	5.44E-01	6.33E-01	0.00E+00	-0.120	-0.377	-0.617
18	0.49	0.0	0.060	1.0	0.778	0.222	1.31E-01	1.93E-01	1.32E+00	3.71E-01	1.00E-02	7.35E-03	2.10E-03	8.53E-01	1.54E-01	5.22E-01	6.07E-01	0.00E+00	-0.109	-0.431	-0.653
17	0.46	0.0	0.056	1.0	0.797	0.203	1.53E-01	1.68E-01	1.54E+00	3.23E-01	8.72E-03	7.53E-03	1.92E-03	8.67E-01	1.77E-01	4.99E-01	5.80E-01	0.00E+00	-0.099	-0.491	-0.692
16	0.43	0.0	0.053	1.0	0.816	0.184	1.78E-01	1.44E-01	1.79E+00	2.77E-01	7.47E-03	7.71E-03	1.74E-03	8.80E-01	2.02E-01	4.75E-01	5.50E-01	0.00E+00	-0.088	-0.558	-0.736
15	0.40	0.0	0.050	1.0	0.836	0.164	2.07E-01	1.21E-01	2.08E+00	2.33E-01	6.28E-03	7.90E-03	1.55E-03	8.94E-01	2.32E-01	4.49E-01	5.19E-01	0.00E+00	-0.078	-0.633	-0.784
14	0.38	0.0	0.046	1.0	0.855	0.145	2.40E-01	9.96E-02	2.41E+00	1.92E-01	5.18E-03	8.08E-03	1.37E-03	9.07E-01	2.64E-01	4.22E-01	4.86E-01	0.00E+00	-0.068	-0.717	-0.837
13	0.35	0.0	0.043	1.0	0.873	0.127	2.77E-01	8.01E-02	2.79E+00	1.54E-01	4.16E-03	8.25E-03	1.20E-03	9.19E-01	3.02E-01	3.94E-01	4.51E-01	0.00E+00	-0.059	-0.812	-0.897
12	0.32	0.0	0.040	1.0	0.891	0.109	3.19E-01	6.27E-02	3.21E+00	1.21E-01	3.26E-03	8.42E-03	1.03E-03	9.31E-01	3.43E-01	3.65E-01	4.14E-01	0.00E+00	-0.050	-0.918	-0.964
11	0.30	0.0	0.036	1.0	0.909	0.091	3.66E-01	4.75E-02	3.68E+00	9.14E-02	2.47E-03	8.59E-03	8.63E-04	9.42E-01	3.89E-01	3.34E-01	3.77E-01	0.00E+00	-0.042	-1.039	-1.039
10	0.27	0.0	0.033	1.0	0.925	0.075	4.18E-01	3.46E-02	4.20E+00	6.67E-02	1.80E-03	8.74E-03	7.09E-04	9.53E-01	4.38E-01	3.03E-01	3.38E-01	0.00E+00	-0.034	-1.176	-1.125
9	0.24	0.0	0.030	1.0	0.940	0.060	4.74E-01	2.41E-02	4.77E+00	4.64E-02	1.25E-03	8.88E-03	5.68E-04	9.62E-01	4.93E-01	2.71E-01	2.98E-01	0.00E+00	-0.027	-1.333	-1.221
8	0.22	0.0	0.027	1.0	0.953	0.047	5.34E-01	1.59E-02	5.38E+00	3.06E-02	8.27E-04	9.01E-03	4.40E-04	9.71E-01	5.50E-01	2.39E-01	2.58E-01	0.00E+00	-0.021	-1.514	-1.332
7	0.19	0.0	0.023	1.0	0.965	0.035	5.98E-01	9.80E-03	6.02E+00	1.89E-02	5.09E-04	9.12E-03	3.27E-04	9.79E-01	6.11E-01	2.06E-01	2.18E-01	0.00E+00	-0.015	-1.724	-1.461
6	0.16	0.0	0.020	1.0	0.976	0.024	6.64E-01	5.53E-03	6.68E+00	1.06E-02	2.87E-04	9.22E-03	2.31E-04	9.85E-01	6.74E-01	1.73E-01	1.79E-01	0.00E+00	-0.011	-1.973	-1.612
5	0.14	0.0	0.017	1.0	0.984	0.016	7.31E-01	2.77E-03	7.36E+00	5.34E-03	1.44E-04	9.30E-03	1.52E-04	9.90E-01	7.39E-01	1.40E-01	1.41E-01	0.00E+00	-0.007	-2.272	-1.794
4	0.11	0.0	0.013	1.0	0.990	0.010	7.98E-01	1.18E-03	8.02E+00	2.27E-03	6.12E-05	9.36E-03	9.04E-05	9.94E-01	8.02E-01	1.08E-01	1.04E-01	0.00E+00	-0.004	-2.645	-2.019
3	0.08	0.0	0.010	1.0	0.995	0.005	8.61E-01	3.85E-04	8.66E+00	7.41E-04	2.00E-05	9.40E-03	4.60E-05	9.97E-01	8.64E-01	7.72E-02	7.06E-02	0.00E+00	-0.002	-3.130	-2.313
2	0.05	0.0	0.007	1.0	0.998	0.002	9.19E-01	7.87E-05	9.25E+00	1.52E-04	4.09E-06	9.43E-03	1.76E-05	9.99E-01	9.21E-01	4.78E-02	4.06E-02	0.00E+00	-0.001	-3.819	-2.729
1	0.03	0.0	0.003	1.0	1.000	0.000	9.69E-01	5.16E-06	9.74E+00	9.94E-06	2.68E-07	9.45E-03	3.41E-06	1.00E+00	9.69E-01	2.10E-02	1.57E-02	0.00E+00	0.000	-5.003	-3.443

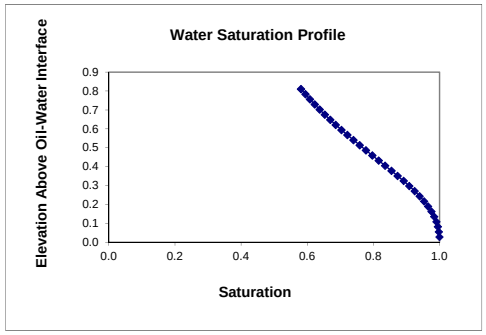
Fluid Saturation and LNAPL Mobility Parameter Plots

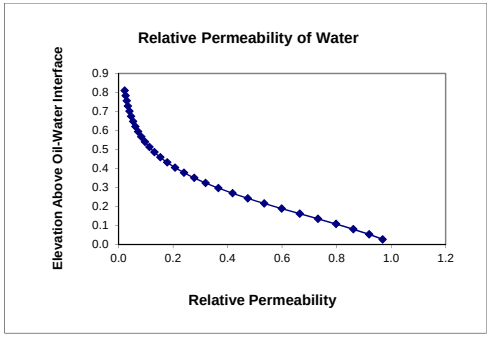
Well ID: MW-05

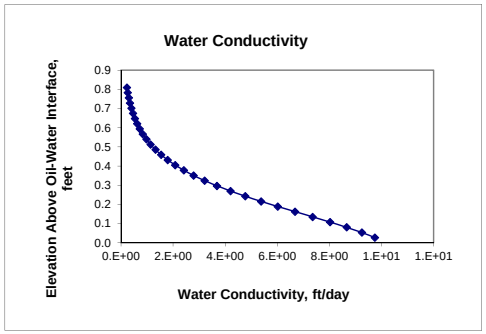












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the Carsel & Parrish Database

Physical Parameter Measured / Evaluated	MW-05 1400 N. Royal St., Alexandria, VA			
	Slug-Test Solution		Parametric Solution[b]	
Starting Free Oil Thickness	0.54	ft	0.54	ft
	16.5	cm	16.5	cm
Hydraulic Conductivity	2.53E-01	ft/day	1.01E+01 [c]	ft/day
	8.92E-05	cm/sec	3.55E-03	cm/sec
Average Oil Conductivity	1.20E-01	ft/day	1.20E-01	ft/day
	4.23E-05	cm/sec	4.24E-05	cm/sec
Free Oil Transmissivity	6.47E-02	ft^2/day	9.73E-02	ft^2/day
	6.96E-04	cm^2/sec	1.05E-03	cm^2/sec
Free Oil Specific Volume			2.93E-02	ft^3/ft^2
			8.93E-01	cm^3/cm^2
Inherent Mobility			3.32E+00	ft/day
			1.17E-03	cm/sec
Assumed Effective Porosity			0.35	
van Genuchten *alpha*			3.41	1/ft
			0.112	1/cm
van Genuchten *n*			2.38	
Irreducible Water Saturation			0.18	
Inferred Lithology			Sand	

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with Carsel and Parish (1988) database for USDA agricultural soils.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-05

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the API (2006) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.877	(dimensionless)
Dynamic viscosity of free oil:	4.581	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	
Free Oil Thickness in Well:	0.54	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.027	feet

Soil Properties of Formation

Hydraulic conductivity:	3.05E+03	ft/day	1.08E+00 cm/sec
Effective Porosity:	0.35	(dimensionless)	
Irreducible water saturation:	2.39E-01	(dimensionless)	
van Genuchten alpha:	0.725	1/feet	
van Genuchten n:	2.54	(dimensionless)	
van Genuchten m:	0.61	(dimensionless)	

Calculated Results

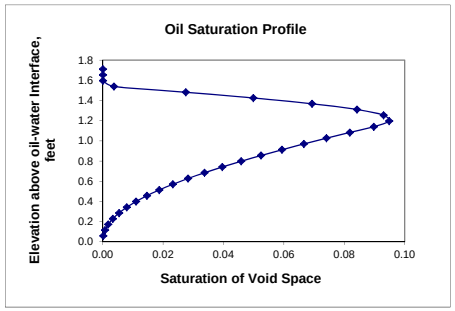
Geometric mean Oil Conductivity (above-below c	6.73E-03 ft/day	**1.20E-01 ft/day =**
Oil Transmissivity of oil layer (above-below oil tal	9.72E-02 ft2/day	**Arithmetic mean K_o**
Geometric mean oil saturation within free oil laye	1.12E-03	
Geometric mean water sat'n within free oil layer:	9.93E-01	
Specific Volume of Oil (above-below oil table):	9.68E-04 ft	2.95E-02 cm
Specific Volume of Water (above & below oil tabl	2.82E-01 ft	8.58E+00 cm
Estimate of oil storativity:	1.96E-04	
Bouwer-Rice Oil Conductivity (below oil table):	1.20E-01 ft/day	4.23E-05 cm/sec

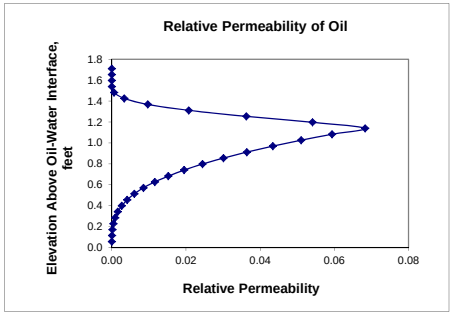
Table of Calculations:

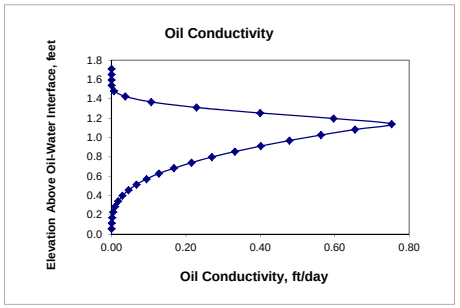
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	0.81	0.237	0.099	0.961	0.977	1.00E-04	6.95E-01	2.06E-09	2.12E+03	1.20E-06	3.25E-08	9.24E-03	9.45E-07	9.85E-01	7.06E-01	1.15E-02	1.60E-01	1.59E-01	-0.010	-5.919	-4.000
29	0.78	0.213	0.096	0.969	0.979	1.00E-04	7.09E-01	2.21E-09	2.16E+03	1.29E-06	3.48E-08	9.25E-03	9.45E-07	9.86E-01	7.19E-01	1.15E-02	1.52E-01	1.52E-01	-0.009	-5.890	-4.000
28	0.76	0.189	0.093	0.977	0.981	1.00E-04	7.23E-01	2.37E-09	2.21E+03	1.38E-06	3.73E-08	9.27E-03	9.45E-07	9.87E-01	7.32E-01	1.15E-02	1.44E-01	1.44E-01	-0.008	-5.859	-4.000
27	0.73	0.166	0.089	0.983	0.982	9.29E-04	7.36E-01	6.83E-07	2.25E+03	3.99E-04	1.08E-05	9.28E-03	8.78E-06	9.88E-01	7.45E-01	3.49E-02	1.37E-01	1.32E-01	-0.008	-3.399	-3.032
26	0.70	0.142	0.086	0.989	0.984	4.64E-03	7.50E-01	4.58E-05	2.29E+03	2.68E-02	7.23E-04	9.30E-03	4.38E-05	9.89E-01	7.58E-01	7.81E-02	1.29E-01	1.05E-01	-0.007	-1.572	-2.334
25	0.67	0.118	0.083	0.993	0.986	7.31E-03	7.63E-01	1.75E-04	2.33E+03	1.02E-01	2.75E-03	9.31E-03	6.90E-05	9.90E-01	7.71E-01	9.80E-02	1.22E-01	7.99E-02	-0.006	-0.991	-2.136
24	0.65	0.095	0.080	0.996	0.987	8.99E-03	7.77E-01	3.65E-04	2.37E+03	2.14E-01	5.77E-03	9.33E-03	8.50E-05	9.91E-01	7.84E-01	1.09E-01	1.15E-01	5.68E-02	-0.006	-0.670	-2.046
23	0.62	0.071	0.076	0.998	0.988	9.79E-03	7.90E-01	5.74E-04	2.41E+03	3.35E-01	9.06E-03	9.34E-03	9.25E-05	9.92E-01	7.96E-01	1.13E-01	1.08E-01	3.66E-02	-0.005	-0.474	-2.009
22	0.59	0.047	0.073	0.999	0.989	9.83E-03	8.03E-01	7.48E-04	2.45E+03	4.37E-01	1.18E-02	9.35E-03	9.29E-05	9.93E-01	8.09E-01	1.14E-01	1.01E-01	1.96E-02	-0.005	-0.359	-2.008
21	0.57	0.024	0.070	1.000	0.991	9.26E-03	8.16E-01	8.38E-04	2.49E+03	4.90E-01	1.32E-02	9.36E-03	8.75E-05	9.94E-01	8.21E-01	1.10E-01	9.39E-02	6.75E-03	-0.004	-0.310	-2.034
20	0.54	0.0	0.066	1.0	0.992	0.008	8.29E-01	7.95E-04	2.53E+03	4.65E-01	1.25E-02	9.37E-03	7.84E-05	9.95E-01	8.33E-01	1.04E-01	8.73E-02	0.00E+00	-0.004	-0.333	-2.081
19	0.51	0.0	0.063	1.0	0.993	0.007	8.41E-01	6.38E-04	2.57E+03	3.73E-01	1.01E-02	9.38E-03	6.90E-05	9.95E-01	8.45E-01	9.79E-02	8.07E-02	0.00E+00	-0.003	-0.428	-2.137
18	0.49	0.0	0.060	1.0	0.994	0.006	8.53E-01	5.06E-04	2.60E+03	2.96E-01	7.99E-03	9.39E-03	6.02E-05	9.96E-01	8.57E-01	9.15E-02	7.44E-02	0.00E+00	-0.003	-0.529	-2.196
17	0.46	0.0	0.056	1.0	0.994	0.006	8.65E-01	3.96E-04	2.64E+03	2.31E-01	6.25E-03	9.40E-03	5.22E-05	9.96E-01	8.68E-01	8.52E-02	6.82E-02	0.00E+00	-0.002	-0.636	-2.258
16	0.43	0.0	0.053	1.0	0.995	0.005	8.77E-01	3.05E-04	2.68E+03	1.78E-01	4.81E-03	9.41E-03	4.48E-05	9.97E-01	8.80E-01	7.89E-02	6.22E-02	0.00E+00	-0.002	-0.749	-2.324
15	0.40	0.0	0.050	1.0	0.996	0.004	8.88E-01	2.31E-04	2.71E+03	1.35E-01	3.64E-03	9.41E-03	3.80E-05	9.97E-01	8.91E-01	7.27E-02	5.63E-02	0.00E+00	-0.002	-0.870	-2.395
14	0.38	0.0	0.046	1.0	0.997	0.003	8.99E-01	1.71E-04	2.74E+03	1.00E-01	2.70E-03	9.42E-03	3.20E-05	9.98E-01	9.01E-01	6.67E-02	5.07E-02	0.00E+00	-0.001	-1.000	-2.471
13	0.35	0.0	0.043	1.0	0.997	0.003	9.10E-01	1.24E-04	2.78E+03	7.27E-02	1.96E-03	9.42E-03	2.65E-05	9.98E-01	9.12E-01	6.07E-02	4.53E-02	0.00E+00	-0.001	-1.139	-2.552
12	0.32	0.0	0.040	1.0	0.998	0.002	9.20E-01	8.79E-05	2.81E+03	5.14E-02	1.39E-03	9.43E-03	2.16E-05	9.98E-01	9.22E-01	5.49E-02	4.00E-02	0.00E+00	-0.001	-1.289	-2.640
11	0.30	0.0	0.036	1.0	0.998	0.002	9.30E-01	6.03E-05	2.84E+03	3.52E-02	9.51E-04	9.43E-03	1.74E-05	9.99E-01	9.31E-01	4.91E-02	3.50E-02	0.00E+00	-0.001	-1.453	-2.736
10	0.27	0.0	0.033	1.0	0.999	0.001	9.40E-01	3.99E-05	2.87E+03	2.33E-02	6.29E-04	9.44E-03	1.36E-05	9.99E-01	9.40E-01	4.36E-02	3.03E-02	0.00E+00	-0.001	-1.633	-2.841
9	0.24	0.0	0.030	1.0	0.999	0.001	9.49E-01	2.52E-05	2.89E+03	1.47E-02	3.98E-04	9.44E-03	1.04E-05	9.99E-01	9.49E-01	3.81E-02	2.57E-02	0.00E+00	0.000	-1.831	-2.957
8	0.22	0.0	0.027	1.0	0.999	0.001	9.57E-01	1.51E-05	2.92E+03	8.84E-03	2.39E-04	9.44E-03	7.74E-06	9.99E-01	9.58E-01	3.28E-02	2.15E-02	0.00E+00	0.000	-2.053	-3.086
7	0.19	0.0	0.023	1.0	0.999	0.001	9.65E-01	8.47E-06	2.94E+03	4.95E-03	1.34E-04	9.44E-03	5.52E-06	1.00E+00	9.65E-01	2.77E-02	1.75E-02	0.00E+00	0.000	-2.306	-3.234
6	0.16	0.0	0.020	1.0	1.000	0.000	9.72E-01	4.33E-06	2.97E+03	2.53E-03	6.83E-05	9.45E-03	3.73E-06	1.00E+00	9.73E-01	2.28E-02	1.38E-02	0.00E+00	0.000	-2.597	-3.404
5	0.14	0.0	0.017	1.0	1.000	0.000	9.79E-01	1.96E-06	2.99E+03	1.15E-03	3.09E-05	9.45E-03	2.35E-06	1.00E+00	9.79E-01	1.81E-02	1.04E-02	0.00E+00	0.000	-2.941	-3.605
4	0.11	0.0	0.013	1.0	1.000	0.000	9.85E-01	7.42E-07	3.01E+03	4.34E-04	1.17E-05	9.45E-03	1.33E-06	1.00E+00	9.85E-01	1.36E-02	7.38E-03	0.00E+00	0.000	-3.363	-3.851
3	0.08	0.0	0.010	1.0	1.000	0.000	9.90E-01	2.12E-07	3.02E+03	1.24E-04	3.35E-06	9.45E-03	6.41E-07	1.00E+00	9.91E-01	9.45E-03	4.74E-03	0.00E+00	0.000	-3.906	-4.168
2	0.05	0.0	0.007	1.0	1.000	0.000	9.95E-01	3.63E-08	3.04E+03	2.12E-05	5.74E-07	9.45E-03	2.29E-07	1.00E+00	9.95E-01	5.64E-03	2.54E-03	0.00E+00	0.000	-4.673	-4.616
1	0.03	0.0	0.003	1.0	1.000	0.000	9.98E-01	1.78E-09	3.05E+03	1.04E-06	2.81E-08	9.45E-03	3.93E-08	1.00E+00	9.98E-01	2.34E-03	8.72E-04	0.00E+00	0.000	-5.983	-5.381

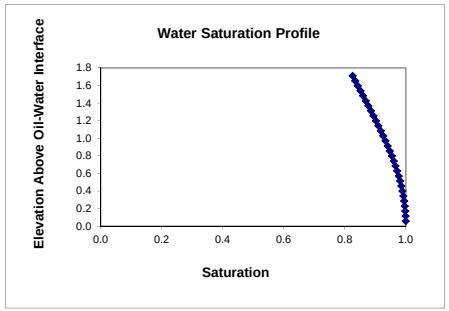
Fluid Saturation and LNAPL Mobility Parameter Plots

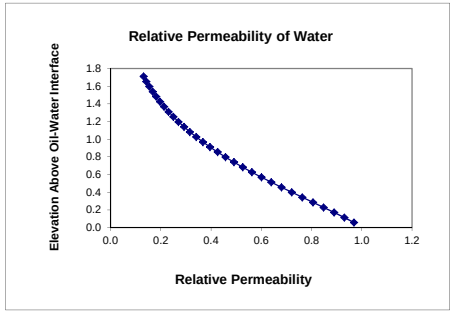
Well ID: MW-05

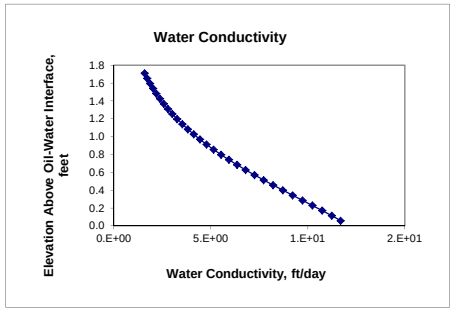












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the API (2006) Database[b]

Physical Parameter Measured / Evaluated	MW-05 1400 N. Royal St., Alexandria, VA			
	Slug-Test Solution		Parametric Solution[b]	
Starting Free Oil Thickness	0.54 16.5	ft cm	0.54 16.5	ft cm
Hydraulic Conductivity	2.53E-01 8.92E-05	ft/day cm/sec	3.05E+03 [c] 1.08E+00	ft/day cm/sec
Average Oil Conductivity	1.20E-01 4.23E-05	ft/day cm/sec	1.20E-01 4.23E-05	ft/day cm/sec
Free Oil Transmissivity	6.47E-02 6.96E-04	ft^2/day cm^2/sec	9.72E-02 1.04E-03	ft^2/day cm^2/sec
Free Oil Specific Volume			9.68E-04 6.58E-01	ft^3/ft^2 cm^3/cm^2
Inherent Mobility			1.00E+02 3.54E-02	ft/day cm/sec
Assumed Effective Porosity			0.35	
van Genuchten *alpha*			0.72 0.024	1/ft 1/cm
van Genuchten *n*			2.54	
Irreducible Water Saturation			0.24	
Inferred Lithology			Sand	

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with API (2006) database for soils at a sampling of petroleum facilities.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Summary of Slug Withdrawal and Parametric Solutions

Hydraulic/Capillary Parameters	Well MW-05			
	Carsel & Parrish Database	API Database		
LNAPL Conductivity (ft/day):	1.20E-01	1.20E-01		
LNAPL Transmissivity (ft^2/day):	9.73E-02	9.72E-02	0.10	0.10
Hydraulic Conductivity (ft/day):	1.01E+01	3.05E+03		
van Genuchten - *alpha* (1/ft):	3.41	0.72		
van Genuchten – *n* (dimensionless):	2.38	2.54		
Residual Water Saturation:	0.18	0.24		
Hydraulic Conductivity of the underlying groundwater zone (ft/day):	2.53E-01	2.53E-01		

GES LNAPL BAILDOWN TEST FIELD LOG

SITE: 1400 N. Royal St., Alexandria, VA
PROJECT: NRG - Potomac River Generating Station (PRGS)
WELL ID: MW-25 Test 1 **DATE:** 9/19/14 **TIME:** 8:58
PERSONNEL: P. Reichardt, D. Rice

Air Temperature: 60 °F Groundwater Temperature: 62 °F
Current Precipitation: None
Esti. Wind Speed: light

STATIC DEPTH TO LNAPL		(A)	26.95	ft btoc	8.22	m btoc
STATIC DEPTH TO WATER		(B)	28.1	ft btoc	8.571	m btoc
LNAPL THICKNESS	(B - A)	(C)	1.15	ft	0.351	m
80% of LNAPL THICKNESS	(C *.80)	(D)	0.92	ft	0.281	m
SPECIFIC GRAVITY OF LNAPL	(at 62 °F)	(E)	0.88			
CORRECTED DEPTH TO WATER	(B - (C x E))	(F)	27.088	ft btoc	8.262	m btoc
MEASURED WELL DEPTH			36.03	ft btoc	10.99	m btoc
DEPTH TO TOP OF SCREEN		(G)	25	ft btoc	7.625	m btoc
DEPTH TO BASE OF SCREEN		(H)	35	ft btoc	10.68	m btoc

★ (A) Must be between (G) and (H). If not, discontinue test. ⇨ OK

WELL CASING INNER DIAMETER	(I)	0.33333	ft	0.102	m
WELL BORE DIAMETER	(J)	0.875	ft	0.267	m

★ (C) Must be > (J)/2. If not, discontinue test. ⇨ OK

WELL CASING SPECIFIC VOLUME	(K)	0.65284	gals/ft	8.1049	liters/m

BAILER TYPE:		HDPE - 1 gal			
BAILER INNER RADIUS	(L)	0.1875	ft		m
BAILER LENGTH	(M)	2.52083	ft		m
NUMBER OF BAILS REMOVED (LNAPL AND GROUNDWATER)	(N)	2	bails		

PRESSURE TRANSDUCER TYPE/MODEL: N/A
PRESSURE TRANSDUCER SETTING IN LNAPL OR WATER?: ft btoc m btoc
DATA LOGGER TYPE/MODEL:
PRESSURE READINGS RECORDED IN _____ SECOND INTERVALS

CALCULATE VOLUME OF BAILER and FRACTION OF LENGTH FILLED WITH EACH FLUID:
Volume = Fraction of Full Bailer x 3.142 x $(L)^2$ x (M) x 7.48 gals/ft OR USE CONTAINER VOLS

VOLUME REMOVED = (N) X NUMBER OF BAILS REMOVED	0.4367	gals	1.65	liters
L OF LNAPL REMOVED _____ VOL OF WATER REMOVED	0.2539	gals	0.96	liters

TEST DISCONTINUED AFTER LNAPL THICKNESS = (D) ft 0 m
TEST DISCONTINUED AFTER 3 HOURS HAD ELAPSED
9/19/2014 10:53:00 AM STARTING TIME 12:53:00 PM END TIME

Conversion Factors: 1 foot = 0.305 m 1 gal = 3.785 liters 2-inch screen = 0.163 gal/ft 4-inch screen = 0.653 gal/ft
1 m = 3.28 feet 1 liter = 0.264 gals 2-inch screen = 2.03 liters/m 4-inch screen = 8.11 liters/m

GES/ES&T LNAPL BAILDOWN TEST FIELD LOG

NOTE: Enter measurements -- change units to metric if necessary

SITE: 1400 N. Royal St., Alexandria, VA
PROJECT: NRG - Potomac River Generating Station (PRGS)
WELL ID: MW-05 **DATE:** 9/19/2014 **TIME:** 8:58
PERSONNEL:

CLOCK TIME	ELAPSED TIME (min)	DEPTH TO LNAPL (ft btoc)	DEPTH TO WATER (ft btoc)	LNAPL THICKNESS (feet)	COMMENTS / OBSERVATIONS
10:45:00		23.18	23.72	0.54	PRETEST MEASUREMENTS
10:53:30	0.5	27.17	27.95	0.78	LAST BAIL REMOVED FROM WELL
10:54:00	1	27.15	27.91	0.76	
10:56:00	3	27.09	27.81	0.72	
10:58:00	5	27.05	27.78	0.73	
11:03:00	10	27.04	27.75	0.71	
11:13:00	20	27.03	27.77	0.74	
11:23:00	30	27.04	27.79	0.75	
11:33:00	40	27.05	27.8	0.75	
11:53:00	60	27.06	27.83	0.77	
12:23:00	90	27.08	27.88	0.8	
12:53:00	120	27.07	27.89	0.82	
13:07:00	134	27.07	27.89	0.82	Final measurement

Basic Input Data for Slug Withdrawal - Baildown Test Analysis

Location and Timing of Baildown Test					Comments About Data	
Well Name:	MW-25 Test 1					
Site Name:	1400 N. Royal St., Alexandria, VA					
Database:	Carsel & Parrish (1988) and API (2006)					
Start Date:	9/19/2014				Date of bailing the well.	
Clock time of start of bailing:	10:50				Known starting time	
Clock time of end of bailing:	10:53				two bailer withdrawals	
Time spend Bailing well:	0:02:45	(hr:min:sec)			Calculated value based on transducer.	
Time of last fluid measurement:	13:07	9/19/2014			Clock time of last measurement.	
End Date:	9/19/2014	(m/d/yr)			Date of last fluid level measurement.	
Test Well Characteristics						
Borehole Diam.	10.50	(inches)	0.267	(meters)	Data from well log.	0.875 (feet)
Casing ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Casing OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Screen ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Screen OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Measuring Point stickup above ground	0.00	(feet)	0.000	(meters)	Data from well log.	
Oil-wet screen length -- pretest:	1.15	(feet)	0.351	(meters)	Data from pretest fluid levels.	
Wtr-wet screen length -- pretest:	6.90	(feet)	2.104	(meters)		
Aquifer thickness:	35.00	(feet)	10.671	(meters)	Estimated	
Specific oil yield of filter pack sand:	0.132	(dimensionless)				
Specific water yield of filter pack sand:	0.03	(dimensionless)				
Oil and Water Volumes Bailed						
Volume of free LNAPL bailed:	0.44	(gallons)	1.65	(liters)	Measured in field after bailing.	heating/ #2 fue
Volume of groundwater bailed:	0.25	(gallons)	0.96	(liters)	Measured in field after bailing.	
Fluid Properties						
Specific gravity of oil:	0.880	(dimensionless)			Measured, addjusted for temp.	
Dynamic viscosity of oil:	5.14	(centipoise)			Measured, addjusted for temp.	
Air-water surface tension:	74.1	(dynes/cm)			Measured at room temp.	
Air-oil surface tension:	32.6	(dynes/cm)			Measured at room temp.	
Oil-water interfacial tension:	17.2	(dynes/cm)			Measured at room temp.	
Groundwater Temperature	62.0	degrees F	16.67	deg C	Assumed value	
Soil Properties--Filter Pack Sand						
Hydraulic conductivity:	800	(ft/day)	Assumed values		Value based on laboratory measurement.	
Effective Porosity:	0.3	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.1	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	4.2	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	2.1	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.52	(dimensionless)			Initial estimate based on soil texture.	
Soil Properties--Formation			Preliminary Estimates			
Hydraulic conductivity:	1	(ft/day)			Use if different from that calculated.	
Effective Porosity:	0.35	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.25	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	2.5	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	1.50	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.33	(dimensionless)			Initial estimate based on soil texture.	

* NB : The surface and interfacial tensions are estimated from other data.

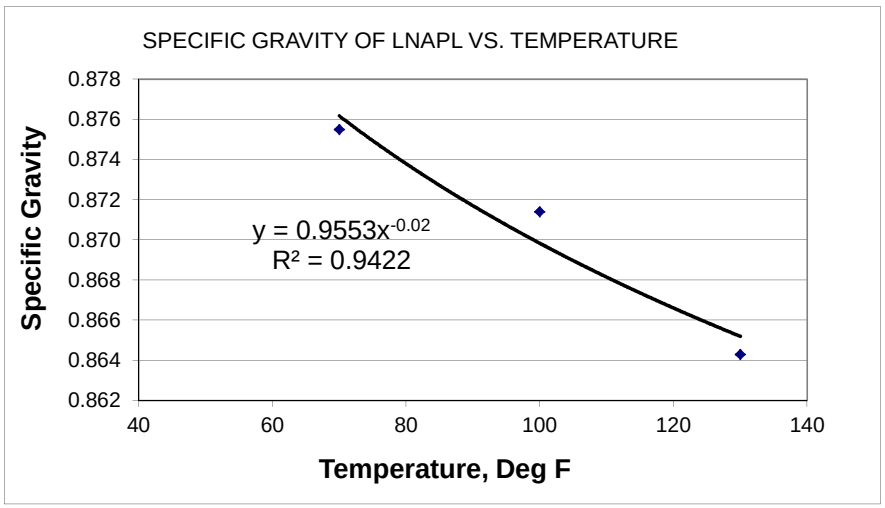
Laboratory Fluid Properties (PTS Lab report)

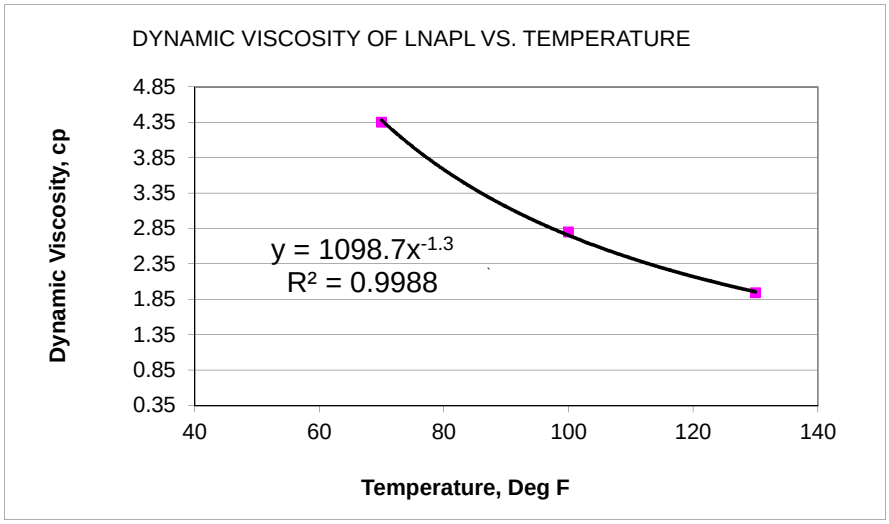
SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY centistokes	VISCOSITY centipoise
MW-25	Water	70	1.001	0.9986	0.998	0.997
		100	1.003	0.9963	0.705	0.703
		130	1.005	0.9910	0.522	0.517
MW-25	NAPL	70	0.8755	0.8737	4.980	4.350
		100	0.8714	0.8653	3.240	2.800
		130	0.8643	0.8522	2.280	1.940

GW Temperatures during GES Sampling

Well ID	Temp, °C
Average	#DIV/0!

PHASE PAIR SAMPLE ID / PHASE	PHASE	TEMPERATURE, °F	INTERFACIAL TENSION, Dynes/centimeter
MW-25 / Water	Air	75	74.1
MW-25 / NAPL	Air	76	32.6
MW-25 / Water	NAPL	76	17.2





Fluid Levels Measured Prior to and After Bailing

Well Name: **MW-25 Test 1** **Site:** **1400 N. Royal St., Alexandria, VA**

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments	Depth to Zaw from Grd (feet)	Depth to Zao from Grd (feet)	Depth to Zow from Grd (feet)
10:50	pretest	26.95	28.1	**1.15**	**27.09**	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table.	22.89	22.75	23.90

Measurements After Bailing

First measurement assumed to be static.

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments
10:53:30	0.01	27.619	28.1	0.48	27.68	The first depth-to-fluids measurement after bailer is raised above air-oil interface.
10:54:00	1.00	27.15	27.91	0.76	27.24	
10:56:00	3.00	27.09	27.81	0.72	27.18	
10:58:00	5.00	27.05	27.78	0.73	27.14	
11:03:00	10.00	27.04	27.75	0.71	27.13	
11:13:00	20.00	27.03	27.77	0.74	27.12	
11:23:00	30.00	27.04	27.79	0.75	27.13	
11:33:00	40.00	27.05	27.8	0.75	27.14	
11:53:00	60.00	27.06	27.83	0.77	27.15	
12:23:00	90.00	27.08	27.88	0.80	27.18	
12:53:00	120.00	27.07	27.89	0.82	27.17	
13:07:00	134.00	27.07	27.89	0.82	27.17	

27.56	Calculated DT Wtr Table at time zero for a single bail.	
0.48	Calculated initial oil thickness at t-zero.	
0	Early change in oil thickness -- negative due to rising WT	
Sceen ID assumed is:	4.00 inches	(read from Basic Input Data)
0.087	ft^3/ft	
0.653	gal/ft	
2.471	Liter/ft	
0.405	ft/Liter	vertical fluid level change with removal of 1 liter
1652.91	ml	Volume of oil = 1/7th of total volume removed
1.653		Volume LANPL in Liters
0.96		Volume groundwater in liters
0.669	ft	Change in fluid level at time zero

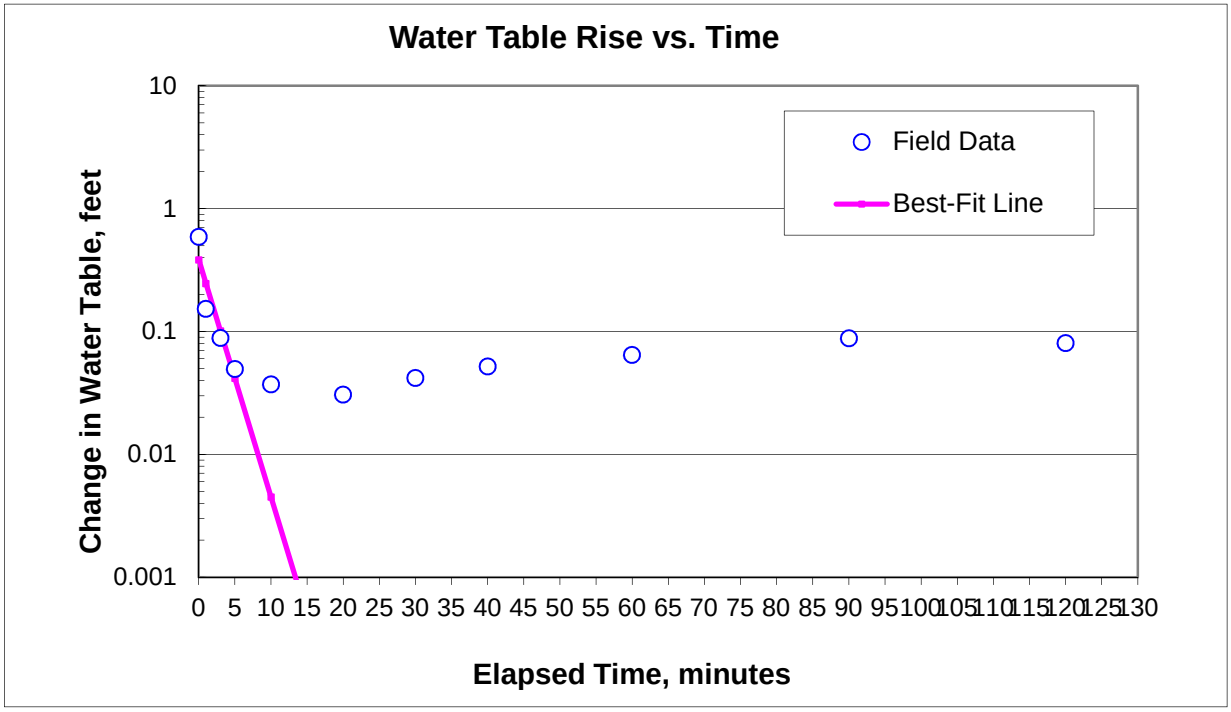
Change assumes instantaneous removal

Semi-Log Plots of Fluid Level Changes with Time and Calculated Slopes of Best-fit Lines and Y-Axis Intercepts

Well Name: MW-25 Test 1
Site: 1400 N. Royal St., Alexandria, VA

Elapsed Time (minutes)	Change in Free Oil Thickness (feet)	Change in Corrected Wtr Table (feet)	Log_{10} of Change in Oil Thick.	Log_{10} of Change in Wtr. Table	Calculated Data For Best-Fit Straight Line	
					Delta Oil	Delta Water
0.010	0.67	0.588	-0.175	-0.230	0.456	3.81E-01
1.000	0.39	0.153	-0.409	-0.815	0.455	2.46E-01
3.000	0.43	0.088	-0.367	-1.054	0.452	1.01E-01
5.000	0.42	0.049	-0.377	-1.306	0.450	4.15E-02
10.000	0.44	0.037	-0.357	-1.431	0.443	4.50E-03
20.000	0.41	0.031	-0.387	-1.514	0.431	5.28E-05
30.000	0.40	0.042	-0.398	-1.378	0.420	6.20E-07
40.000	0.40	0.052	-0.398	-1.285	0.408	7.27E-09
60.000	0.38	0.064	-0.420	-1.192	0.387	1.00E-12
90.000	0.35	0.088	-0.456	-1.056	0.356	1.62E-18
120.000	0.33	0.080	-0.481	-1.095	0.328	2.62E-24
134.000	0.33	0.080	-0.481	-1.095	0.316	5.19E-27

Well ID: MW-25 Test 1



Linear Regression Best Fit for Water Table Rise

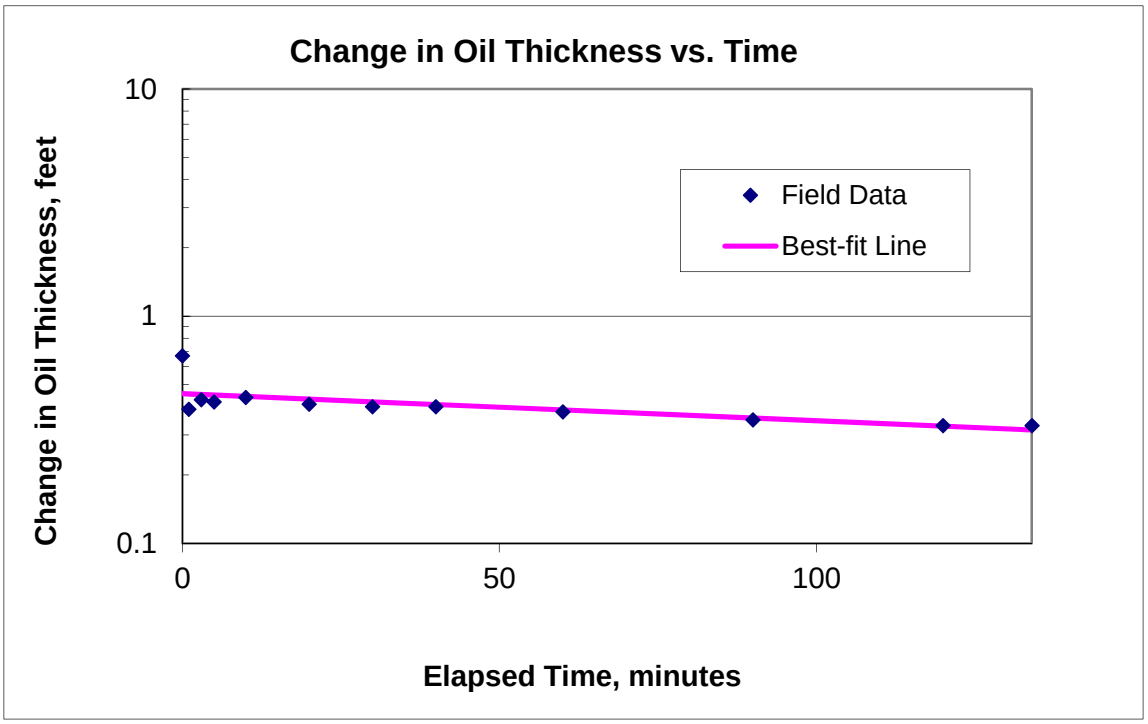
Select cell ranges for the log(water table change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-0.1930
Y-intercept of best-fit line:	0.3832
Elpased time to reach 90% of y-intercept:	5.2 minutes

Data for Plotting Best-Fit Straight Line for Water Table Recovery

	Time, min	Displacement, ft
Yo	0	0.383
Ymin	0.0	3.81E-01

Well ID: **MW-25 Test 1**



Linear Regression Best Fit for Oil Thickness Changes

Select cell ranges for the log(oil thickness change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-1.2E-03
Y-intercept of best-fit line:	4.56E-01
Elpased time to reach 90% of y-intercept:	840.4 minutes

Data for Plotting Best-Fit Straight Line for Oil Thickness Recovery

	Time, min	Displacement, ft
Yo	0	0.456
Ymin	0.0	4.56E-01

Bouwer and Rice Solution Adapted to Estimating the Oil Conductivity

Well Name: W-25 Test **Site: 1400 N. Royal St., Alexandria, VA**

Modified after Lundy and Zimmerman (1966) by including effect of filter pack resaturation.
Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.3	inches	0.44	feet
Initial thickness of oil in well screen:	1.15	feet		
Fluid Dynamic Viscosity, centipoise:	5.138	cp		
Estimate of the y-intercept value (only used when a single bail of oil is removed)				
Free Oil Volume Bailed:	0.4367	gallons	0.06	cubic feet
Initial equiv. thickness change in well:	0.67	feet		
Filter pack specific yield for oil:	0.132			
Max. potential drainable oil volume:	0.229	gallons	0.03	cubic feet
Percent of Oil Slug Vol. Drained	52.55	percent		
Lower Bound Y-o Estimate	0.46	feet		
Estimate of oil conductivity averaged over the initial thickness of free oil zone.				
Screen length to csg + filter pack radius:	2.63			
Bouwer and Rice model parameter A:	1.613			
Bouwer and Rice model parameter B:	0.234			
Bouwer and Rice model parameter C:	0.554			
Effective well radius with filter pack effect:	2.67	inches	0.22	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius:	0.74			
Time for recovery to 90% of y-intercept value:	840.4	minutes		
Oil Conductivity averaged over free oil zone:	**6.28E-02**	**ft/day**	**2.22E-05**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Bouwer and Rice Solution to Estimating the Hydraulic Conductivity

Well Name: **MW-25 Te** **Site:** **1400 N. Royal St., Alexandria, VA**

Based on the rate of water table recovery after bailing a well with free oil and groundwater.
Method includes the effect of filter pack resaturation.
Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.3	inches	0.44	feet
Initial thickness of water column in well screen:	6.9	feet		
Aquifer thickness (for partial pentration):	35	feet		
Fluid Dynamic Viscosity, centipoise:	5.14	cp	Oil Specific Gravity =	0.880
Estimate of the y-intercept value (only used when a single bail of oil is removed)				
Equivalent volume of groundwater bailed:	0.64	gallons	0.09	ft^3 equivalent to LNAPL + water
Initial equiv. thickness change in well:	0.98	feet	0.05	ft^3 equivalent water as LNAPL
Filter pack specific yield for water, EARLY TIME:	0.000		Filter pack specific yield--LATE TIME:	0.03
Max. potential drainable water volume:	0.00E+00	gallons	0.00E+00	ft^3
Percent of Initial Slug Vol. Drained	0.00	percent		
Lower Bound Y-o Estimate	0.40	feet		

Estimate of hydraulic conductivity averaged over the initial thickness of free oil zone and underlying groundwater zone.

Screen length to csg + filter pack radius:	15.77			
Bouwer and Rice model parameter A:	1.958			
Bouwer and Rice model parameter B:	0.279			
Bouwer and Rice model parameter C:	1.567			
Effective well radius with filter pack effect:	2.00	inches	0.17	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius (partial penetration):	1.68			
Time for recovery to 90% of y-intercept value:	5.2	minutes		
Water Conductivity averaged over groundwater zone:	**2.16E+00**	**ft/day**	**7.61E-04**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Filter Pack

Well ID : MW-25 Test 1

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.87961	(dimensionless)
Dynamic viscosity of free oil:	5.13771	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	

Soil Properties of Filter Pack Sand

Hydraulic conductivity:	800	ft/day	2.82E-01 cm/sec
Effective Porosity:	0.3	(dimensionless)	
Irreducible water saturation:	1.00E-01	(dimensionless)	
van Genuchten alpha:	8.000	1/feet	
van Genuchten n:	3.00	(dimensionless)	
van Genuchten m:	0.67	(dimensionless)	

Free Oil Thickness in Well: 1.15 feet

Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.0575	feet

Calculated Results

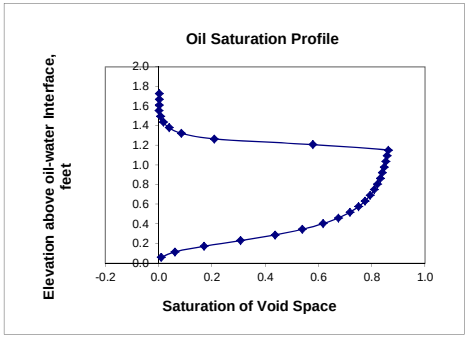
Geometric mean Oil Conductivity (above-below oil table)	4.91E-01 ft/day	9.22E+01 ft/day	
Oil Transmissivity of oil layer (above-below oil table):	1.07E+02 ft2/day		
Geometric mean oil saturation within free oil layer:	1.19E-01		
Geometric mean water sat'n within free oil layer:	2.22E-01		
Specific Volume of Oil (above-below oil table):	2.33E-01 ft		
Specific Volume of Water (above & below oil table):	1.50E-01 ft		
Estimate of oil storativity:	1.79E-02		
LNAPL Volume in filter pack + well at time zero	1.51E-01 ft^3	1.13E+00 gallons	4.27E+00 liters
Volume in filter pack at time zero	5.04E-02 ft^3	3.77E-01 gallons	1.43E+00 liters
Volume in well at time zero	1.00E-01 ft^3	7.51E-01 gallons	2.84E+00 liters

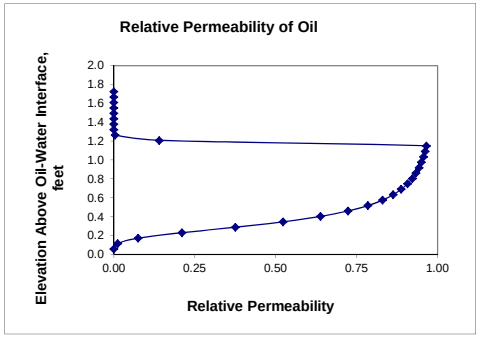
Table of Calculations:

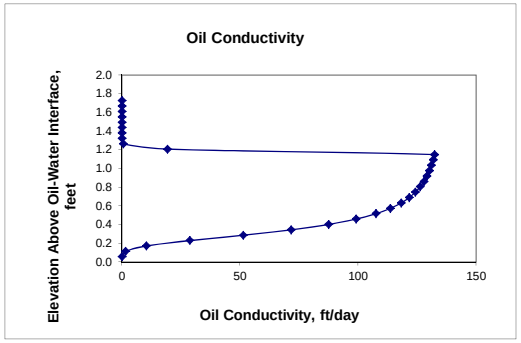
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.73	0.506	0.208	0.111	0.118	1.00E-03	4.59E-07	8.26E-10	3.68E-04	1.13E-07	6.51E-09	2.03E-03	1.73E-05	1.40E-01	3.29E-06	3.33E-02	9.98E-01	9.98E-01	-0.930	-6.946	-3.000
29	1.67	0.455	0.201	0.113	0.119	1.00E-03	5.82E-07	8.83E-10	4.66E-04	1.21E-07	6.95E-09	2.05E-03	1.73E-05	1.44E-01	4.03E-06	3.33E-02	9.98E-01	9.98E-01	-0.925	-6.918	-3.000
28	1.61	0.405	0.194	0.117	0.120	1.00E-03	7.44E-07	9.45E-10	5.95E-04	1.29E-07	7.44E-09	2.07E-03	1.73E-05	1.50E-01	4.97E-06	3.33E-02	9.98E-01	9.98E-01	-0.920	-6.888	-3.000
27	1.55	0.354	0.187	0.122	0.122	2.39E-05	9.59E-07	8.73E-14	7.67E-04	1.20E-11	6.88E-13	2.10E-03	4.12E-07	1.55E-01	6.18E-06	5.15E-03	9.98E-01	9.98E-01	-0.915	-10.922	-4.622
26	1.50	0.303	0.180	0.129	0.123	6.11E-03	1.25E-06	1.12E-07	9.98E-04	1.53E-05	8.80E-07	2.13E-03	1.05E-04	1.61E-01	7.75E-06	8.24E-02	9.97E-01	9.96E-01	-0.909	-4.815	-2.214
25	1.44	0.253	0.173	0.142	0.125	1.71E-02	1.64E-06	1.85E-06	1.31E-03	2.54E-04	1.46E-05	2.16E-03	2.94E-04	1.67E-01	9.80E-06	1.38E-01	9.97E-01	9.93E-01	-0.902	-3.596	-1.768
24	1.38	0.202	0.166	0.166	0.127	3.83E-02	2.18E-06	1.91E-05	1.74E-03	2.62E-03	1.51E-04	2.20E-03	6.60E-04	1.74E-01	1.25E-05	2.06E-01	9.96E-01	9.87E-01	-0.895	-2.581	-1.417
23	1.32	0.152	0.159	0.215	0.130	8.48E-02	2.93E-06	2.16E-04	2.35E-03	2.96E-02	1.70E-03	2.24E-03	1.46E-03	1.82E-01	1.61E-05	3.07E-01	9.96E-01	9.69E-01	-0.887	-1.529	-1.071
22	1.27	0.101	0.152	0.341	0.133	2.08E-01	3.99E-06	3.90E-03	3.20E-03	5.34E-01	3.07E-02	2.29E-03	3.59E-03	1.90E-01	2.10E-05	4.81E-01	9.95E-01	9.05E-01	-0.878	-0.273	-0.681
21	1.21	0.051	0.145	0.713	0.136	5.78E-01	5.52E-06	1.40E-01	4.42E-03	1.92E+01	1.10E+00	2.34E-03	9.96E-03	1.99E-01	2.77E-05	8.01E-01	9.95E-01	5.76E-01	-0.868	1.283	-0.238
20	1.15	0.0	0.138	1.0	0.139	0.861	7.75E-06	9.66E-01	6.20E-03	1.32E+02	7.61E+00	2.40E-03	1.48E-02	2.09E-01	3.71E-05	9.78E-01	9.94E-01	0.00E+00	-0.856	2.122	-0.065
19	1.09	0.0	0.132	1.0	0.143	0.857	1.11E-05	9.62E-01	8.85E-03	1.32E+02	7.57E+00	2.48E-03	1.48E-02	2.20E-01	5.03E-05	9.76E-01	9.93E-01	0.00E+00	-0.843	2.120	-0.067
18	1.04	0.0	0.125	1.0	0.148	0.852	1.61E-05	9.57E-01	1.29E-02	1.31E+02	7.53E+00	2.56E-03	1.47E-02	2.32E-01	6.94E-05	9.73E-01	9.92E-01	0.00E+00	-0.829	2.117	-0.070
17	0.98	0.0	0.118	1.0	0.154	0.846	2.39E-05	9.50E-01	1.91E-02	1.30E+02	7.48E+00	2.66E-03	1.46E-02	2.45E-01	9.74E-05	9.69E-01	9.90E-01	0.00E+00	-0.812	2.115	-0.073
16	0.92	0.0	0.111	1.0	0.161	0.839	3.63E-05	9.43E-01	2.91E-02	1.29E+02	7.43E+00	2.78E-03	1.45E-02	2.60E-01	1.39E-04	9.65E-01	9.88E-01	0.00E+00	-0.793	2.111	-0.076
15	0.86	0.0	0.104	1.0	0.169	0.831	5.66E-05	9.33E-01	4.53E-02	1.28E+02	7.35E+00	2.92E-03	1.43E-02	2.77E-01	2.04E-04	9.61E-01	9.86E-01	0.00E+00	-0.771	2.107	-0.081
14	0.81	0.0	0.097	1.0	0.179	0.821	9.09E-05	9.22E-01	7.27E-02	1.26E+02	7.26E+00	3.09E-03	1.42E-02	2.97E-01	3.06E-04	9.55E-01	9.82E-01	0.00E+00	-0.747	2.101	-0.086
13	0.75	0.0	0.090	1.0	0.192	0.808	1.51E-04	9.07E-01	1.21E-01	1.24E+02	7.14E+00	3.30E-03	1.39E-02	3.19E-01	4.73E-04	9.48E-01	9.78E-01	0.00E+00	-0.718	2.094	-0.092
12	0.69	0.0	0.083	1.0	0.207	0.793	2.59E-04	8.88E-01	2.07E-01	1.22E+02	6.99E+00	3.57E-03	1.37E-02	3.44E-01	7.53E-04	9.39E-01	9.73E-01	0.00E+00	-0.684	2.085	-0.101
11	0.63	0.0	0.076	1.0	0.226	0.774	4.65E-04	8.63E-01	3.72E-01	1.18E+02	6.80E+00	3.90E-03	1.34E-02	3.74E-01	1.24E-03	9.27E-01	9.65E-01	0.00E+00	-0.646	2.073	-0.111
10	0.58	0.0	0.069	1.0	0.251	0.749	8.76E-04	8.30E-01	7.01E-01	1.14E+02	6.54E+00	4.33E-03	1.29E-02	4.09E-01	2.14E-03	9.12E-01	9.54E-01	0.00E+00	-0.601	2.056	-0.125
9	0.52	0.0	0.062	1.0	0.283	0.717	1.74E-03	7.85E-01	1.39E+00	1.08E+02	6.18E+00	4.88E-03	1.24E-02	4.51E-01	3.86E-03	8.93E-01	9.38E-01	0.00E+00	-0.548	2.031	-0.145
8	0.46	0.0	0.055	1.0	0.326	0.674	3.68E-03	7.23E-01	2.94E+00	9.91E+01	5.70E+00	5.62E-03	1.16E-02	5.01E-01	7.34E-03	8.65E-01	9.14E-01	0.00E+00	-0.487	1.996	-0.171
7	0.40	0.0	0.048	1.0	0.383	0.617	8.30E-03	6.39E-01	6.64E+00	8.75E+01	5.03E+00	6.61E-03	1.06E-02	5.61E-01	1.48E-02	8.28E-01	8.78E-01	0.00E+00	-0.416	1.942	-0.210
6	0.35	0.0	0.042	1.0	0.461	0.539	2.00E-02	5.23E-01	1.60E+01	7.17E+01	4.12E+00	7.96E-03	9.29E-03	6.34E-01	3.16E-02	7.74E-01	8.22E-01	0.00E+00	-0.336	1.855	-0.269
5	0.29	0.0	0.035	1.0	0.564	0.436	5.07E-02	3.75E-01	4.06E+01	5.14E+01	2.95E+00	9.74E-03	7.51E-03	7.18E-01	7.06E-02	6.96E-01	7.34E-01	0.00E+00	-0.248	1.711	-0.361
4	0.23	0.0	0.028	1.0	0.693	0.307	1.30E-01	2.10E-01	1.04E+02	2.88E+01	1.66E+00	1.20E-02	5.29E-03	8.12E-01	1.60E-01	5.84E-01	6.00E-01	0.00E+00	-0.159	1.460	-0.513
3	0.17	0.0	0.021	1.0	0.831	0.169	3.07E-01	7.50E-02	2.46E+02	1.03E+01	5.91E-01	1.43E-02	2.92E-03	9.01E-01	3.41E-01	4.34E-01	4.16E-01	0.00E+00	-0.080	1.012	-0.772
2	0.12	0.0	0.014	1.0	0.940	0.060	5.99E-01	1.16E-02	4.79E+02	1.59E+00	9.17E-02	1.62E-02	1.03E-03	9.66E-01	6.20E-01	2.58E-01	2.13E-01	0.00E+00	-0.027	0.203	-1.223
1	0.06	0.0	0.007	1.0	0.992	0.008	8.86E-01	3.01E-04	7.09E+02	4.12E-02	2.37E-03	1.71E-02	1.39E-04	9.96E-01	8.90E-01	9.46E-02	5.64E-02	0.00E+00	-0.004	-1.385	-2.094

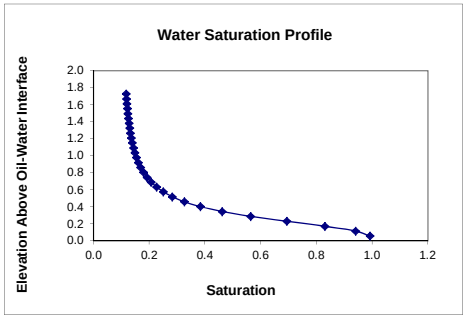
Fluid Saturation and LNAPL Mobility Parameter Plots

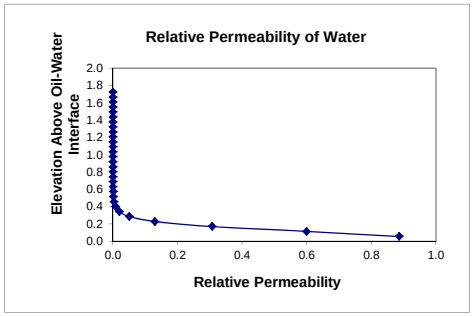
Well ID: IW-25 Test 1

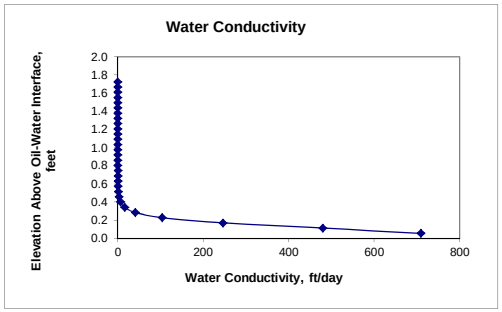












Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-25 Test 1

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the Carsel and Parrish (1988) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.880	(dimensionless)
Dynamic viscosity of free oil:	5.138	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	
Free Oil Thickness in Well:	1.15	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.0575	feet

Soil Properties of Formation

Hydraulic conductivity:	3.19E+00	ft/day	1.12E-03 cm/sec
Effective Porosity:	0.35	(dimensionless)	
Irreducible water saturation:	2.45E-01	(dimensionless)	
van Genuchten alpha:	2.176	1/feet	
van Genuchten n:	1.94	(dimensionless)	
van Genuchten m:	0.48	(dimensionless)	

Calculated Results

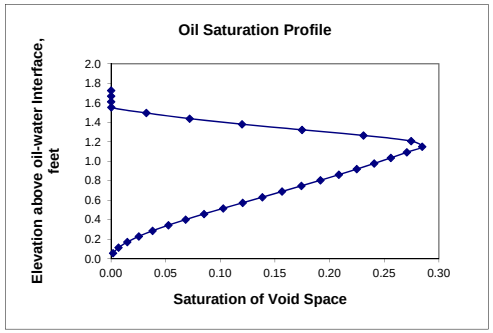
Geometric mean Oil Conductivity (above-below o	1.56E-03	ft/day	**6.28E-02 ft/day =**
Oil Transmissivity of oil layer (above-below oil tat	1.08E-01	ft2/day	**Arithmetic mean K_o**
Geometric mean oil saturation within free oil layer	3.60E-02		
Geometric mean water sat'n within free oil layer:	7.84E-01		
Specific Volume of Oil (above-below oil table):	7.18E-02	ft	2.19E+00 cm
Specific Volume of Water (above & below oil tabl	4.80E-01	ft	1.46E+01 cm
Estimate of oil storativity:	6.31E-03		
Bouwer-Rice Oil Conductivity (below oil table):	6.28E-02	ft/day	2.22E-05 cm/sec

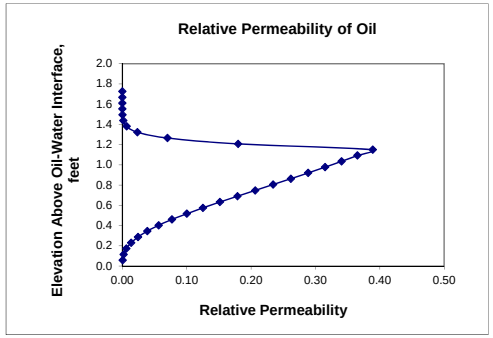
Table of Calculations:

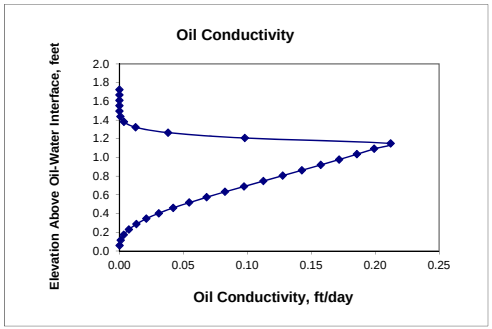
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.73	0.506	0.208	0.541	0.604	1.00E-04	8.48E-03	5.34E-11	2.70E-02	2.91E-11	1.67E-12	1.22E-02	2.01E-06	6.89E-01	1.23E-02	1.15E-02	8.89E-01	8.89E-01	-0.219	-10.536	-4.000
29	1.67	0.455	0.201	0.566	0.613	1.00E-04	9.58E-03	5.71E-11	3.05E-02	3.12E-11	1.79E-12	1.23E-02	2.01E-06	6.98E-01	1.37E-02	1.15E-02	8.83E-01	8.83E-01	-0.213	-10.506	-4.000
28	1.61	0.405	0.194	0.597	0.622	1.00E-04	1.09E-02	6.13E-11	3.46E-02	3.34E-11	1.92E-12	1.25E-02	2.01E-06	7.07E-01	1.54E-02	1.15E-02	8.76E-01	8.76E-01	-0.206	-10.476	-4.000
27	1.55	0.354	0.187	0.632	0.632	1.51E-04	1.23E-02	1.83E-10	3.93E-02	1.00E-10	5.75E-12	1.27E-02	3.03E-06	7.16E-01	1.72E-02	1.41E-02	8.69E-01	8.69E-01	-0.199	-10.000	-3.822
26	1.50	0.303	0.180	0.675	0.643	3.23E-02	1.41E-02	1.50E-04	4.48E-02	8.19E-05	4.71E-06	1.29E-02	6.50E-04	7.25E-01	1.94E-02	2.07E-01	8.61E-01	8.34E-01	-0.192	-4.087	-1.491
25	1.44	0.253	0.173	0.725	0.653	7.20E-02	1.61E-02	1.39E-03	5.12E-02	7.60E-04	4.37E-05	1.31E-02	1.45E-03	7.35E-01	2.19E-02	3.09E-01	8.52E-01	7.85E-01	-0.185	-3.119	-1.143
24	1.38	0.202	0.166	0.785	0.665	1.20E-01	1.84E-02	6.52E-03	5.87E-02	3.56E-03	2.05E-04	1.34E-02	2.41E-03	7.45E-01	2.47E-02	3.99E-01	8.43E-01	7.15E-01	-0.177	-2.449	-0.921
23	1.32	0.152	0.159	0.851	0.676	1.75E-01	2.12E-02	2.32E-02	6.76E-02	1.27E-02	7.28E-04	1.36E-02	3.52E-03	7.56E-01	2.81E-02	4.81E-01	8.32E-01	6.13E-01	-0.170	-1.898	-0.757
22	1.27	0.101	0.152	0.920	0.689	2.31E-01	2.45E-02	6.99E-02	7.80E-02	3.81E-02	2.19E-03	1.39E-02	4.65E-03	7.67E-01	3.19E-02	5.53E-01	8.21E-01	4.66E-01	-0.162	-1.419	-0.636
21	1.21	0.051	0.145	0.976	0.702	2.75E-01	2.84E-02	1.80E-01	9.04E-02	9.81E-02	5.64E-03	1.41E-02	5.53E-03	7.78E-01	3.65E-02	6.03E-01	8.09E-01	2.63E-01	-0.154	-1.008	-0.561
20	1.15	0.0	0.138	1.0	0.715	0.285	3.30E-02	3.89E-01	1.05E-01	2.12E-01	1.22E-02	1.44E-02	5.73E-03	7.89E-01	4.18E-02	6.14E-01	7.96E-01	0.00E+00	-0.146	-0.673	-0.545
19	1.09	0.0	0.132	1.0	0.729	0.271	3.85E-02	3.65E-01	1.23E-01	1.99E-01	1.15E-02	1.47E-02	5.45E-03	8.01E-01	4.80E-02	5.99E-01	7.81E-01	0.00E+00	-0.137	-0.701	-0.567
18	1.04	0.0	0.125	1.0	0.744	0.256	4.50E-02	3.41E-01	1.43E-01	1.86E-01	1.07E-02	1.50E-02	5.15E-03	8.13E-01	5.54E-02	5.83E-01	7.65E-01	0.00E+00	-0.128	-0.731	-0.592
17	0.98	0.0	0.118	1.0	0.759	0.241	5.29E-02	3.15E-01	1.69E-01	1.72E-01	9.88E-03	1.53E-02	4.85E-03	8.25E-01	6.41E-02	5.65E-01	7.47E-01	0.00E+00	-0.120	-0.765	-0.618
16	0.92	0.0	0.111	1.0	0.775	0.225	6.24E-02	2.89E-01	1.99E-01	1.57E-01	9.06E-03	1.56E-02	4.53E-03	8.38E-01	7.44E-02	5.46E-01	7.27E-01	0.00E+00	-0.111	-0.803	-0.648
15	0.86	0.0	0.104	1.0	0.791	0.209	7.38E-02	2.62E-01	2.35E-01	1.43E-01	8.21E-03	1.59E-02	4.20E-03	8.51E-01	8.67E-02	5.26E-01	7.06E-01	0.00E+00	-0.102	-0.845	-0.681
14	0.81	0.0	0.097	1.0	0.808	0.192	8.75E-02	2.34E-01	2.79E-01	1.28E-01	7.34E-03	1.63E-02	3.86E-03	8.64E-01	1.01E-01	5.04E-01	6.82E-01	0.00E+00	-0.092	-0.894	-0.718
13	0.75	0.0	0.090	1.0	0.826	0.174	1.04E-01	2.06E-01	3.32E-01	1.13E-01	6.47E-03	1.66E-02	3.51E-03	8.77E-01	1.19E-01	4.81E-01	6.55E-01	0.00E+00	-0.083	-0.948	-0.759
12	0.69	0.0	0.083	1.0	0.843	0.157	1.24E-01	1.79E-01	3.96E-01	9.75E-02	5.61E-03	1.70E-02	3.15E-03	8.90E-01	1.40E-01	4.55E-01	6.26E-01	0.00E+00	-0.074	-1.011	-0.805
11	0.63	0.0	0.076	1.0	0.861	0.139	1.49E-01	1.51E-01	4.73E-01	8.26E-02	4.75E-03	1.73E-02	2.79E-03	9.04E-01	1.64E-01	4.29E-01	5.95E-01	0.00E+00	-0.065	-1.083	-0.858
10	0.58	0.0	0.069	1.0	0.879	0.121	1.78E-01	1.25E-01	5.67E-01	6.82E-02	3.92E-03	1.77E-02	2.43E-03	9.17E-01	1.94E-01	4.00E-01	5.59E-01	0.00E+00	-0.056	-1.166	-0.919
9	0.52	0.0	0.062	1.0	0.897	0.103	2.13E-01	1.00E-01	6.80E-01	5.46E-02	3.14E-03	1.81E-02	2.07E-03	9.29E-01	2.29E-01	3.69E-01	5.21E-01	0.00E+00	-0.047	-1.263	-0.989
8	0.46	0.0	0.055	1.0	0.915	0.085	2.56E-01	7.70E-02	8.15E-01	4.20E-02	2.42E-03	1.84E-02	1.71E-03	9.42E-01	2.72E-01	3.36E-01	4.79E-01	0.00E+00	-0.039	-1.377	-1.070
7	0.40	0.0	0.048	1.0	0.932	0.068	3.07E-01	5.64E-02	9.77E-01	3.08E-02	1.77E-03	1.88E-02	1.37E-03	9.54E-01	3.22E-01	3.01E-01	4.33E-01	0.00E+00	-0.031	-1.512	-1.166
6	0.35	0.0	0.042	1.0	0.948	0.052	3.67E-01	3.87E-02	1.17E+00	2.11E-02	1.21E-03	1.91E-02	1.06E-03	9.65E-01	3.81E-01	2.64E-01	3.83E-01	0.00E+00	-0.023	-1.675	-1.280
5	0.29	0.0	0.035	1.0	0.962	0.038	4.38E-01	2.44E-02	1.40E+00	1.33E-02	7.64E-04	1.94E-02	7.65E-04	9.74E-01	4.50E-01	2.24E-01	3.29E-01	0.00E+00	-0.017	-1.877	-1.420
4	0.23	0.0	0.028	1.0	0.975	0.025	5.21E-01	1.35E-02	1.66E+00	7.38E-03	4.24E-04	1.96E-02	5.10E-04	9.83E-01	5.30E-01	1.83E-01	2.72E-01	0.00E+00	-0.011	-2.132	-1.596
3	0.17	0.0	0.021	1.0	0.985	0.015	6.17E-01	6.20E-03	1.97E+00	3.38E-03	1.94E-04	1.98E-02	2.98E-04	9.90E-01	6.24E-01	1.40E-01	2.10E-01	0.00E+00	-0.006	-2.471	-1.829
2	0.12	0.0	0.014	1.0	0.993	0.007	7.27E-01	2.01E-03	2.32E+00	1.10E-03	6.30E-05	2.00E-02	1.38E-04	9.95E-01	7.31E-01	9.53E-02	1.45E-01	0.00E+00	-0.003	-2.960	-2.164
1	0.06	0.0	0.007	1.0	0.998	0.002	8.52E-01	2.84E-04	2.72E+00	1.55E-04	8.90E-06	2.01E-02	3.63E-05	9.99E-01	8.54E-01	4.89E-02	7.61E-02	0.00E+00	-0.001	-3.811	-2.744

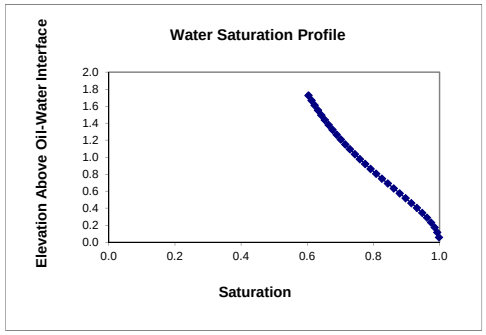
Fluid Saturation and LNAPL Mobility Parameter Plots

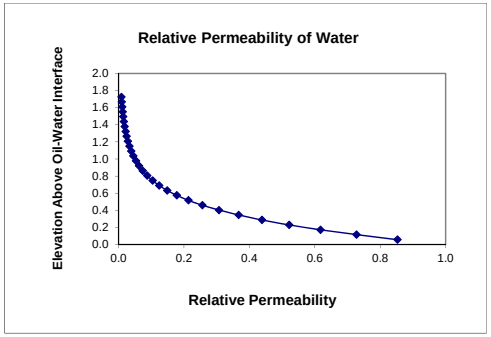
Well ID: *N*-25 Test 1

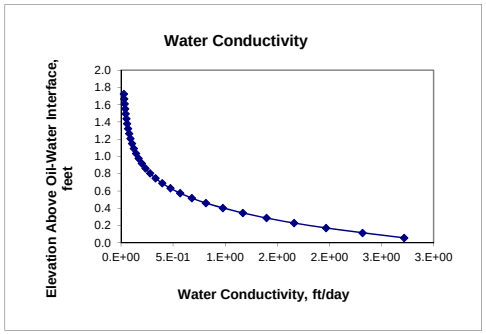












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the Carsel & Parrish Database

Physical Parameter Measured / Evaluated	MW-25 Test 1 1400 N. Royal St., Alexandria, VA			
	Slug-Test Solution		Parametric Solution[b]	
Starting Free Oil Thickness	1.15	ft	1.15	ft
	35.1	cm	35.1	cm
Hydraulic Conductivity	2.16E+00	ft/day	3.19E+00 [c]	ft/day
	7.61E-04	cm/sec	1.12E-03	cm/sec
Average Oil Conductivity	6.28E-02	ft/day	6.28E-02	ft/day
	2.22E-05	cm/sec	2.22E-05	cm/sec
Free Oil Transmissivity	7.22E-02	ft^2/day	1.08E-01	ft^2/day
	7.76E-04	cm^2/sec	1.17E-03	cm^2/sec
Free Oil Specific Volume			7.18E-02	ft^3/ft^2
			2.19E+00	cm^3/cm^2
Inherent Mobility			1.51E+00	ft/day
			5.33E-04	cm/sec
Assumed Effective Porosity			0.35	
van Genuchten *alpha*			2.18	1/ft
			0.071	1/cm
van Genuchten *n*			1.94	
Irreducible Water Saturation			0.25	
Inferred Lithology			Sand	

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with Carsel and Parish (1988) database for USDA agricultural soils.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-25 Test 1

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the API (2006) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.880	(dimensionless)
Dynamic viscosity of free oil:	5.138	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	
Free Oil Thickness in Well:	1.15	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.0575	feet

Soil Properties of Formation

Hydraulic conductivity:	1.47E+02	ft/day	5.18E-02 cm/sec
Effective Porosity:	0.35	(dimensionless)	
Irreducible water saturation:	2.50E-01	(dimensionless)	
van Genuchten alpha:	0.558	1/feet	
van Genuchten n:	2.32	(dimensionless)	
van Genuchten m:	0.57	(dimensionless)	

Calculated Results

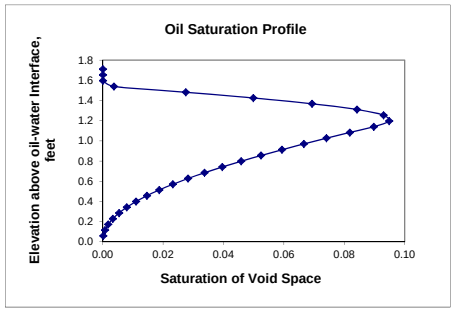
Geometric mean Oil Conductivity (above-below c	2.41E-03 ft/day	**6.29E-02 ft/day =**
Oil Transmissivity of oil layer (above-below oil tal	1.08E-01 ft2/day	**Arithmetic mean K_o**
Geometric mean oil saturation within free oil laye	3.64E-03	
Geometric mean water sat'n within free oil layer:	9.75E-01	
Specific Volume of Oil (above-below oil table):	7.53E-03 ft	2.29E-01 cm
Specific Volume of Water (above & below oil tabl	5.89E-01 ft	1.79E+01 cm
Estimate of oil storativity:	6.37E-04	
Bouwer-Rice Oil Conductivity (below oil table):	6.28E-02 ft/day	2.22E-05 cm/sec

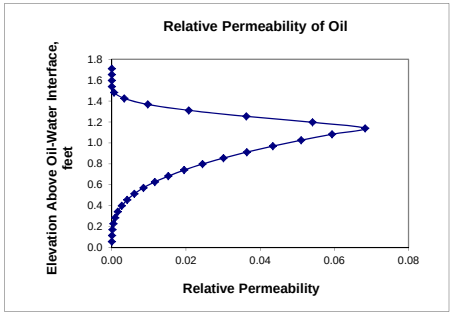
Table of Calculations:

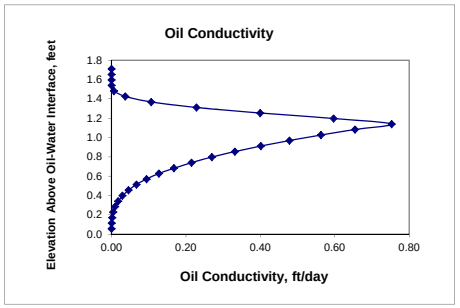
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.73	0.506	0.208	0.880	0.926	1.00E-04	3.89E-01	8.23E-10	5.71E+01	2.07E-08	1.19E-09	1.86E-02	2.01E-06	9.50E-01	4.10E-01	1.15E-02	3.60E-01	3.59E-01	-0.033	-7.684	-4.000
29	1.67	0.455	0.201	0.902	0.931	1.00E-04	4.07E-01	8.81E-10	5.98E+01	2.21E-08	1.27E-09	1.87E-02	2.01E-06	9.53E-01	4.27E-01	1.15E-02	3.46E-01	3.46E-01	-0.031	-7.655	-4.000
28	1.61	0.405	0.194	0.922	0.936	1.00E-04	4.25E-01	9.45E-10	6.24E+01	2.37E-08	1.37E-09	1.88E-02	2.01E-06	9.56E-01	4.45E-01	1.15E-02	3.33E-01	3.33E-01	-0.029	-7.624	-4.000
27	1.55	0.354	0.187	0.941	0.941	6.82E-05	4.44E-01	3.91E-10	6.52E+01	9.82E-09	5.64E-10	1.89E-02	1.37E-06	9.60E-01	4.63E-01	9.54E-03	3.20E-01	3.19E-01	-0.027	-8.008	-4.166
26	1.50	0.303	0.180	0.957	0.945	1.21E-02	4.64E-01	1.96E-04	6.81E+01	4.93E-03	2.83E-04	1.90E-02	2.43E-04	9.63E-01	4.82E-01	1.27E-01	3.06E-01	2.67E-01	-0.025	-2.307	-1.918
25	1.44	0.253	0.173	0.971	0.949	2.18E-02	4.84E-01	1.05E-03	7.10E+01	2.65E-02	1.52E-03	1.91E-02	4.38E-04	9.66E-01	5.01E-01	1.70E-01	2.92E-01	2.14E-01	-0.023	-1.577	-1.662
24	1.38	0.202	0.166	0.982	0.954	2.89E-02	5.04E-01	2.69E-03	7.40E+01	6.76E-02	3.89E-03	1.92E-02	5.81E-04	9.69E-01	5.20E-01	1.96E-01	2.79E-01	1.61E-01	-0.021	-1.170	-1.540
23	1.32	0.152	0.159	0.991	0.958	3.32E-02	5.25E-01	4.94E-03	7.71E+01	1.24E-01	7.14E-03	1.93E-02	6.69E-04	9.71E-01	5.40E-01	2.10E-01	2.65E-01	1.12E-01	-0.019	-0.906	-1.478
22	1.27	0.101	0.152	0.996	0.961	3.49E-02	5.46E-01	7.41E-03	8.02E+01	1.86E-01	1.07E-02	1.93E-02	7.03E-04	9.74E-01	5.61E-01	2.16E-01	2.51E-01	6.58E-02	-0.017	-0.730	-1.457
21	1.21	0.051	0.145	0.999	0.965	3.41E-02	5.68E-01	9.48E-03	8.34E+01	2.38E-01	1.37E-02	1.94E-02	6.86E-04	9.77E-01	5.82E-01	2.13E-01	2.37E-01	2.64E-02	-0.015	-0.623	-1.467
20	1.15	0.0	0.138	1.0	0.969	0.031	5.90E-01	1.02E-02	8.66E+01	2.57E-01	1.47E-02	1.95E-02	6.30E-04	9.79E-01	6.03E-01	2.04E-01	2.24E-01	0.00E+00	-0.014	-0.591	-1.505
19	1.09	0.0	0.132	1.0	0.972	0.028	6.13E-01	8.50E-03	8.99E+01	2.14E-01	1.23E-02	1.96E-02	5.63E-04	9.81E-01	6.24E-01	1.93E-01	2.10E-01	0.00E+00	-0.012	-0.670	-1.553
18	1.04	0.0	0.125	1.0	0.975	0.025	6.35E-01	7.00E-03	9.33E+01	1.76E-01	1.01E-02	1.96E-02	4.99E-04	9.83E-01	6.46E-01	1.82E-01	1.96E-01	0.00E+00	-0.011	-0.755	-1.605
17	0.98	0.0	0.118	1.0	0.978	0.022	6.58E-01	5.69E-03	9.66E+01	1.43E-01	8.23E-03	1.97E-02	4.40E-04	9.85E-01	6.68E-01	1.71E-01	1.83E-01	0.00E+00	-0.010	-0.844	-1.661
16	0.92	0.0	0.111	1.0	0.981	0.019	6.81E-01	4.57E-03	1.00E+02	1.15E-01	6.60E-03	1.97E-02	3.84E-04	9.87E-01	6.90E-01	1.59E-01	1.69E-01	0.00E+00	-0.008	-0.940	-1.720
15	0.86	0.0	0.104	1.0	0.984	0.016	7.05E-01	3.60E-03	1.03E+02	9.06E-02	5.21E-03	1.98E-02	3.32E-04	9.89E-01	7.12E-01	1.48E-01	1.56E-01	0.00E+00	-0.007	-1.043	-1.783
14	0.81	0.0	0.097	1.0	0.986	0.014	7.28E-01	2.80E-03	1.07E+02	7.03E-02	4.04E-03	1.98E-02	2.84E-04	9.91E-01	7.35E-01	1.37E-01	1.43E-01	0.00E+00	-0.006	-1.153	-1.850
13	0.75	0.0	0.090	1.0	0.988	0.012	7.51E-01	2.13E-03	1.10E+02	5.34E-02	3.07E-03	1.99E-02	2.40E-04	9.92E-01	7.57E-01	1.26E-01	1.30E-01	0.00E+00	-0.005	-1.272	-1.923
12	0.69	0.0	0.083	1.0	0.990	0.010	7.74E-01	1.58E-03	1.14E+02	3.97E-02	2.28E-03	1.99E-02	2.00E-04	9.93E-01	7.80E-01	1.15E-01	1.17E-01	0.00E+00	-0.004	-1.402	-2.002
11	0.63	0.0	0.076	1.0	0.992	0.008	7.97E-01	1.14E-03	1.17E+02	2.87E-02	1.65E-03	2.00E-02	1.64E-04	9.95E-01	8.02E-01	1.04E-01	1.05E-01	0.00E+00	-0.004	-1.543	-2.089
10	0.58	0.0	0.069	1.0	0.993	0.007	8.20E-01	7.98E-04	1.20E+02	2.01E-02	1.15E-03	2.00E-02	1.32E-04	9.96E-01	8.24E-01	9.34E-02	9.24E-02	0.00E+00	-0.003	-1.698	-2.184
9	0.52	0.0	0.062	1.0	0.995	0.005	8.43E-01	5.37E-04	1.24E+02	1.35E-02	7.76E-04	2.00E-02	1.03E-04	9.97E-01	8.45E-01	8.28E-02	8.05E-02	0.00E+00	-0.002	-1.870	-2.289
8	0.46	0.0	0.055	1.0	0.996	0.004	8.64E-01	3.44E-04	1.27E+02	8.65E-03	4.98E-04	2.00E-02	7.89E-05	9.97E-01	8.67E-01	7.23E-02	6.90E-02	0.00E+00	-0.002	-2.063	-2.407
7	0.40	0.0	0.048	1.0	0.997	0.003	8.86E-01	2.08E-04	1.30E+02	5.22E-03	3.00E-04	2.01E-02	5.80E-05	9.98E-01	8.88E-01	6.20E-02	5.79E-02	0.00E+00	-0.001	-2.282	-2.541
6	0.35	0.0	0.042	1.0	0.998	0.002	9.06E-01	1.16E-04	1.33E+02	2.91E-03	1.67E-04	2.01E-02	4.06E-05	9.99E-01	9.08E-01	5.18E-02	4.73E-02	0.00E+00	-0.001	-2.536	-2.695
5	0.29	0.0	0.035	1.0	0.999	0.001	9.26E-01	5.80E-05	1.36E+02	1.46E-03	8.38E-05	2.01E-02	2.66E-05	9.99E-01	9.27E-01	4.20E-02	3.72E-02	0.00E+00	-0.001	-2.836	-2.879
4	0.23	0.0	0.028	1.0	0.999	0.001	9.45E-01	2.48E-05	1.39E+02	6.24E-04	3.59E-05	2.01E-02	1.59E-05	9.99E-01	9.45E-01	3.24E-02	2.77E-02	0.00E+00	0.000	-3.205	-3.104
3	0.17	0.0	0.021	1.0	1.000	0.000	9.62E-01	8.32E-06	1.41E+02	2.09E-04	1.20E-05	2.01E-02	8.13E-06	1.00E+00	9.62E-01	2.32E-02	1.89E-02	0.00E+00	0.000	-3.680	-3.394
2	0.12	0.0	0.014	1.0	1.000	0.000	9.78E-01	1.78E-06	1.44E+02	4.47E-05	2.57E-06	2.01E-02	3.17E-06	1.00E+00	9.78E-01	1.45E-02	1.11E-02	0.00E+00	0.000	-4.350	-3.803
1	0.06	0.0	0.007	1.0	1.000	0.000	9.91E-01	1.27E-07	1.45E+02	3.19E-06	1.83E-07	2.01E-02	6.34E-07	1.00E+00	9.91E-01	6.48E-03	4.43E-03	0.00E+00	0.000	-5.496	-4.502

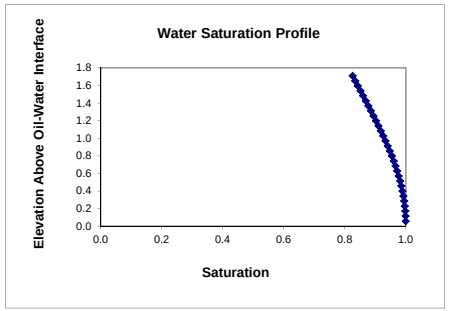
Fluid Saturation and LNAPL Mobility Parameter Plots

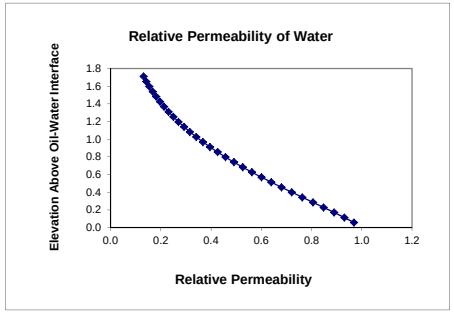
Well ID: *N*-25 Test 1

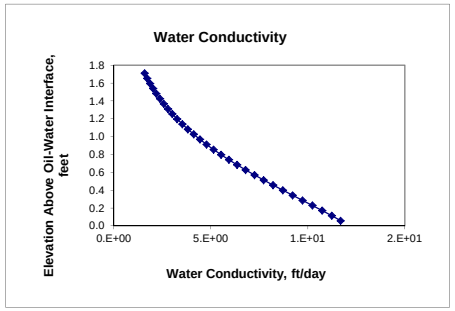












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the API (2006) Database[b]

Physical Parameter Measured / Evaluated	MW-25 Test 1 1400 N. Royal St., Alexandria, VA			
	Slug-Test Solution		Parametric Solution[b]	
Starting Free Oil Thickness	1.15	ft	1.15	ft
	35.1	cm	35.1	cm
Hydraulic Conductivity	2.16E+00	ft/day	1.47E+02 [c]	ft/day
	7.61E-04	cm/sec	5.18E-02	cm/sec
Average Oil Conductivity	6.28E-02	ft/day	6.29E-02	ft/day
	2.22E-05	cm/sec	2.22E-05	cm/sec
Free Oil Transmissivity	7.22E-02	ft^2/day	1.08E-01	ft^2/day
	7.76E-04	cm^2/sec	1.17E-03	cm^2/sec
Free Oil Specific Volume			7.53E-03	ft^3/ft^2
			6.58E-01	cm^3/cm^2
Inherent Mobility			1.44E+01	ft/day
			5.08E-03	cm/sec
Assumed Effective Porosity			0.35	
van Genuchten *alpha*			0.56	1/ft
			0.018	1/cm
van Genuchten *n*			2.32	
Irreducible Water Saturation			0.25	
Inferred Lithology			Sand	

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with API (2006) database for soils at a sampling of petroleum facilities.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Summary of Slug Withdrawal and Parametric Solutions

Hydraulic/Capillary Parameters	Well MW-25 - Test 1			
	Carsel & Parrish Database	API Database		
LNAPL Conductivity (ft/day):	6.28E-02	6.29E-02		
LNAPL Transmissivity (ft^2/day):	1.08E-01	1.08E-01	0.11	0.11
Hydraulic Conductivity (ft/day):	3.19E+00	1.47E+02		
van Genuchten - *alpha* (1/ft):	2.18	0.56		
van Genuchten – *n* (dimensionless):	1.94	2.32		
Residual Water Saturation:	0.25	0.25		
Hydraulic Conductivity of the underlying groundwater zone (ft/day):	2.16E+00	2.16E+00		

GES LNAPL BAILDOWN TEST FIELD LOG

SITE: **1400 N. Royal St., Alexandria, VA**
PROJECT: **NRG - Potomac River Generating Station (PRGS)**
WELL ID: **MW-25 Test 2** **DATE: 9/19/14** **TIME: 13:07**
PERSONNEL: P. Reichardt, D. Rice

Air Temperature: 60 °F Groundwater Temperature: 62 °F
Current Precipitation: None
Esti. Wind Speed: light

STATIC DEPTH TO LNAPL		(A)	27.07	ft btoc	8.256	m btoc
STATIC DEPTH TO WATER		(B)	27.89	ft btoc	8.506	m btoc
LNAPL THICKNESS	(B - A)	(C)	0.82	ft	0.25	m
80% of LNAPL THICKNESS	(C *.80)	(D)	0.656	ft	0.2	m
SPECIFIC GRAVITY OF LNAPL	(at 62 °F)	(E)	0.88			
CORRECTED DEPTH TO WATER	(B - (C x E))	(F)	27.1684	ft btoc	8.286	m btoc
MEASURED WELL DEPTH			36.03	ft btoc	10.99	m btoc
DEPTH TO TOP OF SCREEN		(G)	25	ft btoc	7.625	m btoc
DEPTH TO BASE OF SCREEN		(H)	35	ft btoc	10.68	m btoc

★ (A) Must be between (G) and (H). If not, discontinue test. ⇨ OK

WELL CASING INNER DIAMETER	(I)	0.33333	ft	0.102	m
WELL BORE DIAMETER	(J)	0.875	ft	0.267	m

★ (C) Must be > (J)/2. If not, discontinue test. ⇨ OK

WELL CASING SPECIFIC VOLUME	(K)	0.65284	gals/ft	8.1049	liters/m

BAILER TYPE:		HDPE - 1 gal			
BAILER INNER RADIUS	(L)	0.1875	ft		m
BAILER LENGTH	(M)	2.52083	ft		m
NUMBER OF BAILS REMOVED (LNAPL AND GROUNDWATER)	(N)	2	bails		

PRESSURE TRANSDUCER TYPE/MODEL: N/A
PRESSURE TRANSDUCER SETTING IN LNAPL OR WATER?: ft btoc m btoc
DATA LOGGER TYPE/MODEL:
PRESSURE READINGS RECORDED IN _____ SECOND INTERVALS

CALCULATE VOLUME OF BAILER and FRACTION OF LENGTH FILLED WITH EACH FLUID:
Volume = Fraction of Full Bailer x 3.142 x $(L)^2$ x (M) x 7.48 gals/ft OR USE CONTAINER VOLS

VOLUME REMOVED = (N) X NUMBER OF BAILS REMOVED	0.4883	gals	0.65	liters
L OF LNAPL REMOVED _____ VOL OF WATER REMOVED	1.7734	gals	1.4	liters

TEST DISCONTINUED AFTER LNAPL THICKNESS = (D) ft 0 m
TEST DISCONTINUED AFTER 3 HOURS HAD ELAPSED
9/19/2014 1:07:00 PM STARTING TIME 2:38:00 PM END TIME

Conversion Factors: 1 foot = 0.305 m 1 gal = 3.785 liters 2-inch screen = 0.163 gal/ft 4-inch screen = 0.653 gal/ft
1 m = 3.28 feet 1 liter = 0.264 gals 2-inch screen = 2.03 liters/m 4-inch screen = 8.11 liters/m

GES/ES&T LNAPL BAILDOWN TEST FIELD LOG

NOTE: Enter measurements -- change units to metric if necessary

SITE: 1400 N. Royal St., Alexandria, VA
PROJECT: NRG - Potomac River Generating Station (PRGS)
WELL ID: MW-25 - Test 2 **DATE:** 9/19/2014 **TIME:** 13:07
PERSONNEL:

CLOCK TIME	ELAPSED TIME (min)	DEPTH TO LNAPL (ft btoc)	DEPTH TO WATER (ft btoc)	LNAPL THICKNESS (feet)	COMMENTS / OBSERVATIONS
13:07:00		27.07	27.89	0.82	PRETEST MEASUREMENTS
13:11:30	0.5	27.6	27.95	0.35	LAST BAIL REMOVED FROM WELL
13:12:00	1	27.49	27.79	0.3	
13:14:00	3	27.31	27.9	0.59	
13:16:00	5	27.25	27.51	0.26	
13:21:00	10	27.18	27.52	0.34	
13:31:00	20	27.15	27.54	0.39	
13:41:00	30	27.14	27.51	0.37	
13:51:00	40	27.12	27.51	0.39	
14:11:00	60	27.1	27.5	0.4	
14:38:00	87	27.09	27.49	0.4	Final measurement

Basic Input Data for Slug Withdrawal - Baildown Test Analysis

Location and Timing of Baildown Test					Comments About Data	
Well Name:	MW-25 Test 2					
Site Name:	1400 N. Royal St., Alexandria, VA					
Database:	Carsel & Parrish (1988) and API (2006)					
Start Date:	9/19/2014				Date of bailing the well.	
Clock time of start of bailing:	13:08				Known starting time	
Clock time of end of bailing:	13:11				four bailer withdrawals	
Time spend Bailing well:	0:02:45	(hr:min:sec)			Calculated value based on transducer.	
Time of last fluid measurement:	14:38	9/19/2014			Clock time of last measurement.	
End Date:	9/19/2014	(m/d/yr)			Date of last fluid level measurement.	
Test Well Characteristics						
Borehole Diam.	10.00	(inches)	0.254	(meters)	Data from well log.	0.833 (feet)
Casing ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Casing OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Screen ID:	4.00	(inches)	0.102	(meters)	Data from well log.	0.333 (feet)
Screen OD:	4.20	(inches)	0.107	(meters)	Data from well log.	0.350 (feet)
Measuring Point stickup above ground	0.00	(feet)	0.000	(meters)	Data from well log.	
Oil-wet screen length -- pretest:	0.82	(feet)	0.250	(meters)	Data from pretest fluid levels.	
Wtr-wet screen length -- pretest:	7.11	(feet)	2.168	(meters)		
Aquifer thickness:	35.00	(feet)	10.671	(meters)	Estimated	
Specific oil yield of filter pack sand:	0.132	(dimensionless)				
Specific water yield of filter pack sand:	0.03	(dimensionless)				
Oil and Water Volumes Bailed						
Volume of free LNAPL bailed:	0.49	(gallons)	1.85	(liters)	Measured in field after bailing.	heating/ #2 fue
Volume of groundwater bailed:	1.77	(gallons)	6.71	(liters)	Measured in field after bailing.	
Fluid Properties						
Specific gravity of oil:	0.880	(dimensionless)			Measured, addjusted for temp.	
Dynamic viscosity of oil:	5.14	(centipoise)			Measured, addjusted for temp.	
Air-water surface tension:	74.1	(dynes/cm)			Measured at room temp.	
Air-oil surface tension:	32.6	(dynes/cm)			Measured at room temp.	
Oil-water interfacial tension:	17.2	(dynes/cm)			Measured at room temp.	
Groundwater Temperature	62.0	degrees F	16.67	deg C	Assumed value	
Soil Properties--Filter Pack Sand						
Hydraulic conductivity:	800	(ft/day)	Assumed values		Value based on laboratory measurement.	
Effective Porosity:	0.3	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.1	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	4.2	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	2.1	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.52	(dimensionless)			Initial estimate based on soil texture.	
Soil Properties--Formation			Preliminary Estimates			
Hydraulic conductivity:	1	(ft/day)			Use if different from that calculated.	
Effective Porosity:	0.35	(dimensionless)			Estimate or laboratory measurement.	
Irreducible water saturation:	0.25	(dimensionless)			Estimate or laboratory measurement.	
van Genuchten alpha:	2.5	(1/feet)			Initial estimate based on soil texture.	
van Genuchten n:	1.50	(dimensionless)			Initial estimate based on soil texture.	
van Genuchten m:	0.33	(dimensionless)			Initial estimate based on soil texture.	

* NB : The surface and interfacial tensions are estimated from other data.

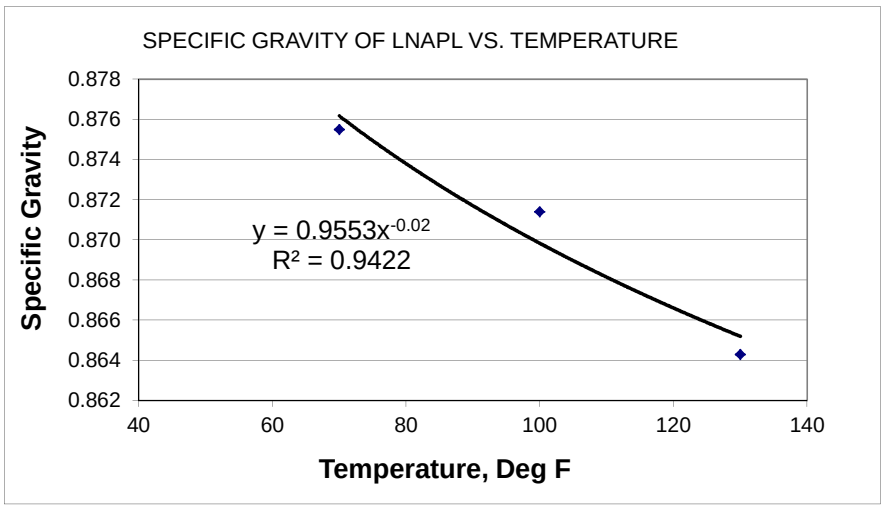
Laboratory Fluid Properties (PTS Lab report)

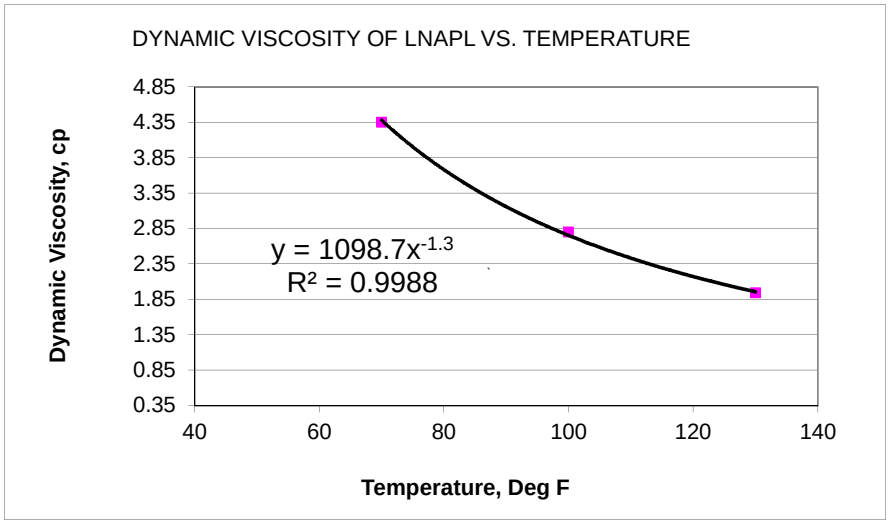
SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY centistokes	VISCOSITY centipoise
MW-25	Water	70	1.001	0.9986	0.998	0.997
		100	1.003	0.9963	0.705	0.703
		130	1.005	0.9910	0.522	0.517
MW-25	NAPL	70	0.8755	0.8737	4.980	4.350
		100	0.8714	0.8653	3.240	2.800
		130	0.8643	0.8522	2.280	1.940

GW Temperatures during GES Sampling

Well ID	Temp, °C
Average	#DIV/0!

PHASE PAIR SAMPLE ID / PHASE	PHASE	TEMPERATURE, °F	INTERFACIAL TENSION, Dynes/centimeter
MW-25 / Water	Air	75	74.1
MW-25 / NAPL	Air	76	32.6
MW-25 / Water	NAPL	76	17.2





Fluid Levels Measured Prior to and After Bailing

Well Name: **MW-25 Test 2** **Site:** **1400 N. Royal St., Alexandria, VA**

Measurements Prior to Bailing

Clock Time (military)*	Elapsed Time (minutes)	Depth to Air-Oil (feet)	Depth to Oil-Water (feet)	Free Oil Thickness (feet)	Depth to Water Table** (feet)	Comments	Depth to Zaw from Grd (feet)	Depth to Zao from Grd (feet)	Depth to Zow from Grd (feet)
13:08	pretest	27.07	27.89	**0.82**	**27.17**	*Clock time in hrs-minutes-m/d/yr format if user wants spreadsheet to compute elapsed time from these clock times. ** Water table = "corrected" water table.	22.97	22.87	23.69

Measurements After Bailing

13:11:30	0.01	27.818	27.89	0.07	27.83	First measurement assumed to be static. The first depth-to-fluids measurement after bailer is raised above air-oil interface.
13:12:00	1.00	27.49	27.79	0.30	27.53	
13:14:00	3.00	27.31	27.9	0.59	27.38	
13:16:00	5.00	27.25	27.51	0.26	27.28	
13:21:00	10.00	27.18	27.52	0.34	27.22	
13:31:00	20.00	27.15	27.54	0.39	27.20	
13:41:00	30.00	27.14	27.51	0.37	27.18	
13:51:00	40.00	27.12	27.51	0.39	27.17	
14:11:00	60.00	27.1	27.5	0.40	27.15	
14:38:00	87.00	27.09	27.49	0.40	27.14	

27.69	Calculated DT Wtr Table at time zero for a single bail.
0.07	Calculated initial oil thickness at t-zero.
0	Early change in oil thickness -- negative due to rising WT

Sceen ID assumed is:	4.00 inches	(read from Basic Input Data)
0.087	ft^3/ft	
0.653	gal/ft	
2.471	Liter/ft	
0.405	ft/Liter	vertical fluid level change with removal of 1 liter
1848.22	ml	Volume of oil = 1/7th of total volume removed
1.848		Volume LANPL in Liters
6.71		Volume groundwater in liters
0.748	ft	Change in fluid level at time zero

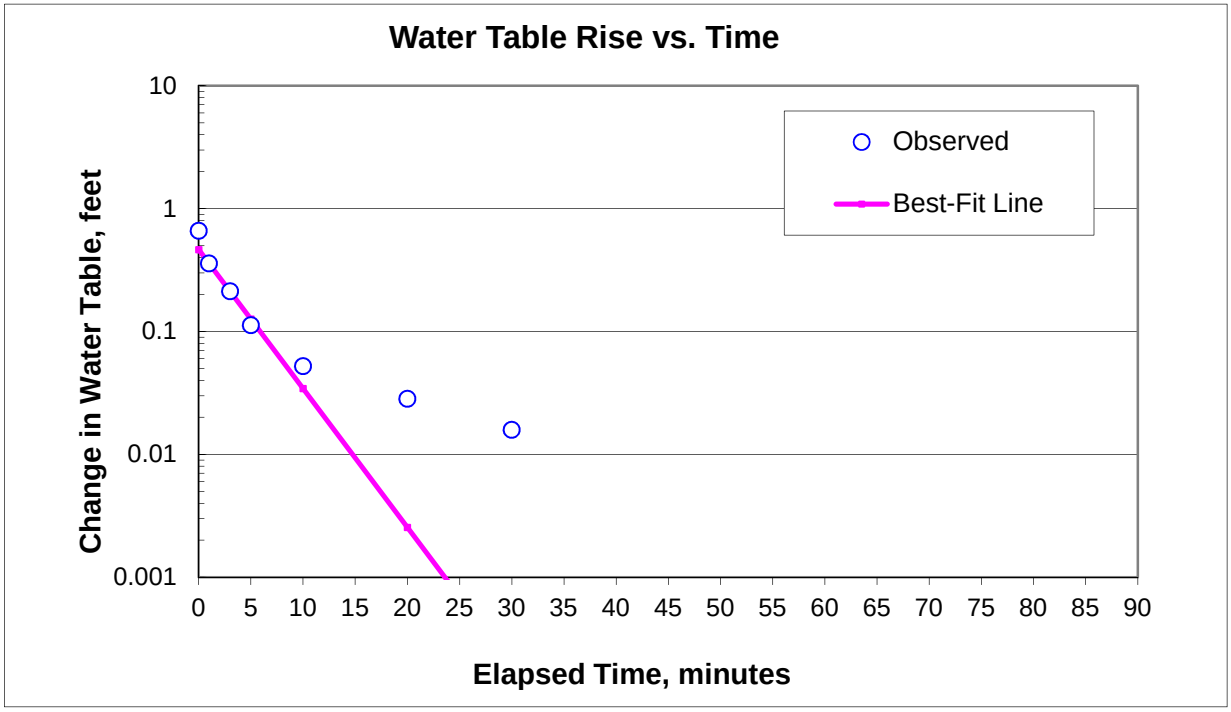
Change assumes instantaneous removal

Semi-Log Plots of Fluid Level Changes with Time and Calculated Slopes of Best-fit Lines and Y-Axis Intercepts

Well Name: MW-25 Test 2
Site: 1400 N. Royal St., Alexandria, VA

Elapsed Time (minutes)	Change in Free Oil Thickness (feet)	Change in Corrected Wtr Table (feet)	Log_{10} of Change in Oil Thick.	Log_{10} of Change in Wtr. Table	Calculated Data For Best-Fit Straight Line	
					Delta Oil	Delta Water
0.010	0.75	0.658	-0.126	-0.182	0.480	4.63E-01
1.000	0.52	0.357	-0.284	-0.447	0.479	3.57E-01
3.000	0.23	0.212	-0.638	-0.673	0.476	2.12E-01
5.000	0.56	0.113	-0.252	-0.949	0.473	1.26E-01
10.000	0.48	0.052	-0.319	-1.282	0.467	3.43E-02
20.000	0.43	0.028	-0.367	-1.549	0.453	2.54E-03
30.000	0.45	0.016	-0.347	-1.801	0.441	1.88E-04
40.000	0.43	-0.002	-0.367	#NUM!	0.428	1.39E-05
60.000	0.42	-0.021	-0.377	#NUM!	0.405	7.60E-08
87.000	0.42	-0.031	-0.377	#NUM!	0.375	6.72E-11

Well ID: MW-25 Test 2



Linear Regression Best Fit for Water Table Rise

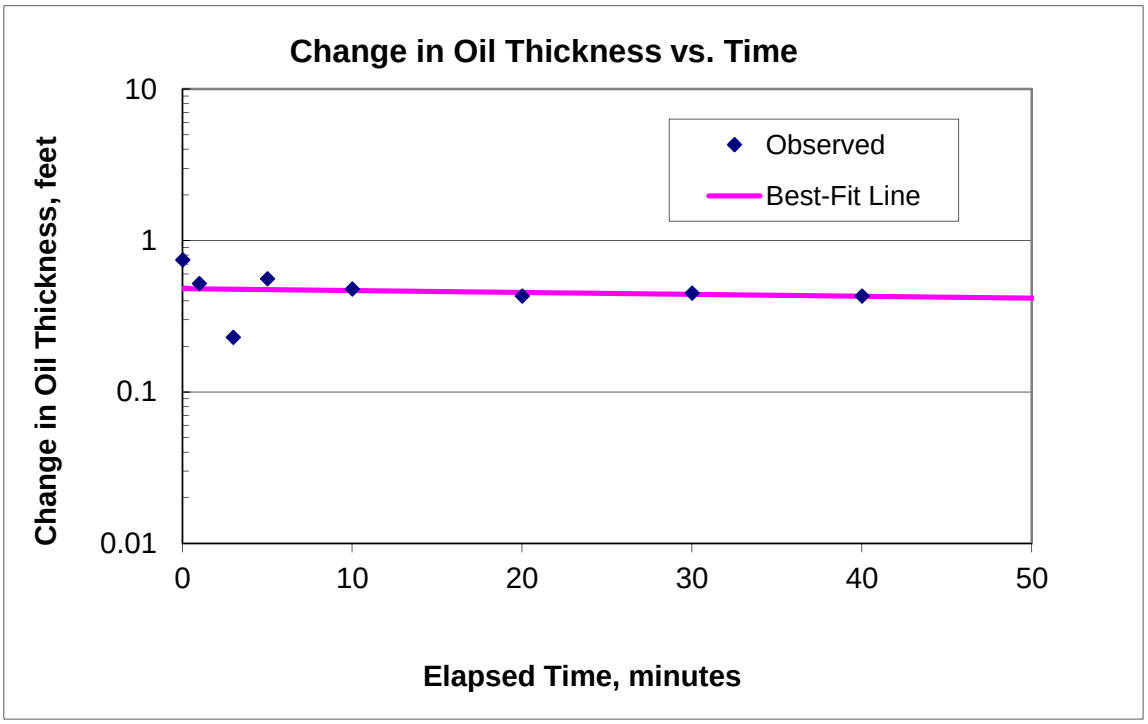
Select cell ranges for the log(water table change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-0.1131
Y-intercept of best-fit line:	0.4637
Elpased time to reach 90% of y-intercept:	8.8 minutes

Data for Plotting Best-Fit Straight Line for Water Table Recovery

	Time, min	Displacement, ft
Yo	0	0.464
Ymin	0.0	4.63E-01

Well ID: **MW-25 Test 2**



Linear Regression Best Fit for Oil Thickness Changes

Select cell ranges for the log(oil thickness change) and elapsed times using the slope and y-intercept functions below:

Slope of best-fit line:	-1.2E-03
Y-intercept of best-fit line:	4.80E-01
Elpased time to reach 90% of y-intercept:	809.2 minutes

Data for Plotting Best-Fit Straight Line for Oil Thickness Recovery

	Time, min	Displacement, ft
Yo	0	0.480
Ymin	0.0	4.80E-01

Bouwer and Rice Solution Adapted to Estimating the Oil Conductivity

Well Name: W-25 Test **Site: 1400 N. Royal St., Alexandria, VA**

Modified after Lundy and Zimmerman (1966) by including effect of filter pack resaturation.
Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.0	inches	0.42	feet
Initial thickness of oil in well screen:	0.82	feet		
Fluid Dynamic Viscosity, centipoise:	5.138	cp		
Estimate of the y-intercept value (only used when a single bail of oil is removed)				
Free Oil Volume Bailed:	0.4883	gallons	0.07	cubic feet
Initial equiv. thickness change in well:	0.75	feet		
Filter pack specific yield for oil:	0.132			
Max. potential drainable oil volume:	0.257	gallons	0.03	cubic feet
Percent of Oil Slug Vol. Drained	52.55	percent		
Lower Bound Y-o Estimate	0.58	feet		
Estimate of oil conductivity averaged over the initial thickness of free oil zone.				
Screen length to csg + filter pack radius:	1.97			
Bouwer and Rice model parameter A:	1.588			
Bouwer and Rice model parameter B:	0.232			
Bouwer and Rice model parameter C:	0.491			
Effective well radius with filter pack effect:	2.60	inches	0.22	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius:	0.53			
Time for recovery to 90% of y-intercept value:	809.2	minutes		
Oil Conductivity averaged over free oil zone:	**6.27E-02**	**ft/day**	**2.21E-05**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Bouwer and Rice Solution to Estimating the Hydraulic Conductivity

Well Name: **MW-25 Te** **Site:** **1400 N. Royal St., Alexandria, VA**

Based on the rate of water table recovery after bailing a well with free oil and groundwater.
Method includes the effect of filter pack resaturation.
Assumes time spent bailing is small relative to time spent recovering.

Well Characteristics (calculations based on basic input data)				
Radius of well casing/screen ID:	2.0	inches	0.17	feet
Radius of well casing/screen OD:	2.1	inches	0.18	feet
Radius of casing and filter pack:	5.0	inches	0.42	feet
Initial thickness of water column in well screen:	7.1	feet		
Aquifer thickness (for partial pentration):	35	feet		
Fluid Dynamic Viscosity, centipoise:	5.14	cp	Oil Specific Gravity =	0.880
Estimate of the y-intercept value (only used when a single bail of oil is removed)				
Equivalent volume of groundwater bailed:	2.20	gallons	0.29	ft^3 equivalent to LNAPL + water
Initial equiv. thickness change in well:	3.38	feet	0.06	ft^3 equivalent water as LNAPL
Filter pack specific yield for water, EARLY TIME:	0.000		Filter pack specific yield--LATE TIME:	0.03
Max. potential drainable water volume:	0.00E+00	gallons	0.00E+00	ft^3
Percent of Initial Slug Vol. Drained	0.00	percent		
Lower Bound Y-o Estimate	0.51	feet		

Estimate of hydraulic conductivity averaged over the initial thickness of free oil zone and underlying groundwater zone.

Screen length to csg + filter pack radius:	17.06			
Bouwer and Rice model parameter A:	1.971			
Bouwer and Rice model parameter B:	0.285			
Bouwer and Rice model parameter C:	1.639			
Effective well radius with filter pack effect:	2.00	inches	0.17	feet
Natural log of ratio of effective radius over which head loss occurs to the csg + filter pack radius (partial penetration):	1.74			
Time for recovery to 90% of y-intercept value:	8.8	minutes		
Water Conductivity averaged over groundwater zone:	**1.28E+00**	**ft/day**	**4.50E-04**	**cm/sec**

Bouwer and Rice Parameter Look-up Table

L/rw	A	B	C
2000	9.5	3.2	12.9
1000	9.1	2.8	12.3
900	9	2.75	12.1
800	8.8	2.65	11.75
700	8.7	2.5	11.5
600	8.4	2.4	11.1
500	8.1	2.2	10.6
400	7.55	1.9	9.8
300	7	1.5	8.7
200	6	1.15	6.8
150	5.3	0.95	5.6
100	4.4	0.75	4.1
70	3.5	0.6	3.2
50	3	0.5	2.6
30	2.4	0.4	2
20	2	0.3	1.8
10	1.9	0.25	1.25
1	1.55	0.23	0.4

Parametric Equation Approach to Estimating the Fluid Saturations and Conductivities in the Filter Pack

Well ID : MW-25 Test 2

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)

Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.87961	(dimensionless)
Dynamic viscosity of free oil:	5.13771	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	

Soil Properties of Filter Pack Sand

Hydraulic conductivity:	800	ft/day	2.82E-01 cm/sec
Effective Porosity:	0.3	(dimensionless)	
Irreducible water saturation:	1.00E-01	(dimensionless)	
van Genuchten alpha:	8.000	1/feet	
van Genuchten n:	3.00	(dimensionless)	
van Genuchten m:	0.67	(dimensionless)	

Free Oil Thickness in Well: 0.82 feet

Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.041	feet

Calculated Results

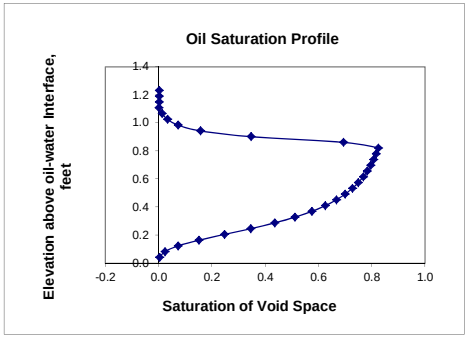
Geometric mean Oil Conductivity (above-below oil table)	5.95E-01 ft/day	7.55E+01 ft/day	
Oil Transmissivity of oil layer (above-below oil table):	6.40E+01 ft2/day		
Geometric mean oil saturation within free oil layer:	1.10E-01		
Geometric mean water sat'n within free oil layer:	2.84E-01		
Specific Volume of Oil (above-below oil table):	1.47E-01 ft		
Specific Volume of Water (above & below oil table):	1.34E-01 ft		
Estimate of oil storativity:	1.64E-02		
LNAPL Volume in filter pack + well at time zero	9.85E-02 ft^3	7.37E-01 gallons	2.79E+00 liters
Volume in filter pack at time zero	2.69E-02 ft^3	2.01E-01 gallons	7.62E-01 liters
Volume in well at time zero	7.16E-02 ft^3	5.35E-01 gallons	2.03E+00 liters

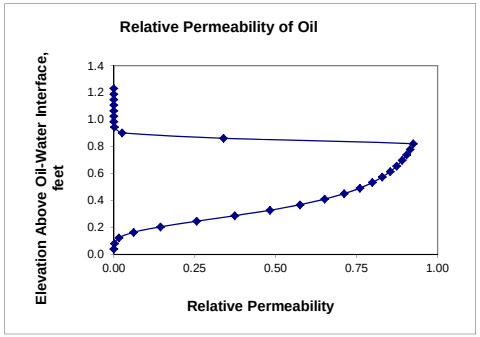
Table of Calculations:

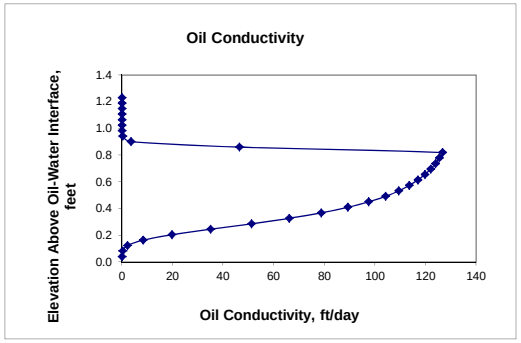
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.23	0.361	0.148	0.121	0.134	1.00E-03	4.86E-06	1.60E-09	3.88E-03	2.20E-07	9.00E-09	1.65E-03	1.23E-05	1.95E-01	2.48E-05	3.33E-02	9.95E-01	9.95E-01	-0.872	-6.658	-3.000
29	1.19	0.325	0.143	0.126	0.137	1.00E-03	6.15E-06	1.71E-09	4.92E-03	2.35E-07	9.63E-09	1.68E-03	1.23E-05	2.02E-01	3.04E-05	3.33E-02	9.94E-01	9.94E-01	-0.864	-6.629	-3.000
28	1.15	0.289	0.138	0.133	0.139	1.00E-03	7.84E-06	1.84E-09	6.27E-03	2.52E-07	1.03E-08	1.71E-03	1.23E-05	2.09E-01	3.75E-05	3.33E-02	9.94E-01	9.94E-01	-0.856	-6.599	-3.000
27	1.11	0.252	0.133	0.142	0.142	4.64E-05	1.01E-05	9.07E-13	8.08E-03	1.24E-10	5.09E-12	1.75E-03	5.71E-07	2.17E-01	4.65E-05	7.18E-03	9.93E-01	9.93E-01	-0.847	-9.906	-4.333
26	1.07	0.216	0.128	0.158	0.146	1.18E-02	1.31E-05	1.15E-06	1.05E-02	1.57E-04	6.45E-06	1.79E-03	1.46E-04	2.25E-01	5.82E-05	1.15E-01	9.92E-01	9.89E-01	-0.837	-3.803	-1.926
25	1.03	0.180	0.123	0.182	0.149	3.28E-02	1.72E-05	1.87E-05	1.38E-02	2.56E-03	1.05E-04	1.84E-03	4.04E-04	2.34E-01	7.35E-05	1.91E-01	9.91E-01	9.82E-01	-0.826	-2.591	-1.484
24	0.98	0.144	0.118	0.226	0.153	7.27E-02	2.28E-05	1.87E-04	1.83E-02	2.56E-02	1.05E-03	1.89E-03	8.94E-04	2.44E-01	9.37E-05	2.84E-01	9.90E-01	9.65E-01	-0.814	-1.592	-1.138
23	0.94	0.108	0.114	0.314	0.158	1.56E-01	3.06E-05	1.92E-03	2.45E-02	2.64E-01	1.08E-02	1.95E-03	1.92E-03	2.54E-01	1.21E-04	4.16E-01	9.89E-01	9.21E-01	-0.801	-0.579	-0.807
22	0.90	0.072	0.109	0.510	0.163	3.46E-01	4.16E-05	2.59E-02	3.33E-02	3.55E+00	1.46E-01	2.01E-03	4.26E-03	2.66E-01	1.57E-04	6.20E-01	9.87E-01	7.83E-01	-0.787	0.550	-0.461
21	0.86	0.036	0.104	0.863	0.170	6.93E-01	5.73E-05	3.39E-01	4.58E-02	4.64E+01	1.90E+00	2.08E-03	8.53E-03	2.78E-01	2.06E-04	8.78E-01	9.86E-01	3.64E-01	-0.771	1.666	-0.159
20	0.82	0.0	0.099	1.0	0.176	0.824	8.01E-05	9.25E-01	6.41E-02	1.27E+02	5.20E+00	2.17E-03	1.01E-02	2.91E-01	2.75E-04	9.57E-01	9.83E-01	0.00E+00	-0.753	2.103	-0.084
19	0.78	0.0	0.094	1.0	0.184	0.816	1.14E-04	9.16E-01	9.10E-02	1.25E+02	5.14E+00	2.27E-03	1.00E-02	3.06E-01	3.71E-04	9.52E-01	9.81E-01	0.00E+00	-0.734	2.098	-0.089
18	0.74	0.0	0.089	1.0	0.194	0.806	1.64E-04	9.04E-01	1.32E-01	1.24E+02	5.08E+00	2.38E-03	9.92E-03	3.23E-01	5.09E-04	9.46E-01	9.77E-01	0.00E+00	-0.713	2.093	-0.094
17	0.70	0.0	0.084	1.0	0.205	0.795	2.42E-04	8.91E-01	1.94E-01	1.22E+02	5.00E+00	2.52E-03	9.78E-03	3.41E-01	7.10E-04	9.40E-01	9.73E-01	0.00E+00	-0.689	2.086	-0.099
16	0.66	0.0	0.079	1.0	0.218	0.782	3.65E-04	8.74E-01	2.92E-01	1.20E+02	4.91E+00	2.68E-03	9.62E-03	3.62E-01	1.01E-03	9.32E-01	9.68E-01	0.00E+00	-0.662	2.078	-0.107
15	0.62	0.0	0.074	1.0	0.233	0.767	5.61E-04	8.54E-01	4.49E-01	1.17E+02	4.80E+00	2.87E-03	9.43E-03	3.84E-01	1.46E-03	9.23E-01	9.62E-01	0.00E+00	-0.633	2.068	-0.115
14	0.57	0.0	0.069	1.0	0.251	0.749	8.86E-04	8.29E-01	7.09E-01	1.14E+02	4.66E+00	3.09E-03	9.21E-03	4.10E-01	2.16E-03	9.12E-01	9.54E-01	0.00E+00	-0.600	2.055	-0.126
13	0.53	0.0	0.064	1.0	0.273	0.727	1.44E-03	7.99E-01	1.15E+00	1.09E+02	4.48E+00	3.36E-03	8.94E-03	4.39E-01	3.28E-03	8.98E-01	9.43E-01	0.00E+00	-0.563	2.039	-0.139
12	0.49	0.0	0.059	1.0	0.301	0.699	2.41E-03	7.60E-01	1.93E+00	1.04E+02	4.27E+00	3.70E-03	8.60E-03	4.72E-01	5.10E-03	8.82E-01	9.29E-01	0.00E+00	-0.522	2.018	-0.155
11	0.45	0.0	0.054	1.0	0.334	0.666	4.16E-03	7.12E-01	3.33E+00	9.75E+01	4.00E+00	4.11E-03	8.19E-03	5.10E-01	8.16E-03	8.60E-01	9.10E-01	0.00E+00	-0.477	1.989	-0.176
10	0.41	0.0	0.049	1.0	0.375	0.625	7.44E-03	6.51E-01	5.95E+00	8.92E+01	3.66E+00	4.61E-03	7.69E-03	5.53E-01	1.35E-02	8.33E-01	8.84E-01	0.00E+00	-0.426	1.950	-0.204
9	0.37	0.0	0.044	1.0	0.426	0.574	1.37E-02	5.75E-01	1.10E+01	7.88E+01	3.23E+00	5.24E-03	7.06E-03	6.02E-01	2.28E-02	7.99E-01	8.49E-01	0.00E+00	-0.371	1.897	-0.241
8	0.33	0.0	0.039	1.0	0.489	0.511	2.62E-02	4.83E-01	2.10E+01	6.61E+01	2.71E+00	6.01E-03	6.29E-03	6.57E-01	3.99E-02	7.54E-01	8.00E-01	0.00E+00	-0.311	1.820	-0.291
7	0.29	0.0	0.035	1.0	0.565	0.435	5.11E-02	3.74E-01	4.09E+01	5.12E+01	2.10E+00	6.96E-03	5.34E-03	7.19E-01	7.11E-02	6.95E-01	7.33E-01	0.00E+00	-0.248	1.709	-0.362
6	0.25	0.0	0.030	1.0	0.655	0.345	1.00E-01	2.56E-01	8.02E+01	3.50E+01	1.44E+00	8.06E-03	4.24E-03	7.85E-01	1.28E-01	6.19E-01	6.43E-01	0.00E+00	-0.184	1.544	-0.463
5	0.21	0.0	0.025	1.0	0.754	0.246	1.92E-01	1.44E-01	1.54E+02	1.98E+01	8.11E-01	9.27E-03	3.03E-03	8.52E-01	2.25E-01	5.23E-01	5.26E-01	0.00E+00	-0.123	1.296	-0.609
4	0.16	0.0	0.020	1.0	0.850	0.150	3.44E-01	6.08E-02	2.76E+02	8.33E+00	3.41E-01	1.05E-02	1.85E-03	9.13E-01	3.77E-01	4.09E-01	3.86E-01	0.00E+00	-0.071	0.920	-0.823
3	0.12	0.0	0.015	1.0	0.928	0.072	5.55E-01	1.62E-02	4.44E+02	2.22E+00	9.11E-02	1.14E-02	8.84E-04	9.59E-01	5.78E-01	2.83E-01	2.40E-01	0.00E+00	-0.032	0.347	-1.144
2	0.08	0.0	0.010	1.0	0.977	0.023	7.77E-01	2.03E-03	6.22E+02	2.78E-01	1.14E-02	1.20E-02	2.81E-04	9.87E-01	7.87E-01	1.59E-01	1.13E-01	0.00E+00	-0.010	-0.556	-1.641
1	0.04	0.0	0.005	1.0	0.997	0.003	9.42E-01	4.76E-05	7.53E+02	6.51E-03	2.67E-04	1.23E-02	3.62E-05	9.98E-01	9.43E-01	5.72E-02	2.88E-02	0.00E+00	-0.001	-2.186	-2.531

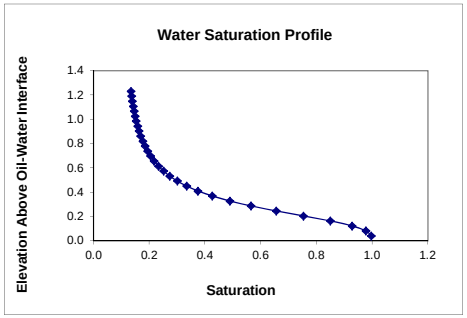
Fluid Saturation and LNAPL Mobility Parameter Plots

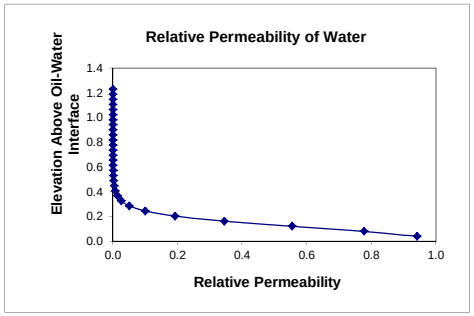
Well ID: IW-25 Test 2

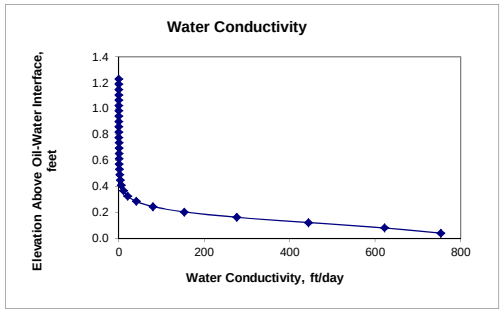












Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-25 Test 2

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the Carsel and Parrish (1988) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

Fluid Properties

Specific gravity of oil:	0.880	(dimensionless)
Dynamic viscosity of free oil:	5.138	centipoise
Air-water surface tension:	74.1	dynes/cm
Air-oil surface tension:	32.6	dynes/cm
Oil-water interfacial tension:	17.2	dynes/cm
BETA-AO	2.273	
BETA-OW	4.31	
Free Oil Thickness in Well:	0.82	feet
Elevation at Oil-Wtr Interface:	0	feet
Elevation increment for calculations:	0.041	feet

Soil Properties of Formation

Hydraulic conductivity:	4.55E+00	ft/day	1.61E-03 cm/sec
Effective Porosity:	0.35	(dimensionless)	
Irreducible water saturation:	2.24E-01	(dimensionless)	
van Genuchten alpha:	2.502	1/feet	
van Genuchten n:	2.08	(dimensionless)	
van Genuchten m:	0.52	(dimensionless)	

Calculated Results

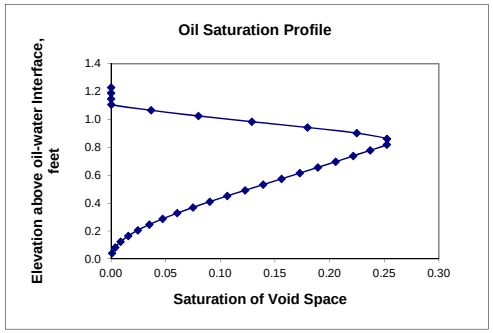
Geometric mean Oil Conductivity (above-below o	1.63E-03	ft/day	**6.29E-02 ft/day =**
Oil Transmissivity of oil layer (above-below oil tat	7.74E-02	ft2/day	**Arithmetic mean K_o**
Geometric mean oil saturation within free oil layer	2.96E-02		
Geometric mean water sat'n within free oil layer:	8.10E-01		
Specific Volume of Oil (above-below oil table):	4.40E-02	ft	1.34E+00 cm
Specific Volume of Water (above & below oil tabl	3.53E-01	ft	1.08E+01 cm
Estimate of oil storativity:	5.18E-03		
Bouwer-Rice Oil Conductivity (below oil table):	6.27E-02	ft/day	2.21E-05 cm/sec

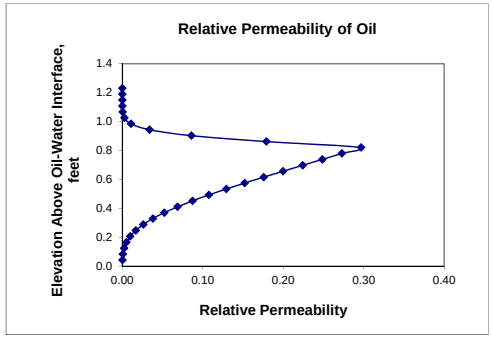
Table of Calculations:

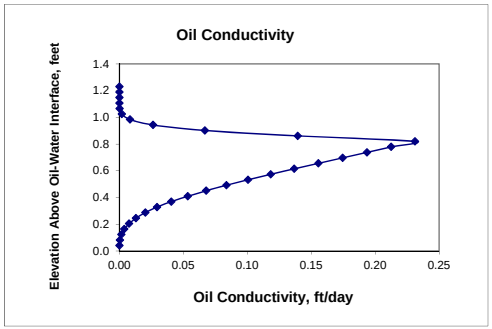
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.23	0.361	0.148	0.547	0.621	1.00E-04	1.68E-02	7.41E-11	7.66E-02	5.77E-11	2.37E-12	8.92E-03	1.44E-06	7.16E-01	2.35E-02	1.14E-02	8.47E-01	8.47E-01	-0.207	-10.239	-4.000
29	1.19	0.325	0.143	0.577	0.632	1.00E-04	1.90E-02	7.93E-11	8.66E-02	6.18E-11	2.53E-12	9.07E-03	1.44E-06	7.25E-01	2.62E-02	1.14E-02	8.38E-01	8.38E-01	-0.199	-10.209	-4.000
28	1.15	0.289	0.138	0.613	0.643	1.00E-04	2.16E-02	8.51E-11	9.81E-02	6.63E-11	2.72E-12	9.23E-03	1.44E-06	7.35E-01	2.94E-02	1.14E-02	8.29E-01	8.29E-01	-0.192	-10.179	-4.000
27	1.11	0.252	0.133	0.655	0.654	1.74E-04	2.45E-02	3.65E-10	1.11E-01	2.84E-10	1.17E-11	9.39E-03	2.50E-06	7.45E-01	3.29E-02	1.50E-02	8.19E-01	8.18E-01	-0.184	-9.546	-3.760
26	1.07	0.216	0.128	0.703	0.666	3.67E-02	2.79E-02	2.87E-04	1.27E-01	2.23E-04	9.15E-06	9.56E-03	5.27E-04	7.55E-01	3.70E-02	2.18E-01	8.08E-01	7.71E-01	-0.176	-3.651	-1.435
25	1.03	0.180	0.123	0.759	0.679	7.99E-02	3.18E-02	2.50E-03	1.45E-01	1.95E-03	8.00E-05	9.74E-03	1.15E-03	7.65E-01	4.16E-02	3.21E-01	7.96E-01	7.08E-01	-0.168	-2.710	-1.097
24	0.98	0.144	0.118	0.820	0.691	1.29E-01	3.64E-02	1.07E-02	1.66E-01	8.37E-03	3.43E-04	9.92E-03	1.85E-03	7.76E-01	4.69E-02	4.08E-01	7.83E-01	6.21E-01	-0.160	-2.078	-0.890
23	0.94	0.108	0.114	0.884	0.705	1.80E-01	4.18E-02	3.37E-02	1.90E-01	2.63E-02	1.08E-03	1.01E-02	2.58E-03	7.87E-01	5.31E-02	4.81E-01	7.70E-01	5.05E-01	-0.152	-1.580	-0.745
22	0.90	0.072	0.109	0.943	0.719	2.25E-01	4.80E-02	8.58E-02	2.18E-01	6.68E-02	2.74E-03	1.03E-02	3.23E-03	7.98E-01	6.01E-02	5.38E-01	7.55E-01	3.56E-01	-0.144	-1.175	-0.648
21	0.86	0.036	0.104	0.985	0.733	2.53E-01	5.53E-02	1.79E-01	2.52E-01	1.39E-01	5.72E-03	1.05E-02	3.62E-03	8.10E-01	6.83E-02	5.71E-01	7.39E-01	1.79E-01	-0.135	-0.856	-0.598
20	0.82	0.0	0.099	1.0	0.748	0.252	6.38E-02	2.97E-01	2.90E-01	2.31E-01	9.48E-03	1.07E-02	3.62E-03	8.21E-01	7.77E-02	5.70E-01	7.21E-01	0.00E+00	-0.126	-0.636	-0.598
19	0.78	0.0	0.094	1.0	0.763	0.237	7.38E-02	2.73E-01	3.36E-01	2.13E-01	8.71E-03	1.09E-02	3.40E-03	8.33E-01	8.86E-02	5.53E-01	7.02E-01	0.00E+00	-0.118	-0.673	-0.625
18	0.74	0.0	0.089	1.0	0.778	0.222	8.55E-02	2.49E-01	3.89E-01	1.94E-01	7.94E-03	1.12E-02	3.18E-03	8.45E-01	1.01E-01	5.35E-01	6.82E-01	0.00E+00	-0.109	-0.713	-0.654
17	0.70	0.0	0.084	1.0	0.794	0.206	9.93E-02	2.24E-01	4.52E-01	1.75E-01	7.16E-03	1.14E-02	2.95E-03	8.57E-01	1.16E-01	5.15E-01	6.60E-01	0.00E+00	-0.100	-0.758	-0.687
16	0.66	0.0	0.079	1.0	0.811	0.189	1.15E-01	2.00E-01	5.25E-01	1.56E-01	6.38E-03	1.16E-02	2.72E-03	8.69E-01	1.33E-01	4.94E-01	6.36E-01	0.00E+00	-0.091	-0.808	-0.723
15	0.62	0.0	0.074	1.0	0.827	0.173	1.34E-01	1.76E-01	6.11E-01	1.37E-01	5.61E-03	1.19E-02	2.48E-03	8.82E-01	1.52E-01	4.72E-01	6.10E-01	0.00E+00	-0.082	-0.864	-0.763
14	0.57	0.0	0.069	1.0	0.844	0.156	1.56E-01	1.52E-01	7.11E-01	1.18E-01	4.85E-03	1.21E-02	2.24E-03	8.94E-01	1.75E-01	4.49E-01	5.82E-01	0.00E+00	-0.074	-0.927	-0.807
13	0.53	0.0	0.064	1.0	0.861	0.139	1.82E-01	1.29E-01	8.28E-01	1.01E-01	4.12E-03	1.24E-02	2.00E-03	9.06E-01	2.01E-01	4.24E-01	5.52E-01	0.00E+00	-0.065	-0.998	-0.856
12	0.49	0.0	0.059	1.0	0.877	0.123	2.12E-01	1.07E-01	9.63E-01	8.37E-02	3.43E-03	1.26E-02	1.76E-03	9.18E-01	2.31E-01	3.98E-01	5.20E-01	0.00E+00	-0.057	-1.078	-0.911
11	0.45	0.0	0.054	1.0	0.894	0.106	2.46E-01	8.71E-02	1.12E+00	6.79E-02	2.78E-03	1.28E-02	1.53E-03	9.29E-01	2.65E-01	3.70E-01	4.85E-01	0.00E+00	-0.049	-1.168	-0.974
10	0.41	0.0	0.049	1.0	0.910	0.090	2.86E-01	6.86E-02	1.30E+00	5.34E-02	2.19E-03	1.31E-02	1.30E-03	9.40E-01	3.04E-01	3.41E-01	4.48E-01	0.00E+00	-0.041	-1.272	-1.044
9	0.37	0.0	0.044	1.0	0.925	0.075	3.32E-01	5.21E-02	1.51E+00	4.06E-02	1.66E-03	1.33E-02	1.08E-03	9.50E-01	3.49E-01	3.11E-01	4.09E-01	0.00E+00	-0.034	-1.392	-1.125
8	0.33	0.0	0.039	1.0	0.939	0.061	3.84E-01	3.78E-02	1.75E+00	2.95E-02	1.21E-03	1.35E-02	8.69E-04	9.60E-01	4.00E-01	2.79E-01	3.68E-01	0.00E+00	-0.027	-1.531	-1.218
7	0.29	0.0	0.035	1.0	0.953	0.047	4.42E-01	2.60E-02	2.01E+00	2.03E-02	8.30E-04	1.37E-02	6.77E-04	9.69E-01	4.56E-01	2.47E-01	3.25E-01	0.00E+00	-0.021	-1.693	-1.326
6	0.25	0.0	0.030	1.0	0.965	0.035	5.07E-01	1.66E-02	2.31E+00	1.30E-02	5.31E-04	1.38E-02	5.04E-04	9.77E-01	5.19E-01	2.13E-01	2.80E-01	0.00E+00	-0.016	-1.887	-1.455
5	0.21	0.0	0.025	1.0	0.975	0.025	5.79E-01	9.67E-03	2.63E+00	7.53E-03	3.09E-04	1.40E-02	3.52E-04	9.84E-01	5.88E-01	1.78E-01	2.33E-01	0.00E+00	-0.011	-2.123	-1.610
4	0.16	0.0	0.020	1.0	0.984	0.016	6.57E-01	4.90E-03	2.99E+00	3.82E-03	1.57E-04	1.41E-02	2.26E-04	9.90E-01	6.63E-01	1.42E-01	1.86E-01	0.00E+00	-0.007	-2.418	-1.804
3	0.12	0.0	0.015	1.0	0.991	0.009	7.40E-01	2.01E-03	3.37E+00	1.56E-03	6.41E-05	1.42E-02	1.26E-04	9.94E-01	7.44E-01	1.06E-01	1.37E-01	0.00E+00	-0.004	-2.806	-2.057
2	0.08	0.0	0.010	1.0	0.996	0.004	8.27E-01	5.61E-04	3.76E+00	4.37E-04	1.79E-05	1.43E-02	5.48E-05	9.98E-01	8.29E-01	7.01E-02	8.94E-02	0.00E+00	-0.002	-3.360	-2.418
1	0.04	0.0	0.005	1.0	0.999	0.001	9.16E-01	6.22E-05	4.17E+00	4.84E-05	1.99E-06	1.43E-02	1.31E-05	9.99E-01	9.17E-01	3.43E-02	4.26E-02	0.00E+00	0.000	-4.315	-3.041

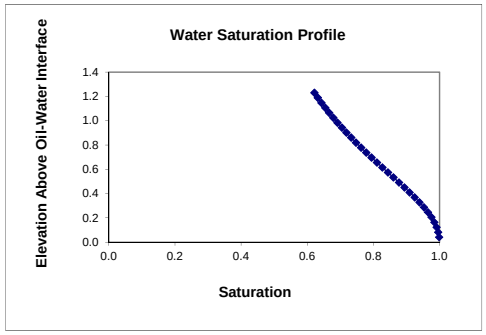
Fluid Saturation and LNAPL Mobility Parameter Plots

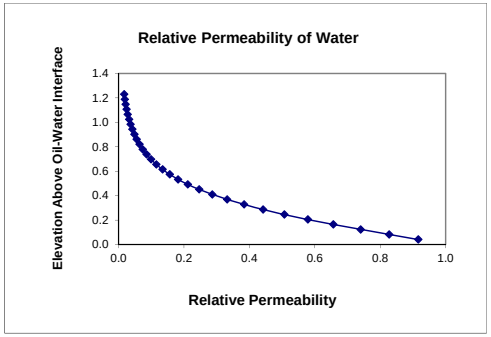
Well ID: *N*-25 Test 2

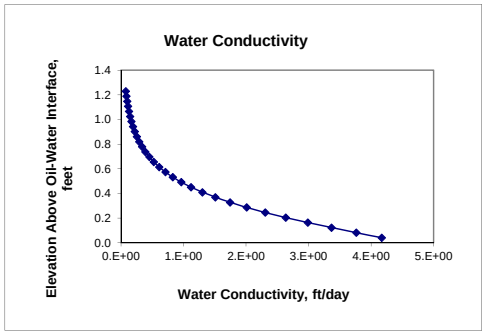












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the Carsel & Parrish Database

Physical Parameter Measured / Evaluated	MW-25 Test 2 1400 N. Royal St., Alexandria, VA				
	Slug-Test Solution		Parametric Solution[b]		
Starting Free Oil Thickness	0.82	ft	0.82	ft	
	25.0	cm	25.0	cm	
Hydraulic Conductivity	1.28E+00	ft/day	4.55E+00 [c]	ft/day	
	4.50E-04	cm/sec	1.61E-03	cm/sec	
Average Oil Conductivity	6.27E-02	ft/day	6.29E-02	ft/day	
	2.21E-05	cm/sec	2.22E-05	cm/sec	
Free Oil Transmissivity	5.14E-02	ft^2/day	7.74E-02	ft^2/day	0.05
	5.53E-04	cm^2/sec	8.32E-04	cm^2/sec	
Free Oil Specific Volume			4.40E-02	ft^3/ft^2	
			1.34E+00	cm^3/cm^2	
Inherent Mobility			1.76E+00	ft/day	
			6.20E-04	cm/sec	
Assumed Effective Porosity			0.35		
van Genuchten *alpha*			2.50	1/ft	
			0.082	1/cm	
van Genuchten *n*			2.08		
Irreducible Water Saturation			0.22		
Inferred Lithology			Sand		

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with Carsel and Parish (1988) database for USDA agricultural soils.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Parametric Equation Approach to Estimating Hydraulic Properties, Fluid Saturations, and Conductivities in the Formation

Well ID : MW-25 Test 2

Based on the papers by Parker, Lenhard, and Kuppusamy (1987) and Lenhard and Parker (1990)
Assumes the API (2006) database of matrix properties correlate with hydraulic conductivity using expressions in Lundy (2006).
Assumes static equilibrium between the free oil inside and outside a well screen.

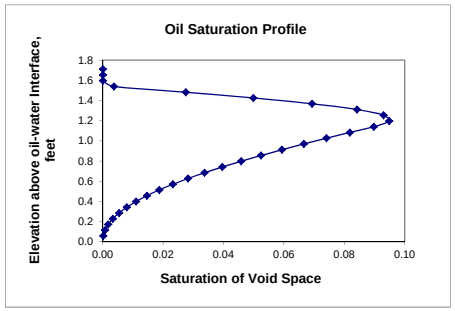
Fluid Properties			**Soil Properties of Formation**			
Specific gravity of oil:	0.880	(dimensionless)	Hydraulic conductivity:	4.49E+02	ft/day	1.58E-01 cm/sec
Dynamic viscosity of free oil:	5.138	centipoise	Effective Porosity:	0.35	(dimensionless)	
Air-water surface tension:	74.1	dynes/cm	Irreducible water saturation:	2.46E-01	(dimensionless)	
Air-oil surface tension:	32.6	dynes/cm				
Oil-water interfacial tension:	17.2	dynes/cm	van Genuchten alpha:	0.615	1/feet	
BETA-AO	2.273		van Genuchten n:	2.40	(dimensionless)	
BETA-OW	4.31		van Genuchten m:	0.58	(dimensionless)	
Free Oil Thickness in Well:	0.82	feet	**Calculated Results**			
Elevation at Oil-Wtr Interface:	0	feet	Geometric mean Oil Conductivity (above-below c	2.59E-03	ft/day	**6.35E-02 ft/day =**
Elevation increment for calculations:	0.041	feet	Oil Transmissivity of oil layer (above-below oil tal	7.82E-02	ft2/day	**Arithmetic mean K_o**
			Geometric mean oil saturation within free oil laye	2.01E-03		
			Geometric mean water sat'n within free oil layer:	9.86E-01		
			Specific Volume of Oil (above-below oil table):	2.93E-03	ft	8.93E-02 cm
			Specific Volume of Water (above & below oil tabl	4.25E-01	ft	1.29E+01 cm
			Estimate of oil storativity:	3.52E-04		
			Bouwer-Rice Oil Conductivity (below oil table):	6.27E-02	ft/day	2.21E-05 cm/sec

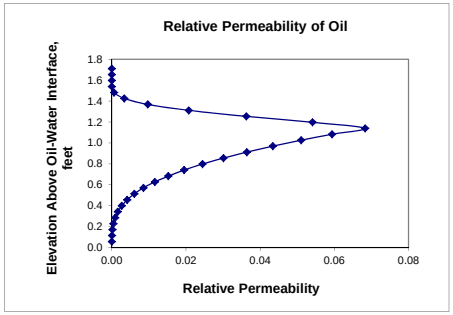
Table of Calculations:

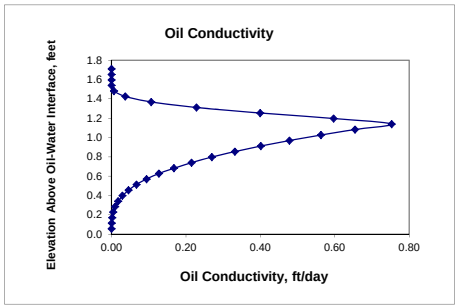
Bottom-up Order of Row Number	Elevation Above of Oil-Wtr Interface (feet)	Air-Oil Capillary Head (feet)	Oil-Water Capillary Head (feet)	Total Oil+Wtr Sat'n	Water Sat'n	Oil Sat'n	Water Relative Perm.	Oil Relative Perm.	Water K (ft/day)	Oil K (ft/day)	Increment Oil Trans. (ft2/day)	Increment Water Specific Volume (ft3/ft2)	Increment Oil Specific Volume (ft3/ft2)	k-Water 1st Term	k-Water 2cd Term	k-Oil 1st Term	k-Oil 2cd Term	k-Oil 3rd Term	Log of Water Sat'n	Log of Oil K	Log of Oil Sat'n.
30	1.23	0.361	0.148	0.926	0.957	1.00E-04	5.41E-01	1.32E-09	2.43E+02	1.01E-07	4.15E-09	1.37E-02	1.44E-06	9.71E-01	5.57E-01	1.15E-02	2.54E-01	2.54E-01	-0.019	-6.995	-4.000
29	1.19	0.325	0.143	0.941	0.960	1.00E-04	5.57E-01	1.41E-09	2.50E+02	1.08E-07	4.44E-09	1.38E-02	1.44E-06	9.73E-01	5.73E-01	1.15E-02	2.43E-01	2.43E-01	-0.018	-6.965	-4.000
28	1.15	0.289	0.138	0.954	0.963	1.00E-04	5.74E-01	1.51E-09	2.58E+02	1.16E-07	4.77E-09	1.38E-02	1.44E-06	9.75E-01	5.89E-01	1.15E-02	2.33E-01	2.32E-01	-0.016	-6.935	-4.000
27	1.11	0.252	0.133	0.966	0.966	4.23E-05	5.92E-01	1.89E-10	2.65E+02	1.45E-08	5.96E-10	1.39E-02	6.07E-07	9.77E-01	6.06E-01	7.49E-03	2.22E-01	2.22E-01	-0.015	-7.838	-4.374
26	1.07	0.216	0.128	0.976	0.969	7.30E-03	6.09E-01	8.93E-05	2.73E+02	6.86E-03	2.81E-04	1.39E-02	1.05E-04	9.79E-01	6.22E-01	9.84E-02	2.11E-01	1.81E-01	-0.014	-2.164	-2.137
25	1.03	0.180	0.123	0.984	0.972	1.29E-02	6.27E-01	4.52E-04	2.81E+02	3.47E-02	1.42E-03	1.39E-02	1.84E-04	9.81E-01	6.39E-01	1.31E-01	2.01E-01	1.42E-01	-0.013	-1.460	-1.891
24	0.98	0.144	0.118	0.991	0.974	1.67E-02	6.44E-01	1.09E-03	2.89E+02	8.36E-02	3.43E-03	1.40E-02	2.39E-04	9.83E-01	6.56E-01	1.49E-01	1.90E-01	1.05E-01	-0.011	-1.078	-1.778
23	0.94	0.108	0.114	0.995	0.976	1.88E-02	6.62E-01	1.89E-03	2.97E+02	1.45E-01	5.96E-03	1.40E-02	2.70E-04	9.84E-01	6.73E-01	1.58E-01	1.80E-01	7.04E-02	-0.010	-0.838	-1.725
22	0.90	0.072	0.109	0.998	0.979	1.94E-02	6.80E-01	2.69E-03	3.05E+02	2.07E-01	8.47E-03	1.40E-02	2.79E-04	9.86E-01	6.90E-01	1.61E-01	1.69E-01	4.00E-02	-0.009	-0.685	-1.711
21	0.86	0.036	0.104	1.000	0.981	1.87E-02	6.98E-01	3.27E-03	3.13E+02	2.51E-01	1.03E-02	1.41E-02	2.69E-04	9.87E-01	7.07E-01	1.58E-01	1.59E-01	1.52E-02	-0.008	-0.600	-1.728
20	0.82	0.0	0.099	1.0	0.983	0.017	7.16E-01	3.34E-03	3.21E+02	2.56E-01	1.05E-02	1.41E-02	2.44E-04	9.89E-01	7.24E-01	1.50E-01	1.49E-01	0.00E+00	-0.007	-0.591	-1.769
19	0.78	0.0	0.094	1.0	0.985	0.015	7.34E-01	2.74E-03	3.29E+02	2.10E-01	8.62E-03	1.41E-02	2.17E-04	9.90E-01	7.41E-01	1.41E-01	1.39E-01	0.00E+00	-0.007	-0.677	-1.821
18	0.74	0.0	0.089	1.0	0.987	0.013	7.51E-01	2.22E-03	3.37E+02	1.71E-01	6.99E-03	1.42E-02	1.91E-04	9.91E-01	7.58E-01	1.33E-01	1.29E-01	0.00E+00	-0.006	-0.768	-1.876
17	0.70	0.0	0.084	1.0	0.988	0.012	7.69E-01	1.78E-03	3.45E+02	1.36E-01	5.59E-03	1.42E-02	1.67E-04	9.92E-01	7.75E-01	1.24E-01	1.20E-01	0.00E+00	-0.005	-0.865	-1.934
16	0.66	0.0	0.079	1.0	0.990	0.010	7.87E-01	1.40E-03	3.53E+02	1.08E-01	4.41E-03	1.42E-02	1.45E-04	9.93E-01	7.92E-01	1.16E-01	1.10E-01	0.00E+00	-0.004	-0.968	-1.996
15	0.62	0.0	0.074	1.0	0.991	0.009	8.04E-01	1.09E-03	3.61E+02	8.36E-02	3.43E-03	1.42E-02	1.24E-04	9.94E-01	8.09E-01	1.07E-01	1.01E-01	0.00E+00	-0.004	-1.078	-2.063
14	0.57	0.0	0.069	1.0	0.993	0.007	8.21E-01	8.29E-04	3.68E+02	6.37E-02	2.61E-03	1.42E-02	1.06E-04	9.95E-01	8.25E-01	9.87E-02	9.16E-02	0.00E+00	-0.003	-1.196	-2.134
13	0.53	0.0	0.064	1.0	0.994	0.006	8.38E-01	6.19E-04	3.76E+02	4.75E-02	1.95E-03	1.43E-02	8.85E-05	9.96E-01	8.41E-01	9.04E-02	8.27E-02	0.00E+00	-0.003	-1.323	-2.210
12	0.49	0.0	0.059	1.0	0.995	0.005	8.54E-01	4.51E-04	3.83E+02	3.46E-02	1.42E-03	1.43E-02	7.32E-05	9.97E-01	8.57E-01	8.22E-02	7.41E-02	0.00E+00	-0.002	-1.460	-2.292
11	0.45	0.0	0.054	1.0	0.996	0.004	8.71E-01	3.19E-04	3.91E+02	2.45E-02	1.01E-03	1.43E-02	5.95E-05	9.97E-01	8.73E-01	7.41E-02	6.56E-02	0.00E+00	-0.002	-1.610	-2.382
10	0.41	0.0	0.049	1.0	0.997	0.003	8.86E-01	2.19E-04	3.98E+02	1.68E-02	6.89E-04	1.43E-02	4.74E-05	9.98E-01	8.88E-01	6.62E-02	5.75E-02	0.00E+00	-0.001	-1.775	-2.481
9	0.37	0.0	0.044	1.0	0.997	0.003	9.02E-01	1.44E-04	4.05E+02	1.10E-02	4.53E-04	1.43E-02	3.68E-05	9.98E-01	9.03E-01	5.83E-02	4.97E-02	0.00E+00	-0.001	-1.957	-2.591
8	0.33	0.0	0.039	1.0	0.998	0.002	9.16E-01	9.00E-05	4.11E+02	6.91E-03	2.83E-04	1.43E-02	2.78E-05	9.99E-01	9.18E-01	5.07E-02	4.21E-02	0.00E+00	-0.001	-2.160	-2.713
7	0.29	0.0	0.035	1.0	0.999	0.001	9.30E-01	5.28E-05	4.17E+02	4.06E-03	1.66E-04	1.43E-02	2.02E-05	9.99E-01	9.31E-01	4.32E-02	3.50E-02	0.00E+00	-0.001	-2.392	-2.852
6	0.25	0.0	0.030	1.0	0.999	0.001	9.44E-01	2.85E-05	4.23E+02	2.19E-03	8.99E-05	1.43E-02	1.40E-05	9.99E-01	9.44E-01	3.59E-02	2.82E-02	0.00E+00	0.000	-2.659	-3.012
5	0.21	0.0	0.025	1.0	0.999	0.001	9.56E-01	1.38E-05	4.29E+02	1.06E-03	4.34E-05	1.43E-02	9.01E-06	1.00E+00	9.57E-01	2.89E-02	2.18E-02	0.00E+00	0.000	-2.976	-3.202
4	0.16	0.0	0.020	1.0	1.000	0.000	9.68E-01	5.64E-06	4.34E+02	4.33E-04	1.78E-05	1.43E-02	5.28E-06	1.00E+00	9.68E-01	2.21E-02	1.60E-02	0.00E+00	0.000	-3.363	-3.435
3	0.12	0.0	0.015	1.0	1.000	0.000	9.79E-01	1.78E-06	4.39E+02	1.37E-04	5.62E-06	1.43E-02	2.65E-06	1.00E+00	9.79E-01	1.56E-02	1.07E-02	0.00E+00	0.000	-3.863	-3.734
2	0.08	0.0	0.010	1.0	1.000	0.000	9.88E-01	3.52E-07	4.43E+02	2.71E-05	1.11E-06	1.43E-02	9.99E-07	1.00E+00	9.88E-01	9.61E-03	6.05E-03	0.00E+00	0.000	-4.568	-4.157
1	0.04	0.0	0.005	1.0	1.000	0.000	9.95E-01	2.20E-08	4.47E+02	1.69E-06	6.92E-08	1.43E-02	1.89E-07	1.00E+00	9.95E-01	4.18E-03	2.29E-03	0.00E+00	0.000	-5.773	-4.880

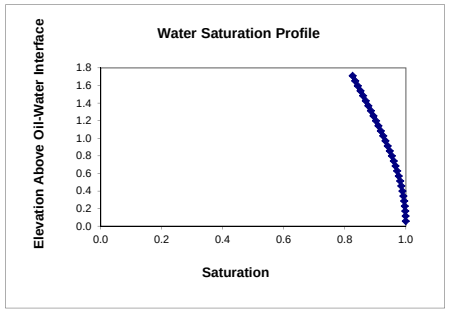
Fluid Saturation and LNAPL Mobility Parameter Plots

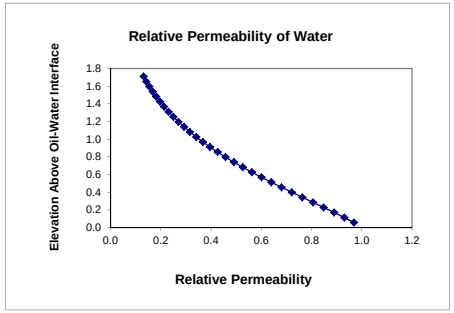
Well ID: *N*-25 Test 2

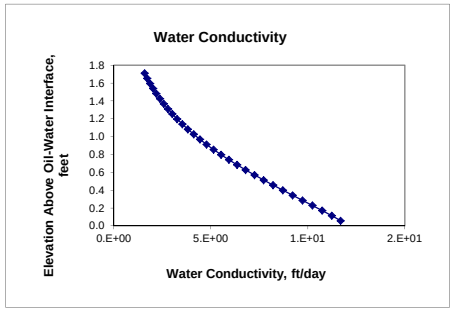












Summary of Hydraulic Properties from Baildown Test[a]
Using the Lundy-Zimmerman method and the API (2006) Database[b]

Physical Parameter Measured / Evaluated	MW-25 Test 2 1400 N. Royal St., Alexandria, VA			
	Slug-Test Solution		Parametric Solution[b]	
Starting Free Oil Thickness	0.82	ft	0.82	ft
	25.0	cm	25.0	cm
Hydraulic Conductivity	1.28E+00	ft/day	4.49E+02 [c]	ft/day
	4.50E-04	cm/sec	1.58E-01	cm/sec
Average Oil Conductivity	6.27E-02	ft/day	6.35E-02	ft/day
	2.21E-05	cm/sec	2.24E-05	cm/sec
Free Oil Transmissivity	5.14E-02	ft^2/day	7.82E-02	ft^2/day
	5.53E-04	cm^2/sec	8.40E-04	cm^2/sec
Free Oil Specific Volume			2.93E-03	ft^3/ft^2
			6.58E-01	cm^3/cm^2
Inherent Mobility			2.67E+01	ft/day
			9.41E-03	cm/sec
Assumed Effective Porosity			0.35	
van Genuchten *alpha*			0.61	1/ft
			0.020	1/cm
van Genuchten *n*			2.40	
Irreducible Water Saturation			0.25	
Inferred Lithology			Sand	

[a] Analysis follows method described in Lundy and Zimmerman (1996), a modified Bouwer & Rice (1976) approach, combined with parametric solution of Kuppusamy, Lenhard and Parker (1987) and Lenhard and Parker (1990).
[b] Parametric solution results are consistent with API (2006) database for soils at a sampling of petroleum facilities.
[c] The optimum value for hydraulic conductivity was based on the arithmetic mean value of oil conductivity along the vertical oil saturation profile.

Summary of Slug Withdrawal and Parametric Solutions

Hydraulic/Capillary Parameters	Well MW-25 - Test 2			
	Carsel & Parrish Database	API Database		
LNAPL Conductivity (ft/day):	6.29E-02	6.35E-02		
LNAPL Transmissivity (ft^2/day):	7.74E-02	7.82E-02	0.08	0.08
Hydraulic Conductivity (ft/day):	4.55E+00	4.49E+02		
van Genuchten - *alpha* (1/ft):	2.50	0.61		
van Genuchten – *n* (dimensionless):	2.08	2.40		
Residual Water Saturation:	0.22	0.25		
Hydraulic Conductivity of the underlying groundwater zone (ft/day):	1.28E+00	1.28E+00		

APPENDIX G

PTS LNAPL Analytical Report

PTS Laboratories, Inc.

8100 Secura Way • Santa Fe Springs, CA 90670
Telephone (562) 347-2500 • Fax (562) 907-3610

October 29, 2014

Greg Reichart
Groundwater & Environmental Services, Inc.
1350 Blair Dr., Suite A
Odenton, MD 21113

Re: PTS File No: 44641
Physical Properties Data
Potomac River Generating Station; 0402859-01-814

Dear Mr. Reichart:

Please find enclosed report for Physical Properties analyses conducted upon samples received from your Potomac River Generating Station; 0402859-01-814 project. All analyses were performed by applicable ASTM, EPA, or API methodologies. An electronic version of the report has previously been sent to your attention via the internet. The samples are currently in storage and will be retained for thirty days past completion of testing at no charge. Please note that the samples will be disposed of at that time. You may contact me regarding storage, disposal, or return of the samples.

PTS Laboratories Inc. appreciates the opportunity to be of service. If you have any questions or require additional information, please contact Morgan Richards at (562) 347-2509.

Sincerely,
PTS Laboratories, Inc.

Michael Mark Brady, P.G.
Laboratory Director

Encl.

PTS Laboratories

Project Name: **Potomac River Generating Station** **PTS File No:** **44641**
Project Number: **0402859-01-814** **Client:** **Groundwater & Environmental Services, Inc.**

TEST PROGRAM - 20141007

FLUID ID	Date	Time	Fluid Type	Fluid Properties Pkg.	Fluid Cleaning			Comments
			Method:	ASTM D1481, 445, 971	Proprietary			
Date Received: 20141007								
MW-05	**20140919**	**1346**	**water/NAPL**	**X**	**X**			
MW-25	**20140919**	**1235**	**water/NAPL**	**X**	**X**			
TOTALS:	**18 jars**			**2**	**2**			

Laboratory Test Program Notes

Standard TAT for basic analysis is 10 business days.

Fluid Properties Package - LNAPL & Water: Includes dynamic viscosity and fluid density at three temperatures (70, 100, 130°F), surface tension for each fluid, and interfacial tensions (three phase pairs; oil/water, oil/air, and water/air (at ambient laboratory temperature)).

PTS Laboratories

PTS File No: 44641
Client: Groundwater & Environmental Services, Inc.
Report Date: 10/29/14

VISCOSITY, DENSITY, and SPECIFIC GRAVITY DATA

(METHODOLOGY: ASTM D445, ASTM D1481, API RP40)

Project Name: Potomac River Generating Station
Project No: 0402859-01-814

SAMPLE ID	MATRIX	TEMPERATURE, °F	SPECIFIC GRAVITY	DENSITY, g/cc	VISCOSITY	
					centistokes	centipoise
MW-05	Water	70	1.001	0.9990	1.03	1.03
		100	1.004	0.9967	0.707	0.705
		130	1.005	0.9910	0.524	0.519
MW-05	NAPL	70	0.8730	0.8713	4.49	3.91
		100	0.8689	0.8629	2.98	2.57
		130	0.8618	0.8497	2.13	1.81
MW-25	Water	70	1.001	0.9986	0.998	0.997
		100	1.003	0.9963	0.705	0.703
		130	1.005	0.9910	0.522	0.517
MW-25	NAPL	70	0.8755	0.8737	4.98	4.35
		100	0.8714	0.8653	3.24	2.80
		130	0.8643	0.8522	2.28	1.94

QUALITY CONTROL DATA

Date:	10/22/14	10/22/14	10/23/14	10/24/14	10/24/14
FLUID TYPE:	Cannon® CVS S3	DI Water	Cannon® CVS S3	Cannon® CVS S3	DI Water
TEMPERATURE, °F:	70	70	70	70	70
DENSITY, MEASURED:	0.8653	0.9981		0.8653	0.9981
DENSITY, PUBLISHED:	0.8649	0.9980		0.8649	0.9980
RPD:	0.05	0.01		0.05	0.01
VISCOSITY, MEASURED:	4.74	1.01	4.63	4.64	
VISCOSITY, PUBLISHED:	4.63	0.977	4.63	4.63	
RPD:	2.46	3.63	0.02	0.28	

CVS Lot #: 13401 CVS = Certified Viscosity Standard

PTS File No: 44641
Client: Groundwater & Environmental Services, Inc.
Report Date: 10/29/14

PTS Laboratories

INTERFACIAL / SURFACE TENSION DATA

(METHODOLOGY: DuNuoy Method - ASTM D971)

Project Name: Potomac River Generating Station
Project No: 0402859-01-814

PHASE PAIR		TEMPERATURE, °F	INTERFACIAL TENSION, Dynes/centimeter
SAMPLE ID / PHASE	SAMPLE ID / PHASE		
MW-05 / Water	Air	75	74.1
MW-05 / NAPL	Air	76	32.6
MW-05 / Water	MW-05 / NAPL	76	17.2
MW-25 / Water	Air	74	69.7
MW-25 / NAPL	Air	75	31.5
MW-25 / Water	MW-25 / NAPL	75	19.5

QUALITY CONTROL DATA

Date: 10/23/14
PHASE PAIR: DIWATER / AIR
TEMPERATURE, °F: 73
IFT, MEASURED: 73.2
IFT, PUBLISHED: 72.3
RPD: 1.24

PTS Laboratories, Inc.

CHAIN OF CUSTODY RECORD

COMPANY: Groundwater & Environmental Services, Inc. (GES)

ADDRESS: 1350 Blair Dr. Ste. A | CITY: Odenton | ZIP CODE: 21113

PROJECT MANAGER: Greg Reichart | email: greichart@gesonline.com

PROJECT NAME: Potomac River Generating Station | PHONE NUMBER:

PROJECT NUMBER: 0402859-01-814 | FAX NUMBER: 410-737-9171

SITE LOCATION: 1400 N. Royal St, Alexandria VA

SAMPLER SIGNATURE: [signature]

PO# WO#

TURNAROUND TIME: 24 HOURS ☐ 5 DAYS ☐ 72 HOURS ☐ NORMAL ☑

OTHER:

SAMPLE INTEGRITY (CHECK): INTACT X TEMP(F) 79

PTS QUOTE NO. Q14-162

PTS FILE: 44641

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	DEPTH, FT	NUMBER OF SAMPLES	SOIL PROPERTIES PACKAGE	HYDRAULIC CONDUCTIVITY PACKAGE	PORE FLUID SATURATIONS PACKAGE	TCEQ/TNRCC PROPERTIES PACKAGE	CAPILLARITY PACKAGE	FLUID PROPERTIES PACKAGE	PHOTOLOG: CORE PHOTOGRAPHY	VAPOR TRANSPORT PACKAGE	POROSITY: TOTAL, AIR FILLED, WATER FILLED	POROSITY: EFFECTIVE, ASTM D425M	SPECIFIC GRAVITY, ASTM D854	BULK DENSITY (DRY), API RP40 or ASTM D2937	AIR PERMEABILITY, API RP40	HYDRAULIC CONDUCTIVITY, EPA9100/API RP40 or D5084	GRAIN SIZE DISTRIBUTION, ASTM D422 or 4464M	TOC: WALKLEY-BLACK	ATTERBERG LIMITS, ASTM D4318	VAPOR INTRUSION PACKAGE	FREE PRODUCT MOBILITY PACKAGE			COMMENTS
✓ MW-05	9-19-14	13:46		9						X																ASTM D1481, D445, D971
✓ MW-25	9-19-14	12:35		9						X																ASTM D1481, D445, D971
																										Email results to:
																										MDLabs@gesonline.com

1. RELINQUISHED BY	2. RECEIVED BY	3. RELINQUISHED BY	4. RECEIVED BY
[signature]	[signature]		
COMPANY: GES	COMPANY: PTS LABS	COMPANY:	COMPANY:
DATE: 10-01-14 TIME: 1600	DATE: 10/7/14 TIME: 10:55	DATE: TIME:	DATE: TIME:

APPENDIX H

Laboratory Data – Seeps Summary

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

November 03, 2014

Project: NRG PRGS

Submittal Date: 10/22/2014
Group Number: 1512949
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
Seep B Grab Surface Water	7646758
Seep D Grab Surface Water	7646759
Trip Blank Water	7646760

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

Sample Description: Seep B Grab Surface Water
NRG - PRGS

LL Sample # WW 7646758
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:25 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPB

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**	**ug/l**	
10945	Benzene	71-43-2	4	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Acenaphthene	83-32-9	N.D.	0.02	1
10262	Acenaphthylene	208-96-8	N.D.	0.02	1
10262	Anthracene	120-12-7	0.07	0.02	1
10262	Benzo(a)anthracene	56-55-3	N.D.	0.02	1
10262	Benzo(a)pyrene	50-32-8	N.D.	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	N.D.	0.02	1
10262	Benzo(e)pyrene	192-97-2	N.D.	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	N.D.	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	N.D.	0.02	1
10262	Biphenyl	92-52-4	0.3	0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C1-Fluorenes	n.a.	N.D.	0.02	1
10262	C1-Naphthalenes	n.a.	0.09	0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C2-Fluorenes	n.a.	N.D.	0.02	1
10262	C2-Naphthalenes	n.a.	N.D.	0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C3-Fluorenes	n.a.	N.D.	0.02	1
10262	C3-Naphthalenes	n.a.	N.D.	0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.	0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.	0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.	0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.	0.02	1
10262	C4-Naphthalenes	n.a.	N.D.	0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.	0.02	1
10262	Chrysene	218-01-9	N.D.	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.	0.02	1
10262	Dibenzofuran	132-64-9	0.07	0.02	1
10262	Dibenzothiophene	132-65-0	N.D.	0.02	1

Sample Description: Seep B Grab Surface Water
NRG - PRGS

LL Sample # WW 7646758
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:25 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPB

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Fluoranthene	206-44-0	0.03	J	0.02	1
10262	Fluorene	86-73-7	0.2		0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.		0.02	1
10262	1-Methylnaphthalene	90-12-0	0.04	J	0.02	1
10262	2-Methylnaphthalene	91-57-6	0.06		0.02	1
10262	Naphthalene	91-20-3	N.D.		0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.		0.02	1
10262	Perylene	198-55-0	N.D.		0.02	1
10262	Phenanthrene	85-01-8	0.06		0.02	1
10262	Pyrene	129-00-0	N.D.		0.02	1

The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. The following corrective action was taken:

The sample was re-extracted outside the method required holding time and the QC is again outside of the acceptance limits.
All results are reported from the first trial. Similar results were obtained in both trials.

GC Volatiles	**SW-846 8015B modified**		**ug/l**		**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.		20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**		**ug/l**	
12858	DRO C10-C28	n.a.	240		45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**		**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.		0.20	1
05260	Coal Tar Oil	8001-58-9	N.D.		0.20	1
05260	Diesel/#2 Fuel	68334-30-5	0.55	J	0.20	1
05260	#6 Fuel Oil	68553-00-4	N.D.		1.0	1
05260	Gasoline	8006-61-9	N.D.		0.20	1
05260	Kerosene	8008-20-6	N.D.		0.20	1
05260	Mineral Spirits	8030-30-6	N.D.		0.20	1
05260	Motor Oil	n.a.	N.D.		1.0	1
Wet Chemistry	**EPA 1664A**		**mg/l**		**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.		1.4	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

eurofins | Lancaster Laboratories Environmental

2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: Seep B Grab Surface Water
NRG - PRGS

LL Sample # WW 7646758
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 13:25 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPB

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 15:49	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 15:49	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 14:17	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297B94A	10/25/2014 18:38	Marie D Beamenderfer	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297B94A	10/25/2014 18:38	Marie D Beamenderfer	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 18:59	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/27/2014 22:57	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807901A	10/28/2014 08:30	Yolunder Y Bunch	1

Sample Description: Seep D Grab Surface Water
NRG - PRGS

LL Sample # WW 7646759
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPD

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**ug/l**		**ug/l**	
10945	Benzene	71-43-2	N.D.		0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.		2	1
10945	1,2-Dibromoethane	106-93-4	N.D.		0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.		0.5	1
10945	Ethylbenzene	100-41-4	N.D.		0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.		0.5	1
10945	Toluene	108-88-3	N.D.		0.5	1
10945	Xylene (Total)	1330-20-7	N.D.		0.5	1
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**		**ug/l**	
10262	Acenaphthene	83-32-9	N.D.		0.02	1
10262	Acenaphthylene	208-96-8	N.D.		0.02	1
10262	Anthracene	120-12-7	N.D.		0.02	1
10262	Benzo(a)anthracene	56-55-3	N.D.		0.02	1
10262	Benzo(a)pyrene	50-32-8	0.02	J	0.02	1
10262	Benzo(b)fluoranthene	205-99-2	0.03	J	0.02	1
10262	Benzo(e)pyrene	192-97-2	0.02	J	0.02	1
10262	Benzo(g,h,i)perylene	191-24-2	0.02	J	0.02	1
10262	Benzo(k)fluoranthene	207-08-9	0.02	J	0.02	1
10262	Biphenyl	92-52-4	N.D.		0.02	1
10262	C1-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C1-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C1-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C1-Fluorenes	n.a.	N.D.		0.02	1
10262	C1-Naphthalenes	n.a.	N.D.		0.02	1
10262	C1-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C1-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	C2-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C2-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C2-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C2-Fluorenes	n.a.	N.D.		0.02	1
10262	C2-Naphthalenes	n.a.	N.D.		0.02	1
10262	C2-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C2-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	C3-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C3-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C3-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C3-Fluorenes	n.a.	N.D.		0.02	1
10262	C3-Naphthalenes	n.a.	N.D.		0.02	1
10262	C3-Naphthobenzothiophenes	n.a.	N.D.		0.02	1
10262	C3-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	C4-Benzanthrene/chrysenes	n.a.	N.D.		0.02	1
10262	C4-Dibenzothiophene	n.a.	N.D.		0.02	1
10262	C4-Fluoranthrenes/pyrenes	n.a.	N.D.		0.02	1
10262	C4-Naphthalenes	n.a.	N.D.		0.02	1
10262	C4-Phenanthrenes/anthracenes	n.a.	N.D.		0.02	1
10262	Chrysene	218-01-9	0.03	J	0.02	1
10262	Dibenz(a,h)anthracene	53-70-3	N.D.		0.02	1
10262	Dibenzofuran	132-64-9	N.D.		0.02	1
10262	Dibenzothiophene	132-65-0	N.D.		0.02	1

Sample Description: Seep D Grab Surface Water
NRG - PRGS

LL Sample # WW 7646759
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPD

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM Modified**		**ug/l**	**ug/l**	
10262	Fluoranthene	206-44-0	0.04 J	0.02	1
10262	Fluorene	86-73-7	N.D.	0.02	1
10262	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.02	1
10262	1-Methylnaphthalene	90-12-0	N.D.	0.02	1
10262	2-Methylnaphthalene	91-57-6	N.D.	0.02	1
10262	Naphthalene	91-20-3	N.D.	0.02	1
10262	Naphthobenzothiophene	224-10-2	N.D.	0.02	1
10262	Perylene	198-55-0	N.D.	0.02	1
10262	Phenanthrene	85-01-8	N.D.	0.02	1
10262	Pyrene	129-00-0	0.03 J	0.02	1
	The recovery for a target analyte(s) in the Laboratory Control Spike(s) is outside the QC acceptance limits as noted on the QC Summary. Sufficient sample was not available to repeat the analysis.				
GC Volatiles	**SW-846 8015B modified**		**ug/l**	**ug/l**	
01635	TPH-GRO water C6-C10	n.a.	N.D.	20	1
GC Petroleum Hydrocarbons	**SW-846 8015B**		**ug/l**	**ug/l**	
12858	DRO C10-C28	n.a.	N.D.	45	1
GC Petroleum Hydrocarbons	**SW-846 8015B modified**		**mg/l**	**mg/l**	
05260	#4 Fuel Oil	68476-31-3	N.D.	0.20	1
05260	Coal Tar Oil	8001-58-9	N.D.	0.20	1
05260	Diesel/#2 Fuel	68334-30-5	N.D.	0.20	1
05260	#6 Fuel Oil	68553-00-4	N.D.	1.0	1
05260	Gasoline	8006-61-9	N.D.	0.20	1
05260	Kerosene	8008-20-6	N.D.	0.20	1
05260	Mineral Spirits	8030-30-6	N.D.	0.20	1
05260	Motor Oil	n.a.	N.D.	1.0	1
Wet Chemistry	**EPA 1664A**		**mg/l**	**mg/l**	
08079	HEM (oil & grease)	n.a.	N.D.	1.4	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor

Sample Description: Seep D Grab Surface Water
NRG - PRGS

LL Sample # WW 7646759
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40 by PR

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPD

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 16:17	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 16:17	Anita M Dale	1
10262	50 alkyl PAHs/PAHs	SW-846 8270C SIM Modified	1	14297WAE026	10/27/2014 15:01	Joseph M Gambler	1
11012	Alkyl PAH Extract	SW-846 3510C	1	14297WAE026	10/25/2014 16:20	JoElla L Rice	1
01635	TPH-GRO water C6-C10	SW-846 8015B modified	1	14297B94A	10/25/2014 19:04	Miranda P Tillinghast	1
01146	GC VOA Water Prep	SW-846 5030B	1	14297B94A	10/25/2014 19:04	Miranda P Tillinghast	1
12858	DRO micro-ext 8015B	SW-846 8015B	1	143010008A	10/29/2014 19:23	Christine E Dolman	1
05260	TPH by GC-FID (Waters)	SW-846 8015B modified	1	142980016A	10/28/2014 00:34	Heather E Williams	1
11176	TPH by GC-FID Waters Ext.	SW-846 3510C	1	142980016A	10/27/2014 06:00	Roman Kuropatkin	1
12059	Microextraction - DRO (waters)	SW-846 3511	1	143010008A	10/28/2014 13:00	Wanda F Oswald	1
08079	HEM (oil & grease)	EPA 1664A	1	14301807901A	10/28/2014 08:30	Yolunder Y Bunch	1

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Analysis Report

Sample Description: Trip Blank Water
NRG - PRGS

LL Sample # WW 7646760
LL Group # 1512949
Account # 08390

Project Name: NRG PRGS

Collected: 10/21/2014 14:40

Submitted: 10/22/2014 16:05
Reported: 11/03/2014 09:21

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

SEEPT

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		ug/l	ug/l	
10945	Benzene	71-43-2	N.D.	0.5	1
10945	t-Butyl alcohol	75-65-0	N.D.	2	1
10945	1,2-Dibromoethane	106-93-4	N.D.	0.5	1
10945	1,2-Dichloroethane	107-06-2	N.D.	0.5	1
10945	Ethylbenzene	100-41-4	N.D.	0.5	1
10945	Methyl Tertiary Butyl Ether	1634-04-4	N.D.	0.5	1
10945	Toluene	108-88-3	N.D.	0.5	1
10945	Xylene (Total)	1330-20-7	N.D.	0.5	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10945	BTEX,MTBE,TBA,EDB,EDC	SW-846 8260B	1	P142972AA	10/24/2014 16:46	Anita M Dale	1
01163	GC/MS VOA Water Prep	SW-846 5030B	1	P142972AA	10/24/2014 16:46	Anita M Dale	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512949
Reported: 11/03/14 at 09:21 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: P142972AA	Sample number(s): 7646758-7646760							
Benzene	N.D.	0.5	ug/l	101		78-120		
t-Butyl alcohol	N.D.	2.	ug/l	101		75-120		
1,2-Dibromoethane	N.D.	0.5	ug/l	107		80-120		
1,2-Dichloroethane	N.D.	0.5	ug/l	102		65-135		
Ethylbenzene	N.D.	0.5	ug/l	99		79-120		
Methyl Tertiary Butyl Ether	N.D.	0.5	ug/l	105		75-120		
Toluene	N.D.	0.5	ug/l	101		80-120		
Xylene (Total)	N.D.	0.5	ug/l	103		80-120		
Batch number: 14297WAE026	Sample number(s): 7646758-7646759							
Acenaphthene	N.D.	0.02	ug/l	79*	75*	82-126	5	30
Acenaphthylene	N.D.	0.02	ug/l	79	75	72-124	6	30
Anthracene	N.D.	0.02	ug/l	79	77	70-117	2	30
Benzo(a)anthracene	N.D.	0.02	ug/l	80	77	75-115	4	30
Benzo(a)pyrene	N.D.	0.02	ug/l	76	73	72-126	4	30
Benzo(b)fluoranthene	N.D.	0.02	ug/l	78	76	72-129	2	30
Benzo(e)pyrene	N.D.	0.02	ug/l	91	87	75-117	4	30
Benzo(g,h,i)perylene	N.D.	0.02	ug/l	81	79	59-137	3	30
Benzo(k)fluoranthene	N.D.	0.02	ug/l	77	74	74-118	5	30
Biphenyl	N.D.	0.02	ug/l	90	86	74-101	4	30
C1-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C1-Dibenzothiophene	N.D.	0.02	ug/l					
C1-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C1-Fluorenes	N.D.	0.02	ug/l					
C1-Naphthalenes	N.D.	0.02	ug/l					
C1-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C1-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C2-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C2-Dibenzothiophene	N.D.	0.02	ug/l					
C2-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C2-Fluorenes	N.D.	0.02	ug/l					
C2-Naphthalenes	N.D.	0.02	ug/l					
C2-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C2-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C3-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C3-Dibenzothiophene	N.D.	0.02	ug/l					
C3-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C3-Fluorenes	N.D.	0.02	ug/l					
C3-Naphthalenes	N.D.	0.02	ug/l					
C3-Naphthobenzothiophenes	N.D.	0.02	ug/l					
C3-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
C4-Benzanthrene/chrysenes	N.D.	0.02	ug/l					
C4-Dibenzothiophene	N.D.	0.02	ug/l					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512949
Reported: 11/03/14 at 09:21 AM

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
C4-Fluoranthrenes/pyrenes	N.D.	0.02	ug/l					
C4-Naphthalenes	N.D.	0.02	ug/l					
C4-Phenanthrenes/anthracenes	N.D.	0.02	ug/l					
Chrysene	N.D.	0.02	ug/l	75*	72*	77-122	5	30
Dibenz(a,h)anthracene	N.D.	0.02	ug/l	84	81	42-143	4	30
Dibenzofuran	N.D.	0.02	ug/l					
Dibenzothiophene	N.D.	0.02	ug/l	81	79	76-111	2	30
Fluoranthene	N.D.	0.02	ug/l	91	88	76-121	3	30
Fluorene	N.D.	0.02	ug/l	86	82	74-115	5	30
Indeno(1,2,3-cd)pyrene	N.D.	0.02	ug/l	82	79	53-136	4	30
1-Methylnaphthalene	N.D.	0.02	ug/l	76	72*	75-117	5	30
2-Methylnaphthalene	N.D.	0.02	ug/l	77	73	68-124	5	30
Naphthalene	N.D.	0.02	ug/l	68*	76*	78-117	12	30
Naphthobenzothiophene	N.D.	0.02	ug/l					
Perylene	N.D.	0.02	ug/l	85	75	61-123	12	30
Phenanthrene	N.D.	0.02	ug/l	84	80	72-109	5	30
Pyrene	N.D.	0.02	ug/l	67*	69*	70-124	3	30
Batch number: 14297B94A	Sample number(s): 7646758-7646759							
TPH-GRO water C6-C10	N.D.	20.	ug/l	100	100	80-129	0	30
Batch number: 142980016A	Sample number(s): 7646758-7646759							
#4 Fuel Oil	N.D.	0.20	mg/l					
Coal Tar Oil	N.D.	0.20	mg/l					
Diesel/#2 Fuel	N.D.	0.20	mg/l	54	62	52-120	14	20
#6 Fuel Oil	N.D.	1.0	mg/l					
Gasoline	N.D.	0.20	mg/l					
Kerosene	N.D.	0.20	mg/l					
Mineral Spirits	N.D.	0.20	mg/l					
Motor Oil	N.D.	1.0	mg/l					
Batch number: 143010008A	Sample number(s): 7646758-7646759							
DRO C10-C28	N.D.	45.	ug/l	83	87	69-115	4	20
Batch number: 14301807901A	Sample number(s): 7646758-7646759							
HEM (oil & grease)	N.D.	1.4	mg/l	95	96	78-114	1	16

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: P142972AA	Sample number(s): 7646758-7646760 UNSPK: P647654								
Benzene	107	104	72-134	3	30				
t-Butyl alcohol	70 (2)	89 (2)	67-119	2	30				
1,2-Dibromoethane	102	102	77-116	0	30				
1,2-Dichloroethane	102	102	63-142	1	30				
Ethylbenzene	100	99	71-134	0	30				
Methyl Tertiary Butyl Ether	103	101	72-126	2	30				
Toluene	102	102	80-125	0	30				
Xylene (Total)	103	102	79-125	1	30				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512949
Reported: 11/03/14 at 09:21 AM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 14301807901A	Sample number(s): 7646758-7646759 UNSPK: P646167								
HEM (oil & grease)	86		78-114						

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: BTEX,MTBE,TBA,EDB,EDC
Batch number: P142972AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
7646758	101	98	100	100
7646759	101	97	100	100
7646760	100	99	99	97
Blank	100	97	99	99
LCS	100	101	100	100
MS	101	102	99	100
MSD	101	100	100	99
Limits:	80-116	77-113	80-113	78-113

Analysis Name: 50 alkyl PAHs/PAHs
Batch number: 14297WAE026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
7646758	116	30*	92
7646759	99	94	93
Blank	115	114	100
LCS	101	105	94
LCSD	97	100	90
Limits:	56-134	36-156	59-132

Analysis Name: TPH-GRO water C6-C10
Batch number: 14297B94A

	Trifluorotoluene-F
7646758	82
7646759	80
Blank	84
LCS	102
LCSD	100
Limits:	63-135

Analysis Name: TPH by GC-FID (Waters)
Batch number: 142980016A

	Chlorobenzene	Orthoterphenyl
7646758 1ST	71	91
7646759	76	85

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512949
Reported: 11/03/14 at 09:21 AM

Surrogate Quality Control

1ST		
Blank	62	71
LCS	71	85
LCSD	69	86
Limits:	35-135	48-122

Analysis Name: DRO micro-ext 8015B
Batch number: 143010008A

	Orthoterphenyl
7646758	123
7646759	125
Blank	127
LCS	122
LCSD	125
Limits:	42-160

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Cooler #22

Environmental Analysis Request/Chain of Custody

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Acct. # 8390 Group # 1512949 Sample # 7646758-60

Client: Groundwater & Env. Services, Inc.
Project Name/#: NRG PRGS — Site ID #: NRG PRGS
Project Manager: Gregory Reichart — P.O. #: 0402859
Sampler: P. Reichardt — PWSID #:
Phone #: 800-220-3606 x 3717 — Quote #: 212032A
State where sample(s) were collected: 1400 North Royal St., Alexandria, VA

For Lab Use Only
SF #:
SCR #:

Preservation Codes: H = HCl, T = Thiosulfate, N = HNO_3, B = NaOH, S = H_2SO_4, P = H_3PO_4, O = Other

Sample Identification	Collection Date	Collection Time	Grab	Composite	Matrix: Soil	Matrix: Sediment	Matrix: Potable Water	Matrix: Ground Water	Matrix: Surface Water	Matrix: NPDES	Matrix: Other:	Total # of Containers	TPH-DRO C10-C28 (SW-846 8015B)	BTEX, MTBE,TBA, EDC, EDB (SW-846 8260B)	TPH-GRO C6-C10 (SW-846 8015B)	PAHs & Alkylated PAHs by SIM (SW-846 8270C SIM)	HEM Oil and Grease (EPA 1664A)	TPH by GC-FID - Fingerprinting (SW-846 8015B modified)	Turbidity (SM 2130B)	Alkalinity (SM 2320B)	Nitrate NO3 -1 (EPA 353.2)	Ferrous Iron Fe2+ (EPA 353.2)	Sulfate SO42- (SM 3500-Fe B modified-1997)	Methane (RSKSOP-175 modified)	Remarks
Preservation Codes													H	H	H	–	H	–							
Seep B	10/21/14	13:25	X				X					12	X	X	X	X	X	X							
Seep D	10/21/14	14:40	X				X					10	X	X	X	X	X	X							Limited available H_2O
Trip Blank	10/21/14	14:40										2		X											14281

Turnaround Time Requested (TAT) (please check): Standard ☑ Rush ☐
(Rush TAT is subject to laboratory approval and surcharges.)

Date results are needed:
Rush results requested by (please check): E-Mail ☑ Phone ☐
E-mail Address: mdlabs@gesonline.com & ges@equisonline.com
Phone:

Data Package Options (please check if required)
Type I (Validation/non-CLP) ☐ MA MCP ☐
Type III (Reduced non-CLP) ☐ CT RCP ☐
Type VI (Raw Data Only) ☐ TX TRRP-13 ☐
NYSDEC Category ☐ A or ☐ B

EDD Required? Yes ☑ No ☐ If yes, format: GES EQEDD
EQEDD Name: NRG PRGS.*Lab report* #.25800.EQEDD.zip

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	10-21-14	18:00	Denise Woodring	10-22-14	11:12
Denise Woodring	10-22-14	11:40	[signature]	10/22/14	11:40
[signature]	10/22/14	16:00			
			[signature]	10/22/14	1605

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____

Temperature upon receipt 5.6 °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35901

Group Number(s): 1512949

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/22/2014 16:05
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	Yes	Sample Date/Times match COC:	Yes
Custody Seal Intact:	Yes	VOA Vial Headspace ≥ 6mm:	No
Samples Chilled:	Yes	Total Trip Blank Qty:	2
Paperwork Enclosed:	Yes	Trip Blank Type:	HCl
Samples Intact:	Yes	Air Quality Samples Present:	No
Missing Samples:	No		
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:15 on 10/22/2014

Samples Chilled Details

Thermometer Types: DT = Digital (Temp. Bottle) IR = Infrared (Surface Temp) All Temperatures in °C.

Cooler #	Thermometer ID	Corrected Temp	Therm. Type	Ice Type	Ice Present?	Ice Container	Elevated Temp?
1	8013596-IR	5.6	IR	Wet	Y	Bagged	N

2425 New Holland Pike
Lancaster, PA 17605-2425
T | 717-656-2300
F | 717-656-2681
www.LancasterLabs.co

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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APPENDIX I

Hydrocarbon Mass Estimate Calculations

APPENDIX K

HYDROCARBON MASS ESTIMATE CALCULATIONS

Total DRO (GALLONS)	8,070

Total DRO (kg)	25,376

Mass Estimate In Soil

*(Mass = Average Concentration * Soil Mass * Thickness * Area)*

Average Soil Concentration Across Site

Inputs				Results	
Average Concentration(µg/kg)	Soil Mass (kg/ft^3	Thickness (ft)	Area (ft^2)	Total Mass (kg)	Gallons DRO
1,592	38	13	28,300	22,260	7,078

Assumed Soil Concentration Below the UST's

Inputs				Results	
Average Concentration(µg/kg)	Soil Mass (kg/ft^3	Thickness (ft)	Area (ft^2)	Total Mass (kg)	Gallons DRO
11,000	38	3	1,742	2,184	695

Mass Estimate in Groundwater

*(Mass = Average Concentration * Porosity * Thickness * Area)*

Deep

Inputs				Results	
Iso Concentration (µg/L)	Porosity	Thickness (ft)	Area (ft^2)	Total Mass (kg)	Gallons DRO
3,000	35%	40	7,174	9	19
8,000	35%	40	5,219	17	
13,000	35%	40	3,054	16	
25,000	35%	40	1,857	18	

Shallow

Inputs				Results	
Iso Concentration (µg/L)	Porosity	Thickness (ft)	Area (ft^2)	Total Mass (kg)	Gallons DRO
3,000	35%	8	11,342	3	10
5,000	35%	8	4,549	2	
13,000	35%	8	4,549	5	
76,000	35%	8	3,945	24	

LNAPL

*(Volume = Porosity * Average Thickness * Area)*

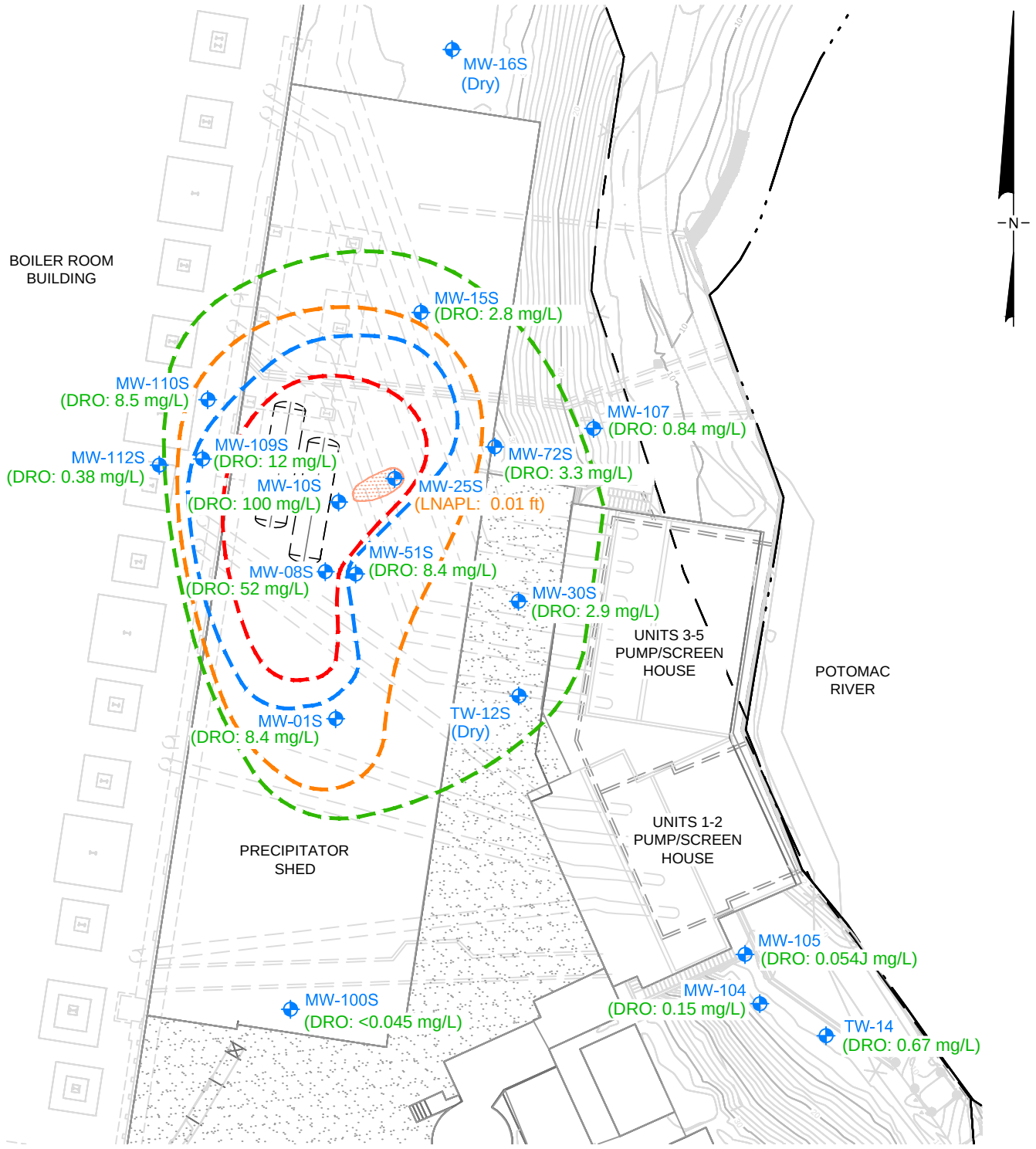
Shallow

Inputs			Results		
Porosity	Average Thickness (ft)	Area (ft^2)	Volume (ft^3)	Volume (gallons)	Mass in Soil
35%	0.01	261	1	7	21

Deep

Inputs			Results		
Porosity	Average Thickness (ft)	Area (ft^2)	Volume (ft^3)	Volume (gallons)	Mass in Soil
35%	0.11	906	35	261	819

Conversion Factors	
Liter per ft^3	28.31
Liters per gallon	3.78
density of diesel kg/l	0.832
kg per mg	0.000001
grams per µg	0.000000001
Average Soil Concentration	1,592



LEGEND

Property Boundary

Waterline (river)

Monitoring Well

DRO CONCENTRATION

15 mg/L

10 mg/L

5 mg/L

1 mg/L

LNAPL THICKNESS

0.01 ft

NOTES:

DRO - Diesel Range Organics

LNAPL - Light Non-Aqueous Phase Liquid (thickness)

ug/L - micrograms per liter

Samples and measurements taken between 20 October 2014 and 22 October 2014. Data are shown only where samples were collected or LNAPL was observed.

DRO CONCENTRATIONS AND LANAPL THICKNESS – SHALLOW ZONE

FORMER POTOMAC RIVER GENERATING STATION

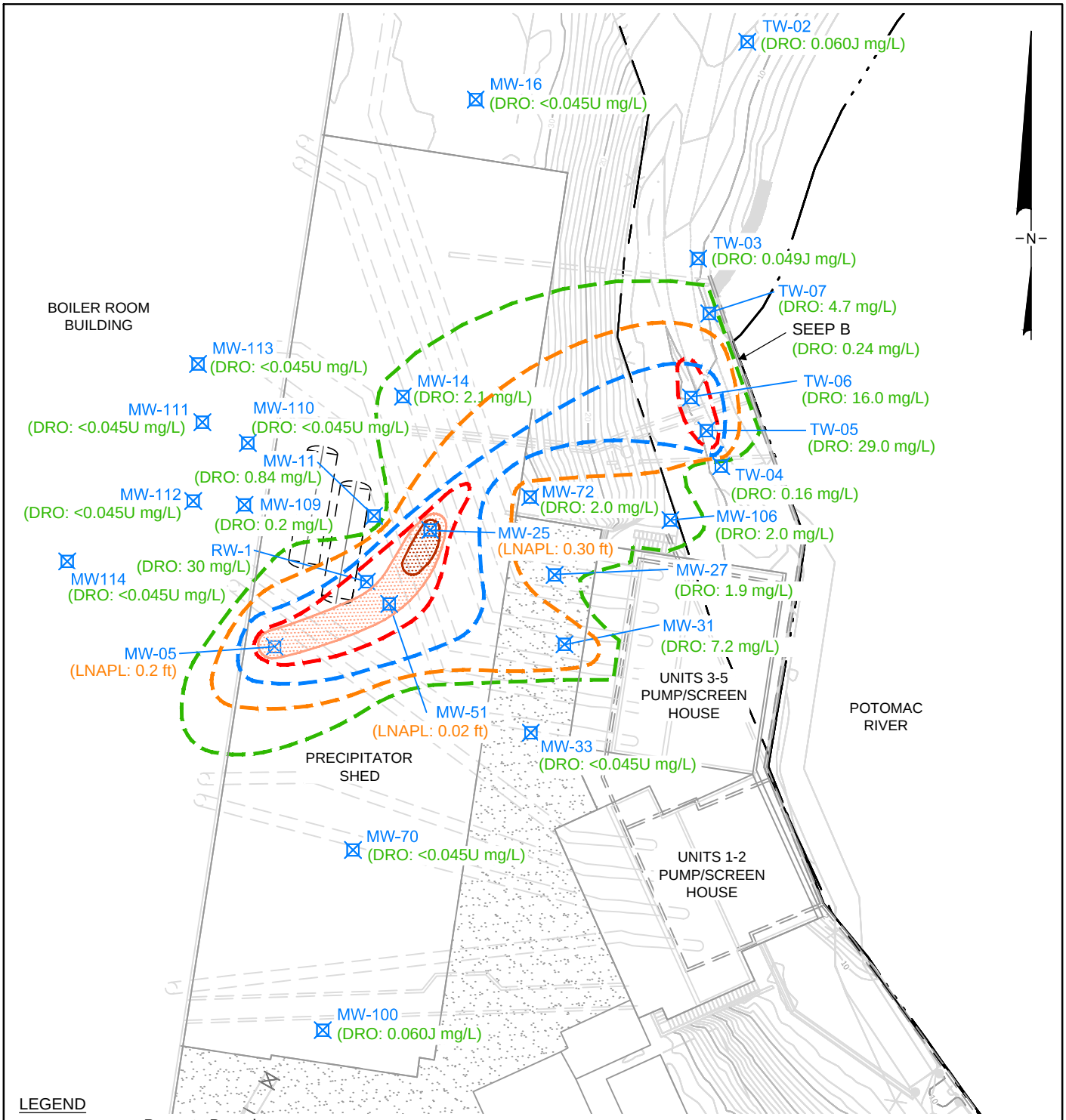
ALEXANDRIA, VIRGINIA

Geosyntec consultants

COLUMBIA, MARYLAND

GES

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 1.1



NOTES:
DRO - Diesel Range Organics (in ppb)
LNAPL - Light Non-Aqueous Phase Liquid (thickness, in feet)
ug/L - micrograms per liter

Samples and measurements taken between 20 October 2014 and 22 October 2014. Data are shown only where samples were collected or LNAPL was observed.

DRO CONCENTRATIONS AND LANAPL THICKNESS – DEEP ZONE

FORMER POTOMAC RIVER GENERATING STATION
ALEXANDRIA, VIRGINIA

Geosyntec consultants
COLUMBIA, MARYLAND

DATE: DECEMBER 2014	DOCUMENT NO.
PROJECT NO. MEM1108	FIGURE NO. 1.2

APPENDIX J

Laboratory Data – Feasibility Testing

2019 Ninth Avenue
PO Box 1925
Altoona, PA 16603
(814) 946-4306
NELAP: PA 07-062, VA 460212

89 Kristi Road
Pennsdale, PA 17756
(570) 494-6380
PaDEP: PA 41-04684

State Certifications: MD 275, WV 364

FAIRWAY LABORATORIES
www.fairwaylaboratories.com

GES Maryland		Project:	NRG-POTOMAC RIVER LLC.
1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported:
10/31/14 17:01

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Sample Type	Date Sampled	Date Received
MW-51-20141014	4J17081-01	Water	Grab	10/14/14 16:45	10/17/14 15:15
MW-27-20141014	4J17081-02	Water	Grab	10/16/14 13:25	10/17/14 15:15

Fairway Laboratories, Inc.

Reviewed and Submitted by:

Michael P. Tyler
Laboratory Director

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1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported: 10/31/14 17:01

Client Sample ID: **MW-51-20141014** **Date/Time Sampled:** 10/14/14 16:45

Laboratory Sample ID: **4J17081-01 (Water/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Method	* Analyst	Note
Diesel Range Organics by EPA 8015								
Diesel Range Organics	88600		30000	ug/l	10/22/14 07:48	EPA 8015D mod	rsr	2a, 2b
Surrogate: o-Terphenyl		*178 %*	*40-140*		*10/22/14 07:48*	*EPA 8015D mod*	rsr	2n
Metals by EPA 200 Series Methods								
Calcium, Dissolved	48.1		0.100	mg/l	10/27/14 11:33	EPA 200.7/4.4	rab	2b
Calcium	51.7		0.100	mg/l	10/27/14 12:23	EPA 200.7/4.4	rab	
Iron, Dissolved	0.163		0.0200	mg/l	10/27/14 11:34	EPA 200.7/4.4	rab	2b
Iron	4.45		0.0200	mg/l	10/27/14 12:23	EPA 200.7/4.4	rab	2d
Magnesium, Dissolved	26.7		0.100	mg/l	10/27/14 11:33	EPA 200.7/4.4	rab	2b
Magnesium	28.1		0.100	mg/l	10/27/14 12:23	EPA 200.7/4.4	rab	
Manganese, Dissolved	9.52		0.0100	mg/l	10/27/14 11:35	EPA 200.7/4.4	rab	2b
Manganese	11.1		0.0100	mg/l	10/27/14 12:25	EPA 200.7/4.4	rab	
Lead	0.00744		0.00400	mg/l	10/27/14 12:25	EPA 200.7/4.4	rab	
Volatile Organic Compounds by EPA Method 8260B								
Benzene	<5.00		5.00	ug/l	10/20/14 20:33	EPA 8260B	mtc	U
Toluene	<5.00		5.00	ug/l	10/20/14 20:33	EPA 8260B	mtc	U
Ethylbenzene	5.15		5.00	ug/l	10/20/14 20:33	EPA 8260B	mtc	

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www.fairwaylaboratories.com

GES Maryland		Project:	NRG-POTOMAC RIVER LLC.
1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported: 10/31/14 17:01

Client Sample ID: **MW-51-20141014** **Date/Time Sampled:** 10/14/14 16:45

Laboratory Sample ID: **4J17081-01 (Water/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Method	* Analyst	Note
Volatile Organic Compounds by EPA Method 8260B								
Xylenes (total)	10.8		10.0	ug/l	10/20/14 20:33	EPA 8260B	mtc	
Surrogate: 4-Bromofluorobenzene		*97.9 %*	*70-130*		*10/20/14 20:33*	*EPA 8260B*	mtc	
Surrogate: 1,2-Dichloroethane-d4		*90.0 %*	*70-130*		*10/20/14 20:33*	*EPA 8260B*	mtc	
Surrogate: Fluorobenzene		*87.1 %*	*70-130*		*10/20/14 20:33*	*EPA 8260B*	mtc	
Conventional Chemistry Parameters by SM/EPA Methods								
Oil & Grease	<6.25		6.25	mg/l	10/19/14 12:34	EPA 1664A	SR	U
Total Dissolved Solids	450		100	mg/l	10/20/14 15:00	SM20-2540C	arr	
Total Suspended Solids	928		16.0	mg/l	10/20/14 09:05	SM20-2540D	arr	
Volatile Petroleum Hydrocarbons by 8015 GRO								
Gasoline Range Organics	168		100	ug/l	10/20/14 23:11	EPA 8015D mod	bag	
Surrogate: a,a,a-Trifluorotoluene		*116 %*	*70-130*		*10/20/14 23:11*	*EPA 8015D mod*	bag	

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1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported: 10/31/14 17:01

Client Sample ID: **MW-27-20141014** **Date/Time Sampled:** 10/16/14 13:25

Laboratory Sample ID: **4J17081-02 (Water/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Method	* Analyst	Note
Diesel Range Organics by EPA 8015								
Diesel Range Organics	3100		600	ug/l	10/22/14 03:20	EPA 8015D mod	rsr	
Surrogate: o-Terphenyl		*81.9 %*	*40-140*		*10/22/14 03:20*	*EPA 8015D mod*	rsr	
Metals by EPA 200 Series Methods								
Calcium, Dissolved	75.9		0.100	mg/l	10/27/14 11:46	EPA 200.7/4.4	rab	
Calcium	79.4		0.100	mg/l	10/27/14 12:47	EPA 200.7/4.4	rab	
Iron, Dissolved	<0.0200		0.0200	mg/l	10/27/14 11:46	EPA 200.7/4.4	rab	
Iron	0.111		0.0200	mg/l	10/27/14 12:47	EPA 200.7/4.4	rab	2d
Magnesium, Dissolved	34.3		0.100	mg/l	10/27/14 11:46	EPA 200.7/4.4	rab	
Magnesium	35.1		0.100	mg/l	10/27/14 12:47	EPA 200.7/4.4	rab	
Manganese, Dissolved	4.22		0.0100	mg/l	10/27/14 11:48	EPA 200.7/4.4	rab	
Manganese	4.55		0.0100	mg/l	10/27/14 12:49	EPA 200.7/4.4	rab	
Lead	<0.00400		0.00400	mg/l	10/27/14 12:49	EPA 200.7/4.4	rab	U
Volatile Organic Compounds by EPA Method 8260B								
Benzene	<2.00		2.00	ug/l	10/22/14 13:20	EPA 8260B	mtc	U
Toluene	<2.00		2.00	ug/l	10/22/14 13:20	EPA 8260B	mtc	U
Ethylbenzene	<2.00		2.00	ug/l	10/22/14 13:20	EPA 8260B	mtc	U

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GES Maryland		Project:	NRG-POTOMAC RIVER LLC.
1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported: 10/31/14 17:01

Client Sample ID: **MW-27-20141014** **Date/Time Sampled:** 10/16/14 13:25

Laboratory Sample ID: **4J17081-02 (Water/Grab)**

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Method	* Analyst	Note
Volatile Organic Compounds by EPA Method 8260B								
Xylenes (total)	<4.00		4.00	ug/l	10/22/14 13:20	EPA 8260B	mtc	U
Surrogate: 4-Bromofluorobenzene		*96.9 %*	*70-130*		*10/22/14 13:20*	*EPA 8260B*	mtc	
Surrogate: 1,2-Dichloroethane-d4		*91.1 %*	*70-130*		*10/22/14 13:20*	*EPA 8260B*	mtc	
Surrogate: Fluorobenzene		*86.7 %*	*70-130*		*10/22/14 13:20*	*EPA 8260B*	mtc	
Conventional Chemistry Parameters by SM/EPA Methods								
Oil & Grease	23.1		6.25	mg/l	10/19/14 12:34	EPA 1664A	SR	
Total Dissolved Solids	420		40.0	mg/l	10/20/14 15:00	SM20-2540C	arr	
Total Suspended Solids	792		16.0	mg/l	10/20/14 14:13	SM20-2540D	arr	
Volatile Petroleum Hydrocarbons by 8015 GRO								
Gasoline Range Organics	<100		100	ug/l	10/20/14 23:47	EPA 8015D mod	bag	U
Surrogate: a,a,a-Trifluorotoluene		*116 %*	*70-130*		*10/20/14 23:47*	*EPA 8015D mod*	bag	

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GES Maryland		Project:	NRG-POTOMAC RIVER LLC.
1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported:
10/31/14 17:01

Notes

2a	The RPD result exceeded the QC control limits for the duplicate, LCSD or MSD sample analyzed.
2b	The spike recovery was outside acceptance limits for the MS and/or MSD. Data accepted based on acceptable LCS recovery.
2d	The LCS spike recovery was outside acceptance limits. Data accepted based on additional batch QC.
2n	The surrogate value is not within the indicated range, results are considered to be estimated.
U	Analyte included in the analysis, but not detected

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GES Maryland		Project:	NRG-POTOMAC RIVER LLC.
1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported:
10/31/14 17:01

Definitions

If surrogate values are not within the indicated range, then the results are considered to be estimated.

Reporting limits are adjusted accordingly when samples are analyzed at a dilution due to the matrix.

The following analyses are to be performed immediately upon sampling: pH, sulfite, chlorine residual, dissolved oxygen, filtration for ortho phosphorus, and ferrous iron. The date and time reported reflect the time the samples were analyzed at the laboratory.

MBAS, calculated as LAS, mol wt 348

If the solid sample weight for VOC analysis does not fall within the 3.5-6.5 gram range, the results are considered estimated values.

Samples collected by Fairway Laboratories' personnel are done so in accordance with Standard Operating Procedures established by Fairway Laboratories.

*	P indicates analysis performed by Fairway Laboratories, Inc. at the Pennsdale location. This location is PaDEP Chapter 252 certified.
<	Represents "less than" - indicates that the result was less than the reporting limit.
MDL	Method Detection Limit - is the lowest or minimum level that provides 99% confidence level that the analyte is detected. Any reported result values that are less than the RL are considered estimated values.
RL	Reporting Limit - is the lowest or minimum level at which the analyte can be quantified.
[CALC]	Indicates a calculated result. Calculations use results from other analyses performed under accredited methods.

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1350 Blair Drive, Suite A		Project Number:	[none]
Odenton MD, 21113		Collector:	DD
Project Manager:	Greg Reichart	Number of Containers:	18

Reported:
10/31/14 17:01

Terms & Conditions

Services provided by Fairway Laboratories Inc. are limited to the terms and conditions stated herein, unless otherwise agreed to in a formal contract.

CHAIN OF CUSTODY Fairway Laboratories Inc. ("Fairway," "us" or "we") will initiate a chain-of-custody/request for analysis upon sample receipt unless the client includes a completed form with the received sample(s). Upon request, Fairway will provide chain-of-custody forms for use.

CONFIDENTIALITY Fairway maintains confidentiality in all of our client interactions. The client's consent will be required before releasing information about the services provided.

CONTRACTS All contracts are subject to review and approval by Fairway's legal council. Each contract must be signed by a corporate officer.

PAYMENT/BILLING Unless otherwise set forth in a signed contract or purchase order, terms of payment are "NET 30 Days." The time allowed for payment shall begin based on the invoice date. A 1.5% per month service charge may be added to all unpaid balances beyond the initial 30 days. In its sole discretion, Fairway reserves the right to request payment before services and hold sample results for payment of due balances. We will not bill a third party without prior agreement among all parties acknowledging and accepting responsibility for payment.

SAMPLE COLLECTION AND SUBMISSION Clients not requesting collection services from Fairway are responsible for proper collection, preservation, packaging, and delivery of samples to the laboratory in accordance with current law and commercial practice. Fairway shall have no responsibility for sample integrity prior to the receipt of the sample(s) and/or for any inaccuracy in test or analyses results as a result of the failure of the client or any third party to maintain the integrity of samples prior to delivery to Fairway. All samples submitted must be accompanied by a completed chain of custody or similar document clearly noting the requested analyses, dates/time sampled, client contact information, and trail of custody.

SUBCONTRACTING Some analyses may require subcontracting to another laboratory. Unless the client indicates otherwise, this decision will be made by Fairway. Subcontracted work will be identified on the final report in accordance with NELAC requirements.

RETURN OF RESULTS Fairway routinely provides faxed or verbal results within 10 working days of receipt of sample(s) and a hard copy of the data results is routinely received via US Postal Service within 15 working days. At the request of the client, Fairway may offer expedited return of sample results. Surcharges may apply to rush requests. All rush requests must be pre-approved by Fairway. We reserve the right to charge an archive retrieval fee for results older than one (1) year from the date of the request. All records will be maintained by Fairway for 5 years, after which, they will be destroyed.

SAMPLE DISPOSAL Fairway will maintain samples for four (4) weeks after the sample receipt date. Fairway will dispose of samples which are not and/or do not contain hazardous wastes (as such term is defined by applicable federal or state law), unless prior arrangements have been made for long-term storage. Fairway reserves the right to charge a disposal fee for the proper disposal of samples found or suspected to contain hazardous waste. A return shipping charge will be invoiced for samples returned to the client at their request.

HAZARD COMMUNICATION The client has the responsibility to inform the laboratory of any hazardous characteristics known or suspected about the sample, and to provide information on hazard prevention and personal protection as necessary or otherwise required by applicable law.

WARRANTY AND LIMITATION OF LIABILITY For services rendered, Fairway warrants that it will apply its best scientific knowledge and judgment and to employ its best level of effort consistent with professional standards within the environmental testing industry in performing the analytical services requested by its clients. We disclaim any other warranties, expressed or implied by law. Fairway does not accept any legal responsibility for the purposes for which client uses the test results.

LITIGATION All costs associated with compliance to any subpoena for documents, for testimony in a court of law, or for any other purpose relating to work performed by Fairway Laboratories, Inc. shall be invoiced by Fairway and paid by client. These costs shall include, but are not limited to, hourly charges for the persons involved, travel, mileage, and accommodations and for any and all other expenses associated with said litigation.

Fairway Laboratories, Inc.

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CHAIN OF CUSTODY/ REQUEST FOR ANALYSIS

Please print. See back of COC for instructions/terms and conditions.

2019 9th Ave.
P.O. Box 1925
Altoona, PA 16602
Phone: (814) 946-4306
Fax: (814) 946-8791

FAIRWAY LABORATORIES
Environmental Laboratory

89 Kristi Rd
Pennsdale, PA 17756
Phone: (570) 494-6380

COC # 45 17081 #1

Page 1 of 2

Client Name: NRG
Address: 1400 North Royal St
Alexandria, VA
Contact: Grey Reichert
Phone #: 800-220-3606
Fax #:
Project Name: Potomac River Generating Station
Quote/PO #:

TAT: Normal ☒ Rush ☐
Rush TAT subject to pre-approval and surcharge.
Date Required: ___/___/___

Received on ice? Y N
Sample Temp:

Reportable to PADEP? Yes ☐
PWSID #

LAB USE ONLY
FedEx USPS
UPS Other
Tracking #

	Sample Description/Location	GRAB	Composite	Composite Start Date	Composite Start Time	GRAB -or- Composite End Date	GRAB -or- Composite End Time	Matrix: Solid	Matrix: Water	Matrix: Other	# of Containers	BTEX (8260)	TPH GRO, TPH-DRO (8015)	Total Calcium, Iron, Magnesium, and Manganese (EPA 6010)	Dissolved Calcium, Iron, Magnesium and Manganese (EPA 6010)*	Total Lead (EPA 6010)	Oil + Grease (EPA 1664)	TSS + TDS (EPA 2540)	Bottle Type/Comments
1	MW-51	X				10-14-14	16:45		X		9								*Field Filtered - Use field filtered nitric acid preserved bottle for dissolved metals.
2	MW-27	X				10-16-14	1325		X		9								
							16:45												

Sampled by:	Date	Time	Received by:	Date	Time
Dan Drennan	10-16-14	1325	Denise Woodring	10-17-14	1115
Relinquished by:	**Date**	**Time**	**Received by:**	**Date**	**Time**
Denise Woodring	10/17/14		[signature]	10-17-14	1120
Relinquished by:	**Date**	**Time**	**Received by:**	**Date**	**Time**
[signature]	10/17/14	1515			
Relinquished by:	**Date**	**Time**	**Received by:**	**Date**	**Time**
			Callen [signature]	10-17-14	1515

Remarks

Project Address 1400 N Royal St.
Alexandria, VA
Send results to: mdlabs@gesonline.com
and ges@equisonline.com
EQEDD File Name: NRG-PRGS-Lab Report
Number. 25800. EQEDD. zip

By relinquishing my sample to Fairway Laboratories, Inc., I hereby agree to the terms and conditions printed on the reverse.

White Original - FLI File Canary - FLI Copy Pink - Customer Receipt Copy

SOP FLI0601-002 Revision 17 Date: June 18, 2014 Page of

Chain of Custody Receiving Document

Page 2 of 2

Receiver: CR

Date/Time of this check: 10-17-14 15:25 Client: NRG GES MA Lab # 4J17081 #2

Received on ICE? Y ☐ * **Sample Temperature when delivered to the Lab:** 3.8 **Acceptable?** Y ☐ * **or In cool down process?** ☐ *

Custody Seals? Y Intact? Y

COC/Labels on bottles agree? Y ☐ * Correct containers for all the analysis requested? Y ☐ * Matrix: water

COC #	Number and Type of BOTTLES										Comments
	Poly Non-Pres.	Poly H2SO4	Poly HNO3	Amber H2SO4	Amber Non-Pres.	Poly NaOH	VOCS (Head space?)	Other ☐ *	Properly Preserved ☑ *	Bacti	
1	1		2	2			4 HCl				
2	1		2	2							

* DEVIATION PRESENT:	CLIENT CALLED:	CLIENT RESPONSE:
☹ No Ice ( )	YES ( )	Proceed with analysis; qualify data ( )
☹ Not at Proper Temperature ( )	By Whom:	Will Resample ( )
☹ Wrong Container ( )		Provided Information ( )
☹ Missing Information: ( )	_____ Date: _____	No Response; Proceed and qualified ( )
		Client Contact: _____ Date: _____

* Comments: _____

This is a date sensitive document and may not be current after October 13, 2014.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 21, 2014

Project: NRG PRGS

Submittal Date: 09/25/2014
Group Number: 1506259
PO Number: NRG PRGS
Release Number: 0402859-03-227
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-25 Grab Air	7614079
MW-05 Grab Air	7614080
MW-10S Grab Air	7614081

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO GES, Inc.-MD Attn: Report Distribution

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-25 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614079
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 11:15 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	22	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	190	35	1
07090	Ethylbenzene	100-41-4	6	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	20	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/25/2014 23:13	Florida A Cimino	1

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Analysis Report

Sample Description: MW-05 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614080
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 13:20 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		mg/m3		mg/m3	
07090	Benzene	71-43-2	< 3		3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	23,000	E	180	10
07090	>C4-C10 Hydrocarbons hexane	n.a.	470		35	1
07090	Ethylbenzene	100-41-4	10		4	1
07090	Toluene	108-88-3	< 4		4	1
07090	Xylene (total)	1330-20-7	20		9	1

The result reported for C1-C4 hydrocarbons as propane exceeded the calibration range of the instrument and therefore should be considered estimated.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/25/2014 23:42	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1427130AA	09/28/2014 17:01	Florida A Cimino	10

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-10S Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614081
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 14:45 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		mg/m3		mg/m3	
07090	Benzene	71-43-2	5		3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	20,000	E	180	10
07090	>C4-C10 Hydrocarbons hexane	n.a.	700		35	1
07090	Ethylbenzene	100-41-4	20		4	1
07090	Toluene	108-88-3	< 4		4	1
07090	Xylene (total)	1330-20-7	10		9	1

The result reported for C1-C4 hydrocarbons as propane exceeded the calibration range of the instrument and therefore should be considered estimated.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/26/2014 00:11	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1427130AA	09/28/2014 17:30	Florida A Cimino	10

Quality Control Summary

Client Name: GES, Inc. Group Number: 1506259
Reported: 10/21/14 at 03:14 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1426830AA	Sample number(s): 7614079-7614081							
Benzene	< 3	3.	mg/m3	96	97	75-111	0	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	111	107	76-135	4	30
Toluene	< 4	4.	mg/m3	121	119	66-123	2	30
Xylene (total)	< 9	9.	mg/m3	120	112	70-134	7	30
Batch number: M1427130AA	Sample number(s): 7614080-7614081							
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins

Lancaster Laboratories Environmental

Acct. # 8390 For Eurofins Lancaster Laboratories Environmental use only Group # 1500259 Sample # 2014097981

Instructions on reverse side correspond with circled numbers.

360232

1 Client Information

Client: GES - 1350 Blair Drive Odenton Md. 21113

Acct. #:

Project Name/#: NRG - PRGS - 1400 N. Royal St. Alexandria Va.

PWSID #:

Project Manager: Greg Reichart - 1800220-3606 ext. 3717

P.O. #: 0402859-03-227

Sampler: Jeff Plummer

Quote #:

Name of state where samples were collected: Virginia

4 Matrix: Sediment ☐ Soil ☐ Ground ☐ Potable ☐ Surface ☐ NPDES ☐ Water Other: Airbag

5 Analysis Requested — Preservation Codes

2 Sample Identification LF 9/25/14

Sample Identification	Collected Date	Collected Time	3 Grab	Composite	Total # of Containers	BTEX (Epa 18)	TPH (C1-C4) (>C4-C10) (Epa 18)
MW-25 * 11:15	9-24-14	*~~0940~~	X		1	X	X
MW-05	9-24-14	1320	X		1	X	X
MW-10S	9-24-14	1445	X		1	X	X

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate

N=HNO_3 B=NaOH

S=H_2SO_4 O=Other

6 Remarks

*MW-25 was collected @ 11:15 per D. Drennan. LF 9/25/14

7 Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

*EQEDD File Name: NRG PRGS - Lab report number.

~~Date results are needed~~: 25800.EQEDD.zip

*email results to mdlabs@gesonline.com

*email EQEDD package to ges@equisonline.com

*E-mail address:

8 Data Package Options (circle if required)

Type I (Validation/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) TX TRRP-13

Type IV (CLP SOW) MA MCP CT RCP

9

Relinquished by	Date	Time	Received by	Date	Time
Jeff Plummer	9-24-14	1645	Denise Woodring	9-24-14	1645
Denise Woodring	9-25-14	12:10	Billy DeLong	9-25-14	12:10
Billy DeLong	9-25-14	14:50			
			Received by: Woods	9/25/14	14:50

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt N/A °C

eurofins | Lancaster Laboratories Environmental

Sample Administration Receipt Documentation Log

Doc Log ID: 30814

Group Number(s): 1506259

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	09/25/2014 14:50
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Total Trip Blank Qty:	0
Custody Seal Present:	No	Trip Blank Type:	N/A
Custody Seal Intact:	N/A	Air Quality Samples Present:	Yes
Samples Chilled:	No	Air Quality Flow Controllers Present:	No
Paperwork Enclosed:	Yes	Flow Controller Quantity:	0
Samples Intact:	Yes	Air Quality Returns:	No
Missing Samples:	No	Summa Canister Returns:	
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		
Sample IDs on COC match Containers:	Yes		
Sample Date/Times match COC:	No		
VOA Vial Headspace ≥ 6mm:	N/A		
VOA IDs (≥ 6mm):	N/A		

Unpacked by Jordan Woods (6698) at 15:02 on 09/25/2014

Sample Date/Time Discrepancy Details

Sample ID on COC	Date/Time on Label	Comments
MW-25	9/24/2014 11:15	COC lists 0940. Label (11:15) is correct per D. Drennan (GES). LF 9/25/14

2425 New Holland Pike
Lancaster, PA 17605-2425

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 31, 2014

Project: NRG PRGS

Submittal Date: 10/28/2014
Group Number: 1514216
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-25 Grab Air	7653333

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

eurofins
Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-25 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7653333
LL Group # 1514216
Account # 08390

Project Name: NRG PRGS

Collected: 10/27/2014 12:30 by JP

Submitted: 10/28/2014 16:20
Reported: 10/31/2014 15:07

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	22	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	220	35	1
07090	Ethylbenzene	100-41-4	9	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	30	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1430230AA	10/29/2014 18:15	Florida A Cimino	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1514216
Reported: 10/31/14 at 03:07 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1430230AA	Sample number(s): 7653333							
Benzene	< 3	3.	mg/m3	99	97	75-111	2	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	101	102	76-135	1	30
Toluene	< 4	4.	mg/m3	118	113	66-123	4	30
Xylene (total)	< 9	9.	mg/m3	102	99	70-134	3	30

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 8390 Group # 1514216 Sample # 7653333

| | | |

eurofins | Lancaster Laboratories Environmental

Sample Administration Receipt Documentation Log

Doc Log ID: 36976

Group Number(s): 1514216

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/28/2014 16:20
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	N/A	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	Yes
Missing Samples:	No	Air Quality Flow Controllers Present:	No
Extra Samples:	No	Air Quality Returns:	No
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 16:37 on 10/28/2014

2425 New Holland Pike
Lancaster, PA 17605-2425

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F | 717-656-2681
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Explanation of Symbols and Abbreviations

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IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

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J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

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A	TIC is a possible aldol-condensation product
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P	Concentration difference between primary and confirmation columns >25%
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X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
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S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 21, 2014

Project: NRG PRGS

Submittal Date: 09/25/2014
Group Number: 1506259
PO Number: NRG PRGS
Release Number: 0402859-03-227
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-25 Grab Air	7614079
MW-05 Grab Air	7614080
MW-10S Grab Air	7614081

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO GES, Inc.-MD Attn: Report Distribution

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Lancaster Laboratories Environmental
2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

Analysis Report

Sample Description: MW-25 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614079
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 11:15 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	22	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	190	35	1
07090	Ethylbenzene	100-41-4	6	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	20	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/25/2014 23:13	Florida A Cimino	1

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Analysis Report

Sample Description: MW-05 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614080
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 13:20 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		mg/m3		mg/m3	
07090	Benzene	71-43-2	< 3		3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	23,000	E	180	10
07090	>C4-C10 Hydrocarbons hexane	n.a.	470		35	1
07090	Ethylbenzene	100-41-4	10		4	1
07090	Toluene	108-88-3	< 4		4	1
07090	Xylene (total)	1330-20-7	20		9	1

The result reported for C1-C4 hydrocarbons as propane exceeded the calibration range of the instrument and therefore should be considered estimated.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/25/2014 23:42	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1427130AA	09/28/2014 17:01	Florida A Cimino	10

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Analysis Report

Sample Description: MW-10S Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7614081
LL Group # 1506259
Account # 08390

Project Name: NRG PRGS

Collected: 09/24/2014 14:45 by JP

Submitted: 09/25/2014 14:50
Reported: 10/21/2014 15:14

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		mg/m3		mg/m3	
07090	Benzene	71-43-2	5		3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	20,000	E	180	10
07090	>C4-C10 Hydrocarbons hexane	n.a.	700		35	1
07090	Ethylbenzene	100-41-4	20		4	1
07090	Toluene	108-88-3	< 4		4	1
07090	Xylene (total)	1330-20-7	10		9	1

The result reported for C1-C4 hydrocarbons as propane exceeded the calibration range of the instrument and therefore should be considered estimated.

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1426830AA	09/26/2014 00:11	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1427130AA	09/28/2014 17:30	Florida A Cimino	10

Quality Control Summary

Client Name: GES, Inc. Group Number: 1506259
Reported: 10/21/14 at 03:14 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1426830AA	Sample number(s): 7614079-7614081							
Benzene	< 3	3.	mg/m3	96	97	75-111	0	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	111	107	76-135	4	30
Toluene	< 4	4.	mg/m3	121	119	66-123	2	30
Xylene (total)	< 9	9.	mg/m3	120	112	70-134	7	30
Batch number: M1427130AA	Sample number(s): 7614080-7614081							
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins

Lancaster Laboratories Environmental

Acct. # 8390 For Eurofins Lancaster Laboratories Environmental use only Group # 1500259 Sample # 2014097981

Instructions on reverse side correspond with circled numbers.

360232

1 Client Information

Client: GES - 1350 Blair Drive Odenton Md. 21113

Acct. #:

Project Name/#: NRG - PRGS - 1400 N. Royal St. Alexandria Va.

PWSID #:

Project Manager: Greg Reichart - 1800220-3606 ext. 3717

P.O. #: 0402859-03-227

Sampler: Jeff Plummer

Quote #:

Name of state where samples were collected: Virginia

4 Matrix: Sediment ☐ Soil ☐ Ground ☐ Potable ☐ Surface ☐ NPDES ☐ Water Other: Airbag

5 Analysis Requested — Preservation Codes

2 Sample Identification LF 9/25/14

Sample Identification	Collected Date	Collected Time	3 Grab	Composite	Total # of Containers	BTEX (Epa 18)	TPH (C1-C4) (>C4-C10) (Epa 18)
MW-25 * 11:15	9-24-14	*~~0940~~	X		1	X	X
MW-05	9-24-14	1320	X		1	X	X
MW-10S	9-24-14	1445	X		1	X	X

For Lab Use Only

FSC:

SCR#:

Preservation Codes

H=HCl T=Thiosulfate

N=HNO_3 B=NaOH

S=H_2SO_4 O=Other

6 Remarks

*MW-25 was collected @ 11:15 per D. Drennan. LF 9/25/14

7 Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

*EQEDD File Name: NRG PRGS - Lab report number.

~~Date results are needed~~: 25800.EQEDD.zip

*email results to mdlabs@gesonline.com

*email EQEDD package to ges@equisonline.com

*E-mail address:

8 Data Package Options (circle if required)

Type I (Validation/non-CLP) Type VI (Raw Data Only)

Type III (Reduced non-CLP) TX TRRP-13

Type IV (CLP SOW) MA MCP CT RCP

9

Relinquished by	Date	Time	Received by	Date	Time
Jeff Plummer	9-24-14	1645	Denise Woodring	9-24-14	1645
Denise Woodring	9-25-14	12:10	Billy DeLong	9-25-14	12:10
Billy DeLong	9-25-14	14:50			
			Received by: Woods	9/25/14	14:50

EDD Required? Yes No

If yes, format:

Site-Specific QC (MS/MSD/Dup)? Yes No

(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS FedEx Other

Temperature upon receipt N/A °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 30814

Group Number(s): 1506259

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	09/25/2014 14:50
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Total Trip Blank Qty:	0
Custody Seal Present:	No	Trip Blank Type:	N/A
Custody Seal Intact:	N/A	Air Quality Samples Present:	Yes
Samples Chilled:	No	Air Quality Flow Controllers Present:	No
Paperwork Enclosed:	Yes	Flow Controller Quantity:	0
Samples Intact:	Yes	Air Quality Returns:	No
Missing Samples:	No	Summa Canister Returns:	
Extra Samples:	No		
Discrepancy in Container Qty on COC:	No		
Sample IDs on COC match Containers:	Yes		
Sample Date/Times match COC:	No		
VOA Vial Headspace ≥ 6mm:	N/A		
VOA IDs (≥ 6mm):	N/A		

Unpacked by Jordan Woods (6698) at 15:02 on 09/25/2014

Sample Date/Time Discrepancy Details

Sample ID on COC	Date/Time on Label	Comments
MW-25	9/24/2014 11:15	COC lists 0940. Label (11:15) is correct per D. Drennan (GES). LF 9/25/14

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Lancaster, PA 17605-2425

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		Inorganic Qualifiers	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 23, 2014

Project: Potomac River Generation Station

Submittal Date: 10/16/2014
Group Number: 1511601
PO Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-51S SVE Step 1 Grab Air	7640084
MW-51S SVE Step 2 Grab Air	7640085
MW-51S SVE Step 3 Grab Air	7640086
RW-1 SVE Step 2 Grab Air	7640087
RW-1 VEGE Grab Air	7640088
MW-51 VEGE Step 1 Grab Air	7640089
MW-51 VEGE Step 2 Grab Air	7640090
MW-51 VEGE Step 3 Grab Air	7640091
MW-51 AS/VEGE Grab Air	7640092

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: MW-51S SVE Step 1 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640084
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/13/2014 15:20 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	140,000	1,800	100
07090	>C4-C10 Hydrocarbons hexane	n.a.	520	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/16/2014 21:40	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 18:57	Florida A Cimino	100

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Analysis Report

Sample Description: MW-51S SVE Step 2 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640085
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/13/2014 16:05 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	92,000	1,800	100
07090	>C4-C10 Hydrocarbons hexane	n.a.	520	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/16/2014 22:09	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 19:26	Florida A Cimino	100

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Analysis Report

Sample Description: MW-51S SVE Step 3 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640086
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/13/2014 16:48 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	51,000	1,800	100
07090	>C4-C10 Hydrocarbons hexane	n.a.	650	35	1
07090	Ethylbenzene	100-41-4	5	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/16/2014 22:38	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 19:55	Florida A Cimino	100

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Analysis Report

Sample Description: RW-1 SVE Step 2 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640087
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 10:20 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	71	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	< 35	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 20:25	Florida A Cimino	1

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Analysis Report

Sample Description: RW-1 VEGE Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640088
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 11:51 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	22	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	< 35	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 20:54	Florida A Cimino	1

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Analysis Report

Sample Description: MW-51 VEGE Step 1 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640089
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 14:10 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	66	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	< 35	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/17/2014 21:23	Florida A Cimino	1

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Analysis Report

Sample Description: MW-51 VEGE Step 2 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640090
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 14:45 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	120	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	70	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/17/2014 00:34	Florida A Cimino	1

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Analysis Report

Sample Description: MW-51 VEGE Step 3 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640091
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 15:54 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	49	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	< 35	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/17/2014 01:03	Florida A Cimino	1

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Analysis Report

Sample Description: MW-51 AS/VEGE Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7640092
LL Group # 1511601
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/14/2014 16:50 by DD

Submitted: 10/16/2014 14:30
Reported: 10/23/2014 13:52

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	180	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	99	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1428930AA	10/17/2014 01:32	Florida A Cimino	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1511601
Reported: 10/23/14 at 01:52 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1428930AA	Sample number(s): 7640084-7640086,7640090-7640092							
Benzene	< 3	3.	mg/m3	95	99	75-111	4	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	90	98	76-135	9	30
Toluene	< 4	4.	mg/m3	111	113	66-123	1	30
Xylene (total)	< 9	9.	mg/m3	90	98	70-134	8	30
Batch number: M1429030AA	Sample number(s): 7640084-7640089							
Benzene	< 3	3.	mg/m3	88	93	75-111	5	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	82	92	76-135	12	30
Toluene	< 4	4.	mg/m3	97	108	66-123	11	30
Xylene (total)	< 9	9.	mg/m3	81	93	70-134	13	30

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Lancaster Laboratories Environmental

Acct. # 8390 For Eurofins Lancaster Laboratories Environmental use only Group # 1511601 Sample # 7040084-92
Instructions on reverse side correspond with circled numbers.

359519

1 Client Information

Client: NRG
Acct. #:
Project Name/#: Potomac River Generating Station
PWSID #:
Project Manager: Gregory Reichart
P.O. #: 0402859
Sampler: Dan Drennan
Quote #:
Name of state where samples were collected: 1400 North Royal Street, Alexandria, VA

For Lab Use Only
FSC:
SCR#:

Preservation Codes: H=HCl, T=Thiosulfate, N=HNO_3, B=NaOH, S=H_2SO_4, O=Other

2 Sample Identification / 3 Collected / 4 Matrix / 5 Analysis Requested / 6 Remarks

Sample Identification	Collected Date	Collected Time	3 Grab	Composite	4 Sediment	Soil	Ground Water	Potable Water	NPDES Water	Surface Water	Other: Air	Total # of Containers	BTEX via (EPA 18)	TPH C1-C4 via (EPA 25)	TPH >C4 to C10 (EPA 25)	6 Remarks
MW-51S SVE Step 1	10/13/14	1520	X								X	1	x	x	x	
MW-51S SVE Step 2	10/13/14	1605										1				
MW-51S SVE Step 3	10/13/14	1648										1				
RW-1 SVE Step 1 *	10/14/14	9:55										1				
RW-1 SVE Step 2		10:20										1				* BAG received empty. LF 10/17/14
RW-1 VEGE		1151										1				
MW-51 VEGE Step 1		1410										1				
MW-51 VEGE Step 2		1445										1				
MW-51 VEGE Step 3		1654										1				
MW-51 AS/VEGE	10/14/14	1650	X								X	2				

7 Turnaround Time (TAT) Requested (please circle)

Standard Rush

(Rush TAT is subject to laboratory approval and surcharge.)

Equis File: NRG-PRGS.lab report.25800.EQED
~~Date results are needed:~~ pm 6. R/LF 10/17/14

E-mail address: mdlabs@gesonline.com & ges@equisonline.com

8 Data Package Options (circle if required)

Type I (Validation/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) TX TRRP-13
Type IV (CLP SOW) MA MCP CT RCP

9

Relinquished by	Date	Time	Received by	Date	Time
David Drennan	10-14-14	19:05	Denise Woodring	10-15-14	1600
Denise Woodring	10-16-14	11:42	[illegible]	10/16/14	11:42
[illegible]	10/16/14	14:30	[illegible]		
			[illegible]	10/16/14	1430

EDD Required? Yes No
If yes, format: equis edd

Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Temperature upon receipt NA °C

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The white copy should accompany samples to Eurofins Lancaster Laboratories Environmental. The yellow copy should be retained by the client.

7044 0514

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Sample Administration Receipt Documentation Log

Doc Log ID: 34917

Group Number(s): 1511601

Client: NRG

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/16/2014 14:30
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	N/A	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	Yes
Missing Samples:	No	Air Quality Flow Controllers Present:	No
Extra Samples:	No	Air Quality Returns:	No
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 17:40 on 10/16/2014

General Comments: Received Tedlar bag for sample RW-1 SVE Stop 1 with containing little to no air, no damage noticed on tedlar.

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 27, 2014

Project: Potomac River Generation Station

Submittal Date: 10/17/2014
Group Number: 1512028
PO Number: NRG PRGS
Release Number: 0402859-03-270
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-25S TPE Grab Air	7642595
MW-27 SVE Grab Air	7642596
MW-10S TPE Grab Air	7642597
MW-27 VEGE Step 1 Grab Air	7642598
MW-27 VEGE Step 2 Grab Air	7642599

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Analysis Report

Sample Description: MW-25S TPE Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7642595
LL Group # 1512028
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/15/2014 16:31 by DD

Submitted: 10/17/2014 19:14
Reported: 10/27/2014 07:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	7	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	36,000	900	50
07090	>C4-C10 Hydrocarbons hexane	n.a.	1,200	35	1
07090	Ethylbenzene	100-41-4	20	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	10	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/18/2014 00:47	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429330AA	10/20/2014 17:22	Florida A Cimino	50

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Analysis Report

Sample Description: MW-27 SVE Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7642596
LL Group # 1512028
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/15/2014 10:02 by DD

Submitted: 10/17/2014 19:14
Reported: 10/27/2014 07:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	6,100	900	50
07090	>C4-C10 Hydrocarbons hexane	n.a.	70	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/18/2014 01:16	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429330AA	10/20/2014 17:52	Florida A Cimino	50

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Analysis Report

Sample Description: MW-10S TPE Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7642597
LL Group # 1512028
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/16/2014 10:20 by DD

Submitted: 10/17/2014 19:14
Reported: 10/27/2014 07:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	7	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	20,000	900	50
07090	>C4-C10 Hydrocarbons hexane	n.a.	1,000	35	1
07090	Ethylbenzene	100-41-4	20	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	10	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/18/2014 01:46	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429330AA	10/20/2014 18:21	Florida A Cimino	50

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Analysis Report

Sample Description: MW-27 VEGE Step 1 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7642598
LL Group # 1512028
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/16/2014 12:35 by DD

Submitted: 10/17/2014 19:14
Reported: 10/27/2014 07:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	3,000	900	50
07090	>C4-C10 Hydrocarbons hexane	n.a.	55	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/18/2014 02:44	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429330AA	10/20/2014 18:50	Florida A Cimino	50

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Analysis Report

Sample Description: MW-27 VEGE Step 2 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7642599
LL Group # 1512028
Account # 08390

Project Name: Potomac River Generation Station

Collected: 10/16/2014 12:57 by DD

Submitted: 10/17/2014 19:14
Reported: 10/27/2014 07:29

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	4,400	900	50
07090	>C4-C10 Hydrocarbons hexane	n.a.	81	35	1
07090	Ethylbenzene	100-41-4	< 4	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	< 9	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429030AA	10/18/2014 03:13	Florida A Cimino	1
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1429330AA	10/20/2014 19:19	Florida A Cimino	50

Quality Control Summary

Client Name: GES, Inc. Group Number: 1512028
Reported: 10/27/14 at 07:29 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1429030AA	Sample number(s): 7642595-7642599							
Benzene	< 3	3.	mg/m3	88	93	75-111	5	30
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	82	92	76-135	12	30
Toluene	< 4	4.	mg/m3	97	108	66-123	11	30
Xylene (total)	< 9	9.	mg/m3	81	93	70-134	13	30
Batch number: M1429330AA	Sample number(s): 7642595-7642599							
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

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Lancaster Laboratories Environmental

For Eurofins Lancaster Laboratories Environmental use only
Acct. # 8390 Group # 572028 Sample # 7042595-99
Instructions on reverse side correspond with circled numbers.

359521

1 Client Information

Client: NRG
Acct. #:
Project Name/#: Potomac River Generating Station
PWSID #:
Project Manager: Greg Reichart
P.O. #: 0402859-03-270
Sampler: Dan Drennan
Quote #:
Name of state where samples were collected: VA
1400 North Royal St, Alexandria, VA

4 Matrix: Sediment ☐ Soil ☐ Water: Ground ☐ Potable ☐ Surface ☐ NPDES ☐ Other: Air

5 Analysis Requested — Preservation Codes

For Lab Use Only
FSC:
SCR#:

Preservation Codes
H=HCl T=Thiosulfate
N=HNO_3 B=NaOH
S=H_2SO_4 O=Other

6 Remarks

2 Sample Identification	Collected Date	Collected Time	3 Grab	Composite	Total # of Containers	BTEX via EPA 18	TPH C1-C4 via EPA 25/18	TPH >C4-C10 via EPA 25/18
MW-25S TPE	10/15/14	16:31	X		2	X	X	X
MW-27 SVE	10/15/14	10:02	X		2	X	X	X
MW-10S TPE	10/16/14	10:20	X		2	X	X	X
MW-27 VEGE Step 1	10/16/14	12:35	X		2	X	X	X
MW-27 VEGE Step 2	10/16/14	12:57	X		2	X	X	X

7 Turnaround Time (TAT) Requested (please circle)
Standard Rush
(Rush TAT is subject to laboratory approval and surcharge.)
Date results are needed: EQEDD File Name: NRG-PRES-Lab Report Number. 25800. EQEDD.zip
E-mail address: mdlabs@gesonline.com and ges@equisonline.com

8 Data Package Options (circle if required)
Type I (Validation/non-CLP) Type VI (Raw Data Only)
Type III (Reduced non-CLP) TX TRRP-13
Type IV (CLP SOW) MA MCP CT RCP

9

Relinquished by	Date	Time	Received by	Date	Time
Daniel Drennan	10/17/14	1115	Denise Wooding	10-17-14	1115
Denise Wooding	10/17/14	1440	[signature]	10-17-14	1440
[signature]	10-17-14	1914			
			[signature]	10/17/14	19:14

EDD Required? Yes No
If yes, format: See box 7
Site-Specific QC (MS/MSD/Dup)? Yes No
(If yes, indicate QC sample and submit triplicate sample volume.)

Relinquished by Commercial Carrier:
UPS _____ FedEx _____ Other _____
Temperature upon receipt N/A °C

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Sample Administration Receipt Documentation Log

Doc Log ID: 35259

Group Number(s): 1572028

Client: NRG

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/17/2014 19:14
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	No
Samples Chilled:	N/A	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	Yes
Missing Samples:	No	Air Quality Flow Controllers Present:	No
Extra Samples:	No	Air Quality Returns:	No
Discrepancy in Container Qty on COC:	No		

Unpacked by Jordan Woods (6698) at 19:29 on 10/17/2014

Sample Date/Time Discrepancy Details

Sample ID on COC	Date/Time on Label	Comments
MW-27 VEGE Step 2	10/16/2014 12:35	Time correct on one sample.

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers

A	TIC is a possible aldol-condensation product
B	Analyte was also detected in the blank
C	Pesticide result confirmed by GC/MS
D	Compound quantitated on a diluted sample
E	Concentration exceeds the calibration range of the instrument
N	Presumptive evidence of a compound (TICs only)
P	Concentration difference between primary and confirmation columns >25%
U	Compound was not detected
X,Y,Z	Defined in case narrative

Inorganic Qualifiers

B	Value is <CRDL, but ≥IDL
E	Estimated due to interference
M	Duplicate injection precision not met
N	Spike sample not within control limits
S	Method of standard additions (MSA) used for calculation
U	Compound was not detected
W	Post digestion spike out of control limits
*****	Duplicate analysis not within control limits
+	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

WARRANTY AND LIMITS OF LIABILITY - In accepting analytical work, we warrant the accuracy of test results for the sample as submitted. THE FOREGOING EXPRESS WARRANTY IS EXCLUSIVE AND IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WE DISCLAIM ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING A WARRANTY OF FITNESS FOR PARTICULAR PURPOSE AND WARRANTY OF MERCHANTABILITY. IN NO EVENT SHALL EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL, LLC BE LIABLE FOR INDIRECT, SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES INCLUDING, BUT NOT LIMITED TO, DAMAGES FOR LOSS OF PROFIT OR GOODWILL REGARDLESS OF (A) THE NEGLIGENCE (EITHER SOLE OR CONCURRENT) OF EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL AND (B) WHETHER EUROFINS LANCASTER LABORATORIES ENVIRONMENTAL HAS BEEN INFORMED OF THE POSSIBILITY OF SUCH DAMAGES. We accept no legal responsibility for the purposes for which the client uses the test results. No purchase order or other order for work shall be accepted by Eurofins Lancaster Laboratories Environmental which includes any conditions that vary from the Standard Terms and Conditions, and Eurofins Lancaster Laboratories Environmental hereby objects to any conflicting terms contained in any acceptance or order submitted by client.

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

October 31, 2014

Project: NRG PRGS

Submittal Date: 10/28/2014
Group Number: 1514216
PO Number: NRG PRGS
Release Number: 0402859
State of Sample Origin: VA

Client Sample Description	Lancaster Labs (LL) #
MW-25 Grab Air	7653333

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	GES, Inc.-MD	Attn: Report Distribution
ELECTRONIC COPY TO	GES	Attn: Greg Reichart

Respectfully Submitted,

Lynn M. Frederiksen
Principal Specialist Group Leader

(717) 556-7255

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Lancaster Laboratories Environmental
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Analysis Report

Sample Description: MW-25 Grab Air
NRG PRGS - Alexandria, VA

LL Sample # AQ 7653333
LL Group # 1514216
Account # 08390

Project Name: NRG PRGS

Collected: 10/27/2014 12:30 by JP

Submitted: 10/28/2014 16:20
Reported: 10/31/2014 15:07

GES, Inc.
Suite A
1350 Blair Dr
Odenton MD 21113

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Limit of Quantitation	Dilution Factor
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		**mg/m3**	**mg/m3**	
07090	Benzene	71-43-2	< 3	3	1
07090	C1-C4 Hydrocarbons as propane	n.a.	22	18	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	220	35	1
07090	Ethylbenzene	100-41-4	9	4	1
07090	Toluene	108-88-3	< 4	4	1
07090	Xylene (total)	1330-20-7	30	9	1

General Sample Comments

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	BTEX/C1-C4/>C4-C10	EPA 18 mod/EPA 25 mod	1	M1430230AA	10/29/2014 18:15	Florida A Cimino	1

Quality Control Summary

Client Name: GES, Inc. Group Number: 1514216
Reported: 10/31/14 at 03:07 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank LOQ	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1430230AA	Sample number(s): 7653333							
Benzene	< 3	3.	mg/m3	99	97	75-111	2	30
C1-C4 Hydrocarbons as propane	< 18	18.	mg/m3					
>C4-C10 Hydrocarbons hexane	< 35	35.	mg/m3					
Ethylbenzene	< 4	4.	mg/m3	101	102	76-135	1	30
Toluene	< 4	4.	mg/m3	118	113	66-123	4	30
Xylene (total)	< 9	9.	mg/m3	102	99	70-134	3	30

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Environmental Analysis Request/Chain of Custody

eurofins | Lancaster Laboratories Environmental

Acct. # 8390 Group # 1514216 Sample # 7653333

| | | |

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Sample Administration Receipt Documentation Log

Doc Log ID: 36976

Group Number(s): 1514216

Client: GES

Delivery and Receipt Information

Delivery Method:	ELLE Courier	Arrival Timestamp:	10/28/2014 16:20
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	VA		

Arrival Condition Summary

Shipping Container Sealed:	No	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	N/A	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	Yes
Missing Samples:	No	Air Quality Flow Controllers Present:	No
Extra Samples:	No	Air Quality Returns:	No
Discrepancy in Container Qty on COC:	No		

Unpacked by Patrick Engle (3472) at 16:37 on 10/28/2014

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umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

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> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.

ppb parts per billion

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APPENDIX K

Feasibility Testing Data Summary

TESTS 1 & 2

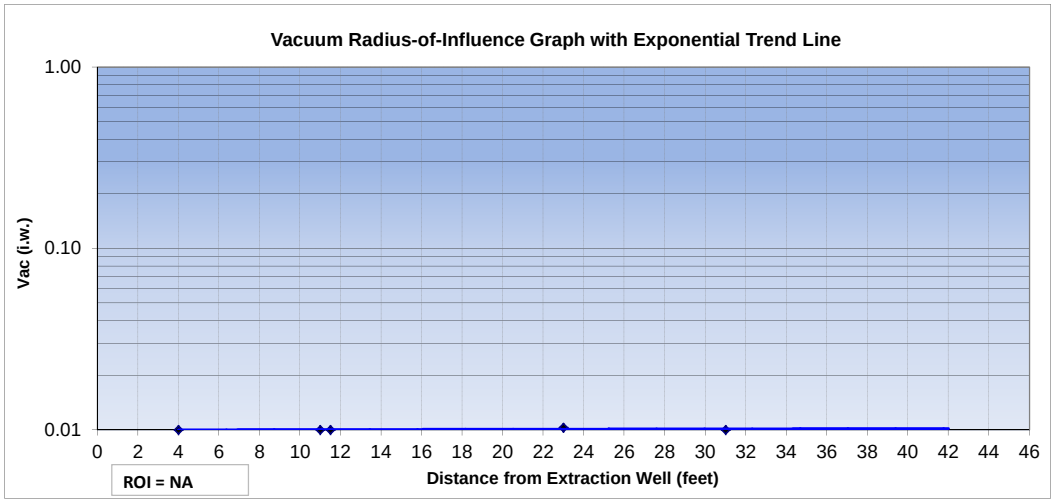
Air Sparge / SVE Testing at SP-1 and MW-51

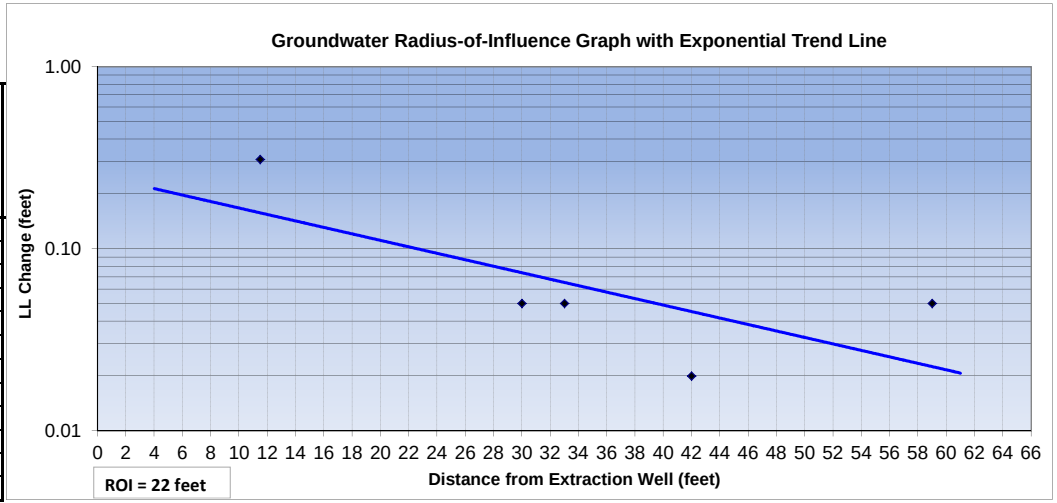
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 1
Test Description: SVE
Extraction Well: MW-51
Sparge Well: -
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	11:22:48
End of Step Time:	11:59:18
Extraction Well ID:	MW-51
Initial DTW (feet):	26.94
Total Depth (feet):	37
Screen Interval (feet):	10
Average Vapor Flow (scfm):	0.0
Blower Discharge Temp. (F):	104
Average Vac @ well (in H_2O):	-15
PID concentration (ppm):	NM
Percent Oxygen (%):	NM
Max Upwelling/Drawdown (feet):	0.89

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	4	15.5-25.5	21.52	0.00	NA
MW-8S	11	15-25	21.72	-0.01	-0.01
RW-1	11.5	26-41	27.09	-0.01	0.31
MW-10S	23	17-27	22.21	-0.01	0.02
MW-25S	31	16-26	22.11	-0.01	0.00
MW-05	42	25-35	26.71	NM	0.02
MW-11	33	25-35	26.86	NM	0.05
MW-25	30	25-35	27.03	NM	0.05
MW-109	59	14-24	15.09	NM	0.05
MW-109S	61	3.5-13.5	10.58	NM	0.00
MW-106	112	3-10	7.92	NM	0.02
TW-05	120	0-10	6.58	NM	0.06





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

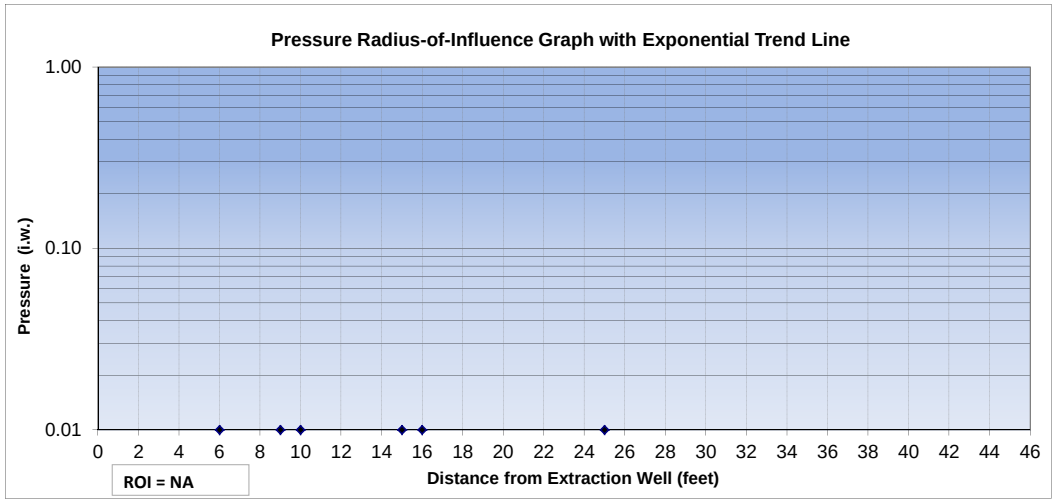
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

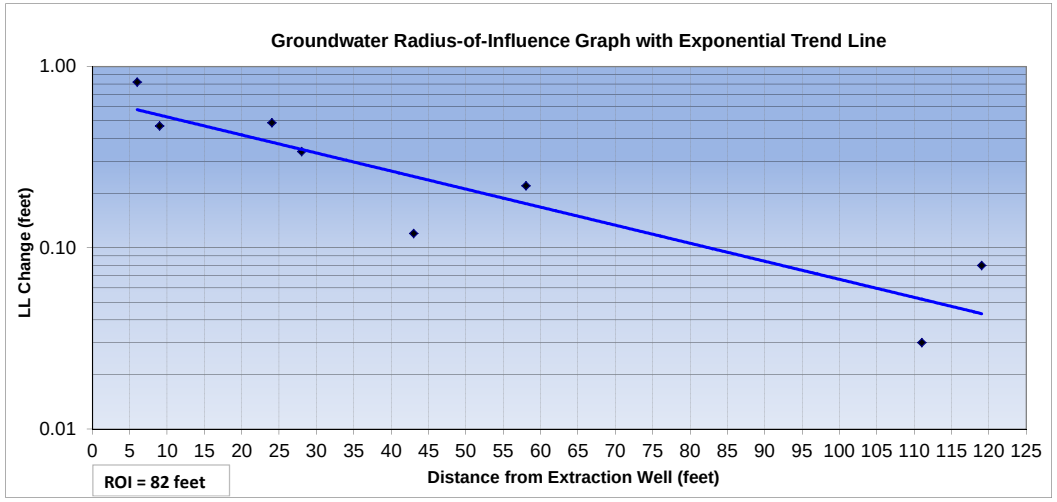
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 2
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-1
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	12:17:18
End of Step Time:	12:50:48
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	35
Screen Interval (feet):	32-35
Avg. Injection Pressure (psi):	6.0
Average Sparge Flow (scfm):	0.7
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	6	27-37	26.94	0.00	0.82
RW-1	9	26-41	27.09	-0.01	0.47
MW-51S	10	15.5-25.5	21.52	0.00	NA
MW-8S	15	15-25	21.72	-0.01	0.01
MW-10S	16	17-27	22.21	-0.01	0.02
MW-25S	25	16-26	22.11	-0.01	0.00
MW-05	43	25-35	26.71	NM	0.12
MW-11	28	25-35	26.86	NM	0.34
MW-25	24	25-35	27.03	NM	0.49
MW-109	58	14-24	15.09	NM	0.22
MW-109S	60	3.5-13.5	10.58	NM	0.00
MW-106	111	3-10	7.92	NM	0.03
TW-05	119	0-10	6.58	NM	0.08





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

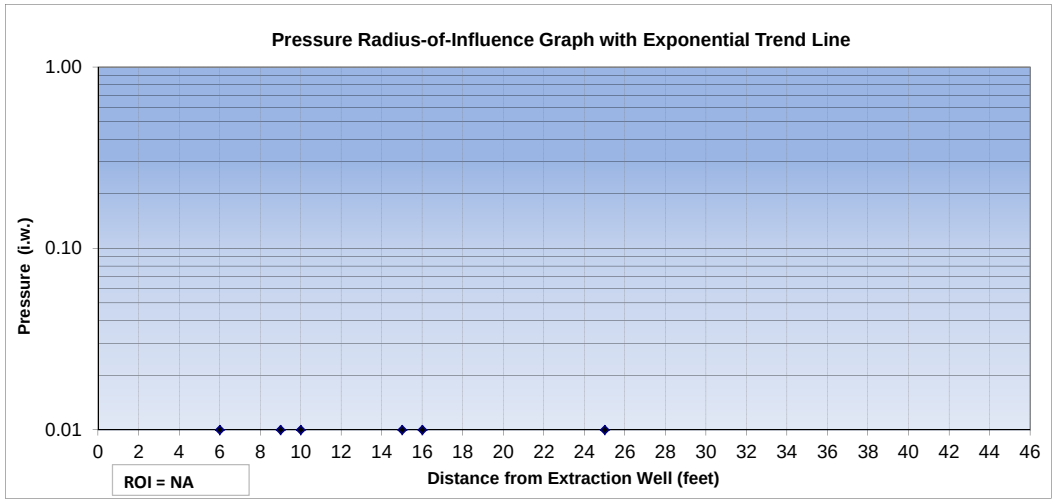
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

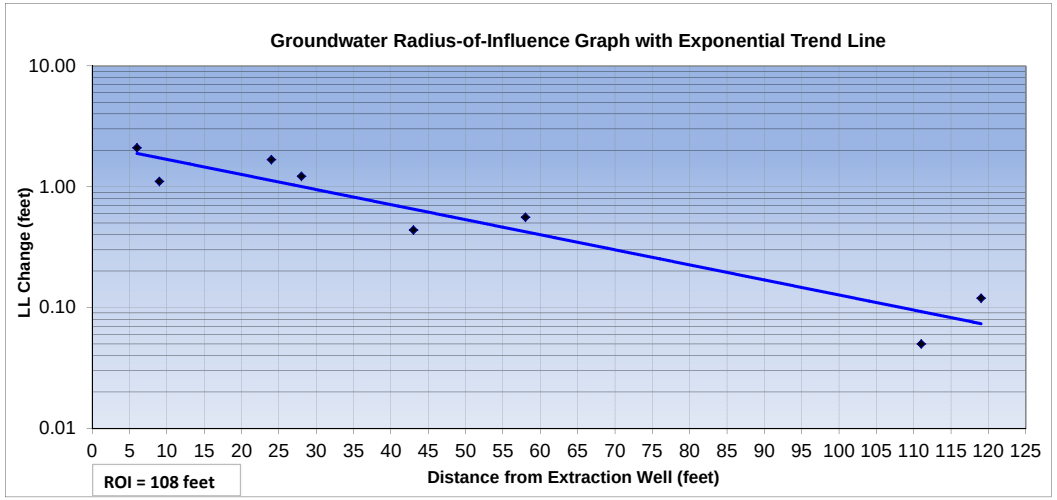
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 2
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-1
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	12:51:18
End of Step Time:	13:41:49
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	35
Screen Interval (feet):	32-35
Avg. Injection Pressure (psi):	6.6
Average Sparge Flow (scfm):	2.1
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	6	27-37	26.94	0.00	2.10
RW-1	9	26-41	27.09	-0.01	1.11
MW-51S	10	15.5-25.5	21.52	-0.01	NA
MW-8S	15	15-25	21.72	-0.01	0.02
MW-10S	16	17-27	22.21	-0.02	0.02
MW-25S	25	16-26	22.11	-0.01	0.00
MW-05	43	25-35	26.71	NM	0.44
MW-11	28	25-35	26.86	NM	1.22
MW-25	24	25-35	27.03	NM	1.68
MW-109	58	14-24	15.09	NM	0.56
MW-109S	60	3.5-13.5	10.58	NM	0.00
MW-106	111	3-10	7.92	NM	0.05
TW-05	119	0-10	6.58	NM	0.12





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

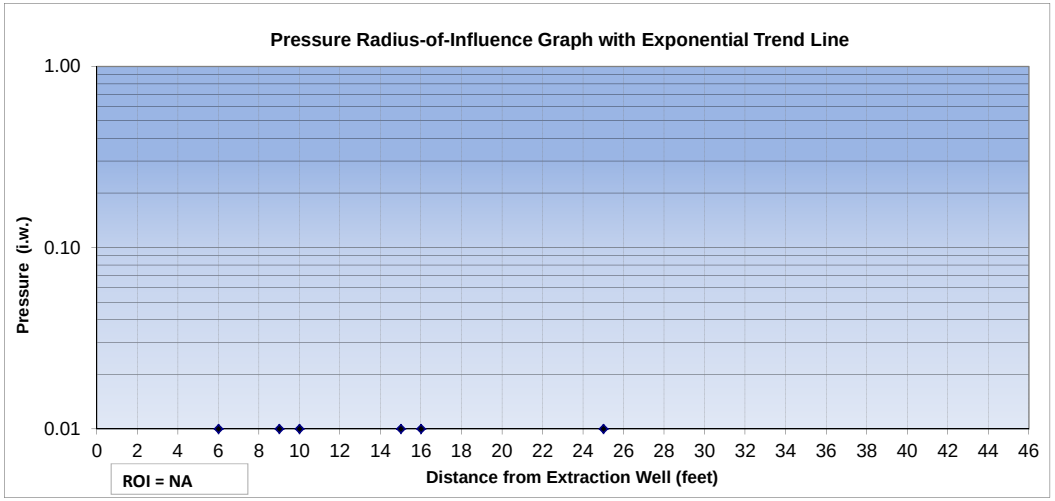
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

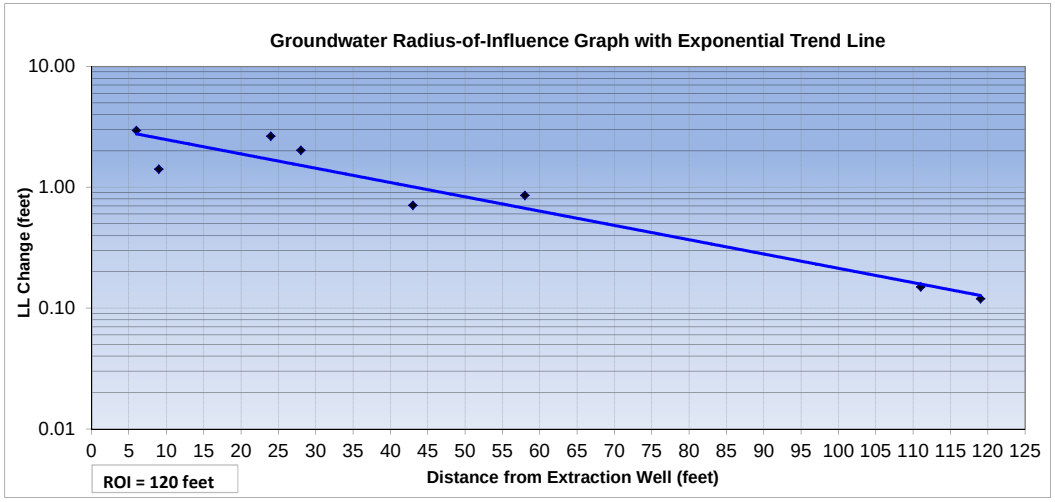
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 2
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-1
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	13:42:19
End of Step Time:	14:09:19
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	35
Screen Interval (feet):	32-35
Avg. Injection Pressure (psi):	7.7
Average Sparge Flow (scfm):	3.9
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	6	27-37	26.94	0.00	2.97
RW-1	9	26-41	27.09	-0.01	1.42
MW-51S	10	15.5-25.5	21.52	-0.01	NA
MW-8S	15	15-25	21.72	-0.01	0.08
MW-10S	16	17-27	22.21	-0.02	0.03
MW-25S	25	16-26	22.11	-0.01	0.00
MW-05	43	25-35	26.71	NM	0.71
MW-11	28	25-35	26.86	NM	2.03
MW-25	24	25-35	27.03	NM	2.66
MW-109	58	14-24	15.09	NM	0.86
MW-109S	60	3.5-13.5	10.58	NM	0.00
MW-106	111	3-10	7.92	NM	0.15
TW-05	119	0-10	6.58	NM	0.12





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

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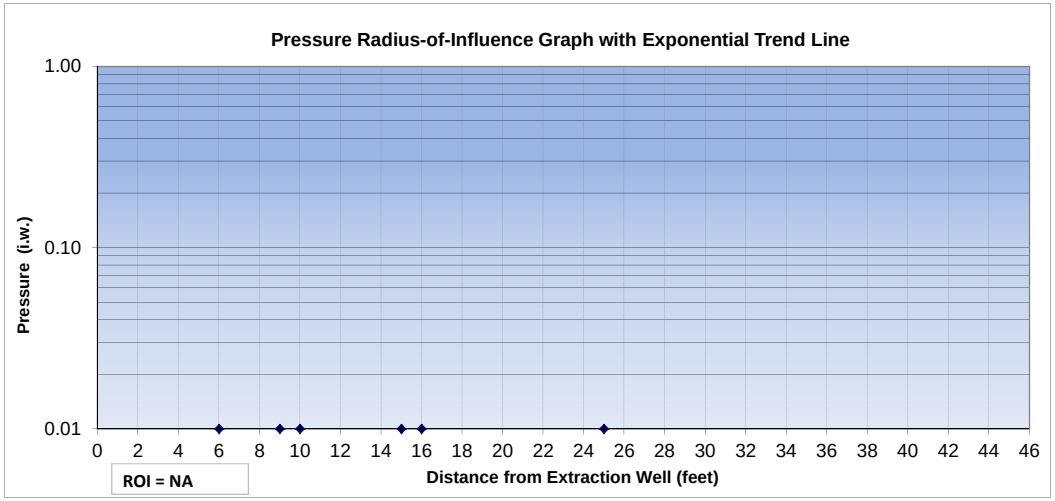
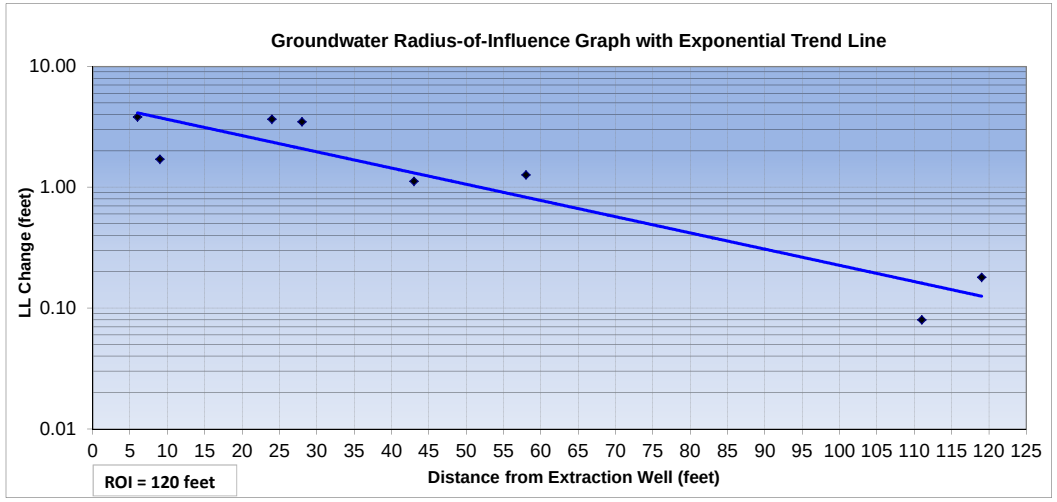
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 2
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-1
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	14:09:49
End of Step Time:	14:36:19
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	35
Screen Interval (feet):	32-35
Avg. Injection Pressure (psi):	9.9
Average Sparge Flow (scfm):	5.8
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	6	27-37	26.94	0.00	3.82
RW-1	9	26-41	27.09	0.00	1.71
MW-51S	10	15.5-25.5	21.52	-0.01	NA
MW-8S	15	15-25	21.72	0.00	0.08
MW-10S	16	17-27	22.21	-0.02	0.03
MW-25S	25	16-26	22.11	-0.01	0.00
MW-05	43	25-35	26.71	NM	1.12
MW-11	28	25-35	26.86	NM	3.49
MW-25	24	25-35	27.03	NM	3.66
MW-109	58	14-24	15.09	NM	1.27
MW-109S	60	3.5-13.5	10.58	NM	0.00
MW-106	111	3-10	7.92	NM	0.08
TW-05	119	0-10	6.58	NM	0.18





NOTES:

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NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

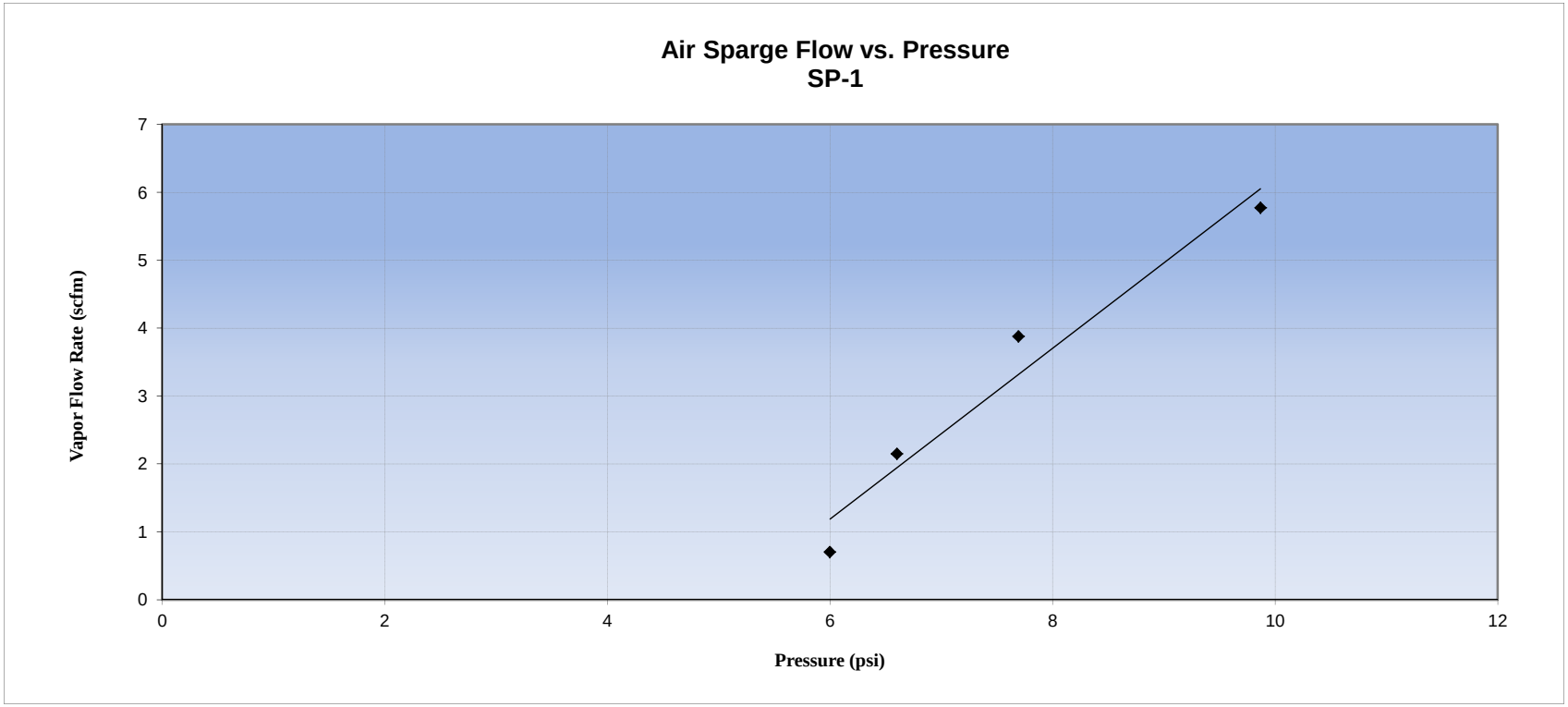
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

Air Sparge Flow vs. Pressure Data

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 2
Test Description: Air Sparge
Test Well: SP-1

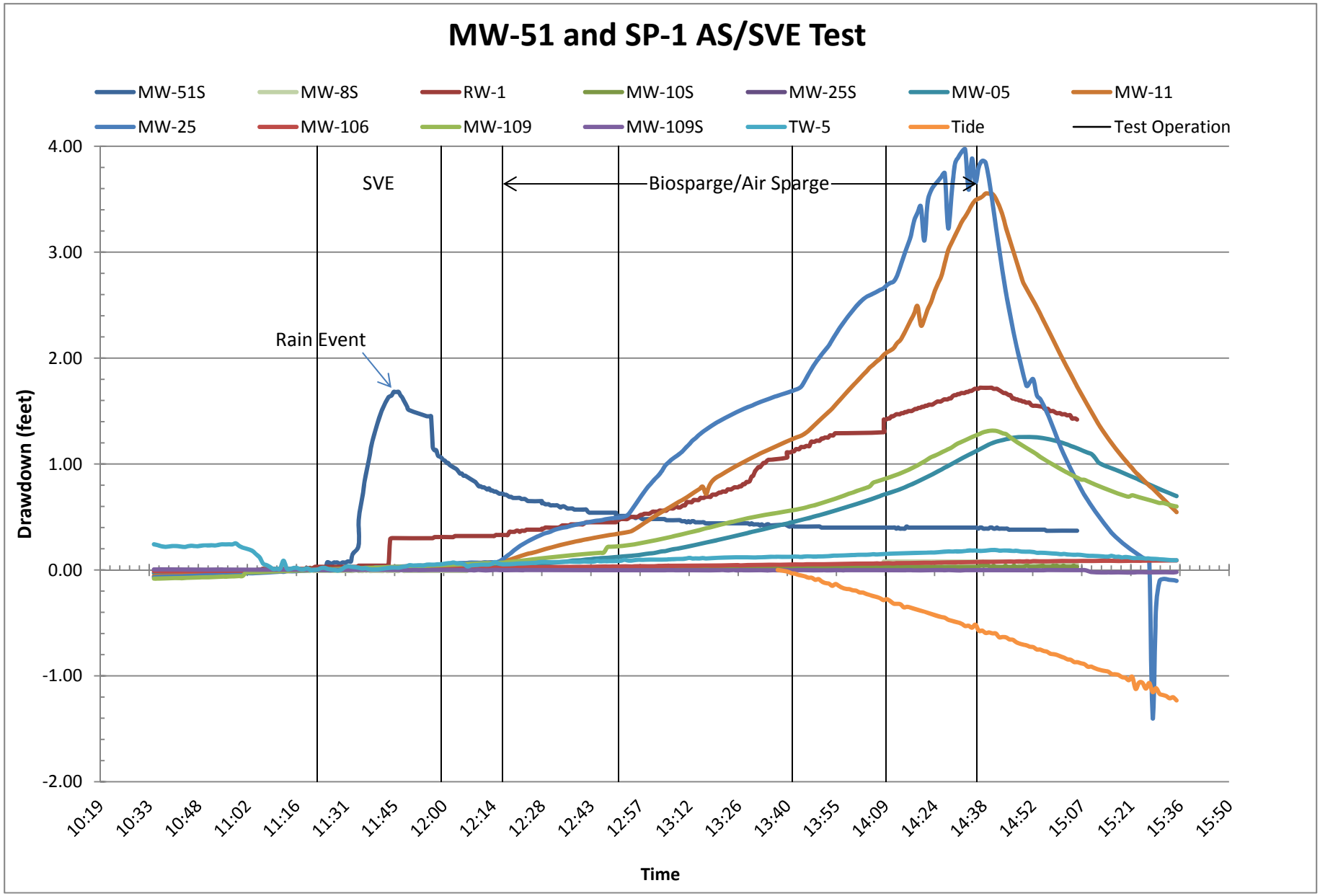
Test Date:	October 13, 2014
Injection Well ID:	SP-1
Initial DTW (feet):	27.0
Initial DTP (feet):	-
Total Depth (feet):	35
Screen Length (feet):	3

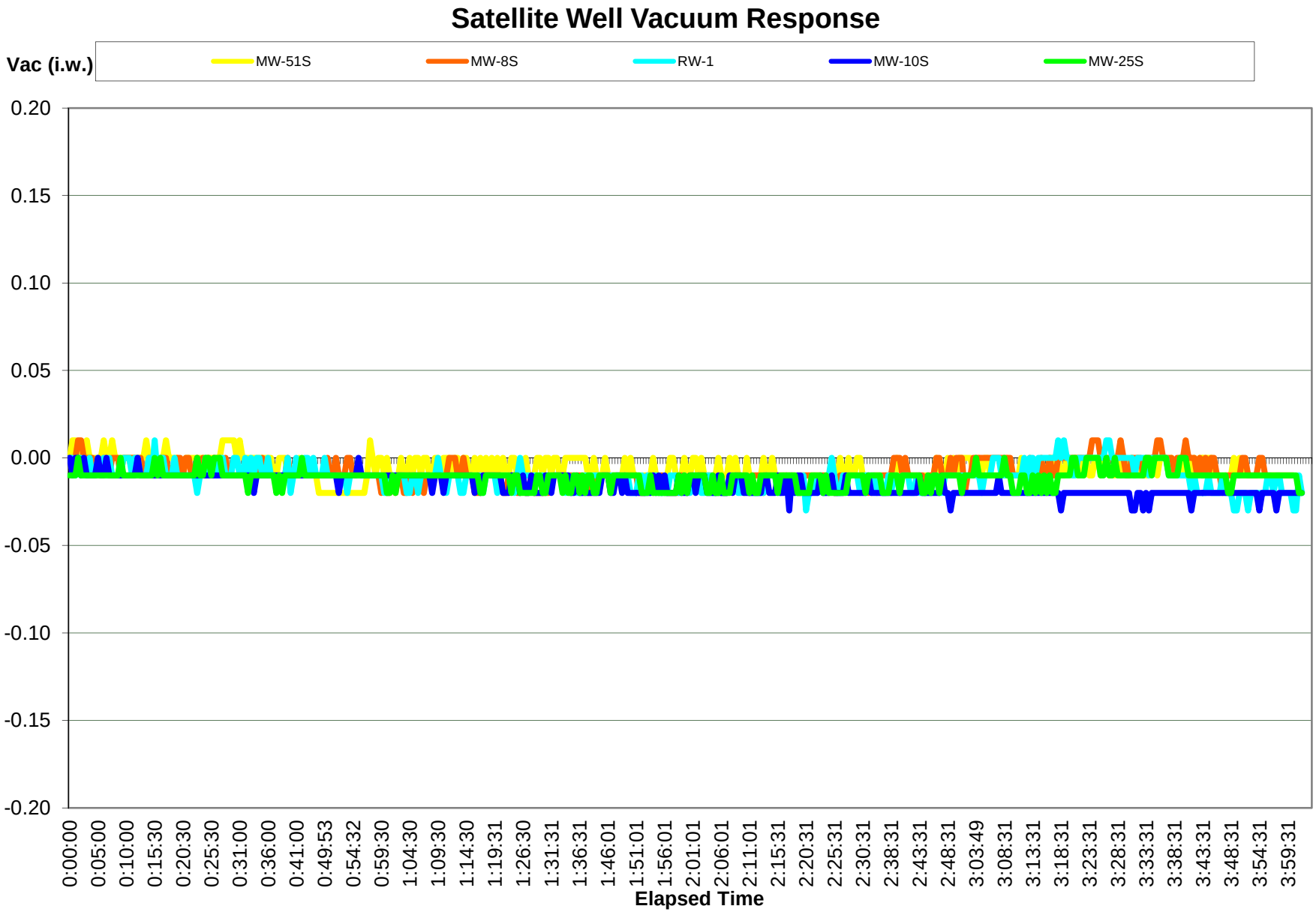
Step Number	***Avg. Injection Pressure (psi)***	***Avg. Air Flow (scfm)***
1	6.0	0.7
2	6.6	2.1
3	7.7	3.9
4	9.9	5.8

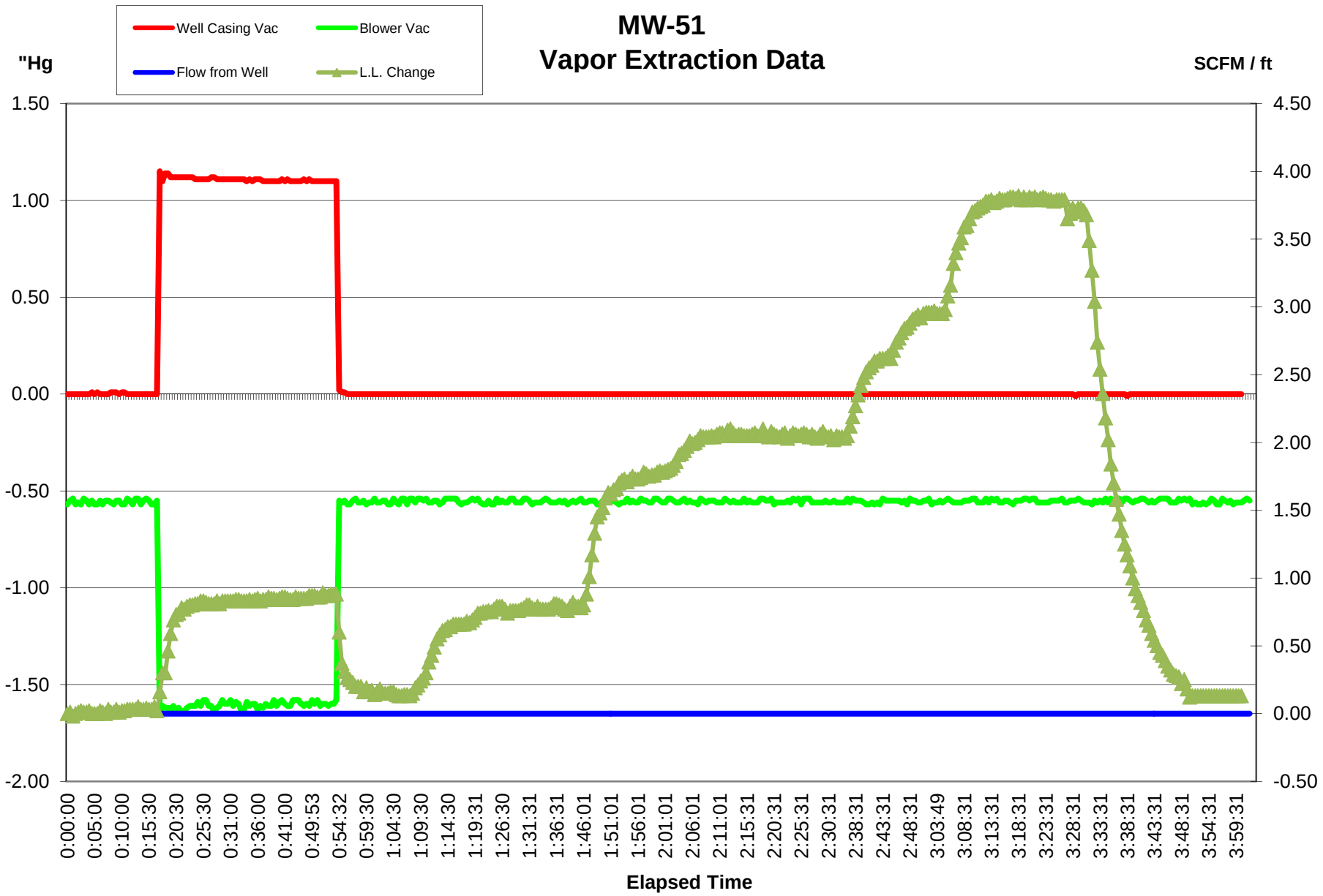


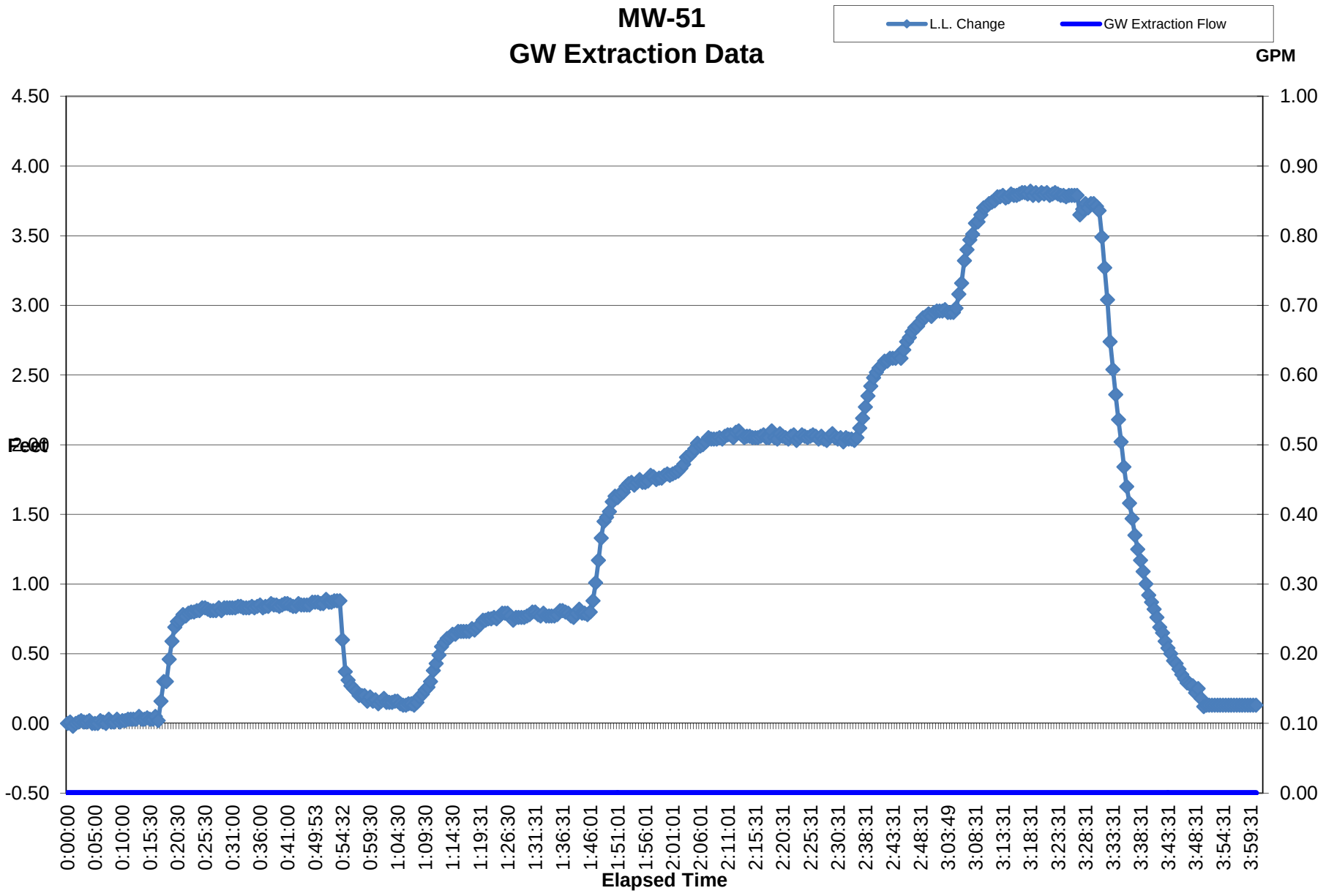
LIQUID LEVEL INFLUENCE GRAPH

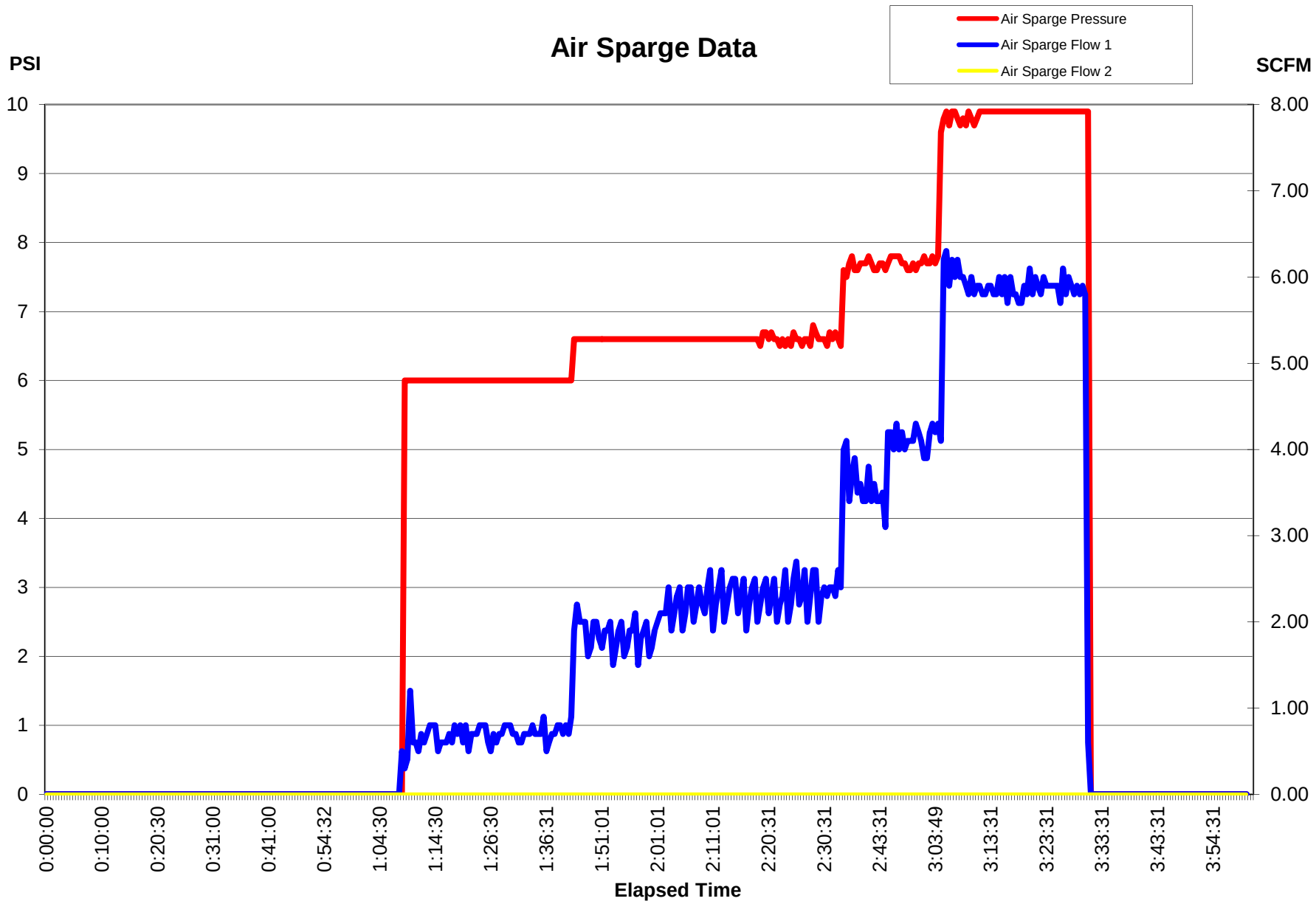
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
Vac (i.w.)
MW-51S
MW-8S
RW-1
MW-10S
MW-25S
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
0:00:00
0:05:00
0:10:00
0:15:30
0:20:30
0:25:30
0:31:00
0:36:00
0:41:00
0:49:53
0:54:32
0:59:30
1:04:30
1:09:30
1:14:30
1:19:31
1:26:30
1:31:31
1:36:31
1:46:01
1:51:01
1:56:01
2:01:01
2:06:01
2:11:01
2:15:31
2:20:31
2:25:31
2:30:31
2:38:31
2:43:31
2:48:31
3:03:49
3:08:31
3:13:31
3:18:31
3:23:31
3:28:31
3:33:31
3:38:31
3:43:31
3:48:31
3:54:31
3:59:31
Elapsed Time


MW-51
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
0:00:00
0:05:00
0:10:00
0:15:30
0:20:30
0:25:30
0:31:00
0:36:00
0:41:00
0:49:53
0:54:32
0:59:30
1:04:30
1:09:30
1:14:30
1:19:31
1:26:30
1:31:31
1:36:31
1:46:01
1:51:01
1:56:01
2:01:01
2:06:01
2:11:01
2:15:31
2:20:31
2:25:31
2:30:31
2:38:31
2:43:31
2:48:31
3:03:49
3:08:31
3:13:31
3:18:31
3:23:31
3:28:31
3:33:31
3:38:31
3:43:31
3:48:31
3:54:31
3:59:31
Elapsed Time


MW-51
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0:00:00
0:05:00
0:10:00
0:15:30
0:20:30
0:25:30
0:31:00
0:36:00
0:41:00
0:49:53
0:54:32
0:59:30
1:04:30
1:09:30
1:14:30
1:19:31
1:26:30
1:31:31
1:36:31
1:46:01
1:51:01
1:56:01
2:01:01
2:06:01
2:11:01
2:15:31
2:20:31
2:25:31
2:30:31
2:38:31
2:43:31
2:48:31
3:03:49
3:08:31
3:13:31
3:18:31
3:23:31
3:28:31
3:33:31
3:38:31
3:43:31
3:48:31
3:54:31
3:59:31
Elapsed Time


Air Sparge Data
Air Sparge Pressure
Air Sparge Flow 1
Air Sparge Flow 2
PSI
SCFM
10
9
8
7
6
5
4
3
2
1
0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0:00:00
0:10:00
0:20:30
0:31:00
0:41:00
0:54:32
1:04:30
1:14:30
1:26:30
1:36:31
1:51:01
2:01:01
2:11:01
2:20:31
2:30:31
2:43:31
3:03:49
3:13:31
3:23:31
3:33:31
3:43:31
3:54:31
Elapsed Time

TEST 3

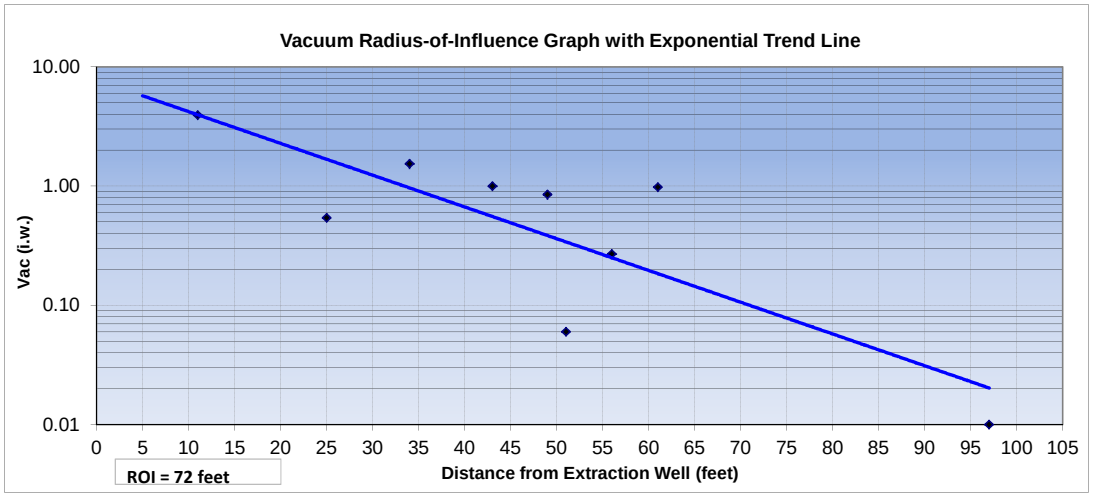
SVE Testing MW-51S

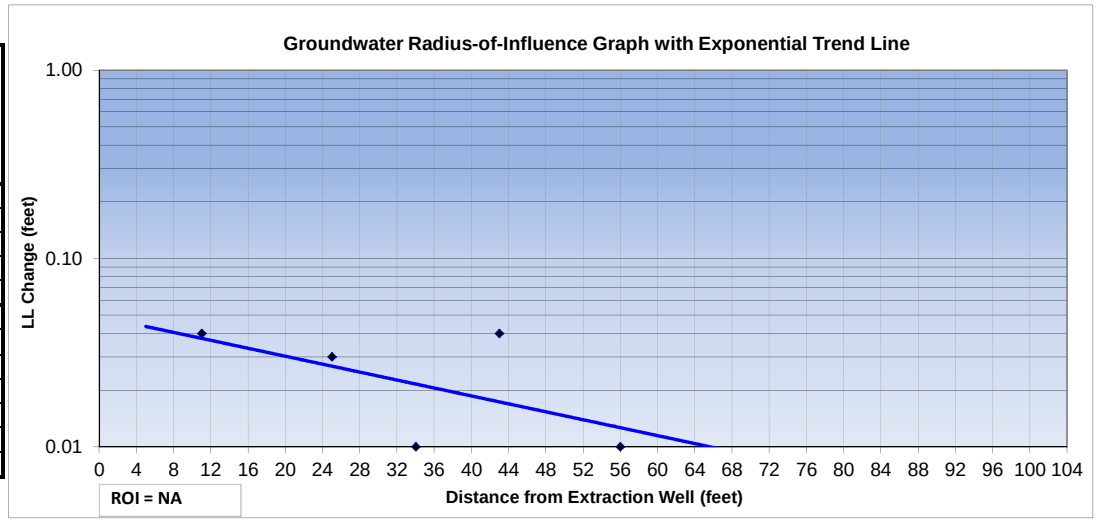
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 3
Test Description: SVE
Extraction Well: MW-51S
Sparge Well: -
Step Number: 1

Test Date:	October 13, 2014
Start of Step Time:	15:10:19
End of Step Time:	15:48:19
Extraction Well ID:	MW-51S
Initial DTW (feet):	21.52
Total Depth (feet):	25.5
Screen Interval (feet):	10
PID concentration (ppm):	18.1
Percent Oxygen (%):	13.1
Average Vapor Flow (scfm):	37.1
Blower Discharge Temp. (F):	118
Average Vac @ well (in H_2O):	-28
Max Upwelling/Drawdown (feet):	0.81

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	5	27-37	26.94	-1.69	-0.18
MW-8S	11	15-25	21.72	-3.93	0.04
RW-1	12	26-41	27.09	-0.02	NA (1.38)
MW-10S	25	17-27	22.21	-0.54	0.03
MW-25S	34	16-26	22.11	-1.54	0.00
MW-5	43	25-35	26.71	-1.00	0.04
MW-1S	49	15-25	23.06	-0.85	NM
MW-30S	51	16-26	24.87	-0.06	NM
MW-72S	61	15-25	21.69	-0.98	NM
MW-107	97	3-11	10.67	0.00	NM
MW-11	33	25-35	26.86	0.00	NA (-1.28)
MW-109S	56	3.5-13.5	10.58	-0.27	-0.02





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

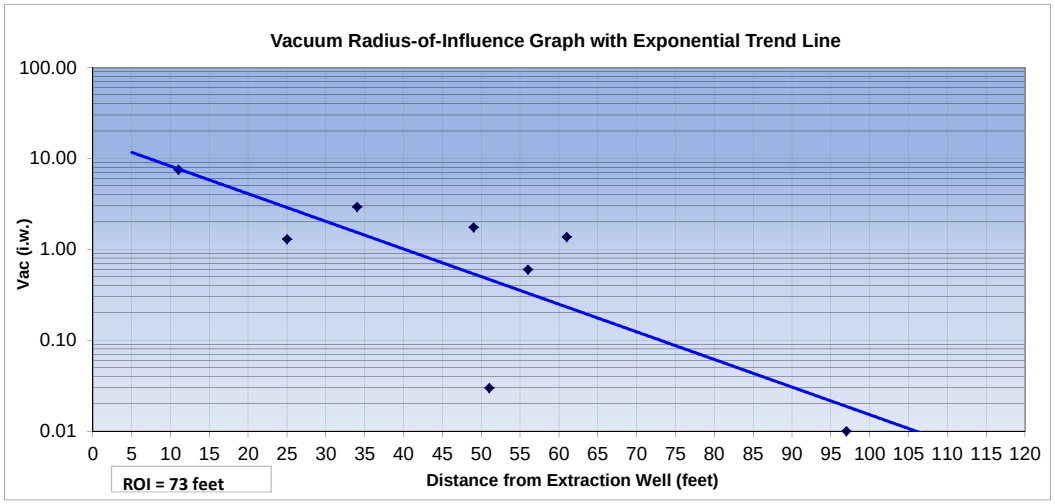
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

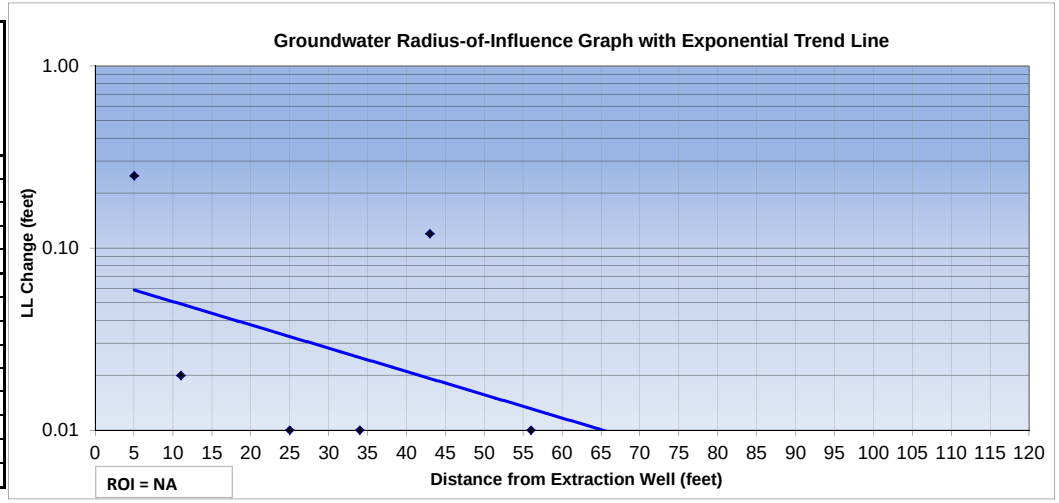
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 3
Test Description: SVE
Extraction Well: MW-51S
Sparge Well: -
Step Number: 2

Test Date:	October 13, 2014
Start of Step Time:	15:48:49
End of Step Time:	16:22:19
Extraction Well ID:	MW-51S
Initial DTW (feet):	21.52
Total Depth (feet):	25.5
Screen Interval (feet):	10
PID concentration (ppm):	14.9
Percent Oxygen (%):	14.5
Average Vapor Flow (scfm):	64.9
Blower Discharge Temp. (F):	144
Average Vac @ well (in H_2O):	-54
Max Upwelling/Drawdown (feet):	1.62

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	5	27-37	26.94	-2.72	0.25
MW-8S	11	15-25	21.72	-7.54	0.02
RW-1	12	26-41	27.09	-0.02	0.78
MW-10S	25	17-27	22.21	-1.30	0.01
MW-25S	34	16-26	22.11	-2.93	0.00
MW-5	43	25-35	26.71	0.00	0.12
MW-1S	49	15-25	23.06	-1.75	NM
MW-30S	51	16-26	24.87	-0.03	NM
MW-72S	61	15-25	21.69	-1.37	NM
MW-106	112	3-10	7.92	0.00	0.02
MW-107	97	3-11	10.67	0.00	NM
MW-11	33	25-35	26.86	0.00	-1.52
MW-109S	56	3.5-13.5	10.58	-0.60	-0.04
MW-109	55	14-24	15.09	0.00	-0.12





NOTES:

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NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
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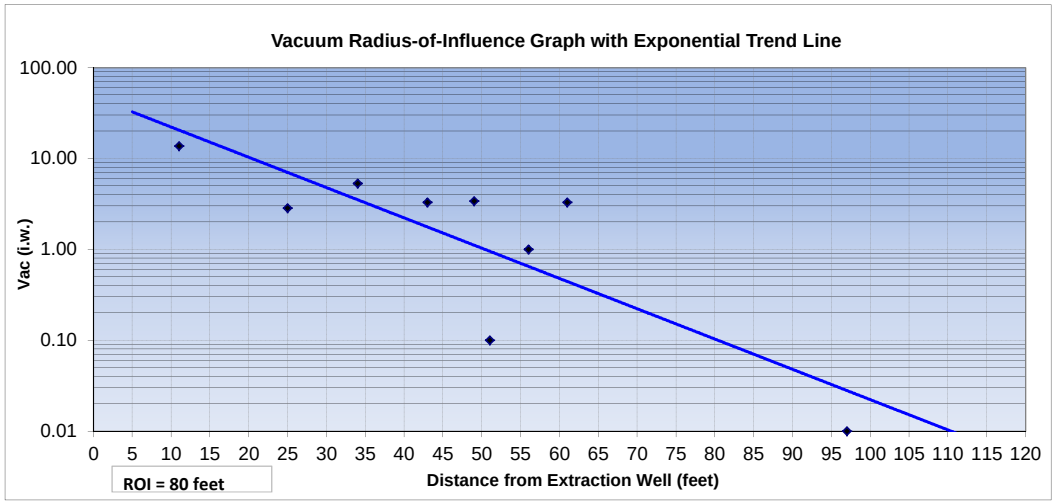
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

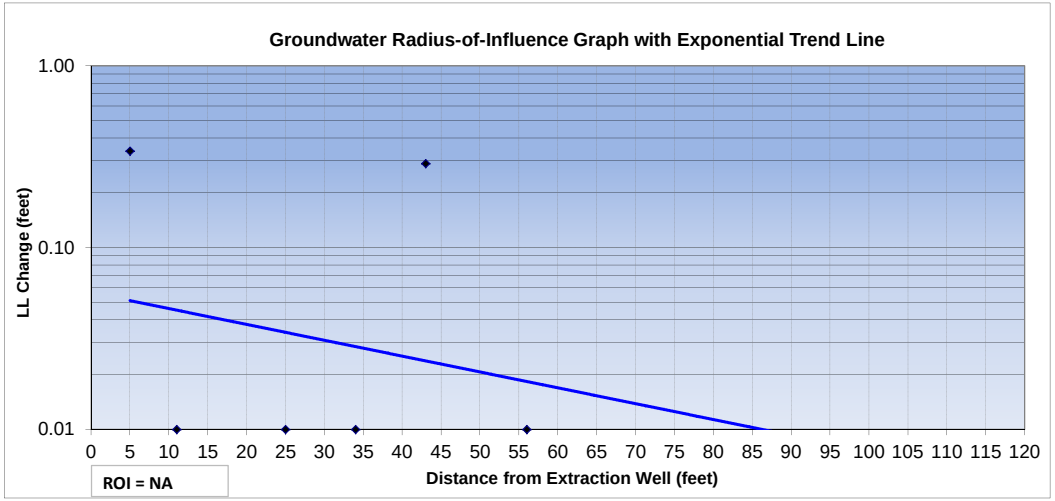
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 3
Test Description: SVE
Extraction Well: MW-51S
Sparge Well: -
Step Number: 3

Test Date:	October 13, 2014
Start of Step Time:	16:24:19
End of Step Time:	16:53:19
Extraction Well ID:	MW-51S
Initial DTW (feet):	21.52
Total Depth (feet):	25.5
Screen Interval (feet):	10
PID concentration (ppm):	34.2
Percent Oxygen (%):	14.1
Average Vapor Flow (scfm):	95.2
Blower Discharge Temp. (F):	143
Average Vac @ well (in H_2O):	-103
Max Upwelling/Drawdown (feet):	2.70

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51	5	27-37	26.94	-3.13	0.34
MW-8S	11	15-25	21.72	-13.78	-0.01
RW-1	12	26-41	27.09	-0.02	0.50
MW-10S	25	17-27	22.21	-2.86	0.00
MW-25S	34	16-26	22.11	-5.32	0.00
MW-5	43	25-35	26.71	-3.30	0.29
MW-1S	49	15-25	23.06	-3.40	NM
MW-30S	51	16-26	24.87	-0.10	NM
MW-72S	61	15-25	21.69	-3.30	NM
MW-106	112	3-10	7.92	0.00	0.00
MW-107	97	3-11	10.67	0.00	NM
MW-11	33	25-35	26.86	0.00	-1.59
MW-109S	56	3.5-13.5	10.58	-1.00	-0.07
MW-109	55	14-24	15.09	0.00	-0.46





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

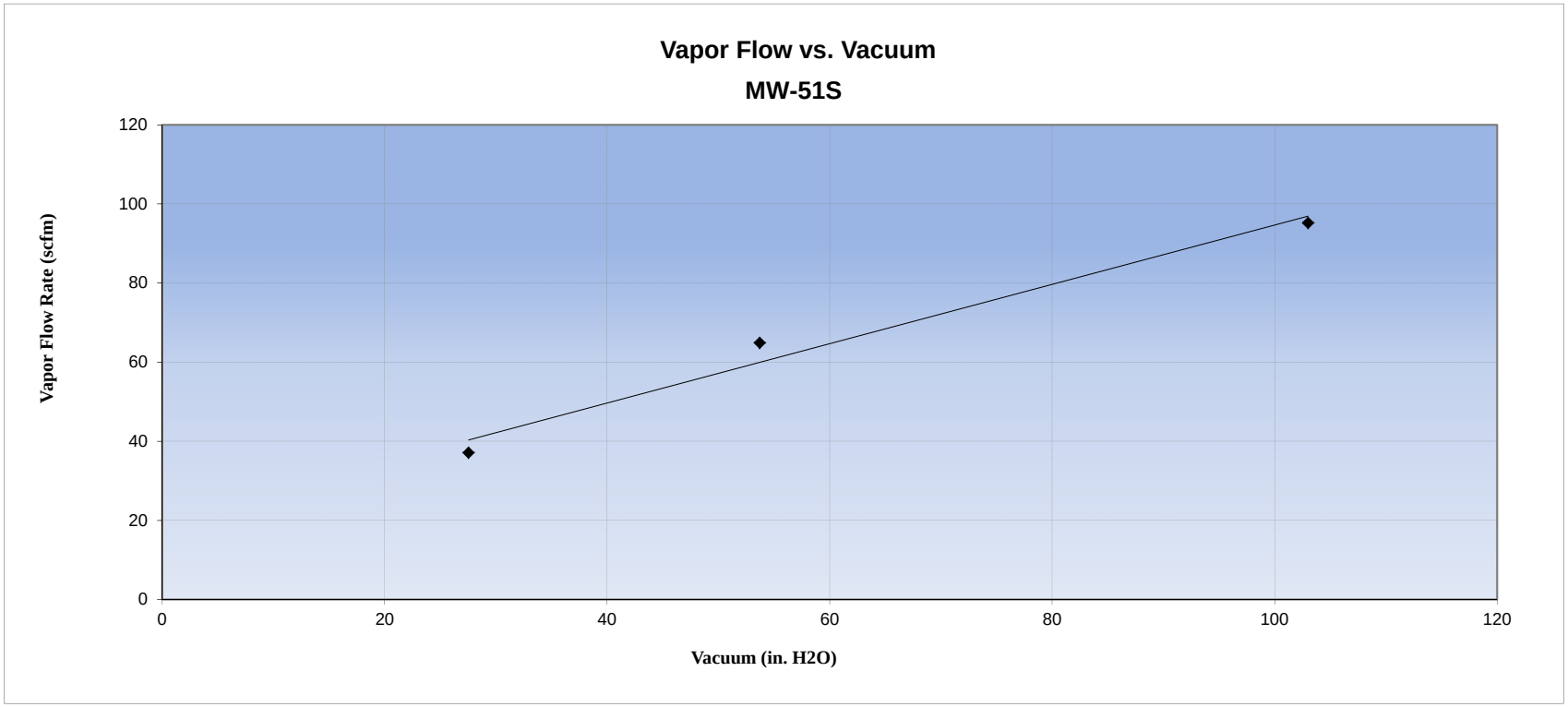
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

SVE Vapor Flow vs. Vacuum Data

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 3
Test Description: SVE
Test Well: MW-51S

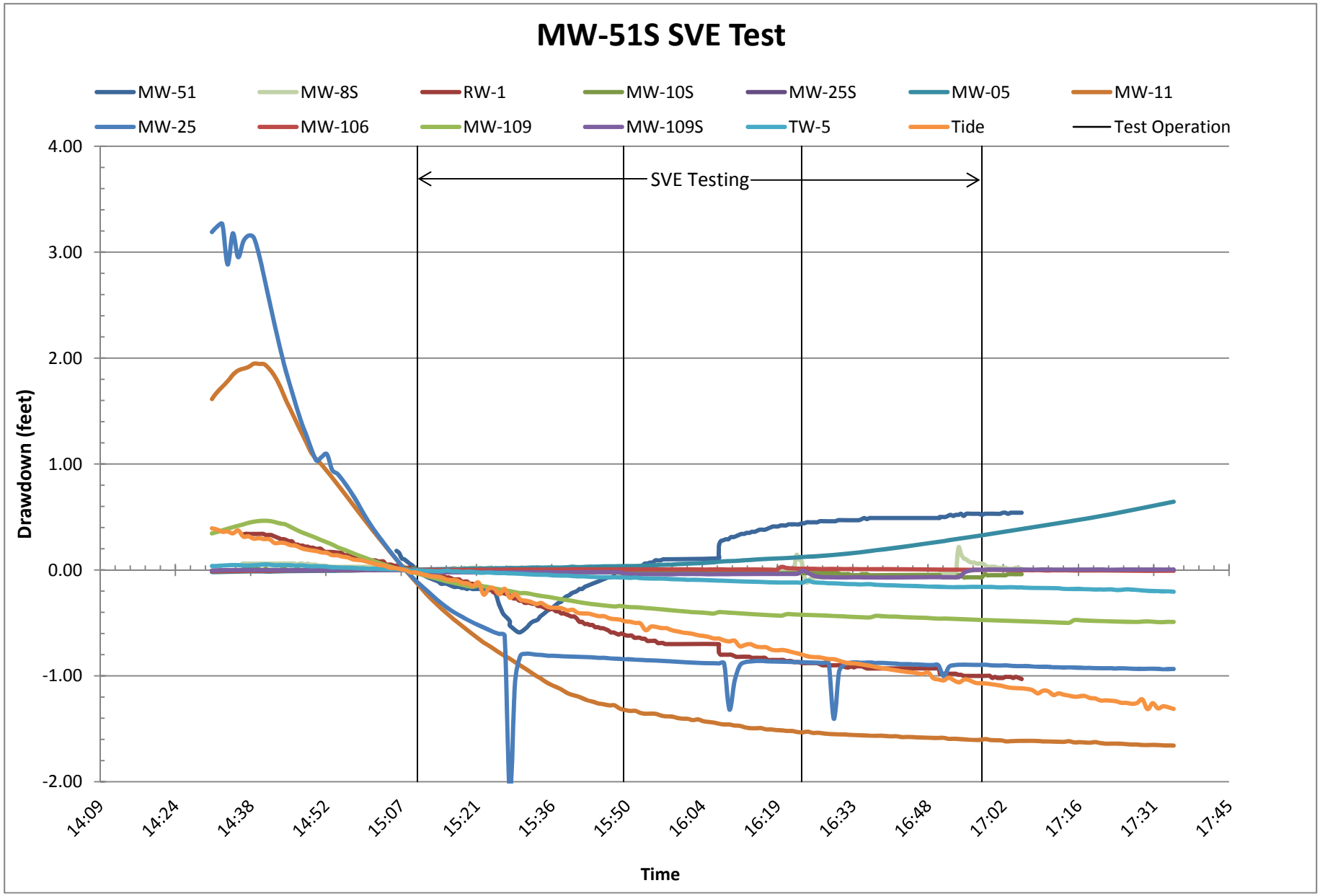
Test Date:	October 13, 2014
Extraction Well ID:	MW-51S
Initial DTW (feet):	21.52
Initial DTP (feet):	-
Total Depth (feet):	25.50
Screen Length (feet):	10.00

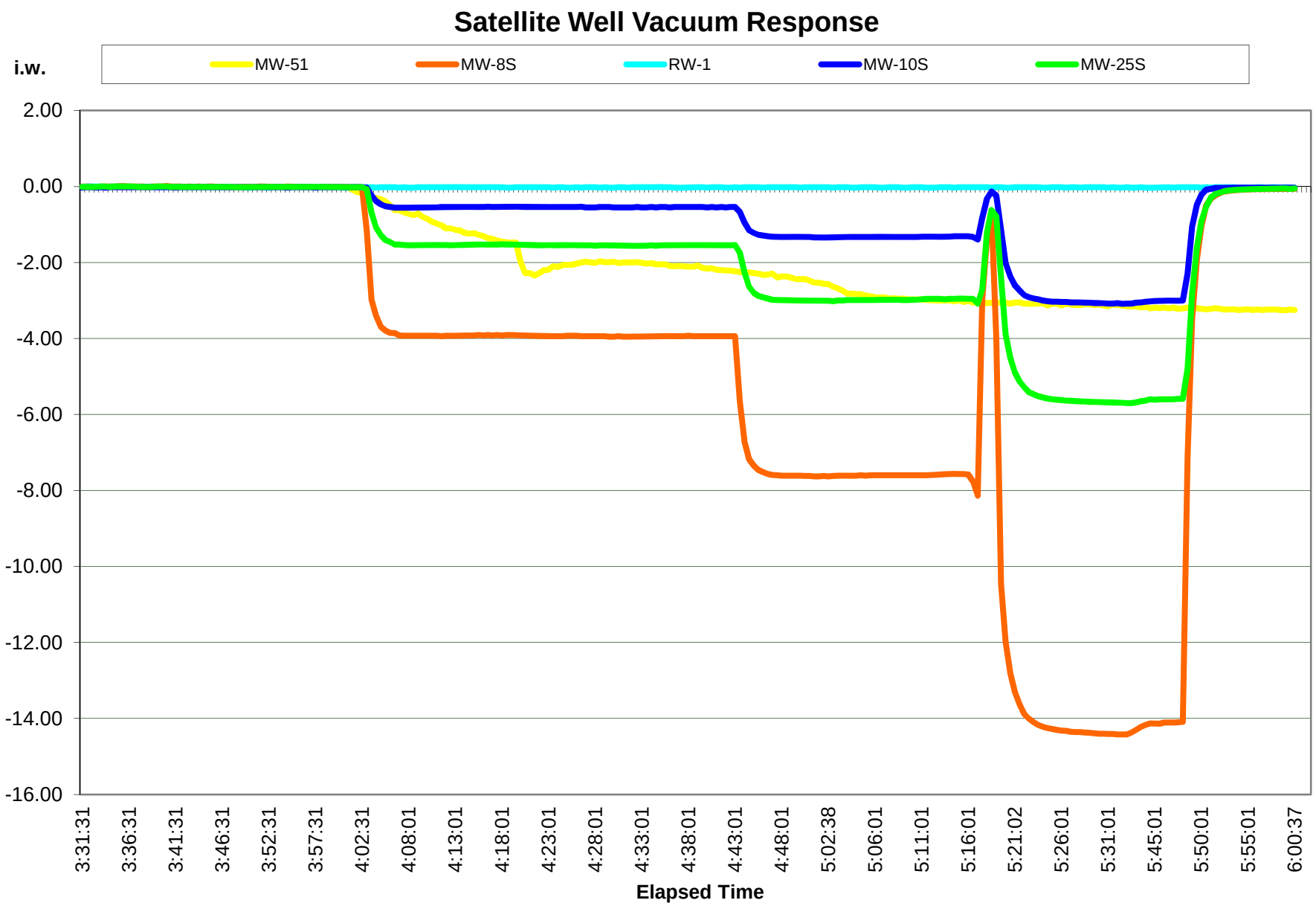
Step Number	***Avg. Well Vacuum (in.H_2O)***	***Avg. Vapor Flow (scfm)***
1	28	37.1
2	54	64.9
3	103	95.2

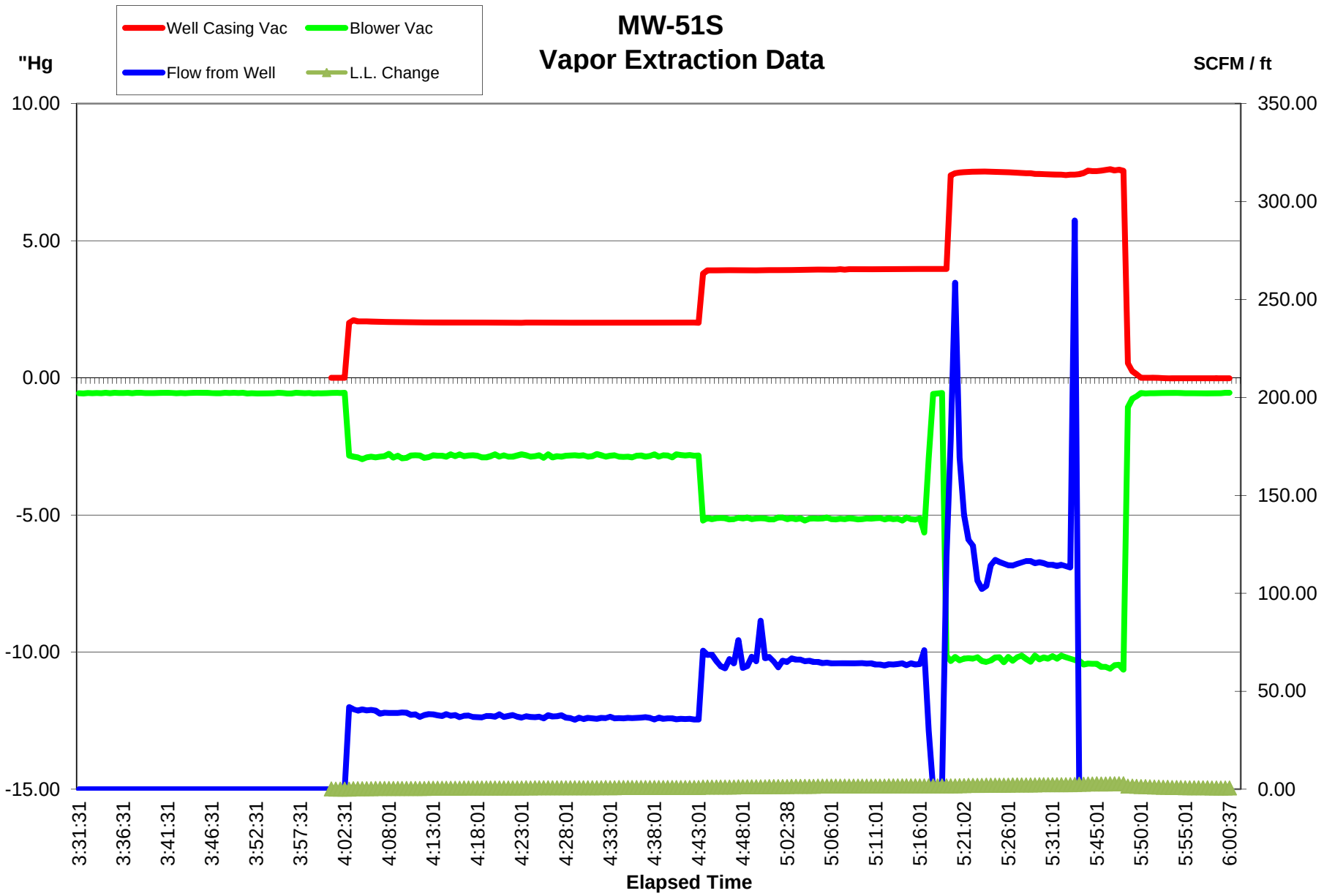


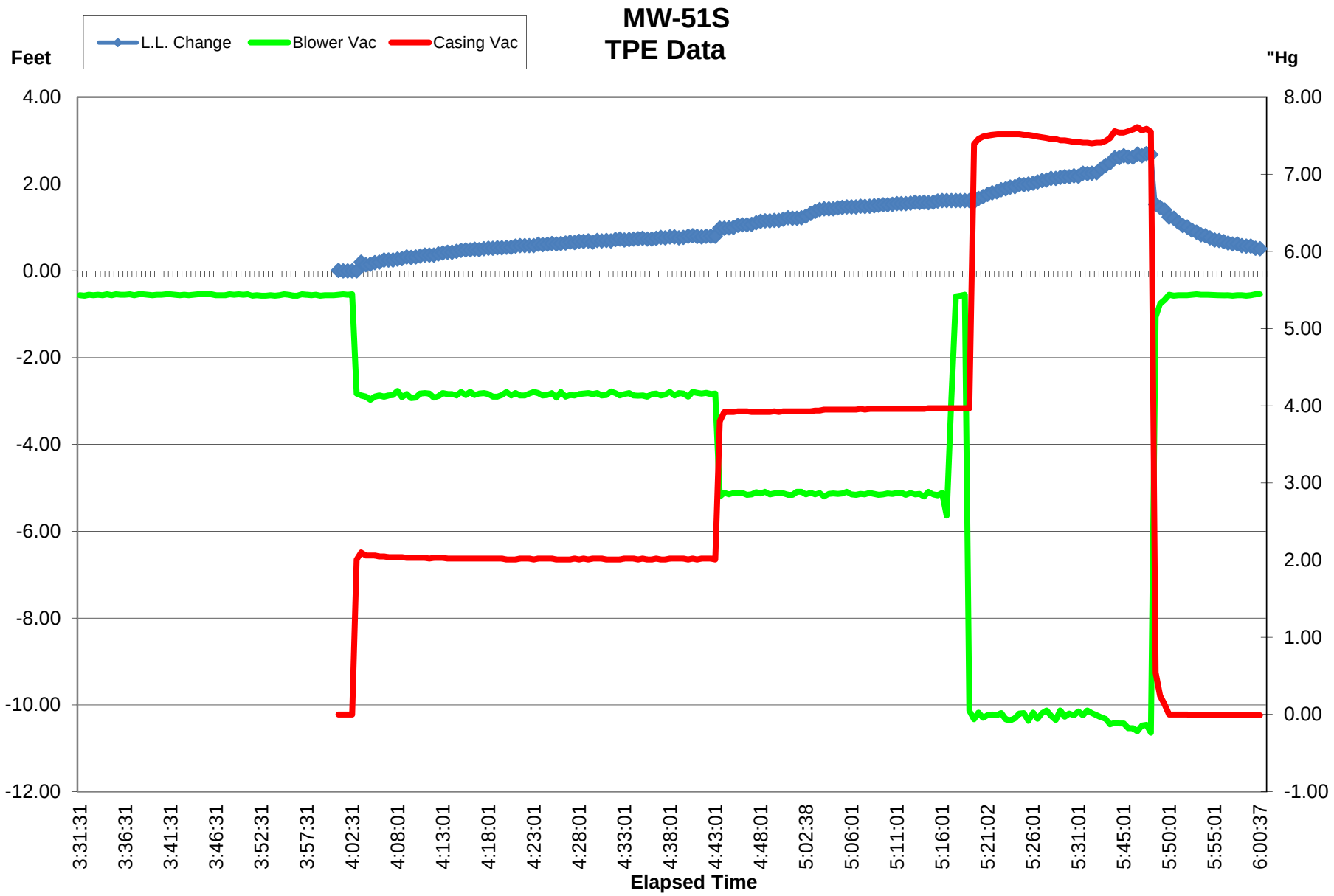
LIQUID LEVEL INFLUENCE GRAPH

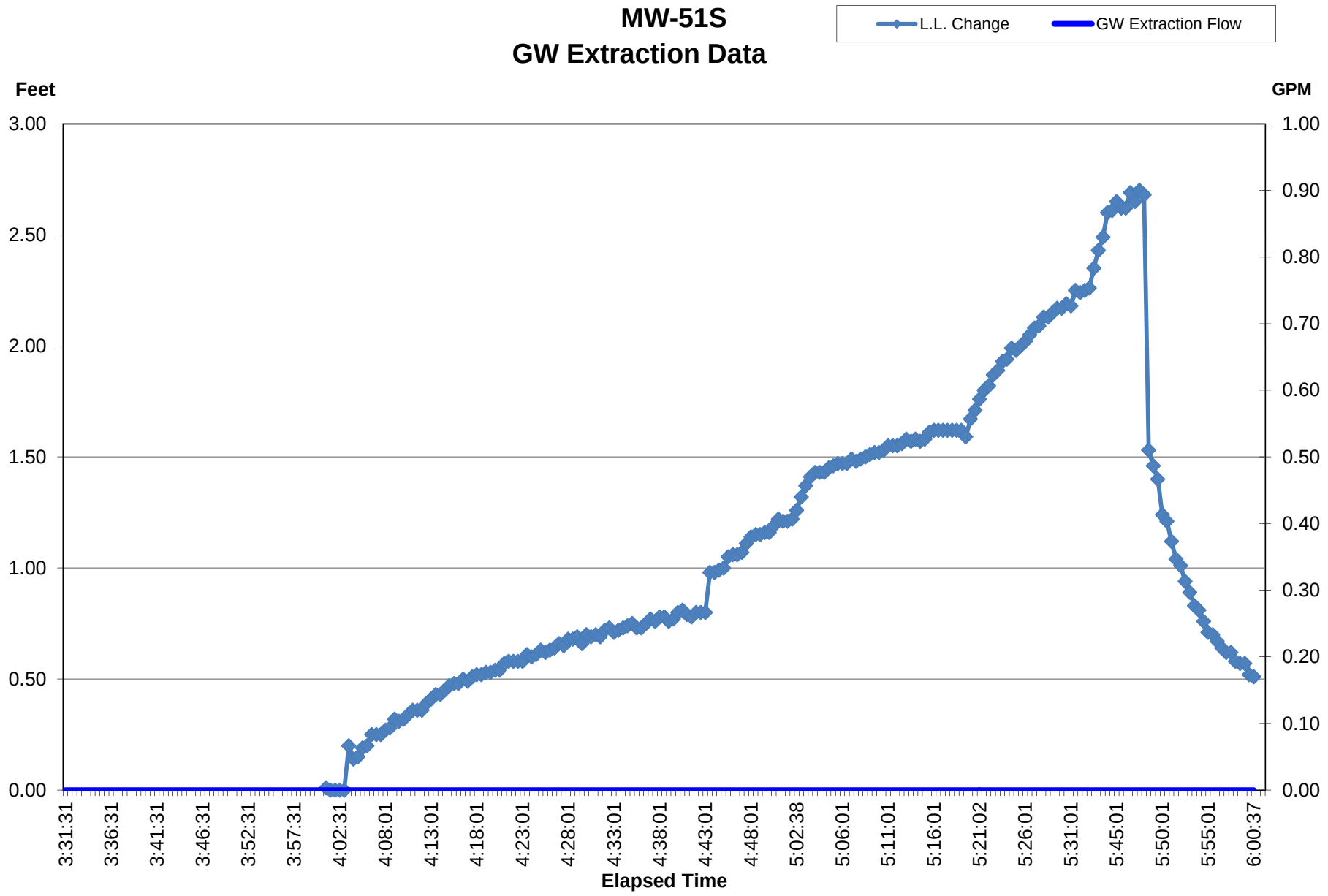
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
i.w.
MW-51
MW-8S
RW-1
MW-10S
MW-25S
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
-14.00
-16.00
3:31:31
3:36:31
3:41:31
3:46:31
3:52:31
3:57:31
4:02:31
4:08:01
4:13:01
4:18:01
4:23:01
4:28:01
4:33:01
4:38:01
4:43:01
4:48:01
5:02:38
5:06:01
5:11:01
5:16:01
5:21:02
5:26:01
5:31:01
5:45:01
5:50:01
5:55:01
6:00:37
Elapsed Time


MW-51S
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
10.00
5.00
0.00
-5.00
-10.00
-15.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
3:31:31
3:36:31
3:41:31
3:46:31
3:52:31
3:57:31
4:02:31
4:08:01
4:13:01
4:18:01
4:23:01
4:28:01
4:33:01
4:38:01
4:43:01
4:48:01
5:02:38
5:06:01
5:11:01
5:16:01
5:21:02
5:26:01
5:31:01
5:45:01
5:50:01
5:55:01
6:00:37
Elapsed Time


MW-51S
TPE Data
L.L. Change
Blower Vac
Casing Vac
Feet
"Hg
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
-10.00
-12.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
3:31:31
3:36:31
3:41:31
3:46:31
3:52:31
3:57:31
4:02:31
4:08:01
4:13:01
4:18:01
4:23:01
4:28:01
4:33:01
4:38:01
4:43:01
4:48:01
5:02:38
5:06:01
5:11:01
5:16:01
5:21:02
5:26:01
5:31:01
5:45:01
5:50:01
5:55:01
6:00:37
Elapsed Time


MW-51S
GW Extraction Data
L.L. Change
GW Extraction Flow
Feet
GPM
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
3:31:31
3:36:31
3:41:31
3:46:31
3:52:31
3:57:31
4:02:31
4:08:01
4:13:01
4:18:01
4:23:01
4:28:01
4:33:01
4:38:01
4:43:01
4:48:01
5:02:38
5:06:01
5:11:01
5:16:01
5:21:02
5:26:01
5:31:01
5:45:01
5:50:01
5:55:01
6:00:37
Elapsed Time

TEST 4

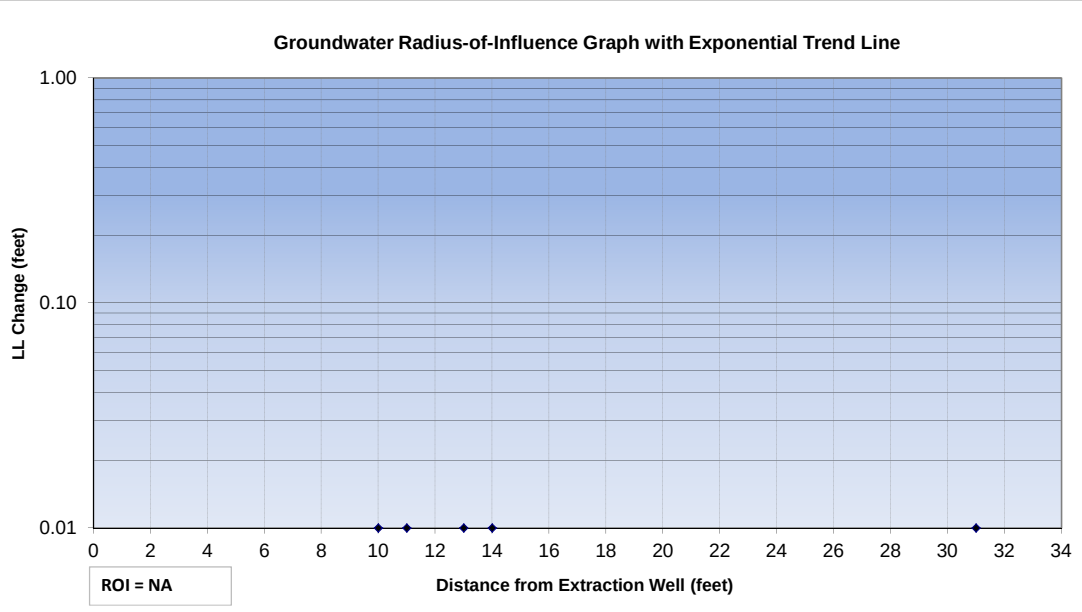
Total Fluids Pumping and VEGE Testing at RW-1

DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 4
Test Description: GW Pumping
Extraction Well: RW-1
Sparge Well: -
Step Number: 1

Test Date:	October 14, 2014
Start of Step Time:	11:36:58
End of Step Time:	11:52:28
Extraction Well ID:	RW-1
Initial DTW (feet):	27.07
Total Depth (feet):	41.0
Screen Interval (feet):	15
Average Vapor Flow (scfm):	NA
Blower Discharge Temp. (F):	NA
Average Vac @ well (in H_2O):	NA
PID concentration (ppm):	NA
Percent Oxygen (%):	NA
Groundwater Flow Rate (gpm):	0.13
Max Upwelling/Drawdown (feet):	-6.75

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	13.00	15.5-25.5	21.52	0.00	0.00
MW-8S	10.00	15-25	27.71	0.03	0.00
MW-51	11.00	27-37	27.06	-0.01	0.04
MW-10S	14.00	17-27	22.21	0.00	0.00
MW-25	31.00	27-37	26.97	0.00	0.05



NOTES:

NA- not available	Vac. - vacuum	conc. - concentration	psi - pounds per square inch	NM(D)- Not measured because the well was dry
NM - not measured	ppm - parts per million	max - maximum	F - degrees fahrenheit	NM- Not measured
AS - air sparge	i.w. - inches of water	scfm - standard cubic feet per minute	"Hg - inches of mercury	gpm - gallons per minute
SVE- soil vapor extraction	DTW - depth to water	DTP - depth to product	PID - photoionization detector	ppmv - parts per million by volume

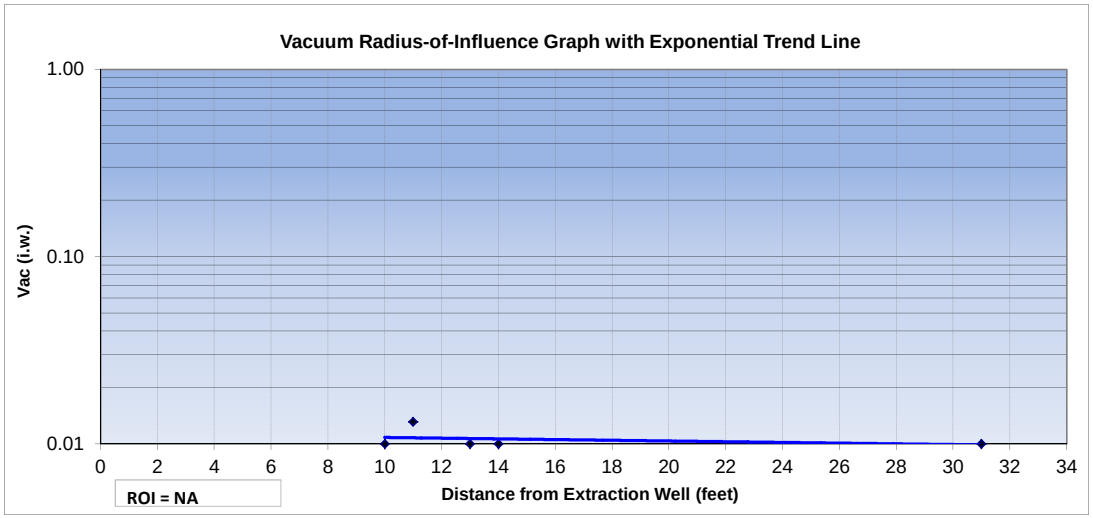
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

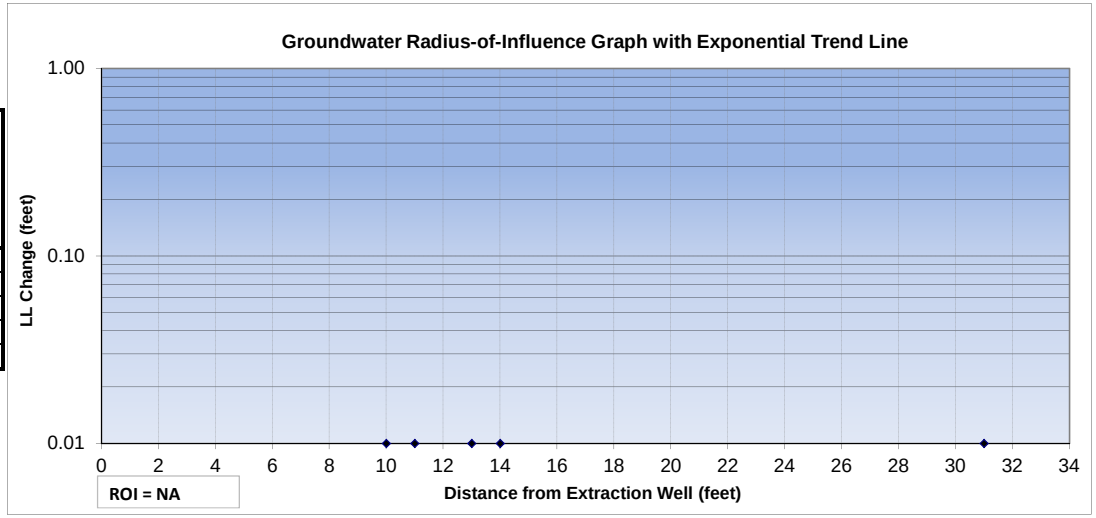
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 4
Test Description: VEGE
Extraction Well: RW-1
Sparge Well: -
Step Number: 1

Test Date:	October 14, 2014
Start of Step Time:	11:36:58
End of Step Time:	11:52:28
Extraction Well ID:	RW-1
Initial DTW (feet):	27.07
Total Depth (feet):	41.0
Screen Interval (feet):	15
Average Vapor Flow (scfm):	4.1
Blower Discharge Temp. (F):	152
Average Vac @ well (in H_2O):	-59
PID concentration (ppm):	15.5
Percent Oxygen (%):	20.9
Groundwater Flow Rate (gpm):	0.16
Max Upwelling/Drawdown (feet):	-6.75

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	13.00	15.5-25.5	21.52	0.00	0.00
MW-8S	10.00	15-25	27.71	0.03	0.00
MW-51	11.00	27-37	27.06	-0.01	0.04
MW-10S	14.00	17-27	22.21	0.00	0.00
MW-25	31.00	27-37	26.97	0.00	0.05

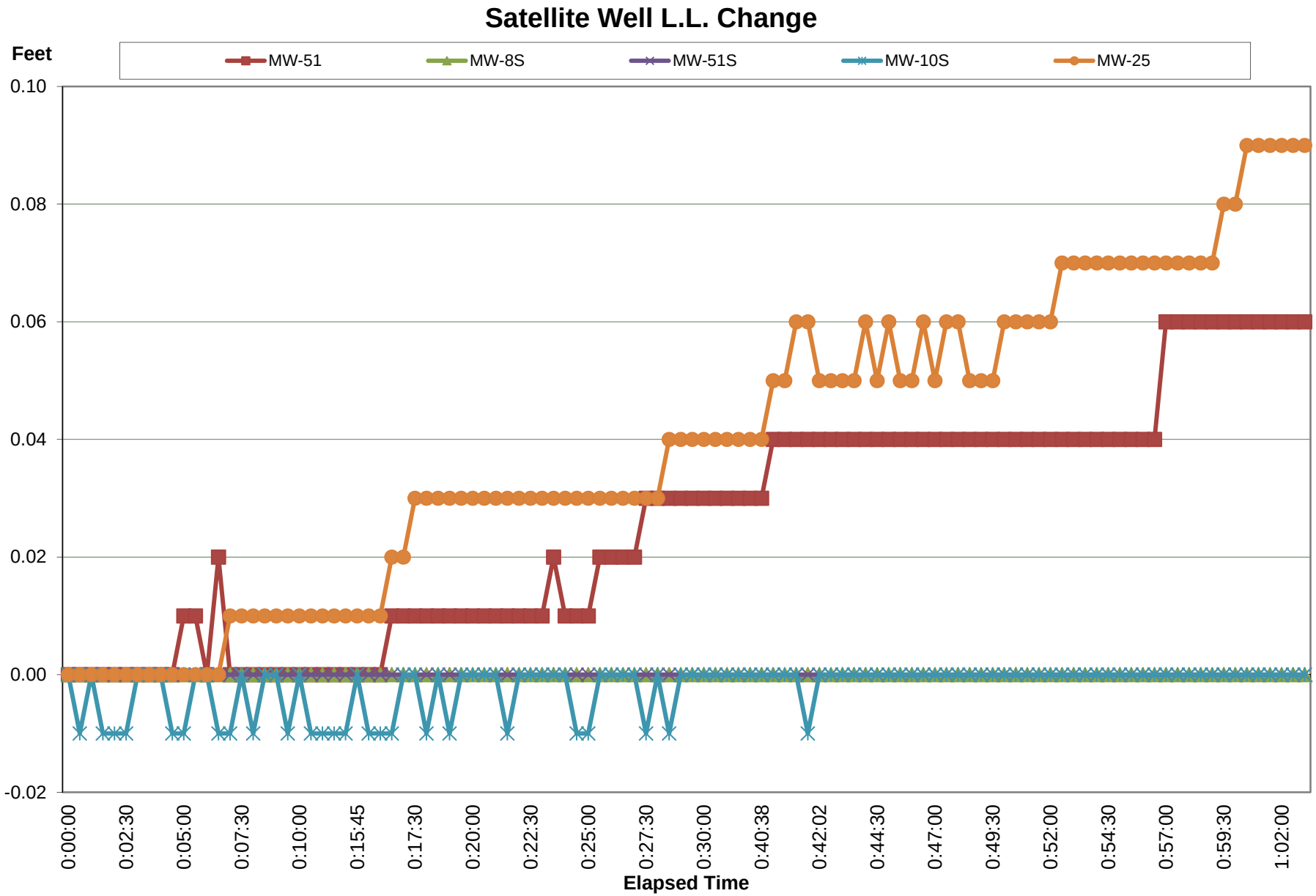


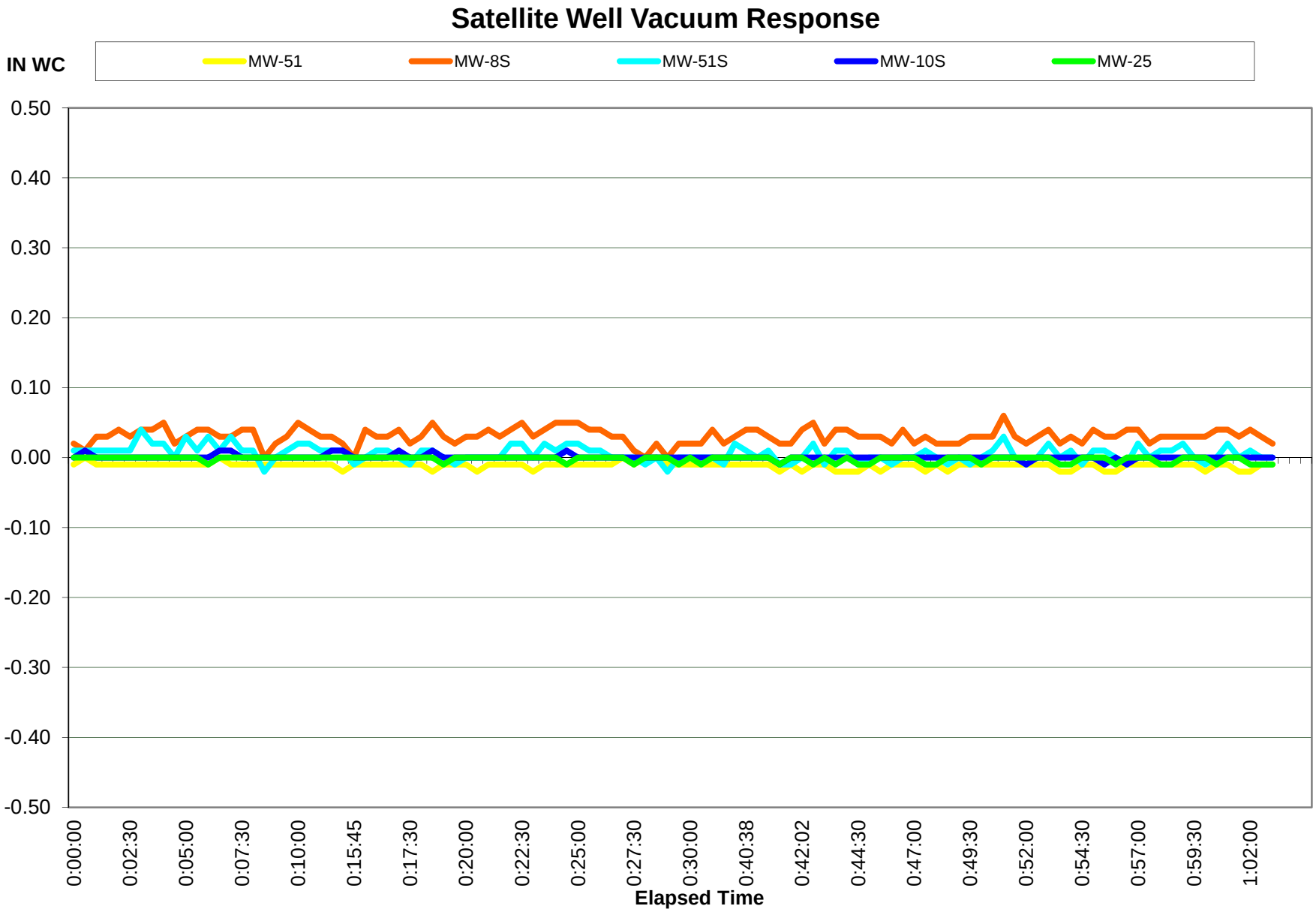


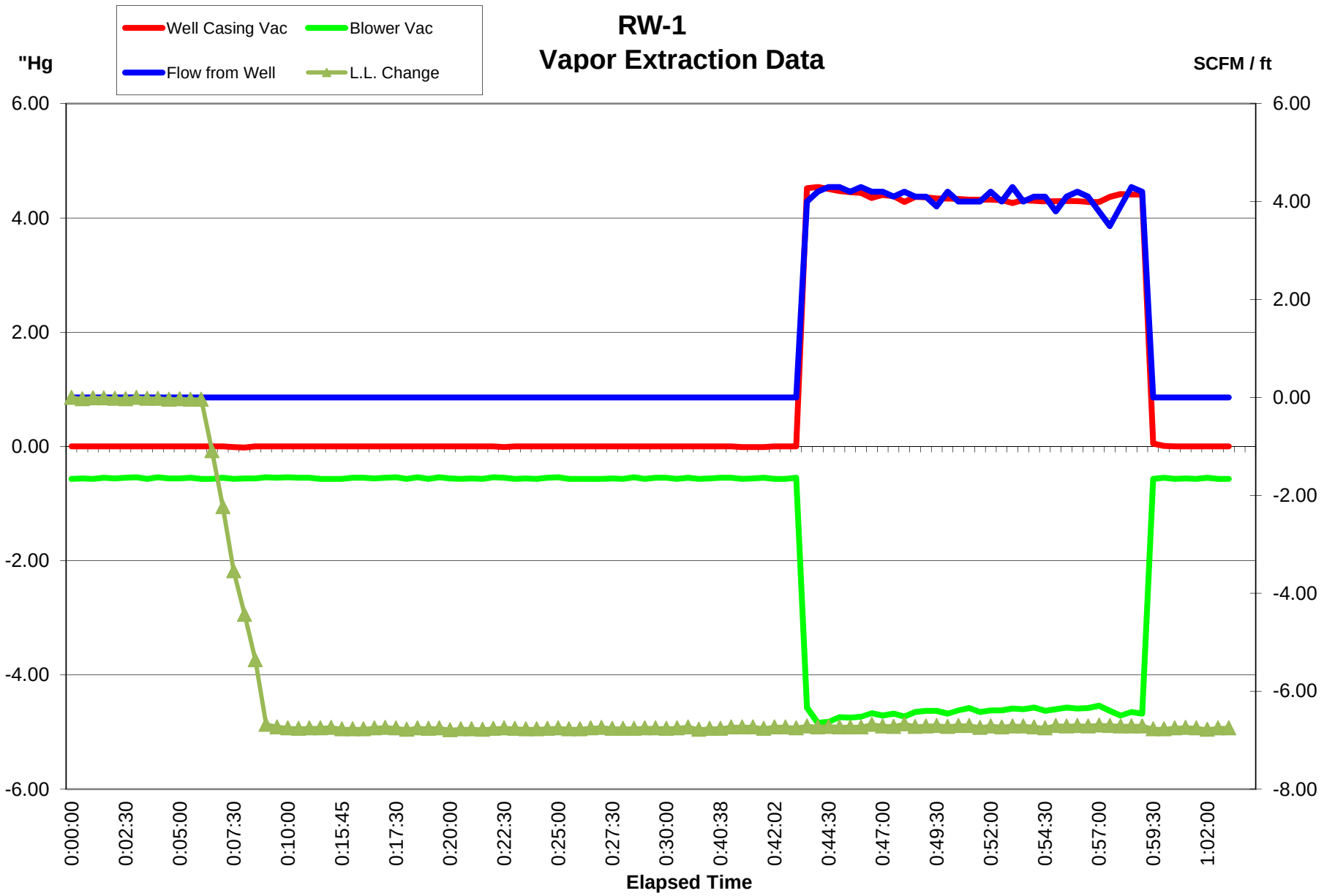
NOTES:

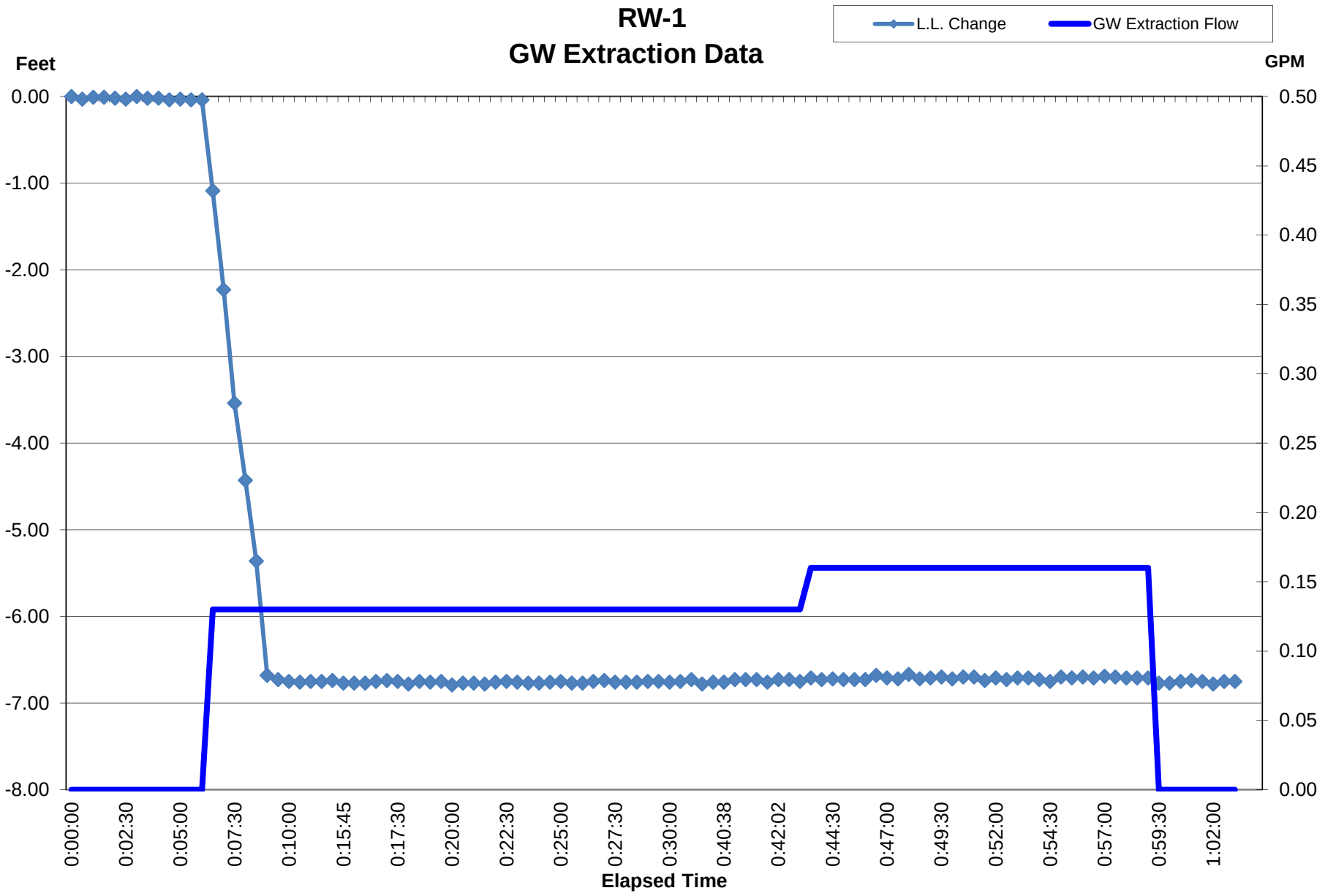
NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.


Satellite Well L.L. Change
Feet
MW-51
MW-8S
MW-51S
MW-10S
MW-25
0.10
0.08
0.06
0.04
0.02
0.00
-0.02
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:15:45
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:30:00
0:40:38
0:42:02
0:44:30
0:47:00
0:49:30
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
Elapsed Time


Satellite Well Vacuum Response
IN WC
MW-51
MW-8S
MW-51S
MW-10S
MW-25
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:15:45
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:30:00
0:40:38
0:42:02
0:44:30
0:47:00
0:49:30
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
Elapsed Time


RW-1
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
6.00
4.00
2.00
0.00
-2.00
-4.00
-6.00
-8.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:15:45
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:30:00
0:40:38
0:42:02
0:44:30
0:47:00
0:49:30
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
Elapsed Time


RW-1
GW Extraction Data
L.L. Change
GW Extraction Flow
Feet
GPM
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
-7.00
-8.00
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:15:45
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:30:00
0:40:38
0:42:02
0:44:30
0:47:00
0:49:30
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
Elapsed Time

TESTS 5, 6 & 7

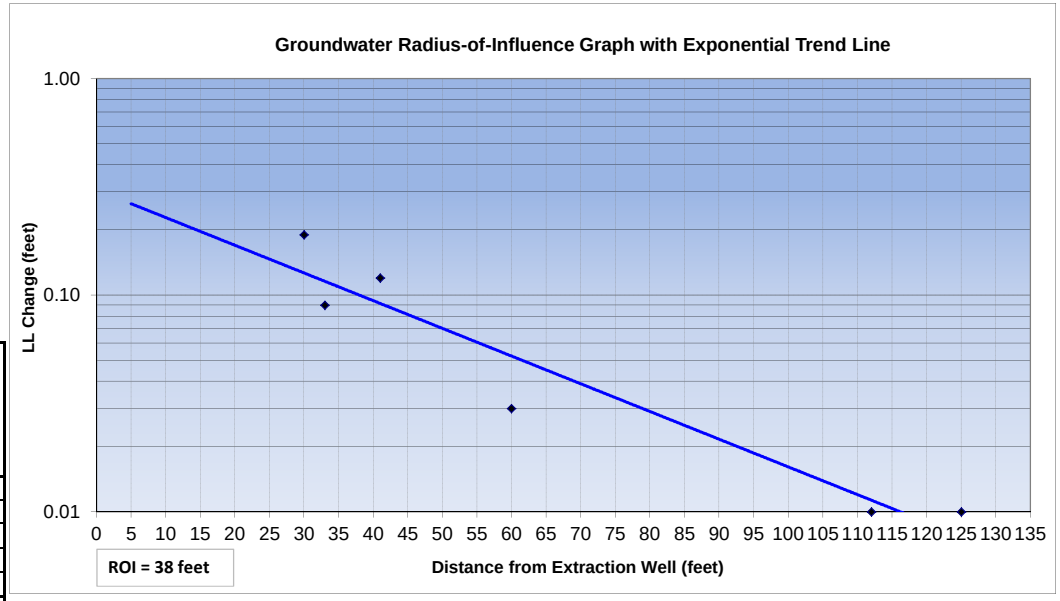
SVE, Total Fluids Pumping, and VEGE Testing at MW-51

DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 5
Test Description: GW Pumping
Extraction Well: MW-51
Sparge Well: -
Step Number: 1

Test Date:	October 14, 2014
Start of Step Time:	12:31:36
End of Step Time:	13:39:37
Extraction Well ID:	MW-51
Initial DTW (feet):	27.00
Total Depth (feet):	37.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	NA
Blower Discharge Temp. (F):	NA
Average Vac @ well (in H_2O):	NA
PID concentration (ppm):	NA
Percent Oxygen (%):	NA
Groundwater Flow Rate (gpm):	3.6
Max Upwelling/Drawdown (feet):	-4.80

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	5	15.5-25.5	21.52	-0.01	-0.01
MW-8S	13	15-25	21.71	0.00	0.00
RW-1	11	26-41	27.07	0.00	NA
MW-10S	22	17-27	22.21	0.00	0.00
MW-25	30	27-37	26.97	0.00	-0.19
MW-5	41	25-35	26.61	NM	-0.12
MW-11	33	25-35	26.81	NM	-0.09
MW-25S	31	16-26	22.09	NM	0.00
MW-106	112	3-10	7.92	NM	0.02
MW-109S	63	3.5-13.5	10.57	NM	0.00
MW-109	60	14-24	15.04	NM	-0.03
TW-05	125	0-10	6.58	NM	0.05



NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

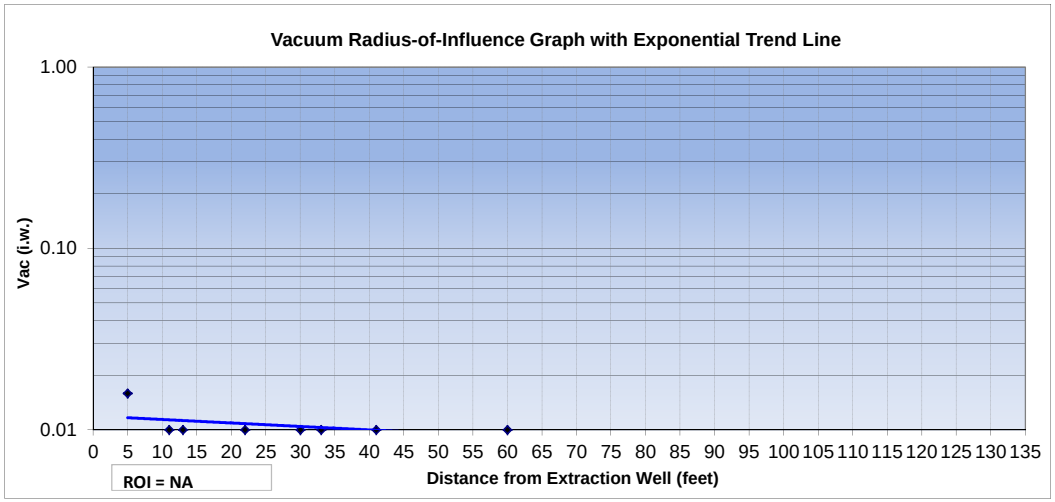
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

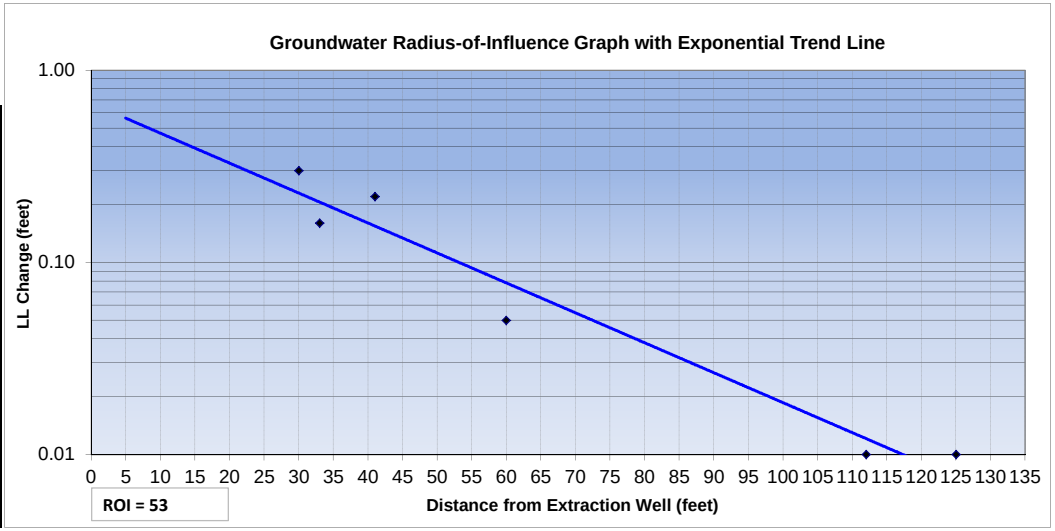
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 6
Test Description: VEGE
Extraction Well: MW-51
Sparge Well: -
Step Number: 1

Test Date:	October 14, 2014
Start of Step Time:	13:41:37
End of Step Time:	14:20:37
Extraction Well ID:	MW-51
Initial DTW (feet):	27.00
Total Depth (feet):	37.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	3.9
Blower Discharge Temp. (F):	151
Average Vac @ well (in H_2O):	-44
PID concentration (ppm):	15
Percent Oxygen (%):	20.9
Groundwater Flow Rate (gpm):	3.6
Max Upwelling/Drawdown (feet):	-4.02

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	5	15.5-25.5	21.52	-0.02	0.01
MW-8S	13	15-25	21.71	0.00	0.02
RW-1	11	26-41	27.07	0.00	NA
MW-10S	22	17-27	22.21	0.00	0.00
MW-25	30	27-37	26.97	0.00	-0.30
MW-5	41	25-35	26.61	NM	-0.22
MW-11	33	25-35	26.81	NM	-0.16
MW-25S	31	16-26	22.09	NM	0.01
MW-106	112	3-10	7.92	NM	0.03
MW-109S	63	3.5-13.5	10.57	NM	0.01
MW-109	60	14-24	15.04	NM	-0.05
TW-05	125	0-10	6.58	NM	0.06





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

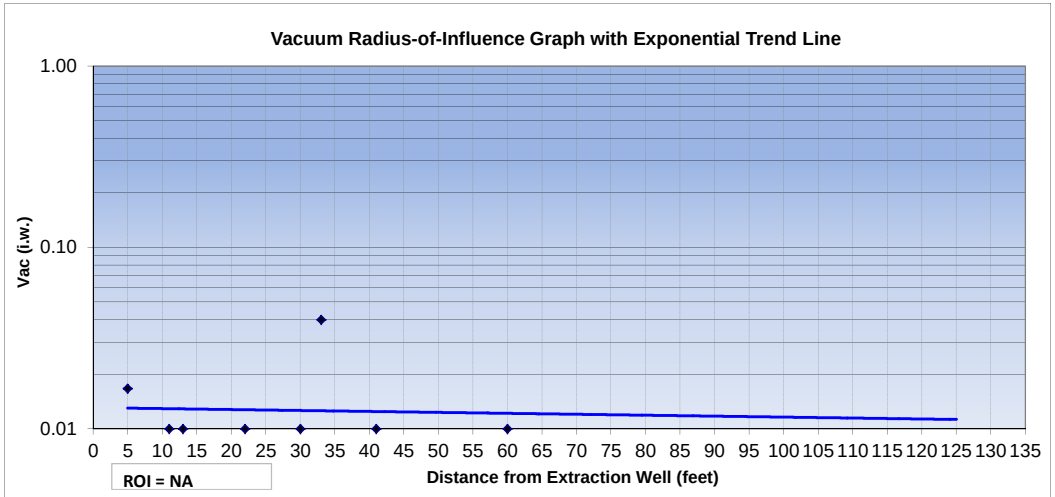
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

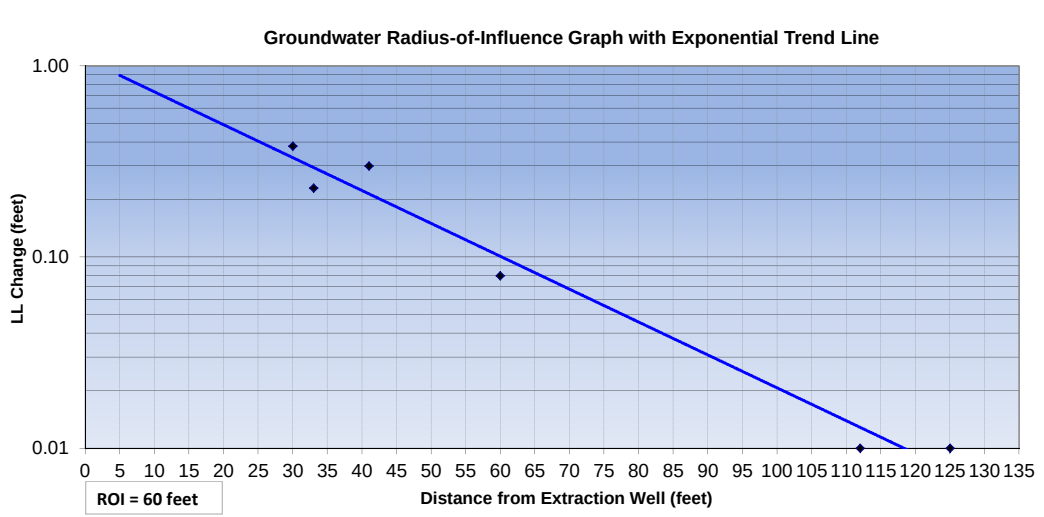
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 6
Test Description: VEGE
Extraction Well: MW-51
Sparge Well: -
Step Number: 2

Test Date:	October 14, 2014
Start of Step Time:	14:22:07
End of Step Time:	14:58:07
Extraction Well ID:	MW-51
Initial DTW (feet):	27.00
Total Depth (feet):	37.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	8.0
Blower Discharge Temp. (F):	146
Average Vac @ well (in H_2O):	-70
PID concentration (ppm):	27
Percent Oxygen (%):	20.9
Groundwater Flow Rate (gpm):	3.6
Max Upwelling/Drawdown (feet):	-3.92

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	5	15.5-25.5	21.52	-0.02	0.00
MW-8S	13	15-25	21.71	-0.01	0.01
RW-1	11	26-41	27.07	0.00	NA
MW-10S	22	17-27	22.21	0.00	0.00
MW-25	30	27-37	26.97	0.00	-0.38
MW-5	41	25-35	26.61	0.00	-0.30
MW-11	33	25-35	26.81	-0.04	-0.23
MW-25S	31	16-26	22.09	NM	0.01
MW-106	112	3-10	7.92	NM	0.04
MW-109S	63	3.5-13.5	10.57	NM	0.01
MW-109	60	14-24	15.04	NM	-0.08
TW-05	125	0-10	6.58	NM	0.05





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

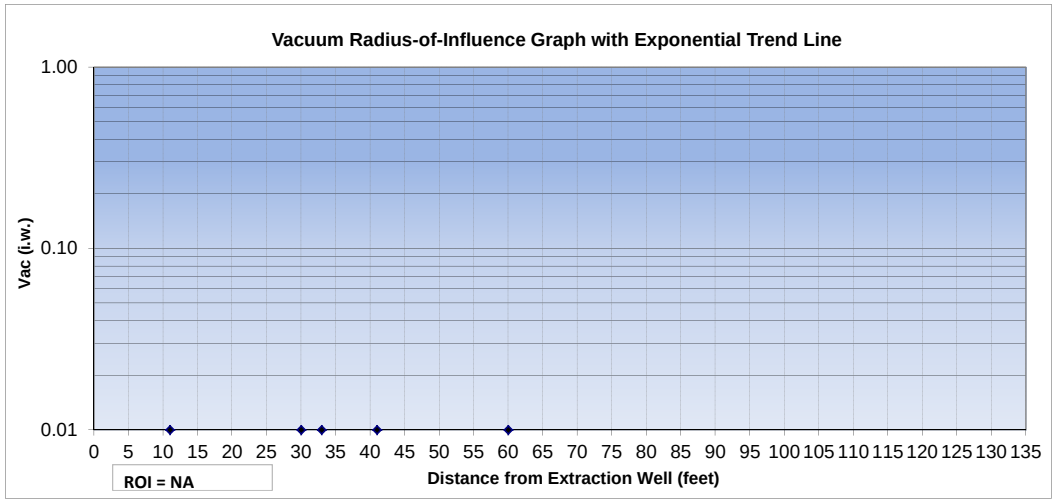
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

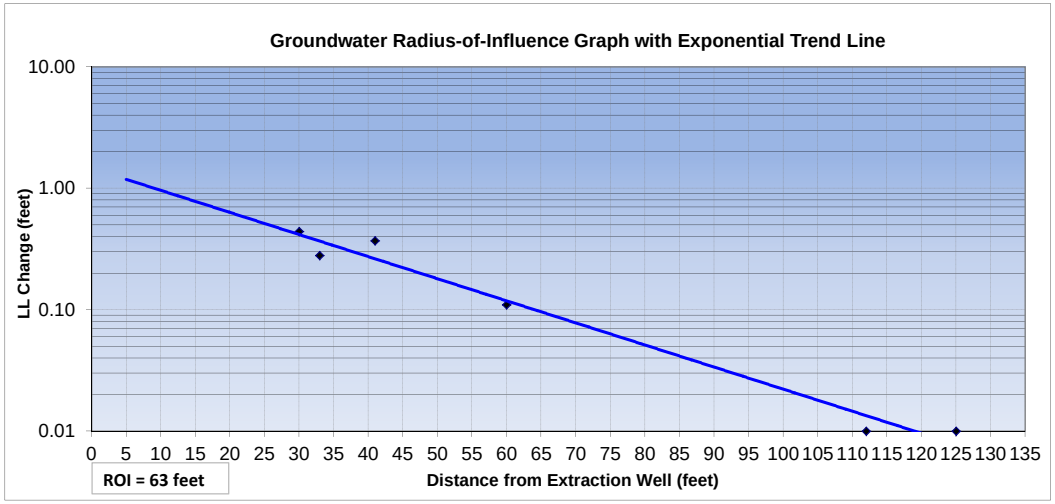
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 6
Test Description: VEGE
Extraction Well: MW-51
Sparge Well: -
Step Number: 3

Test Date:	October 14, 2014
Start of Step Time:	15:16:07
End of Step Time:	15:56:07
Extraction Well ID:	MW-51
Initial DTW (feet):	27.00
Total Depth (feet):	37.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	5.5
Blower Discharge Temp. (F):	162
Average Vac @ well (in H_2O):	-328
PID concentration (ppm):	29
Percent Oxygen (%):	20.9
Groundwater Flow Rate (gpm):	3.0
Max Upwelling/Drawdown (feet):	-2.28

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-51S	5	15.5-25.5	21.52	-0.02	0.01
MW-8S	13	15-25	21.71	-0.01	0.02
RW-1	11	26-41	27.07	0.00	NA
MW-10S	22	17-27	22.21	-0.01	0.00
MW-25	30	27-37	26.97	0.00	-0.44
MW-5	41	25-35	26.61	0.04	-0.37
MW-11	33	25-35	26.81	0.00	-0.28
MW-25S	31	16-26	22.09	0.00	-0.01
MW-106	112	3-10	7.92	NM	0.04
MW-109S	63	3.5-13.5	10.57	0.00	0.01
MW-109	60	14-24	15.04	0.00	-0.11
TW-05	125	0-10	6.58	NM	0.01





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

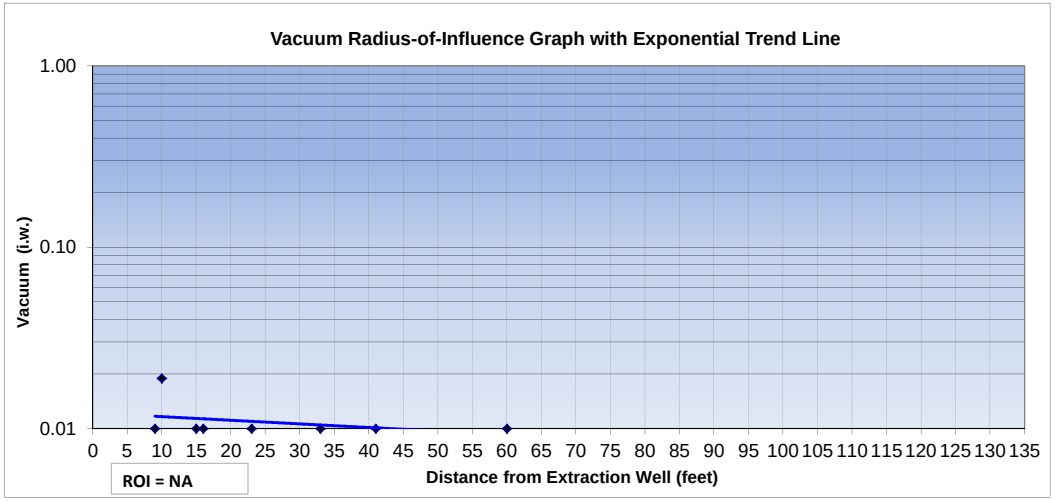
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum or groundwater ROI graphs.

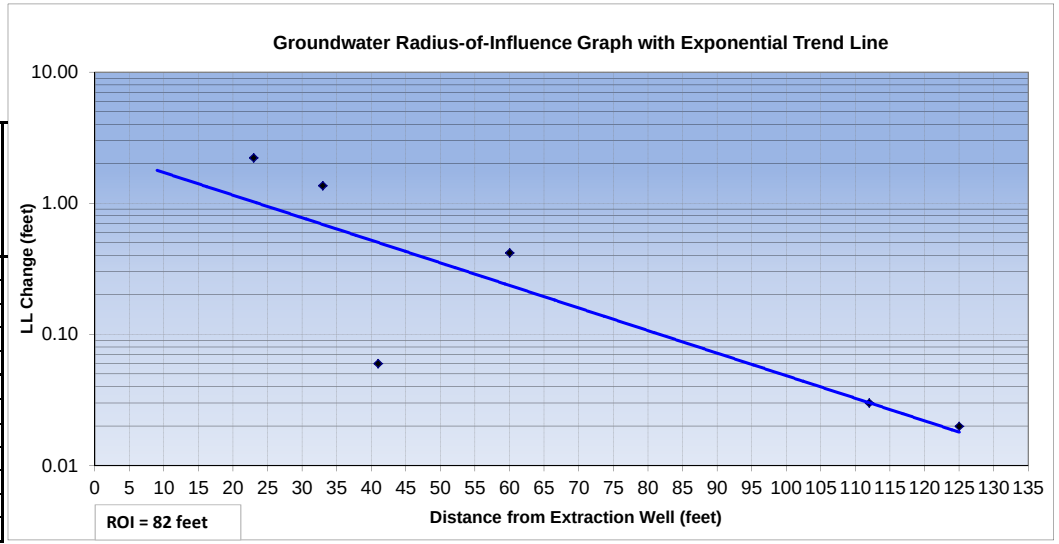
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 7
Test Description: Air Sparge
Extraction Well: MW-51
Sparge Well: SP-1
Step Number: 1

Test Date:	October 14, 2014
Start of Step Time:	15:56:37
End of Step Time:	16:47:37
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	35
Screen Interval (feet):	32-35
Avg. Injection Pressure (psi):	9.5
Average Sparge Flow (scfm):	4.7
Average SVE Flow (scfm):	7
Average Vac @ well (in H_2O):	-327
PID concentration (ppm):	129
Percent Oxygen (%):	20.90
Groundwater Flow Rate (gpm):	3.0
Max Upwelling/Drawdown (feet):	-2.08

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
RW-1	9	26-41	27.07	0.00	NA
MW-51S	10	15.5-25.5	21.52	-0.02	0.03
MW-8S	15	15-25	21.71	0.00	0.02
MW-10S	16	17-27	22.21	0.00	0.02
MW-25	23	27-37	26.97	0.00	2.22
MW-5	41	25-35	26.61	0.04	0.06
MW-11	33	25-35	26.81	0.00	1.36
MW-25S	31	16-26	22.09	0.00	0.01
MW-106	112	3-10	7.92	NM	0.03
MW-109S	63	3.5-13.5	10.57	0.00	0.02
MW-109	60	14-24	15.04	0.00	0.42
TW-05	125	0-10	6.58	NM	0.02





NOTES:

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NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

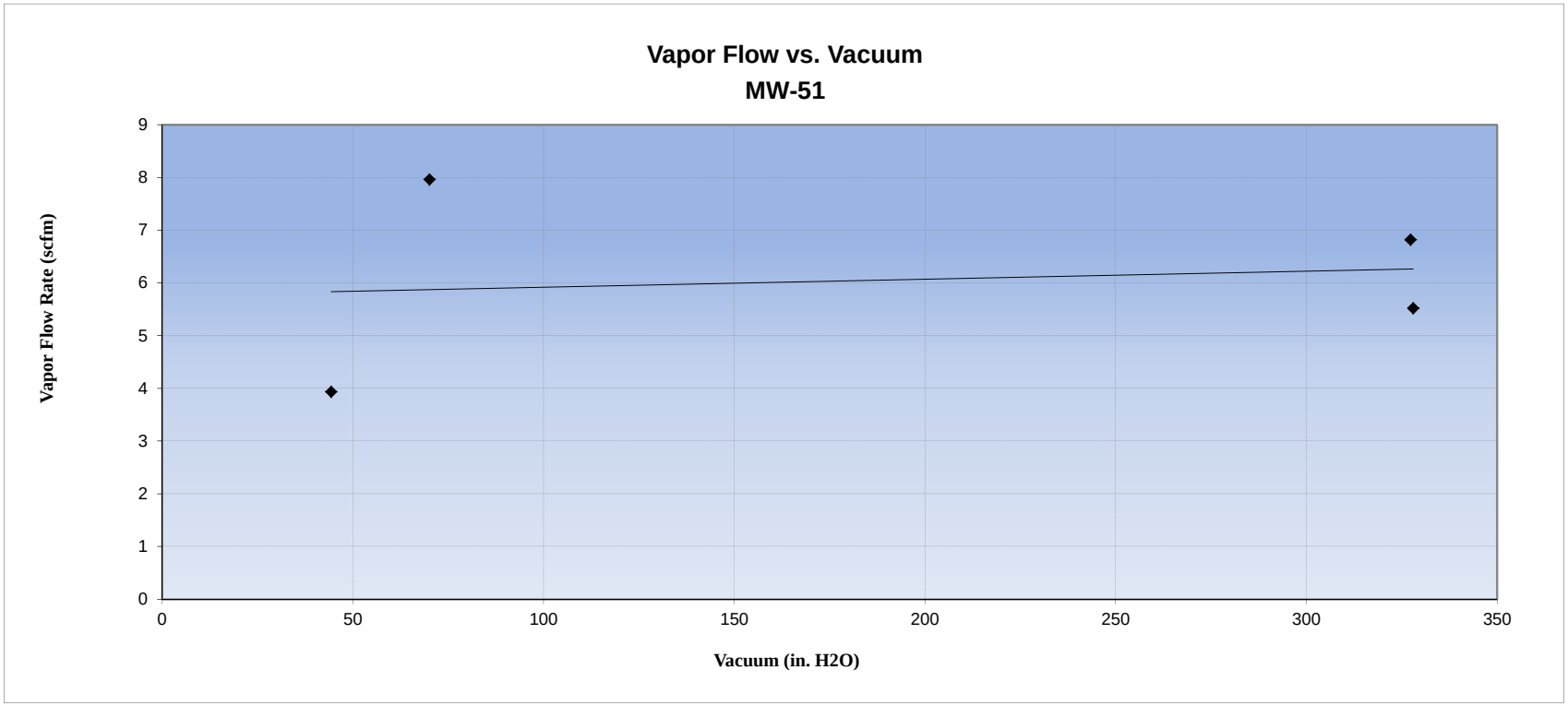
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

SVE Vapor Flow vs. Vacuum Data

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 6
Test Description: VEGE
Test Well: MW-51

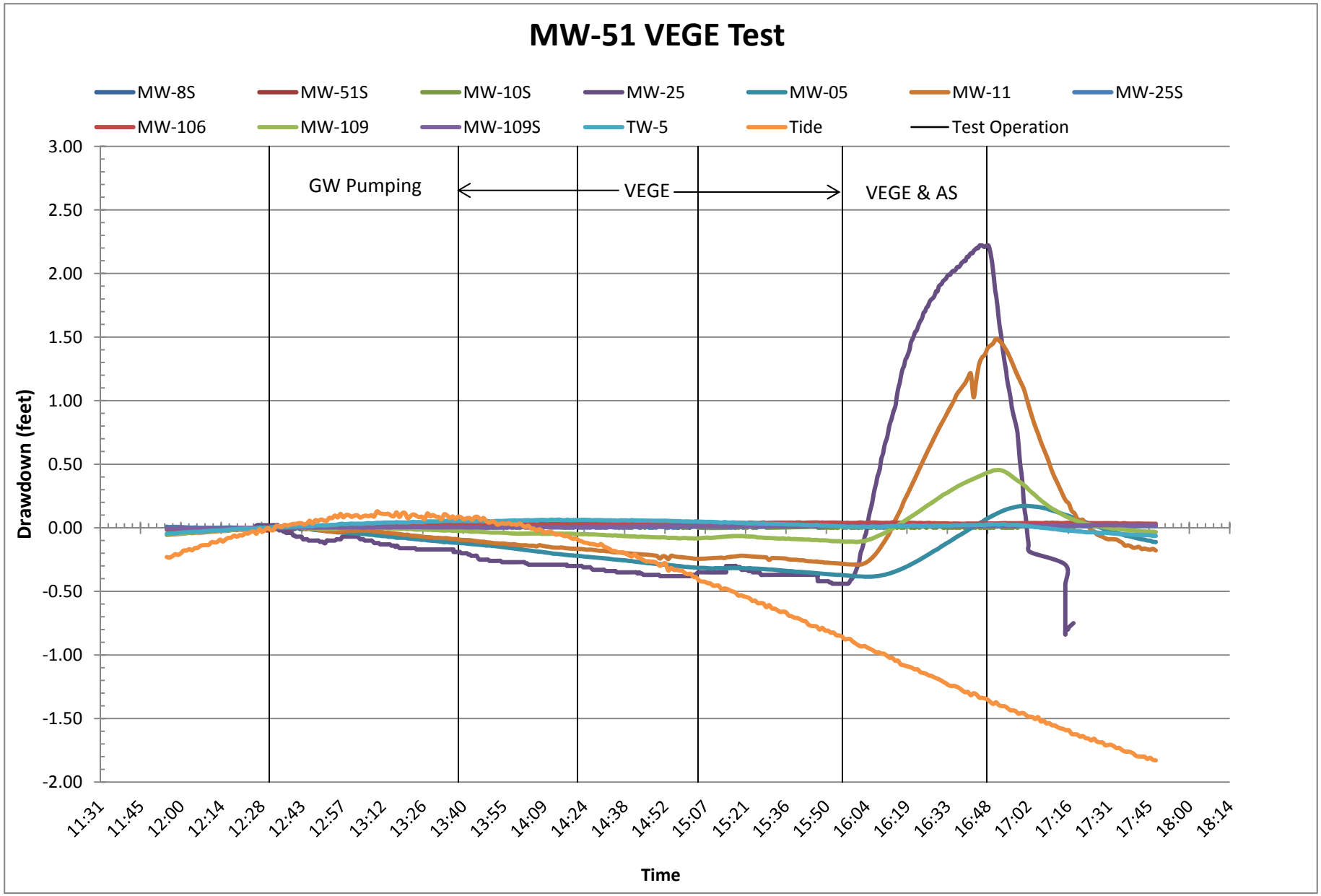
Test Date:	October 14, 2014
Extraction Well ID:	MW-51
Initial DTW (feet):	27.00
Initial DTP (feet):	-
Total Depth (feet):	37.00
Screen Length (feet):	10.00

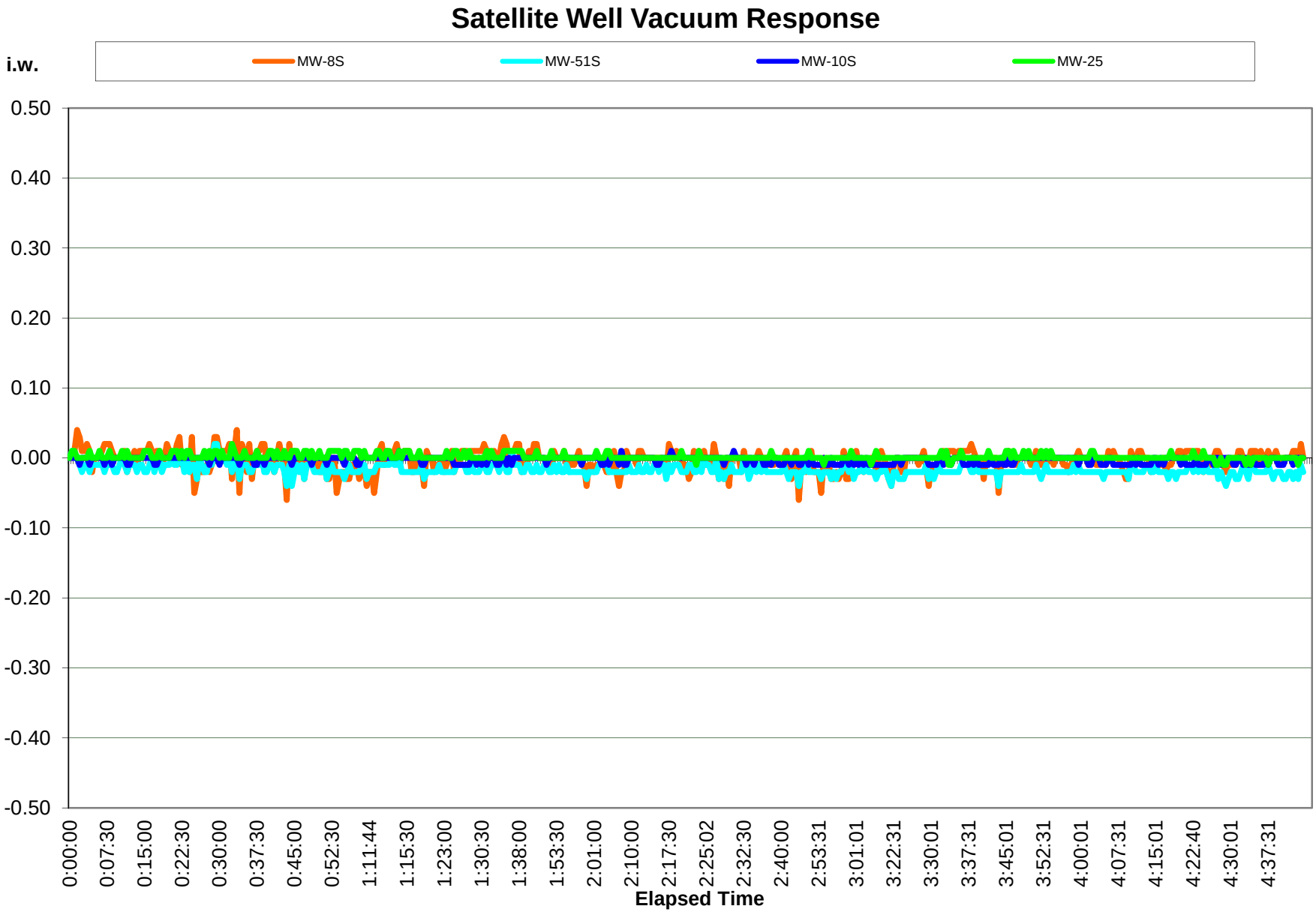
Step Number	***Avg. Well Vacuum (in.H_2O)***	***Avg. Vapor Flow (scfm)***
1	44	3.9
2	70	8.0
3	328	5.5
3	327	6.8

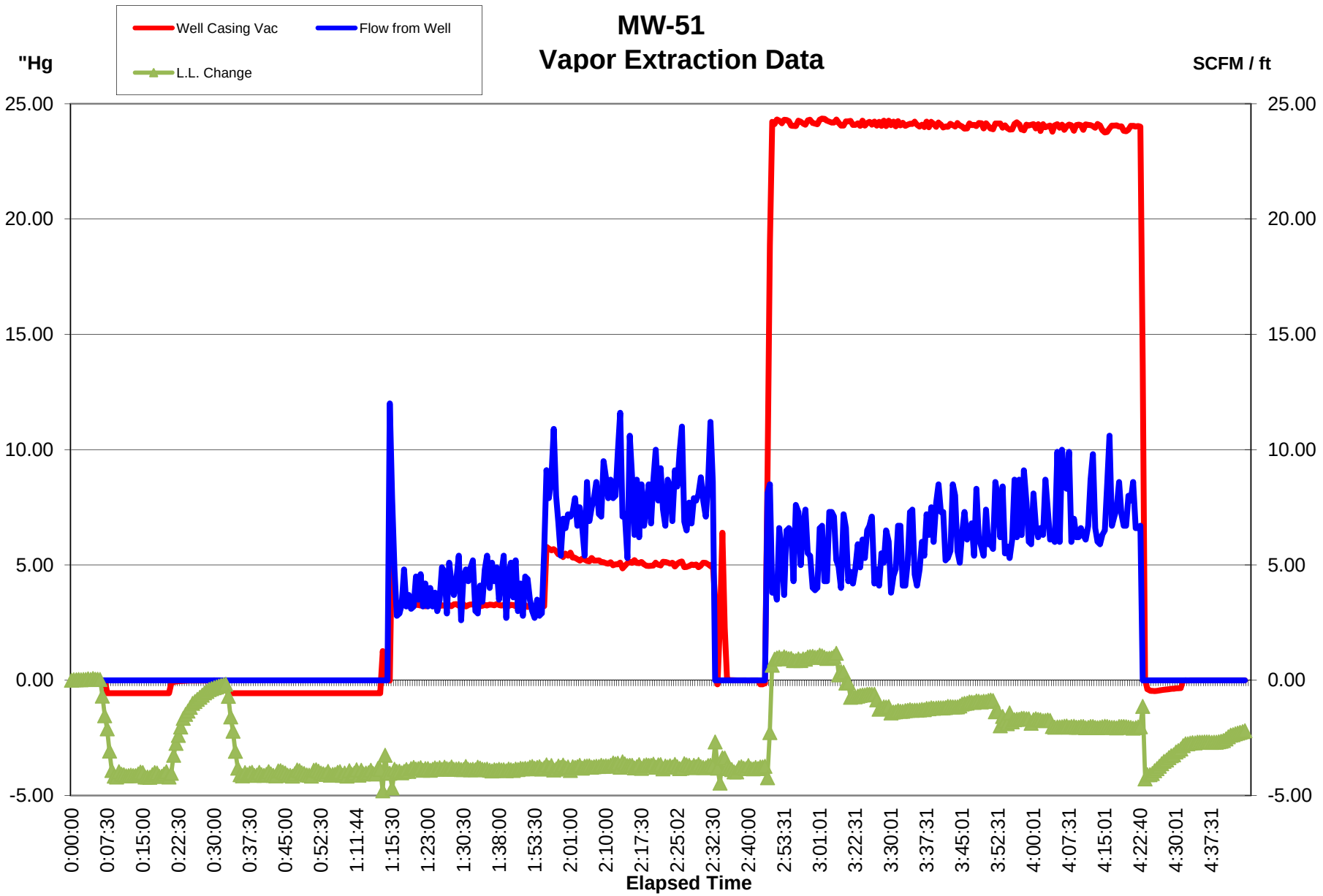


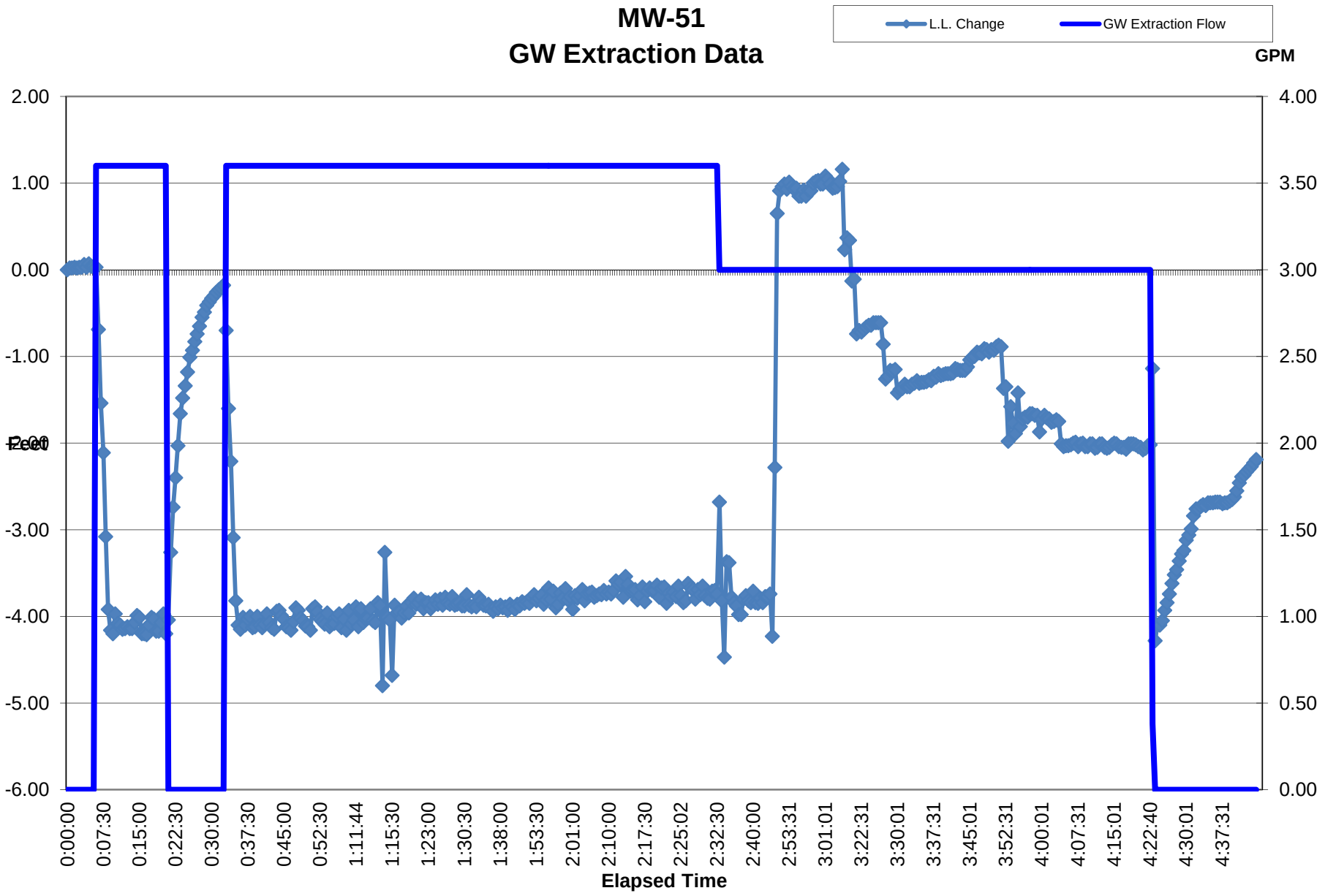
LIQUID LEVEL INFLUENCE GRAPH

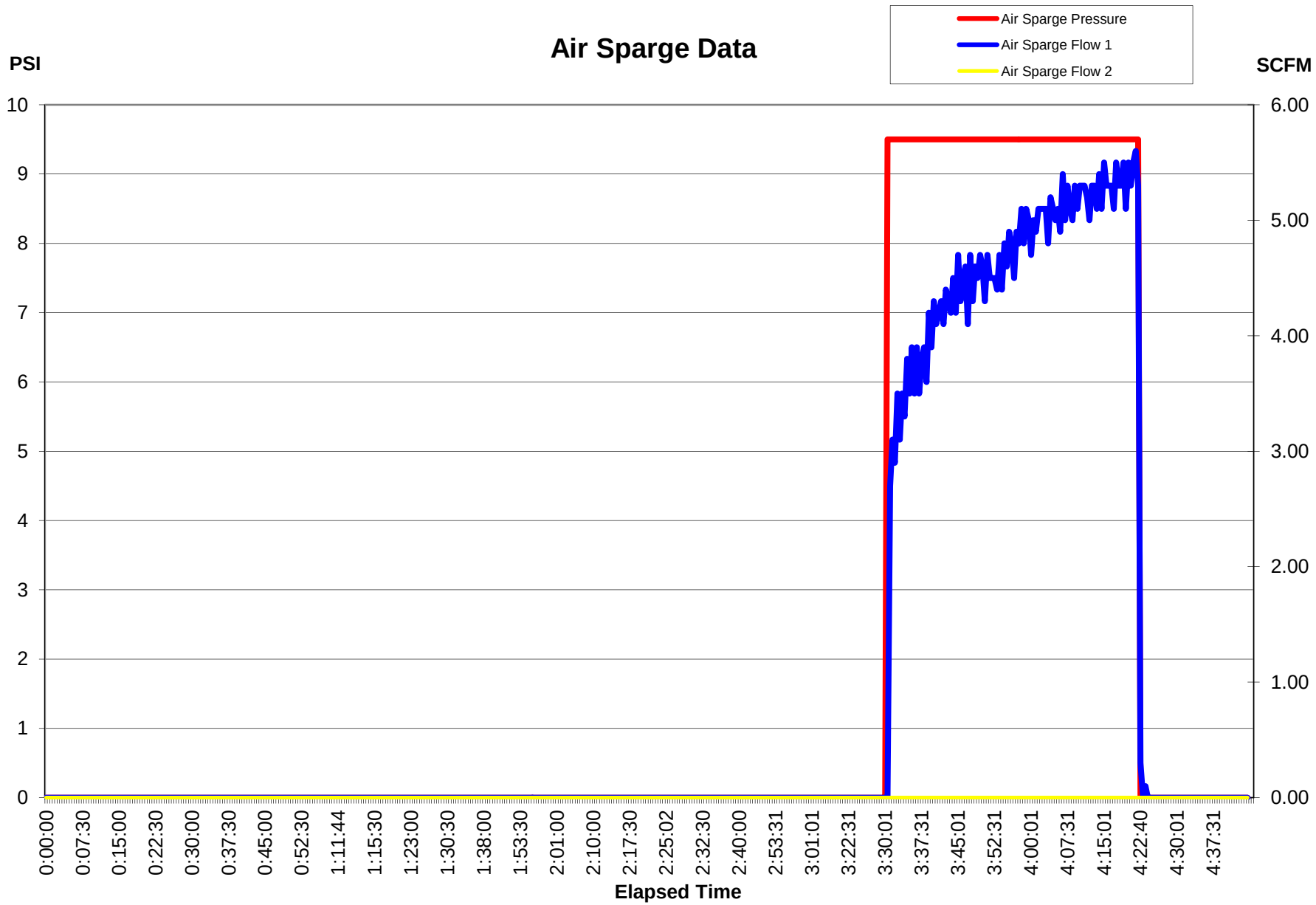
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
i.w.
MW-8S
MW-51S
MW-10S
MW-25
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
0:00:00
0:07:30
0:15:00
0:22:30
0:30:00
0:37:30
0:45:00
0:52:30
1:11:44
1:15:30
1:23:00
1:30:30
1:38:00
1:53:30
2:01:00
2:10:00
2:17:30
2:25:02
2:32:30
2:40:00
2:53:31
3:01:01
3:22:31
3:30:01
3:37:31
3:45:01
3:52:31
4:00:01
4:07:31
4:15:01
4:22:40
4:30:01
4:37:31
Elapsed Time


MW-51
Vapor Extraction Data
Well Casing Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
25.00
20.00
15.00
10.00
5.00
0.00
-5.00
0:00:00
0:07:30
0:15:00
0:22:30
0:30:00
0:37:30
0:45:00
0:52:30
1:11:44
1:15:30
1:23:00
1:30:30
1:38:00
1:53:30
2:01:00
2:10:00
2:17:30
2:25:02
2:32:30
2:40:00
2:53:31
3:01:01
3:22:31
3:30:01
3:37:31
3:45:01
3:52:31
4:00:01
4:07:31
4:15:01
4:22:40
4:30:01
4:37:31
Elapsed Time


MW-51
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0:00:00
0:07:30
0:15:00
0:22:30
0:30:00
0:37:30
0:45:00
0:52:30
1:11:44
1:15:30
1:23:00
1:30:30
1:38:00
1:53:30
2:01:00
2:10:00
2:17:30
2:25:02
2:32:30
2:40:00
2:53:31
3:01:01
3:22:31
3:30:01
3:37:31
3:45:01
3:52:31
4:00:01
4:07:31
4:15:01
4:22:40
4:30:01
4:37:31
Elapsed Time


Air Sparge Data
Air Sparge Pressure
Air Sparge Flow 1
Air Sparge Flow 2
PSI
SCFM
10
9
8
7
6
5
4
3
2
1
0
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0:00:00
0:07:30
0:15:00
0:22:30
0:30:00
0:37:30
0:45:00
0:52:30
1:11:44
1:15:30
1:23:00
1:30:30
1:38:00
1:53:30
2:01:00
2:10:00
2:17:30
2:25:02
2:32:30
2:40:00
2:53:31
3:01:01
3:22:31
3:30:01
3:37:31
3:45:01
3:52:31
4:00:01
4:07:31
4:15:01
4:22:40
4:30:01
4:37:31
Elapsed Time

TESTS 8 & 9

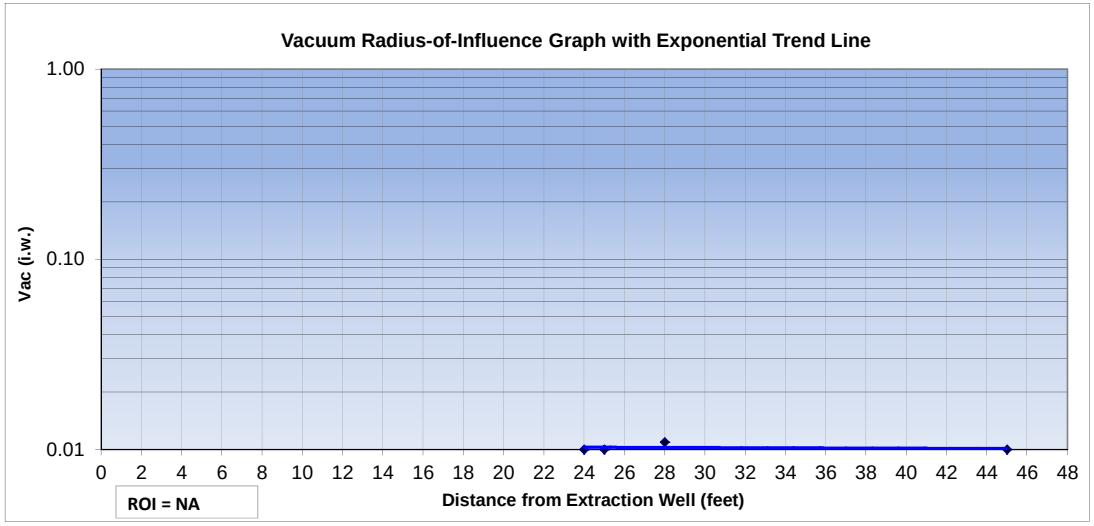
Air Sparge / SVE Testing at SP-2 and MW-27

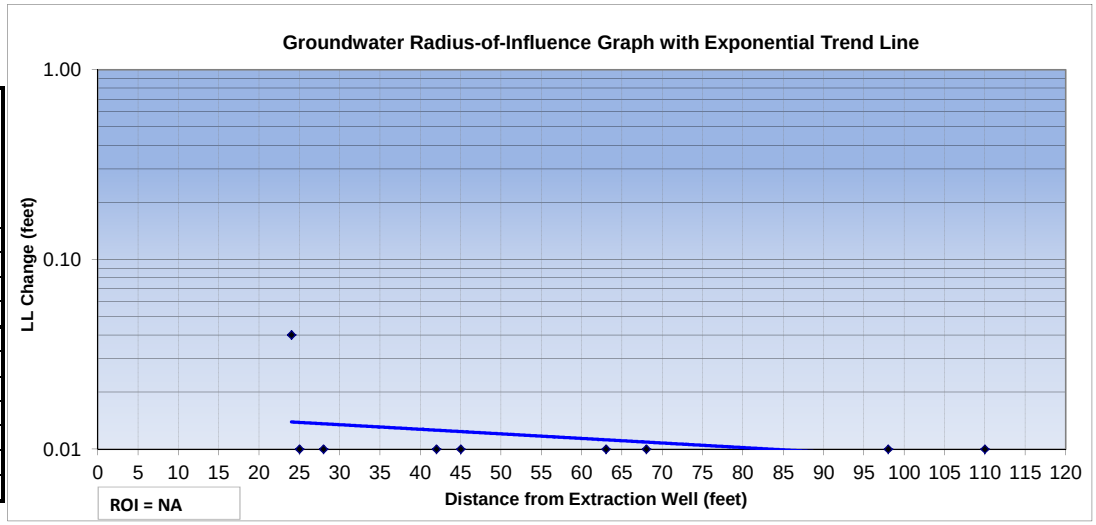
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 8
Test Description: SVE
Extraction Well: MW-27
Sparge Well: -
Step Number: 1

Test Date:	October 15, 2014
Start of Step Time:	9:35:23
End of Step Time:	10:07:53
Extraction Well ID:	MW-27
Initial DTW (feet):	27.00
Total Depth (feet):	35
Screen Interval (feet):	10
Average Vapor Flow (scfm):	0.7
Blower Discharge Temp. (F):	118
Average Vac @ well (in H_2O):	-10
PID concentration (ppm):	43
Percent Oxygen (%):	15.0
Max Upwelling/Drawdown (feet):	0.76

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-31	24	26-36	26.68	0.00	0.04
MW-72	25	25-35	26.7	0.00	0.00
MW-72S	28	15-25	21.6	-0.01	0.00
MW-25	45	25-35	26.69	-0.01	0.00
MW-05	98	25-35	26.42	NM	-0.02
MW-11	63	25-35	26.81	NM	0.00
MW-25S	60	16-26	22.09	NM	0.00
MW-106	42	3-10	7.92	NM	0.01
MW-109	110	14-24	15.04	NM	0.00
MW-109S	112	3.5-13.5	10.57	NM	0.00
TW-05	68	0-10	6.58	NM	-0.01





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

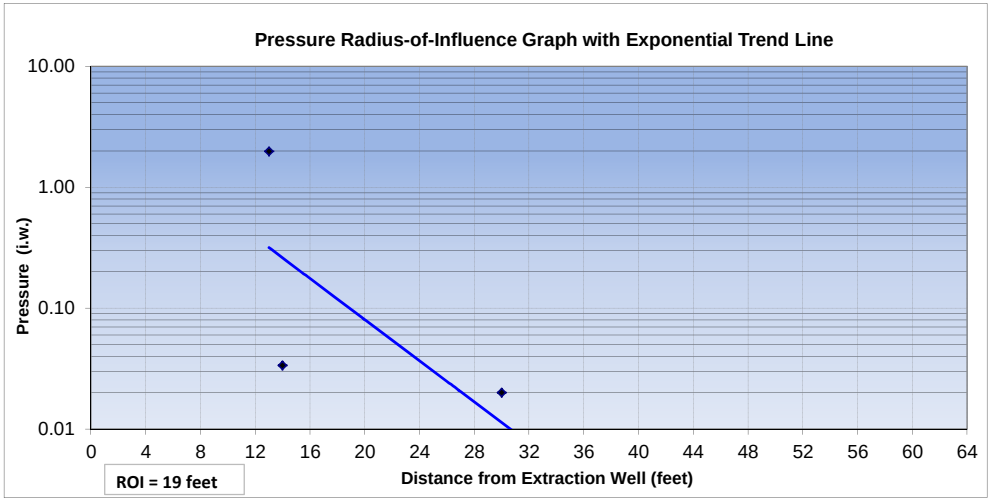
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs.

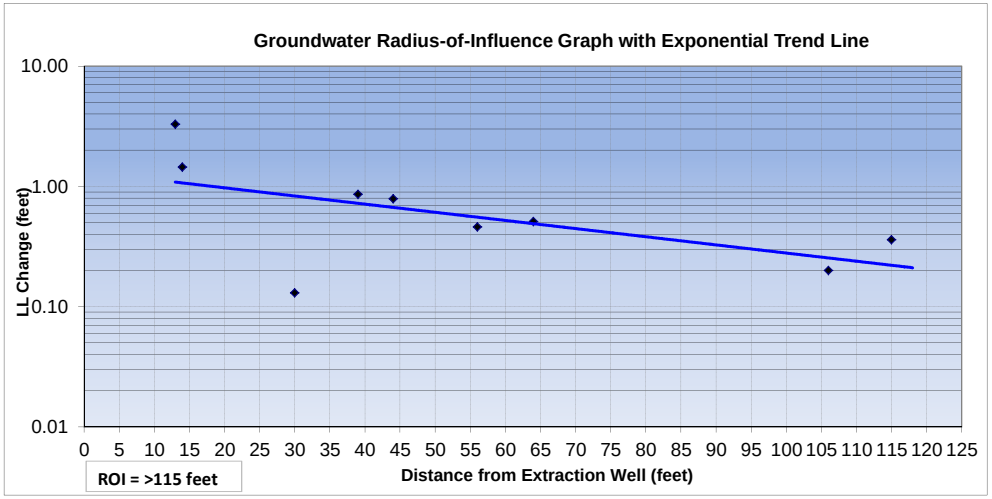
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 9
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-2
Step Number: 1

Test Date:	October 15, 2014
Start of Step Time:	10:58:23
End of Step Time:	15:23:55
Sparge Well ID:	SP-2
Initial DTW (feet):	27.0
Total Depth (feet):	36
Screen Interval (feet):	33-36
Avg. Injection Pressure (psi):	6.0
Average Sparge Flow (scfm):	0.5
Helium Sparge Flow (scfm):	0.7

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***	***Headspace Helium Conc. Or Percent (ppm, %)***
MW-27	14	25-35	27.16	0.03	1.45	30.4%
MW-72	13	25-35	26.70	1.98	3.29	56.0%
MW-31	39	26-36	26.68	0.00	0.86	0
MW-72S	17	15-25	21.60	NA	0.04	23.0%
MW-25	44	25-35	26.69	-0.02	0.79	8,725
MW-5	106	25-35	26.42	0.01	0.20	9.7%
MW-25S	46	16-26	22.09	0.00	0.02	1,550
MW-30S	43	16-26	24.84	0.00	NM	0
MW-33	73	25-35	26.50	0.00	NM	0
MW-10S	68	17-27	22.21	0.00	NM	2,300
MW-14	74	28.5-38.5	27.25	0.00	NM	2,325
MW-15S	79	16-26	26.37	0.00	NM	0
MW-51S	66	15.5-25.5	21.51	0.03	NM	3,300
MW-51	63	27-37	26.57	0.00	NM	7,650
MW-11	64	25-35	26.81	0.00	0.51	7,000
MW-106	30	3-10	7.92	0.02	0.13	NM
MW-109S	118	3.5-13.5	10.57	0.00	0.01	0
MW-109	115	14-24	15.04	0.00	0.36	2,700
TW-05	56	0-10	6.58	0.00	0.46	1,300
TW-06	60	5-15	6.66	0.00	NM	0
TW-07	87	5-15	7.17	0.00	NM	0





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

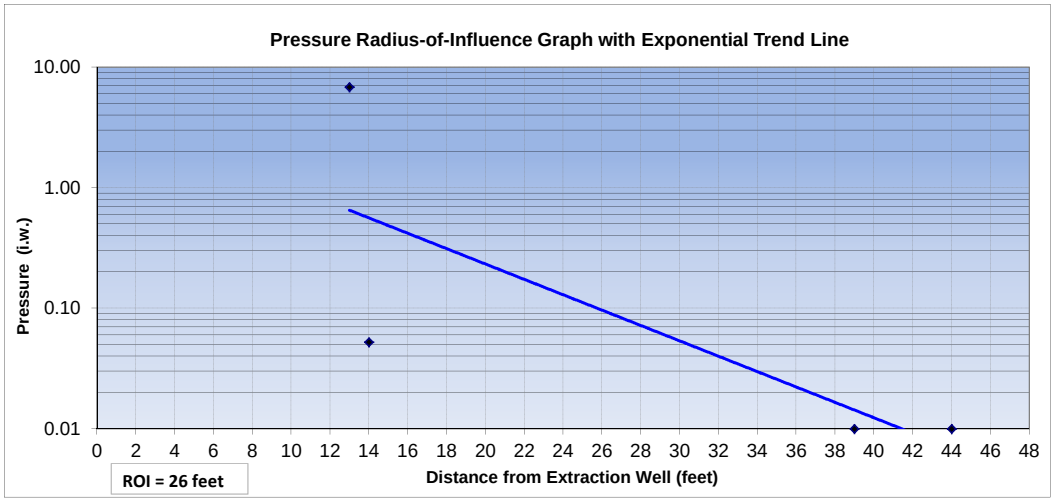
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

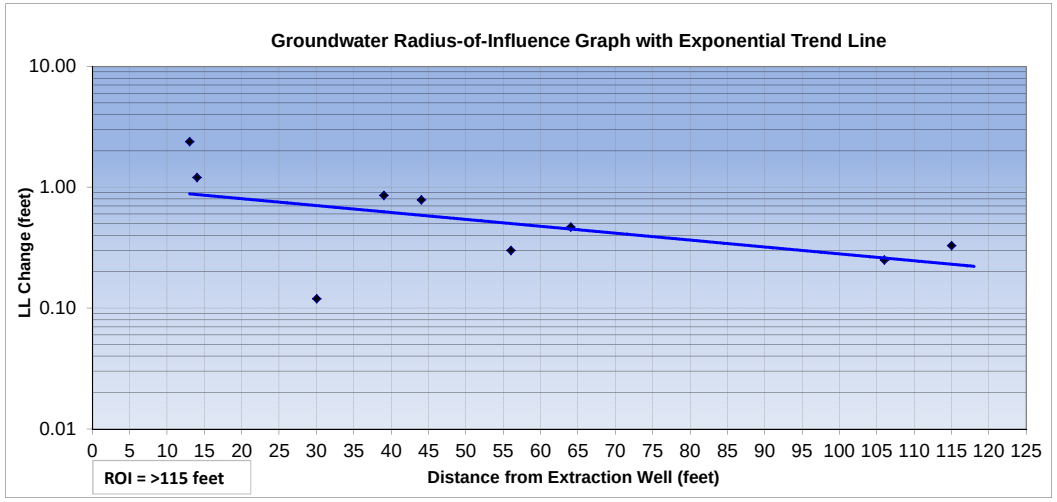
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 9
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-2
Step Number: 2

Test Date:	October 15, 2014
Start of Step Time:	15:26:54
End of Step Time:	15:34:54
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	36
Screen Interval (feet):	33-36
Avg. Injection Pressure (psi):	6.5
Average Sparge Flow (scfm):	2.5
Helium Sparge Flow (scfm):	0.0
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-27	14	25-35	27.16	0.05	1.21
MW-72	13	25-35	26.7	6.82	2.39
MW-31	39	26-36	26.68	0.00	0.86
MW-72S	17	15-25	21.6	0.13	0.01
MW-25	44	25-35	26.69	-0.03	0.79
MW-05	106	25-35	26.42	NM	0.25
MW-11	64	25-35	26.81	NM	0.47
MW-25S	46	16-26	22.09	NM	0.01
MW-106	30	3-10	7.92	NM	0.12
MW-109	115	14-24	15.04	NM	0.33
MW-109S	118	3.5-13.5	10.57	NM	0.01
TW-05	56	0-10	6.58	NM	0.30





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

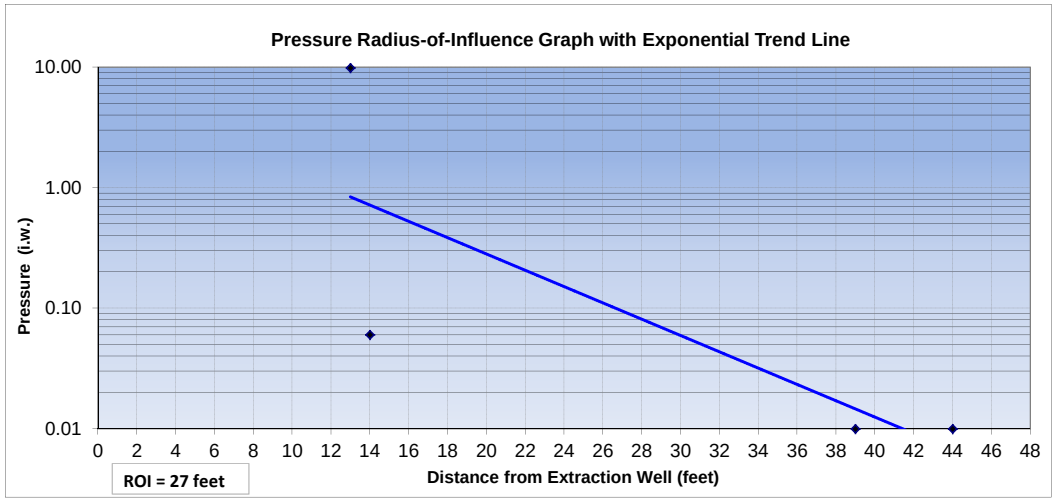
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

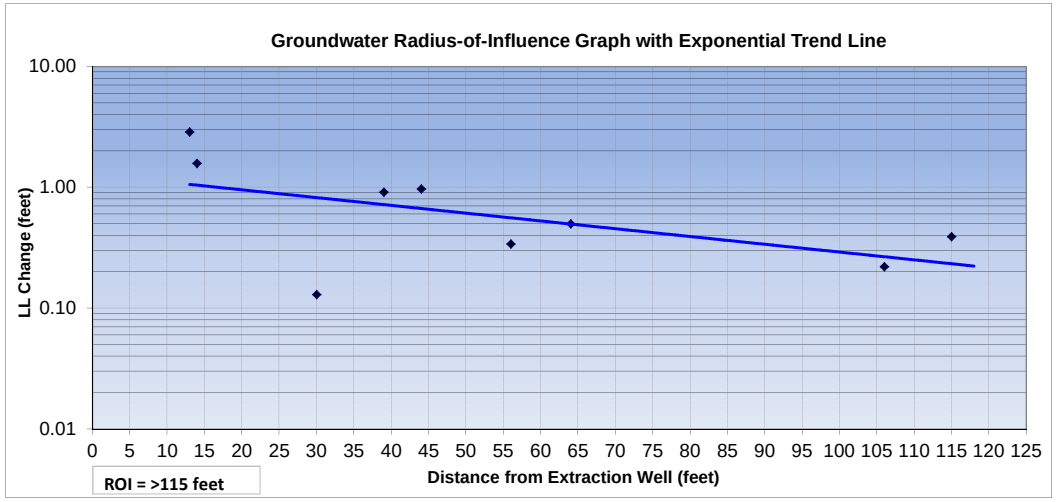
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 9
Test Description: Air Sparge
Extraction Well: -
Sparge Well: SP-2
Step Number: 3

Test Date:	October 15, 2014
Start of Step Time:	15:35:24
End of Step Time:	15:44:25
Sparge Well ID:	SP-1
Initial DTW (feet):	27.0
Total Depth (feet):	36
Screen Interval (feet):	33-36
Avg. Injection Pressure (psi):	7.0
Average Sparge Flow (scfm):	3.1
Helium Sparge Flow (scfm):	0.0
Average SVE Flow (scfm):	-
Average Vac @ well (in H_2O):	-
PID concentration (ppm):	-
Percent Oxygen (%):	-

Well ID	***Radial Distance from Sparge Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/ Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-27	14	25-35	27.16	0.06	1.58
MW-72	13	25-35	26.7	9.80	2.87
MW-31	39	26-36	26.68	0.00	0.91
MW-72S	17	15-25	21.6	0.07	0.01
MW-25	44	25-35	26.69	-0.03	0.97
MW-05	106	25-35	26.42	NM	0.22
MW-11	64	25-35	26.81	NM	0.50
MW-25S	46	16-26	22.09	NM	0.01
MW-106	30	3-10	7.92	NM	0.13
MW-109	115	14-24	15.04	NM	0.39
MW-109S	118	3.5-13.5	10.57	NM	0.01
TW-05	56	0-10	6.58	NM	0.34





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
ppmv - parts per million by volume

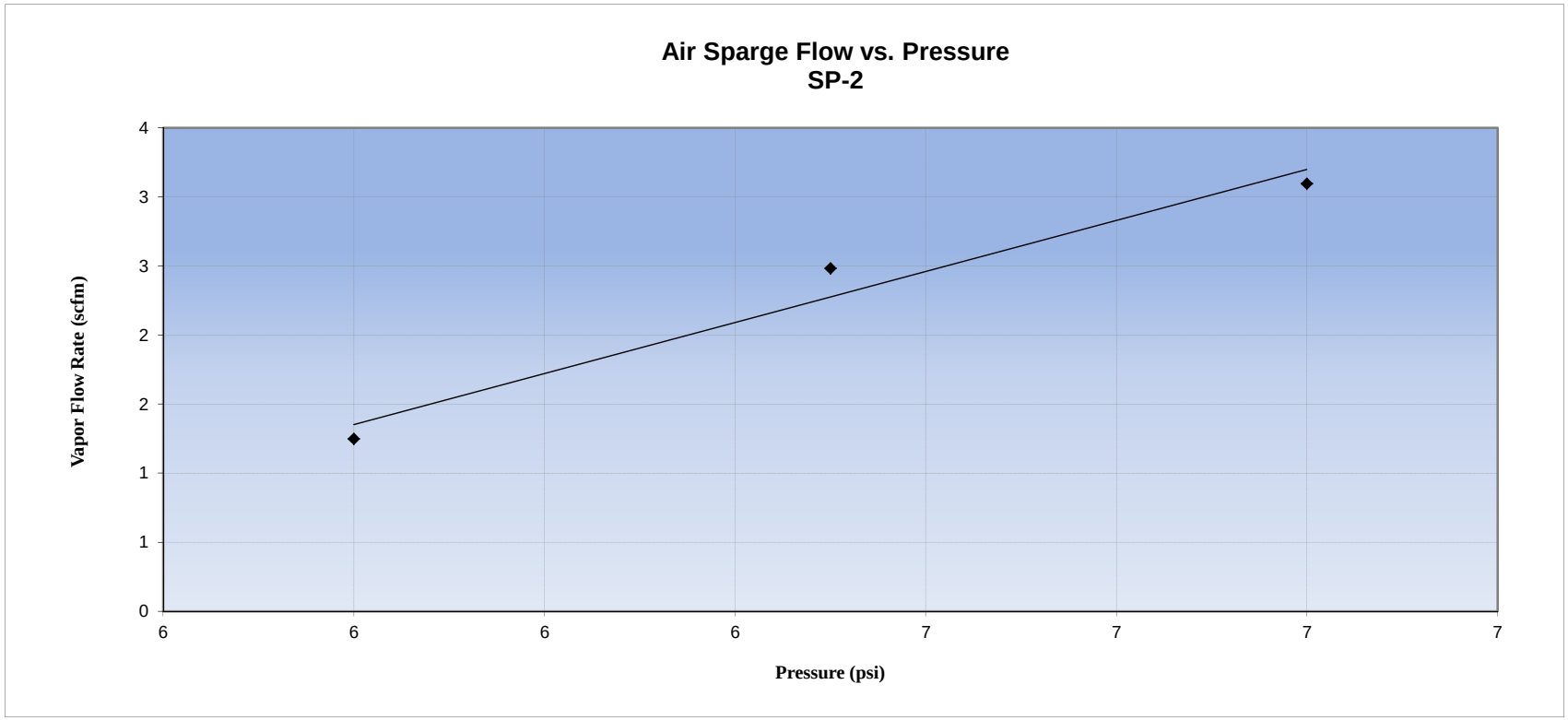
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum. Values less than 0.01 i.w. are plotted as 0.01 i.w.
- A positive influence pressure reading indicates observed pressure.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the pressure and groundwater ROI graphs.

Air Sparge Flow vs. Pressure Data

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 9
Test Description: Air Sparge with Helium
Test Well: SP-2

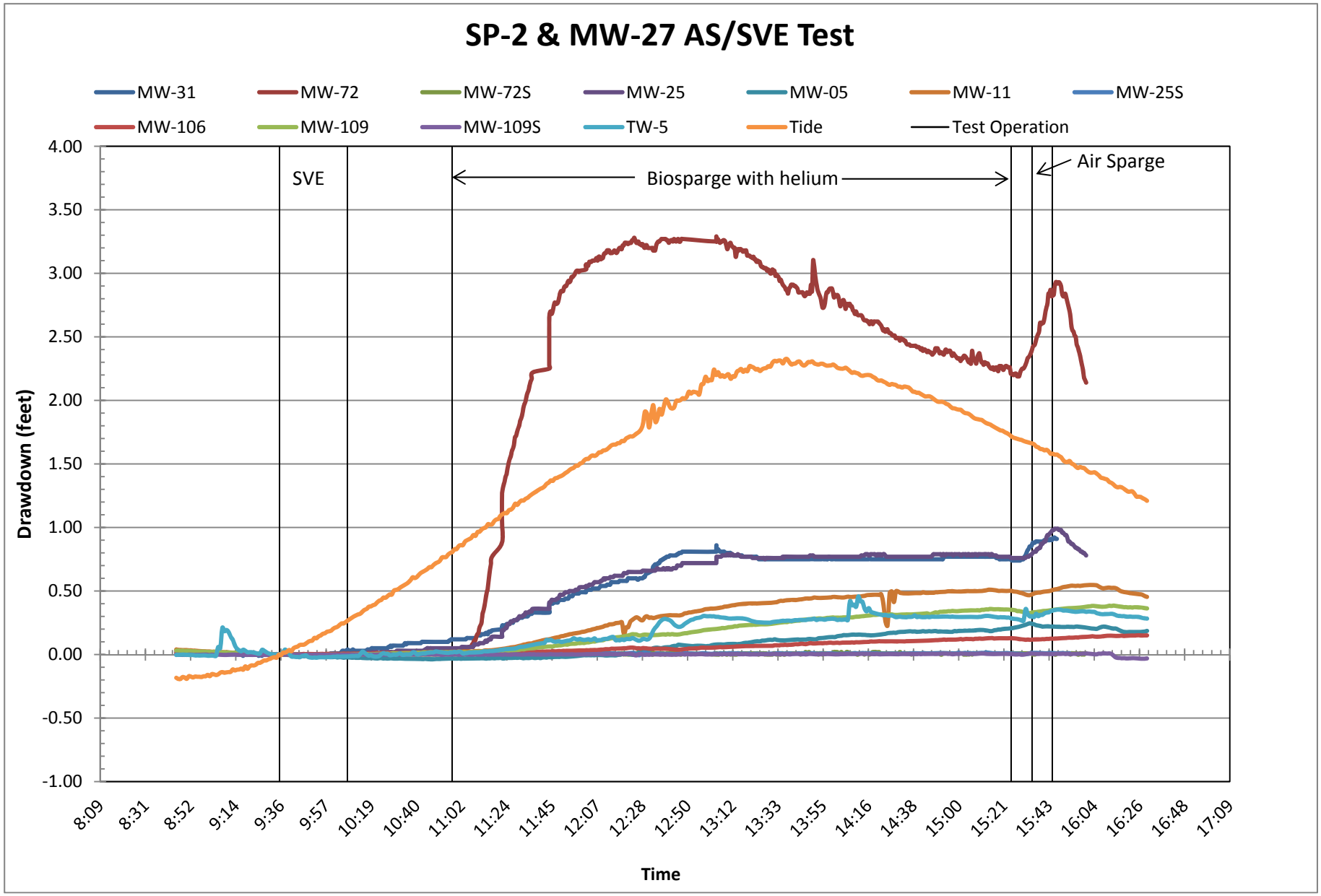
Test Date:	October 15, 2014
Injection Well ID:	SP-2
Initial DTW (feet):	27.0
Initial DTP (feet):	-
Total Depth (feet):	36
Screen Length (feet):	3

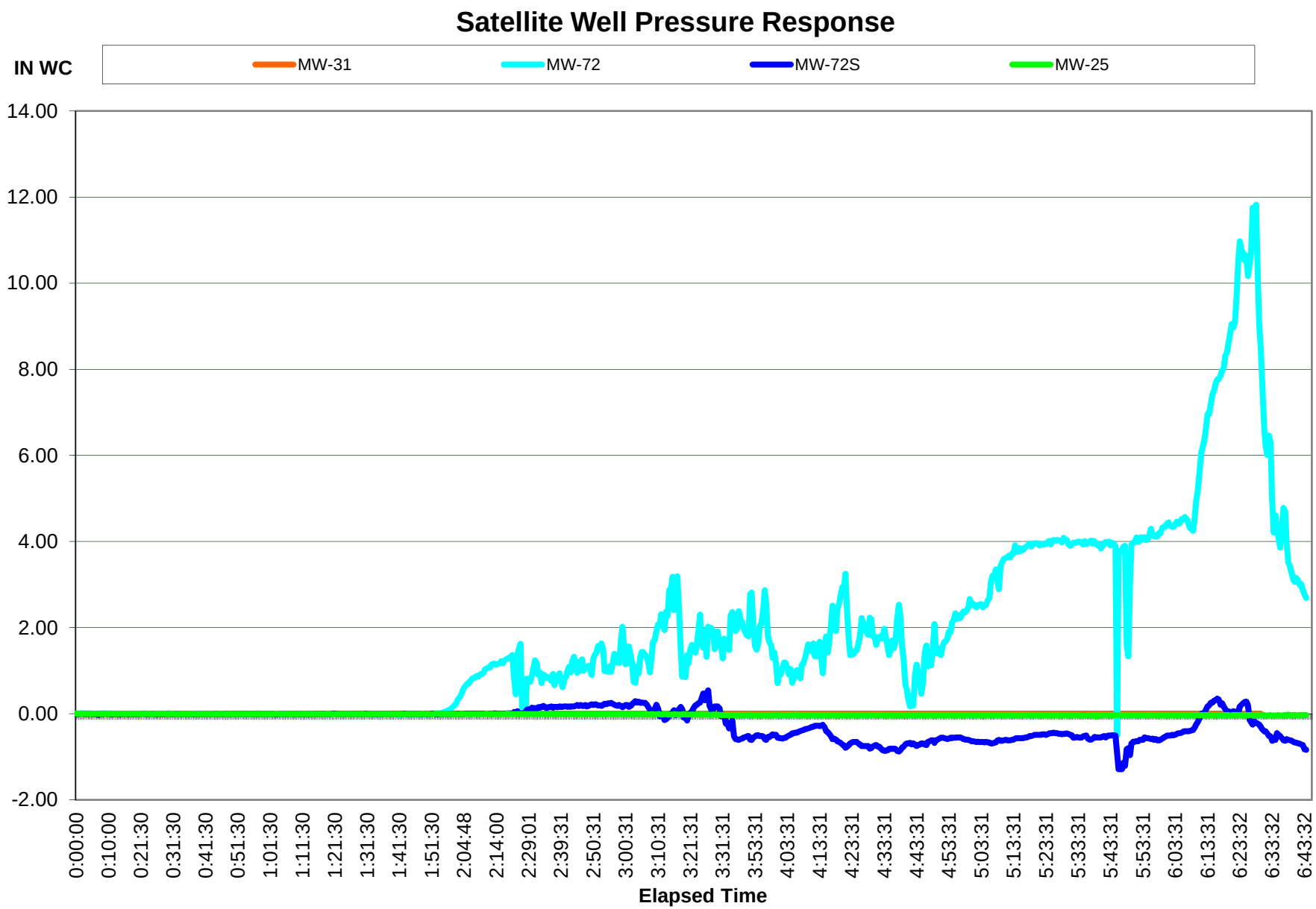
Step Number	***Avg. Injection Pressure (psi)***	***Avg. Air Flow (scfm)***
1	6.0	1.2
2	6.5	2.5
3	7.0	3.1

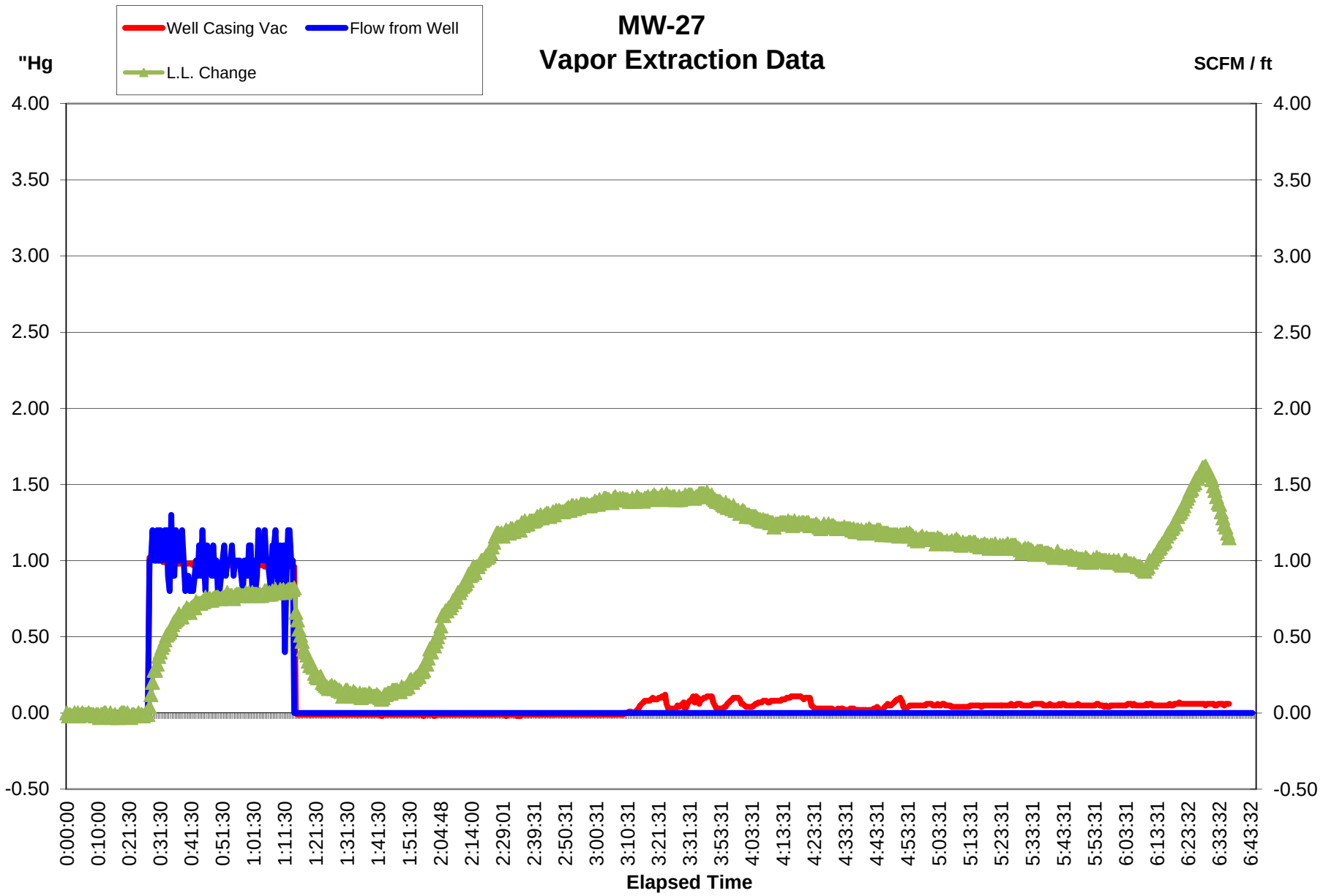


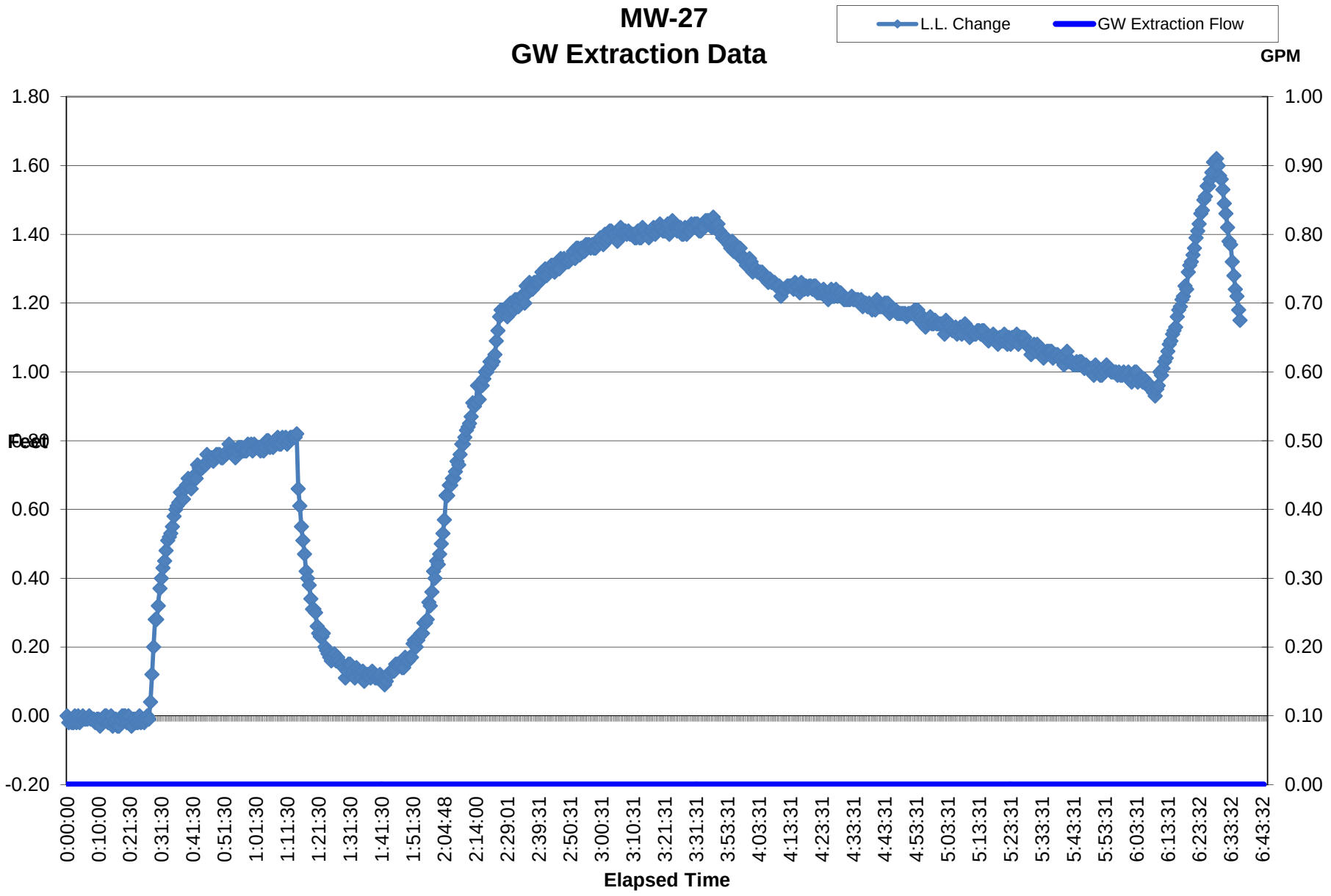
LIQUID LEVEL INFLUENCE GRAPHS

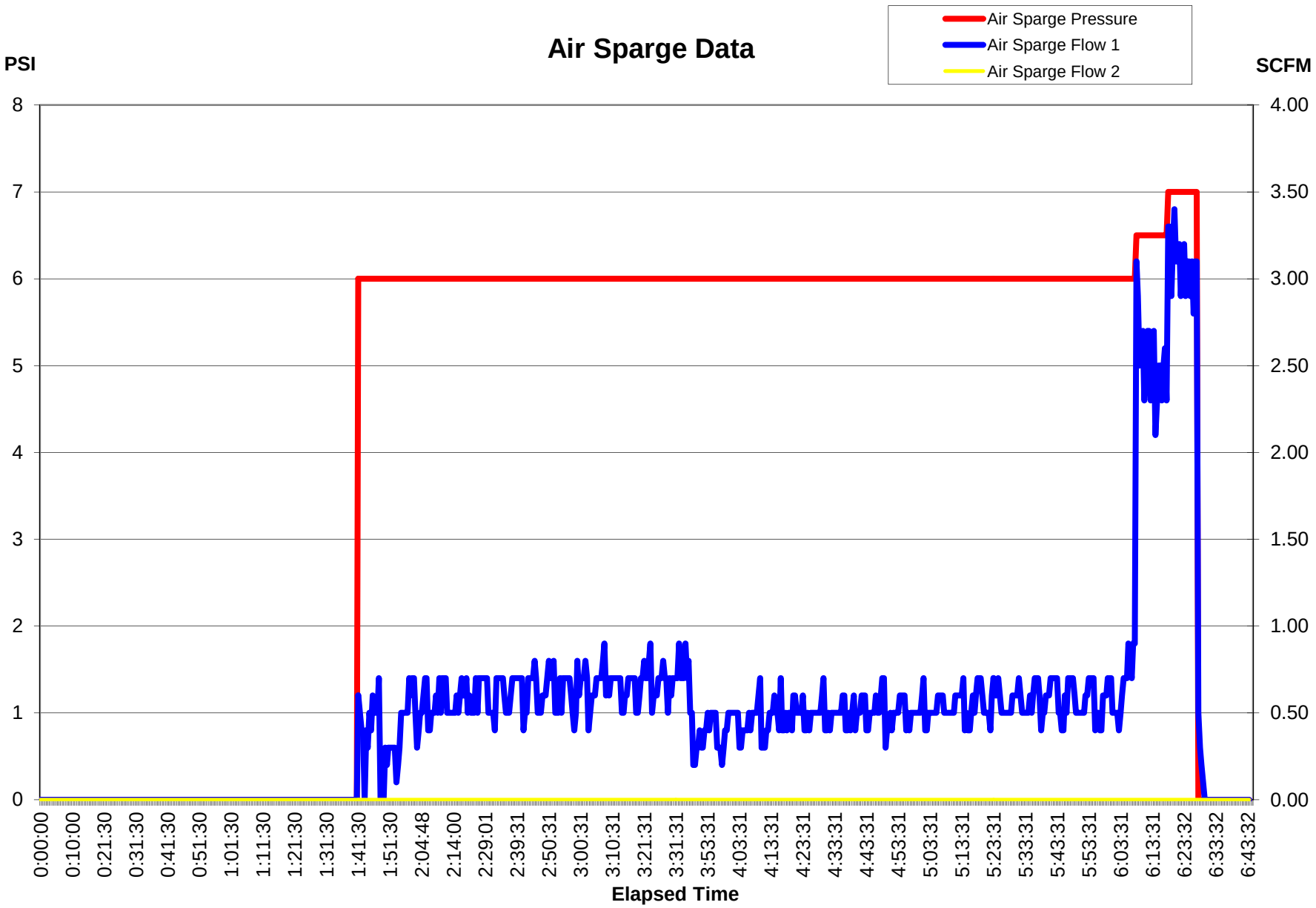
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Pressure Response
IN WC
MW-31
MW-72
MW-72S
MW-25
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
-2.00
0:00:00
0:10:00
0:21:30
0:31:30
0:41:30
0:51:30
1:01:30
1:11:30
1:21:30
1:31:30
1:41:30
1:51:30
2:04:48
2:14:00
2:29:01
2:39:31
2:50:31
3:00:31
3:10:31
3:21:31
3:31:31
3:53:31
4:03:31
4:13:31
4:23:31
4:33:31
4:43:31
4:53:31
5:03:31
5:13:31
5:23:31
5:33:31
5:43:31
5:53:31
6:03:31
6:13:31
6:23:32
6:33:32
6:43:32
Elapsed Time


MW-27
Vapor Extraction Data
Well Casing Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
0:00:00
0:10:00
0:21:30
0:31:30
0:41:30
0:51:30
1:01:30
1:11:30
1:21:30
1:31:30
1:41:30
1:51:30
2:04:48
2:14:00
2:29:01
2:39:31
2:50:31
3:00:31
3:10:31
3:21:31
3:31:31
3:53:31
4:03:31
4:13:31
4:23:31
4:33:31
4:43:31
4:53:31
5:03:31
5:13:31
5:23:31
5:33:31
5:43:31
5:53:31
6:03:31
6:13:31
6:23:32
6:33:32
6:43:32
Elapsed Time


MW-27
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0:00:00
0:10:00
0:21:30
0:31:30
0:41:30
0:51:30
1:01:30
1:11:30
1:21:30
1:31:30
1:41:30
1:51:30
2:04:48
2:14:00
2:29:01
2:39:31
2:50:31
3:00:31
3:10:31
3:21:31
3:31:31
3:53:31
4:03:31
4:13:31
4:23:31
4:33:31
4:43:31
4:53:31
5:03:31
5:13:31
5:23:31
5:33:31
5:43:31
5:53:31
6:03:31
6:13:31
6:23:32
6:33:32
6:43:32
Elapsed Time


Air Sparge Data
Air Sparge Pressure
Air Sparge Flow 1
Air Sparge Flow 2
PSI
SCFM
8
7
6
5
4
3
2
1
0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0:00:00
0:10:00
0:21:30
0:31:30
0:41:30
0:51:30
1:01:30
1:11:30
1:21:30
1:31:30
1:41:30
1:51:30
2:04:48
2:14:00
2:29:01
2:39:31
2:50:31
3:00:31
3:10:31
3:21:31
3:31:31
3:53:31
4:03:31
4:13:31
4:23:31
4:33:31
4:43:31
4:53:31
5:03:31
5:13:31
5:23:31
5:33:31
5:43:31
5:53:31
6:03:31
6:13:31
6:23:32
6:33:32
6:43:32
Elapsed Time

TEST 10

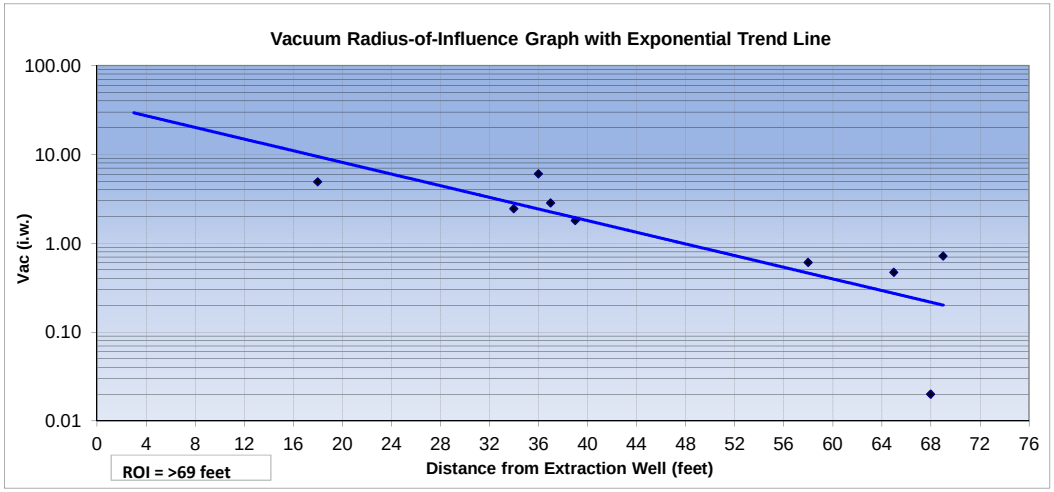
Total Phase Extraction Testing at MW-25S

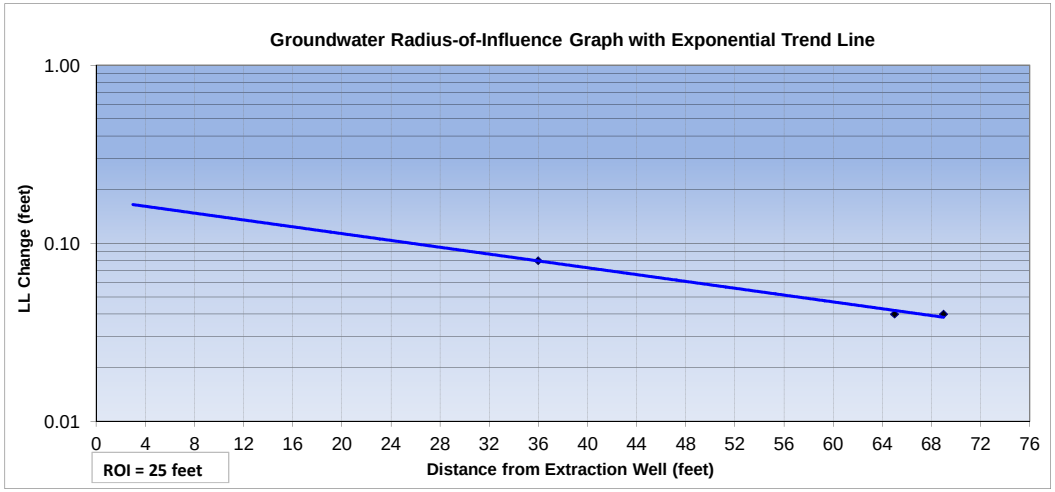
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 10
Test Description: TPE
Extraction Well: MW-25S
Sparge Well: -
Step Number: 1

Test Date:	October 15, 2014
Start of Step Time:	16:15:55
End of Step Time:	17:08:25
Extraction Well ID:	MW-25S
Initial DTW (feet):	22.00
Total Depth (feet):	25.5
Screen Interval (feet):	10
Average Vapor Flow (scfm):	74.2
Blower Discharge Temp. (F):	164
Average Applied Vac (in Hg):	17.3
PID concentration (ppm):	153.5
Percent Oxygen (%):	12.0
Groundwater Flow Rate (gpm):	0.21
Max Upwelling/Drawdown (feet):	-2.53

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	37	25-35	27.13	-2.85	-1.65
MW-10S	18	17-27	22.21	-4.90	-0.02
MW-72S	36	15-25	21.39	-6.07	-0.08
MW-25	3	25-35	26.69	-0.01	-0.42
MW-11	17	25-35	26.81	-0.07	-0.18
MW-51	31	27-37	26.57	0.00	NM
MW-51S	34	15.5-25.5	21.51	-2.45	NM
MW-8S	39	15-25	21.72	-1.80	NM
MW-14	51	28.5-38.5	NM	-0.15	NM
MW-15S	58	16-26	NM	-0.61	NM
MW109S	65	3.5-13.5	10.57	-0.47	-0.04
MW-107	68	3-11	10.66	-0.02	NM
MW-5	69	25-35	26.42	-0.72	-0.04





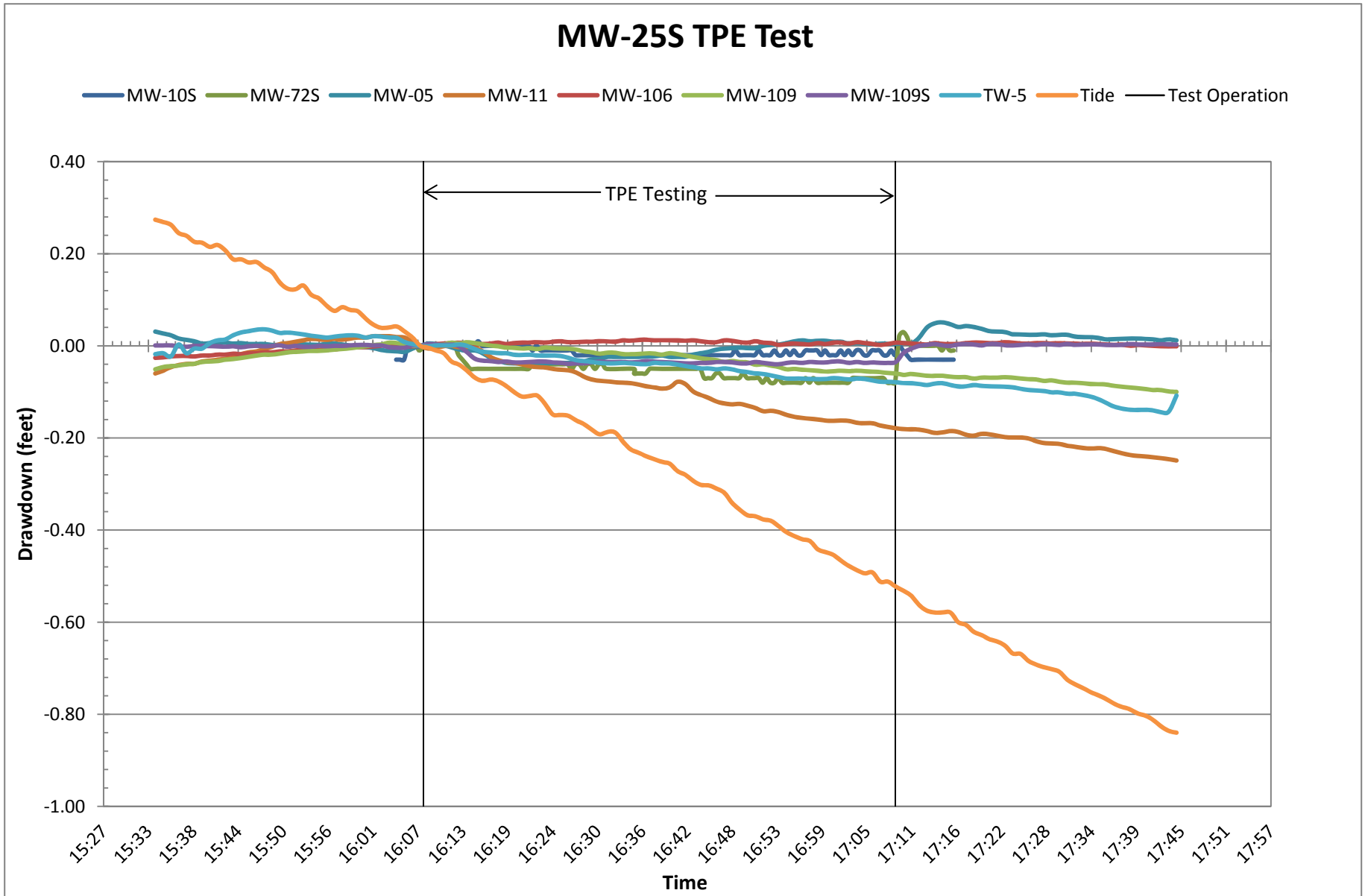
NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

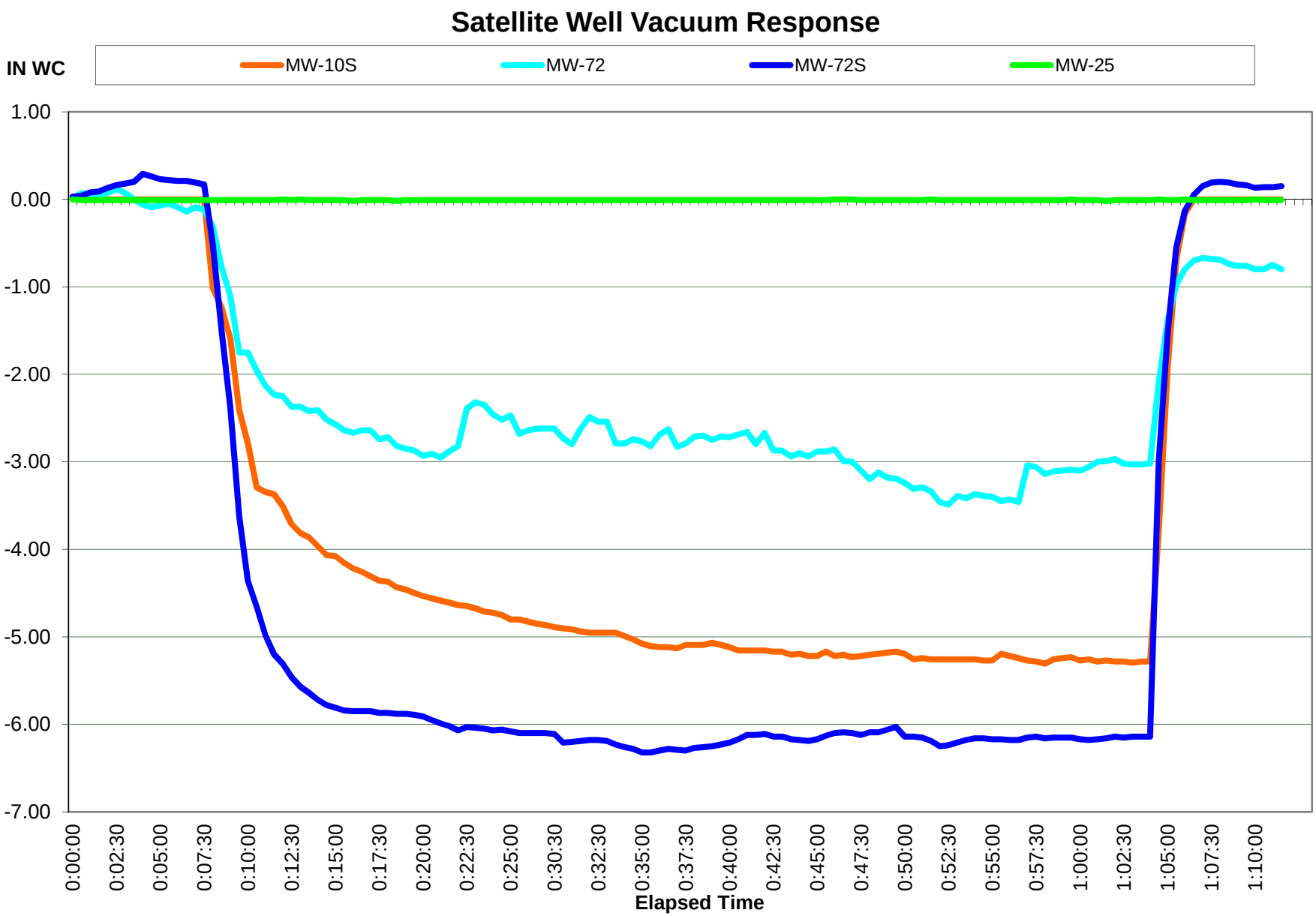
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

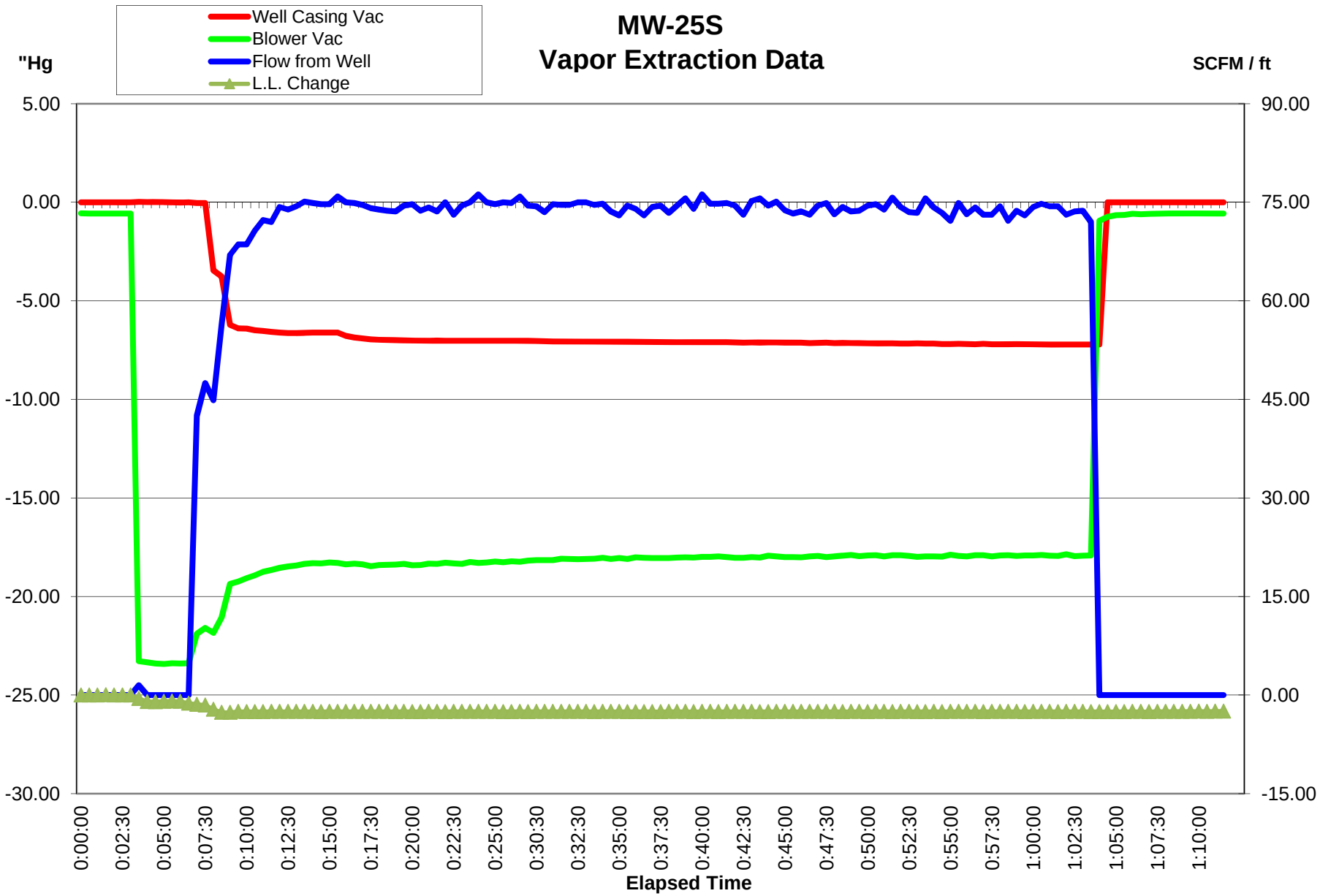
LIQUID LEVEL INFLUENCE GRAPH

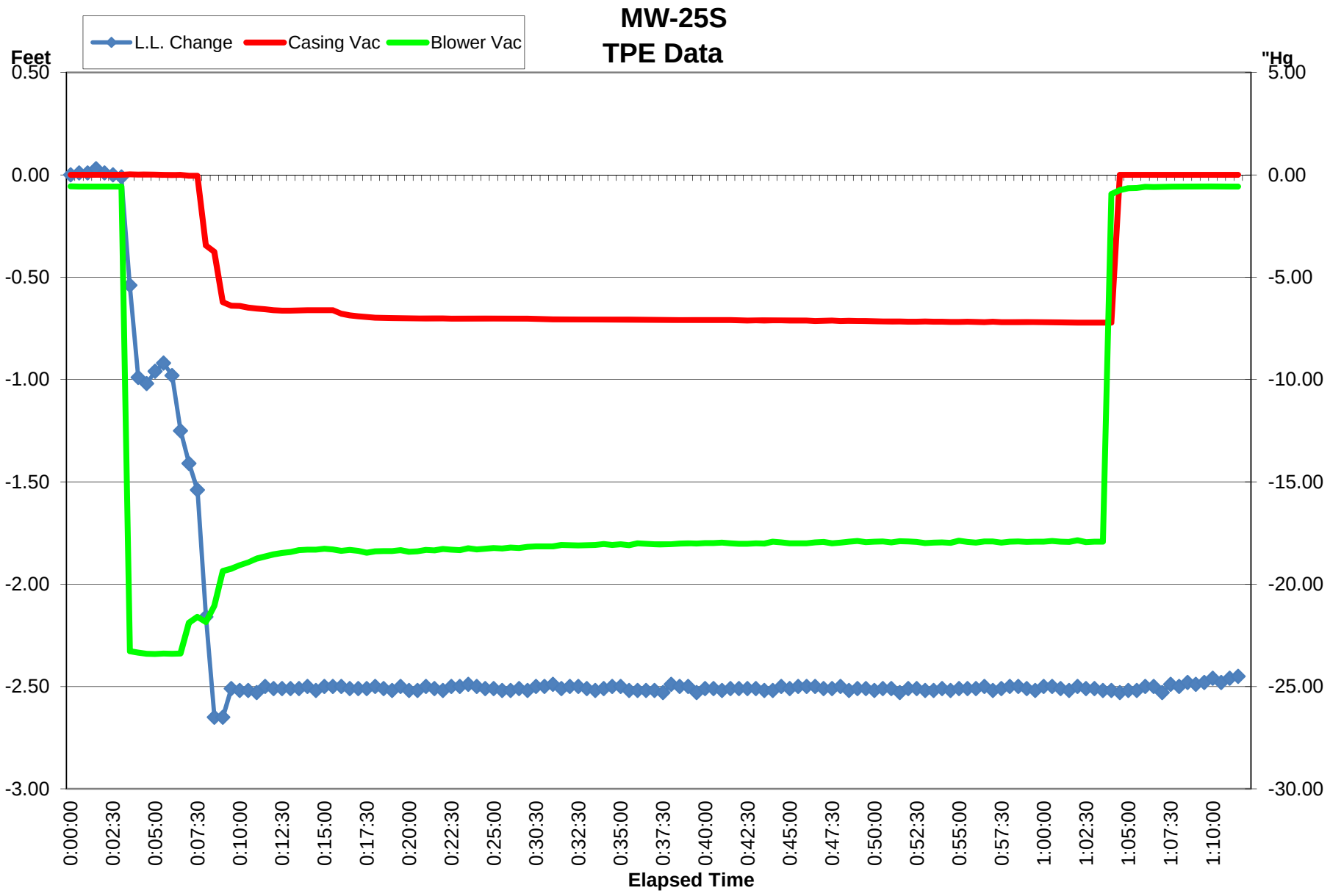
Potomac River Generating Station
October 13 to 16, 2014

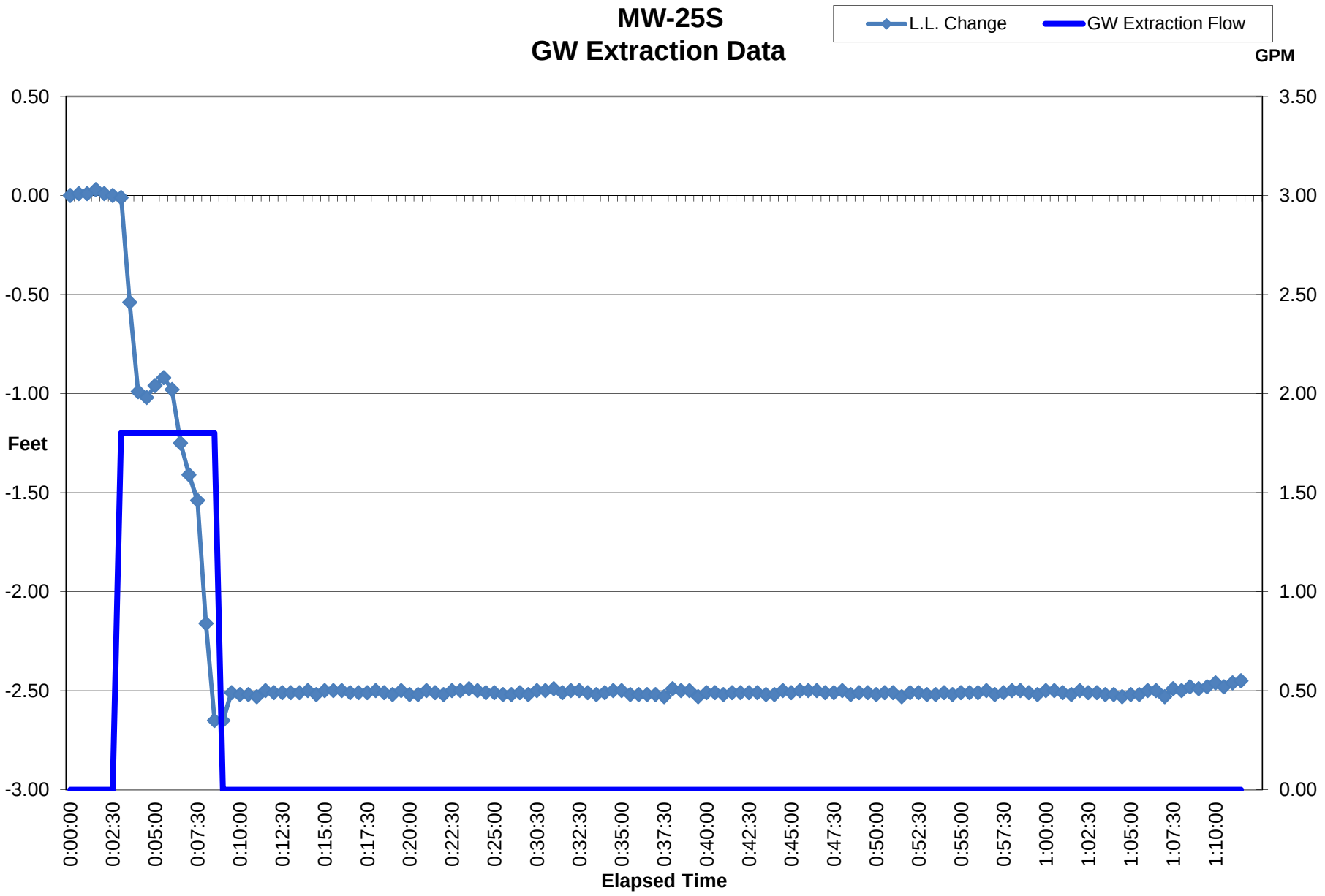


Note: MW-72 and MW-25 data removed due to rebounding occuring from mounding that occurred during previous air sparge testing.


Satellite Well Vacuum Response
IN WC
MW-10S
MW-72
MW-72S
MW-25
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
-7.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:30:30
0:32:30
0:35:00
0:37:30
0:40:00
0:42:30
0:45:00
0:47:30
0:50:00
0:52:30
0:55:00
0:57:30
1:00:00
1:02:30
1:05:00
1:07:30
1:10:00
Elapsed Time


MW-25S
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
90.00
75.00
60.00
45.00
30.00
15.00
0.00
-15.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:30:30
0:32:30
0:35:00
0:37:30
0:40:00
0:42:30
0:45:00
0:47:30
0:50:00
0:52:30
0:55:00
0:57:30
1:00:00
1:02:30
1:05:00
1:07:30
1:10:00
Elapsed Time


MW-25S
TPE Data
L.L. Change
Casing Vac
Blower Vac
Feet
"Hg
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:30:30
0:32:30
0:35:00
0:37:30
0:40:00
0:42:30
0:45:00
0:47:30
0:50:00
0:52:30
0:55:00
0:57:30
1:00:00
1:02:30
1:05:00
1:07:30
1:10:00
Elapsed Time


MW-25S
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:30:30
0:32:30
0:35:00
0:37:30
0:40:00
0:42:30
0:45:00
0:47:30
0:50:00
0:52:30
0:55:00
0:57:30
1:00:00
1:02:30
1:05:00
1:07:30
1:10:00
Elapsed Time

TEST 11

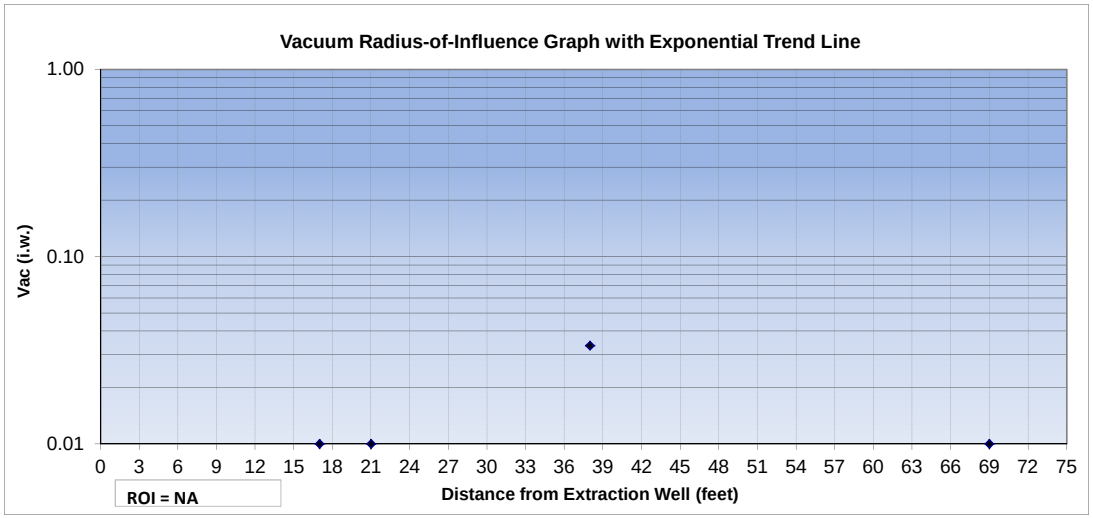
Total Phase Extraction Testing at MW-25

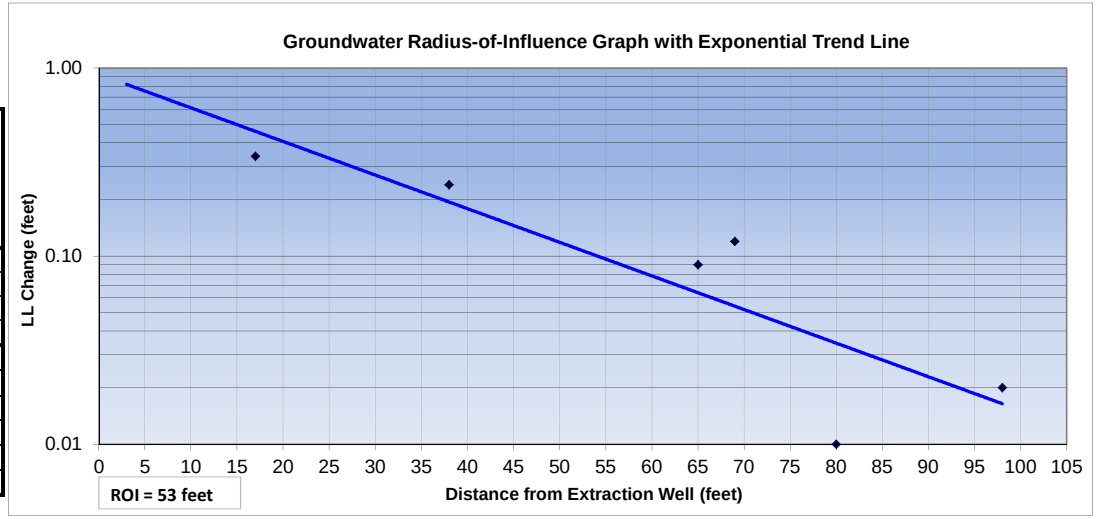
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 11
Test Description: TPE
Extraction Well: MW-25
Sparge Well: -
Step Number: 1

Test Date:	October 16, 2014
Start of Step Time:	8:53:36
End of Step Time:	9:21:36
Extraction Well ID:	MW-25
Initial DTW (feet):	25.50
Total Depth (feet):	36.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	1.6
Blower Discharge Temp. (F):	139
Average Applied Vac (in Hg):	22.9
PID concentration (ppm):	NA
Percent Oxygen (%):	NA
Groundwater Flow Rate (gpm):	3.5
Max Upwelling/Drawdown (feet):	-0.23

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	38.00	25-35	26.80	-0.03	-0.24
MW-10S	21.00	17-27	22.21	0.00	0.00
MW-72S	39.00	15-25	21.60	-0.15	-0.01
MW-25S	3.00	16-26	25.51	0.00	0.00
MW-05	69	25-35	26.71	0.00	-0.12
MW-11	17	25-35	26.86	0.00	-0.34
MW-109	65	14-24	15.09	NM	-0.09
MW-109S	66	3.5-13.5	10.58	NM	0.00
MW-106	80	3-10	7.92	NM	-0.01
TW-05	98	0-10	6.58	NM	-0.02





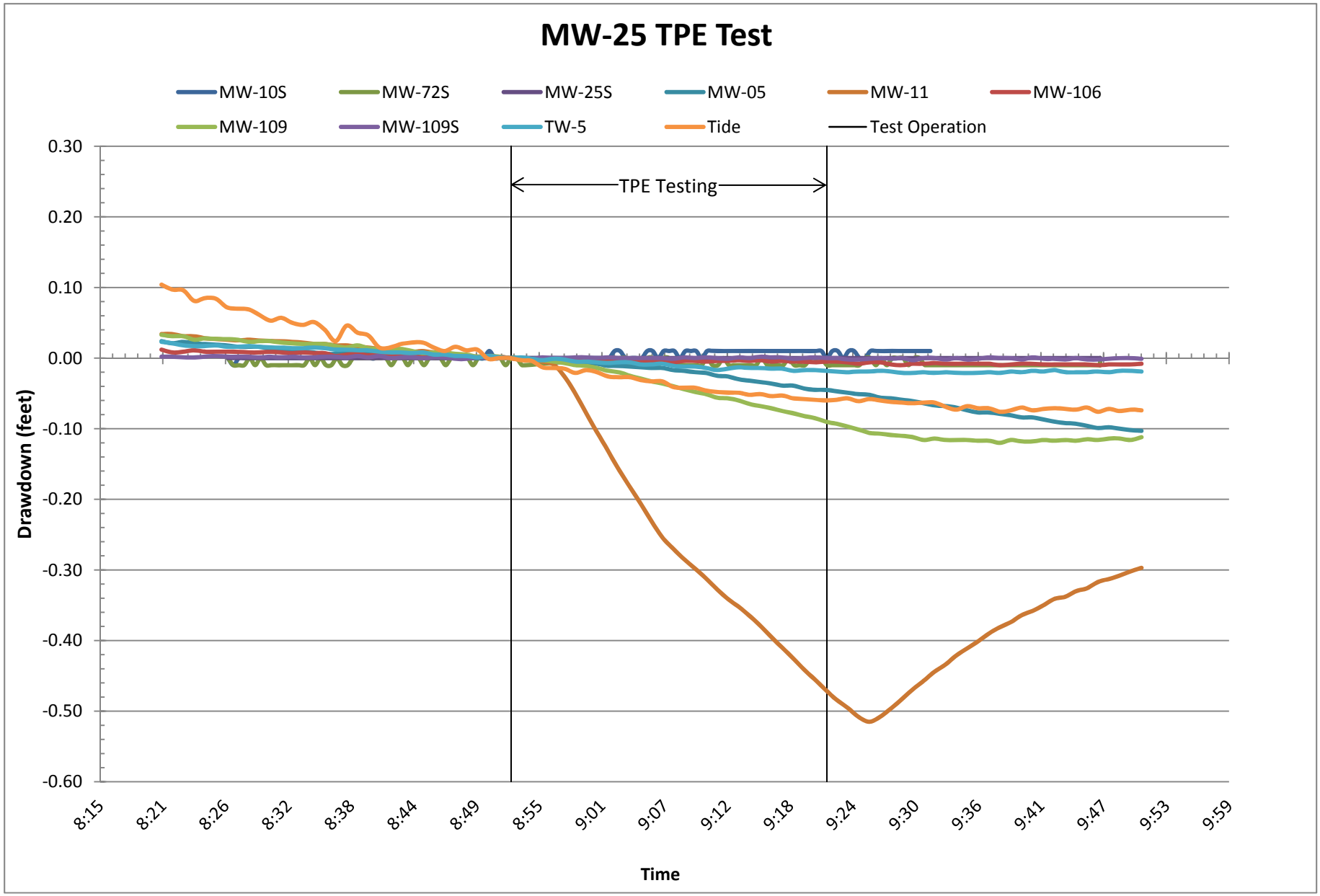
NOTES:

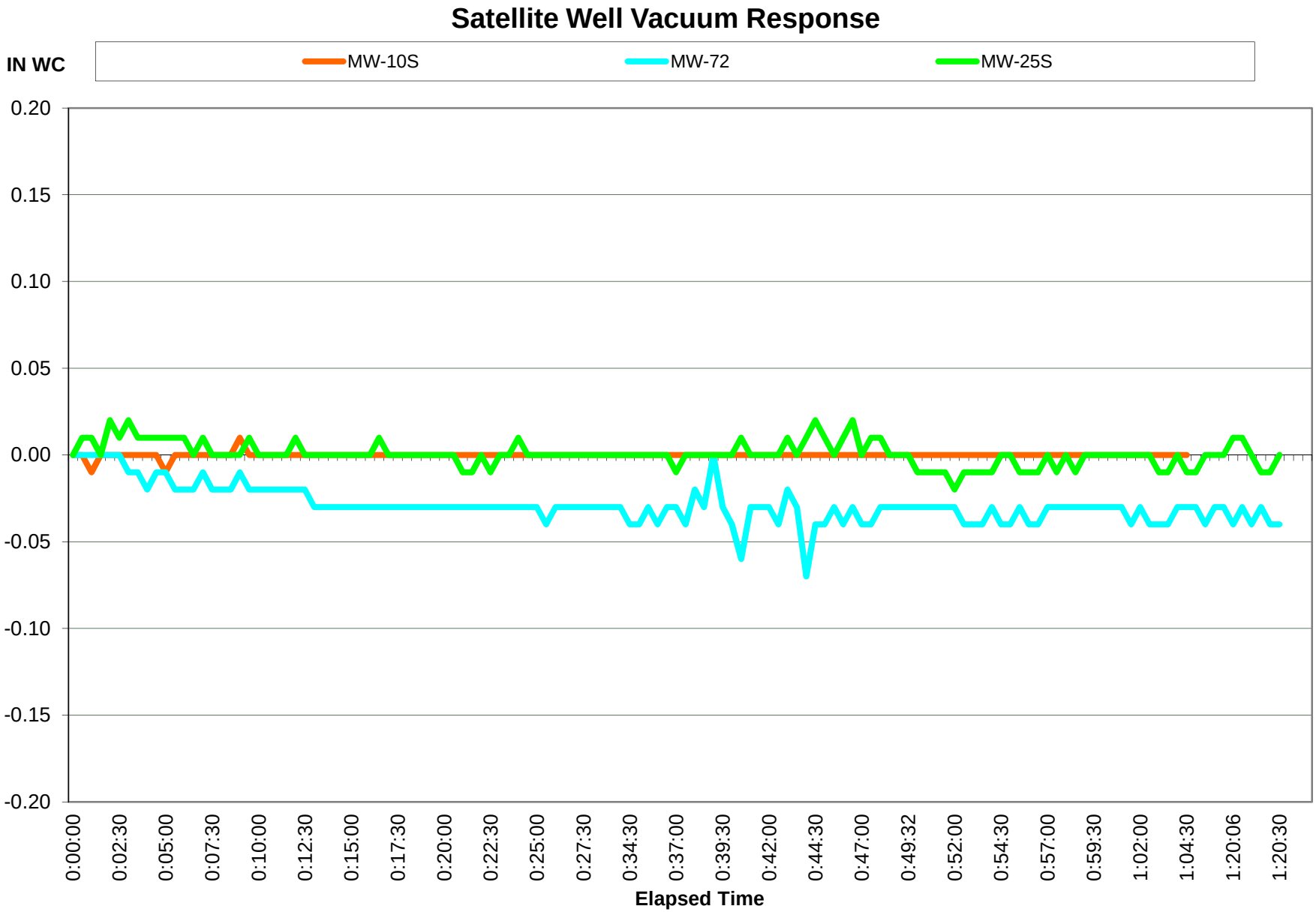
NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

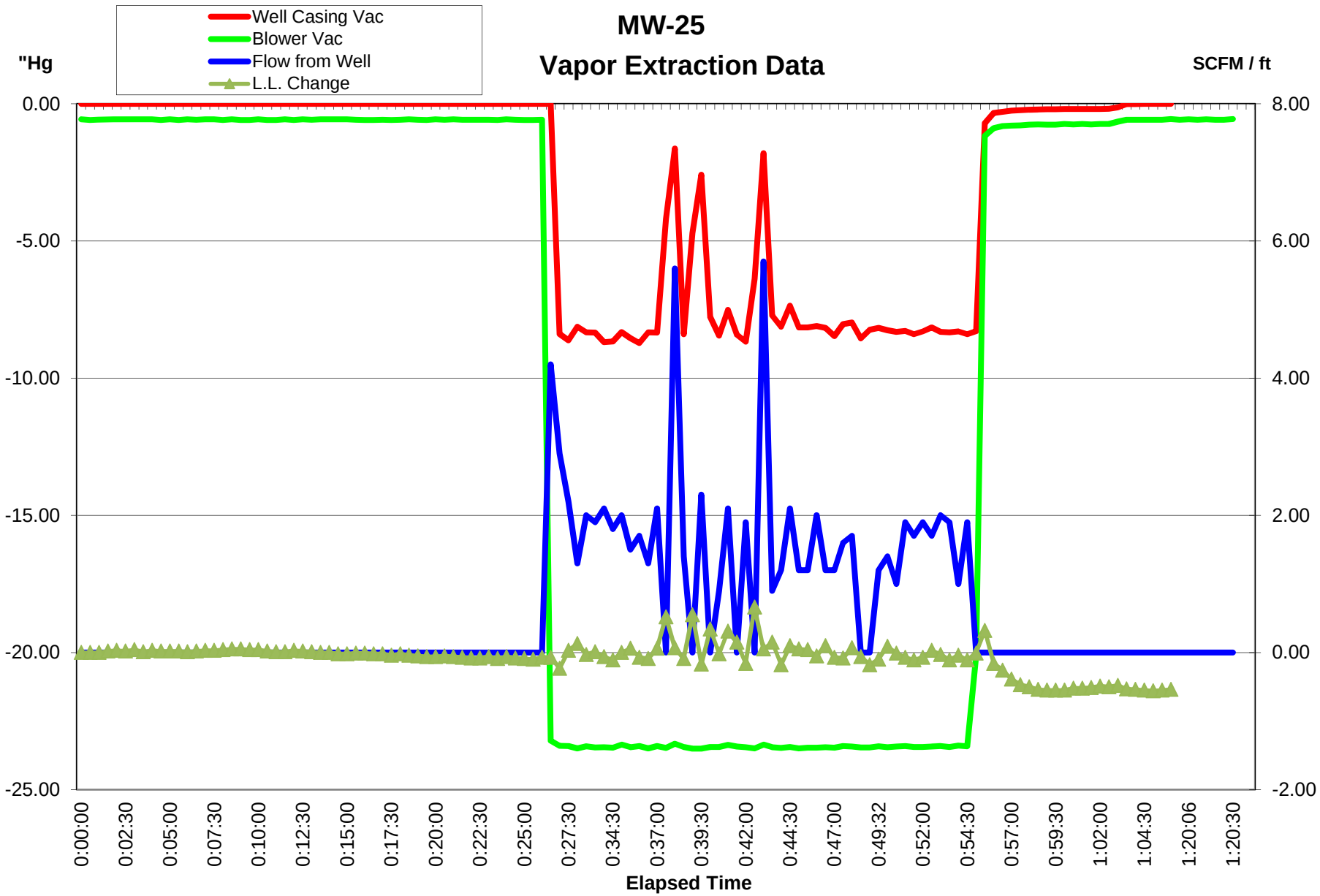
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

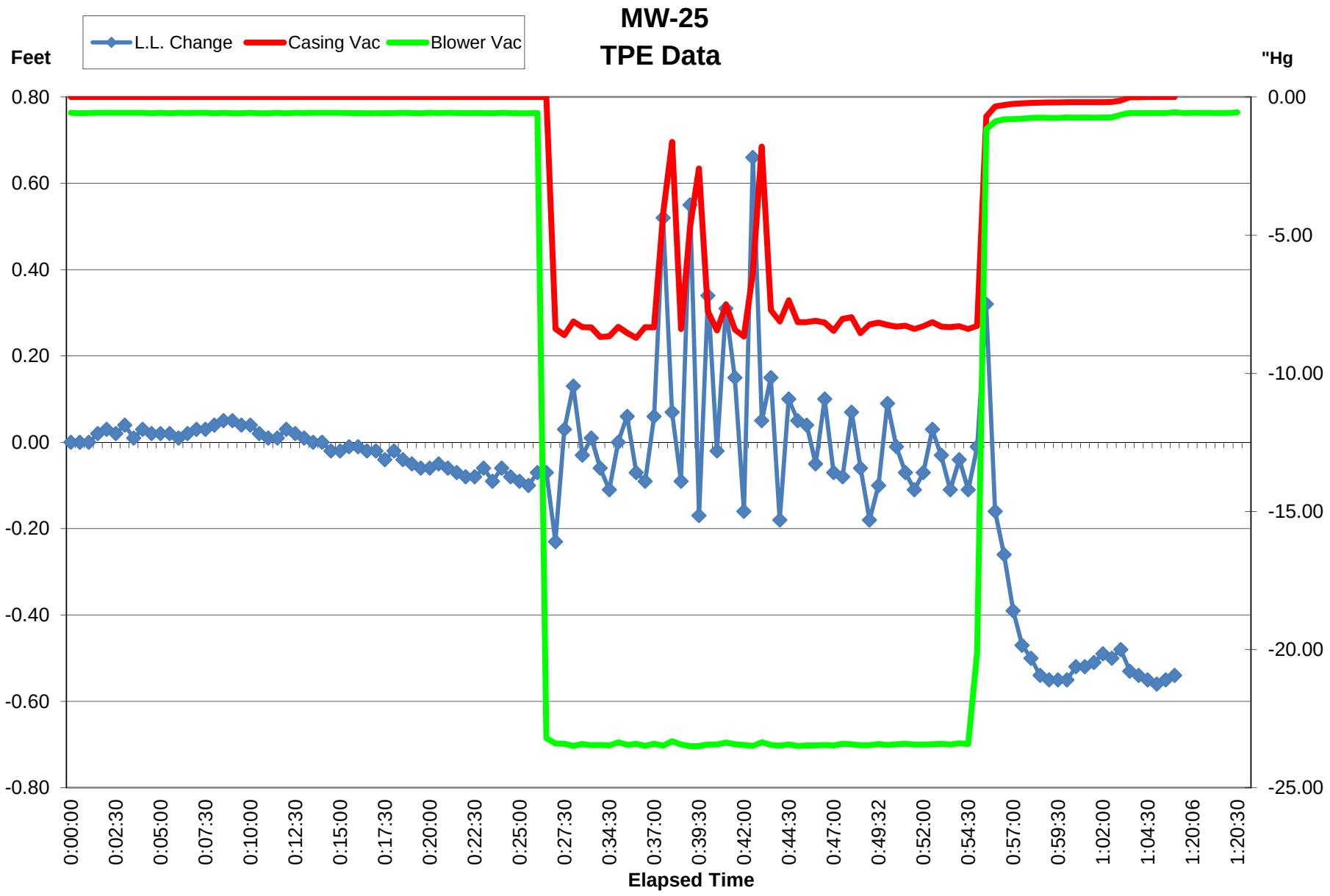
LIQUID LEVEL INFLUENCE GRAPH

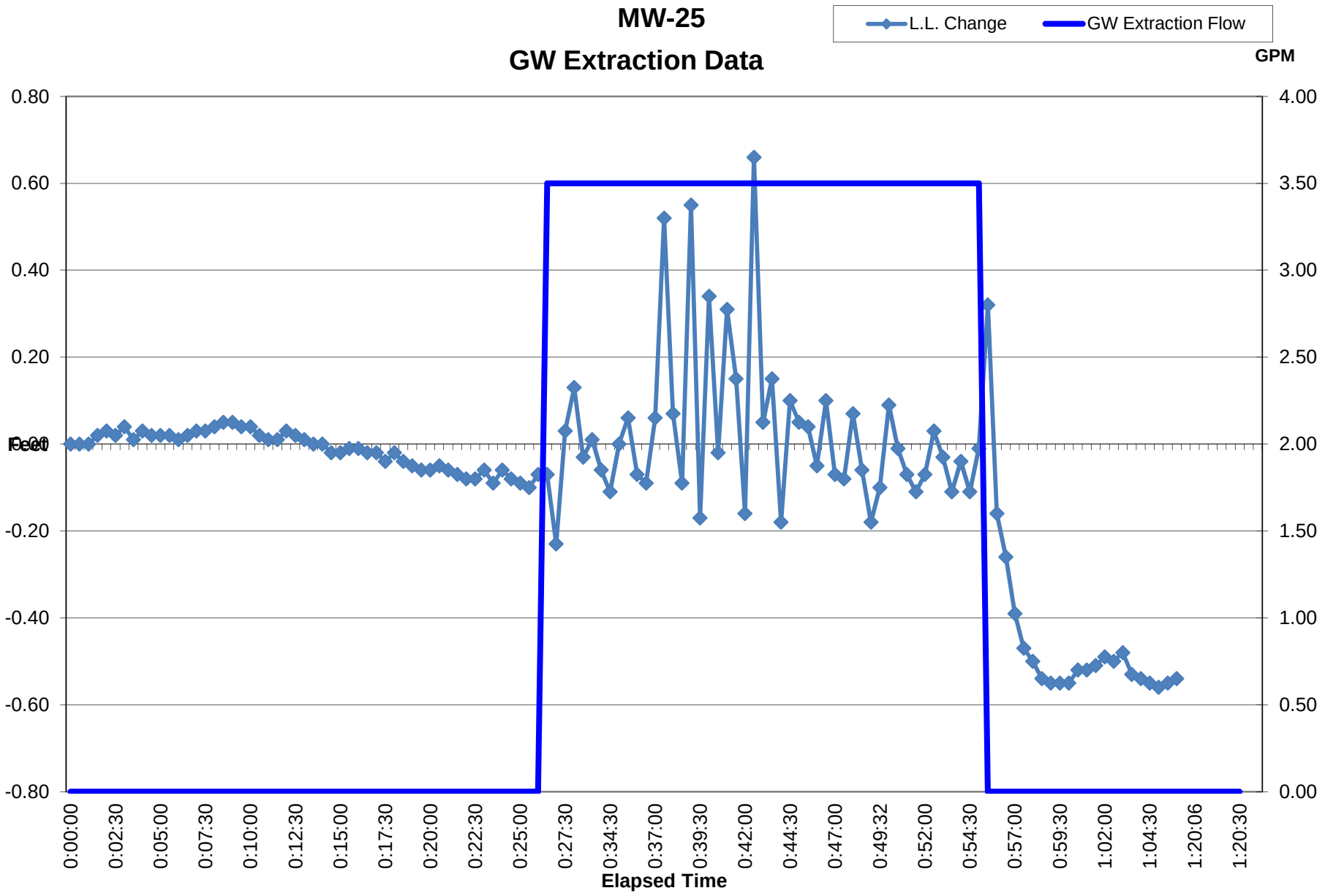
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
IN WC
MW-10S
MW-72
MW-25S
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:34:30
0:37:00
0:39:30
0:42:00
0:44:30
0:47:00
0:49:32
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
1:04:30
1:20:06
1:20:30
Elapsed Time


MW-25
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
8.00
6.00
4.00
2.00
0.00
-2.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:34:30
0:37:00
0:39:30
0:42:00
0:44:30
0:47:00
0:49:32
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
1:04:30
1:20:06
1:20:30
Elapsed Time


MW-25
TPE Data
L.L. Change
Casing Vac
Blower Vac
Feet
"Hg
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:34:30
0:37:00
0:39:30
0:42:00
0:44:30
0:47:00
0:49:32
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
1:04:30
1:20:06
1:20:30
Elapsed Time


MW-25
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
0.80
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
-0.80
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:34:30
0:37:00
0:39:30
0:42:00
0:44:30
0:47:00
0:49:32
0:52:00
0:54:30
0:57:00
0:59:30
1:02:00
1:04:30
1:20:06
1:20:30
Elapsed Time

TEST 12

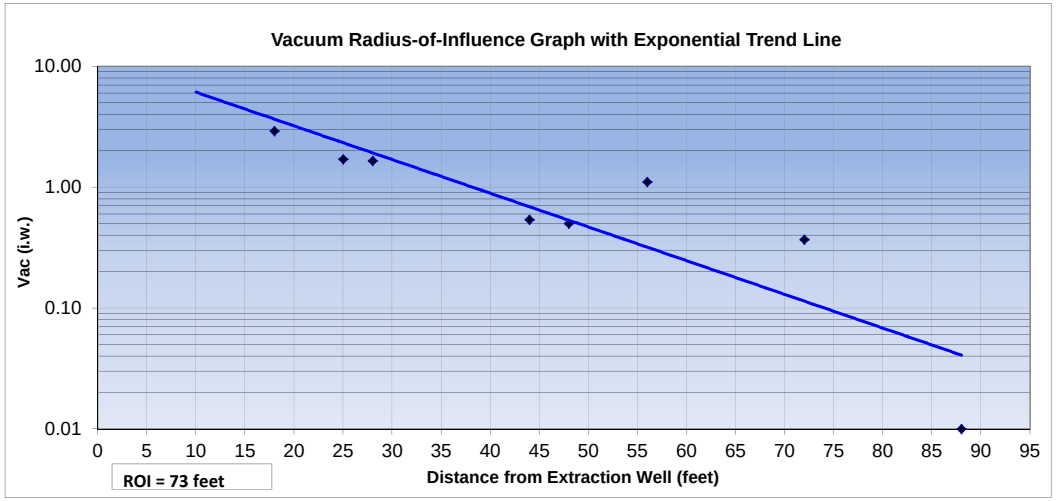
Total Phase Extraction Testing at MW-10S

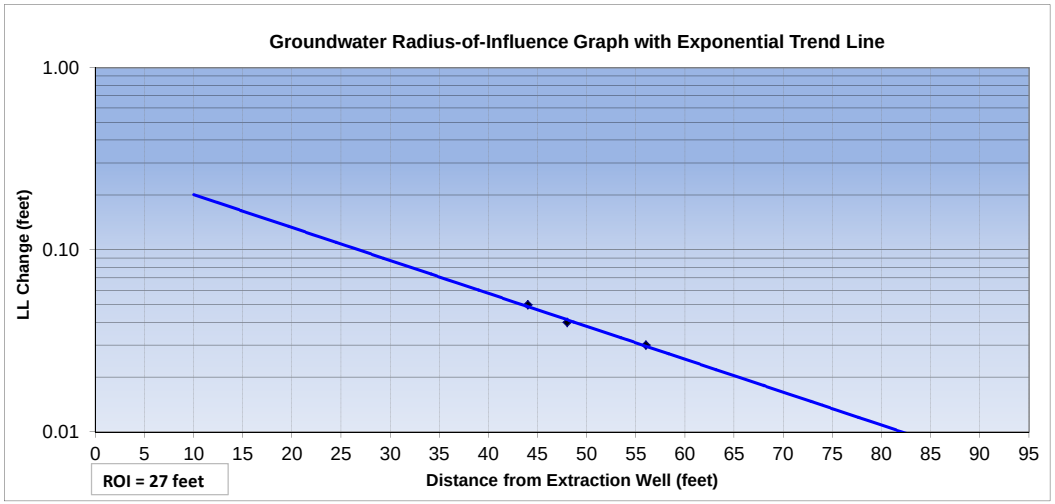
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 12
Test Description: TPE
Extraction Well: MW-10S
Sparge Well: -
Step Number: 1

Test Date:	October 16, 2014
Start of Step Time:	9:54:07
End of Step Time:	10:32:07
Extraction Well ID:	MW-10S
Initial DTW (feet):	22.21
Total Depth (feet):	27.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	52.3
Blower Discharge Temp. (F):	161
Average Applied Vac (in Hg):	20.2
PID concentration (ppm):	144
Percent Oxygen (%):	12.2
Groundwater Flow Rate (gpm):	0.34
Max Upwelling/Drawdown (feet):	-2.46

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	58	25-35	26.80	-0.32	-0.12
MW-25	21	25-35	25.41	0.00	0.14
MW-72S	56	15-25	21.60	-1.10	-0.03
MW-25S	18	16-26	25.51	-2.91	0.00
MW-11	10	25-35	26.81	0.32	0.10
MW-51	24	27-37	26.57	0.00	0.04
MW-51S	28	15.5-25.5	21.51	-1.65	NM
MW-8S	25	15-25	21.72	-1.70	NM
MW-14	54	28.5-38.5	NM	-0.12	NM
MW-15S	72	16-26	NM	-0.37	NM
MW109S	44	3.5-13.5	10.57	-0.54	-0.05
MW-107	88	3-11	10.66	0.00	NM
MW-5	48	25-35	26.42	-0.50	-0.04





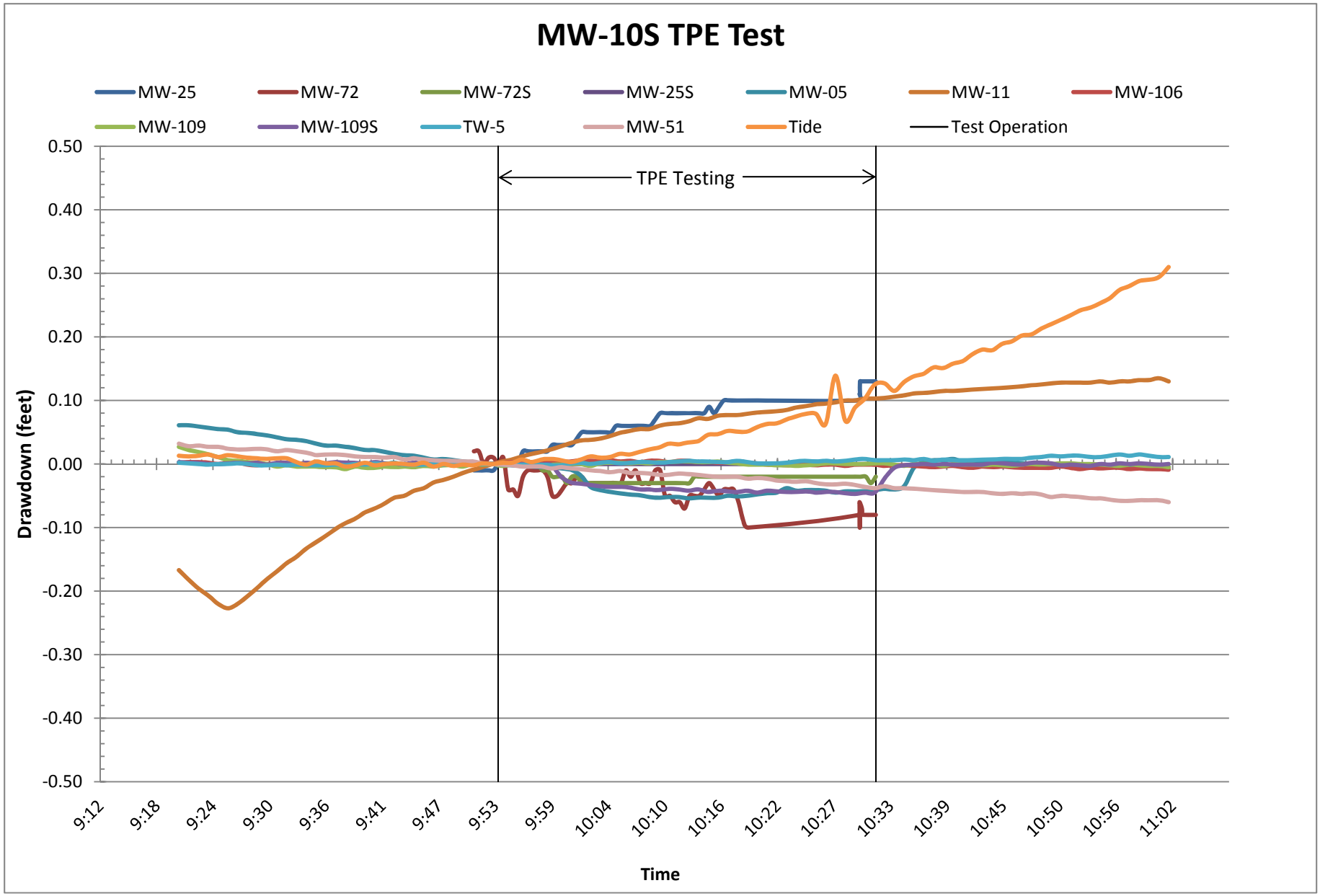
NOTES:

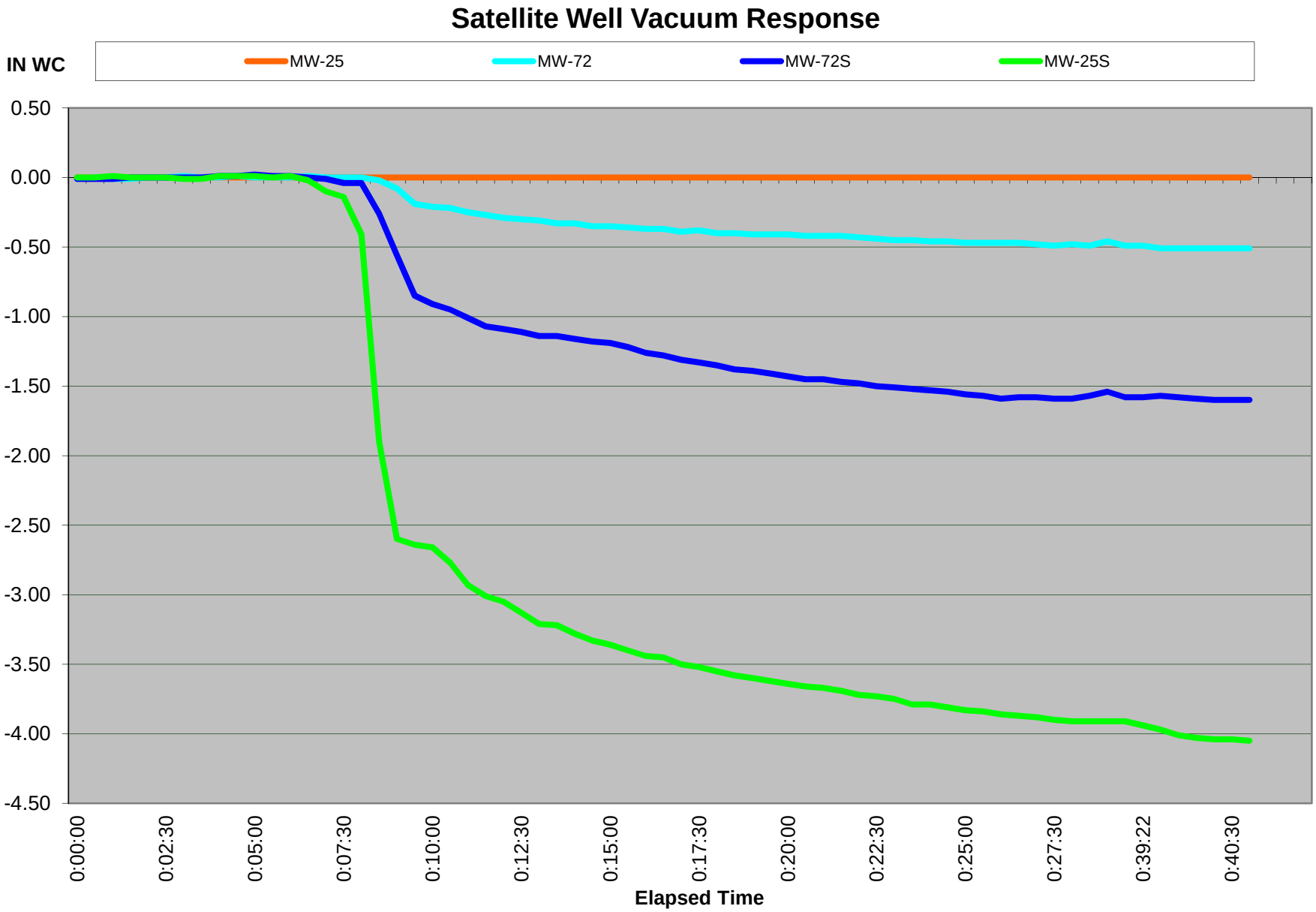
NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

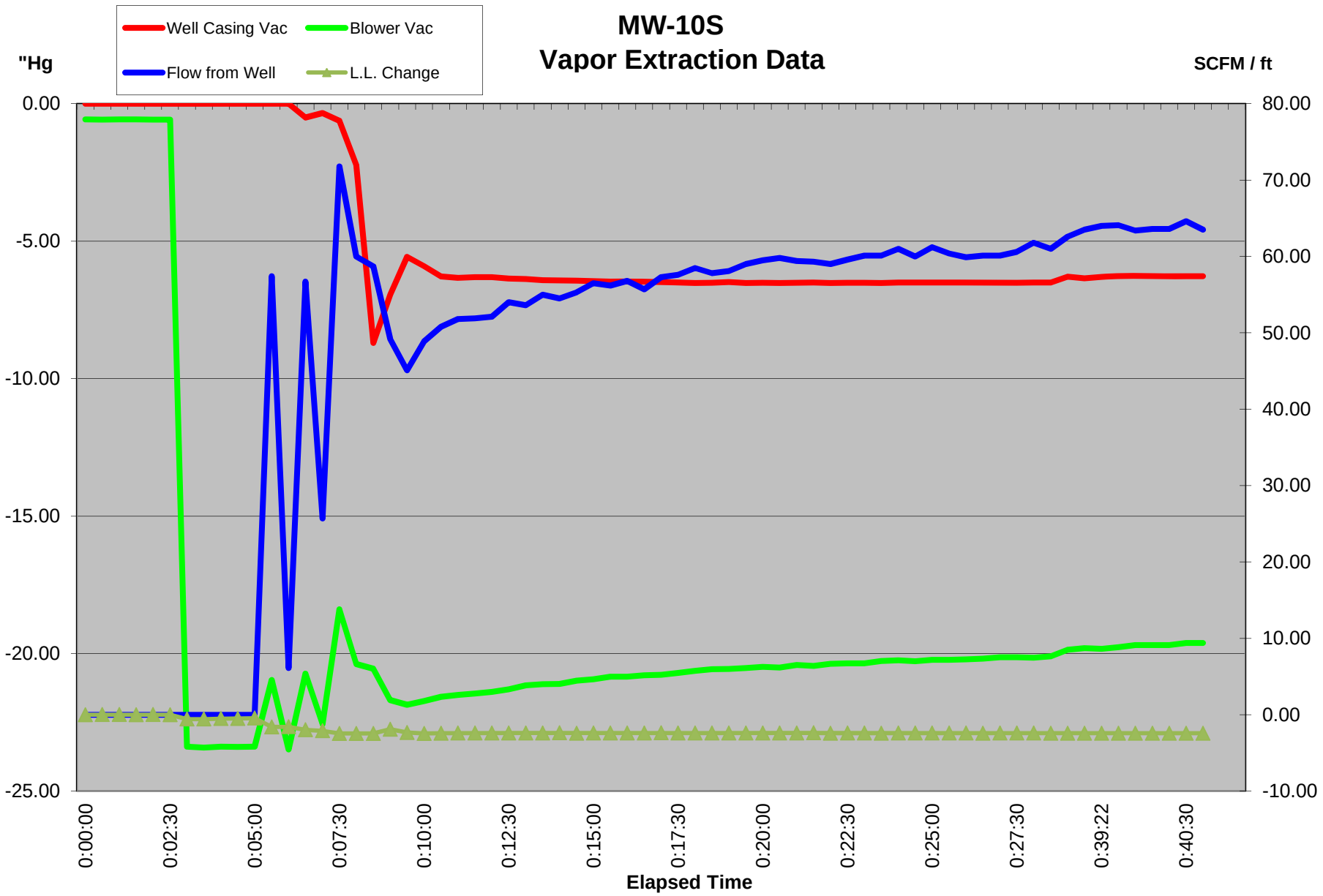
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Deep wells are not plotted on the vacuum and groundwater ROI graphs.

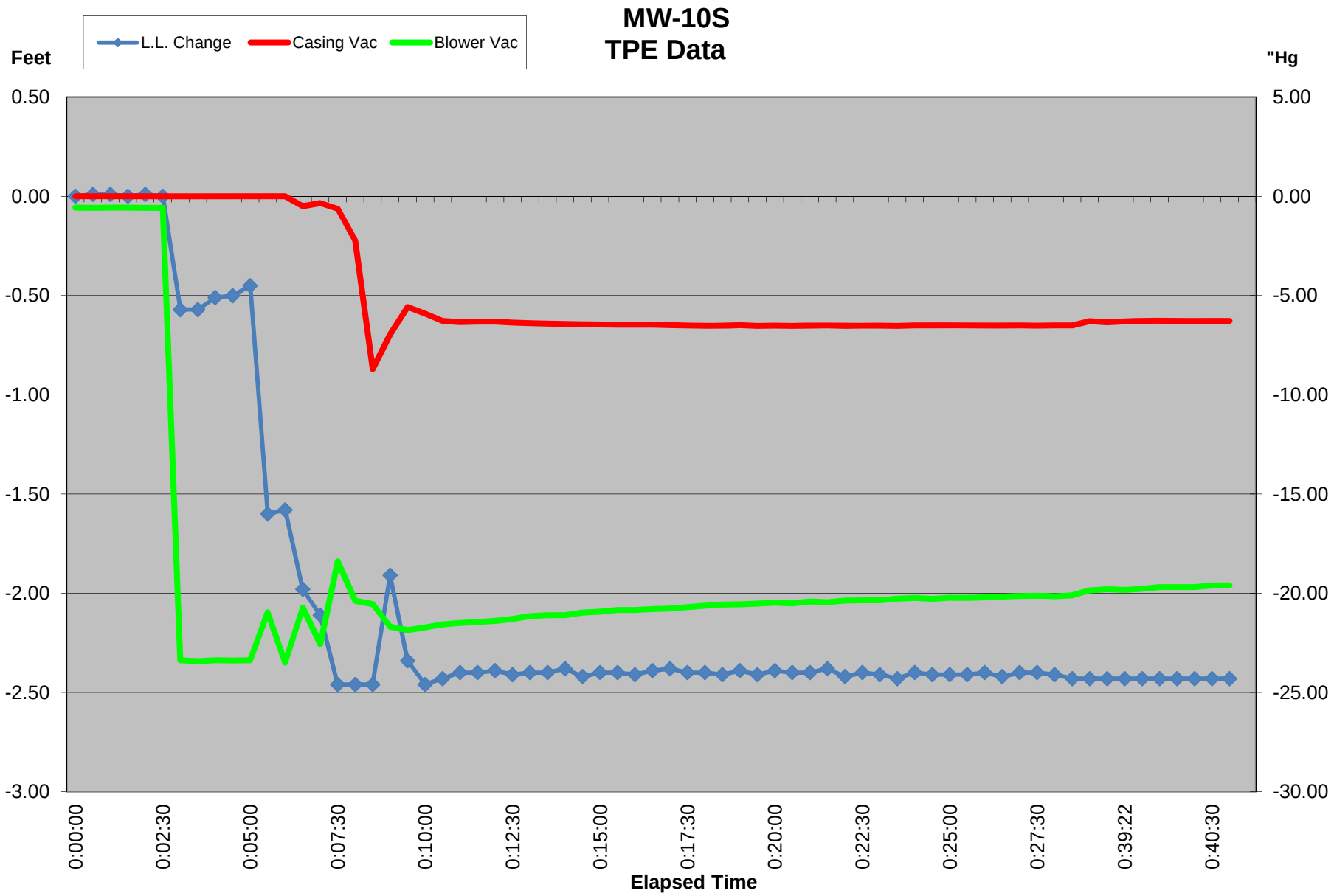
LIQUID LEVEL INFLUENCE GRAPH

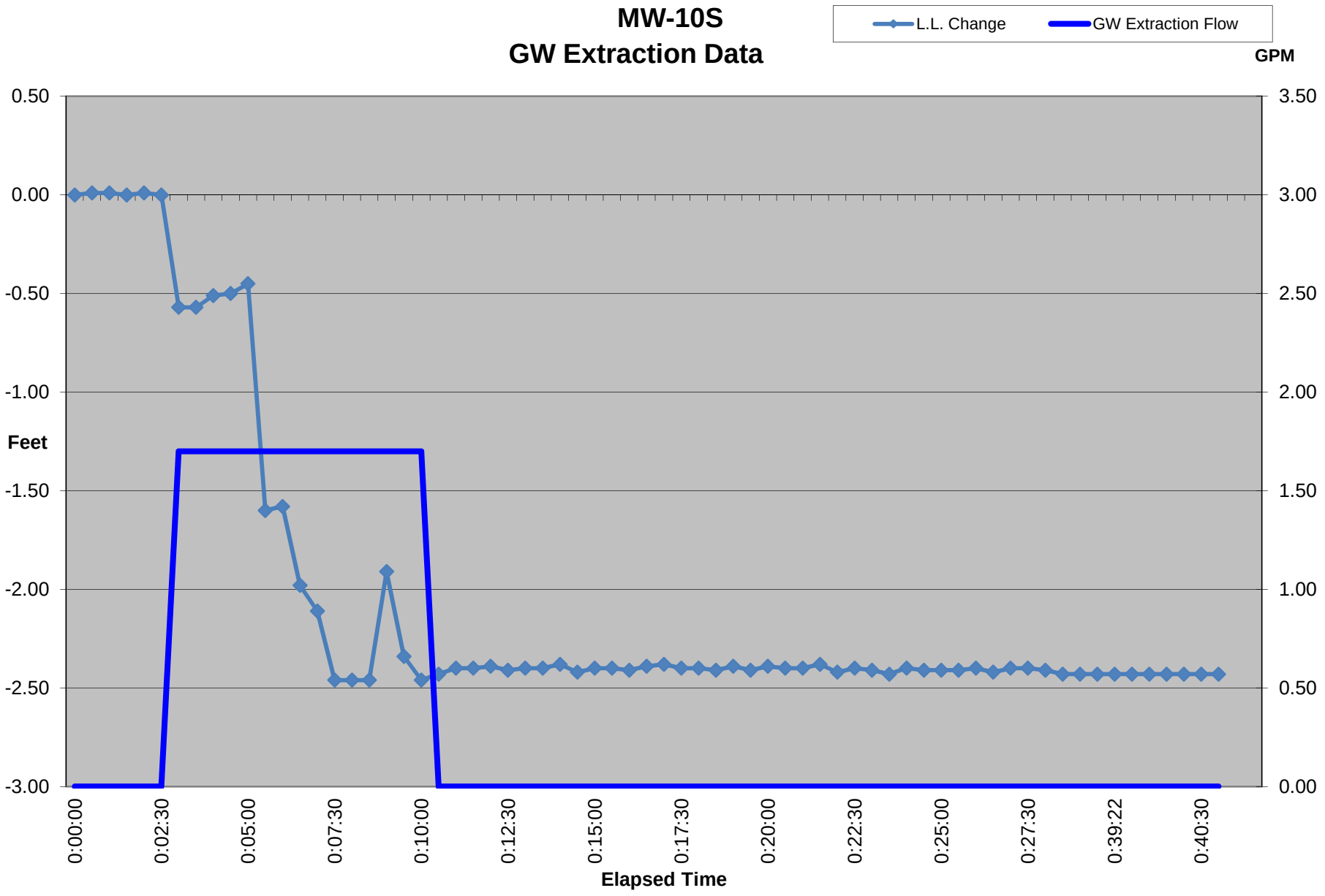
Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
IN WC
MW-25
MW-72
MW-72S
MW-25S
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00
-4.50
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:39:22
0:40:30
Elapsed Time


MW-10S
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
-10.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:39:22
0:40:30
Elapsed Time


MW-10S
TPE Data
L.L. Change
Casing Vac
Blower Vac
Feet
"Hg
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:39:22
0:40:30
Elapsed Time


MW-10S
GW Extraction Data
L.L. Change
GW Extraction Flow
GPM
Feet
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-3.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0:00:00
0:02:30
0:05:00
0:07:30
0:10:00
0:12:30
0:15:00
0:17:30
0:20:00
0:22:30
0:25:00
0:27:30
0:39:22
0:40:30
Elapsed Time

TESTS 13 & 14

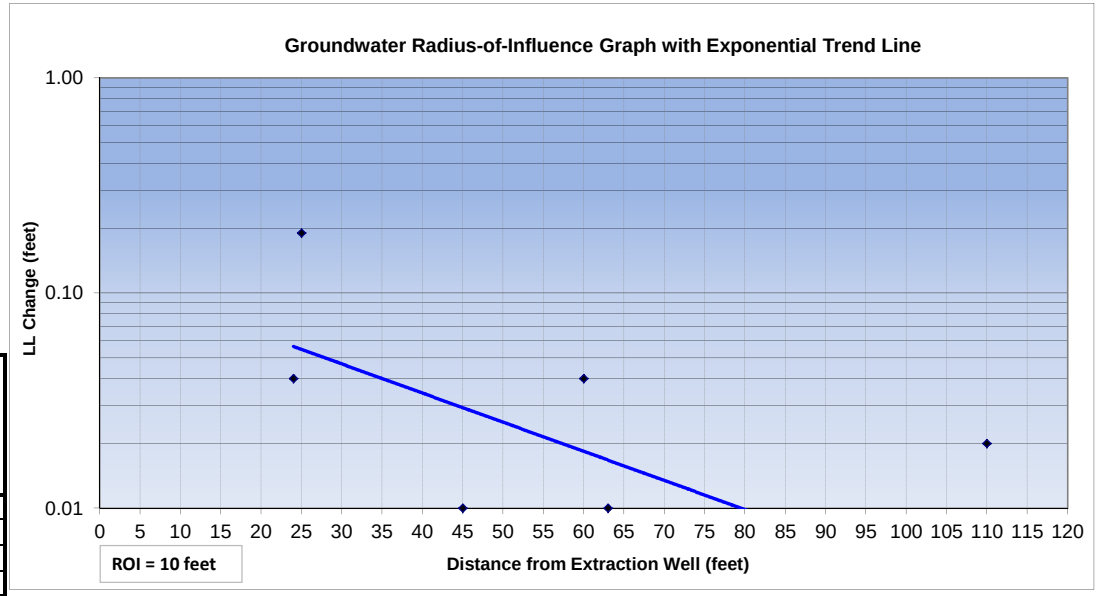
Total Fluids Pumping and VEGE Testing at MW-27

DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 13
Test Description: GW Pumping
Extraction Well: MW-27
Sparge Well: -
Step Number: 1

Test Date:	October 16, 2014
Start of Step Time:	10:54:37
End of Step Time:	11:55:37
Extraction Well ID:	MW-27
Initial DTW (feet):	27.16
Total Depth (feet):	35.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	NA
Blower Discharge Temp. (F):	NA
Average Vac @ well (in H_2O):	NA
PID concentration (ppm):	NA
Percent Oxygen (%):	NA
Groundwater Flow Rate (gpm):	2.1
Max Upwelling/Drawdown (feet):	-5.11

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	25	25-35	26.8	0.00	-0.19
MW-25	45	25-35	25.41	0.00	-0.01
MW-72S	28	15-25	21.6	0.01	-0.01
MW-31	24	26-36	26.68	0.01	-0.04
MW-05	98	25-35	26.42	NM	-0.01
MW-11	63	25-35	26.81	NM	0.00
MW-51	60	16-26	22.09	NM	-0.04
MW-106	42	3-10	7.92	NM	-0.01
MW-109	110	14-24	15.04	NM	-0.02
MW-109S	112	3.5-13.5	10.57	NM	0.00
TW-05	68	0-10	6.58	NM	0.02



NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

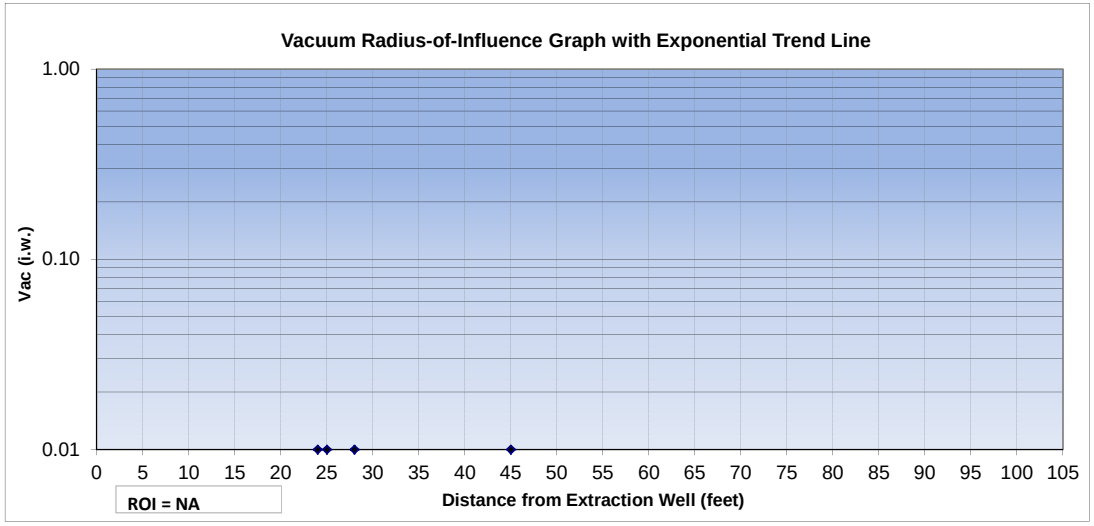
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs. Monitoring wells MW-106 and TW-05 are not plotted on the groundwater ROI graph.

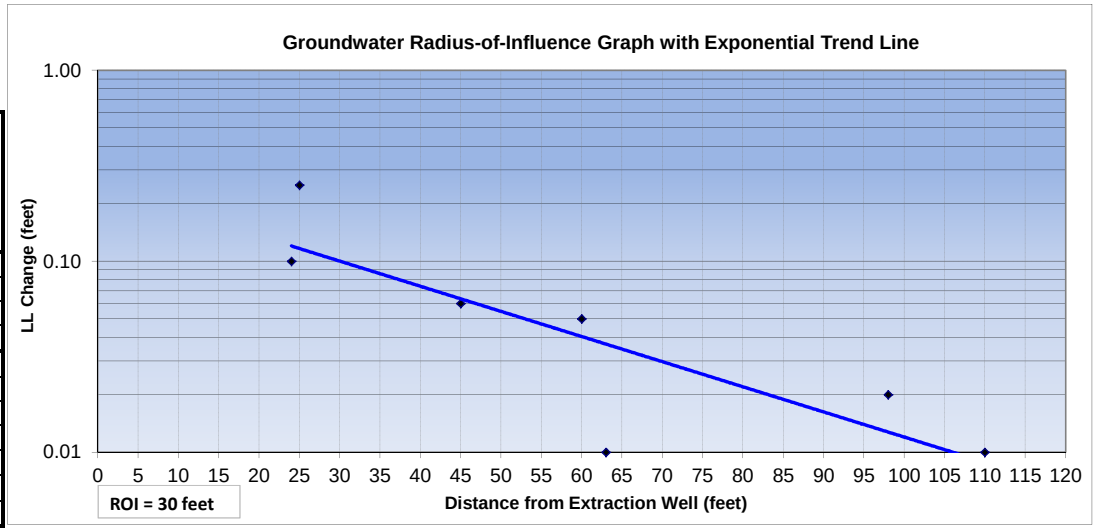
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 14
Test Description: VEGE
Extraction Well: MW-27
Sparge Well: -
Step Number: 1

Test Date:	October 16, 2014
Start of Step Time:	11:57:07
End of Step Time:	12:45:37
Extraction Well ID:	MW-27
Initial DTW (feet):	27.16
Total Depth (feet):	35.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	5.2
Blower Discharge Temp. (F):	137
Average Vac @ well (in H_2O):	42
PID concentration (ppm):	25.4
Percent Oxygen (%):	17.4
Groundwater Flow Rate (gpm):	2.6
Max Upwelling/Drawdown (feet):	-3.21

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	25	25-35	26.8	-0.01	-0.25
MW-25	45	25-35	25.41	0.00	-0.06
MW-72S	28	15-25	21.6	0.18	-0.01
MW-31	24	26-36	26.68	0.00	-0.10
MW-05	98	25-35	26.42	0.00	-0.02
MW-11	63	25-35	26.81	0.00	0.00
MW-51	60	16-26	22.09	0.00	-0.05
MW-106	42	3-10	7.92	NM	0.00
MW-109	110	14-24	15.04	NM	-0.01
MW-109S	112	3.5-13.5	10.57	NM	0.00
TW-05	68	0-10	6.58	NM	0.06





NOTES:

NA- not available
NM - not measured
AS - air sparge
SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

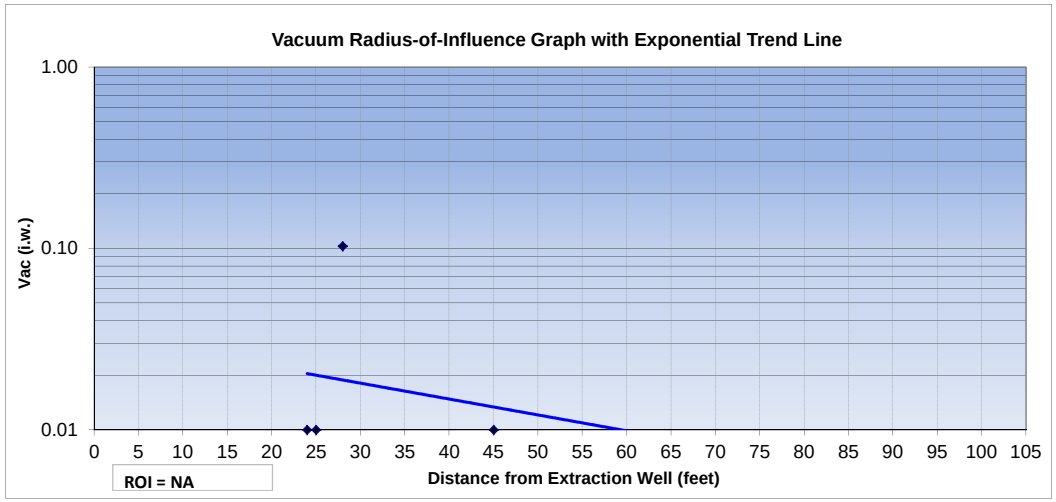
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs. Monitoring wells MW-106 and TW-05 are not plotted on the groundwater ROI graph.

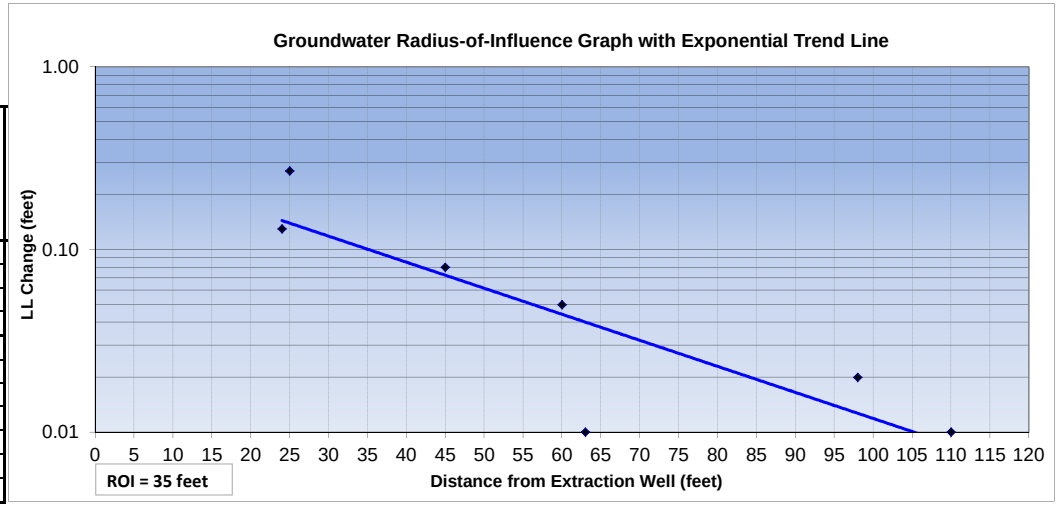
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 14
Test Description: VEGE
Extraction Well: MW-27
Sparge Well: -
Step Number: 2

Test Date:	October 16, 2014
Start of Step Time:	12:46:07
End of Step Time:	13:05:07
Extraction Well ID:	MW-27
Initial DTW (feet):	27.16
Total Depth (feet):	35.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	7.9
Blower Discharge Temp. (F):	132
Average Vac @ well (in H_2O):	73
PID concentration (ppm):	36.4
Percent Oxygen (%):	16.3
Groundwater Flow Rate (gpm):	2.3
Max Upwelling/Drawdown (feet):	-3.28

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	25	25-35	26.8	-0.01	-0.27
MW-25	45	25-35	25.41	0.00	-0.08
MW-72S	28	15-25	21.6	-0.10	-0.02
MW-31	24	26-36	26.68	0.00	-0.13
MW-05	98	25-35	26.42	0.00	-0.02
MW-11	63	25-35	26.81	0.00	0.00
MW-51	60	16-26	22.09	0.00	-0.05
MW-106	42	3-10	7.92	NM	0.00
MW-109	110	14-24	15.04	NM	0.00
MW-109S	112	3.5-13.5	10.57	NM	0.00
TW-05	68	0-10	6.58	NM	0.23





NOTES:

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NM - not measured
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SVE- soil vapor extraction
Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
conc. - concentration
max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
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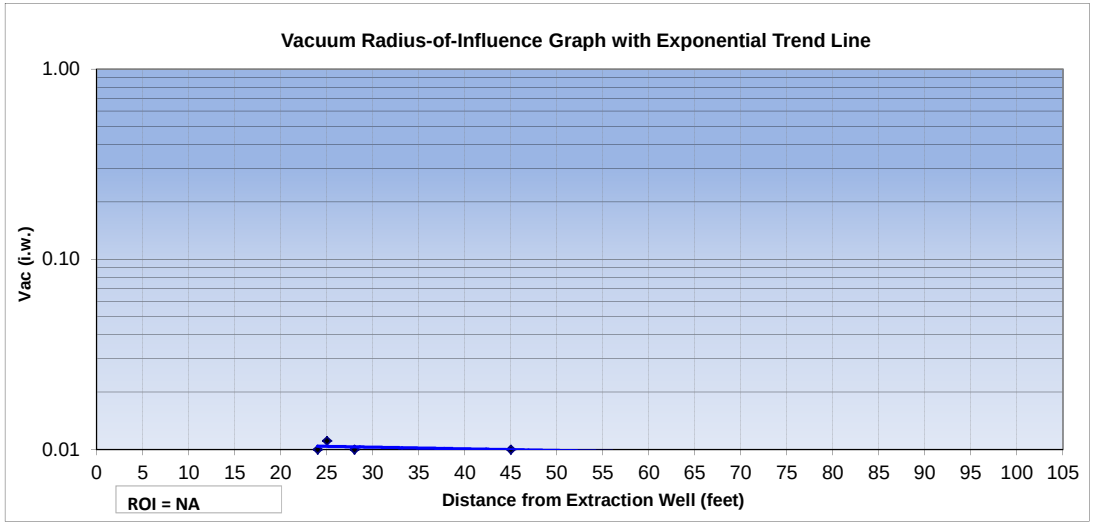
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs. Monitoring wells MW-106 and TW-05 are not plotted on the groundwater ROI graph.

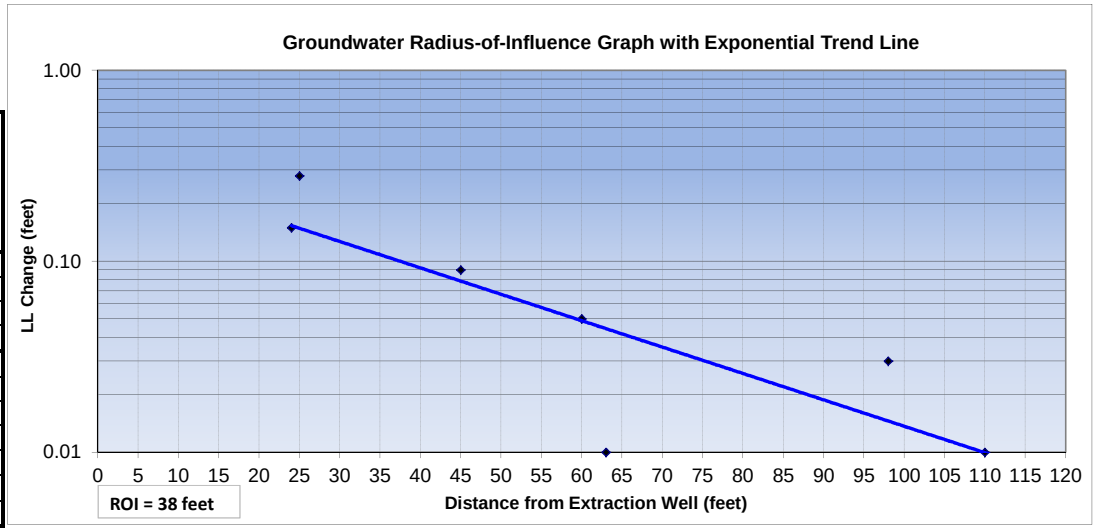
DAPL Data Summary

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 14
Test Description: VEGE
Extraction Well: MW-27
Sparge Well: -
Step Number: 3

Test Date:	October 16, 2014
Start of Step Time:	13:07:07
End of Step Time:	13:11:07
Extraction Well ID:	MW-27
Initial DTW (feet):	27.16
Total Depth (feet):	35.0
Screen Interval (feet):	10
Average Vapor Flow (scfm):	5.7
Blower Discharge Temp. (F):	107
Average Vac @ well (in H_2O):	328
PID concentration (ppm):	NA
Percent Oxygen (%):	NA
Groundwater Flow Rate (gpm):	3.6
Max Upwelling/Drawdown (feet):	0.60

Well ID	***Radial Distance from Extraction Well (feet)***	***Screen Interval (feet)***	***Initial DTW (feet)***	***Average Pressure/Vacuum Influence (i.w.)***	***Liquid Level Change (feet)***
MW-72	25	25-35	26.8	-0.01	-0.28
MW-25	45	25-35	25.41	0.00	-0.09
MW-72S	28	15-25	21.6	0.11	-0.02
MW-31	24	26-36	26.68	0.00	-0.15
MW-05	98	25-35	26.42	NM	-0.03
MW-11	63	25-35	26.81	NM	0.00
MW-51	60	16-26	22.09	NM	-0.05
MW-106	42	3-10	7.92	NM	0.00
MW-109	110	14-24	15.04	NM	0.00
MW-109S	112	3.5-13.5	10.57	NM	0.00
TW-05	68	0-10	6.58	NM	0.22





NOTES:

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NM - not measured
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Vac. - vacuum
ppm - parts per million
i.w. - inches of water
DTW - depth to water
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max - maximum
scfm - standard cubic feet per minute
DTP - depth to product
psi - pounds per square inch
F - degrees fahrenheit
"Hg - inches of mercury
PID - photoionization detector
NM(D)- Not measured because the well was dry
NM- Not measured
gpm - gallons per minute
ppmv - parts per million by volume

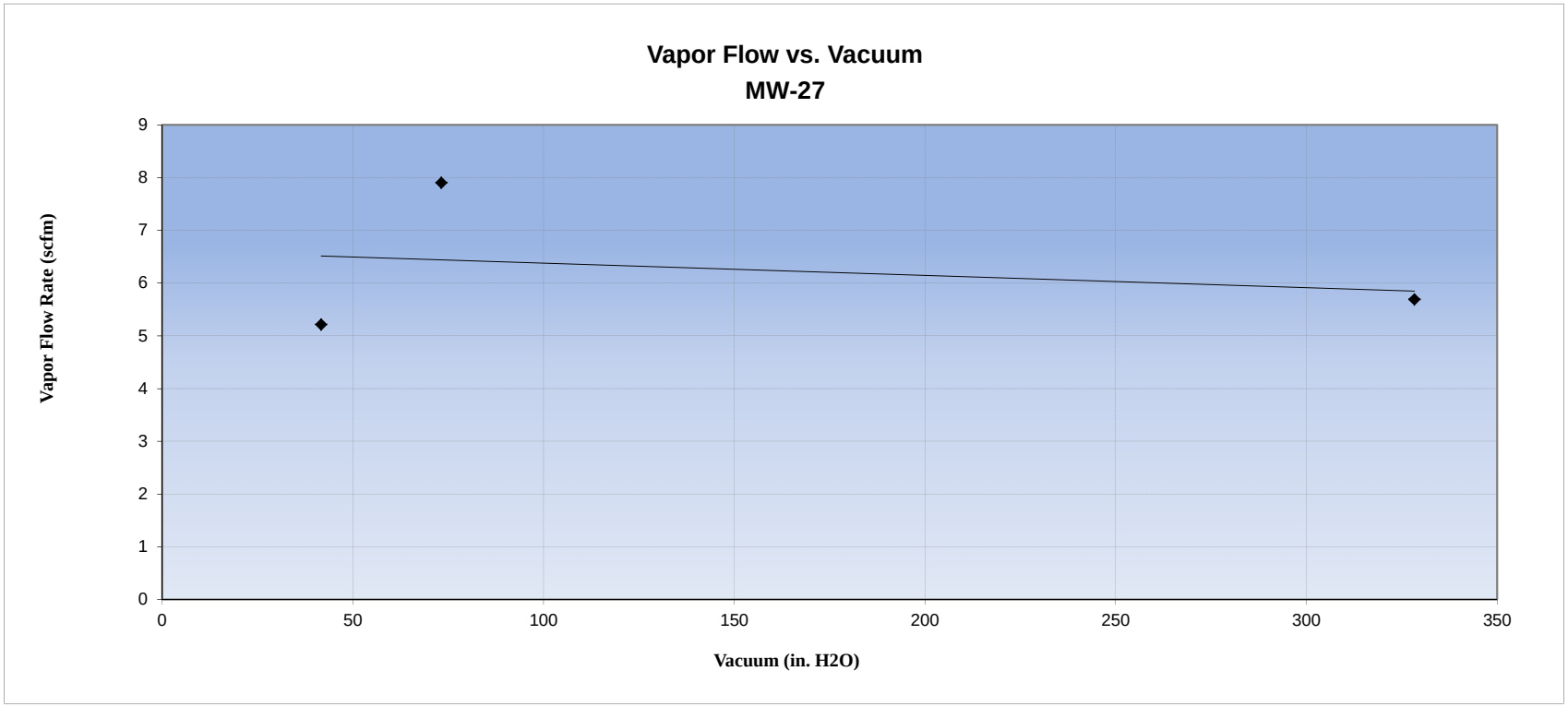
- The ROI is determined using an exponential trend line, with 0.01 units (i.w., feet) assumed to be the minimum effective vacuum influence.
- A negative influence pressure reading indicates observed vacuum.
- A positive influence pressure reading indicates observed pressure. Measurements greater than -0.01 i.w. are plotted as -0.01 i.w.
- A positive change in liquid level indicates that the depth to water decreased, and a negative change in liquid level indicates that the depth to water increased. Measurements less than 0.01 feet are plotted as 0.01 feet.
- Shallow wells are not plotted on the vacuum and groundwater ROI graphs. Monitoring wells MW-106 and TW-05 are not plotted on the groundwater ROI graph.

SVE Vapor Flow vs. Vacuum Data

Site Name: Potomac River Generating Station
Address: 1400 North Royal St
Alexandria, VA
Test #: 6
Test Description: VEGE
Test Well: MW-27

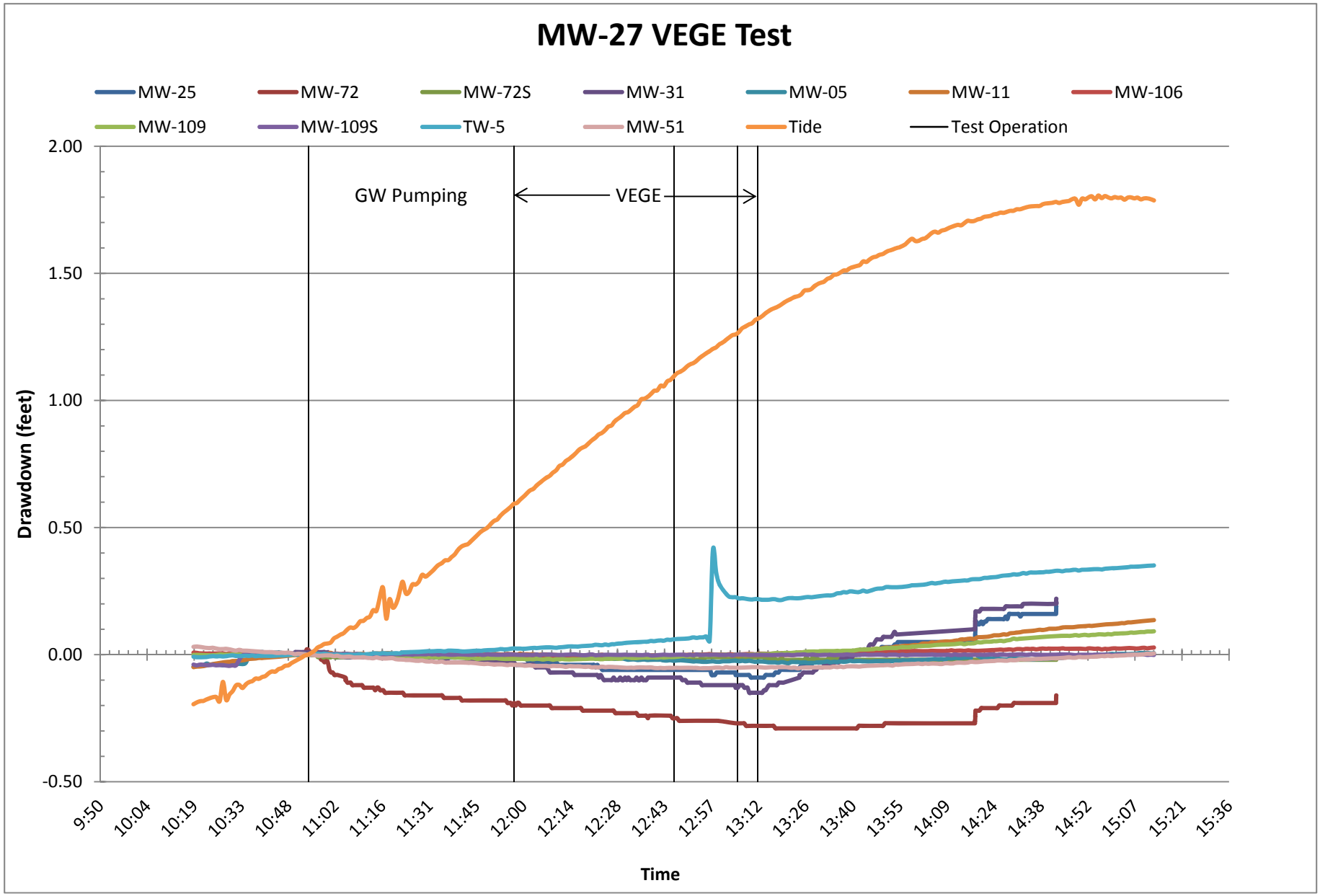
Test Date:	October 15, 2014
Extraction Well ID:	MW-27
Initial DTW (feet):	27.16
Initial DTP (feet):	-
Total Depth (feet):	35.00
Screen Length (feet):	10.00

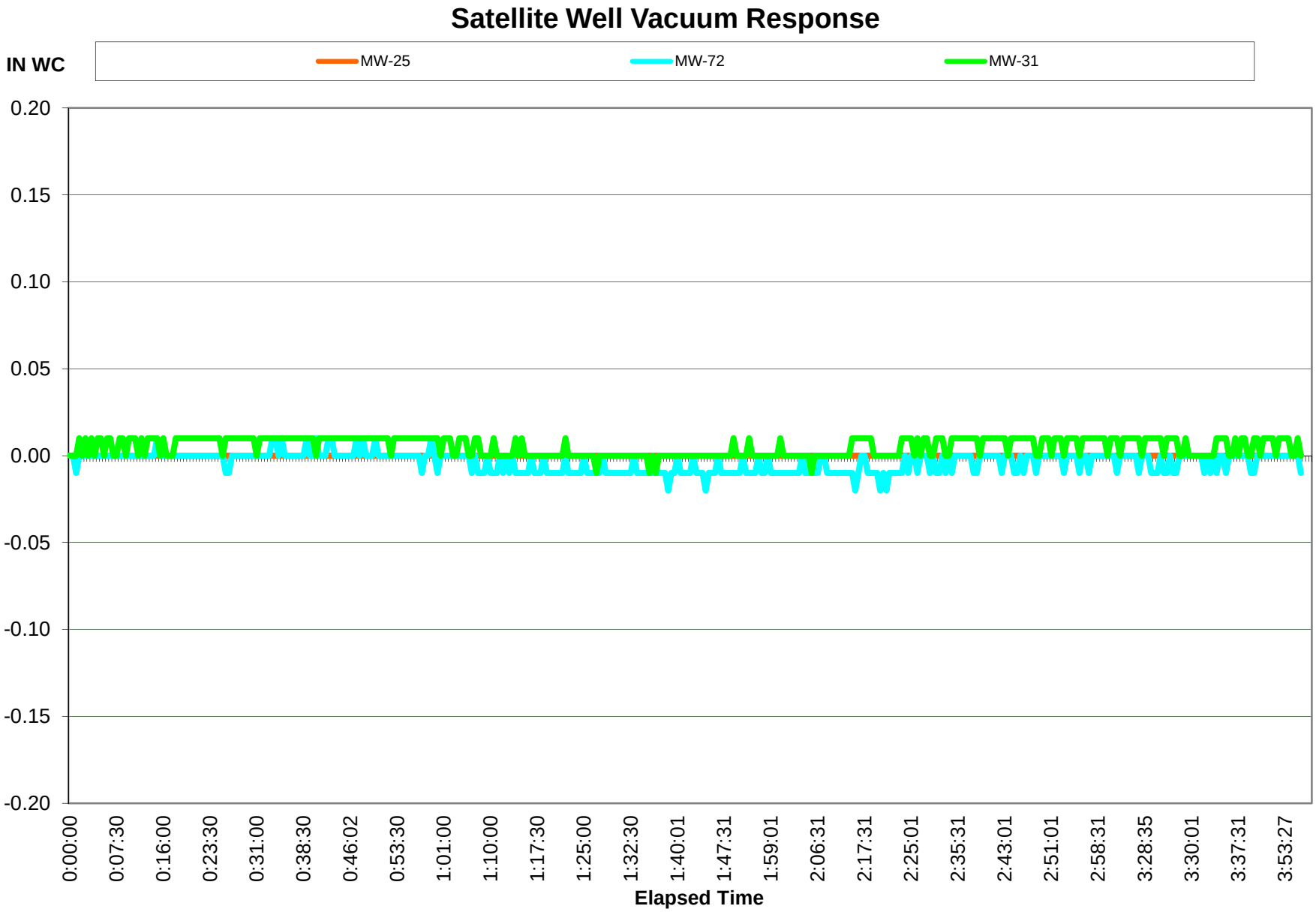
Step Number	***Avg. Well Vacuum (in.H_2O)***	***Avg. Vapor Flow (scfm)***
1	42	5.2
2	73	7.9
3	328	5.7

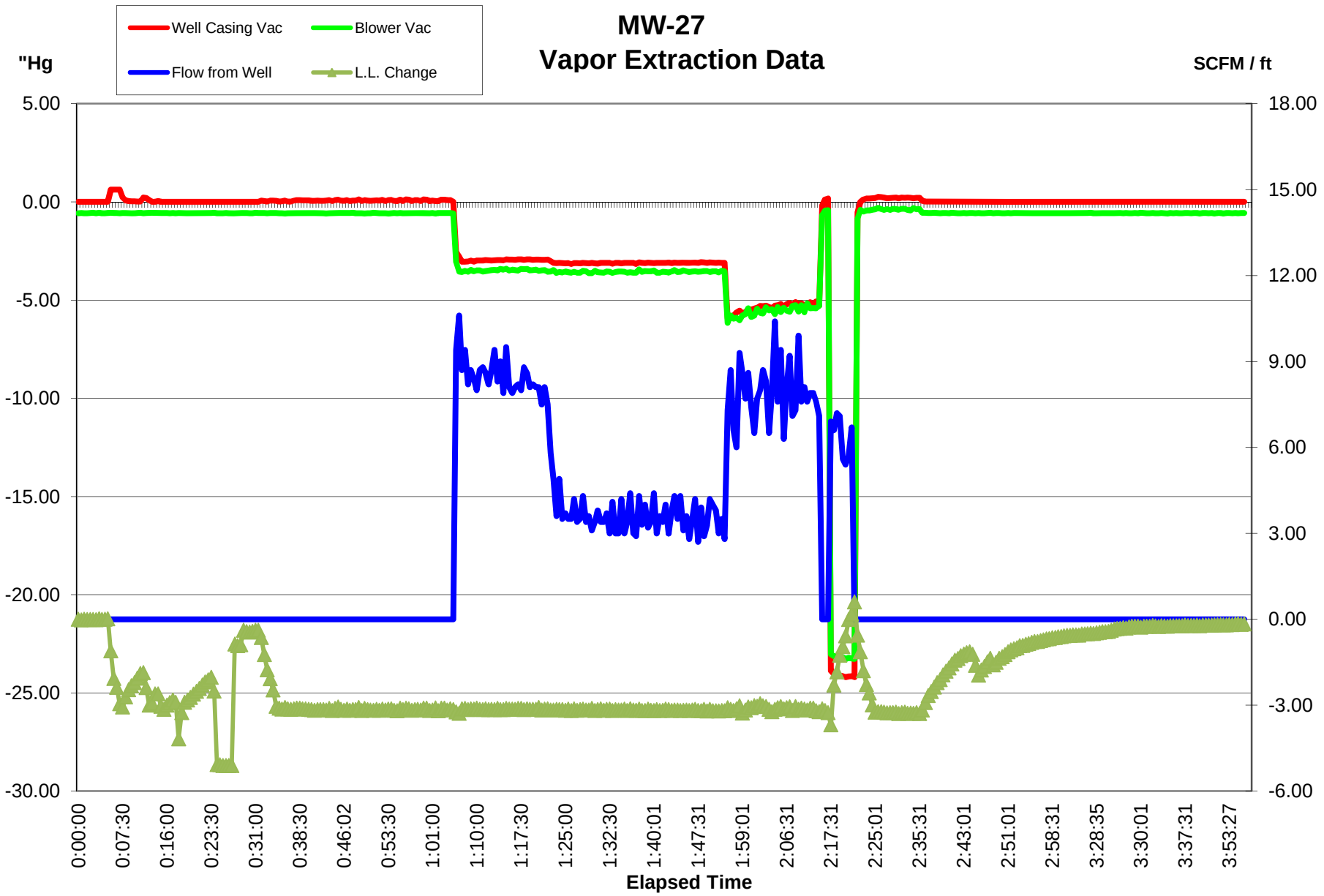


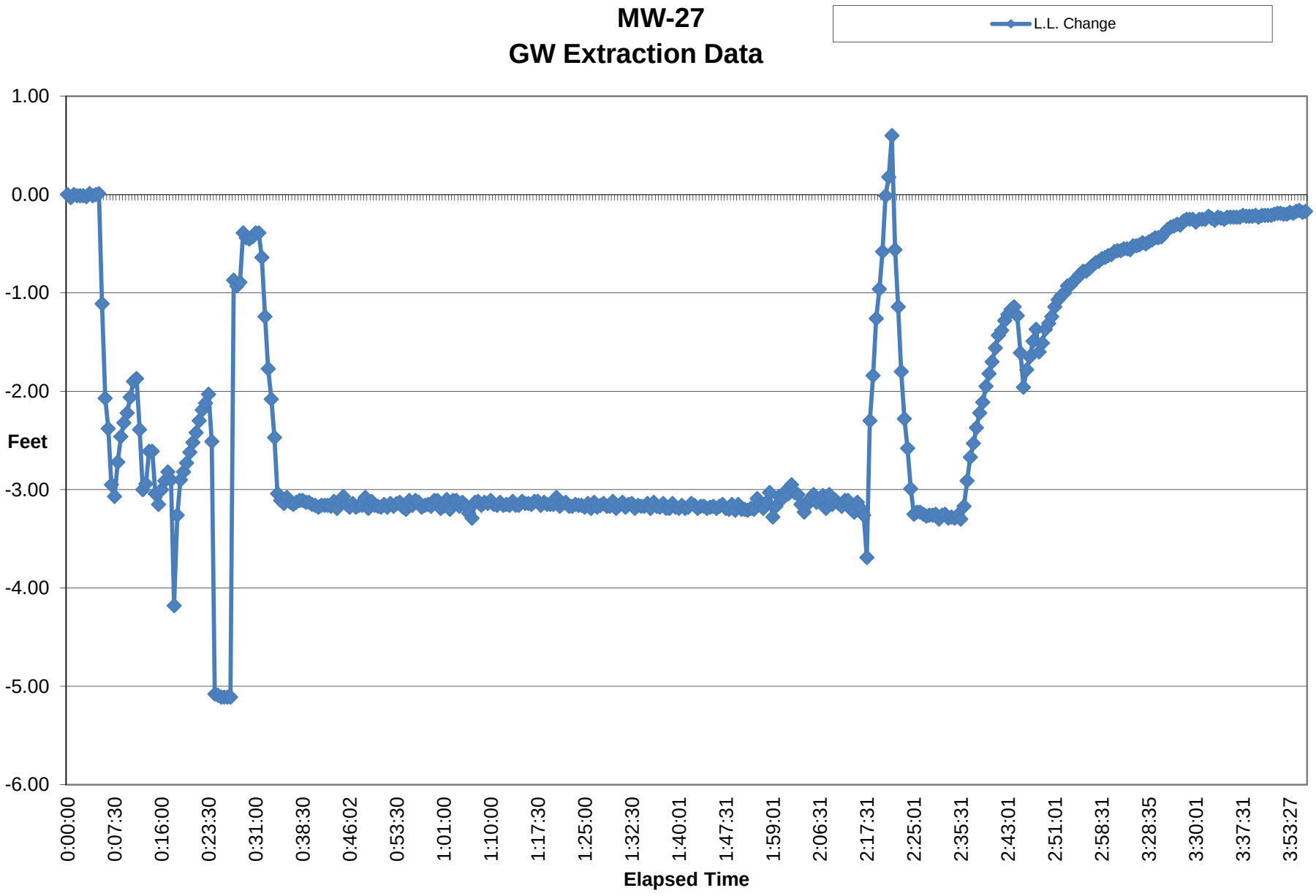
LIQUID LEVEL INFLUENCE GRAPH

Potomac River Generating Station
October 13 to 16, 2014




Satellite Well Vacuum Response
IN WC
MW-25
MW-72
MW-31
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
0:00:00
0:07:30
0:16:00
0:23:30
0:31:00
0:38:30
0:46:02
0:53:30
1:01:00
1:10:00
1:17:30
1:25:00
1:32:30
1:40:01
1:47:31
1:59:01
2:06:31
2:17:31
2:25:01
2:35:31
2:43:01
2:51:01
2:58:31
3:28:35
3:30:01
3:37:31
3:53:27
Elapsed Time


MW-27
Vapor Extraction Data
Well Casing Vac
Blower Vac
Flow from Well
L.L. Change
"Hg
SCFM / ft
5.00
0.00
-5.00
-10.00
-15.00
-20.00
-25.00
-30.00
18.00
15.00
12.00
9.00
6.00
3.00
0.00
-3.00
-6.00
0:00:00
0:07:30
0:16:00
0:23:30
0:31:00
0:38:30
0:46:02
0:53:30
1:01:00
1:10:00
1:17:30
1:25:00
1:32:30
1:40:01
1:47:31
1:59:01
2:06:31
2:17:31
2:25:01
2:35:31
2:43:01
2:51:01
2:58:31
3:28:35
3:30:01
3:37:31
3:53:27
Elapsed Time


MW-27
GW Extraction Data
L.L. Change
1.00
0.00
-1.00
-2.00
Feet
-3.00
-4.00
-5.00
-6.00
0:00:00
0:07:30
0:16:00
0:23:30
0:31:00
0:38:30
0:46:02
0:53:30
1:01:00
1:10:00
1:17:30
1:25:00
1:32:30
1:40:01
1:47:31
1:59:01
2:06:31
2:17:31
2:25:01
2:35:31
2:43:01
2:51:01
2:58:31
3:28:35
3:30:01
3:37:31
3:53:27
Elapsed Time

APPENDIX L

Duration Calculations for Remedial System Operation

Remediation System Performance Calculations - Shallow Zone (TPE System)
Estimating Reduction in Dissolved-Phase Concentrations During System Operation

Site: Potomac River Generating Station, 1400 North Royal St, Alexandria, VA **Date: 12/10/2014**
Prepared by: Groundwater & Environmental Services, Inc.

Average Groundwater Concentrations in Source Area Wells

	Well ID and Concentration							
	MW-01S	MW-10S	MW-25S	MW-30S	MW-51S	MW-72S	MW-109S	AVERAGE
Benzene (µg/l)	-	-	-	-	-	-	-	**0**
Toluene (µg/l)	-	-	-	-	-	-	-	**0**
Ethylbenzene (µg/l)	-	-	-	-	-	-	-	**0**
Xylenes (µg/l)	-	-	-	-	-	-	-	**0**
BTEX (µg/l)	-	-	-	-	-	-	-	**0**
TPH as GRO (µg/l)	-	-	-	-	-	-	-	**0**
TPH as DRO (µg/l)	23,000	100,000	49,000	2,900	8,400	3,300	12,000	**28,371**
MTBE (µg/l)	-	-	-	-	-	-	-	**0**

Note: The October 2014 sampling event was used.

Remediation System Data

Is the entire source area appropriately covered with injection/extraction wells? (1=Yes, 0=No)	1
Are extraction/injection wells installed in the source at a 20 ft ROI or less? (1=Yes, 0=No)	1
Enter ration of (adsorbed + LNAPL contaminat mass)/dissolved mass	98%
Expected system up-time (% running)	90%
Does the technology address saturated soil impact? (1=Yes, 0=No)	1
Enter Remediation Technology Aggressiveness Factor (TPE = 5)	5
Soil Permeability Factor (Gravel=6, Sand=5, Silty-Sand=4, Silt=3, Silty-Clay=2, Clay=0.5)	3

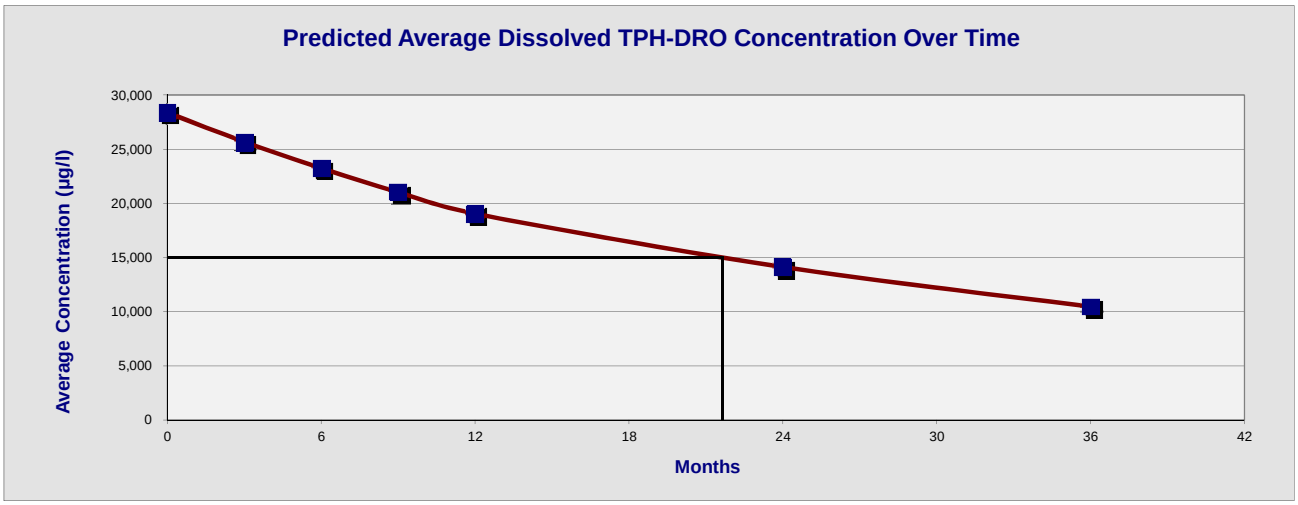
Expected Concentration Reduction Over Time

	BTEX	GRO	DRO	MTBE	
Initial hydrocarbon concentration	0	0	28,371	0	µg/l
Remediation coefficient (k) during months 0 to 12 (calculated)	0.0016759	0.0016759	0.0010893	0.0013407	1/day
Remediation coefficient (k) during months >12 (calculated)	0.0012569	0.0012569	0.0008170	0.0010055	1/day

Time	Dissolved BTEX Concentration and Reduction		Dissolved GRO Concentration and Reduction		Dissolved DRO Concentration and Reduction		Dissolved MTBE Concentration and Reduction	
(months)	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction
0	-	-	-	-	28,371	0	-	-
3	-	-	-	-	25,680	9%	-	-
6	-	-	-	-	23,244	18%	-	-
9	-	-	-	-	21,039	26%	-	-
12	-	-	-	-	19,043	33%	-	-
24	-	-	-	-	14,121	50%	-	-
36	-	-	-	-	10,471	63%	-	-

EQUATIONS:

1st order decrease= (concentration)e^(-kt)



Remediation System Performance Calculations - Deep Zone (P&T and Biosparge Systems)
Estimating Reduction in Dissolved-Phase Concentrations During System Operation

Site: Potomac River Generating Station, 1400 North Royal St, Alexandria, VA **Date: 12/10/2014**
Prepared by: Groundwater & Environmental Services, Inc.

Average Groundwater Concentrations in Source Area Wells

	Well ID and Concentration					
	MW-05	MW-25	MW-31	MW-51	MW-72	AVERAGE
Benzene (µg/l)	-	-	-	-	-	**0**
Toluene (µg/l)	-	-	-	-	-	**0**
Ethylbenzene (µg/l)	-	-	-	-	-	**0**
Xylenes (µg/l)	-	-	-	-	-	**0**
BTEX (µg/l)	-	-	-	-	-	**0**
TPH as GRO (µg/l)	-	-	-	-	-	**0**
TPH as DRO (µg/l)	50,000	50,000	7,200	88,600	2,000	**39,560**
MTBE (µg/l)	-	-	-	-	-	**0**

Note: The October 2014 sampling event was used and a TPH-DRO concentration of 50,000 µg/L was used where no sample was collected due to LNAPL presence.

Remediation System Data

Is the entire source area appropriately covered with injection/extraction wells? (1=Yes, 0=No)	1
Are extraction/injection wells installed in the source at a 20 ft ROI or less? (1=Yes, 0=No)	1
Enter ration of (adsorbed + LNAPL contaminat mass)/dissolved mass	98%
Expected system up-time (% running)	95%
Does the technology address saturated soil impact? (1=Yes, 0=No)	1
Enter Remediation Technology Aggressiveness Factor (fluid extraction [2.5] + biosparge [2.5] = 5)	5
Soil Permeability Factor (Gravel=6, Sand=5, Silty-Sand=4, Silt=3, Silty-Clay=2, Clay=0.5)	4

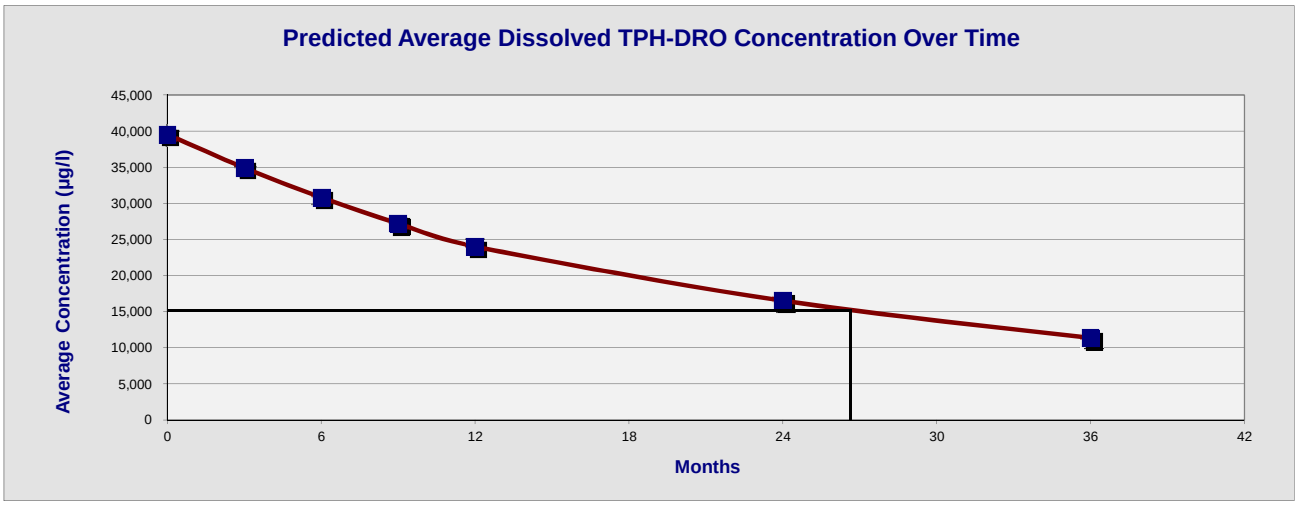
Expected Concentration Reduction Over Time

	BTEX	GRO	DRO	MTBE	
Initial hydrocarbon concentration	0	0	39,560	0	µg/l
Remediation coefficient (k) during months 0 to 12 (calculated)	0.0020986	0.0020986	0.0013641	0.0016789	1/day
Remediation coefficient (k) during months >12 (calculated)	0.0015740	0.0015740	0.0010231	0.0012592	1/day

Time	Dissolved BTEX Concentration and Reduction		Dissolved GRO Concentration and Reduction		Dissolved DRO Concentration and Reduction		Dissolved MTBE Concentration and Reduction	
(months)	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction
0	-	-	-	-	39,560	0	-	-
3	-	-	-	-	34,918	12%	-	-
6	-	-	-	-	30,821	22%	-	-
9	-	-	-	-	27,204	31%	-	-
12	-	-	-	-	24,012	39%	-	-
24	-	-	-	-	16,512	58%	-	-
36	-	-	-	-	11,355	71%	-	-

EQUATIONS:

1st order decrease= (concentration)e^(-kt)



Remediation System Performance Calculations - Deep Zone (Biosparge System)
Estimating Reduction in Dissolved-Phase Concentrations During System Operation

Site: Potomac River Generating Station, 1400 North Royal St, Alexandria, VA **Date: 12/10/2014**
Prepared by: Groundwater & Environmental Services, Inc.

Average Groundwater Concentrations in Source Area Wells

	Well ID and Concentration	
	TW-05	AVERAGE
Benzene (µg/l)	-	**0**
Toluene (µg/l)	-	**0**
Ethylbenzene (µg/l)	-	**0**
Xylenes (µg/l)	-	**0**
BTEX (µg/l)	-	**0**
TPH as GRO (µg/l)	-	**0**
TPH as DRO (µg/l)	29,000	**29,000**
MTBE (µg/l)	-	**0**

Note: The October 2014 sampling event was used.

Remediation System Data

Is the entire source area appropriately covered with injection/extraction wells? (1=Yes, 0=No)	1
Are extraction/injection wells installed in the source at a 20 ft ROI or less? (1=Yes, 0=No)	1
Enter ration of (adsorbed + LNAPL contaminat mass)/dissolved mass	98%
Expected system up-time (% running)	95%
Does the technology address saturated soil impact? (1=Yes, 0=No)	1
Enter Remediation Technology Aggressiveness Factor (biosparge = 2.5)	2.5
Soil Permeability Factor (Gravel=6, Sand=5, Silty-Sand=4, Silt=3, Silty-Clay=2, Clay=0.5)	4

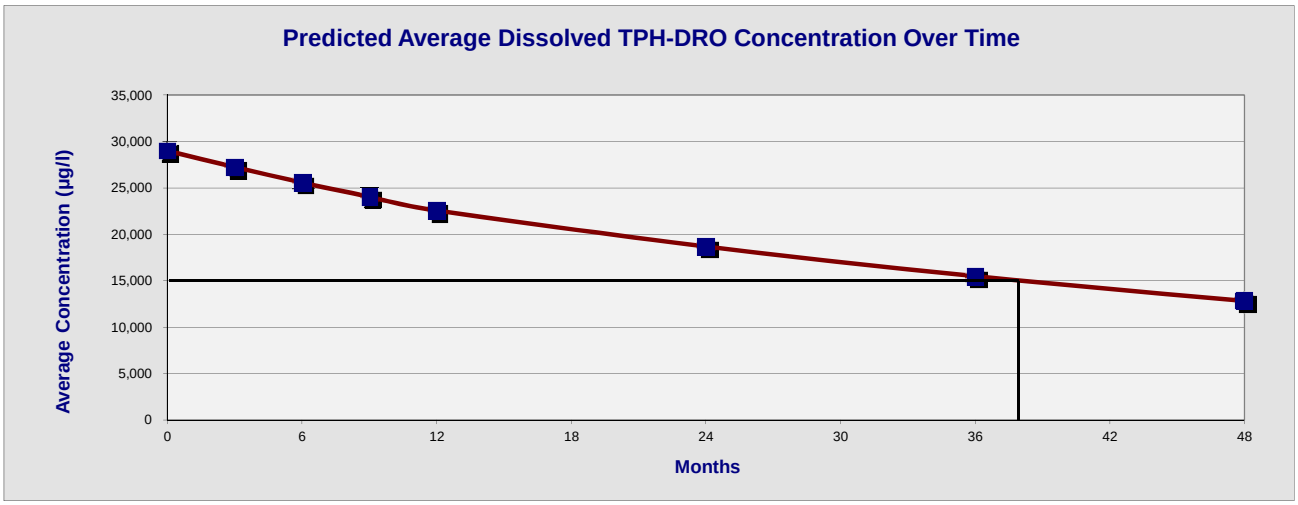
Expected Concentration Reduction Over Time

	BTEX	GRO	DRO	MTBE	
Initial hydrocarbon concentration	0	0	29,000	0	µg/l
Remediation coefficient (k) during months 0 to 12 (calculated)	0.0010552	0.0010552	0.0006859	0.0008442	1/day
Remediation coefficient (k) during months >12 (calculated)	0.0007914	0.0007914	0.0005144	0.0006331	1/day

Time	Dissolved BTEX Concentration and Reduction		Dissolved GRO Concentration and Reduction		Dissolved DRO Concentration and Reduction		Dissolved MTBE Concentration and Reduction	
(months)	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction	(µg/l)	% Reduction
0	-	-	-	-	29,000	0	-	-
3	-	-	-	-	27,236	6%	-	-
6	-	-	-	-	25,579	12%	-	-
9	-	-	-	-	24,023	17%	-	-
12	-	-	-	-	22,562	22%	-	-
24	-	-	-	-	18,690	36%	-	-
36	-	-	-	-	15,482	47%	-	-
48	-	-	-	-	12,825	56%	-	-

EQUATIONS:

1st order decrease= (concentration)e^(-kt)



APPENDIX M

Public Notice Bulletin

PUBLIC NOTICE
PROPOSAL TO CLEANUP
AN UNDERGROUND STORAGE TANK (UST) SITE

There has been a release from an underground storage tank system at:

Potomac River Generating Station (PRGS)
1400 North Royal Street
Alexandria, VA

The Virginia Department of Environmental Quality (VADEQ) is requiring NRG Potomac River LLC to develop a Corrective Action Plan (CAP) to address cleanup of petroleum hydrocarbons at the site. If you have any questions regarding the cleanup, please contact:

NRG Potomac River LLC
Burt McCullough
8301 Professional Place
Suite 230
Landover, MD 20785

The CAP will be submitted to the Northern Virginia Regional Office of the VADEQ on or before December 23, 2014. Additionally, a copy of this CAP has been provided to the Alexandria Library - Beatley Central Library Branch located at 5005 Duke Street, Alexandria, VA 22304 for public viewing. If you would like to review or discuss the CAP with the staff of the VADEQ, please feel free to contact Alex Wardle at (703) 583-3822 after the date of the CAP submittal. The DEQ Northern Virginia Regional Office will consider written comments regarding the CAP until January 23, 2015 and may decide to hold a public meeting if there is significant public interest. Written comments should be sent to the VADEQ at the address listed below. The VADEQ requests that all written comments reference the tracking number for this case; **PC # 2013-3154**

Department of Environmental Quality
Storage Tank Program
Northern Virginia Regional Office
13901 Crown Court
Woodbridge, Virginia 22193-1453