ExxonMobil
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Steve Trifiletti
Project Manager

January 11, 2011

Mr. Brian Davidson
New York State Department of Environmental Conservation
Remedial Bureau B
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

Re: Tidal Study and Hydraulic Conductivity Evaluation Report
Former Pratt Oil Works
Long Island City, New York
Consent Order Case No. D2-1002-12-07AM
Document Tracking No. S241115

Dear Mr. Davidson:

ExxonMobil Oil Corporation ("ExxonMobil") is submitting for your review and comment the enclosed *Tidal Study and Hydraulic Conductivity Evaluation Report* for the subject site. The report describes the methods, results and findings of tidal study and hydraulic conductivity evaluation activities conducted in September and October 2010. One hard copy and an electronic copy are provided per Section VIII of the Consent Order (D2-1002-12-07AM) executed between ExxonMobil and New York State Department of Environmental Conservation (NYSDEC) and a letter from NYSDEC dated June 2, 2010. This report has been prepared on behalf of ExxonMobil by Kleinfelder of Bohemia, New York.

Please do not hesitate to contact me at (718) 404-0652 if you have any questions.

Very truly yours,

Steve Trifiletti
Project Manager

Enclosure

Via FEDEX Overnight

cc: S. Caruso (NYSDEC – electronic copy only)
L. Forte (A&L Cesspool Ser./Co. – hard copy only)
J. Kaplan (Waste Management of New York LLC – electronic and hard copy)
K. Lumpe (Steel Equities – hard copy only)

N. Sherman (HP Sherman Co. Inc. – hard copy only)
G. Werwaiss (Werwaiss Realty co. – hard copy only)
J. Wolf (Kleinfelder)

KLEINFELDER
Bright People. Right Solutions.

DELIVERED VIA OVERNIGHT CARRIER

January 11, 2011

Mr. Steve P. Trifiletti
ExxonMobil Environmental Services Company
Global Remediation – Major Projects
38 Varick Street
Brooklyn, New York 11222

Re: Tidal Study and Hydraulic Conductivity Evaluation Report
Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Long Island City, New York 11101
NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
NYSDEC Case No. 07-07417 (Parcel C)
NYSDEC Case No. 09-04539 (Parcel D)
NYSDEC Case No. 09-03356 (Parcel E)
NYSDEC Case No. 09-03488 (Parcel G)
NYSDEC Case No. 09-03616 (Parcel H)
NYSDEC Case No. 09-03287 (Parcel I)
Consent Order Case No. D2-1002-12-07AM
NYSDEC Remedial Tracking No. S241115

Dear Mr. Trifiletti:

Enclosed please find a *Tidal Study and Hydraulic Conductivity Evaluation Report* prepared by Kleinfelder East, Inc. (Kleinfelder), on behalf of ExxonMobil Environmental Services Company (ExxonMobil), for the Inland and Waterfront Project Areas listed above, which compose Tract I and II (further referred to as the Inland and Waterfront Project Areas, respectively) of the Former Pratt Oil Works (FPOW), further referred to as the Project Area.

This Report documents the methods, results and findings of a tidal study and hydraulic conductivity evaluation conducted in September and October 2010. Pressure transducers were installed in monitoring wells throughout the Project Area on September 14, 2010 and recorded liquid level data through October 15, 2010 in an effort to study tidal influences of Newtown Creek on the Project Area. Slug tests were

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conducted on September 1, 2, 7, 8 and 9, 2010 in an effort to estimate hydraulic conductivity of the water bearing zones beneath the Project Area.

If you have questions or comments, please contact the undersigned at (631) 218-0612.

Very truly yours,
Kleinfelder East, Inc.

John E. Wolf
Senior Project Manager

Daniel T. Canavan, P.G.
Senior Project Hydrogeologist

Enclosure

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TIDAL STUDY AND HYDRAULIC CONDUCTIVITY EVALUATION REPORT

Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Parcel A - 38-30, 38-50 and 38-80 Newtown Creek, and 38-40 Railroad Avenue
Parcel B - 38-42 and 39-14 Review Avenue
Parcel C - 38-70 Review Avenue
Parcel D - 38-84 Railroad Avenue
Parcel E - 38-50 Review Avenue and 38-54 Railroad Avenue
Parcel F - 38-98 Review Avenue
Parcel G - 38-78 Review Avenue
Parcel H - 39-30 Review Avenue
Parcel I - 38-20 Review Avenue
Parcel J - 37-88 Review Avenue
Parcel K - 38-60 Review Avenue
Long Island City, New York

NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
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NYSDEC Case No. 09-03488 (Parcel G)
NYSDEC Case No. 09-03616 (Parcel H)
NYSDEC Case No. 09-03287 (Parcel I)

Consent Order Case No. D2-1002-12-07AM
NYSDEC Remedial Tracking No. S241115

January 11, 2011

Prepared by:

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Prepared for:

ExxonMobil Environmental
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TIDAL STUDY AND HYDRAULIC CONDUCTIVITY EVALUATION REPORT

Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Long Island City, New York

ENGINEERING CERTIFICATION

This Tidal Study and Hydraulic Conductivity Evaluation Report has been reviewed by Kleinfelder Engineering, P.C. for accuracy, content and quality of presentation. The Education Law of the State of New York prohibits any person from altering anything in the report in anyway unless it is under the direction of the licensed professional engineer. Where such alterations are made, the professional engineer must sign, seal, date and describe the full extent of the alteration (NYS Education Law Section 7209-2).

Justin R. Moses, P.E.
Vice President and Secretary
Kleinfelder Engineering, P.C.

1/11/11
Date

TIDAL STUDY AND HYDRAULIC CONDUCTIVITY EVALUATION REPORT

Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Long Island City, New York

QUALITY ASSURANCE/QUALITY CONTROL

The following personnel have reviewed this Report for accuracy, content, and quality of presentation:

John E. Wolf
Project Manager

1/11/11
Date

Jeffrey Hale, P.G.
Senior Principal Hydrogeologist

1/11/11
Date

Daniel T. Canavan, P.G.
Senior Project Hydrogeologist

1/11/11
Date

TABLE OF CONTENTS

LIST OF TABLES, FIGURES, CHARTS AND APPENDICES

TABLES

FIGURES

CHARTS

KLEINFELDER One Corporate Drive, Suite 201, Bohemia, NY 11716 p | 631.218.0612 f | 631.218.0787

LIST OF TABLES, FIGURES, CHARTS AND APPENDICES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	-	American Society for Testing and Materials
CAP	-	Corrective Action Plan
DSNY	-	New York City Department of Sanitation
DTB	-	depth to bottom
DTW	-	depth to water
EIP	-	electronic interface probe
Fbg	-	feet below grade
ft	-	feet
ft/d	-	feet per day
ft/ft	-	feet per foot
ft-msl	-	feet above mean sea level
FPOW	-	Former Pratt Oil Works
LIRR	-	Long Island Railroad
LNAPL	-	light non-aqueous phase liquid
MP	-	marine piezometer
msl	-	mean sea level
NAPL	-	non-aqueous phase liquid
NYSDEC	-	New York State Department of Conservation
PPE	-	personal protective equipment
PSI	-	pound per square inch
PVC	-	polyvinyl chloride
USGS	-	United States Geologic Survey
WMNY	-	Waste Management of New York
Work Plan	-	July 6, 2010, Tidal Study and Hydraulic Conductivity Evaluation Work Plan

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1.0 INTRODUCTION

ExxonMobil Environmental Services Company (ExxonMobil), on behalf of ExxonMobil Oil Corporation, contracted Kleinfelder East, Inc. (Kleinfelder) to conduct a tidal study and hydraulic conductivity evaluation for the Inland and Waterfront Project Areas which compose Tract I and II (further referred to as the Inland and Waterfront Project Areas, respectively) of the Former Pratt Oil Works (FPOW) in Long Island City, New York, further referred to as the Project Area. The evaluation was conducted in accordance with the July 6, 2010 *Tidal Study and Hydraulic Conductivity Evaluation Work Plan* (Work Plan) prepared by Kleinfelder and approved by the New York State Department of Environmental Conservation (NYSDEC) on August 12, 2010. This tidal study and hydraulic conductivity evaluation supplements previous site characterization activities conducted under NYSDEC Consent Order Case No. D2-1002-12-07AM for the Project Area.

The purpose of the evaluation was to assess the tidal influences of Newtown Creek on the Project Area and to endeavor to estimate hydraulic conductivity of the water bearing zones beneath the Project Area. This Report documents the methods, results and findings of tidal study and hydraulic conductivity evaluation activities conducted in September and October 2010.

The parcels that constitute the Project Area have changed ownership over the years. The addresses of the parcels, as well as current property owners known to Kleinfelder at the time of this Report, are as follows:

Inland Project Area

Parcel	Address	Current owner
Parcel A	38-40 Railroad Avenue	Waste Management of New York
Parcel C	38-70 Review Avenue	Keane Realty LLC
Parcel D	38-84 Railroad Avenue	A&L Cesspool Ser./Co.
Parcel E	38-50 Review Avenue, 38-54 Railroad Avenue	HP Sherman Co. Inc.
Parcel F	38-98 Review Avenue	DG Properties LLC
Parcel G	38-78 Review Avenue	Werwaiss Realty Co.

Parcel	Address	Current owner
Parcel H	39-30 Review Avenue	Pepatoba Corp.
Parcel I	38-20 Review Avenue	Review Associates, LLC
Parcel J	37-88 Review Avenue	Up From the Ashes, Inc.
Parcel K	38-60 Review Avenue	Renari LLC

Waterfront Project Area

Parcel	Address	Current owner
Parcel A	38-80,38-50, 38-30 Newtown Creek	Waste Management of New York
Parcel B	38-42, 39-14 Review Avenue	Apollo Steel

2.0 SITE DESCRIPTION

The following subsections: (1) describe the Project Area; (2) discuss its historic and current property uses; and (3) describe underlying geology and hydrogeology.

2.1 Site Description

The Project Area was a former wax refinery that operated until approximately 1949. The Project Area is an approximately 18.51 acre commercial/industrial area located within the United States Geological Survey (USGS) 7.5-Minute Topographic Map, Brooklyn, New York, Quadrangle (USGS, 1979). The Project Area is approximately 5 to 25 feet (ft) above mean sea level (msl). The topography and elevation of the Project Area is illustrated on the Locus Plan provided on Figure 1. There are 22 monitoring wells (MW-1 to MW-10 and MW-13 to MW-24) in the Project Area. Pertinent site features including, but not limited to, block and lot, parcel IDs, property boundaries, Long Island Rail Road (LIRR) train tracks, current buildings, structure layouts and monitoring well locations are illustrated on Figure 2.

2.2 Current Property Use

The Project Area has been subdivided into 16-lots of Block 312. Properties north of the LIRR comprise the Inland Project Area (Tract I) and south of the LIRR comprise the

Waterfront Project Area (Tract II). Each tract is further subdivided into parcels (Parcels A through I) based on property ownership. Current uses of properties within the Project Area include, but are not limited to, the following: New York City Department of Sanitation (DSNY) waste transfer station; warehouse and/or office space; vehicle storage; restaurant oil and grease recovery and recycling; cesspool services; valve manufacturing; lumber and building materials distributors; commercial refrigeration supply distributor; cleaning and maintenance products manufacturing; and wholesale beverage distributor.

2.3 Site Geology

The geology observed in soil samples collected from the Project Area is generally heterogeneous. The deposits observed in soil samples beneath the Inland Project Area are predominantly composed of sand of unknown thickness, observed to the maximum depth of investigation (25 to 37 feet below grade [fbg]). Sporadic lenses of silt, gravel and/or cobble were also observed in borings on the Inland Project Area.

Heterogeneity of the subsurface deposits observed in samples increases from the center of the southern Inland Project Area towards Newtown Creek. Layers of urban fill containing coal ash were observed in shallow soil samples (1 to 18 fbg). A deposit of peat/organic silt, ranging in thickness from less than 1 foot to 4 ft, was observed in samples beneath the fill material throughout the northern section of Waterfront Parcel A and onto the western section of Parcel B. A silt layer is present in the south central portion of the Inland Project Area (MW-15), extending to the southwestern portion of the Waterfront Project Area. The silt layer ranges from 2 to 5 ft thick. A sand deposit of unknown thickness underlies the silt layer. On the northern portion of Waterfront Parcel B, the sand deposit is located immediately beneath the fill material in areas where the peat/organic silt are not present.

2.4 Site Hydrogeology

Groundwater is present beneath the Project Area in water table and semi-confined conditions. The water table is present beneath the Project Area at depths ranging from approximately 3 feet along Newtown Creek to approximately 25 fbg in the northernmost portions of the Inland Project Area.

On the Inland Project Area, the water table is present in the sand deposit. On the Waterfront Project Area, the water table is present in the fill material. A semi-confined zones exist in the sand unit beneath the low permeability silt layer on the northern section of Waterfront Parcel A.

On October 15, 2010, groundwater beneath the Project Area was detected in water table and semi-confined conditions. The depth to water ranged from approximately 3.89 fbg (MW-13) to approximately 27.41 fbg in (MW-22). Groundwater flow direction was towards Newtown Creek. The average water table gradient between the northern (MW-20) and southern (MW-8) boundaries of the Project Area was calculated to be approximately 0.01 feet per foot (ft/ft). Table 1 summarizes the groundwater elevation beneath the Project Area.

3.0 METHODS

The following subsections describe the methods of tidal study and hydraulic conductivity evaluation activities performed at the Project Area in September 2010 to October 2010.

3.1 Tidal Study

A tidal study was conducted between September 14 and October 15, 2010 at the Project Area in an effort to accomplish the following:

- Evaluate the effects of semi-diurnal tidal fluctuations on potentiometric surface elevations in monitoring wells located at various distances from Newtown Creek, in the unconfined water table zone and the semi-confined water bearing zone; and

- Evaluate, if present, how light non-aqueous phase liquid (LNAPL) thickness, air/LNAPL interface and LNAPL/water interface positions fluctuate in monitoring wells in response to tidal influence.

The tidal study was conducted across a full lunar cycle from a first quarter moon (neap tide) on September 16, 2010 to a last quarter moon (neap tide) on October 15, 2010. The moon was full and new on September 23 and October 8, 2010, respectively. A spring tide is associated with both a full and a new moon.

The tidal study consisted of the installation of Solinst Levelogger static data logging total pressure transducers (static data logger) in the following monitoring wells: MW-1, MW-2 MW-4S, MW-4D, MW-6, MW-7, MW-8, MW-10, MW-13, MW-14, MW-15, MW-18 and MW-20. Monitoring well MW-12 was proposed to be incorporated into the tidal study, but was destroyed during redevelopment of the bulkhead on Parcel B between April and July, 2010 and, therefore, not included in the study. Figure 3 illustrates the wells included in the tidal study. The wells listed above, with the exception of MW-4D and MW-6, contain screen intervals that bridge the water table and were used in an effort to evaluate tidal effects on the unconfined water table zone. Tidal influence on the semi-confined, water-bearing zone was evaluated using monitoring wells MW-4D and MW-6, screened beneath a silt layer. Screen intervals are summarized on Table 1.

A subset of the tidal study wells, including MW-2, MW-4S, MW-6, MW-7, and MW-14 contained LNAPL at the time of the tidal study. The LNAPL thickness was monitored with a second Solinst Levelogger data logging, total pressure transducer affixed to a float in the wells (dynamic data logger), with the exception of MW-14. The density of the float was customized such that it, and the pressure transducer, remained at a fixed location relative to the water/LNAPL interface. If the water/LNAPL interface moved up or down in a well, the float and pressure transducer moved concomitantly. Changing thickness of LNAPL above the pressure transducer was recorded by the pressure

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transducer affixed to the float. A schematic diagram of the monitoring equipment used for wells containing LNAPL is provided as Figure 4.

Kleinfelder previously conducted a feasibility evaluation of the testing equipment for wells containing LNAPL, as previously reported to the NYSDEC in the Work Plan. A bench test was performed on March 4, 2010 and pilot tests were performed between March 8 and April 5, 2010. The results of testing indicated that this method is a valid approach for estimating tidal influence on water levels and LNAPL thickness, if present, in monitoring wells in the Project Area.

Monitoring well MW-14 contained approximately 5.23 feet of LNAPL and 0.47 feet of water on September 14, 2010. Due to the limited amount of water in the well, a dynamic pressure transducer was not installed in the well, and LNAPL thickness was not continuously monitored. A stationary pressure transducer was installed in the well on September 14, 2010, which provided a means to monitor changes in the potentiometric surface elevation only.

A temporary marine piezometer (MP) was installed and used to monitor water levels in Newtown Creek (Figure 3). The piezometer was constructed with a two inch diameter, schedule 40 polyvinyl chloride (PVC) pipe affixed to the bulkhead and extending from the top of the bulkhead to approximately 5 feet below the low tide level. A Solinst Levelogger data logging total pressure transducer was installed in the bottom of the piezometer.

A Solinst Levelogger data logging pressure transducer was installed in the dry portion of the casings of the marine piezometer and a second transducer was installed in a well on the landward side of the refurbished bulkhead (bulkhead well) on Parcel B to record atmospheric pressure changes. The atmospheric pressure data were used to compensate submerged static and dynamic pressure transducer total pressure readings for atmospheric pressure contributions.

The data logging pressure transducers recorded data at 30 minute intervals from September 14 through October 15, 2010. Monitoring well MW-13 was not accessible during the initiation of the tidal study on September 14, 2010 due to the staging of bulkhead construction material on top of the well. On September 21, 2010, Kleinfelder was able to access MW-13 and installed a data logging pressure transducer.

Liquid level gauging was performed on accessible tidal study wells using an electronic interface probe (EIP) on September 14, 16, 20, 29, October 4 and 15, 2010 in order to normalize recorded data to a common datum and compare manual gauging data to that recorded by the pressure transducers.

3.2 Hydraulic Conductivity Evaluation

Aquifer testing consisting of slug testing was conducted on September 1, 2, 7, 8 and 9, 2010, in an effort to estimate values of hydraulic conductivity of the water bearing zones beneath the Project Area. Testing was conducted on the following wells: MW-1, MW-4D, MW-8, MW-10, MW-13, MW-15, MW-18, MW-20, and MW-21. The wells were selected based on their spatial distribution across the Project Area (Figure 5) and the absence of LNAPL in the wells. Monitoring well MW-12 was proposed to be tested, but was destroyed during redevelopment of the bulkhead on Parcel B between April and July, 2010 and, therefore, was not tested.

Prior to slug testing, the depth to bottom in each well was measured to evaluate if sediment had accumulated in the bottom of the well. As proposed in the Work Plan, wells containing more than six inches of settled sediment would require sediment removal prior to slug testing. The sediment thickness was measured to be less than six inches in each of the test wells; therefore, sediment removal was not performed.

Each monitoring well listed above, with the exception of MW-4D, contains screen intervals that bridge the water table. These wells were tested using a manual rising head technique, wherein a "slug" of known volume was inserted into the well and the water level was allowed to stabilize. Once the water level was nearly stable, the slug was removed, causing rapid displacement of the water column. Water level rise (rising head slug test) was monitored using an In-situ Level Troll data logging pressure transducer. Because of relatively slow (less than 5 feet/day) water level recovery in MW-15, two falling head tests were conducted, in addition to a rising head test, by measuring water level decline after the slug was inserted into the water column. Three slug tests were conducted on each of the wells listed above, with the exception of MW-20. Two tests were performed on MW-20 because water level recovery was relatively slow (less than 5 ft/day) in the well. The same slug size was generally used for two of the tests and slug size was modified for the third test. Testing was conducted following relevant portions of *American Society for Testing and Materials (ASTM), Standard D4404-96, Standard Test Method (Field Procedure) for Instantaneous Changes in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers*.

Monitoring well MW-4D contains a screen interval that is completely submerged beneath the water level, allowing the use pneumatic slug testing techniques. Pneumatic testing was attempted on monitoring well MW-4D on September 1, 2010. After numerous attempts under varying pneumatic pressures, the well and pneumatic well head assembly were unable to sustain pneumatic pressure. Tightness testing was conducted on the well head assembly and it was determined to hold pressure, suggesting that air was escaping from the casing of the monitoring well during the tests. The pneumatic testing technique was abandoned and slug testing was conducted using the manual rising head and falling head techniques discussed above, for a total of three tests on monitoring well MW-4D.

4.0 FINDINGS AND RESULTS

The following subsections describe the findings and results of the Tidal Study and Hydraulic Conductivity Evaluation conducted at the Project Area in September and October 2010.

4.1 Tidal Study

The following subsections summarize data reduction and analyses of the Tidal Study data.

4.1.1 Data Reduction

The data recorded from the data logging pressure transducers were reduced as follows:

1. Data was downloaded from the static, dynamic and barometric pressure transducers.
2. The two barometric pressure data sets collected from loggers installed in the dry portion of the marine piezometer and the bulkhead well were compared. The barometric pressure data sets were found to be similar, with few discrepancies.
3. Data from each static and dynamic pressure transducer were compensated for barometric pressure by subtracting the time-specific barometric pressure recorded from the transducer installed in the bulkhead well from the submerged pressure transducer data. As necessary, transducer data were adjusted for water level shifts associated with the removal of transducer during gauging and/or downloading and return of the transducer to a different depth in the well.
4. For wells that contained a static pressure transducer only (MW-1, MW-4D, MW-8, MW-10, MW-13, MW-14, MW-15, and MW-20), the transducer data was converted into water level elevation (potentiometric surface elevation), by normalizing the data to water level elevations measured manually at the initiation of the test.
5. In wells that contained both a static and dynamic pressure transducer (MW-2, MW-4S, MW-6 and MW-7), the dynamic transducer data was converted into LNAPL thickness and top of LNAPL elevation by first correcting the pressure reading for the density of the LNAPL, and then normalizing the LNAPL thickness to the top of LNAPL elevation and the water level (water/LNAPL interface) elevation data measured manually at the initiation of the test. The elevation of the water level (water/LNAPL interface) was then calculated by reducing the static pressure transducer measurement values by the corresponding dynamic

pressure transducer measurement values. Finally, the calculated LNAPL thickness was added to the water level (water/LNAPL interface) elevation to yield the potentiometric surface elevation in the well.

6. The calculated top of LNAPL elevation (LNAPL/air interface), water level elevation (water/LNAPL interface), and calculated LNAPL thickness for each well, along with barometric pressure, were plotted and are included in Appendix A – Tidal Study Monitoring Data Plots.

4.1.2 Comparison of Manual Measurements

Manual liquid level gauging data were collected from the tidal study wells on September 14, 16, 20, 29, October 4 and 15, 2010. The measurements were converted to top of LNAPL elevation, top of water elevation (water/LNAPL interface or water/air interface), and LNAPL thickness and included on data plots in Appendix A. Plotting the manual measurements and reduced data from pressure transducer measurements allowed for screening of the two data sets for consistency. The manual measurement values and the reduced pressure transducer data were generally consistent with one another. Minor discrepancies in the data may be attributed to a natural change in liquid levels during the time between the manual measurement and the pressure transducer measurement, or other inherent factors such as displacement of liquid in the well or disturbance of the pressure transducer during measurement with the EIP.

4.1.3 Observed Anomalies

Anomalous data associated with the dynamic pressure transducers were observed in discrete periods of data collected from MW-2 and MW-7. In monitoring well MW-2 (on September 22, 26 and October 11 to 13, 2010) and MW-7 (September 19 to 26 and October 11 to 13, 2010) the dynamic pressure transducer data set exhibited data indicating it was not floating freely as the LNAPL/water interface moved up and down in the well. The motion of the dynamic pressure transducer may have been hindered by the tangling of the cable connecting the float assembly to the surface, adhesion of the cable and/or float assembly to the inner wall of the well, or other factors. The anomalous data from the periods listed above were not included in MW-2 and MW-7 data plots (Appendix A). The remaining data from MW-2 and MW-7 did not indicate a hindrance to the vertical motion of the dynamic transducer, and was, therefore, considered to be representative of conditions in the wells.

The data logging pressure transducer in monitoring well MW-18 did not record changes in pressure. The height of the water column above the transducer and atmospheric pressure combined to form a total pressure value that exceeded the maximum gauge pressure of the transducer. As a result, no water level data were obtained from the static transducer in monitoring well MW-18.

4.1.4 Data Analysis

The tidal study data were analyzed to evaluate changes in potentiometric surface and LNAPL thickness resulting from tidal fluctuations in Newtown Creek.

4.1.4.1 Tidal Influence on Potentiometric Surface

The potentiometric surface observed at each tidal study monitoring well and the marine piezometer are included as Chart 1. For ease of viewing, the data series were divided into smaller scaled subsets, representing the potentiometric surface elevation during a seven day period containing the minimum tidal fluctuation (Chart 2) measured in the marine piezometer (September 16, 2010, 04:00 to 10:00, 2.23 feet change), and a seven day period containing the maximum tidal fluctuation (Chart 3) measured in the marine piezometer (October 9, 2010, 04:30 to 11:30, 7.08 feet change).

Trends in Chart 1, 2, and 3 appear to indicate semi-diurnal patterns in the potentiometric surface in MW-2, MW-7, and MW-8, which coincided with tidal fluctuation observed in the marine piezometer. The potentiometric surface elevation data for the remaining wells were examined for trends that may not have been apparent at the scale of Chart 1 through 3. Semi-diurnal trends were not observed in the remaining monitoring wells including: MW-1, MW-4S, MW-4D, MW-6, MW-10, MW-13, MW-14, MW-15, and MW-20. The apparent cyclic pattern that can be observed in the potentiometric surface of some of these wells coincides with barometric pressure cycles (Appendix A – Monitoring Data Plots MW-4D, MW-6, MW-14, and MW-15).

Monitoring wells that exhibited semi-diurnal fluctuations in potentiometric surface elevation, MW-2, MW-7 and MW-8, are located approximately 34 feet, 28 feet, and 12 feet, respectively, from Newtown Creek (Figure 5) and appear to be influenced by tidal cycles. Each of these wells was installed with screens that bridge the water table in an effort to monitor the unconfined, water-bearing zone beneath the Project Area. The absence of semi-diurnal cycles in potentiometric surface in the remaining water table monitoring wells (MW-1, MW-4S, MW-10, MW-13, MW-14, MW-15, and MW-20) and semi-confined, water-bearing zone monitoring wells (MW-4D, MW-6) indicate that tidal influence does not appear to be occurring in these wells. Based on the data collected, tidal effects on potentiometric surface were observed only in monitoring wells located within approximately 40-feet of Newtown Creek.

The relative change in water level in the marine piezometer during the minimum, maximum, and two intermediate magnitude tide changes are plotted on Chart 4 along with the concurring changes in potentiometric surface elevations in monitoring wells MW-2, MW-7 and MW-8. Chart 4 illustrates a direct relationship between the degree of tidal influence on potentiometric surface elevations in monitoring wells MW-2, MW-7 and MW-8 and the change in tide magnitude. The magnitude of potentiometric surface elevation change in response to tide change is consistently greatest in monitoring well MW-8 (closest to the creek), followed by MW-7, and least in MW-2 (furthest from the creek).

Monitoring well MW-13, located approximately 13 feet from Newtown Creek, did not exhibit semi-diurnal cycles in potentiometric surface elevation between September 14 and October 15, 2010. Since tidal influence was observed in wells located at greater distances from Newtown Creek, MW-2 (34 feet), MW-7 (28 feet) and MW-8 (39 feet), it is inferred that tidal influence may be observed in monitoring well MW-13 due to its proximity to Newtown Creek. The absence of tidal influence in MW-13 may suggest that the well is isolated from the unconfined, water-bearing zone located throughout the majority of the Project Area. Monitoring well MW-13 was installed within fill material (concrete, wood, and cobbles) down to 8-fbg due to refusal.

Charts 1 through 3 indicate that the hydraulic gradient is in the general direction of Newtown Creek throughout the majority of the tidal cycles. During late portions of incoming tides and early portions of the outgoing tides, the potentiometric surface elevation in some or all of the tidally influenced monitoring wells, MW-2, MW-7 and MW-8, increases to an elevation above that in monitoring wells located further inland (MW-4S, MW-6, MW-10, MW-14, MW-15). During these periods, the hydraulic gradient reverses and is temporarily in a general inland direction. This phenomenon appears most pronounced during periods of maximum tidal fluctuation (spring tides), represented in the time period displayed in Chart 3.

4.1.4.2 Tidal Influence on LNAPL Thickness

Charts 5 through 8 contain LNAPL thickness and potentiometric surface elevation data from each of the wells containing LNAPL (MW-2, MW-4S, MW-6 and MW-7). The LNAPL thickness in each well and tidal stage (marine piezometer water level elevation) are plotted in Chart 9. No correlations between tidal cycles or potentiometric surface elevation and LNAPL thickness were observed in monitoring wells MW-4S and MW-6 (Charts 6, 7 and 9). Monitoring well MW-2 exhibited subtle changes (<0.1 feet) in calculated LNAPL thickness during the majority of tidal cycles (Charts 5 and 9). LNAPL thickness changed in MW-2 by a maximum value of approximately 0.2 feet during tide changes on October 8 and 9, 2010 (including maximum tide change). Changes in LNAPL thickness were most evident and consistent in monitoring well MW-7 (Charts 8 and 9). LNAPL thickness changed in MW-7 by a maximum of approximately 0.84 feet during a tide change on September 15, 2010. In both monitoring wells MW-2 and MW-7, LNAPL thickness generally increased during outgoing tides (decreasing potentiometric surface elevation) and decreased during incoming tides (period of increasing potentiometric surface elevation).

4.2 Hydraulic Conductivity Evaluation

Slug testing was conducted on September 1, 2, 7, 8 and 9, 2010, to estimate values of hydraulic conductivity of the water bearing zones beneath the Project Area. Slug testing was conducted on monitoring wells MW-1, MW-4D, MW-8, MW-10, MW-12, MW-13, MW-15, MW-18, MW-20, and MW-21.

Analysis of the slug test data consisted of the following:

1. Initial data usability screening;
2. Quantitative analyses and hydraulic conductivity determination;
3. Comparison of calculated hydraulic conductivity to published values of similar soil types.

The following subsections summarize the data reduction and analysis of the slug test data.

4.2.1 Initial Data Usability Screening

The raw water level recovery data obtained using In-Situ Level Troll data logging pressure transducers were plotted on charts and screened to determine if the data was of sufficient quality to warrant further quantitative analyses. Charts of the raw water level transducer data are provided as Appendix B. Based on initial usability screening, the following data sets were eliminated from further analyses:

> **MW-8:** Each of the three rising head tests were eliminated from further analyses. Complete water level recovery occurred less than approximately 1 second after the initiation of the slug test. Although the data logging pressure transducer was

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recording data at its maximum frequency of 4 times per second, (0.25 second intervals), a sufficient amount of data points could not be collected to warrant quantitative analysis of the data. Such rapid water level recovery is a qualitative indicator of relatively high hydraulic conductivity of the material surrounding the well screen.

MW-15: One falling head test was eliminated from further analyses due to uncharacteristic fluctuations in water level during the water level recovery period. Two additional slug tests were performed on MW-15; each of which was selected for quantitative analyses.

4.2.2 Quantitative Analysis

Data reduction and quantitative analyses were performed on slug test data sets that were not eliminated from further analysis during initial data usability screening. Analysis was conducted on slug test data sets obtained from monitoring wells MW-1, MW-4D, MW-10, MW-13, MW-15, MW-18, MW-20, and MW-21. A total of 22 tests were analyzed.

The relationship between each tested well and the surrounding water-bearing strata was evaluated and classified into one of three conceptual model categories. The categories were based on the well screen's location in either the unconfined, water table zone or the semi-confined, water-bearing zone, and the depth to the bottom of the associated water-bearing zone. Each of the three conceptual model classifications is described below.

Shallow Unconfined Condition: MW-1, MW-10, MW-13 and MW-21

The shallow unconfined condition is characterized as having a well screen situated both above and below the water table and extended to the top of a shallow low permeability deposit, such that the well fully spans the unconfined, water-bearing zone.

Deep, Unconfined Condition: MW-15, MW-16 and MW-20

The deep, unconfined condition is characterized by a lack of a shallow low permeability deposit, with a well screen installed such that it bridges the water table and does not fully span the water bearing zone. The bottom of the water bearing zone was selected as the top of the subjacent bedrock/Raritan Clay at approximately -100 ft-msl (Smolensky et al., 1989)

Semi-Confined Condition: MW-4D

The semi-confined condition is characterized by the well screen being located entirely below the water table and a low permeability unit, and does not fully span the entire thickness of the water-bearing unit. The bottom of the water-bearing unit was selected to be the top of the subjacent bedrock/Raritan clay at approximately -100 ft-msl.

Slug test data were analyzed using AQTESOLV® for Windows Version 4.50 Professional software by HydroSOLVE, Inc. Water level data, well construction geometry, and aquifer dimensions were input into AQTESOLV® software for analysis using the Bouwer-Rice solution for a single well slug test (Bouwer and Rice, 1976, Bouwer, 1989, Zlotnick, 1994). The Bouwer-Rice solution requires straight line fitting of water level displacement data on a semi-logarithmic axis plot. A complete list of the equations, assumptions and data requirements associated with the Bouwer-Rice solution is included in Appendix C.

The Bouwer-Rice solution calculates an equivalent well radius for partial penetration conditions by incorporating a uniform anisotropy of the water bearing zone. The ratio of vertical to horizontal hydraulic conductivity of the water-bearing units was selected to be 0.1, which is consistent with anisotropy values reported for the Upper Glacial Aquifer by Smolensky et al., 1989. Partial penetration correction was applied to slug tests performed on monitoring wells, MW-15, MW-16, MW-20 (deep, unconfined conditions) and MW-4D (semi-confined conditions)

Input parameters for each slug test and the final fitted straight line and calculated hydraulic conductivity values are included in AQTESOLV® outputs in Appendix D.

4.2.3 Hydraulic Conductivity Results

A summary of the hydraulic conductivity results are included in Table 2. Hydraulic conductivity results from the multiple tests were used to calculate an average value for each well. Average calculated hydraulic conductivity ranged from 0.03 feet per day (ft/d) in monitoring well MW-20 to 217 ft/d in monitoring well MW-13. The numeric distribution of calculated average hydraulic conductivity values is depicted graphically on Chart 10 and compared to the expected range of hydraulic conductivity of various soil types reported by Domenico and Schwartz, 1990.

The hydraulic conductivity values measured in monitoring wells MW-1, MW-10, MW-13, MW-16, and MW-21 are within the range of those reported for fine to coarse sand and gravel. Monitoring wells MW-16 and MW-21 are screened in the unconfined, water table zone opposite material generally characterized as sand. The average hydraulic conductivity values calculated from MW-16 (30 ft/d) and MW-21(170 ft/d) are consistent with the range of values reported for sand. Monitoring wells MW-1, MW-10 and MW-13 are screened in the unconfined, water-bearing zone at depths where heterogeneous fill material was encountered. The values of hydraulic conductivity calculated from slug tests performed on the wells ranged from 51 to 217 ft/day.

Monitoring well MW-4D is screened in the semi-confined, water-bearing zone comprised of fine to medium sand. The average hydraulic conductivity measured at MW-4D, 0.60 ft/d, is consistent with reported values for fine to medium sand.

Monitoring well MW-15 is screened in the unconfined, water table zone in material consisting of fine to medium sand. The average hydraulic conductivity value calculated at MW-15 is 0.11 ft/d which lies at the lower end of the range of reported values for fine sand and within the reported ranges of silt and till. Monitoring well MW-20 is screened in

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the unconfined water table zone, opposite layers of sand of varying grain size and a layer of gravel in the bottom 2 feet of the screened interval. The average hydraulic conductivity calculated from monitoring well MW-20, 0.03 ft/d, falls within the range of silt and till, which is not consistent with the material opposite the well screen. The hydraulic conductivity values calculated for monitoring wells MW-15 and MW-21 appear to underestimate the actual value of hydraulic conductivity of the water zone surrounding the well screens and may be influenced by well construction or clogging of the well screens.

5.0 SUMMARY AND OBSERVATIONS

ExxonMobil, contracted Kleinfelder to conduct a tidal study and hydraulic conductivity evaluation for the Project Area. The study was conducted to endeavor to evaluate the tidal influences of Newtown Creek on the Project Area and estimate approximate hydraulic conductivity values of water-bearing zones beneath the Project Area. Monitoring wells MW-1, MW-2 MW-4S, MW-4D, MW-6, MW-7, MW-8, MW-10, MW-13, MW-14, MW-15, and MW-20 were used to monitor LNAPL (where present) and water levels during the tidal study conducted from September 14, 2010 to October 15, 2010. Slug tests were conducted on September 1, 2, 7, 8 and 9, 2010 on monitoring wells MW-1, MW-4D, MW-8, MW-10, MW-13, MW-15, MW-18, MW-20, and MW-21. Kleinfelder reduced and analyzed the data collected during the tidal study period and slug test events.

The following observations were made through the analysis of tidal study data collected between September 14 through October 15, 2010.

- Monitoring wells MW-2, MW-7 and MW-8 exhibited semi-diurnal cycles in potentiometric surface elevation coinciding with water level fluctuations measured in Newtown Creek. The wells are located within approximately 40 feet from Newtown Creek and are screened within the unconfined, water table zone.

- Semi-diurnal cycles in potentiometric surface were not observed in the remaining tidal study water table monitoring wells (MW-1, MW-4S, MW-10, MW-13, MW-14, MW-15, and MW-20) or semi-confined, water-bearing zone monitoring wells (MW-4D, MW-6), which may indicate that tidal influence is not occurring in the respective water-bearing zones near these wells.
- The degree of tidal influence on potentiometric surface elevations in monitoring wells MW-2, MW-7 and MW-8 appears directly related to the magnitude of tide change. The amount of potentiometric surface elevation change, in response to tide change, appears to be consistently greatest in monitoring MW-8, followed by MW-7, and least in MW-2.
- Due to its proximity to Newtown Creek, and the absence of semi-diurnal cycles in potentiometric surface elevation, monitoring well MW-13 appears to be isolated from the unconfined, water-bearing zone present throughout the majority of the Project Area.
- The hydraulic gradient appears to be in the general direction of Newtown Creek throughout the majority of the tidal cycles. During late portions of incoming tides and early portions of the outgoing tides, the hydraulic gradient often reverses and is temporarily in a general inland direction. This phenomenon appears most pronounced during periods of maximum tidal fluctuation (spring tides).

The following observations were made through reduction and analysis of the slug test data collected September 1, 2, 7, 8 and 9, 2010:

- Average hydraulic conductivity calculated from a total of 22 slug tests on eight monitoring wells ranged from 0.03 ft/d in monitoring well MW-20 to 217 ft/d in monitoring well MW-13.
- Water level recovery during slug testing in MW-8 was too rapid to allow collection of sufficient data to use in quantitative analysis. Such rapid water level recovery is a qualitative indicator of relatively high hydraulic conductivity of the material surrounding the well screen. The well was screened from 1 to 13 fbg with fill material (cobbles, wood, and sand) observed between 5 and 10 fbg.

- The average hydraulic conductivity values calculated from MW-16 (30 ft/d) and MW-21 (170 ft/d) are consistent with the range of values reported for the sand surrounding the well screens.
- Monitoring wells MW-1, MW-10 and MW-13 are screened in the unconfined, water-bearing zone at depths where heterogeneous fill material was encountered. The values of hydraulic conductivity calculated from slug tests performed on these wells ranged from 51 to 217 ft/day.
- Monitoring well MW-4D is screened in the semi-confined, water-bearing zone comprised of fine to medium sand. The average hydraulic conductivity measured at MW-4D, 0.60 ft/d, is consistent with reported values for fine to medium sand.
- The hydraulic conductivity values calculated for monitoring wells MW-15 (0.11 ft/d) and MW-20 (0.03 ft/d) were generally lower than reported values for soil types similar to those surrounding the well screens. The calculated hydraulic conductivity results may be influenced by well construction or clogging and appear to underestimate the actual value of hydraulic conductivity of the water-bearing zone surrounding the well screens.

6.0 RECOMMENDATIONS

Based on the information gathered from the hydraulic conductivity evaluation, Kleinfelder proposes to attempt to rehabilitate monitoring wells MW-15 and MW-20 using impulse generation technology and to re-evaluate the hydraulic conductivity at the wells.

The proposed impulse generation technology to rehabilitate monitoring wells MW-15 and MW-20 is a Hydropuls® generator. The Hydropuls® generator consists of a tool that is inserted and positioned in the well screens. High pressure nitrogen is then transferred from a tank through a pressurized hose for release from the tool. The impulse generator is equipped with a valve system that releases the accumulated pressure (200 to 1,200 pounds per square inch [psi]) in short and fluctuating bursts (milli-seconds), through a cross section. These pressure bursts cause mineral encrustations, biological material and fine sediment in the well screen and gravel pack to fracture and loosen. The loosened material is then brought into and extracted from the well by pumping. Impulse generation is likely to be a more effective and efficient technology than traditional rehabilitation techniques, such as use of water jetting and surging, because of its inherent ability to propagate energy through the screen slot size of the wells (0.02 inch) into the gravel pack.

The proposed well rehabilitation steps are as follows:

1. Brush the interior of monitoring wells MW-15 and MW-20 using a hand-held, down-hole brush. Pump the groundwater and liberated material from the well using a vacuum truck.
2. Generate impulses in the screened portion of the well using Hydropuls® tool, while extracting groundwater and liberated material from the treatment intervals using a vacuum truck. Tap water will be added to raise the water level in the well in order to facilitate impulse generation in the portion of the screen located above the water table.
3. Continue groundwater extraction following impulse generation to remove additional fine grained material. Additional tap water may be added to the wells if there is insufficient recharge.

Extracted groundwater from the monitoring wells will be contained with the vacuum truck and transported off-site for disposal.

Field activities will commence within 45 days following receipt of written NYSDEC approval of this Report contingent upon access and weather. The hydraulic conductivity evaluation will be performed approximately one week following well rehabilitation activities contingent upon successful well rehabilitation. The hydraulic conductivity evaluation will follow the methods described in the Work Plan dated July 6, 2010.

A report of findings will be submitted to the NYSDEC within 90 days following completion of MW-15 and MW-20 hydraulic conductivity evaluation field activities. The report of findings will include the methods, summary of data collected, analysis performed, and interpretation of the results.

7.0 LIMITATIONS

Kleinfelder performed the services for this project under the Standard Procurement Agreement with Procurement, a division of ExxonMobil Global Services Company (signed on June 21, 2007). Kleinfelder states that the services performed are consistent with professional standard of care defined as that level of services provided by similar professionals under like circumstances. This Report was produced for the primary benefit of Exxon Mobil Global Services Company and its affiliates.

8.0 REFERENCES

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TABLES

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April 2009 through July 2010

		Gauging Data						Field Parameters								
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-1 (6-18)	4/7/2009	13.49	ND	9.51	ND	NA	3.98	0.4	6.57	11.78	0.68	-302	NA*	530	NM	
	4/17/2009	13.49	ND	9.43	ND	NA	4.06	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	13.49	ND	8.56	ND	NA	4.93	0.6	7.02	17.97	0.57	-231	2.64	0.37	NM	
	10/26/2009	13.49	ND	8.08	ND	NA	5.41	NM	6.72	18.59	2.00	-324	0.00	7.20	0.08	
	1/22/2010	13.49	ND	8.36	ND	NA	5.13	0.2	6.76	11.50	0.58	-295	0.69	5.80	0.03	
	4/21/2010	13.49	ND	8.30	ND	NA	5.19	1.4	8.51	10.32	0.551	-283	0.00	0.10	0.00	
	7/19/2010	13.49	ND	8.11	ND	NA	5.38	25.2	6.04	17.52	0.474	-249	2.16***	6.20	0.01	
MW-2 (2-17)	4/7/2009	6.56	ND	5.45	ND	NA	1.11	80.9	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	6.56	7.72	7.81	0.09	0.89**	-1.17	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.56	7.78	8.88	1.10	0.89**	-1.34	0.5	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.56	6.72	8.09	1.37	0.89**	-0.31	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	6.56	8.19	9.93	1.74	0.89**	-1.82	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	6.56	7.54	8.04	0.50	0.89**	-1.04	6.8	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	6.56	7.49	7.73	0.24	0.89**	-0.96	0.2	NM	NM	NM	NM	NM	NM	NM	
MW-3 (3-18)	4/7/2009	7.95	NM	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	7.95	NM	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	7.95	NM	NM	NM	0.9386	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	7.95	8.15	9.70	1.55	0.9386	-0.30	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	7.95	8.20	8.22	0.02	0.9386	-0.25	5.5	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	7.95	8.95	9.05	0.10	0.9386	-1.01	0.2	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	7.95	8.80	9.55	0.75	0.9386	-0.90	18.2	NM	NM	NM	NM	NM	NM	NM	
MW-4 (5-22)	4/7/2009	8.87	6.59	9.65	3.06	0.8908	1.95	135	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	8.87	6.52	11.55	5.03	0.8908	1.80	NS	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	8.87	6.00	10.95	4.95	0.8908	2.33	7.6	NM	NM	NM	NM	NM	NM	NM	Well abandoned
MW-4S (4-9)	10/26/2009	8.81	6.31	7.20	0.89	0.8908	2.40	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	8.81	6.50	7.27	0.77	0.8908	2.23	161.0	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	8.81	5.81	6.43	0.62	0.8908	2.93	15.6	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	8.81	6.34	7.22	0.88	0.8908	2.37	9.7	NM	NM	NM	NM	NM	NM	NM	
MW-4D (13.5-18.5)	10/26/2009	8.57	ND	6.95	ND	NA	1.62	NM	6.68	18.10	1.05	-119	0.00	17.00	0.05	
	1/22/2010	8.57	ND	7.72	ND	NA	0.85	4.9	6.78	15.92	1.07	-136	0.66	59.50	0.08	
	4/21/2010	8.57	ND	6.71	ND	NA	1.86	1.4	6.49	15.39	1.18	-202	0.00	0.00	0.10	
	7/19/2010	8.57	ND	7.09	ND	NA	1.48	0.0	6.15	19.94	1.23	-120	1.49***	2.10	0.04	

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April 2009 through July 2010

		Gauging Data						Field Parameters									
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-5 (13-21)	4/7/2009	9.62	7.14	18.82	11.68	0.8952	1.26	23.0	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	9.62	7.32	18.66	11.34	0.8952	1.11	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	9.62	6.99	20.00	13.01	0.8952	1.27	4.7	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	9.62	7.69	18.05	10.36	0.8952	0.84	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	9.62	NM	NM	NM	0.8952	NM	NM	NM	NM	NM	NM	NM	NM	NM	Passive Bailer
	4/21/2010	9.62	7.11	19.60	12.49	0.8952	1.20	9.8	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	9.62	6.94	19.60	12.66	0.8952	1.35	0.0	NM	NM	NM	NM	NM	NM	NM	
MW-6 (18-23)	4/7/2009	11.80	9.09	12.18	3.09	0.8944	2.38	68.7	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	11.80	9.35	12.55	3.20	0.8944	2.11	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	11.80	8.79	12.82	4.03	0.8944	2.58	2.9	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	11.80	9.08	15.55	6.47	0.8944	2.04	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	11.80	9.22	18.00	8.78	0.8944	1.65	42.7	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	11.80	8.62	9.25	0.63	0.8944	3.11	14.8	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	11.80	8.73	10.34	1.61	0.8944	2.90	0.0	NM	NM	NM	NM	NM	NM	NM	
MW-7 (1-15)	4/7/2009	6.54	4.82	5.18	0.36	0.9129	1.69	211	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	6.54	7.74	8.42	0.68	0.9129	-1.26	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.54	7.80	9.30	1.50	0.9129	-1.39	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.54	7.07	7.70	0.63	0.9129	-0.58	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	6.54	6.04	7.62	1.58	0.9129	0.36	40.0	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	6.54	8.05	8.10	0.05	0.9129	-1.51	107	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	6.54	8.00	9.66	1.66	0.9129	-1.60	29	NM	NM	NM	NM	NM	NM	NM	
MW-8 (1-13)	4/7/2009	5.80	ND	4.09	ND	NA	1.71	0.0	7.59	8.07	37.40	-140	3.7	74.9	2.31	
	4/17/2009	5.80	ND	7.54	ND	NA	-1.74	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	5.80	ND	7.50	ND	NA	-1.70	0.0	7.68	28.95	27.40	-330	0.26	1.4	NM	
	10/26/2009	5.80	ND	6.83	ND	NA	-1.03	NM	7.10	16.32	32.40	-327	0.00	2.90	2.01	
	1/22/2010	5.80	ND	6.59	ND	NA	-0.79	0.0	7.04	7.15	35.20	-238	1.94	148	2.14	
	4/21/2010	5.80	ND	7.66	ND	NA	-1.86	0.2	6.96	11.49	40.2	-295	0.00	2.60	2.50	
	7/19/2010	5.80	ND	7.42	ND	NA	-1.62	0.0	7.02	23.86	37.1	-284	4.28***	0.00	2.27	
MW-9 (3-18)	4/7/2009	9.76	8.40	17.70	9.30	0.9074	0.50	106	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	9.76	8.28	17.51	9.23	0.9074	0.63	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	9.76	8.35	17.90	9.55	0.9074	0.53	5.3	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	9.76	8.84	17.90	9.06	0.9074	0.08	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	9.76	9.85	18.20	8.35	0.9074	-0.86	9.8	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	9.76	8.86	14.99	6.13	0.9074	0.33	15.7	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	9.76	8.50	17.99	9.49	0.9074	0.38	3.3	NM	NM	NM	NM	NM	NM	NM	

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April 2009 through July 2010

		Gauging Data						Field Parameters									
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-10 (3-13)	4/7/2009	10.56	ND	8.74	ND	NA	1.82	1.8	6.90	12.32	0.478	-143	0.0	95.4	0.02	
	4/17/2009	10.56	ND	8.64	ND	NA	1.92	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	10.56	ND	8.10	ND	NA	2.46	0.0	6.94	18.44	0.54	-135	5.47	0.0	NM	
	10/26/2009	10.56	ND	8.20	ND	NA	2.36	NM	6.71	17.93	0.78	-180	0.00	5.50	0.04	
	1/22/2010	10.56	ND	8.63	ND	NA	1.93	0.0	6.51	14.69	1.54	-196	0.70	3.70	0.08	
	4/21/2010	10.56	ND	8.28	ND	NA	2.28	0.0	6.78	15.04	1.25	201	0.24	46.0	0.00	
	7/19/2010	10.56	ND	8.47	ND	NA	2.09	0.0	5.78	18.34	0.91	-54	3.62***	1.6	0.02	
MW-11 (2-17)	4/7/2009	6.98	ND	5.73	ND	NA	1.25	0.0	4.62	10.54	29.6	-242	0.00	77.1	NM	
	4/17/2009	6.98	ND	8.72	ND	NA	-1.74	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.98	ND	7.98	ND	NA	-1.00	0.0	6.87	18.76	26.60	-221	5.49	6.9	NM	
	10/26/2009	6.98	ND	8.15	ND	NA	-1.17	NM	6.71	17.88	30.90	-291	0.00	0.00	1.94	
	4/21/2010	6.98	ND	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	Well destroyed
MW-12 (2-16)	4/7/2009	6.67	ND	8.26	ND	NA	-1.59	0.0	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	6.67	8.40	8.41	0.01	0.91**	-1.73	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.67	ND	NM	ND	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.67	7.81	7.95	0.14	0.91**	-1.15	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	6.67	ND	7.96	ND	NA	-1.29	2.0	NM	NM	NM	NM	NM	NM	NM	Shean observed
	7/19/2010	6.67	ND	NM	ND	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	Well destroyed
MW-13 (1-8)	4/7/2009	7.82	ND	NM	NM	NA	NM	0.0	8.43	9.68	1.14	-155	0.00	102	0.05	
	4/17/2009	7.82	ND	3.64	ND	NA	4.18	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	7.82	ND	3.51	ND	NA	4.31	0.0	7.22	20.84	1.40	-131	4.18	0.0	NM	
	10/26/2009	7.82	ND	3.59	ND	NA	4.23	NM	6.87	15.90	1.34	-76	0.0	10.50	0.07	
	4/21/2010	7.82	ND	3.70	ND	NA	4.12	0.0	7.34	12.31	1.40	-166	0.00	2.70	0.10	
	7/19/2010	7.82	ND	NM	ND	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	Well inaccessible
MW-14 (7.5-27.5)	7/29/2009	22.92	20.65	26.80	6.15	0.9086	1.71	10.9	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	22.92	21.31	26.50	5.19	0.9086	1.14	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	22.92	20.67	23.33	2.66	0.9086	2.01	4.7	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	22.92	20.91	26.81	5.90	0.9086	1.47	0.4	NM	NM	NM	NM	NM	NM	NM	
MW-15 (5.5-20.5)	7/29/2009	13.05	ND	10.59	ND	NA	2.46	0.0	7.05	19.48	0.78	-104	0.32	786	NM	
	10/26/2009	13.05	ND	11.32	ND	NA	1.73	NM	6.41	13.60	216.00	-138	8.11	990	0.10	
	4/21/2010	13.05	ND	10.79	ND	NA	2.26	0.2	7.08	15.02	1.12	-161	0.00	41.50	0.10	
	7/19/2010	13.05	ND	11.02	ND	NA	2.03	NM	6.19	17.25	0.96	-107	2.44***	6.30	0.03	
MW-16 (10.5-30.5)	7/29/2009	24.12	20.91	21.00	0.09	0.91**	3.20	0.2	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	24.12	21.25	21.27	0.02	0.91**	2.87	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	24.12	20.06	20.07	0.01	0.91**	4.06	1.2	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	24.12	ND	20.70	ND	0.91**	3.42	0.0	5.55	16.23	0.90	-75.00	1.02***	31.40	0.02	

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April 2009 through July 2010

		Gauging Data						Field Parameters								
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-17 (8.5-25.5)	7/29/2009	16.81	14.76	22.20	7.44	0.9122	1.40	3.5	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	16.81	15.44	23.0	7.56	0.9122	0.71	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	16.81	15.53	17.22	1.69	0.9122	1.13	1.6	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	16.81	15.03	20.91	5.88	0.9122	1.26	0.9	NM	NM	NM	NM	NM	NM	NM	
MW-18 (17.5-37.5)	9/24/2009	23.55	ND	20.92	ND	NA	2.63	NM	6.50	27.67	1.98	-144	0.40	33.50	NM	
	10/26/2009	23.55	ND	21.32	ND	NA	2.23	NM	6.59	14.84	1.63	-126	0.0	159	0.08	
	4/21/2010	23.55	ND	19.97	ND	NA	3.58	1.9	7.63	15.92	1.73	-212	0.00	60.00	0.10	
	7/19/2010	23.55	20.62	20.67	0.05	0.91**	2.88	NM	NM	NM	NM	NM	NM	NM	NM	
MW-19 (11.5-31.5)	9/24/2009	24.85	21.95	22.55	0.60	0.9087	2.85	NM	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	24.85	22.00	23.05	1.05	0.9087	2.75	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	24.85	20.86	21.55	0.69	0.9087	3.93	8.6	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	24.85	21.42	22.01	0.59	0.9087	3.38	15.0	NM	NM	NM	NM	NM	NM	NM	
MW-20 (9.5-29.5)	7/29/2009	28.63	ND	21.03	ND	NA	7.60	0.1	6.93	19.35	1.43	-94	0.00	189	NM	
	10/26/2009	28.63	ND	21.61	ND	NA	7.02	NM	6.24	16.43	1.14	0.44	0.00	83.20	0.06	
	4/21/2010	28.63	ND	18.07	ND	NA	10.56	0.3	6.75	14.70	3.33	-13.0	0.00	34.30	0.20	
	7/19/2010	28.63	ND	16.53	ND	NA	12.10	0.0	5.98	16.23	1.76	-25.0	4.72***	21.70	0.05	
MW-21 (10.5-25.5)	7/29/2009	16.63	ND	14.37	ND	NA	2.26	0.0	6.96	18.45	1.22	190	4.93	17.8	NM	
	10/26/2009	16.63	ND	14.10	ND	NA	2.53	NM	6.61	5.76	1.07	144	1.07	12.70	0.05	
	4/21/2010	16.63	ND	13.79	ND	NA	2.84	1.4	6.63	13.81	1.16	68	5.20	1.60	0.10	
	7/19/2010	16.63	ND	14.19	ND	NA	2.44	0.0	6.16	15.76	1.24	301	2.5***	30.30	0.04	
MW-22 (14.5-34.5)	7/29/2009	29.36	25.79	27.20	1.41	0.9092	3.44	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	29.36	26.15	28.40	2.25	0.9092	3.01	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	29.36	NM	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	Inaccessible
	7/19/2010	29.36	25.47	26.97	1.50	0.9092	3.75	1.1	NM	NM	NM	NM	NM	NM	NM	
MW-23 (10.5-24.5)	7/29/2009	19.05	17.09	23.85	6.76	0.9094	1.35	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	19.05	17.76	23.82	6.06	0.9094	0.74	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	19.05	17.57	22.36	4.79	0.9094	1.05	15.9	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	19.05	17.40	23.81	6.41	0.9094	1.07	0.4	NM	NM	NM	NM	NM	NM	NM	

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April 2009 through July 2010

		Gauging Data						Field Parameters									
Well ID (screen Interval)	Date	Top of Casing Elevation (feet)	Depth to LNAPL (feet)	Depth to Water (feet)	LNAPL Thickness (feet)	Specific Gravity (g/cm3)	Corrected GW Elevation (feet)	PID Reading (ppmv)	pH (s.u.)	Temp-erature (ºC)	Conductivity (mS/cm)	Oxidation-Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (ntu)	Salinity (ppt)	Comments
MW-24 (5.5-25.5)	7/29/2009	17.56	15.20	24.10	8.90	0.9034	1.50	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	17.56	15.79	24.25	8.46	0.9034	0.95	NM	NM	NM	NM	NM	NM	NM	NM	
	4/21/2010	17.56	15.10	22.60	7.50	0.9034	1.74	3.1	NM	NM	NM	NM	NM	NM	NM	
	7/19/2010	17.56	15.12	24.03	8.91	0.9034	1.58	0.4	NM	NM	NM	NM	NM	NM	NM	

Notes:

~ - no standard or guidance value exists

<1.0 - Not detected at or above the laboratory reporting limit shown

ºC - degrees Celsius

F - degrees Fahrenheit

Corrected GW Elevation - calculated using the following formula:
(top of casing elevation - depth to water) + (LNAPL thickness * LNAPL specific gravity)

Depth to Water - measured in feet below land surface from top of casing

GW - Groundwater

LNAPL - Light non-aqueous phase liquid

mg/L - milligrams per liter (parts per million)

mS/cm - milliSiemens per centimeter

mV - millivolts

N/A - Not applicable

NA - Not analyzed

ND - Not detected

NM - Not monitored

NS - Not sampled

NSVD - Not surveyed to vertical datum

ntu - nephelometric turbidity units

ppmv - parts per million by volume

ppt - parts per thousand

s.u. - standard units

* - equipment malfunction

** - estimated value based on surrounding wells

*** - Dissolved Oxygen (DO) readings recorded on July 22, 2010 with an in-situ DO meter

Field Parameters - Measured from monitoring wells without LNAPL detections during groundwater sampling
Date on table may not reflect actual measurement date

TABLE 2
SUMMARY OF CALCULATED HYDRAULIC CONDUCTIVITY RESULTS

Former Pratt Oil Works
Long Island City, New York

Well Identification	Test	Test Type	Calculated Hydraulic Conductivity (feet/day)
MW-1	1	Rising Head	57
	2	Rising Head	51
	3	Rising Head	47
	Average		**51**
MW-4D	1	Rising Head	0.68
	2	Falling Head	0.43
	3	Rising Head	0.70
	Average		**0.60**
MW-8	1	Rising Head	Not Analyzed
	2	Rising Head	
	3	Rising Head	
MW-10	1	Rising Head	76
	2	Rising Head	89
	3	Rising Head	85
	Average		**83**
MW-13	1	Rising Head	184
	2	Rising Head	271
	3	Rising Head	196
	Average		**217**
MW-15	1	Falling Head	0.11
	2	Rising Head	0.10
	3	Falling Head	Not Analyzed
	Average		**0.11**
MW-16	1	Rising Head	33
	2	Rising Head	27
	3	Rising Head	31
	Average		**30**
MW-20	1	Rising Head	0.04
	2	Rising Head	0.02
	Average		**0.03**
MW-21	1	Rising Head	174
	2	Rising Head	192
	3	Rising Head	144
	Average		**170**

TABLE 2
SUMMARY OF CALCULATED HYDRAULIC CONDUCTIVITY RESULTS

Former Pratt Oil Works
Long Island City, New York

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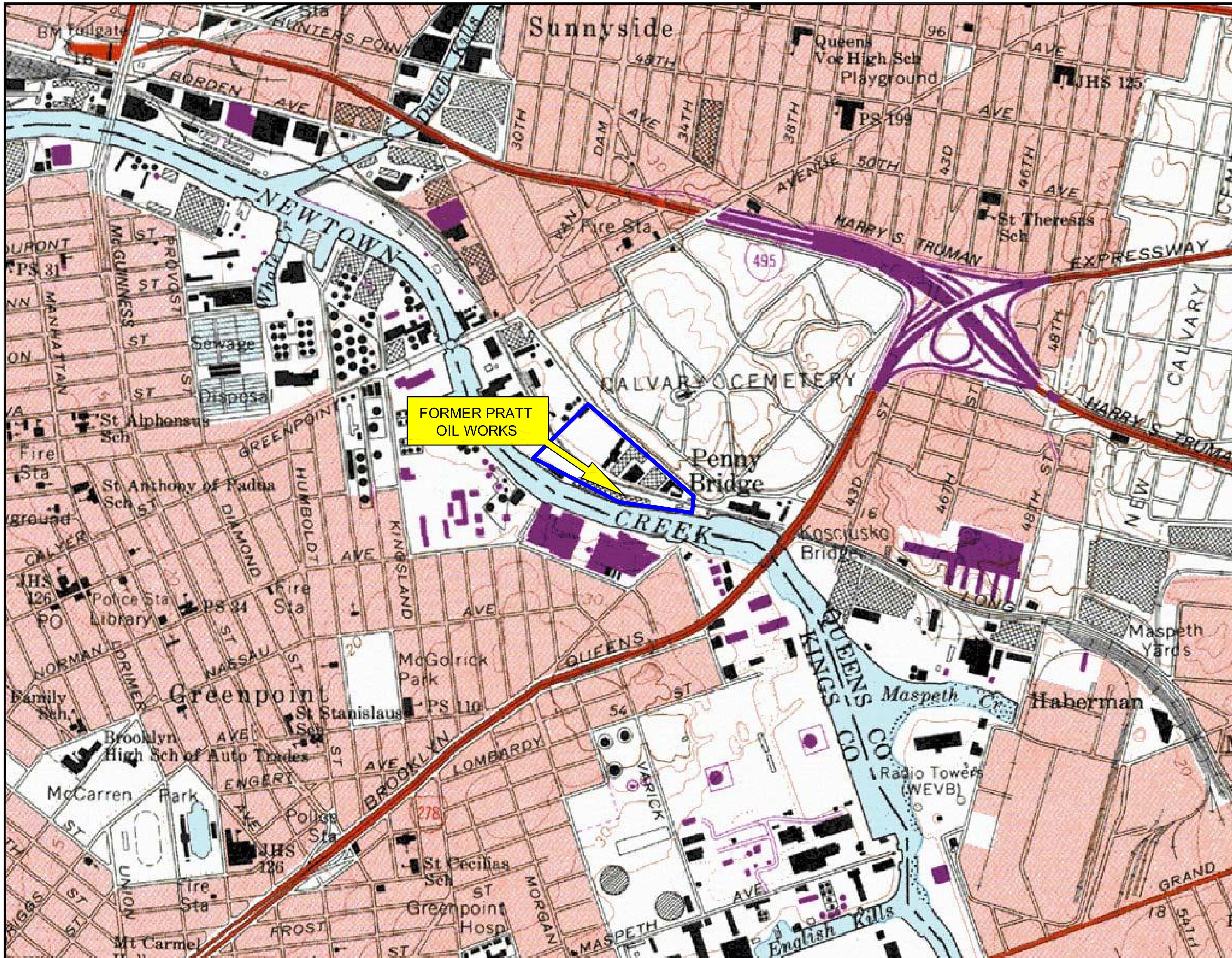
MW-8	1	Rising Head	Not Analyzed
	2	Rising Head	
	3	Rising Head	
MW-10	1	Rising Head	76
	2	Rising Head	89
	3	Rising Head	85
	Average		**83**
MW-13	1	Rising Head	184
	2	Rising Head	271
	3	Rising Head	196
	Average		**217**
MW-15	1	Falling Head	0.11
	2	Rising Head	0.10
	3	Falling Head	Not Analyzed
	Average		**0.11**
MW-16	1	Rising Head	33
	2	Rising Head	27
	3	Rising Head	31
	Average		**30**
MW-20	1	Rising Head	0.04
	2	Rising Head	0.02
	Average		**0.03**
MW-21	1	Rising Head	174
	2	Rising Head	192
	3	Rising Head	144
	Average		**170**

FIGURES



0 500 1,000 2,000

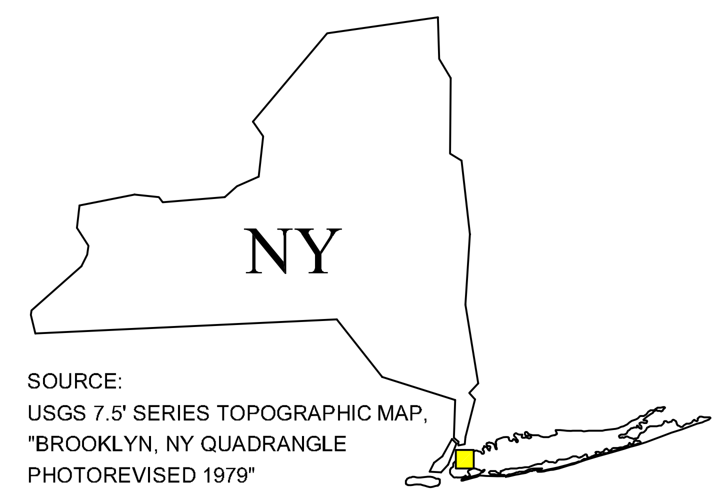
SCALE (feet)

APPROXIMATE LOCATION OF FORMER PRATT OIL WORKS

N

LATITUDE: 40° 43' 47.32" N

LONGITUDE: 73° 56' 08.26" W



SOURCE:
USGS 7.5' SERIES TOPOGRAPHIC MAP,
"BROOKLYN, NY QUADRANGLE
PHOTOREVISED 1979"

QUADRANGLE LOCATION

BOHEMIA, NY

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Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	108988
DRAWN:	11/29/2010
DRAWN BY:	JR
CHECKED BY:	
FILE NAME:	

LOCUS PLAN

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
1

1 inch = 80 feet

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PROJECT NO.	108988
DRAWN:	11/29/2010
DRAWN BY:	J.R.
CHECKED BY:	
FILE NAME:	

AERIAL PLAN

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
2

SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 30 60 Feet

NOTES:
1. MONITORING WELLS MW-1, MW-2, MW-4S, MW-4D, MW-6, MW-7, MW-8, MW-10, MW-13, MW-14, MW-15, MW-18, AND MW-20 WERE USED TO MONITOR LIQUID LEVELS DURING THE TIDAL STUDY.

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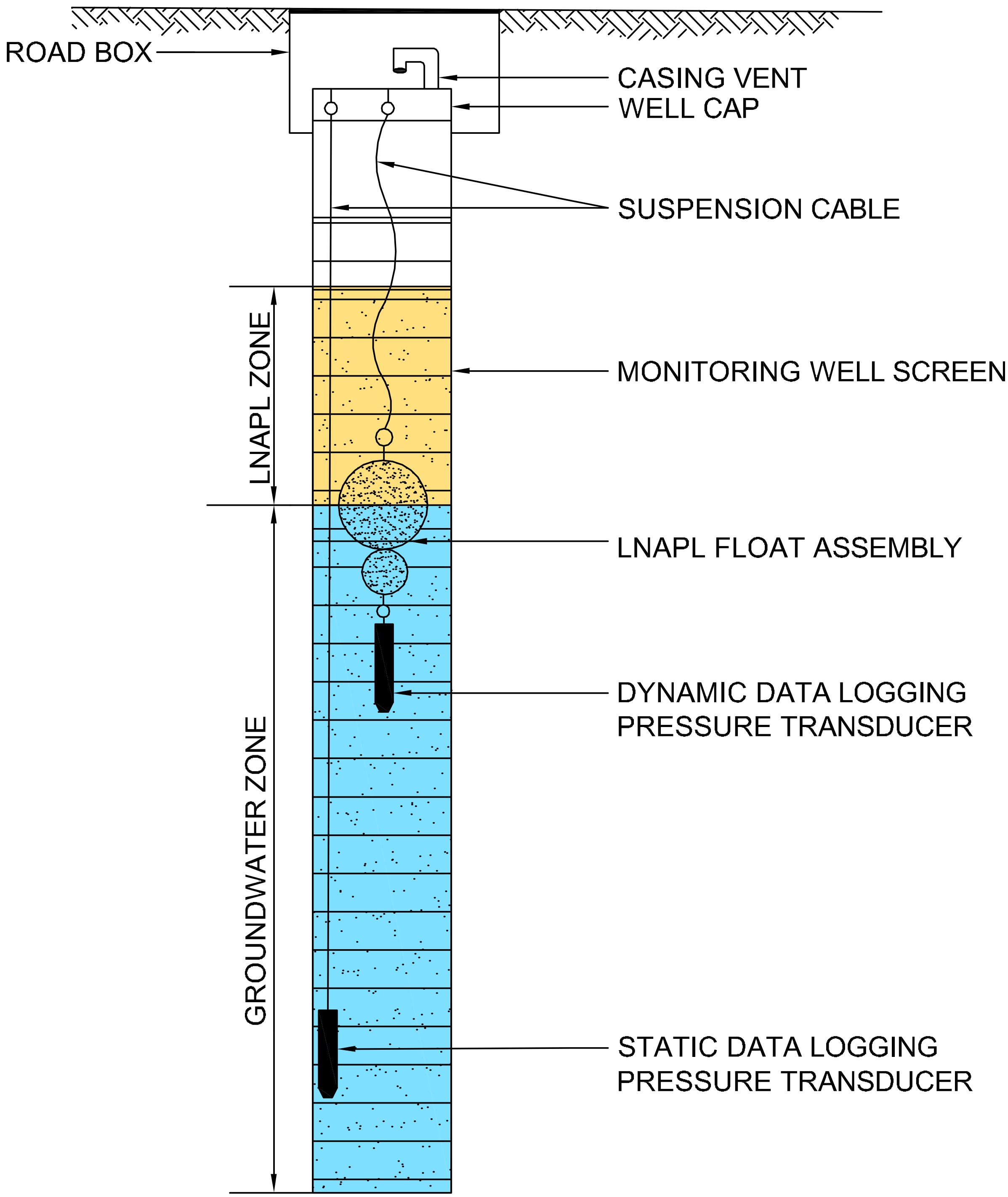
PROJECT NO.	108988
DRAWN:	J.R.
DRAWN BY:	11/29/10
CHECKED BY:	J.W.
FILE NAME:	

TIDAL STUDY
MONITORING WELL NETWORK

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE 3



LNAPL - LIGHT NON-AQUEOUS PHASE LIQUID

NOT TO SCALE

ALBUQUERQUE, NM

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PROJECT NO.	108988
DRAWN:	11/29/2010
DRAWN BY:	PD
CHECKED BY:	JR
FILE NAME:	108988_DIA.dwg

TIDAL STUDY WELL MONITORING EQUIPMENT

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATER FRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
4

SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 30 60 Feet

NOTES:
1. MONITORING WELLS MW-1, MW-2, MW-4S, MW-4D, MW-6, MW-7, MW-8, MW-10, MW-13, MW-14, MW-15, MW-18, AND MW-20 WERE USED TO MONITOR LIQUID LEVELS DURING THE TIDAL STUDY BETWEEN SEPTEMBER 14 AND OCTOBER 15, 2010.

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PROJECT NO.	108988
DRAWN:	J.R.
DRAWN BY:	11/29/10
CHECKED BY:	J.W.
FILE NAME:	

OBSERVED TIDAL FLUCTUATIONS IN POTENTIOMETRIC SURFACE

FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE 5

SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 30 60 Feet

NOTES:
1. SLUG TESTING WAS PERFORMED ON MONITORING WELLS MW-1, MW-4D, MW-8, MW-10, MW-13, MW-15, MW-18, MW-20, AND MW-21 BETWEEN SEPTEMBER 1 AND 9, 2010.

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PROJECT NO.	108988
DRAWN:	J.R.
DRAWN BY:	11/29/10
CHECKED BY:	J.W.
FILE NAME:	

SLUG TESTING
MONITORING WELL NETWORK

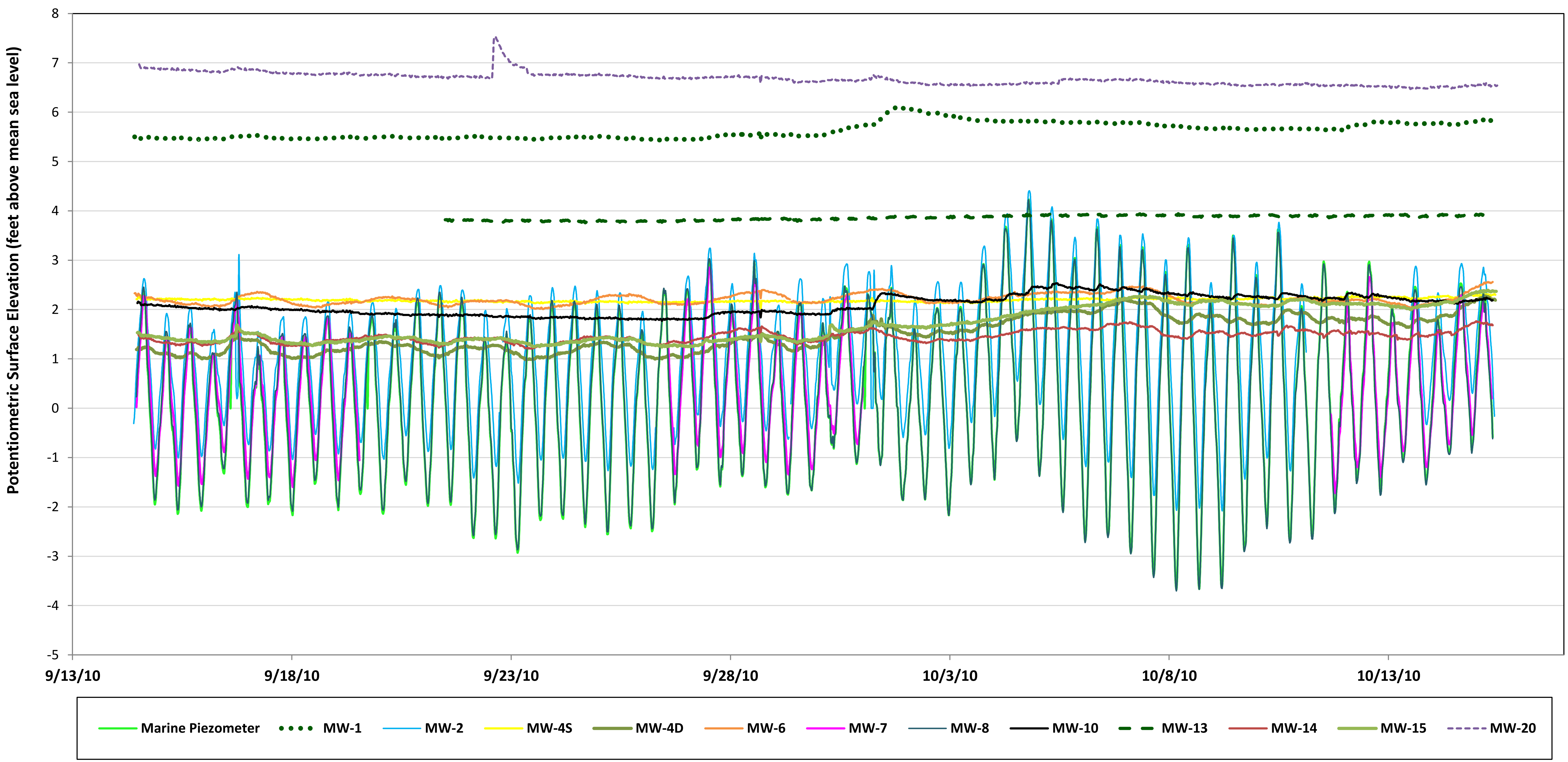
FORMER PRATT OIL WORKS
THE INLAND PROJECT AREA (TRACT I)
THE WATERFRONT PROJECT AREA (TRACT II)
LONG ISLAND CITY, NEW YORK

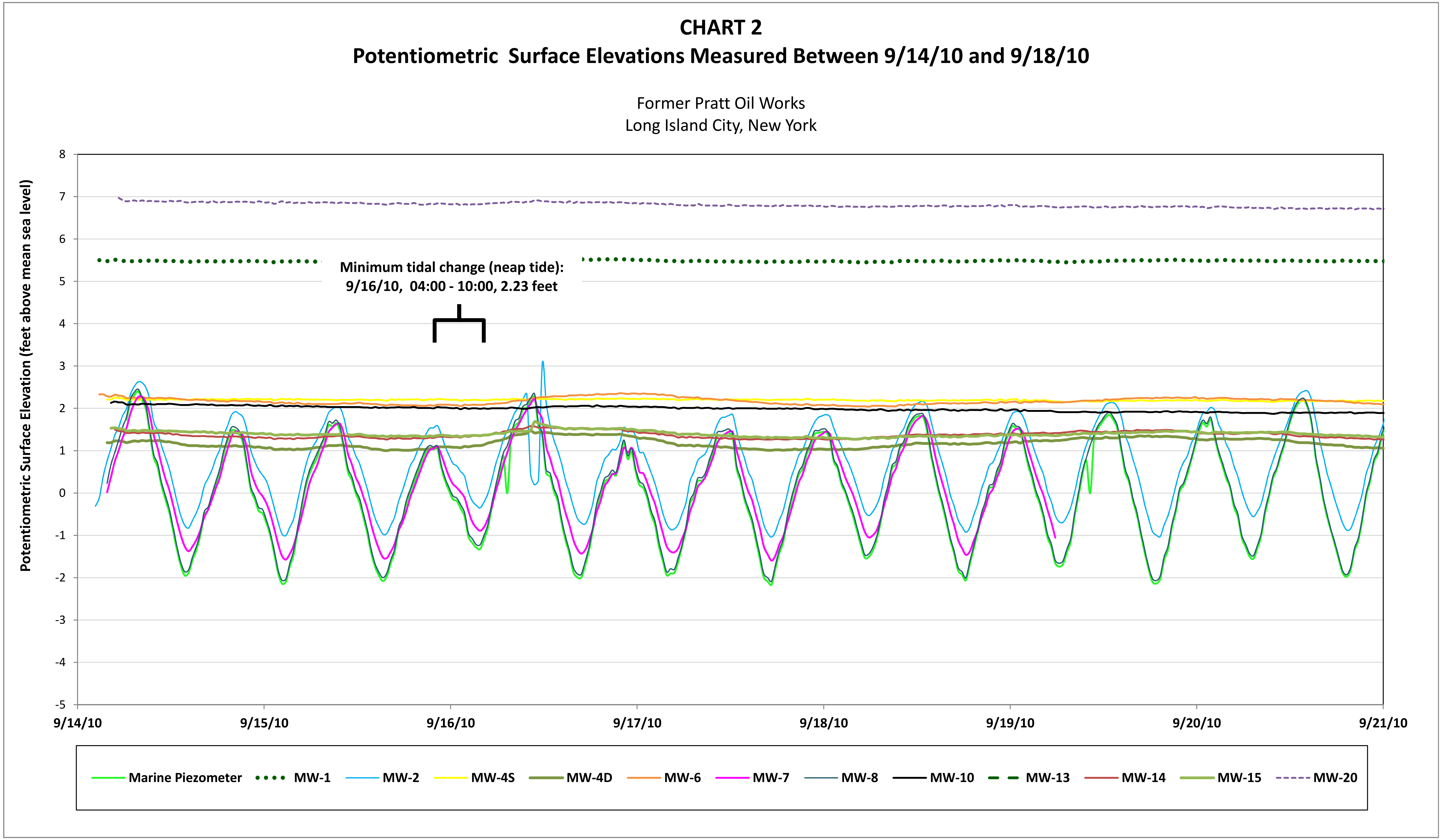
FIGURE
6

CHARTS

CHART 1
Potentiometric Surface Elevations Measured Between 9/14/10 Through 10/15/10

Former Pratt Oil Works
Long Island City, New York





Kleinfelder
One Corporate Drive, Suite 201, Bohemia, NY

CHART 3
Potentiometric Surface Elevations Measured Between 10/6/10 and 10/13/10

Former Pratt Oil Works
Long Island City, New York

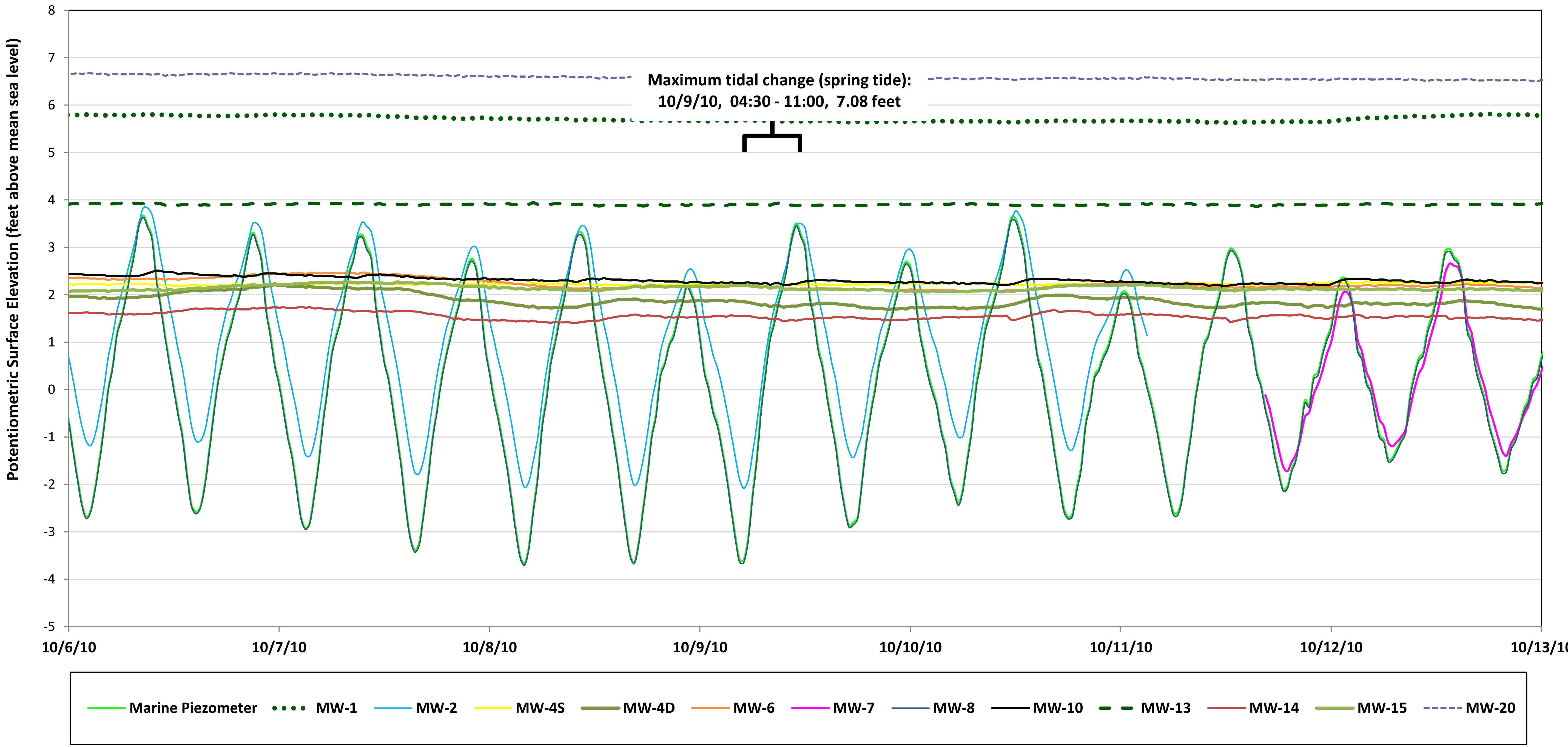


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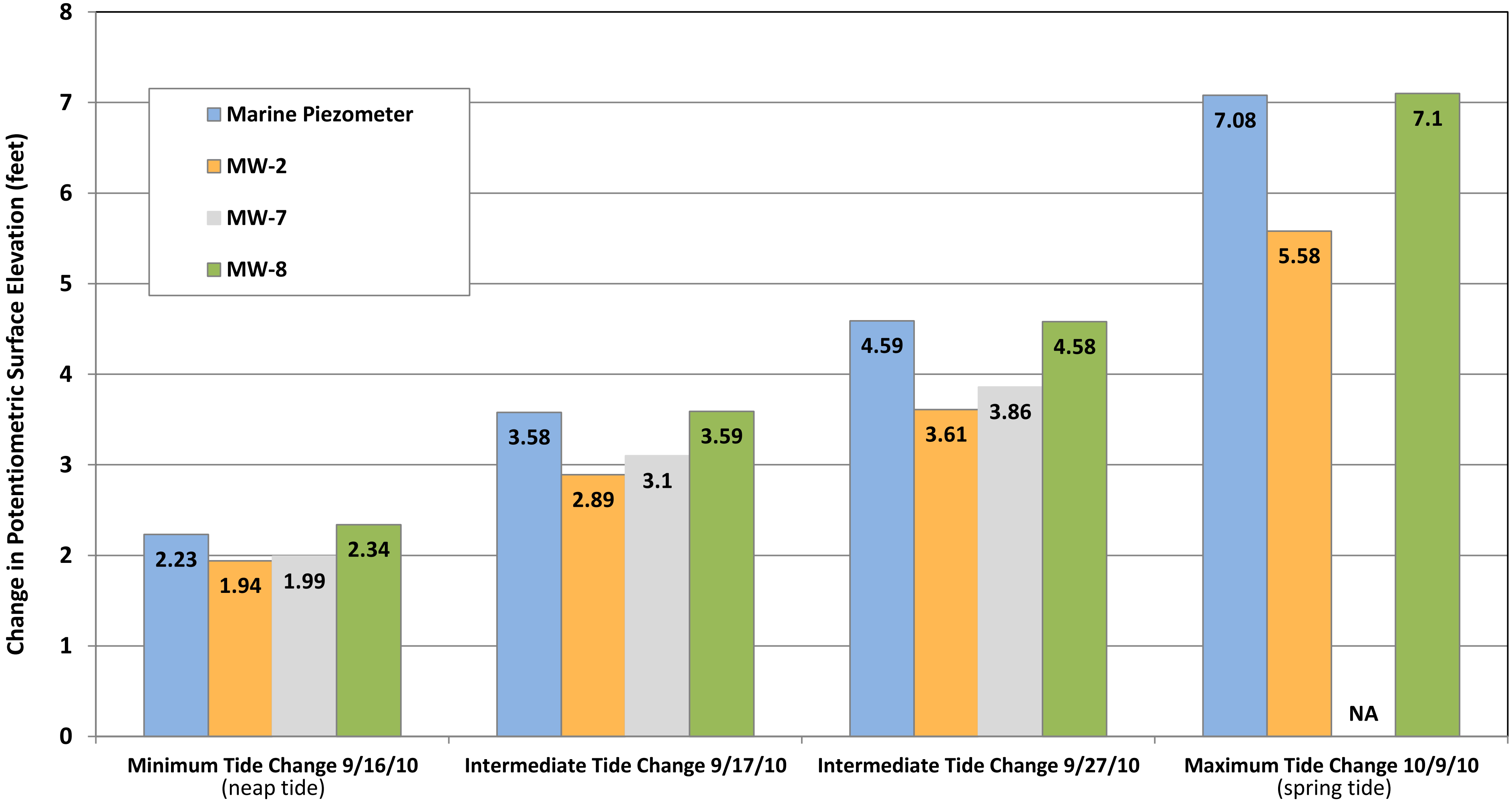
CHART 4
Relative Change in Potentiometric Surface Elevation During Tide Change

Former Pratt Oil Works
Long Island City, New York



Note:
NA - Not Available. Data recorded from MW-7 during maximum tidal change was anomalous.

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CHART 5
MW-2 Potentiometric Surface Elevation and LNAPL Thickness

Former Pratt Oil Works
Long Island City, New York

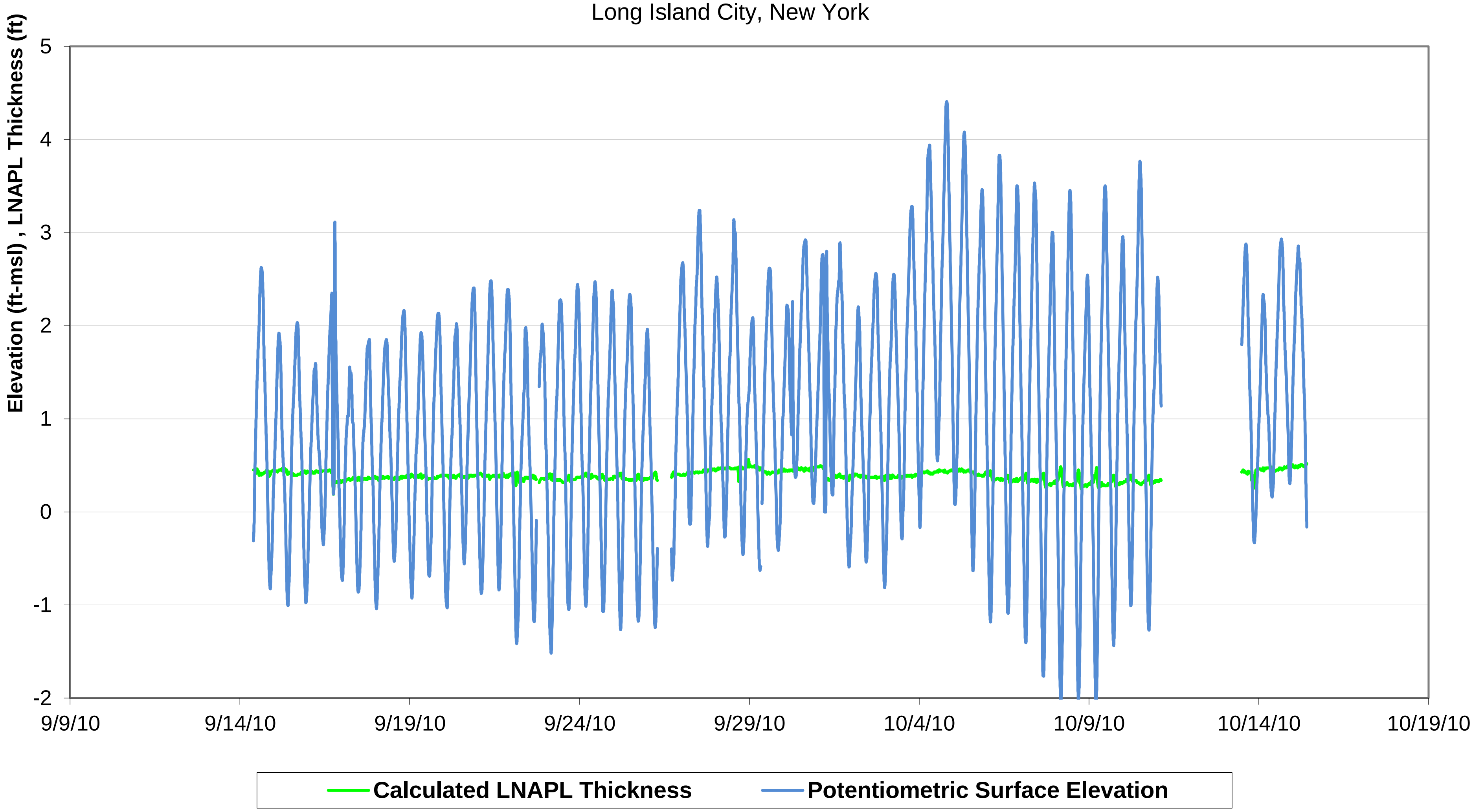

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CHART 6
MW-4S Potentiometric Surface Elevation and LNAPL Thickness

Former Pratt Oil Works
Long Island, New York

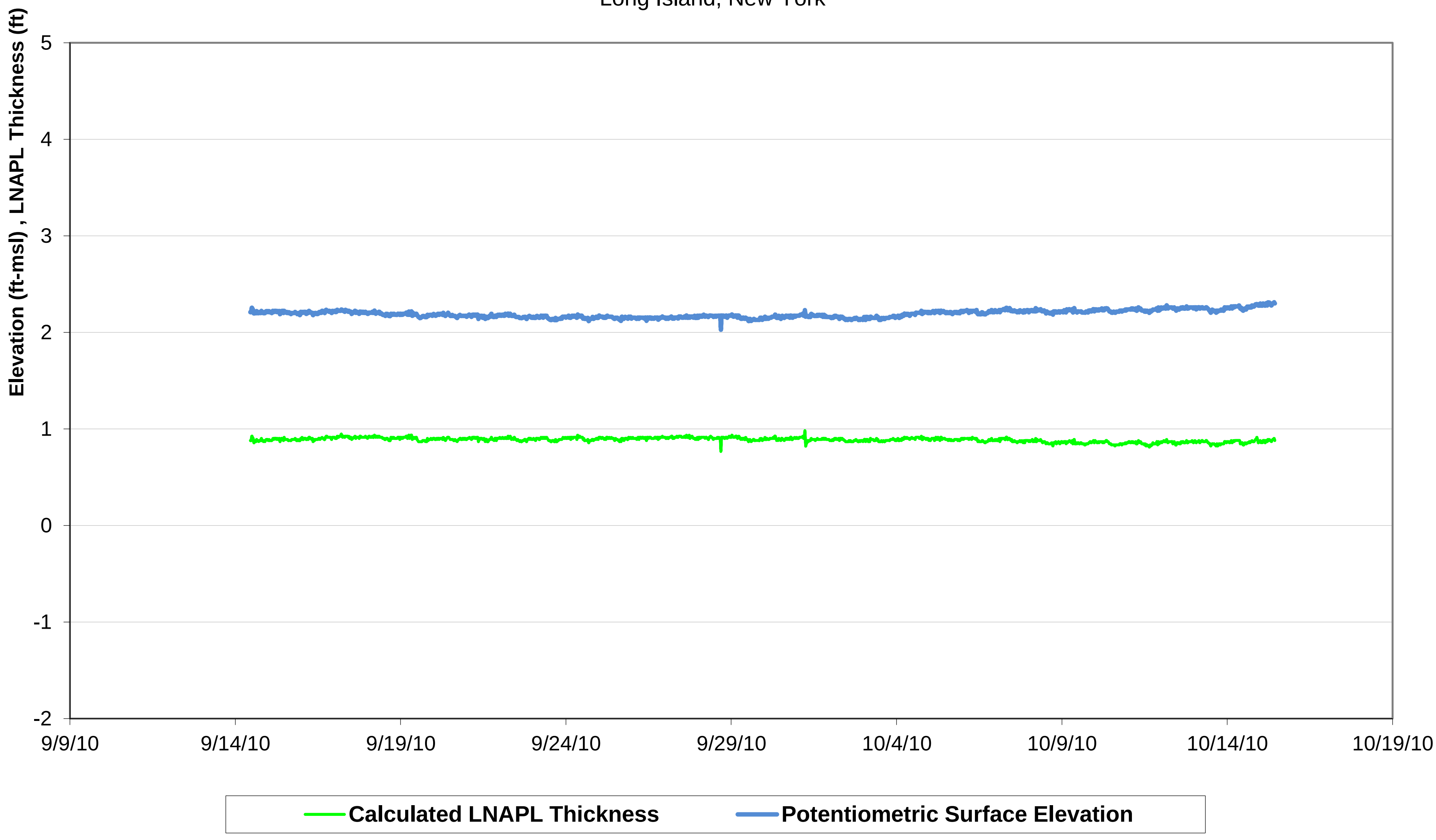

CHART 7
MW-6 Potentiometric Surface Elevation and LNAPL Thickness

Former Pratt Oil Works
Long Island City, New York

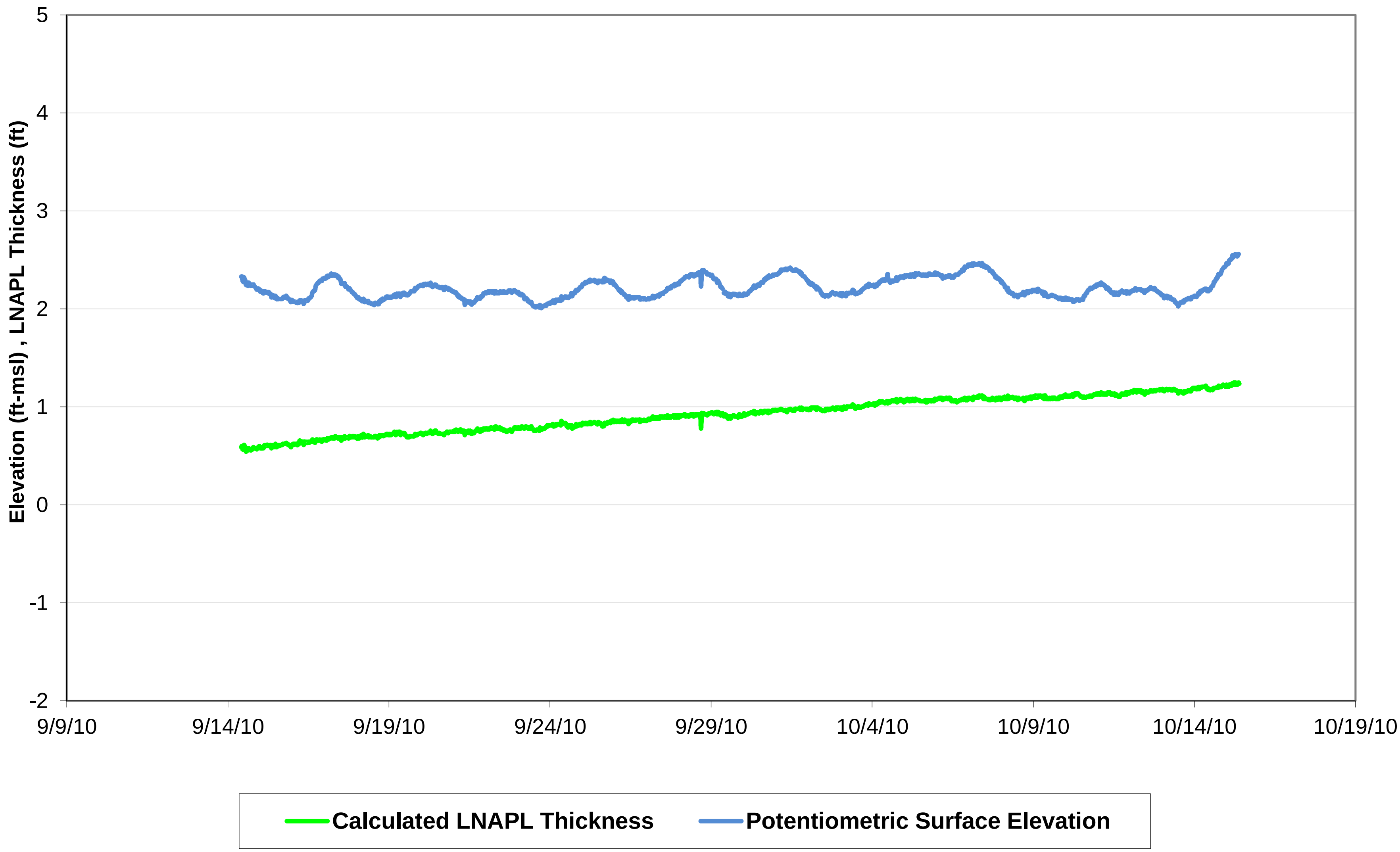

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CHART 8
MW-7 Potentiometric Surface Elevation and LNAPL Thickness

Former Pratt Oil Works
Long Island City, New York

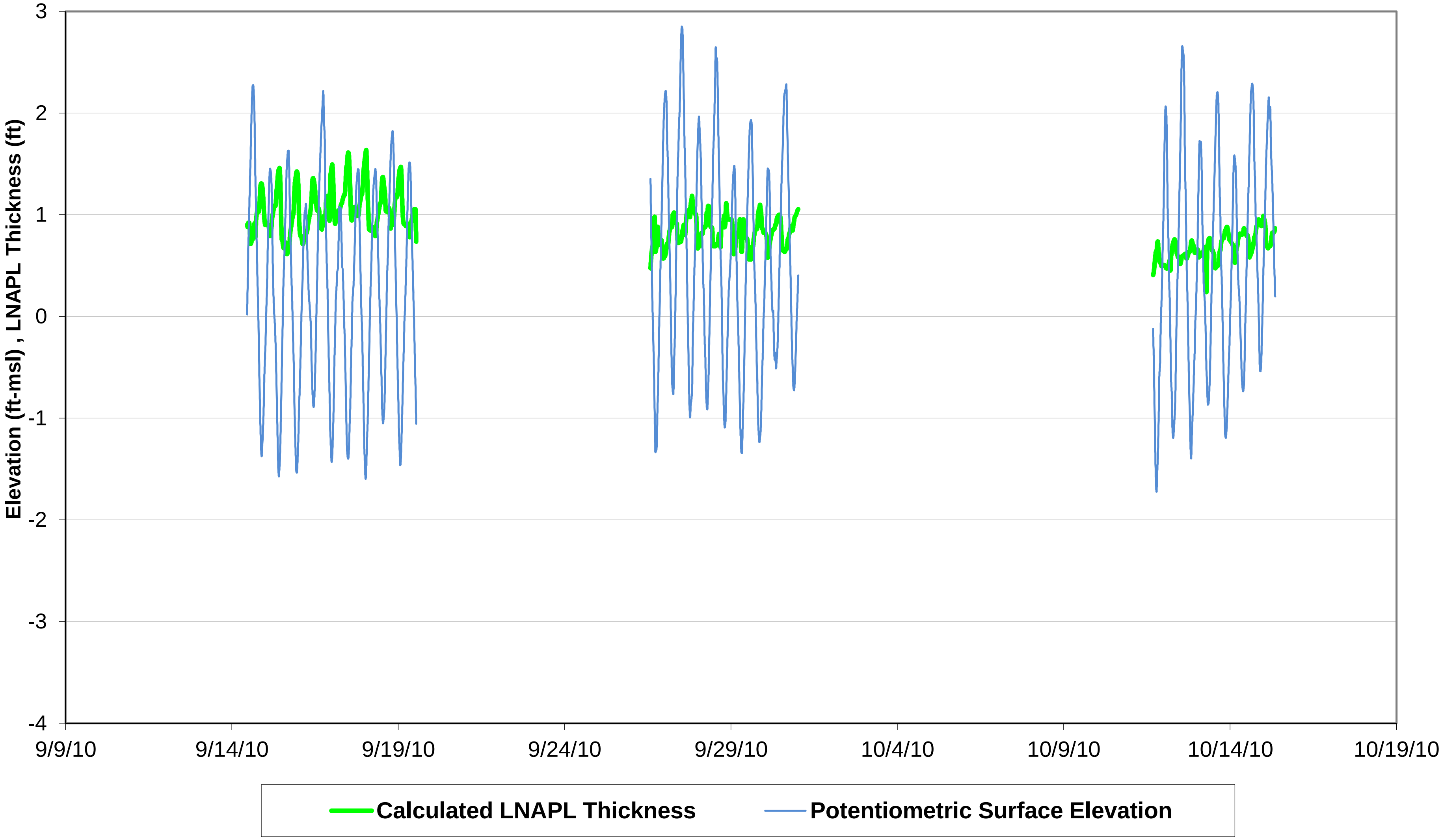

CHART 9
Tidal Stage and LNAPL Thickness

Former Pratt Oil Works
Long Island City, New York

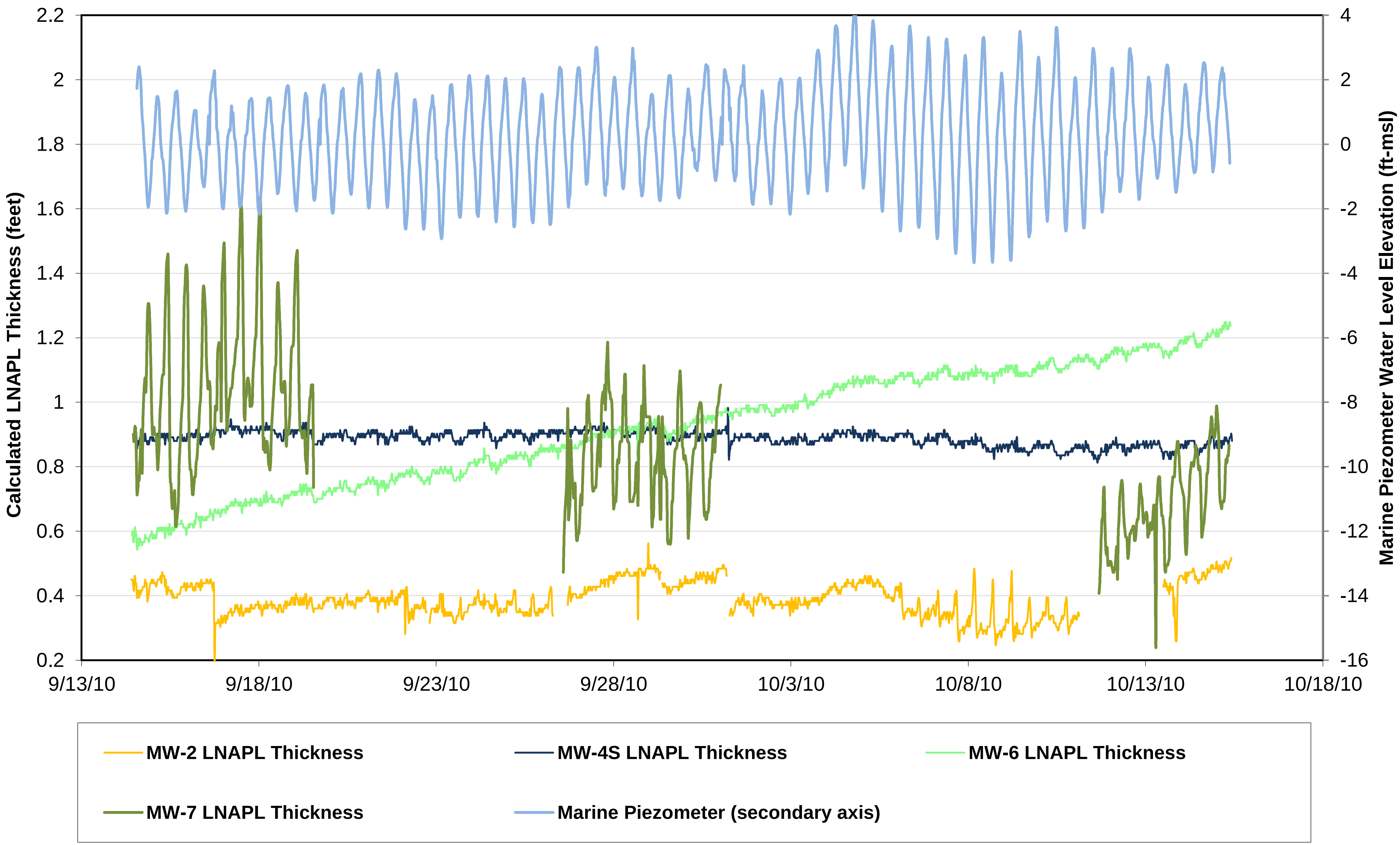

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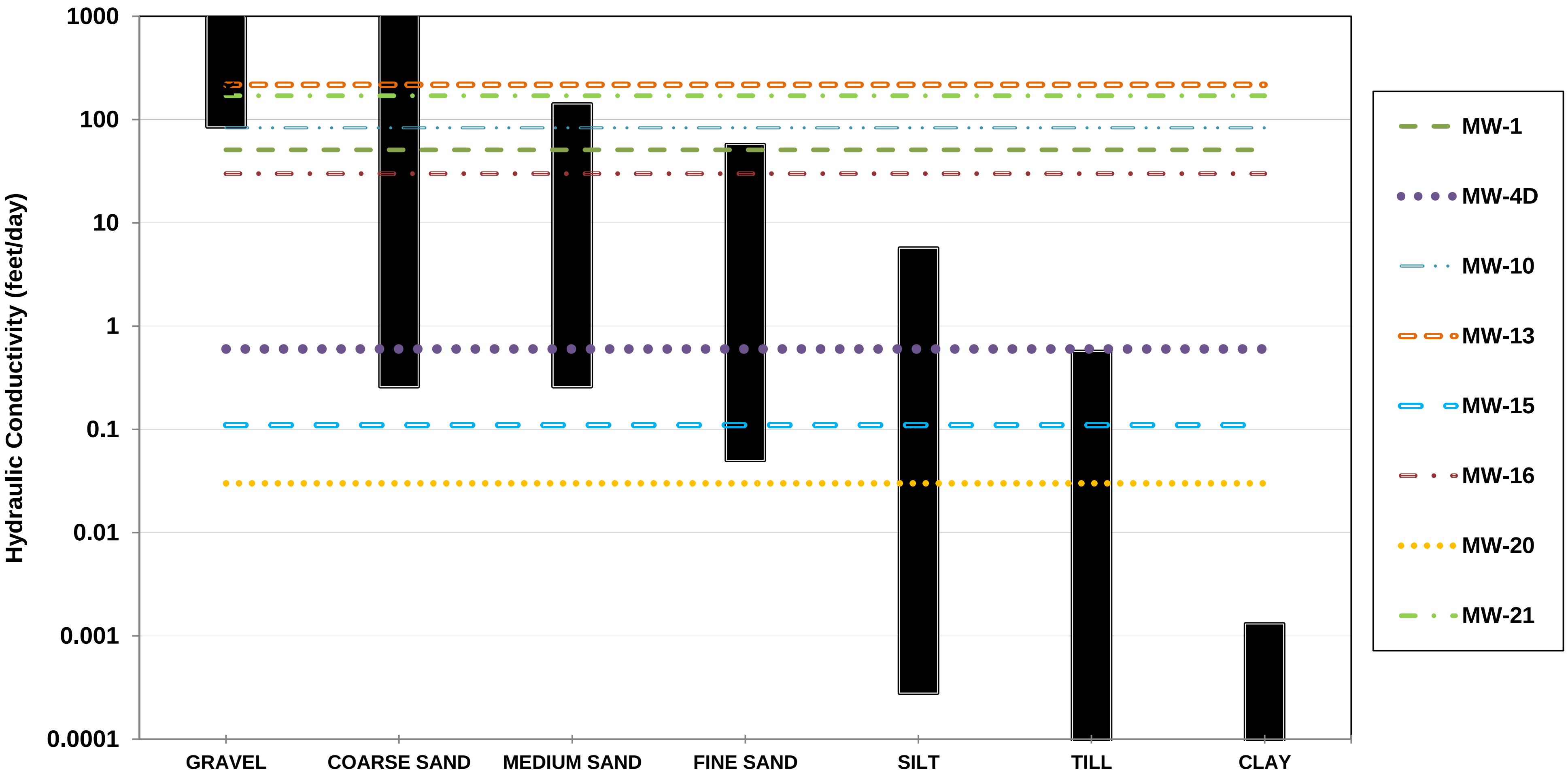
CHART 10
Comparison of Calculated Hydraulic Conductivity to Published Values

Former Pratt Oil Works
The Inland Parcels (Tract I)
The Waterfront Parcels (Tract II)
Long Island City, New York



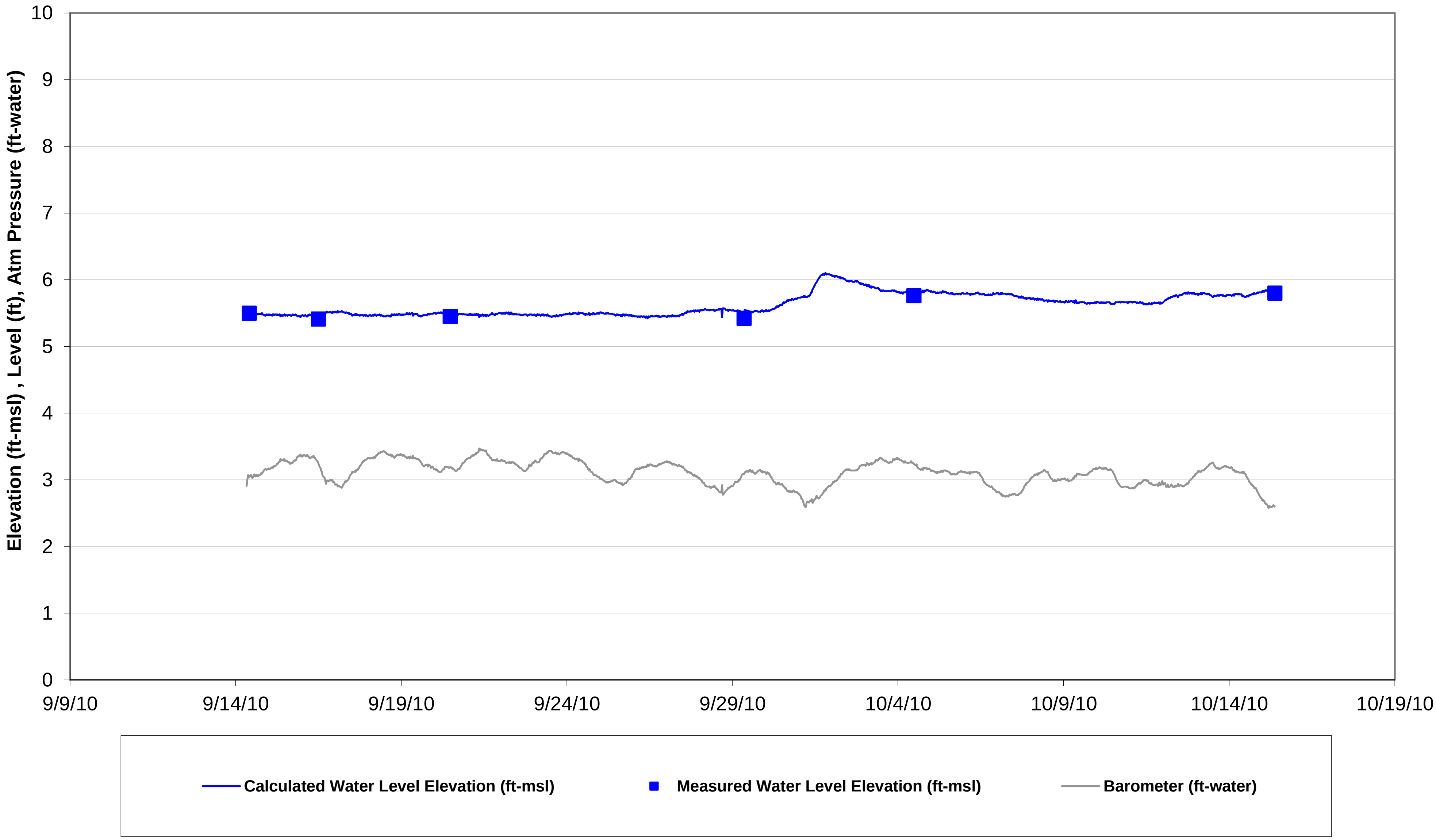
Note:
Columns represent range of hydraulic conductivity for the given soil type as reported in Domenico, P.A., and Schwartz, F.W., 1990.

APPENDIX A

Tidal Study Monitoring Data Plots

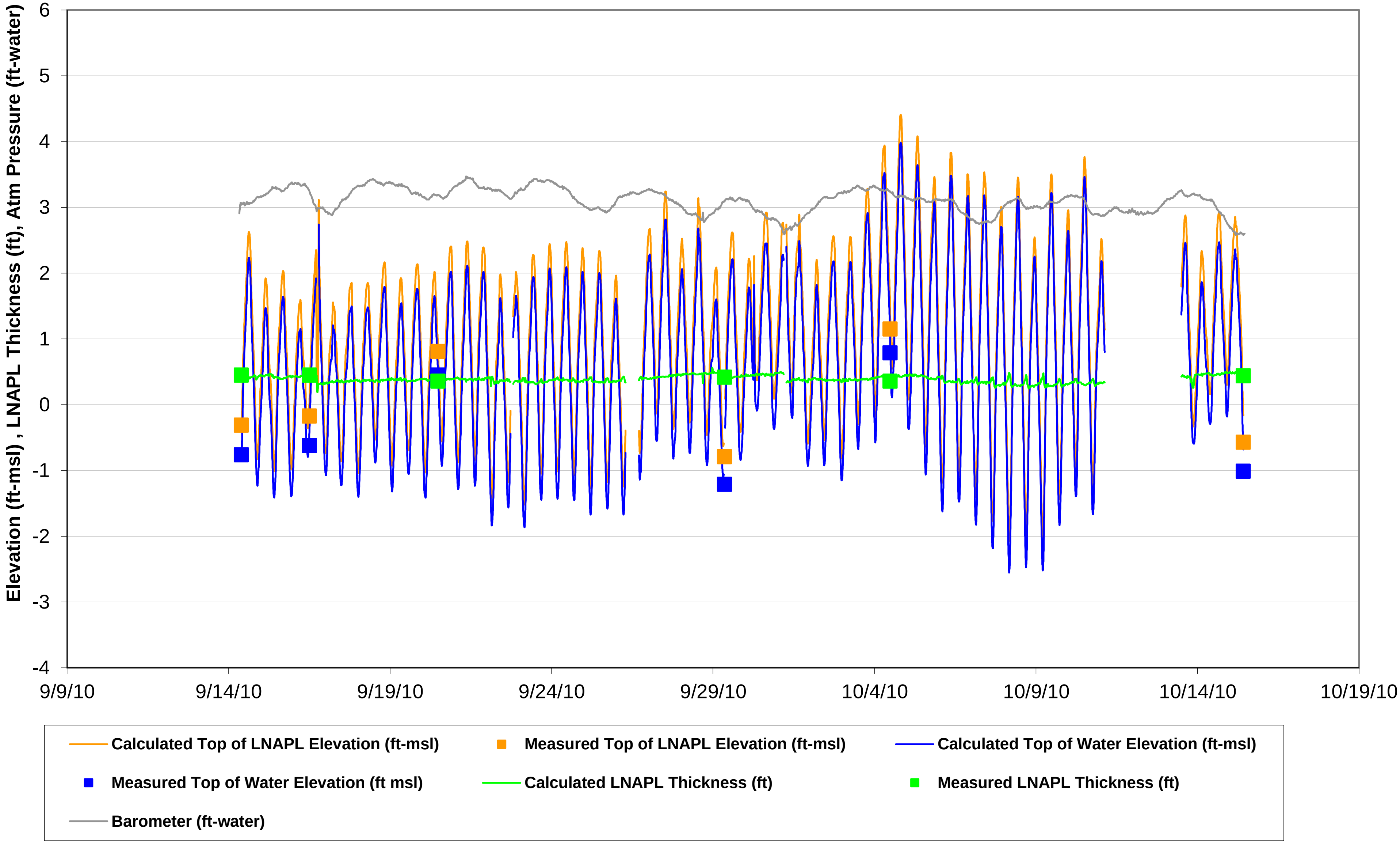
MW-1 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



MW-2 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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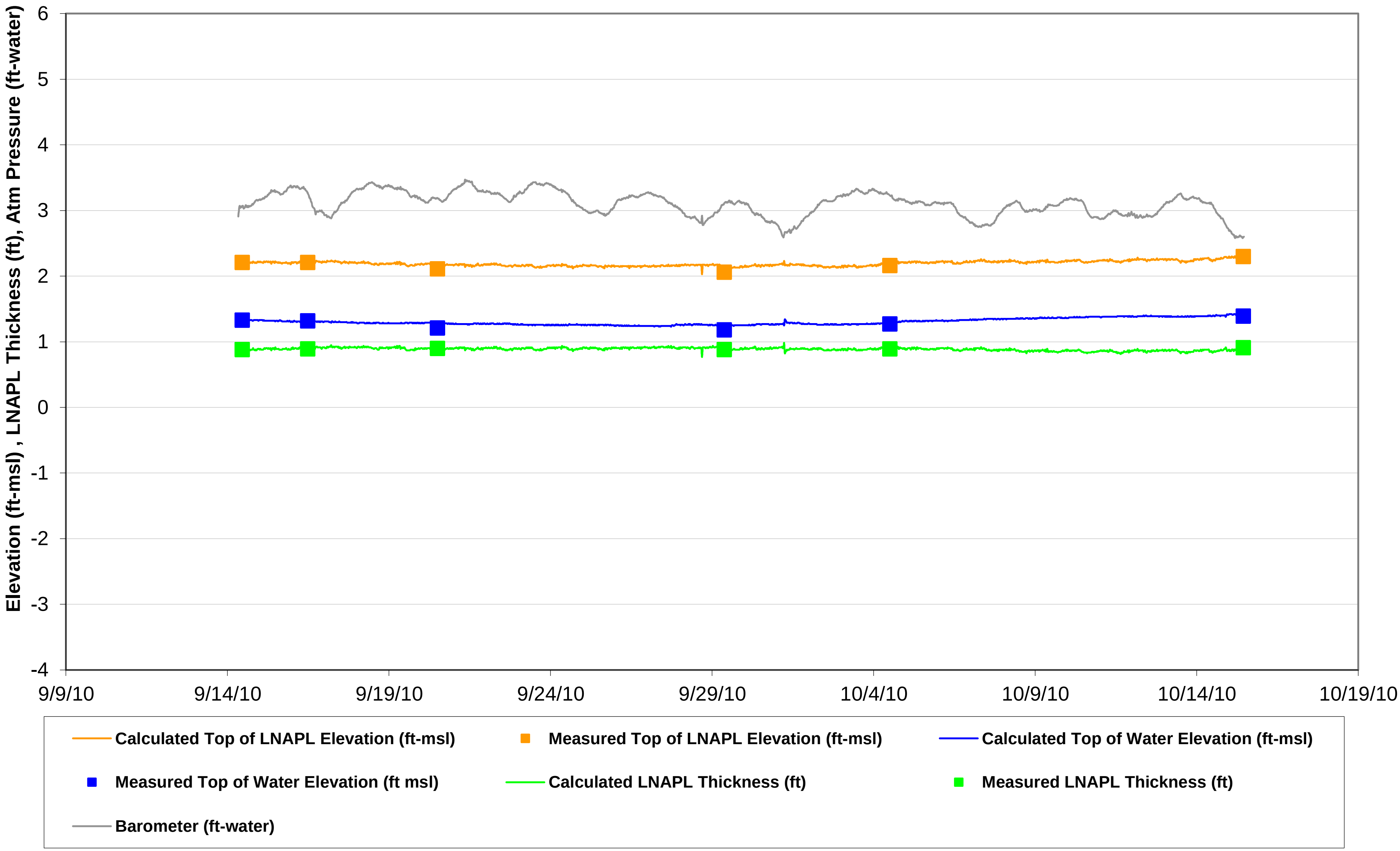
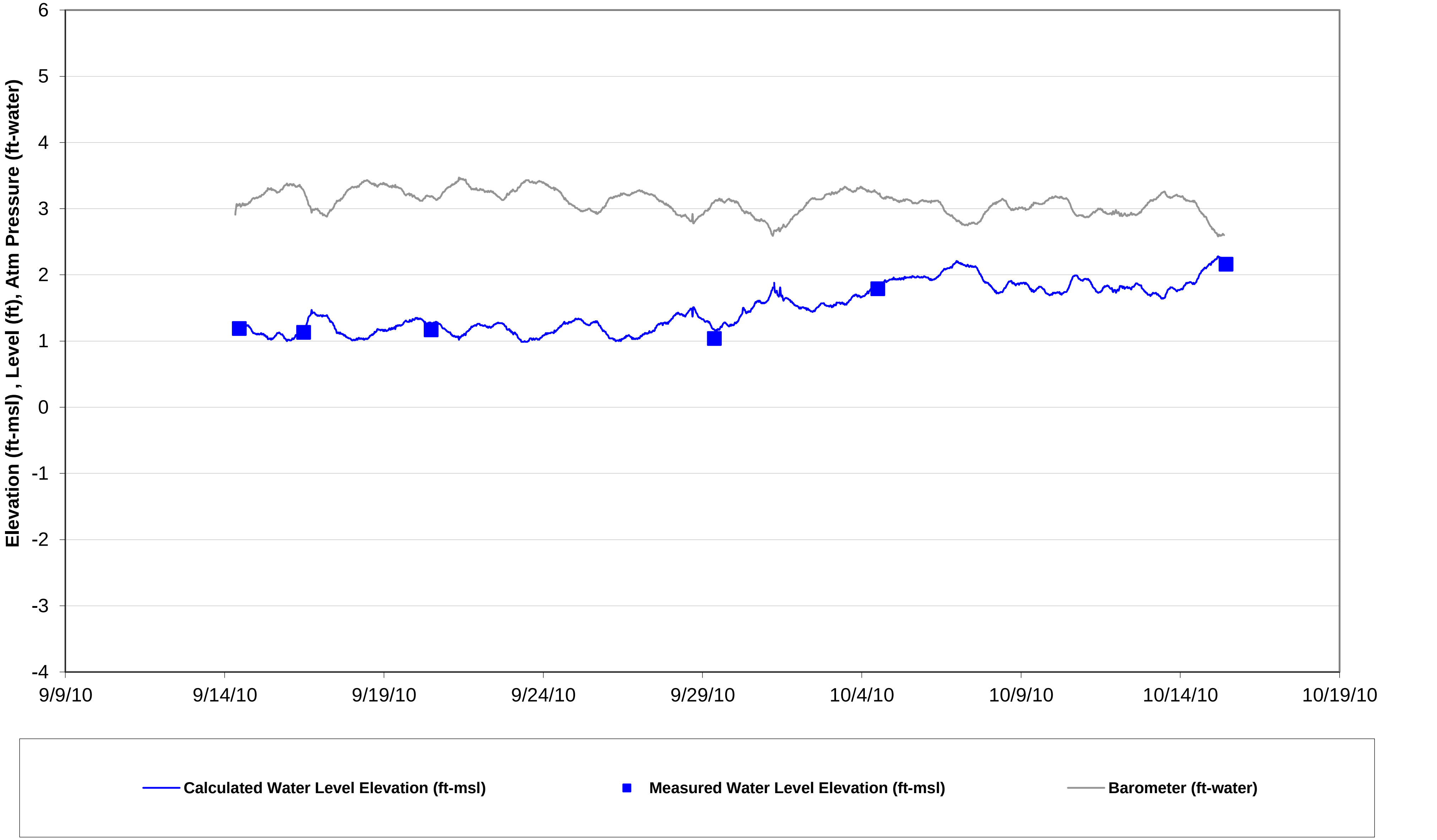
MW-4S MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



MW-4D MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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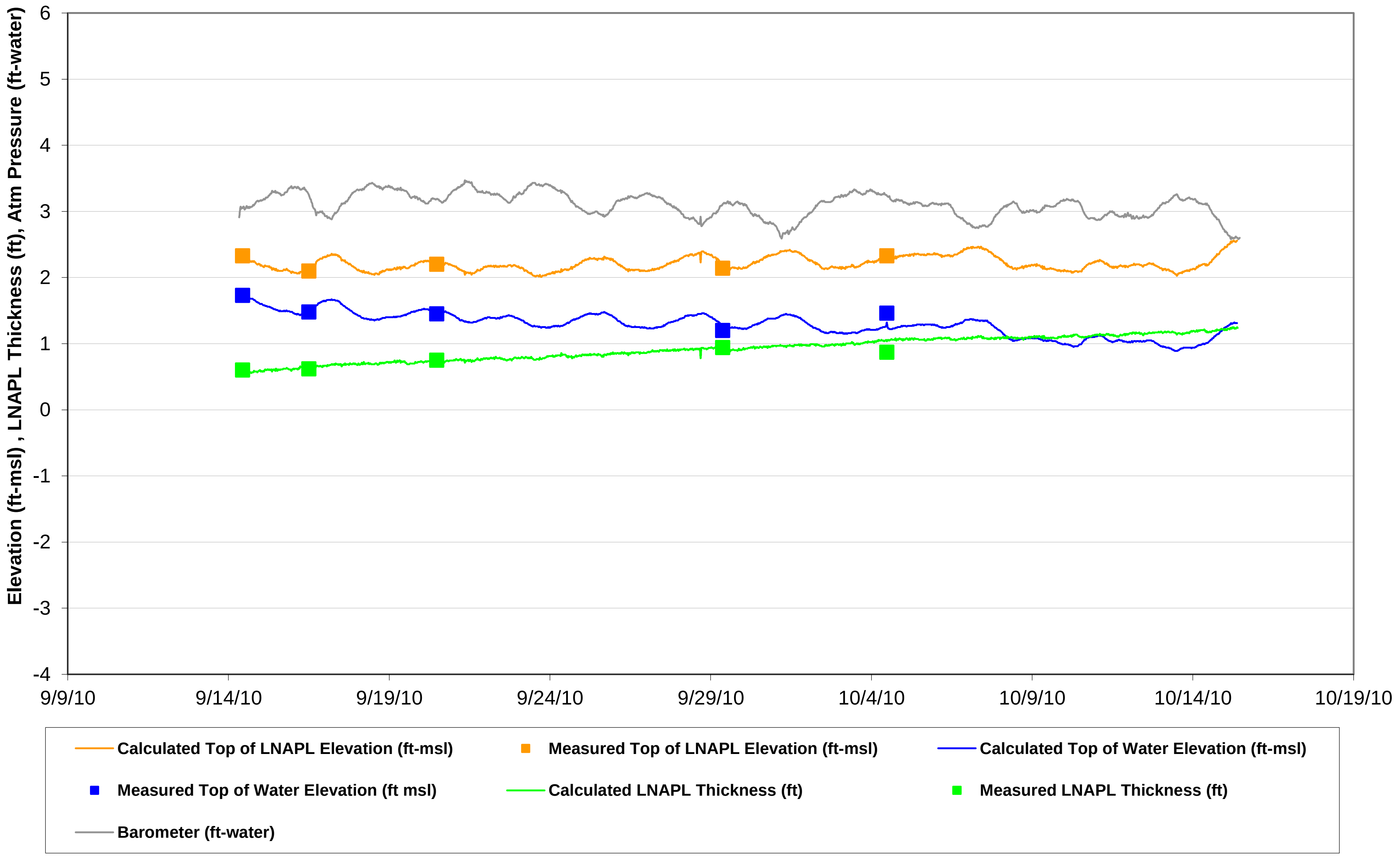
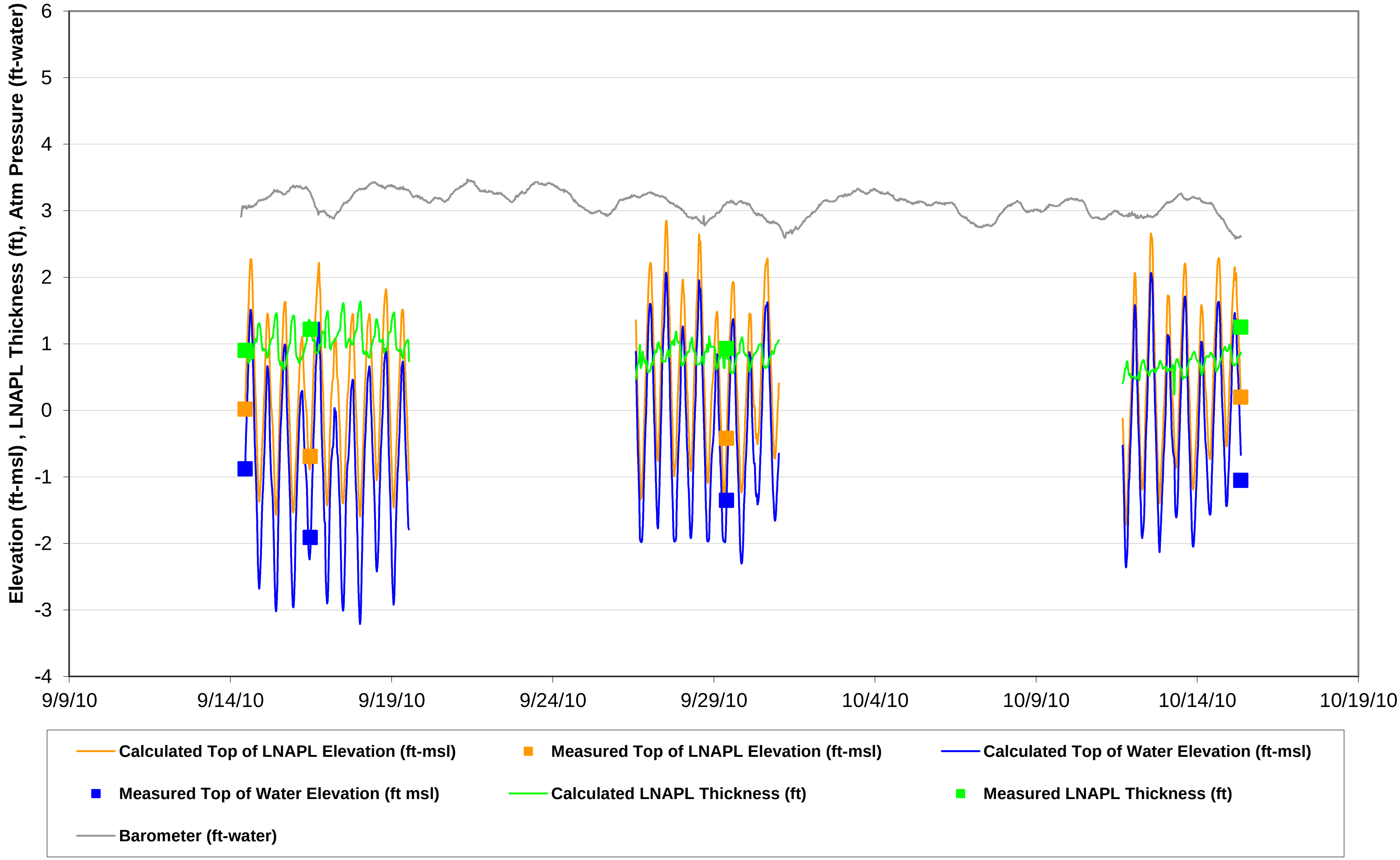
MW-6 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



MW-7 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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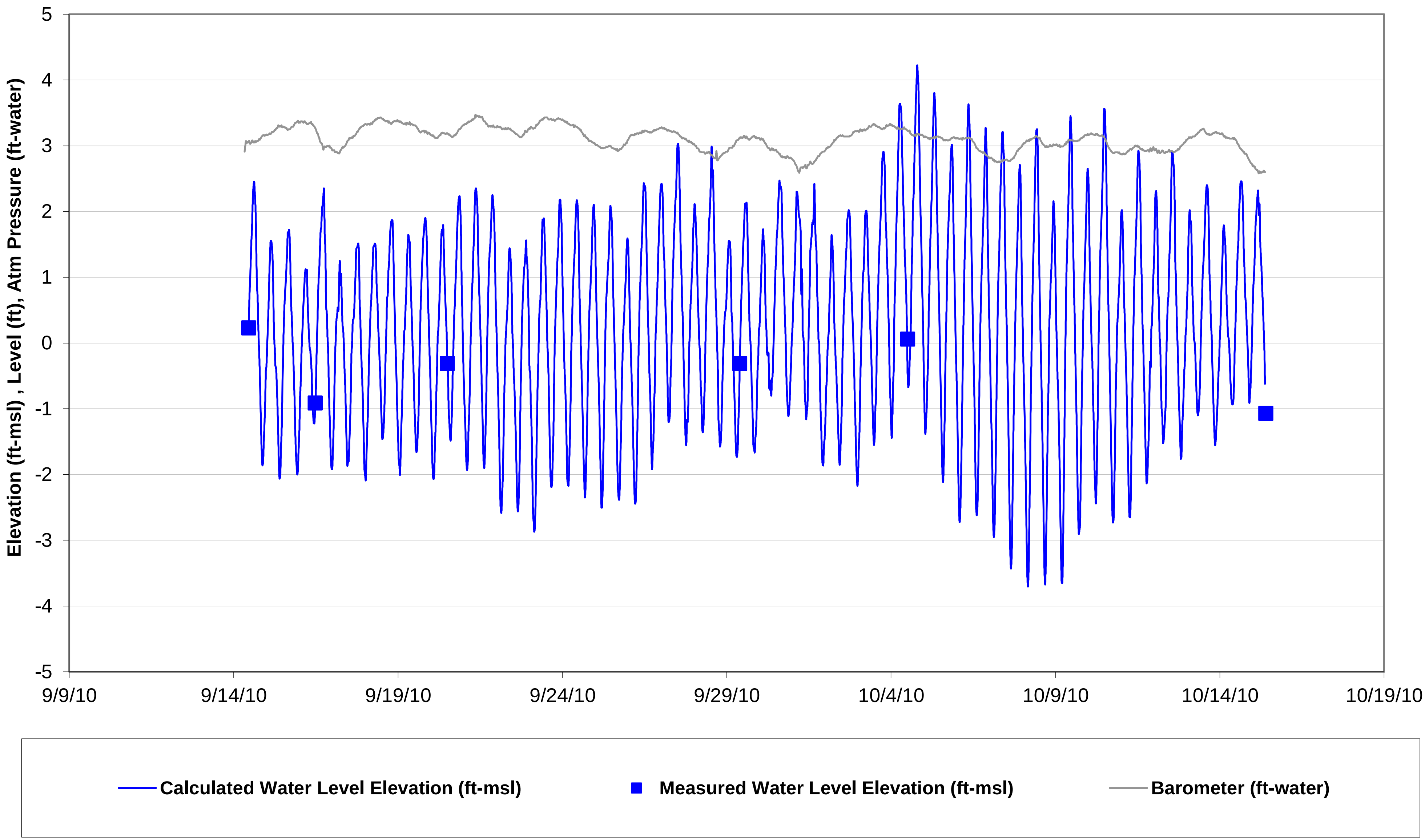
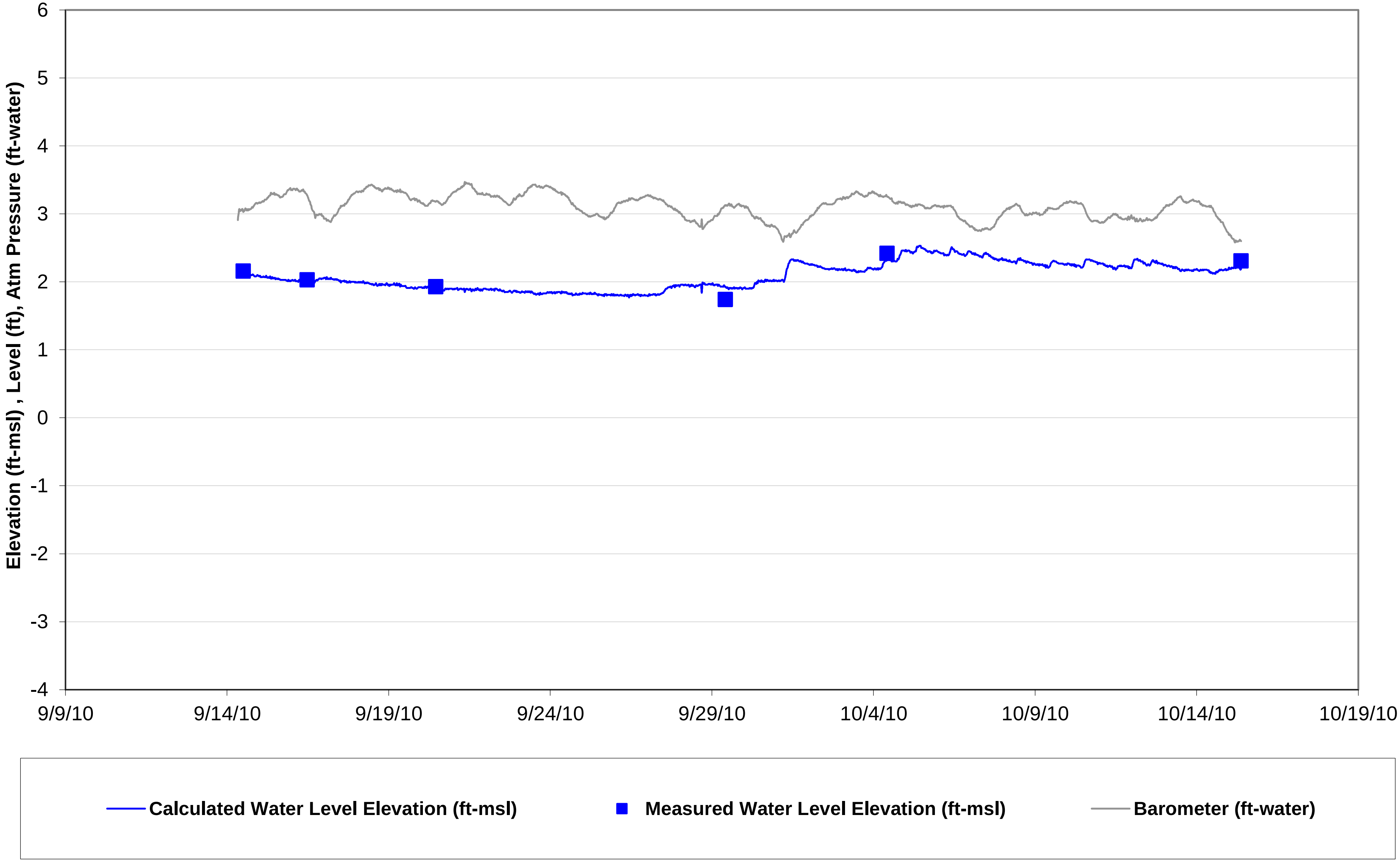
MW-8 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



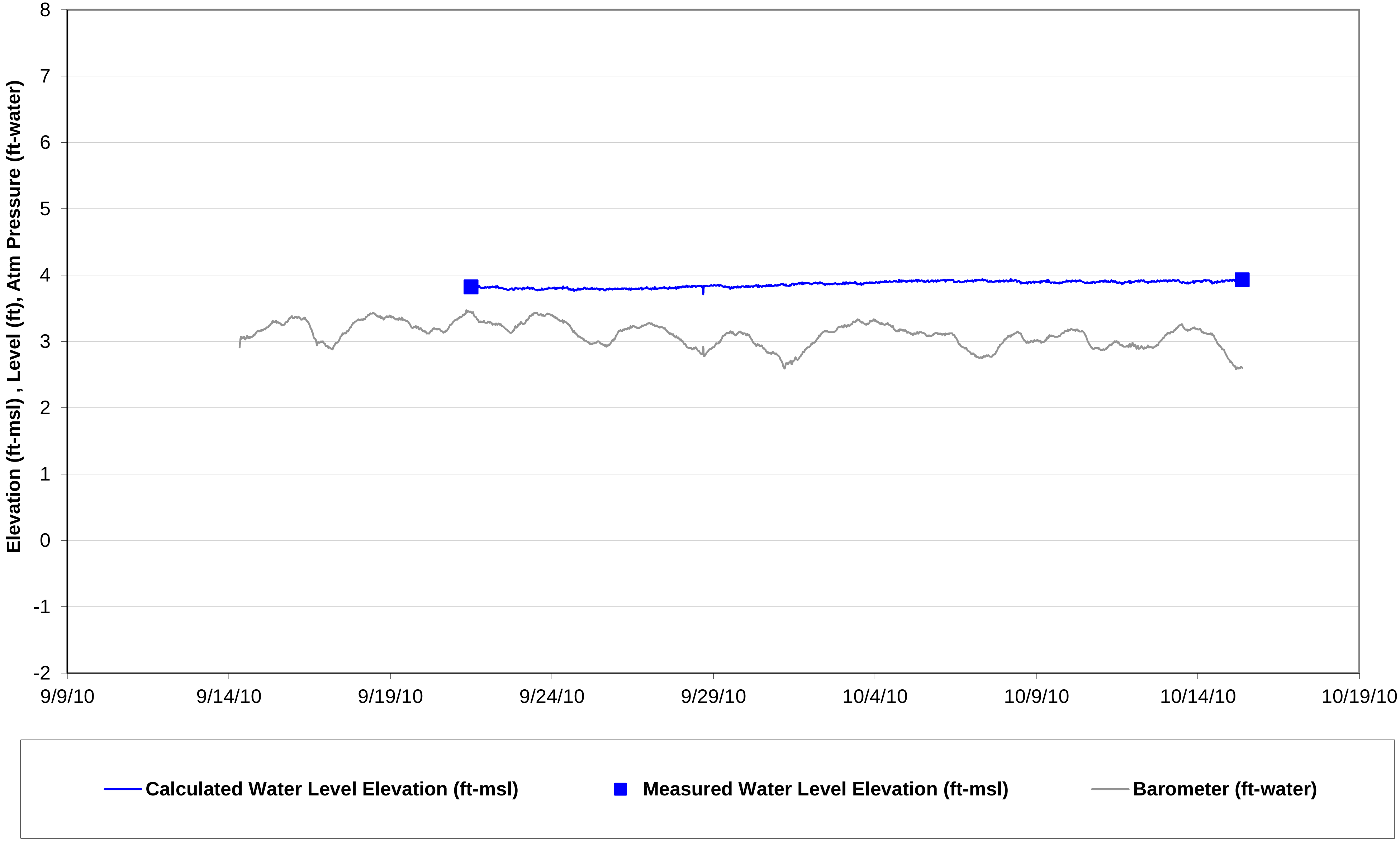
MW-10 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



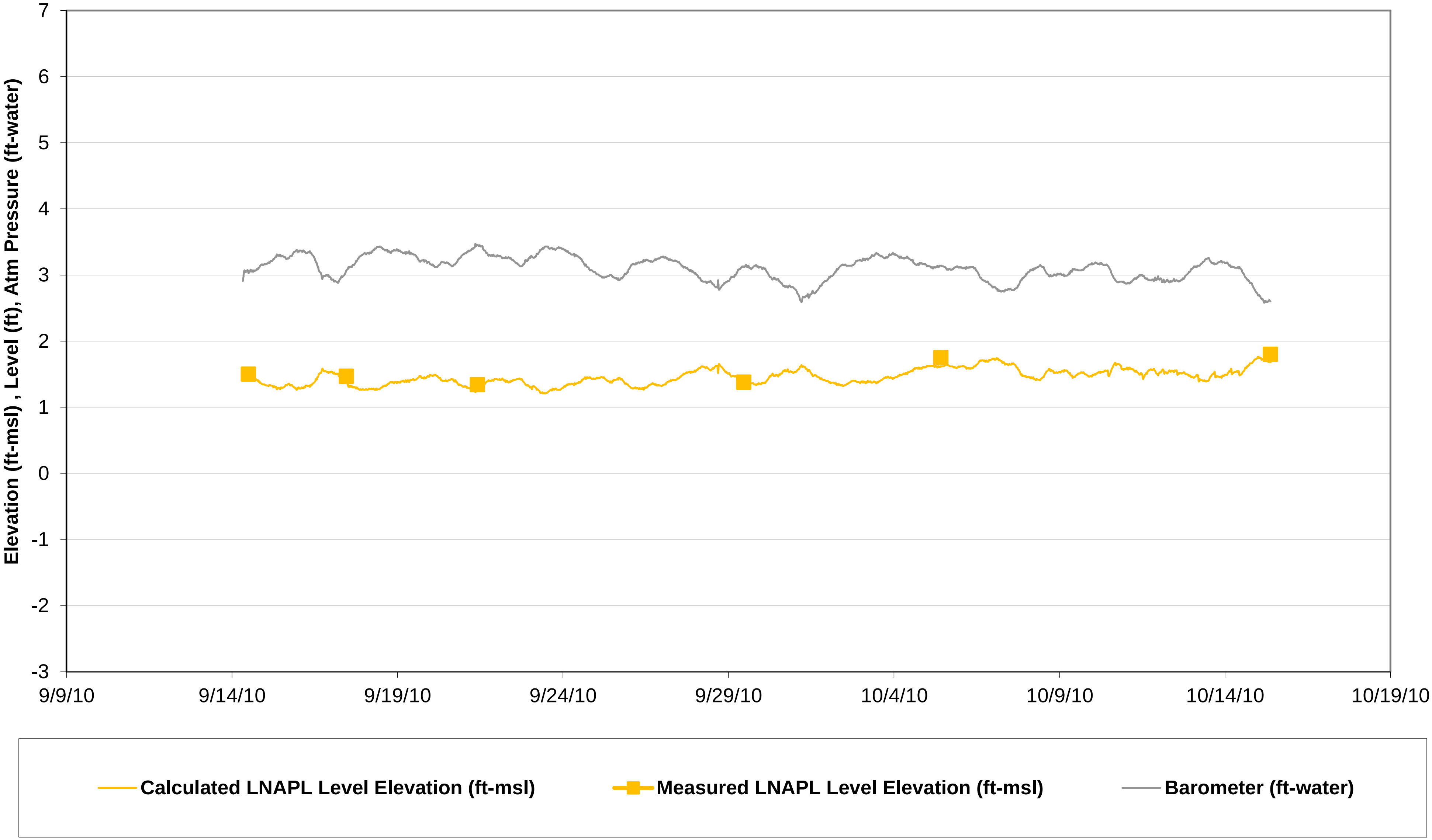
MW-13 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



MW-14 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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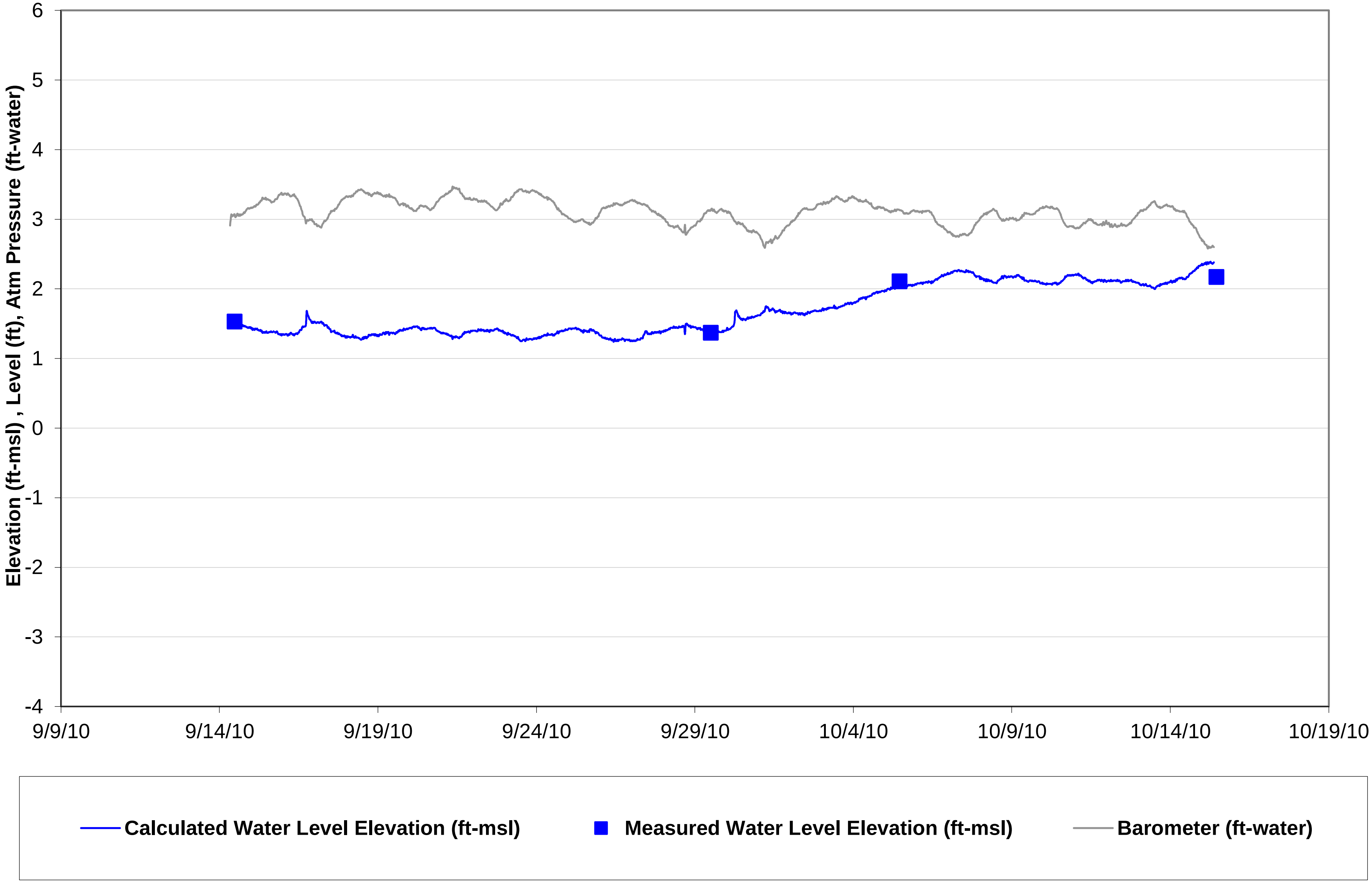
12/7/2010
Tidal Study Data - Master File.xlsApp A MW-14 Plot

MW-15 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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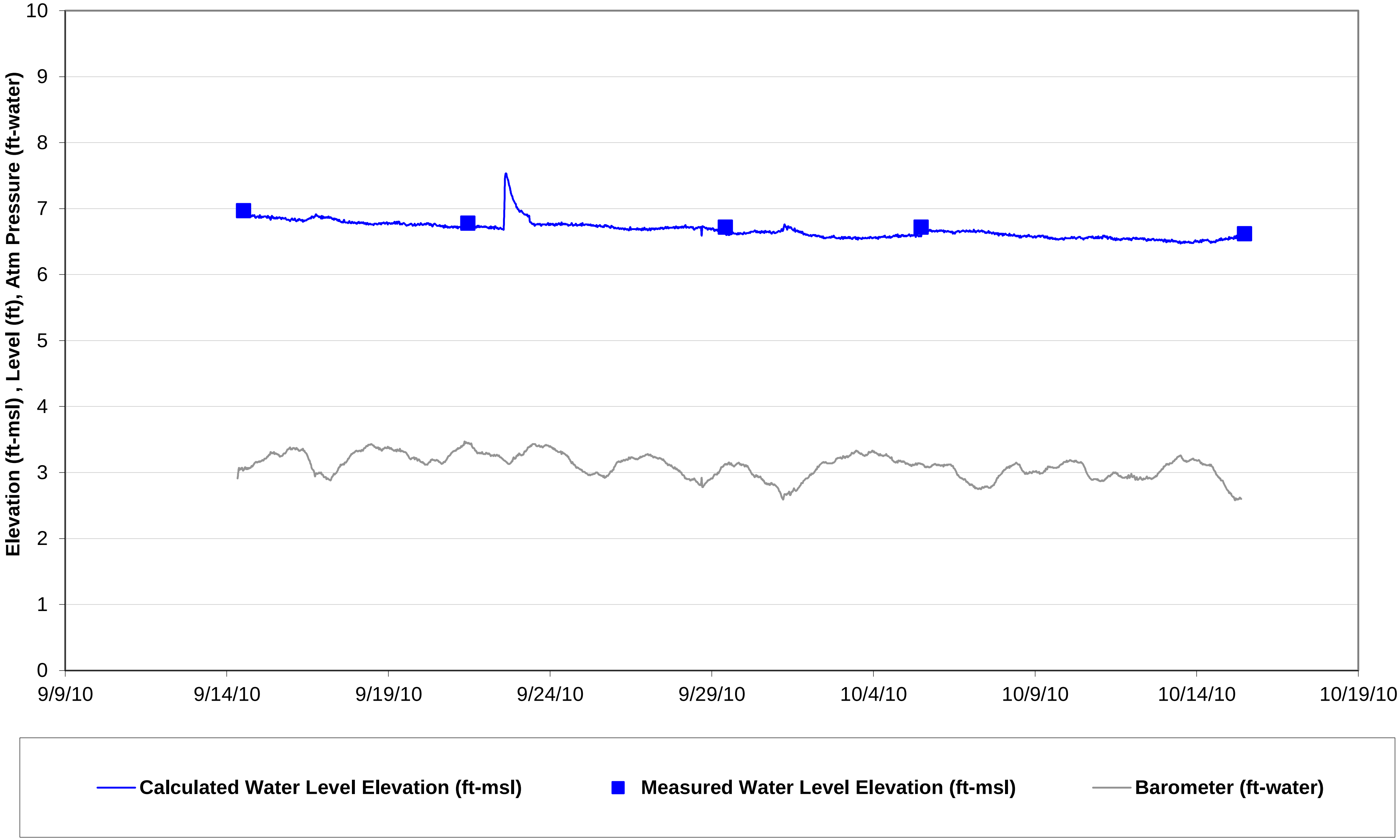
MW-20 MONITORING DATA

Former Pratt Oil Works
Long Island City, New York



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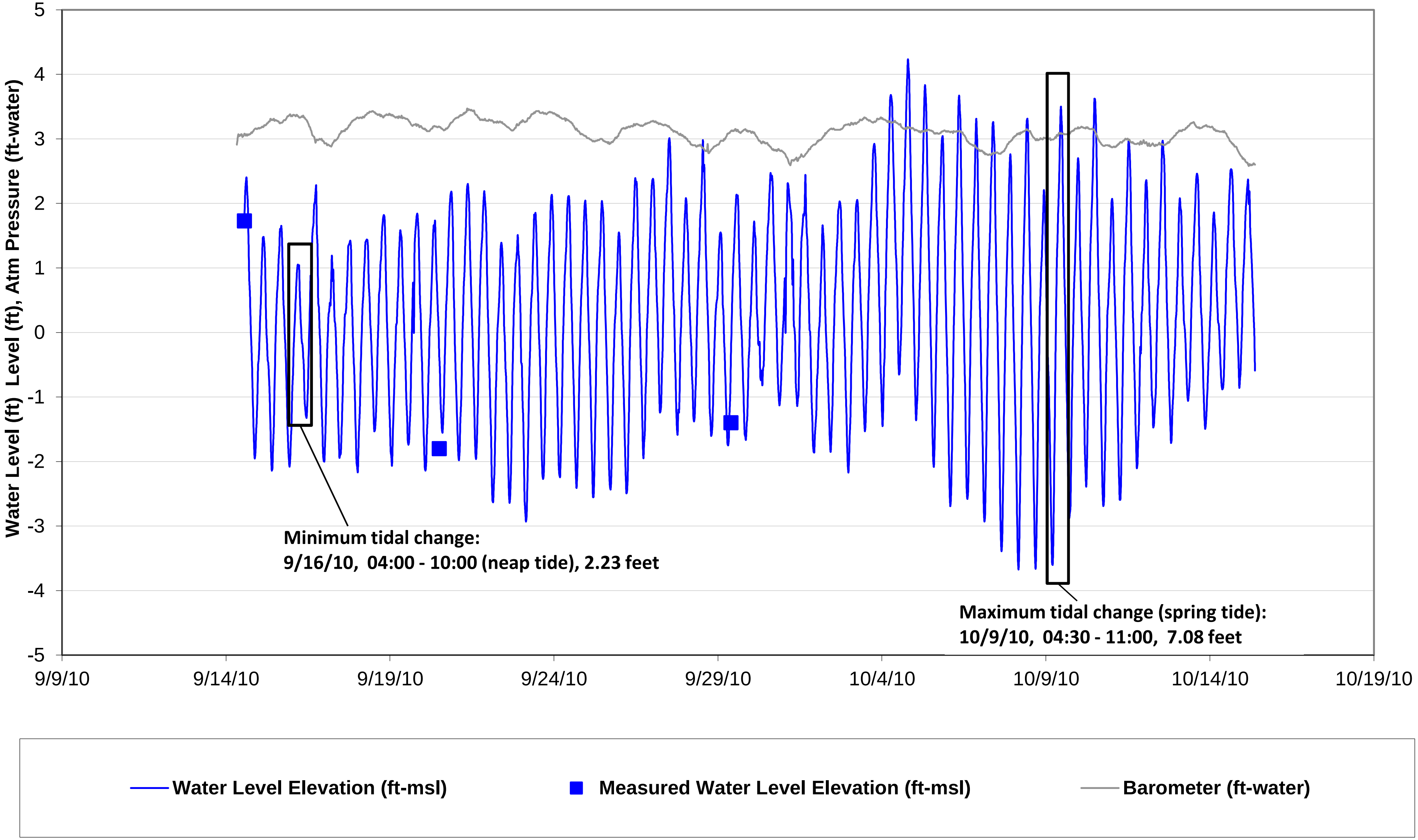
MARINE PIEZOMETER (MP) MONITORING DATA

Former Pratt Oil Works
Long Island City, New York

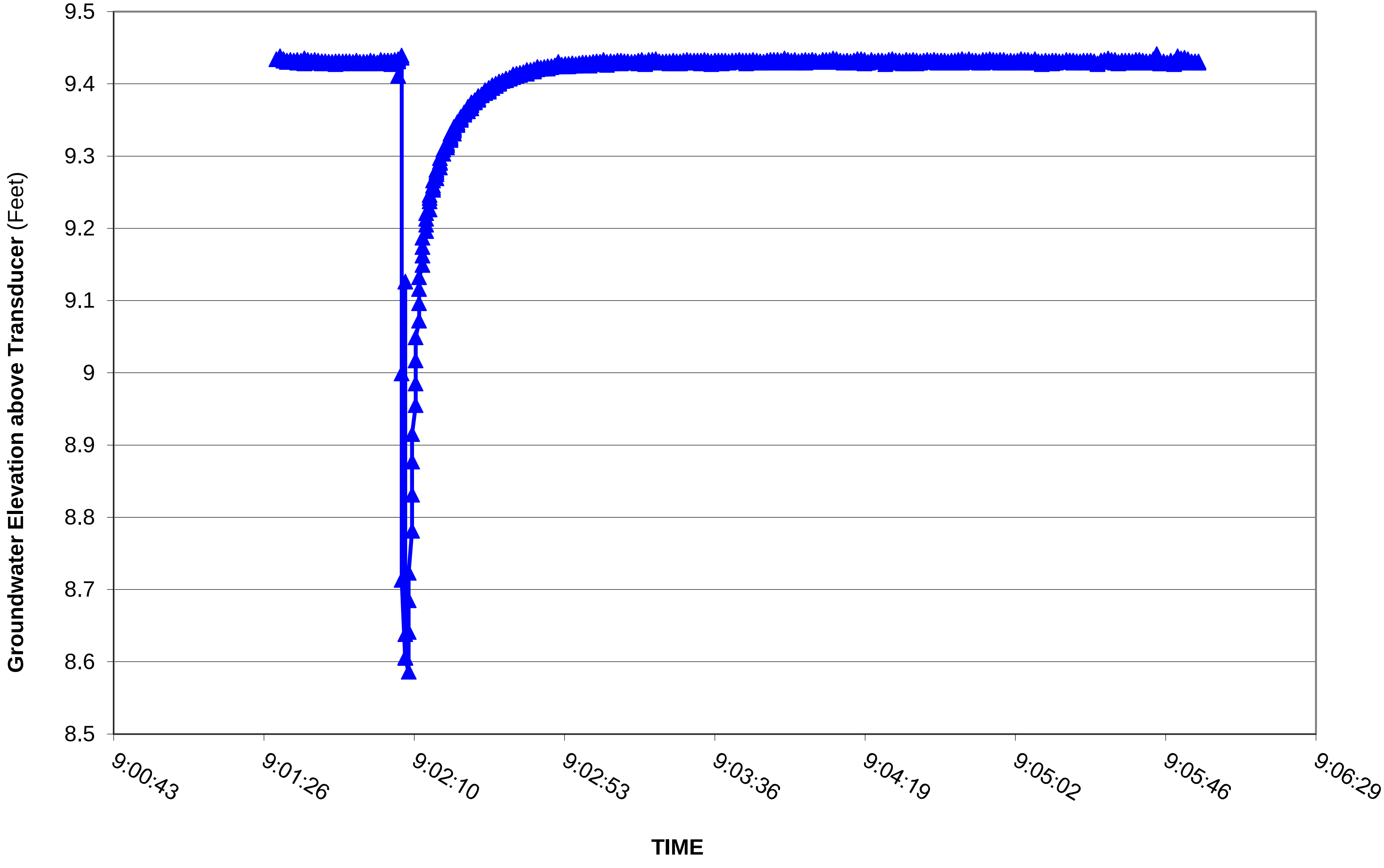


APPENDIX B

Slug Test Water Level Recovery Charts

GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-1 (Slug Test 1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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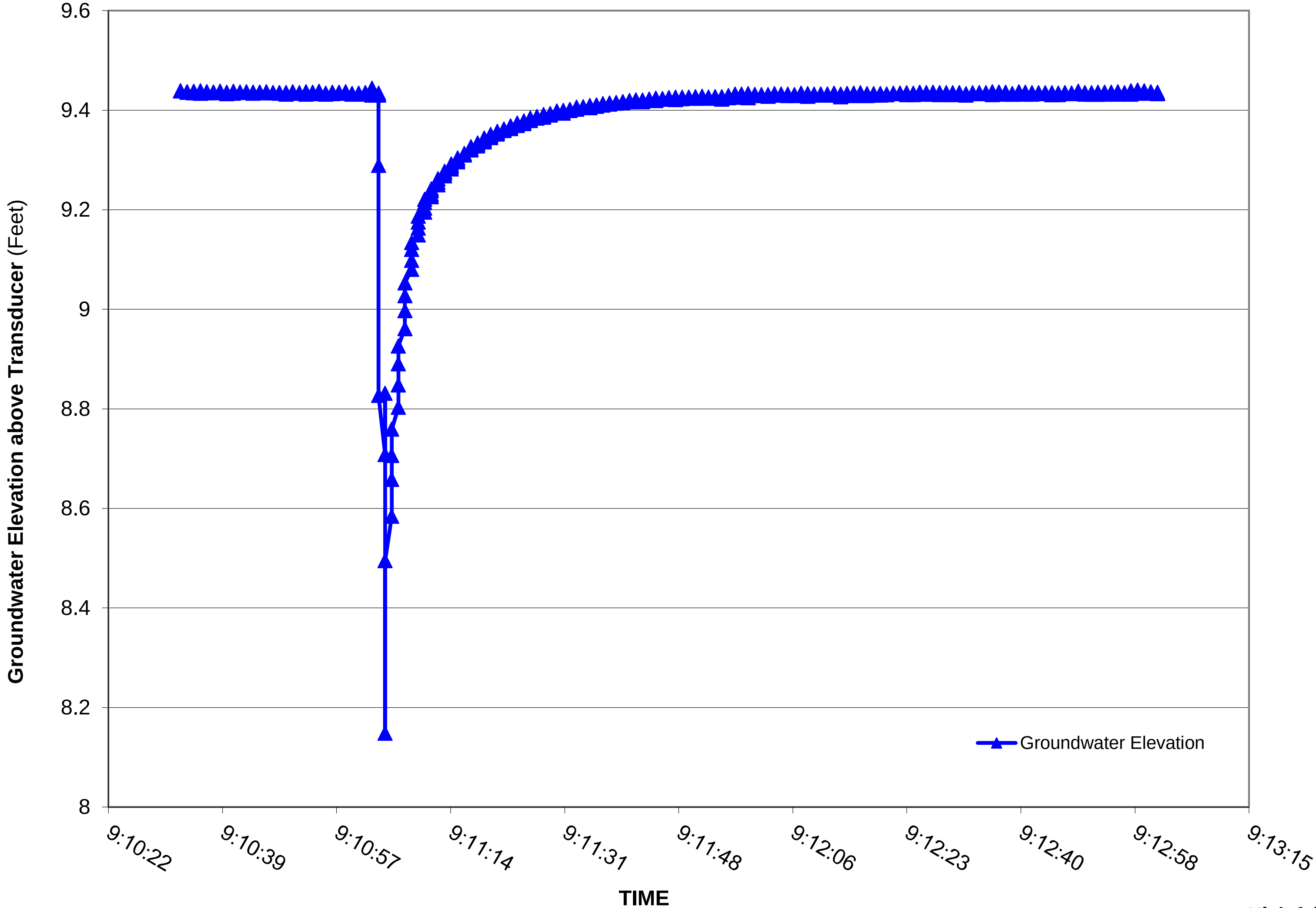
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-1 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



Kleinfelder
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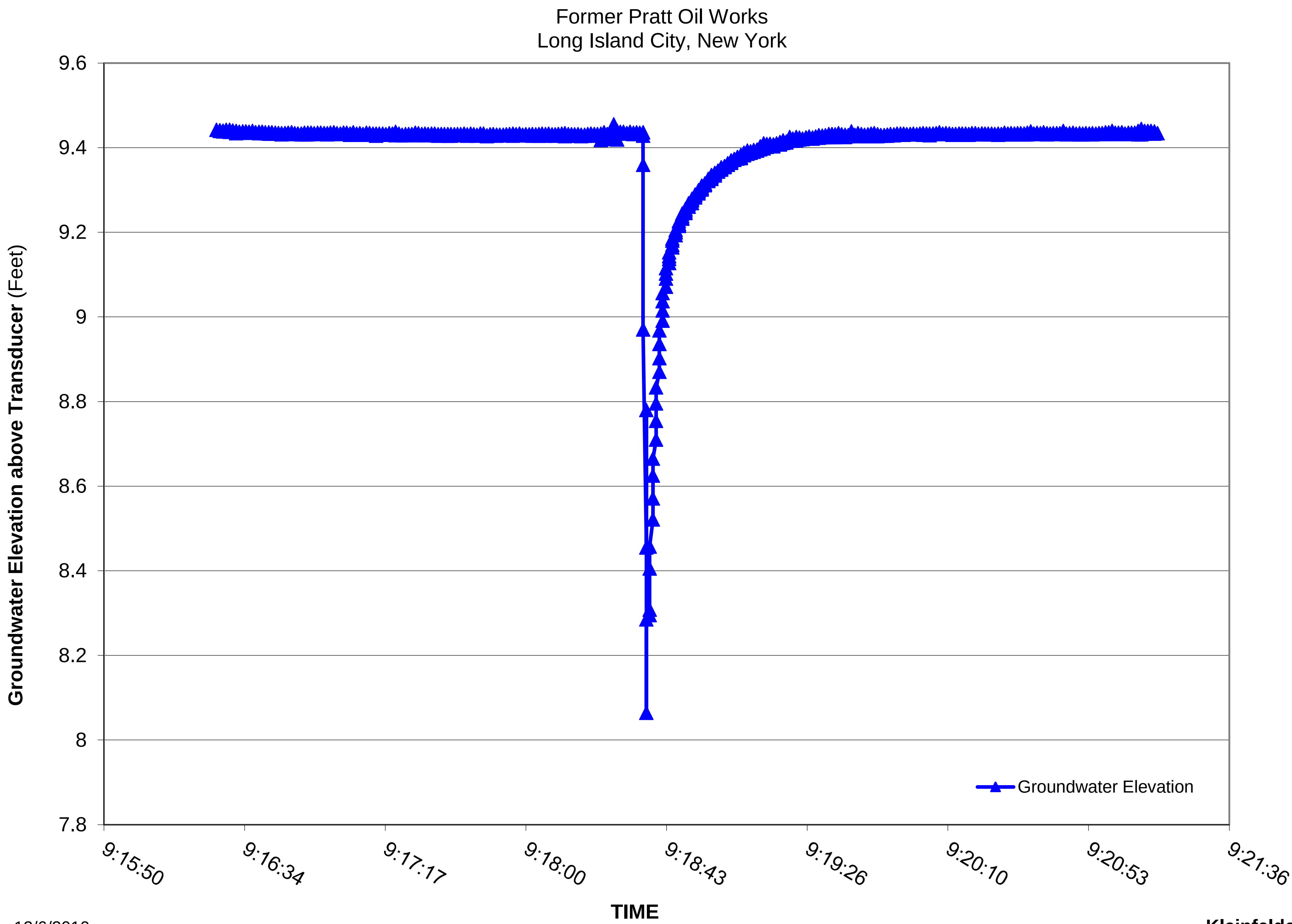
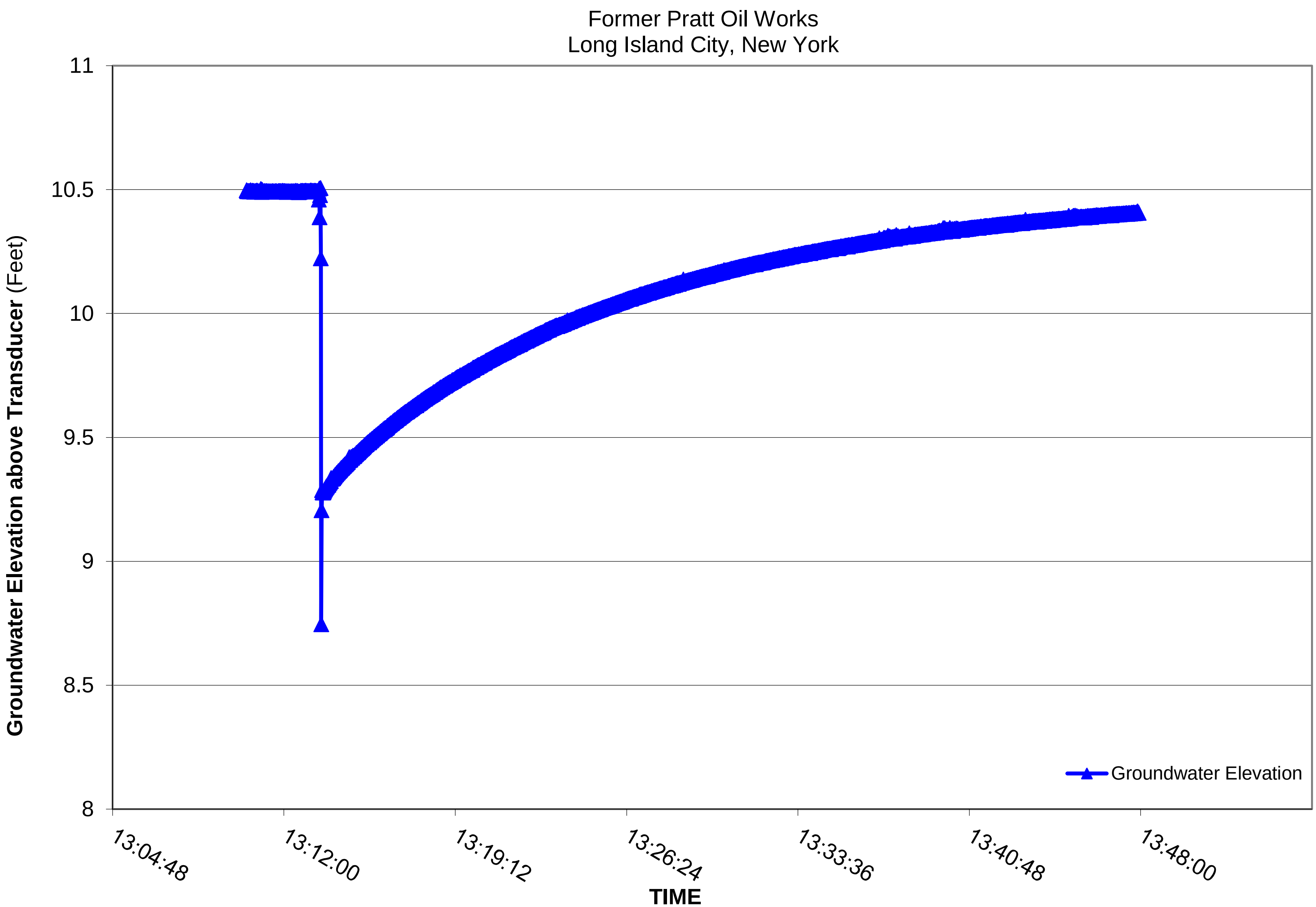
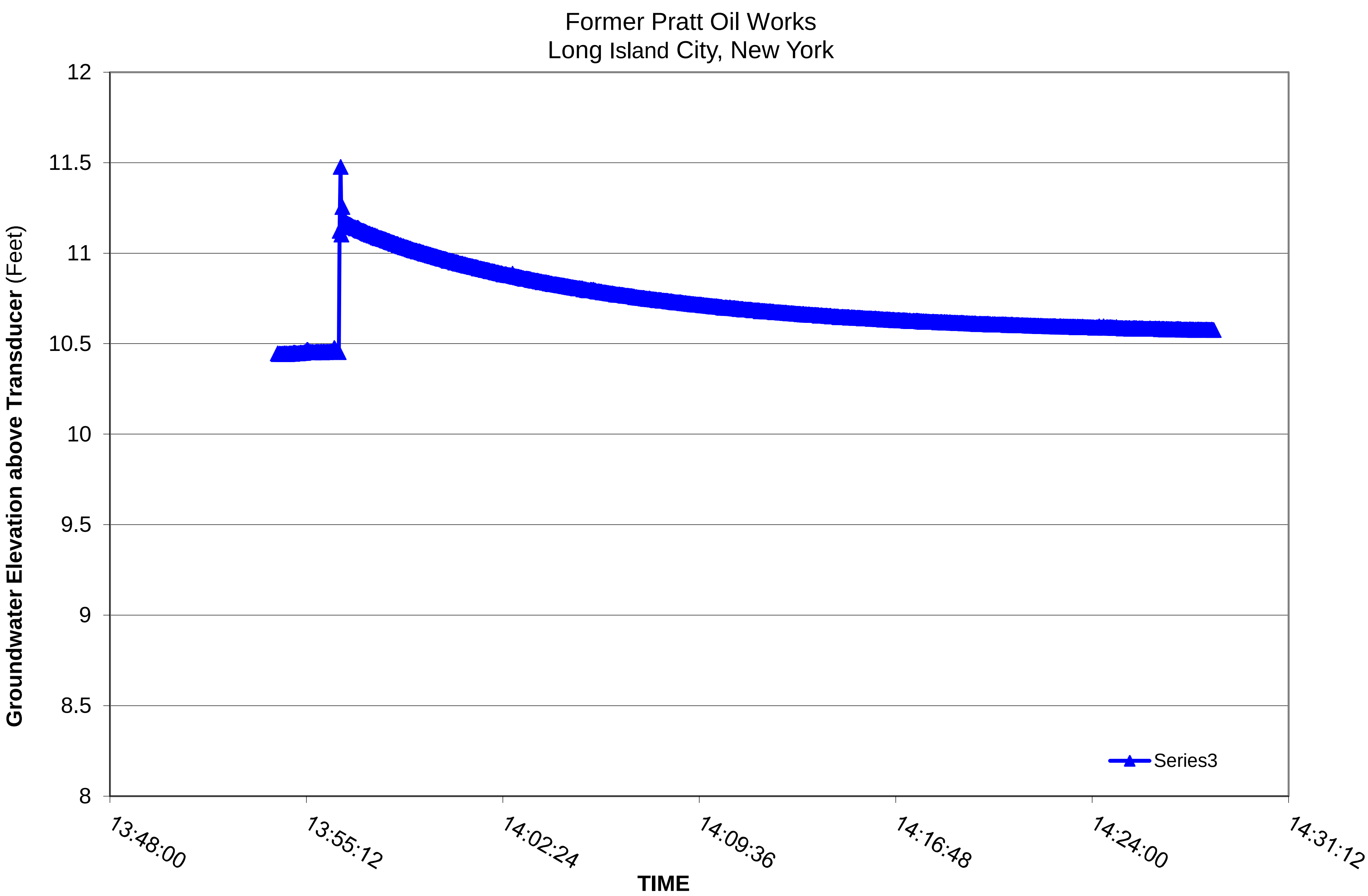
GROUNDWATER ELEVATON ABOVE TRANSDUCER VERSE TIME - MW-1 (Slug Test 3)
September 2010



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-4D (Slug Test 1)
September 2010

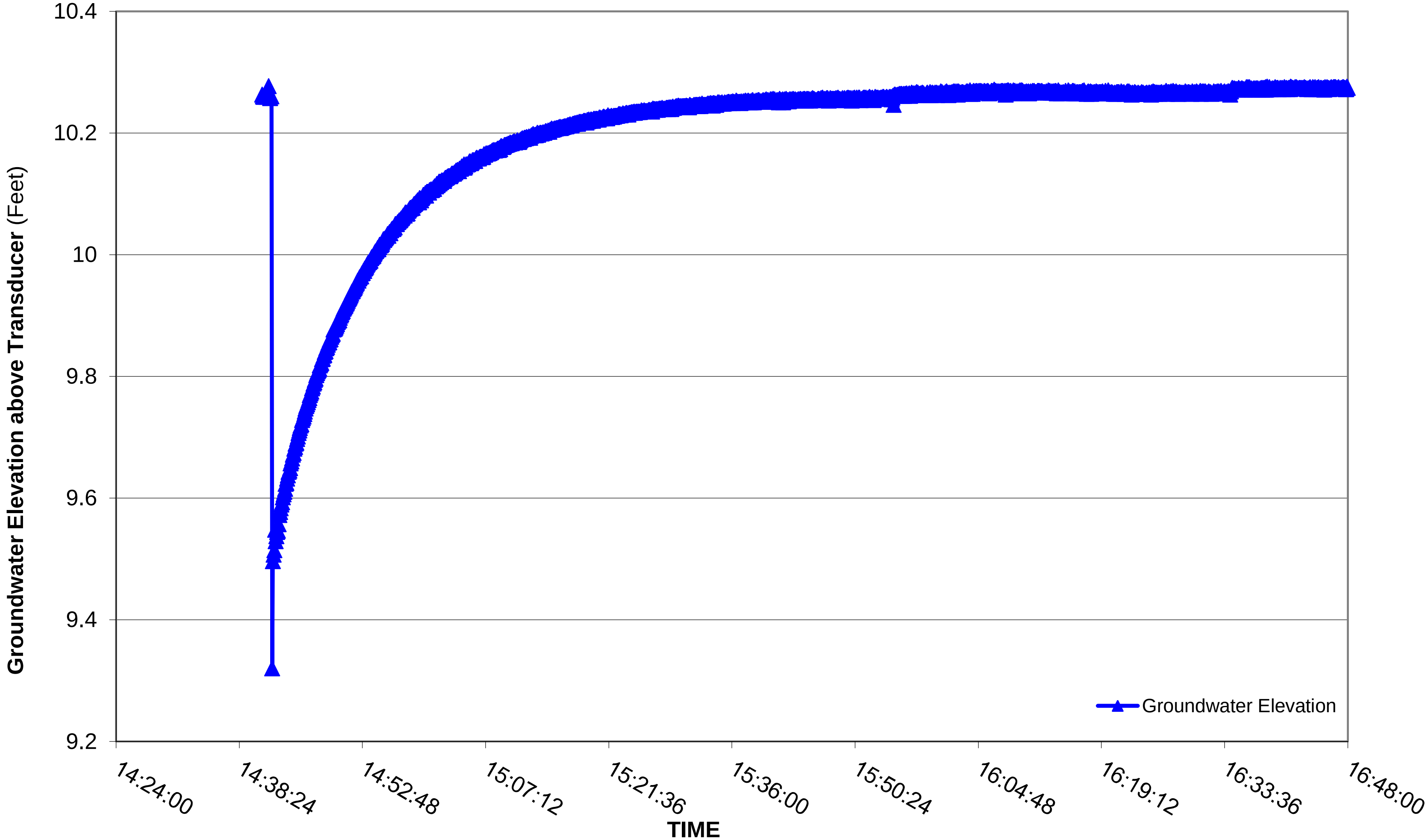


GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-4D (Slug Test 2)
September 2010



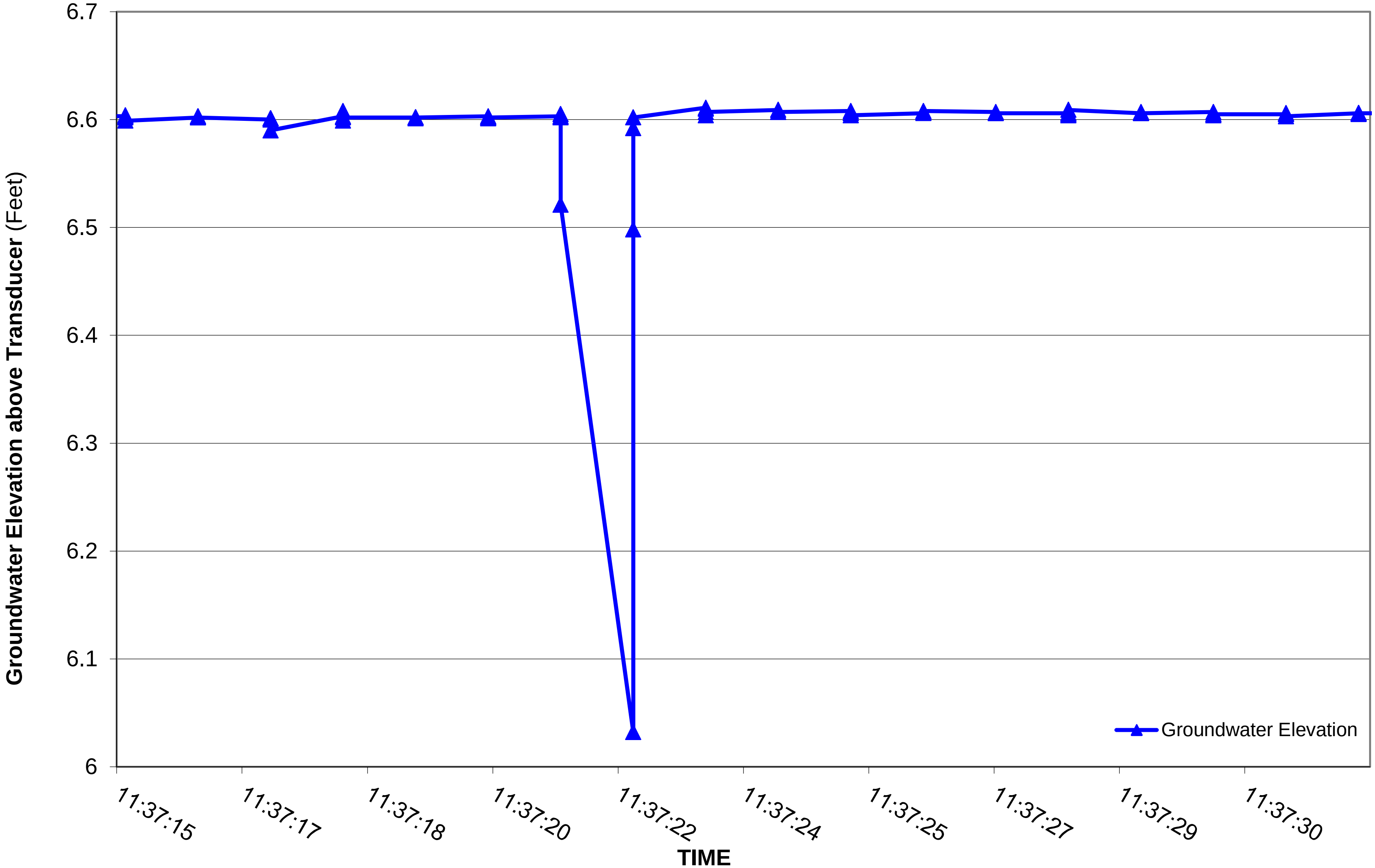
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-4D (Slug Test 3)
September 2010

Former Pratt Oil Works
Long Island City, New York



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-8 (Slug Test1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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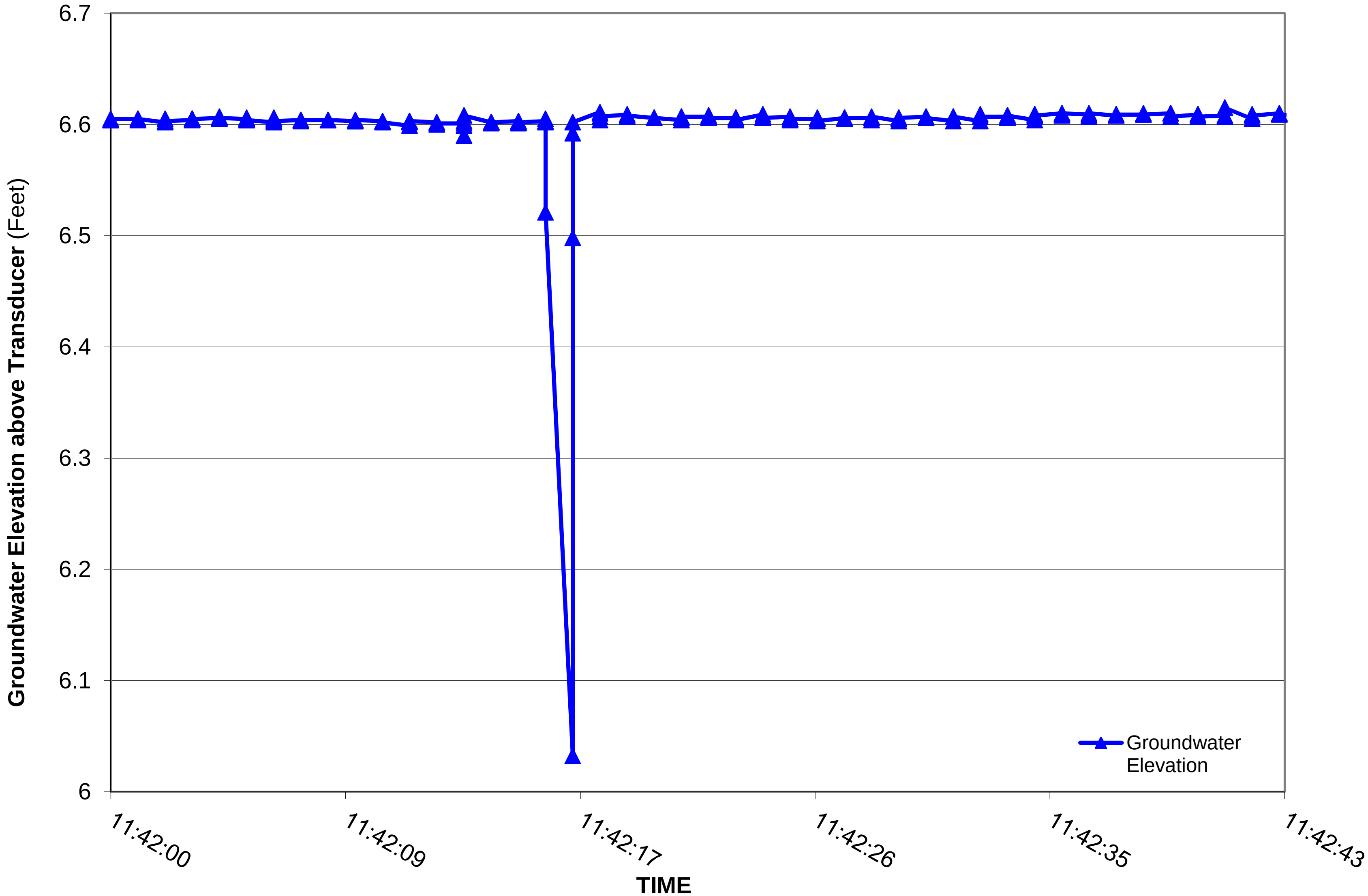
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-8 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



Kleinfelder
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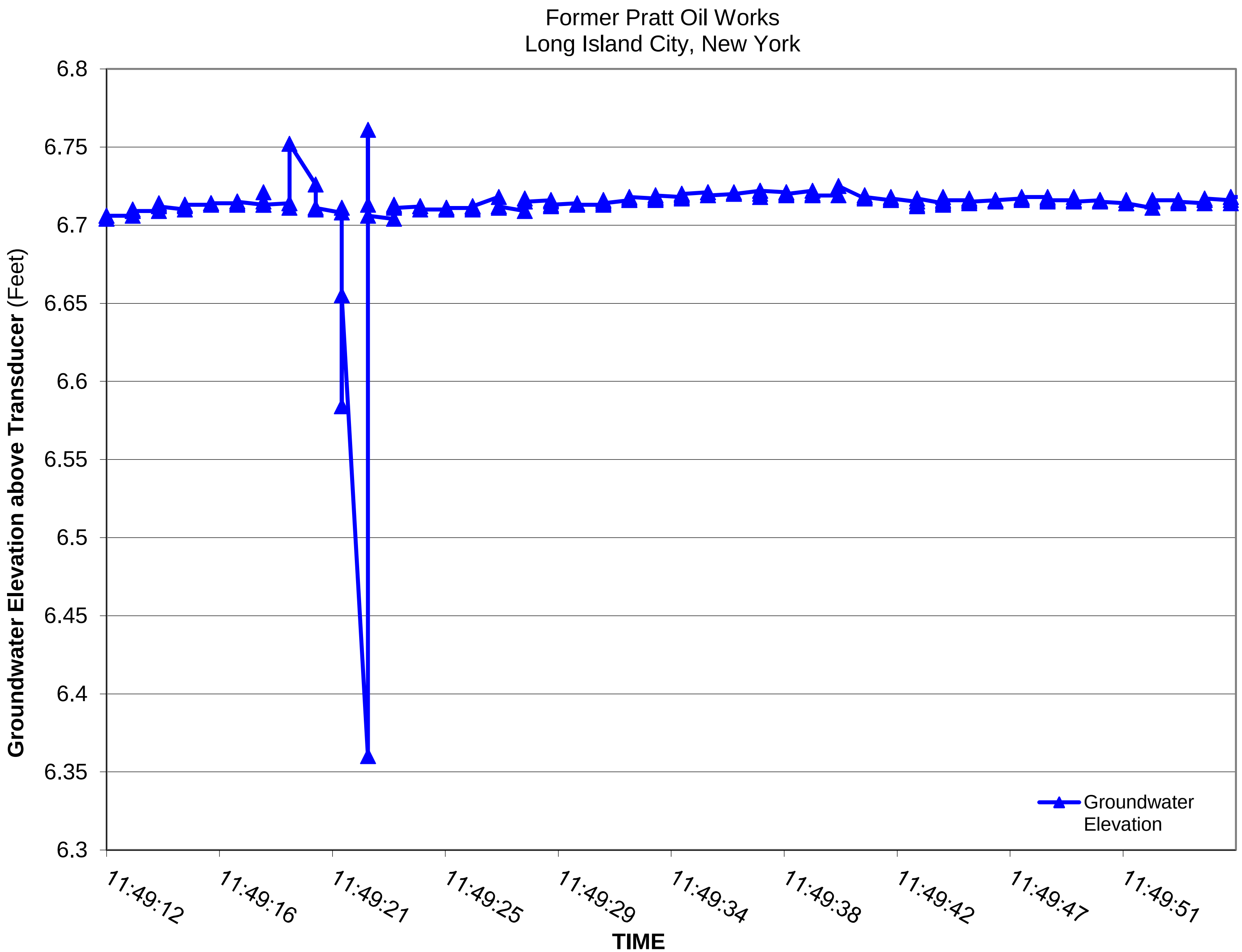
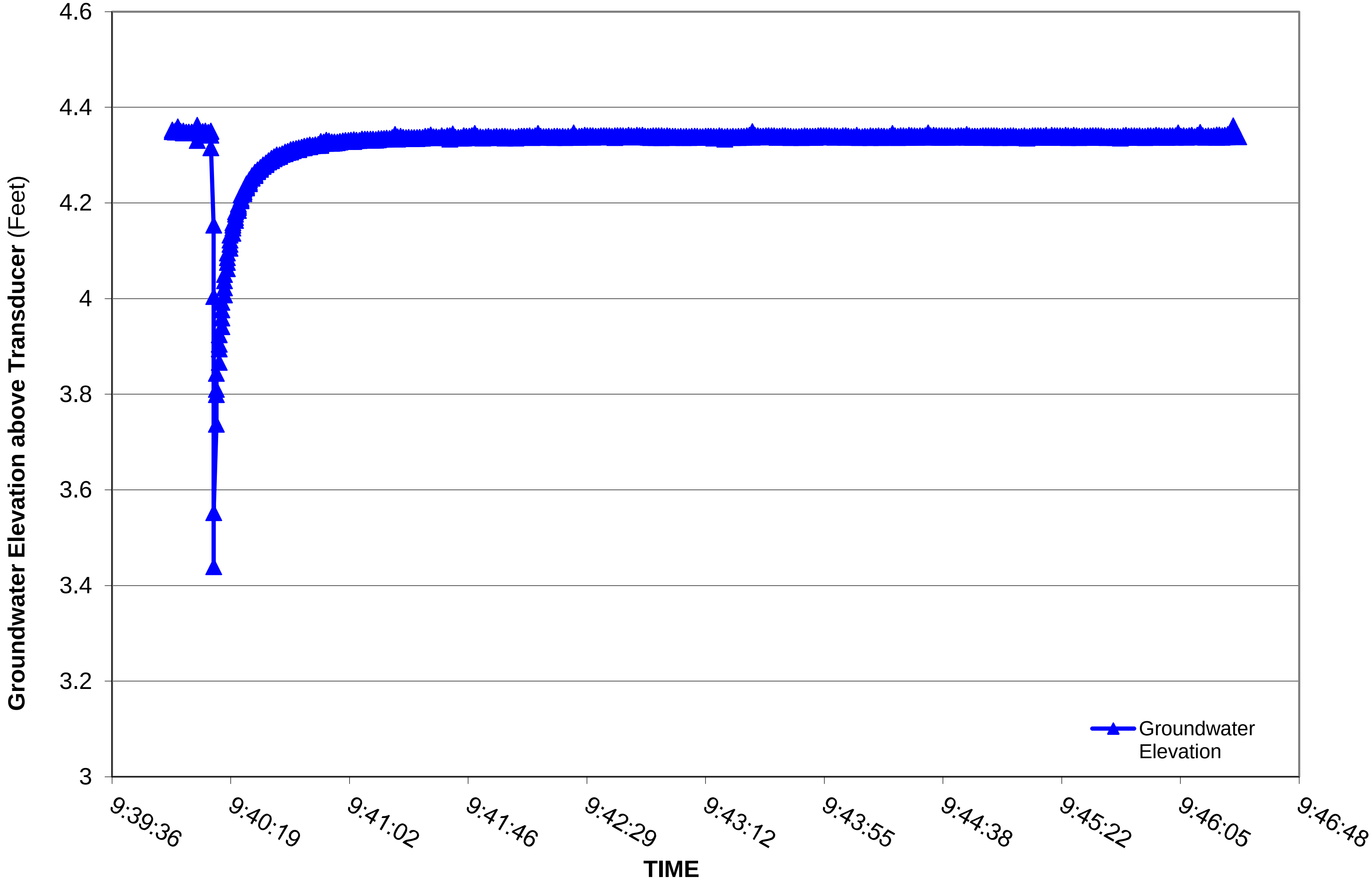
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-8 (Slug Test 3)
September 2010



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-10 (Slug Test1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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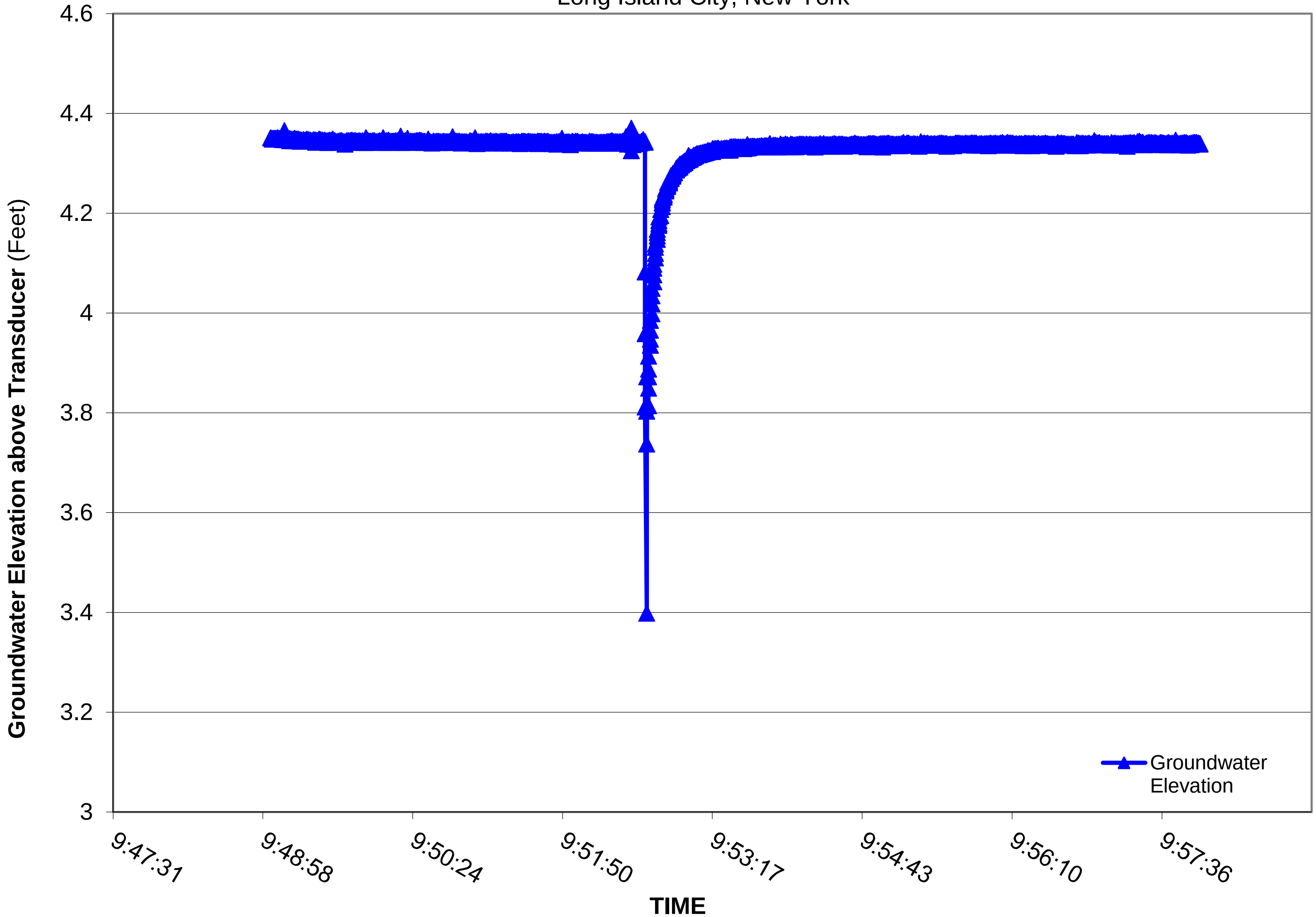
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-10 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



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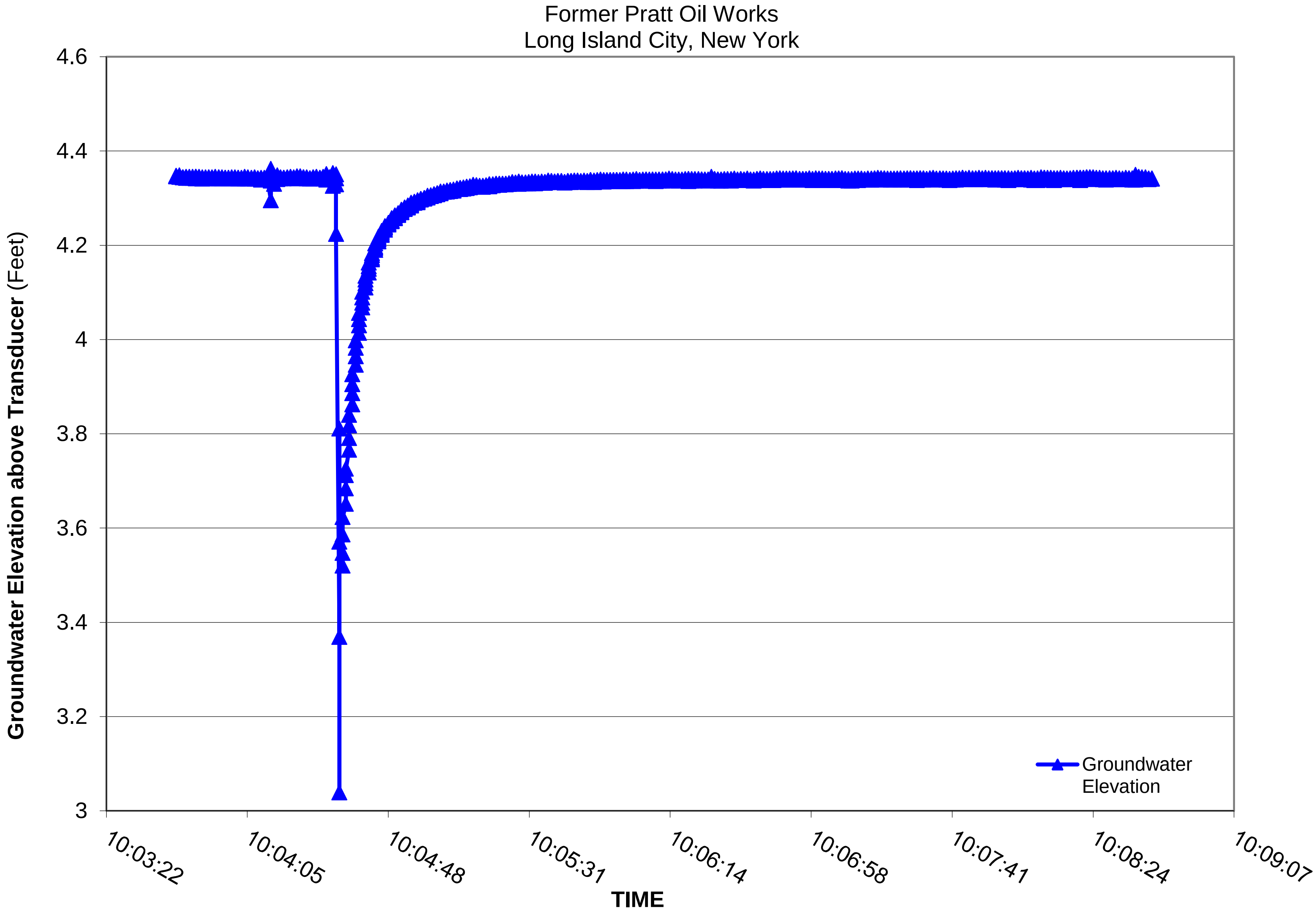
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-10 (Slug Test 3)
September 2010



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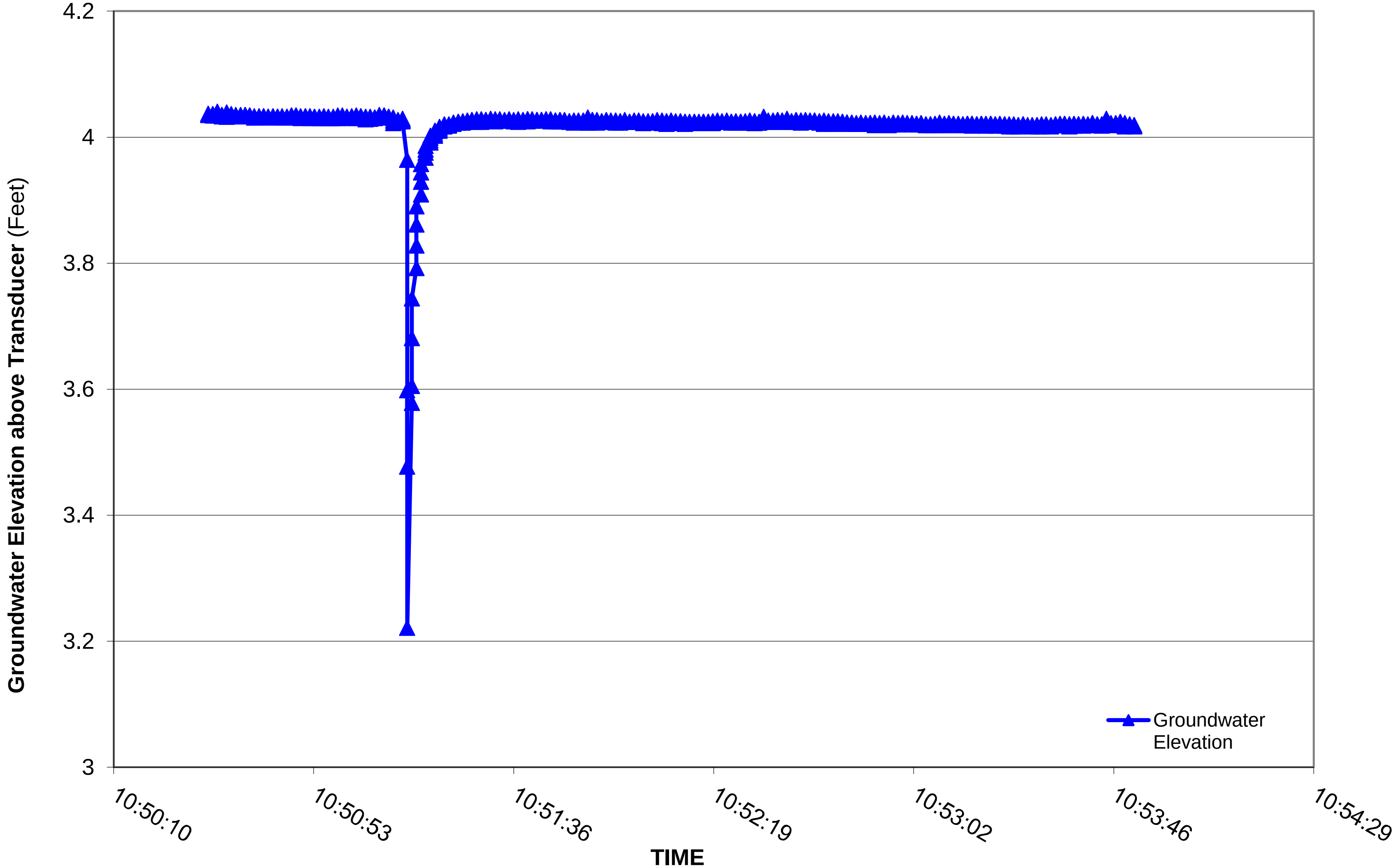
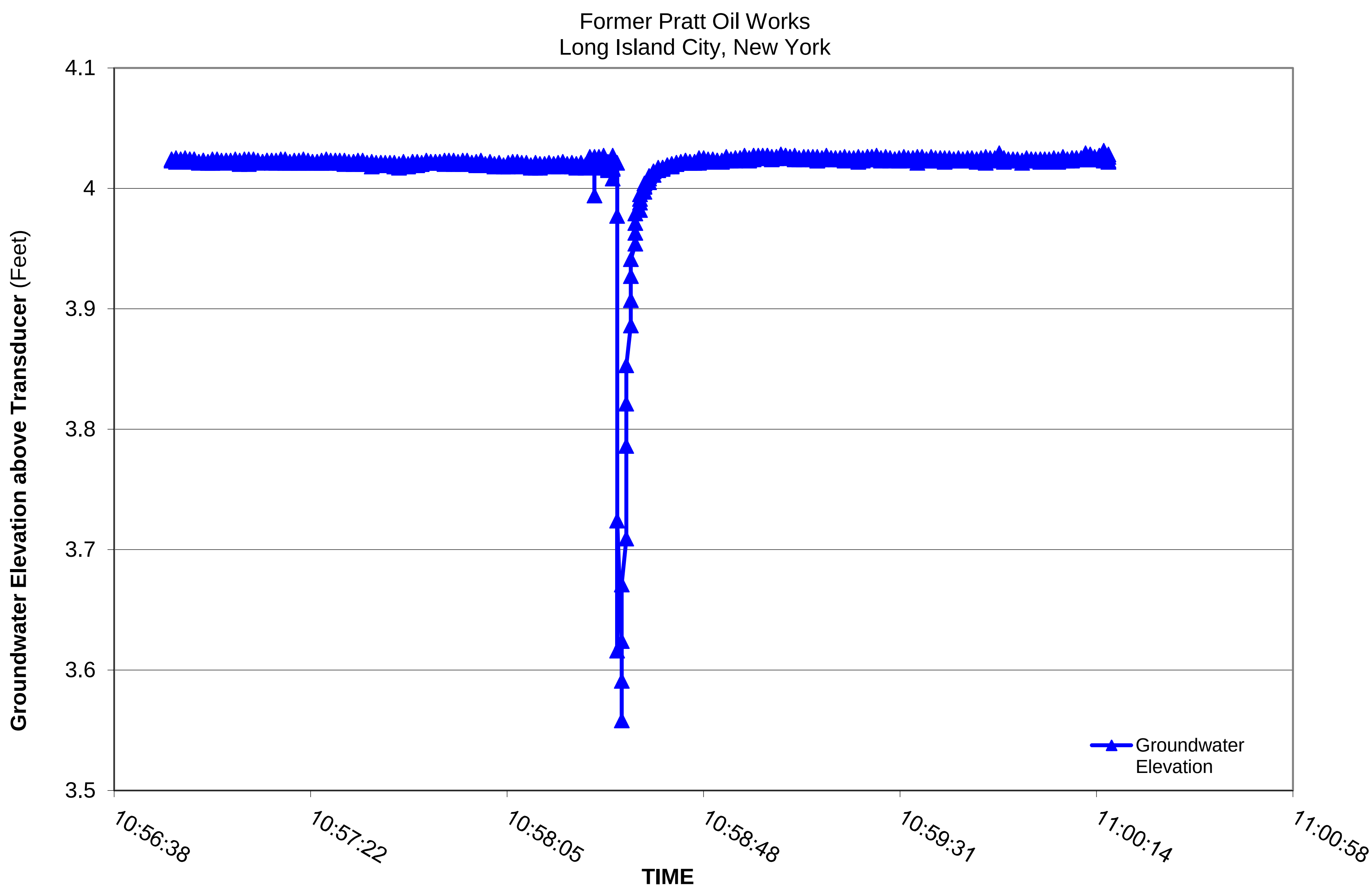
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-13 (Slug Test 1)
September 2010

Former Pratt Oil Works
Long Island City, New York



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-13 (Slug Test 2)
September 2010



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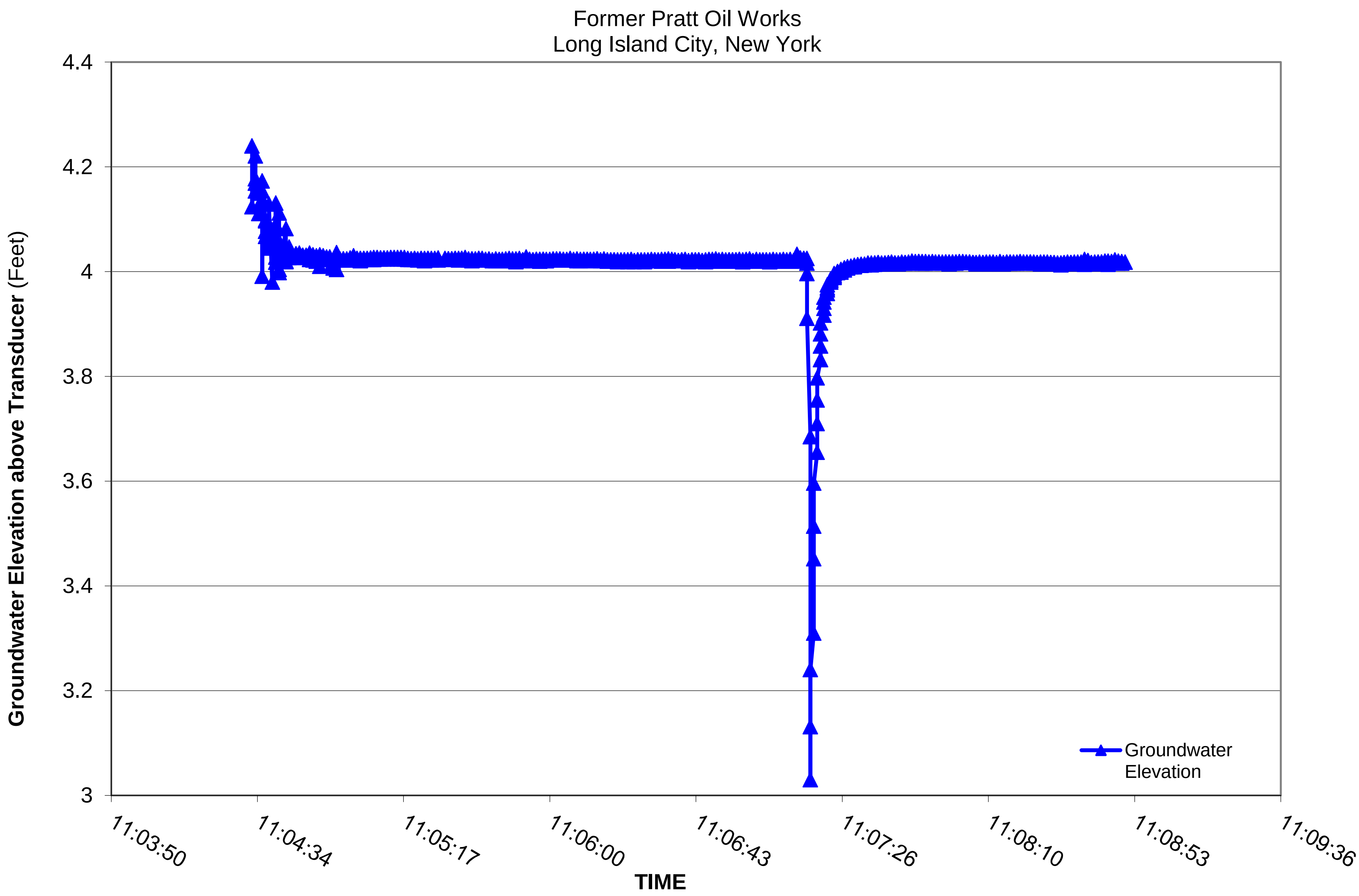
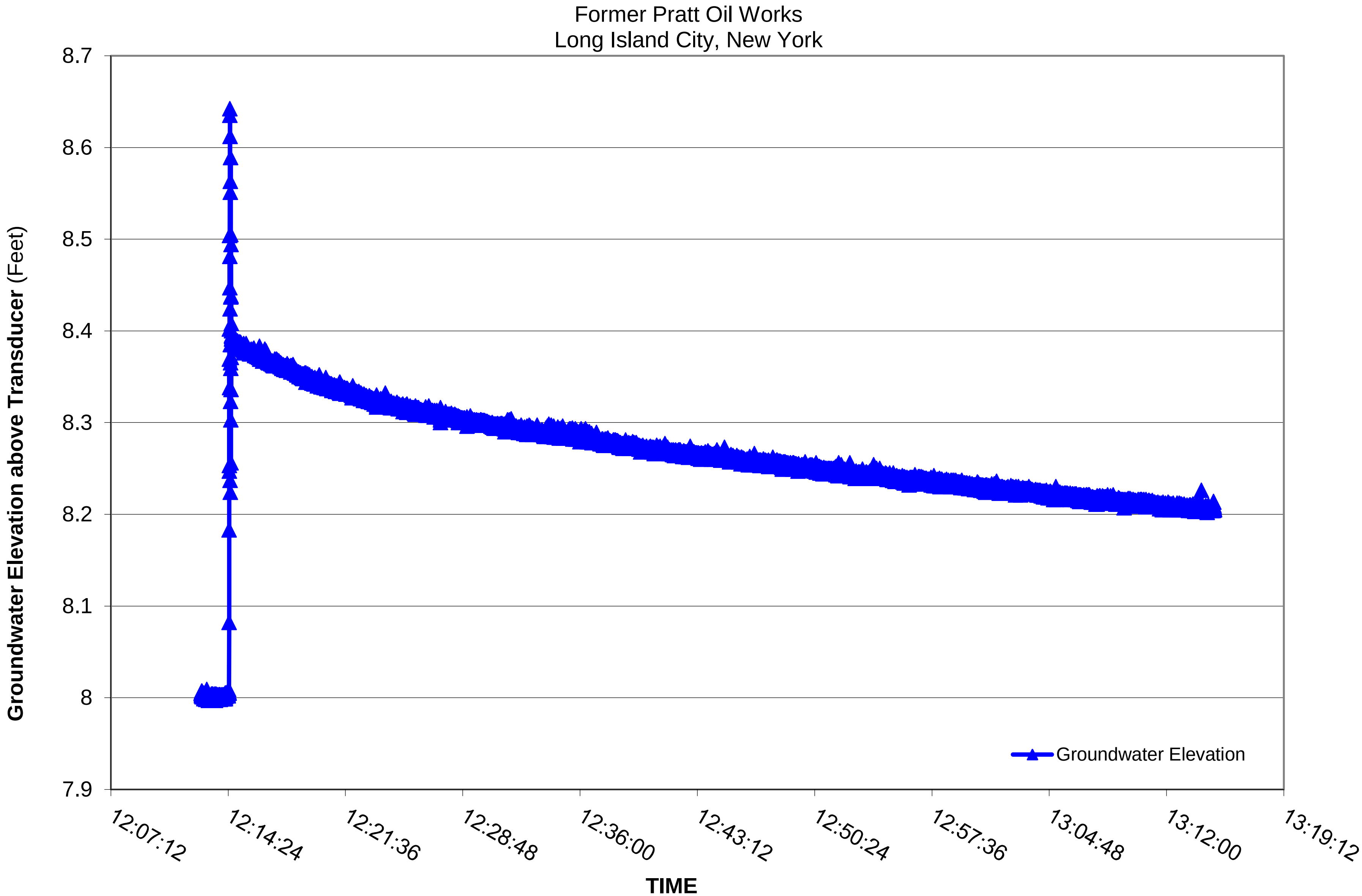
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-13 (Slug Test 3)
September 2010



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-15 (Slug Test 1)
September 2010



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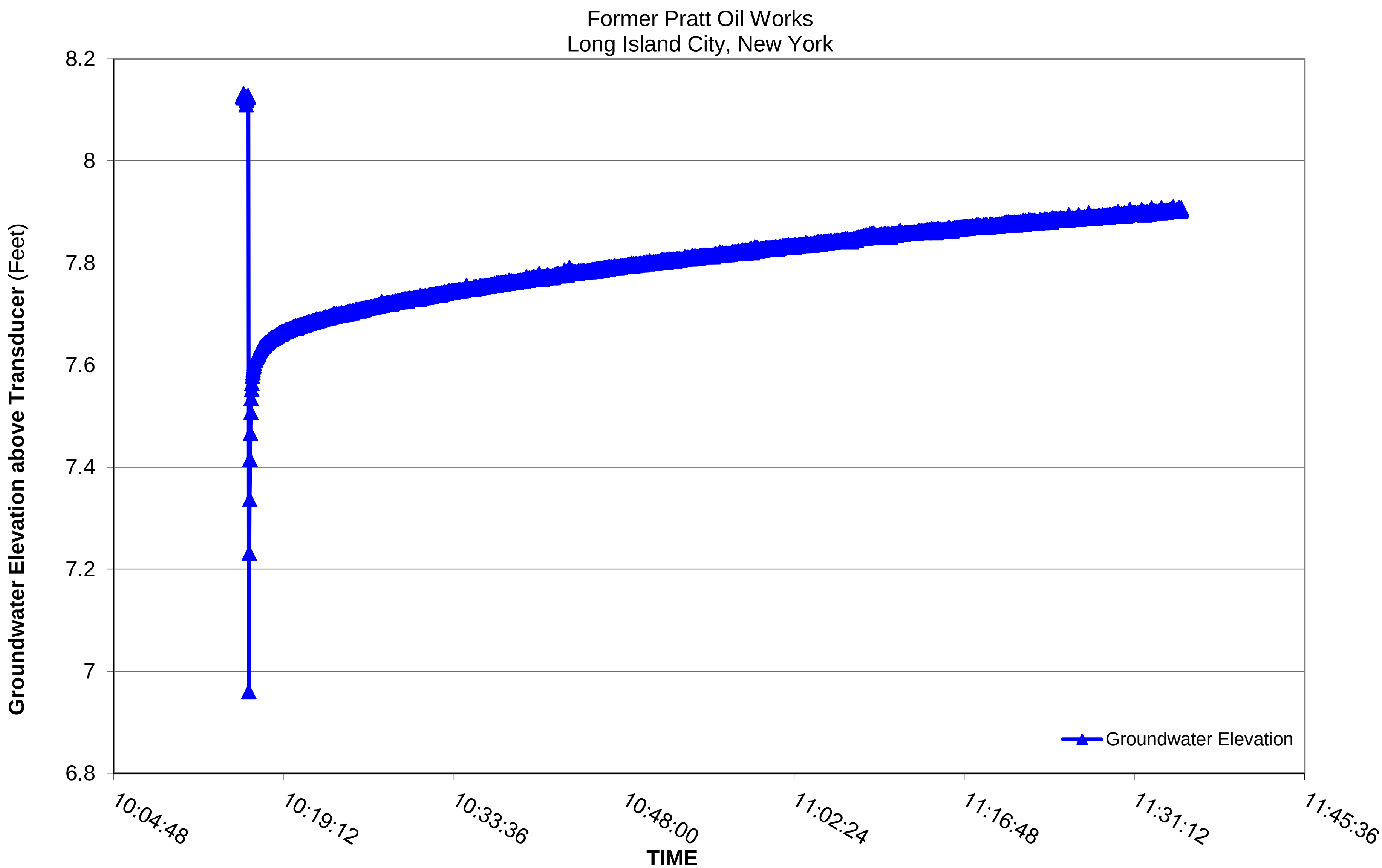
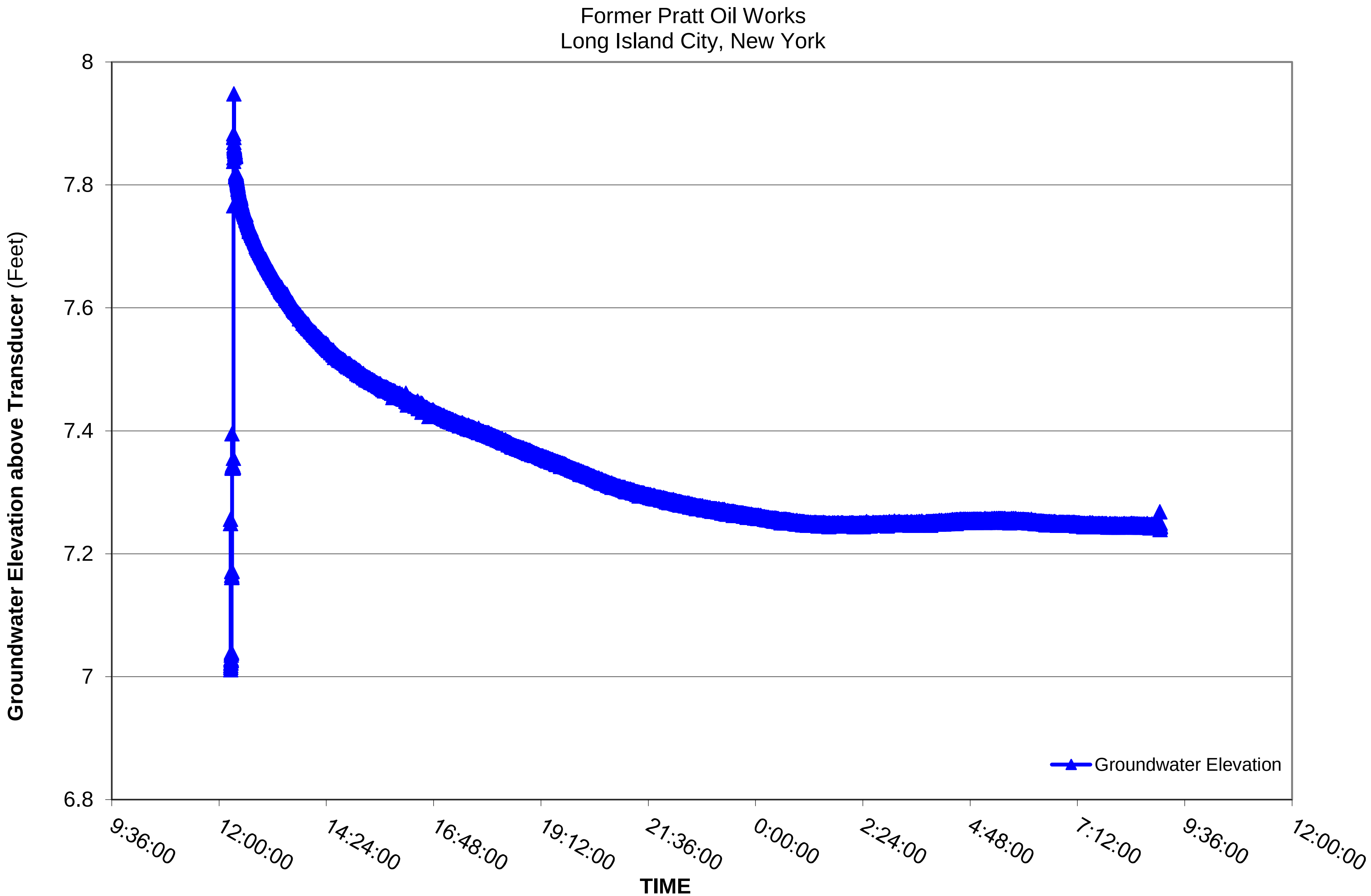
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-15 (Slug Test 2)
September 2010



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-15 (Slug Test 3)
September 2010



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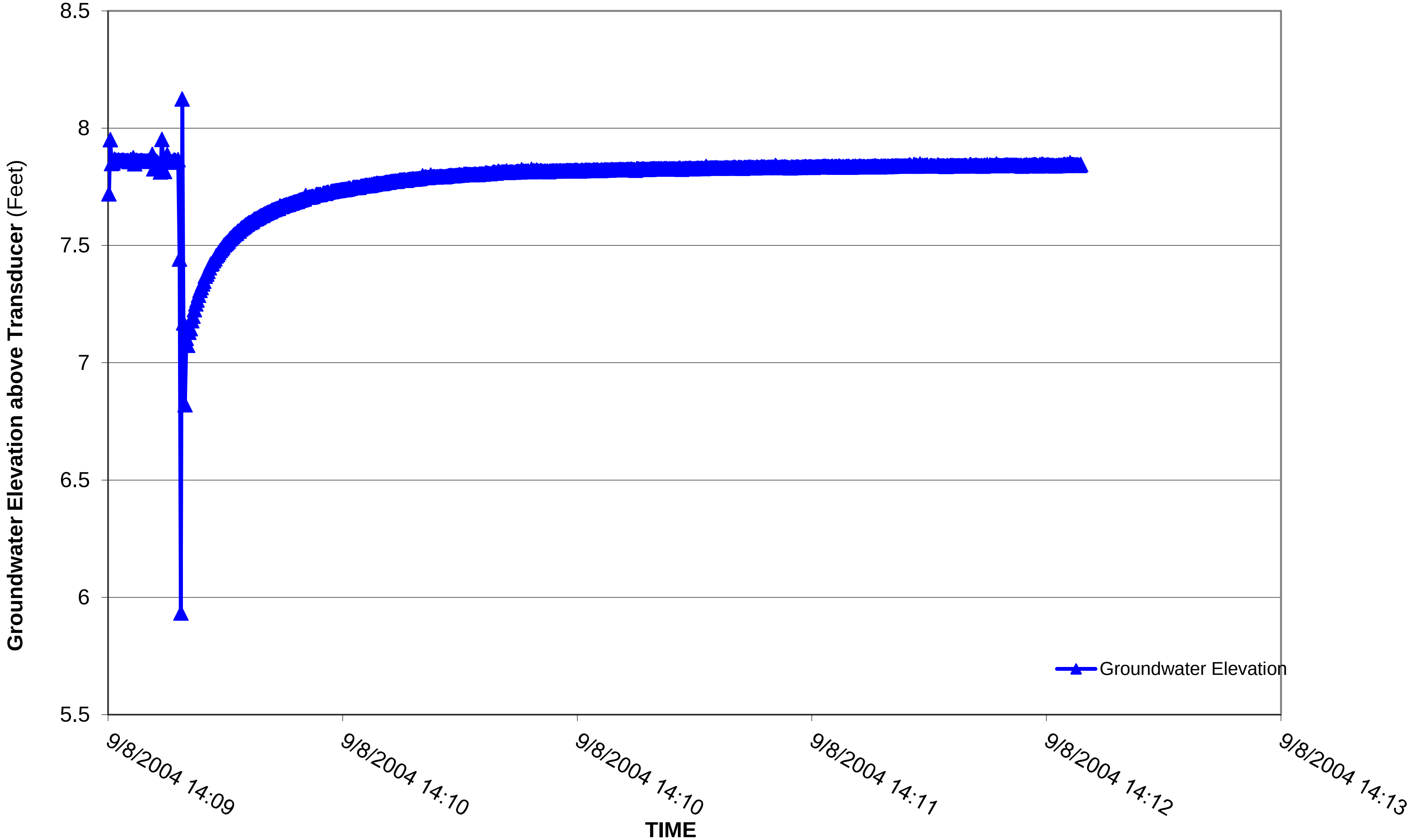
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-16 (Slug Test 1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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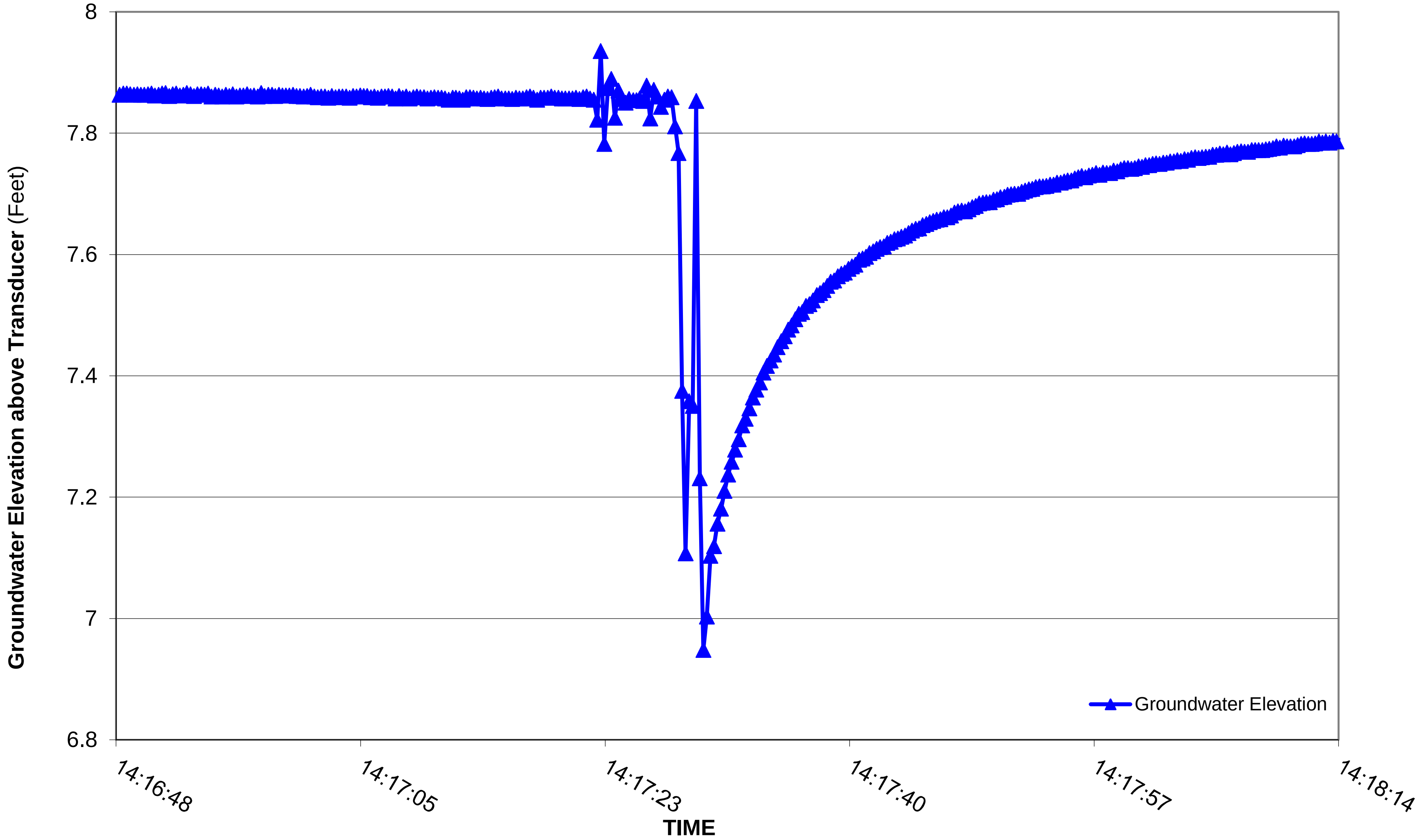
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-16 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



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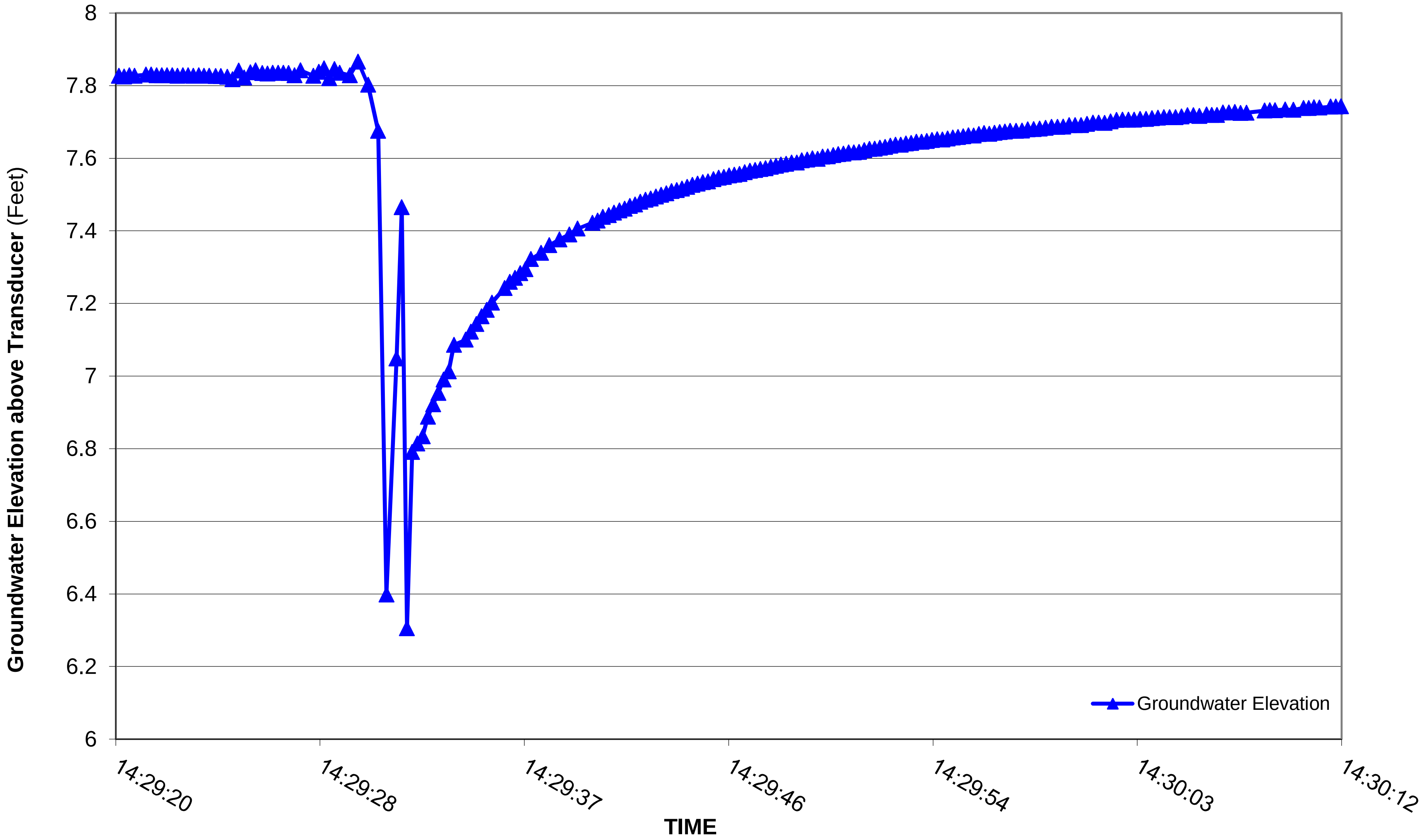
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-16 (Slug Test 3)
September 2010

Former Pratt Oil Works
Long Island City, New York



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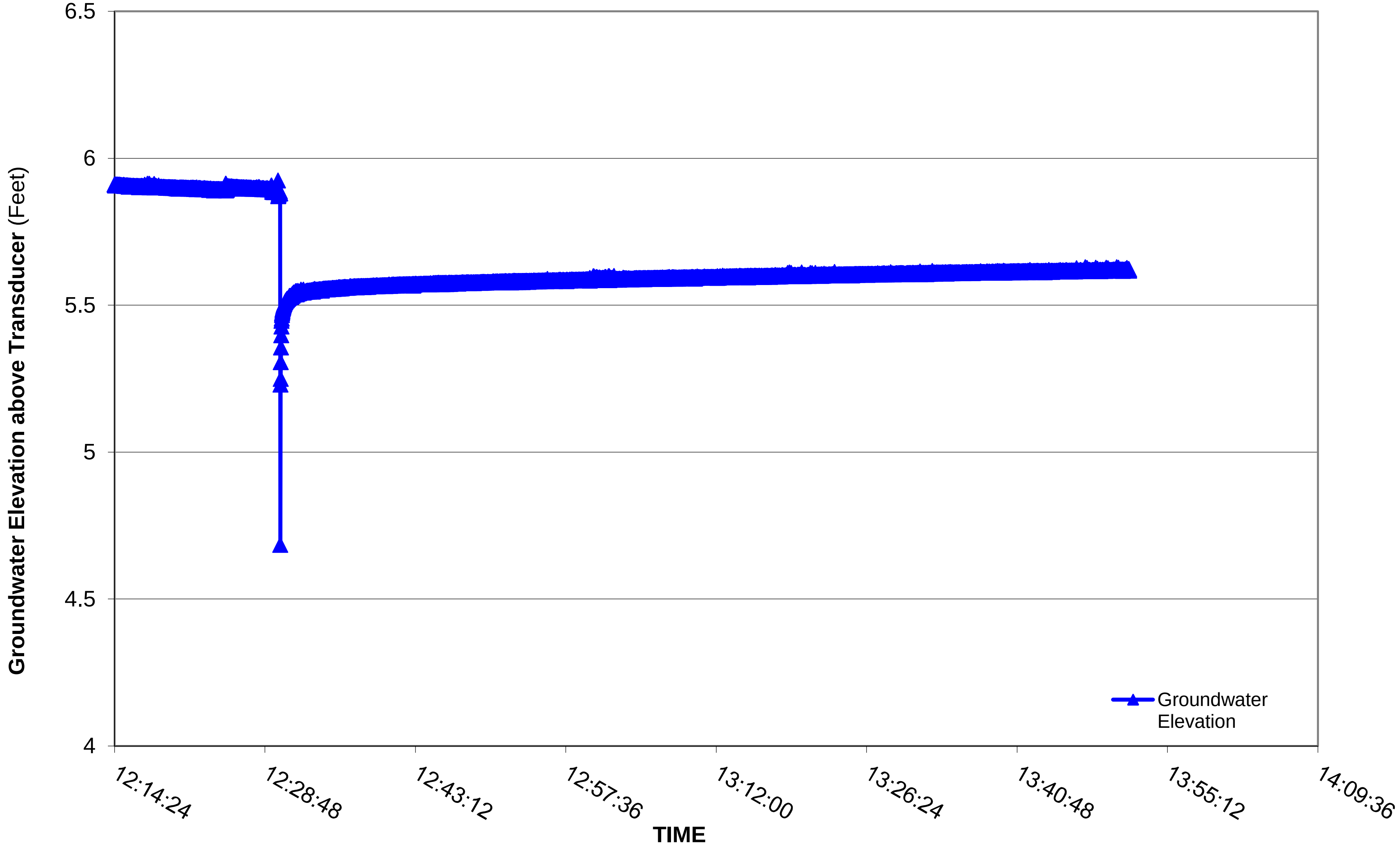
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-20 (Slug Test 1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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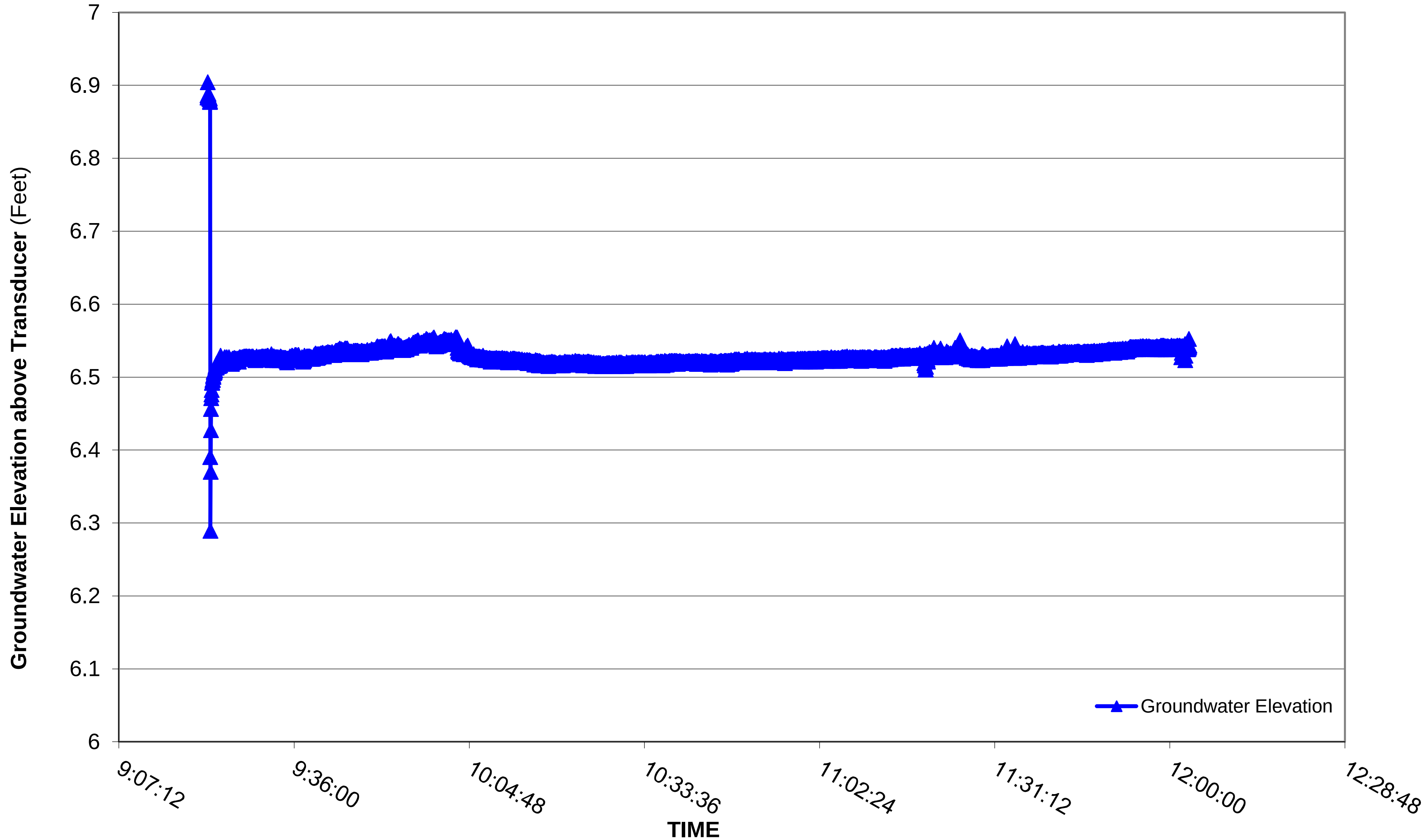
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-20 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



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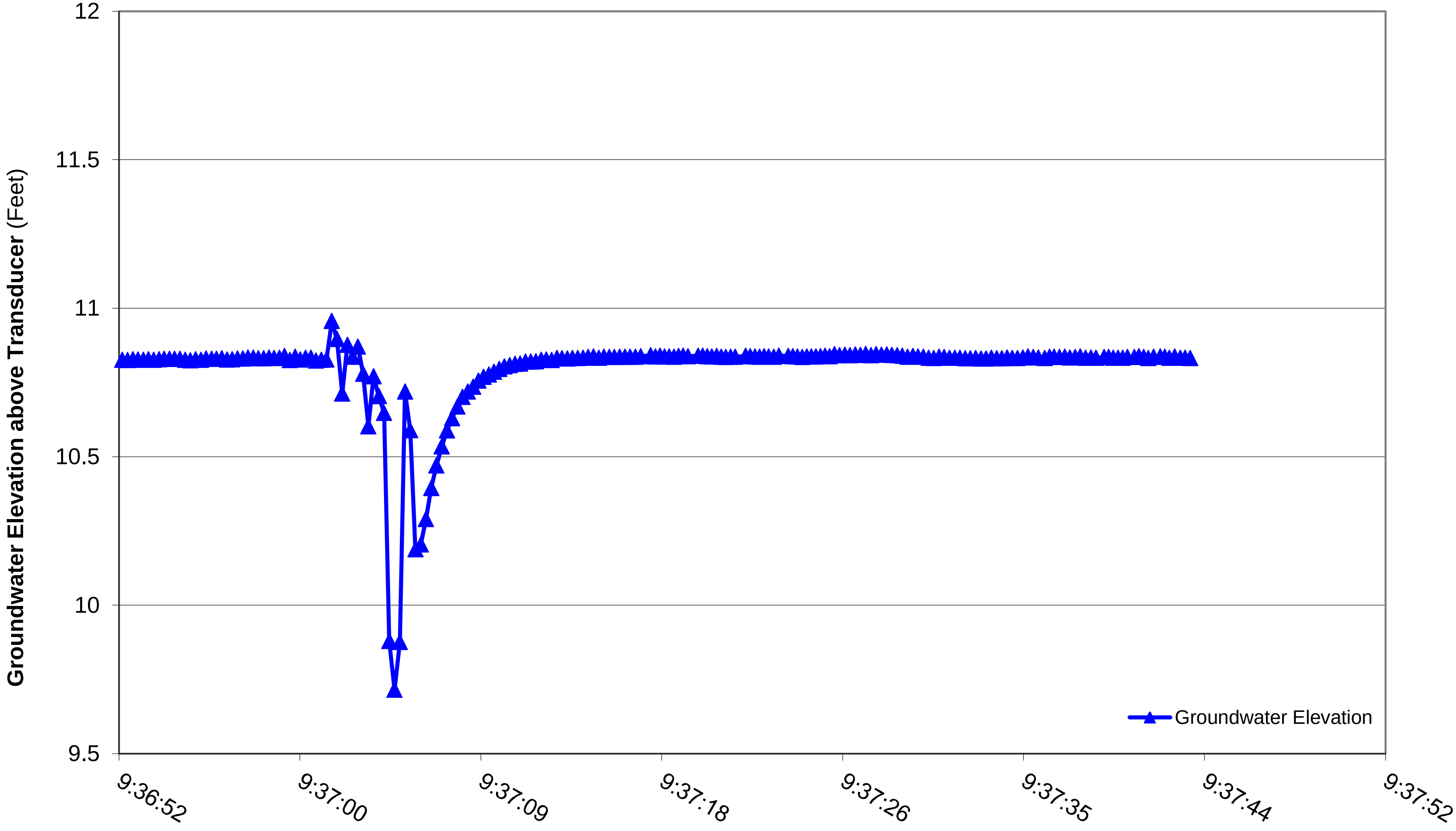
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-21 (Slug Test 1)
September 2010

Former Pratt Oil Works
Long Island City, New York



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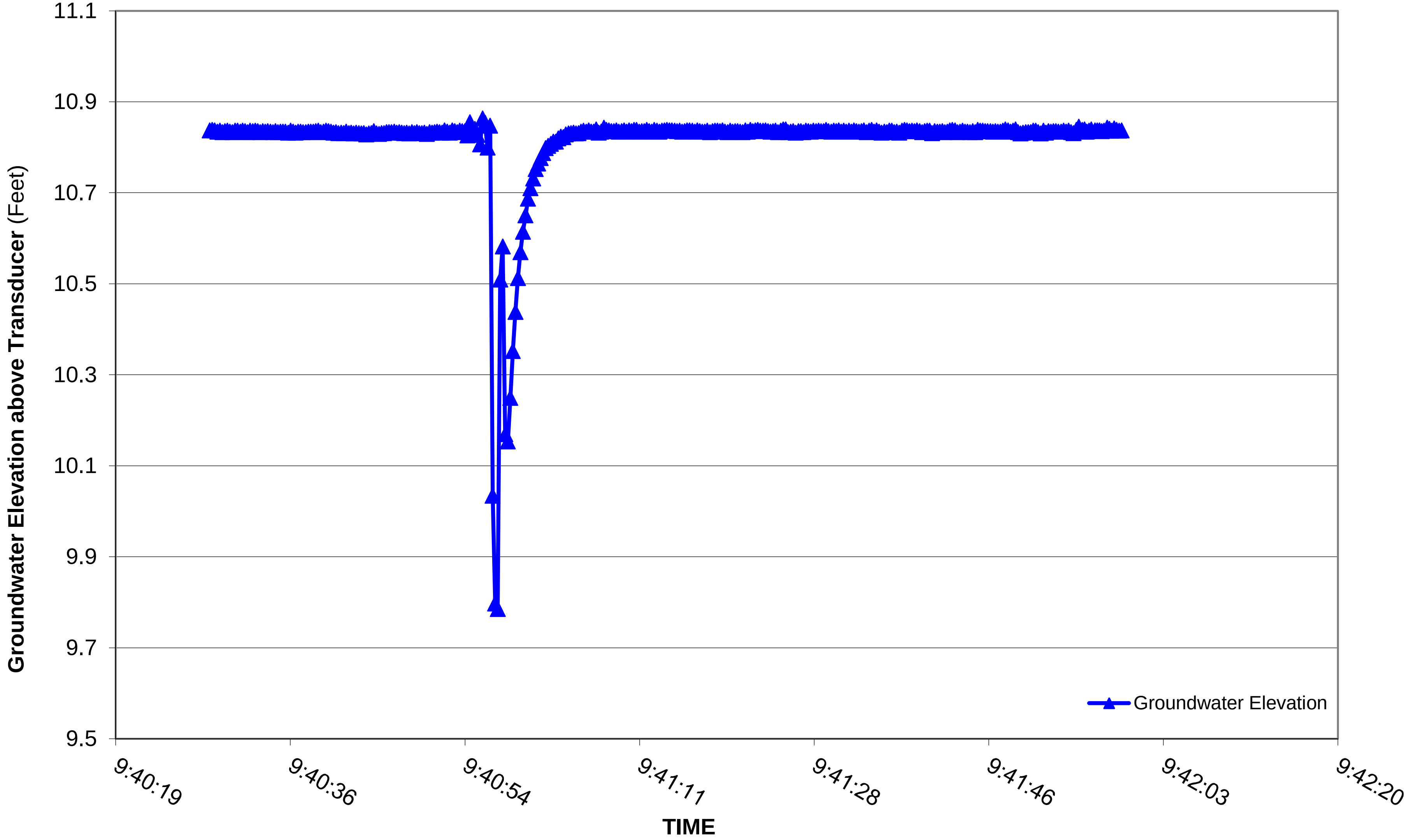
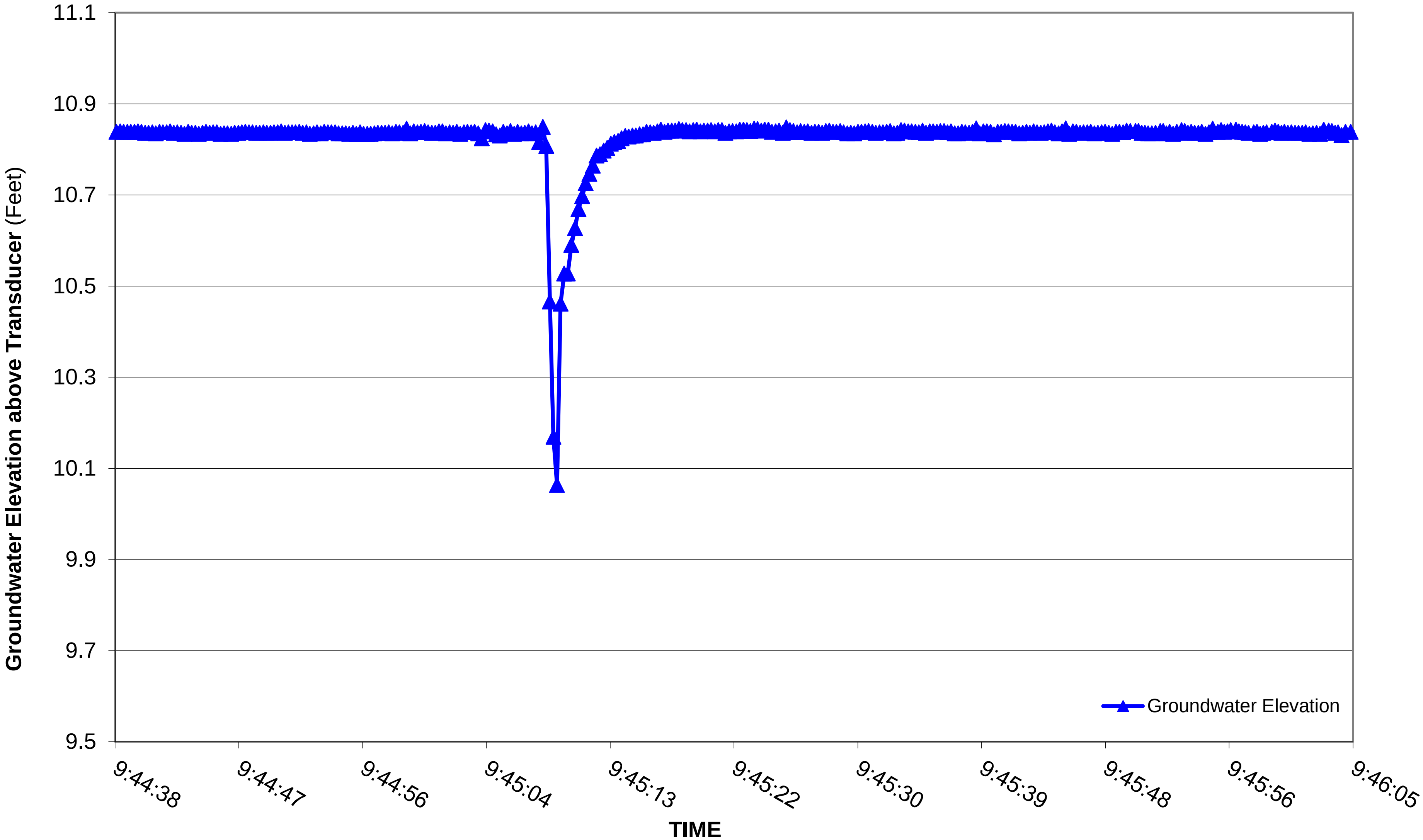
GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-21 (Slug Test 2)
September 2010

Former Pratt Oil Works
Long Island City, New York



GROUNDWATER ELEVATION ABOVE TRANSDUCER VERSE TIME - MW-21 (Slug Test 3)
September 2010

Former Pratt Oil Works
Long Island City, New York



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APPENDIX C

AQTESOLV® Solution Description

Bouwer-Rice (1976) Solution for a Slug Test in an Unconfined Aquifer

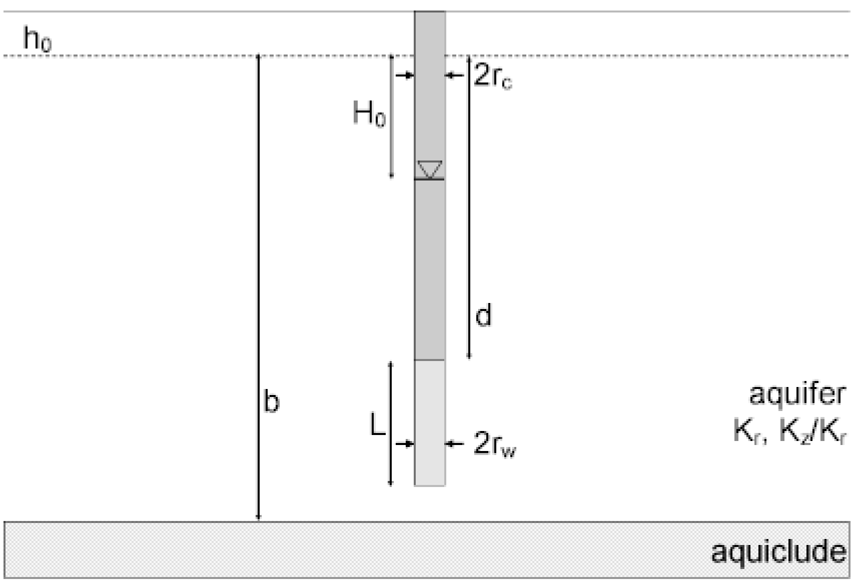
(Match > Solution)

Bouwer and Rice (1976) developed a semi-analytical method for the analysis of an overdamped slug test in a fully or partially penetrating well in an unconfined aquifer. The Bouwer-Rice method employs a quasi-steady-state model that ignores elastic storage in the aquifer.

In cases of noninstantaneous test initiation, apply the translation method of Pandit and Miner (1986) prior to analyzing the data.

If the test well is screened across the water table, you may apply an optional correction for the effective porosity of the filter pack. When the test well is fully submerged (i.e., screened below the water table) or the aquifer is confined, the correction is unnecessary.

- **Illustration**



- **Equations**

Bouwer and Rice (1976) developed an empirical relationship describing the water-level response in an unconfined aquifer due to the instantaneous injection or withdrawal of water from a well:

$$\ln(H_0) - \ln(h) = \frac{2KLt}{r_{ce}^2 \ln(r_e / r_{we})}$$

$$r_{we} = r_w \sqrt{K_z / K_r}$$

where

- h is displacement at time t [L]
- H_0 is initial displacement [L]

- K, K_r is radial hydraulic conductivity [L/T]
- K_z is vertical hydraulic conductivity [L/T]
- L is screen length [L]
- n_e is filter pack effective porosity [dimensionless]
- r_c is nominal casing radius [L]
- r_{ce} is effective casing radius (= r_c when well screen is fully submerged) [L]
- r_e is external radius [L]
- r_w is well radius [L]
- r_{we} is equivalent well radius [L]
- t is time [T]

The term $\ln(r_e/r_{we})$ is an empirical quantity that accounts for well geometry (Bouwer and Rice 1976).

Zlotnik (1994) proposed an equivalent well radius (r_{we}) for a partially penetrating well in an anisotropic aquifer. Enter the anisotropy ratio in the aquifer data for the slug test well; the well radius is unchanged when the anisotropy ratio is set to unity (1.0).

- **Assumptions**
  - aquifer has infinite areal extent
  - aquifer is homogeneous and of uniform thickness
  - test well is fully or partially penetrating
  - aquifer is unconfined
  - flow to well is quasi-steady-state (storage is negligible)
  - volume of water, V, is injected into or discharged from the well instantaneously
- **Data Requirements**
  - test well measurements (time and displacement)
  - initial displacement
  - casing radius and well radius
  - depth to top of well screen and screen length
  - saturated thickness

- porosity of gravel pack for well screened across water table (optional)
- hydraulic conductivity anisotropy ratio (for partially penetrating wells)

- **Estimated Parameters**
  - K (hydraulic conductivity)
  - y0 (intercept of line on y axis)
- **Curve Matching Tips**
- **References**

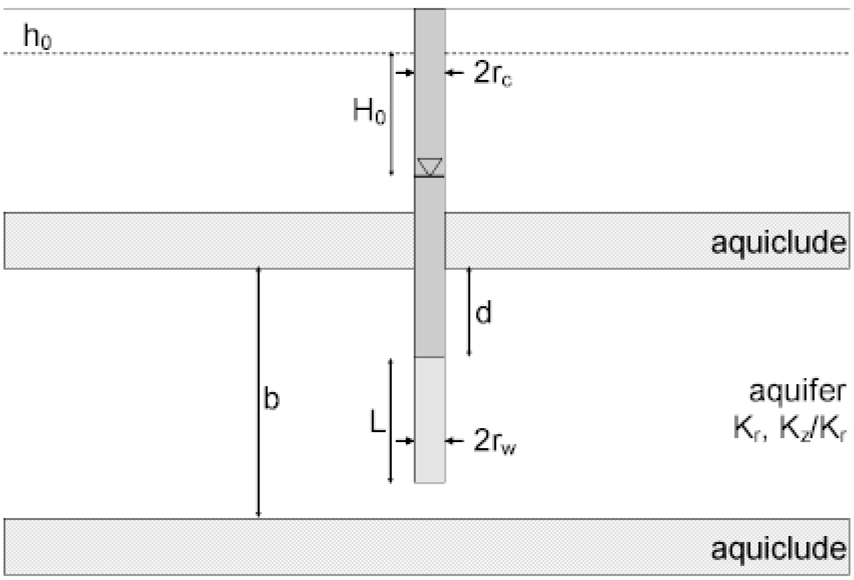
Bouwer-Rice (1976) Solution for a Slug Test in a Confined Aquifer

(Match > Solution)

Bouwer (1989) observed that the Bouwer-Rice (1976) model for a slug test in an unconfined aquifer also could be applied to approximate conditions in confined aquifers. This is due to the fact that the water-table boundary in an unconfined aquifer has little effect on slug test response unless the top of the well screen is positioned close to the boundary.

In cases of noninstantaneous test initiation, apply the translation method of Pandit and Miner (1986) prior to analyzing the data.

- **Illustration**



- **Equations**

  Refer to the equations for the Bouwer-Rice (1976) solution which Bouwer (1989) proposed to use for both confined and unconfined aquifers.

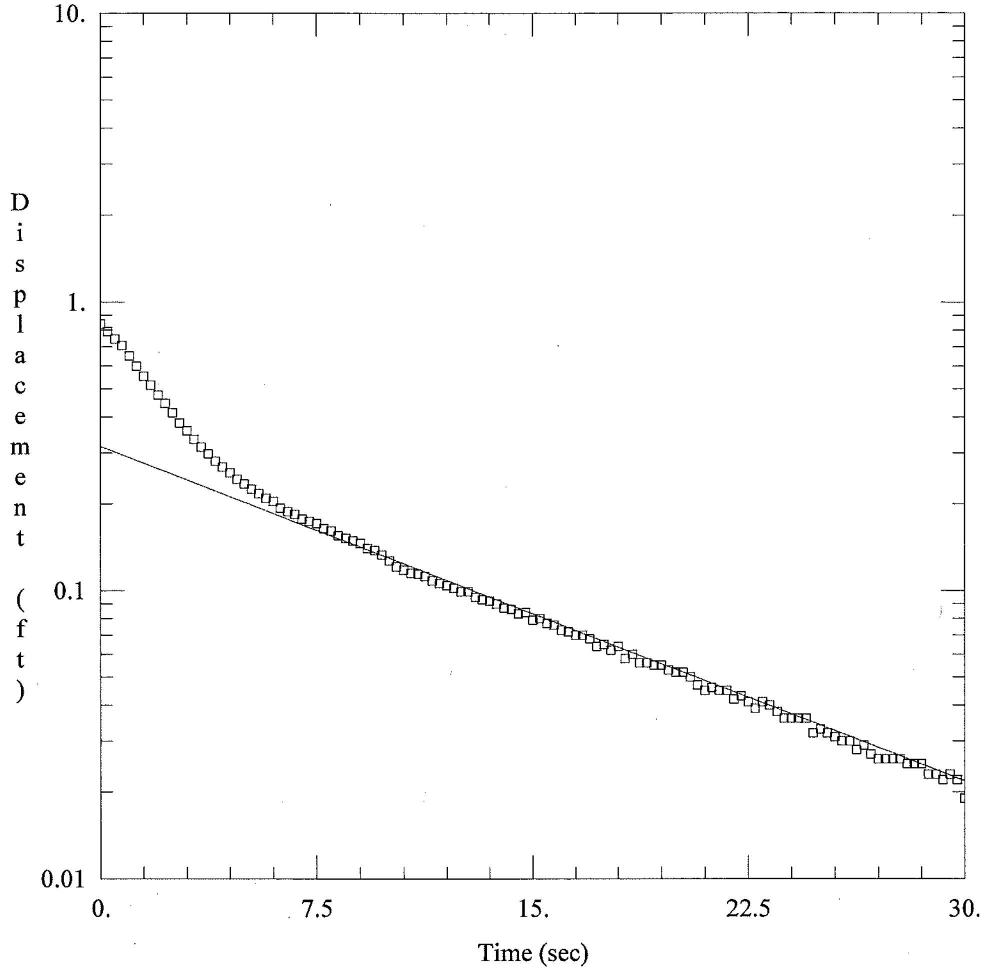
  Note that the correction for filter pack porosity only applies to wells screened across the water table. For the confined variant of the Bouwer-Rice solution, the filter pack correction is unnecessary.

- **Assumptions**
  - aquifer has infinite areal extent
  - aquifer is homogeneous and of uniform thickness
  - test well is fully or partially penetrating
  - aquifer is confined
  - flow to well is quasi-steady-state (storage is negligible)
  - volume of water, V, is injected into or discharged from the well instantaneously

- **Data Requirements**
  - test well measurements (time and displacement)
  - initial displacement
  - casing radius and well radius
  - depth to top of well screen and screen length
  - saturated thickness
  - hydraulic conductivity anisotropy ratio (for partially penetrating wells)
- **Estimated Parameters**
  - K (hydraulic conductivity)
  - y0 (intercept of line on y axis)
- **Curve Matching Tips**
- **References**

APPENDIX D

Slug Test Analysis AQTESOLV® Software Output



MW-1: RISING HEAD TEST 1

Data Set: L:\...\MW-1 (Test-1) FPOW.aqt
Date: 11/29/10 Time: 12:20:46

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-1
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 9.96 ft
Anisotropy Ratio (Kz/Kr): 0.1

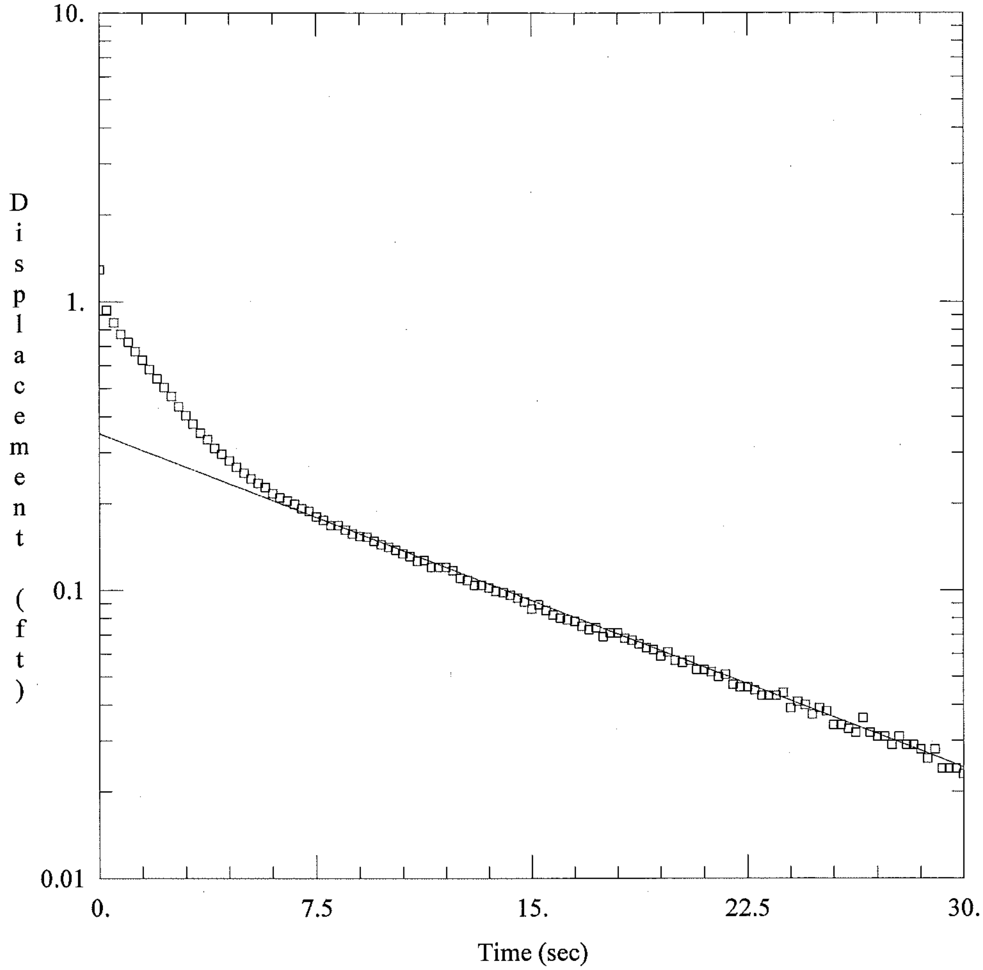
WELL DATA (MW-1)

Initial Displacement: 0.84 ft
Total Well Penetration Depth: 9.96 ft
Casing Radius: 0.167 ft
Static Water Column Height: 9.96 ft
Screen Length: 9.96 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 56.72 ft/day
y0 = 0.3158 ft



MW-1: RISING HEAD TEST 2

Data Set: L:\...\MW-1 (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:20:53

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-1
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 9.96 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-1)

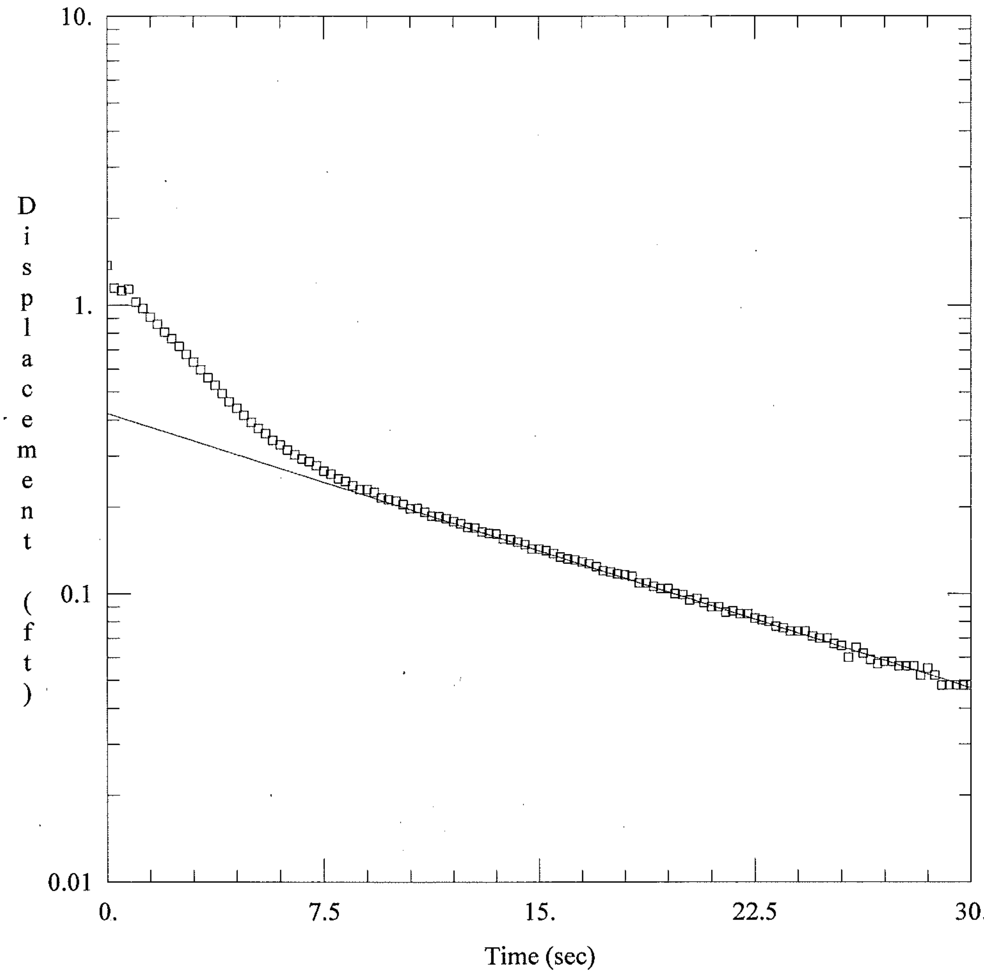
Initial Displacement: 1.29 ft
Total Well Penetration Depth: 9.96 ft
Casing Radius: 0.167 ft

Static Water Column Height: 9.96 ft
Screen Length: 9.96 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 51.25 ft/day y0 = 0.3486 ft



MW-1: RISING HEAD TEST 3

Data Set: L:\...\MW-1 (Test-3) FPOW.aqt
Date: 11/29/10 Time: 12:20:58

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-1
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 9.96 ft Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-1)

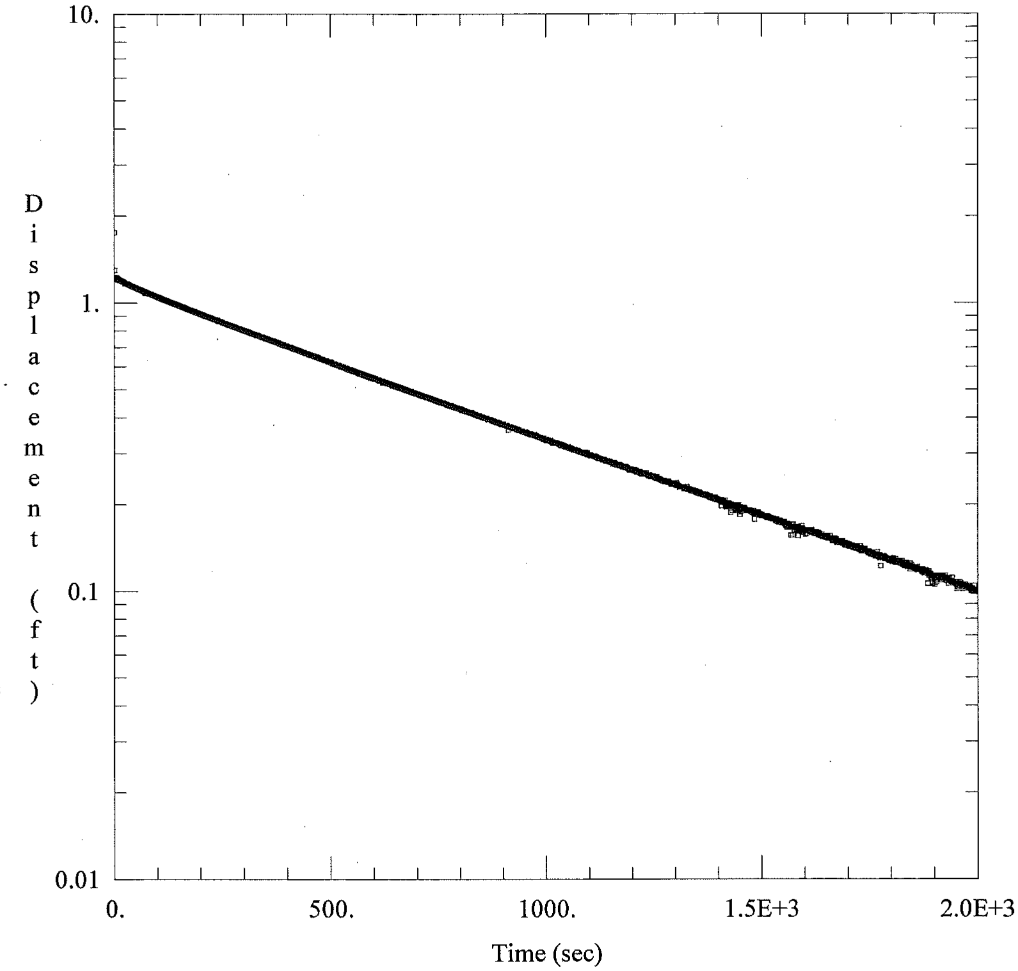
Initial Displacement: 1.37 ft
Total Well Penetration Depth: 9.96 ft
Casing Radius: 0.167 ft

Static Water Column Height: 9.96 ft
Screen Length: 9.96 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 46.52 ft/day y0 = 0.4213 ft



MW-4D: RISING HEAD TEST 1

Data Set: L:\...\MW-4D (Test-1) FPOW.aqt
Date: 11/29/10 Time: 12:21:14

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-4D
Test Date: 9/1/2010

AQUIFER DATA

Saturated Thickness: 98. ft
Anisotropy Ratio (Kz/Kr): 0.1

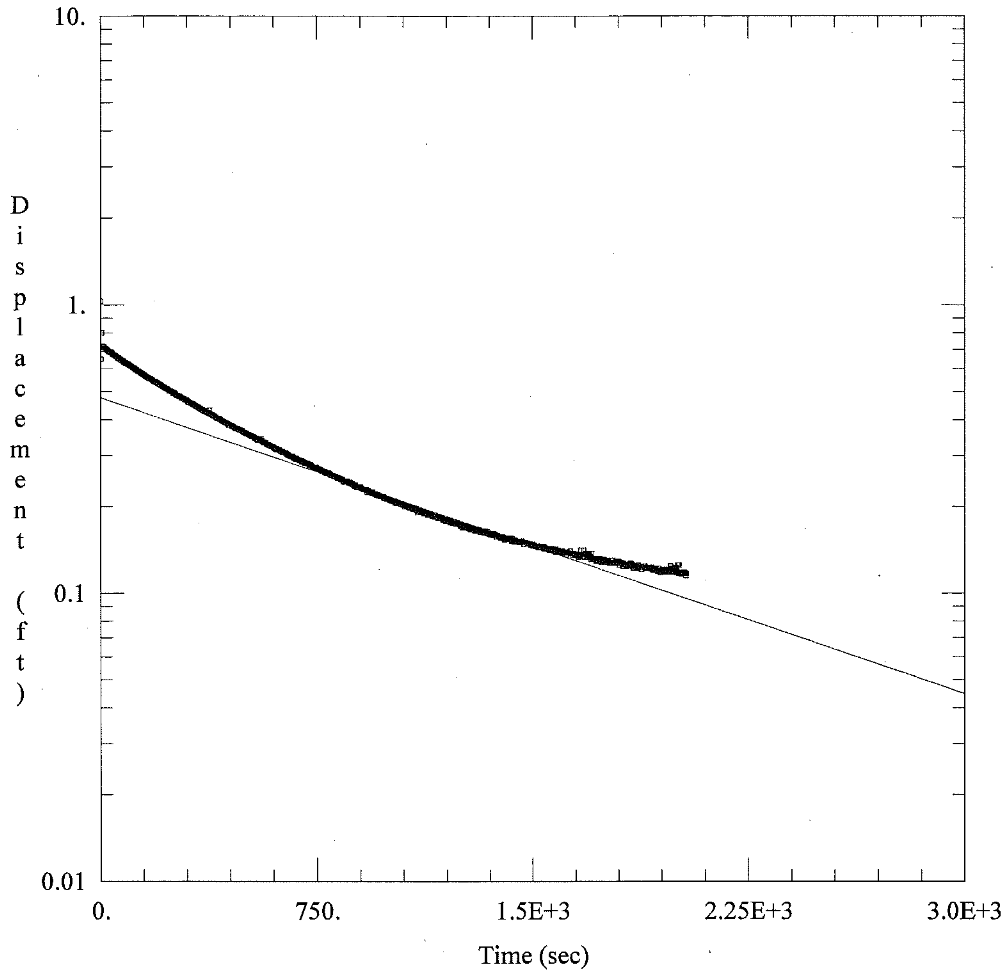
WELL DATA (MW-4D)

Initial Displacement: 1.75 ft
Total Well Penetration Depth: 7.5 ft
Casing Radius: 0.167 ft
Static Water Column Height: 11.13 ft
Screen Length: 5. ft
Well Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.6779 ft/day
y0 = 1.184 ft



MW-4D: FALLING HEAD TEST 2

Data Set: L:\...\MW-4D (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:21:18

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-4D
Test Date: 9/1/2010

AQUIFER DATA

Saturated Thickness: 98. ft
Anisotropy Ratio (Kz/Kr): 0.1

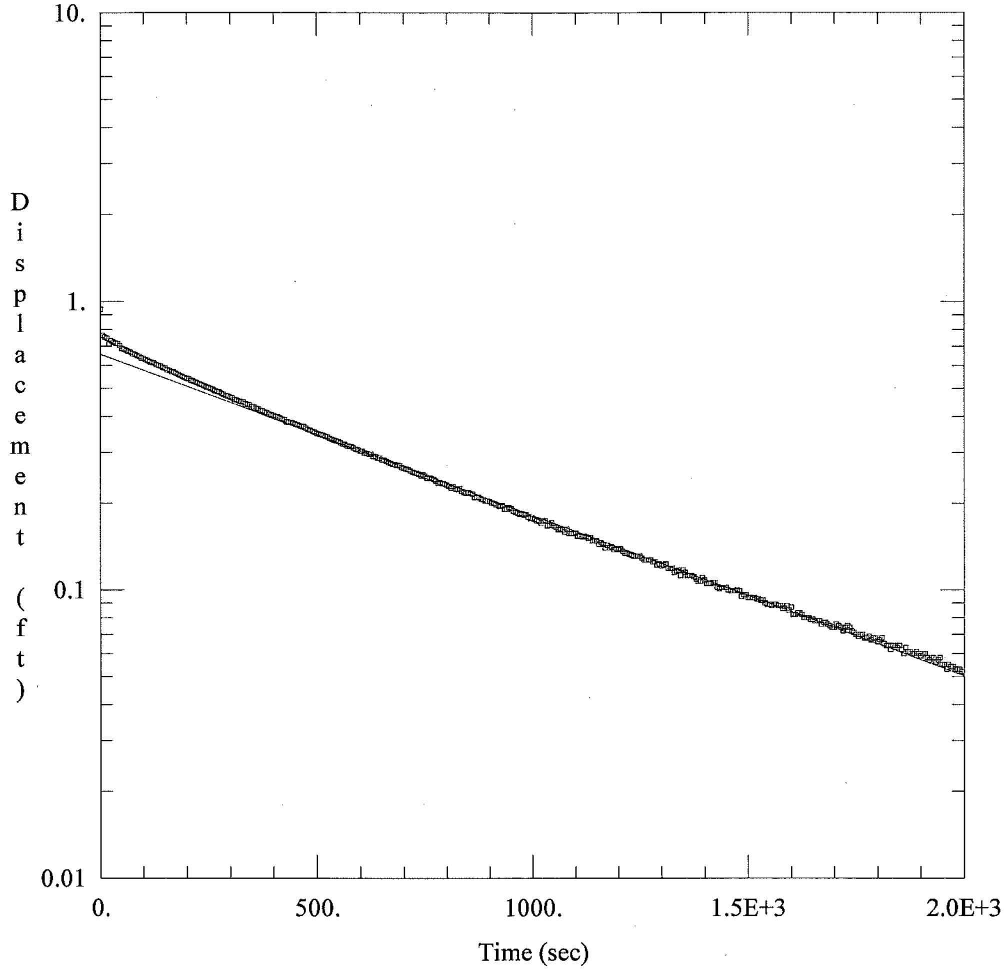
WELL DATA (MW-4D)

Initial Displacement: 1.03 ft
Total Well Penetration Depth: 7.5 ft
Casing Radius: 0.167 ft
Static Water Column Height: 11.18 ft
Screen Length: 5. ft
Well Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.4308 ft/day
y0 = 0.4764 ft



MW-4D: RISING HEAD TEST 3

Data Set: L:\...\MW-4D (Test-3) FPOW.aqt
Date: 11/29/10 Time: 12:21:21

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-4D
Test Date: 9/1/2010

AQUIFER DATA

Saturated Thickness: 98. ft
Anisotropy Ratio (Kz/Kr): 0.1

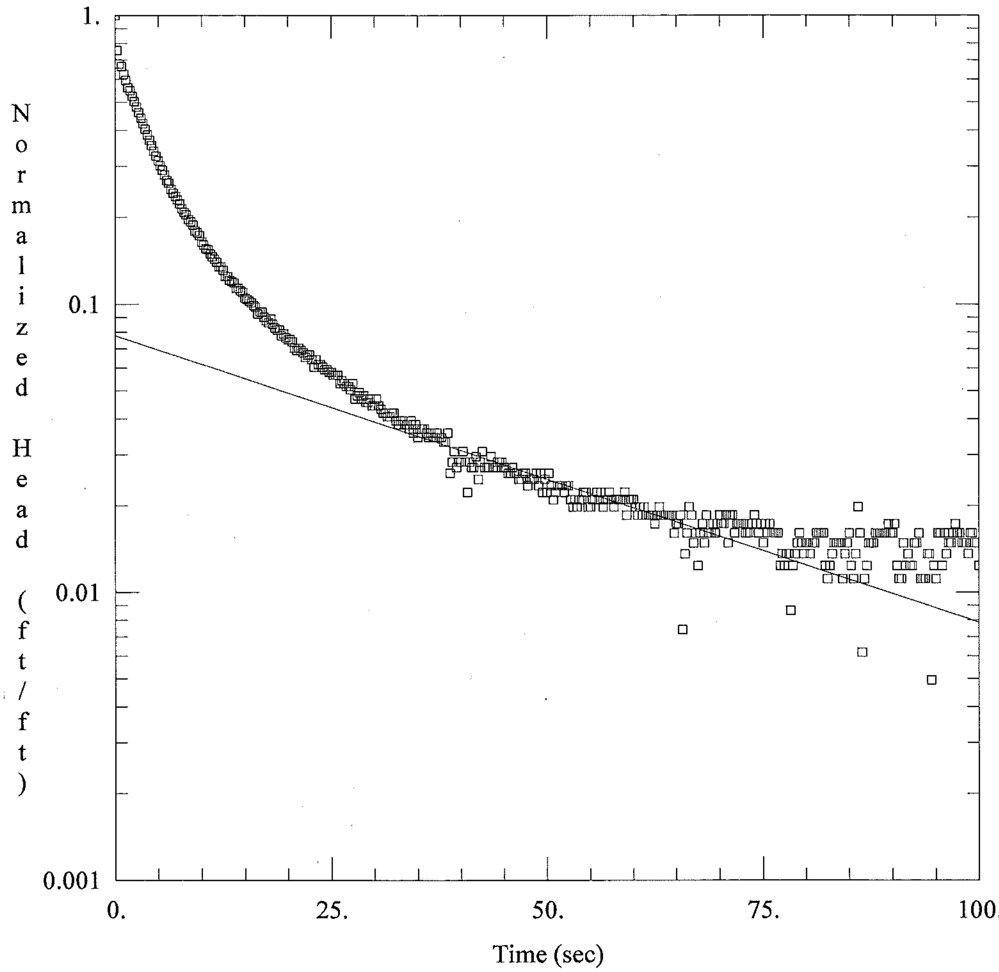
WELL DATA (MW-4D)

Initial Displacement: 0.94 ft
Total Well Penetration Depth: 7.5 ft
Casing Radius: 0.167 ft
Static Water Column Height: 11.18 ft
Screen Length: 5. ft
Well Radius: 0.5 ft

SOLUTION

Aquifer Model: Confined
Solution Method: Bouwer-Rice

K = 0.7023 ft/day
y0 = 0.6571 ft



MW-10: RISING HEAD TEST 1

Data Set: L:\...\MW-10 (Test-1) FPOW.aqt
Date: 11/29/10 Time: 12:21:50

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-10
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.61 ft
Anisotropy Ratio (Kz/Kr): 0.1

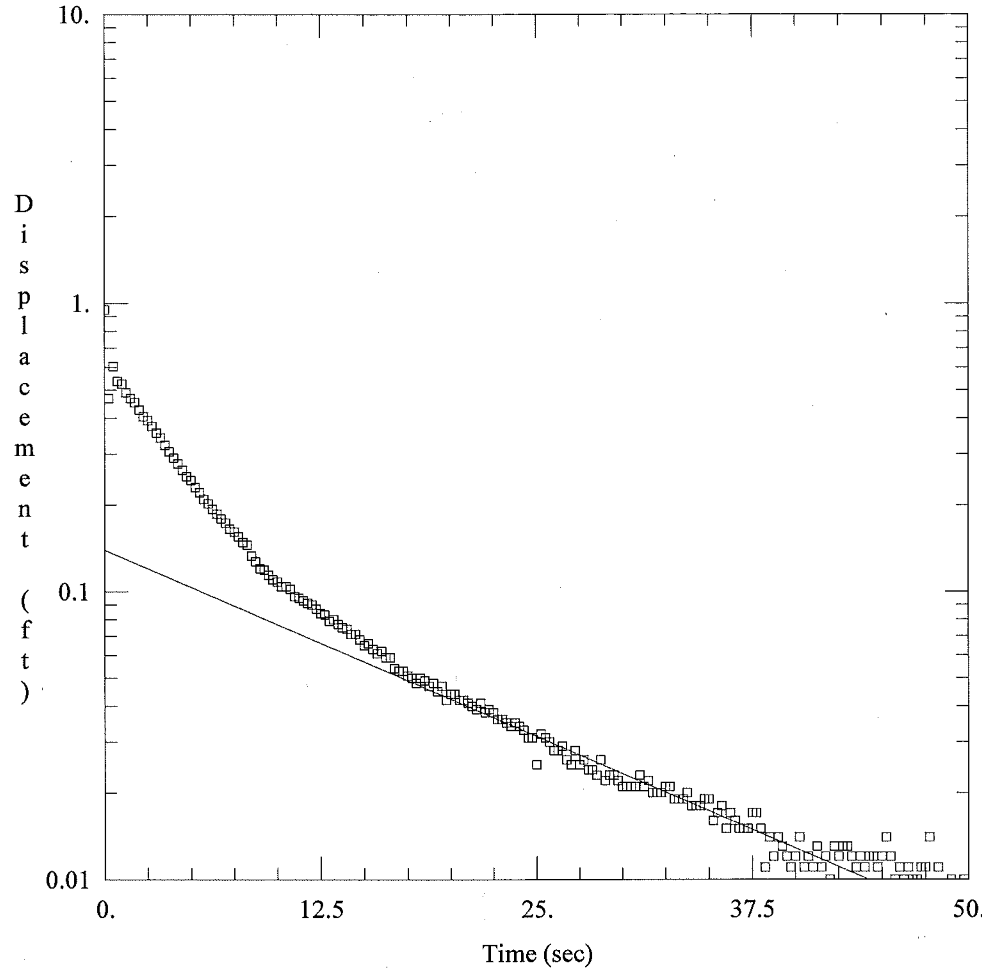
WELL DATA (MW-10)

Initial Displacement: 0.81 ft
Total Well Penetration Depth: 4.61 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.61 ft
Screen Length: 4.61 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 75.59 ft/day
y0 = 0.06297 ft



MW-10: RISING HEAD TEST 2

Data Set: L:\...\MW-10 (Test-2) FPOW.aqt
Date: 11/29/10
Time: 12:21:56

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-10
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.62 ft
Anisotropy Ratio (Kz/Kr): 0.1

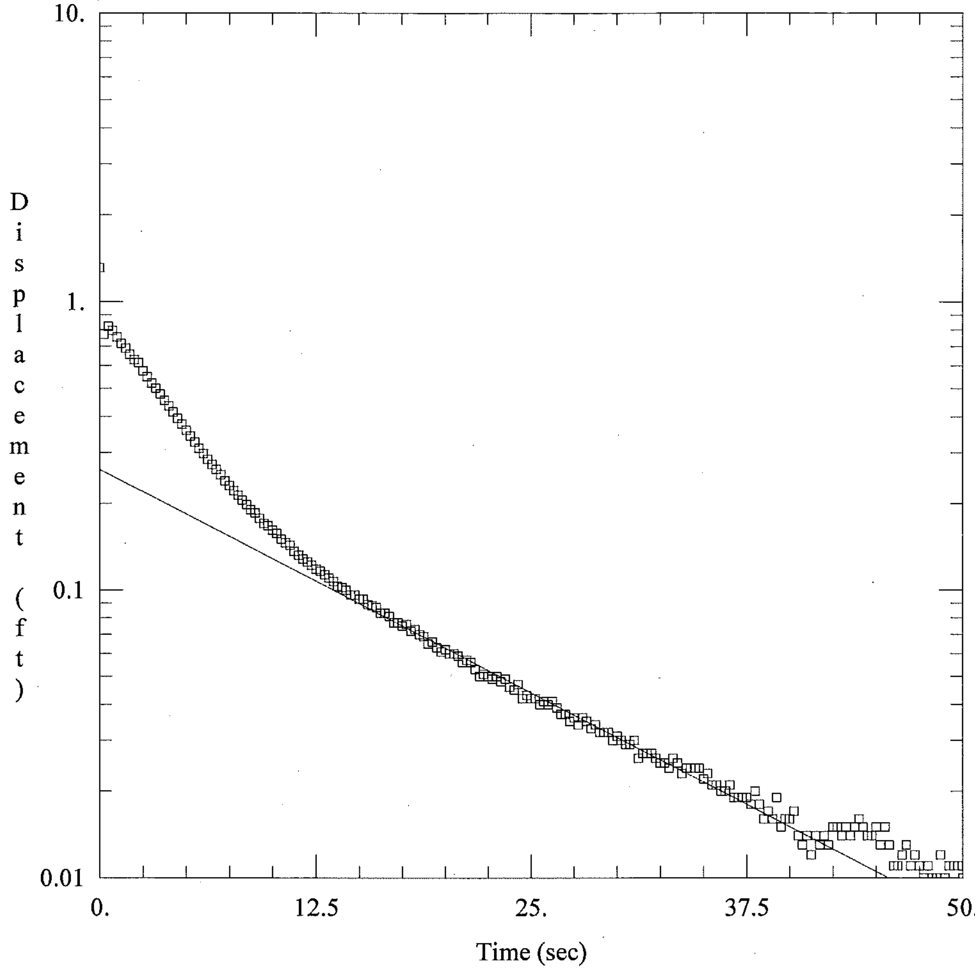
WELL DATA (MW-10)

Initial Displacement: 0.95 ft
Total Well Penetration Depth: 4.62 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.62 ft
Screen Length: 4.62 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 88.74 ft/day
y0 = 0.1393 ft



MW-10: RISING HEAD TEST 3

Data Set: L:\...\MW-10 (Test-3) FPOW.aqt
Date: 11/29/10 Time: 12:22:01

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-10
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.62 ft
Anisotropy Ratio (Kz/Kr): 0.1

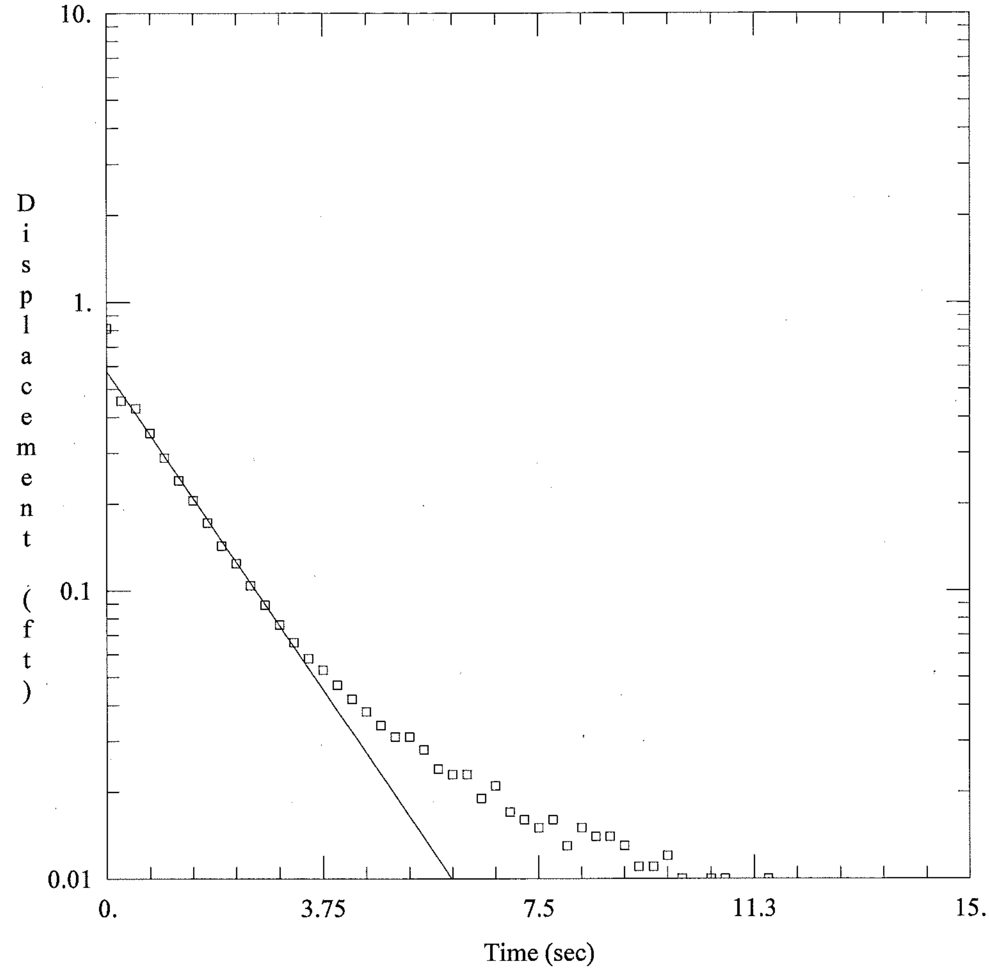
WELL DATA (MW-10)

Initial Displacement: 1.31 ft
Total Well Penetration Depth: 4.62 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.62 ft
Screen Length: 4.62 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 84.78 ft/day
y0 = 0.2623 ft



MW-13: RISING HEAD TEST 1

Data Set: L:\...\MW-13 (Test-1) FPOW.aqt
Date: 11/29/10
Time: 12:22:15

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-13
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

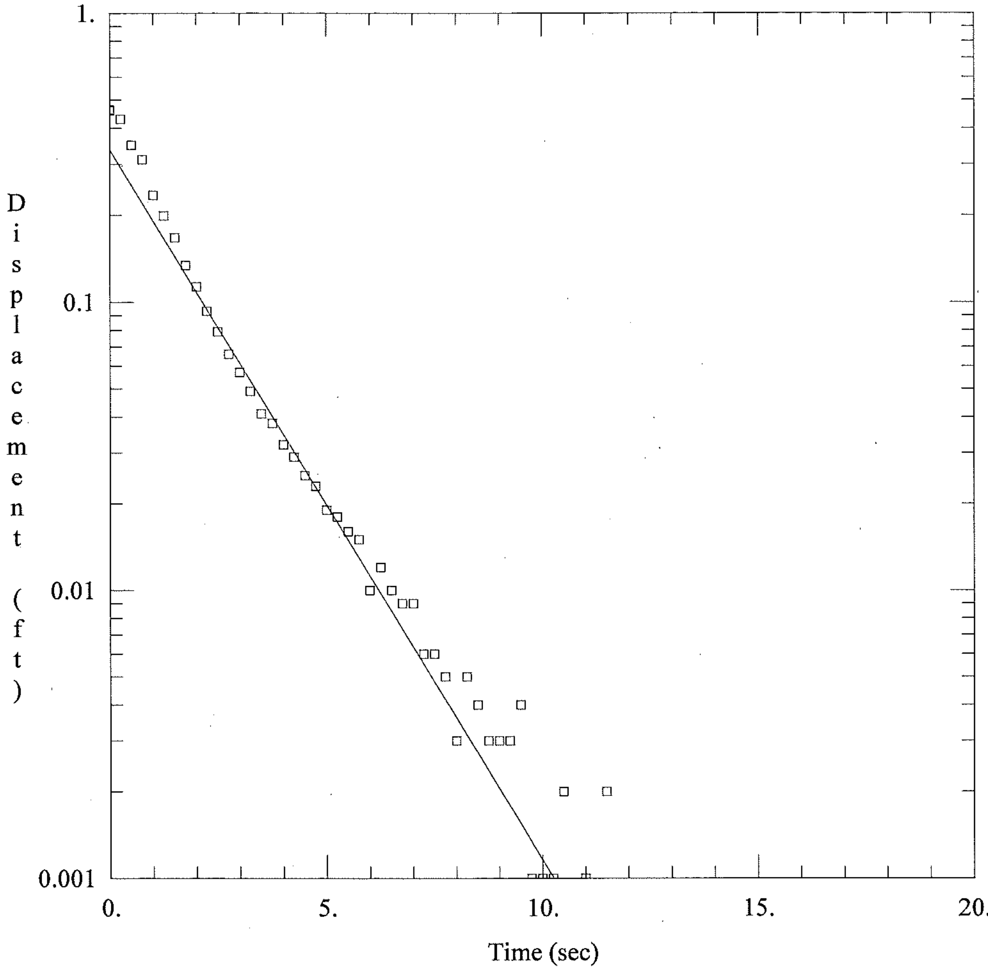
WELL DATA (MW-13)

Initial Displacement: 0.81 ft
Total Well Penetration Depth: 4.12 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.12 ft
Screen Length: 4.12 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 184.2 ft/day
y0 = 0.5768 ft



MW-13: RISING HEAD TEST 2

Data Set: L:\...\MW-13 (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:22:20

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-13
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

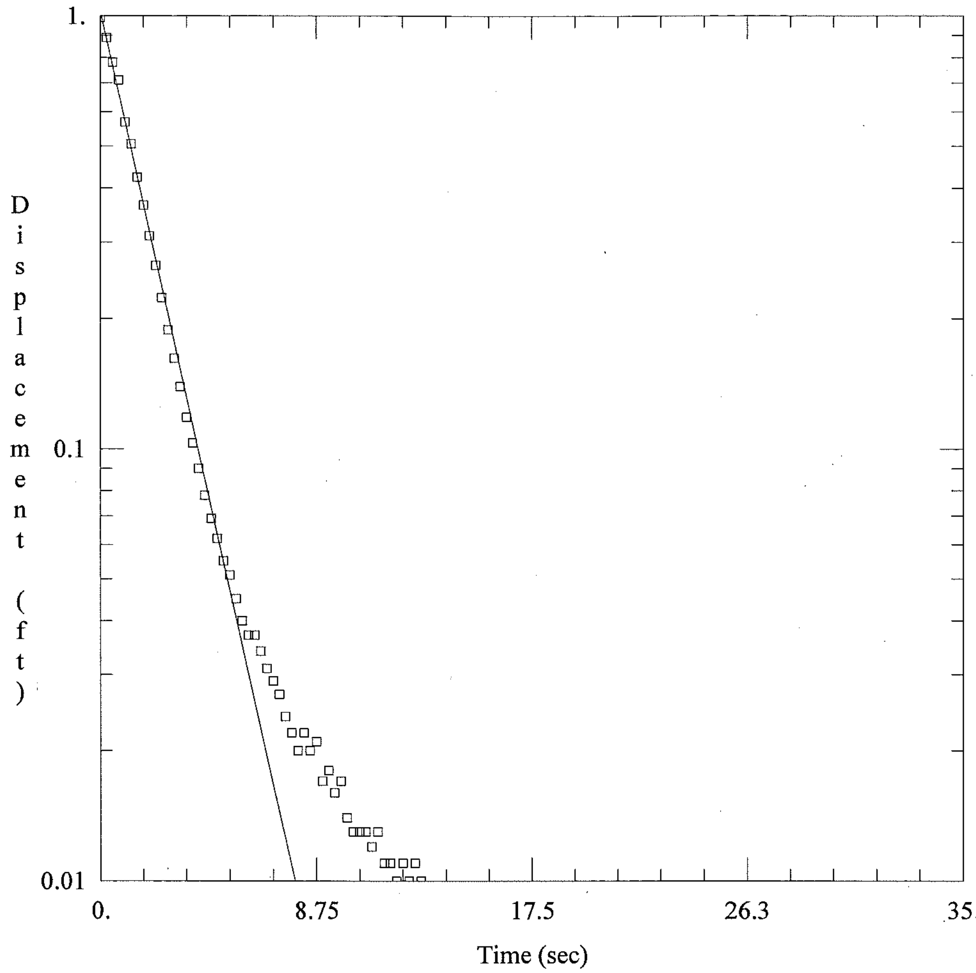
WELL DATA (MW-13)

Initial Displacement: 0.46 ft
Total Well Penetration Depth: 4.12 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.12 ft
Screen Length: 4.12 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 271.2 ft/day
y0 = 0.3357 ft



MW-13: RISING HEAD TEST 3

Data Set: L:\...\MW-13 (Test-3) FPOW.aqt
Date: 11/29/10 Time: 12:22:24

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-13
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 4.12 ft
Anisotropy Ratio (Kz/Kr): 0.1

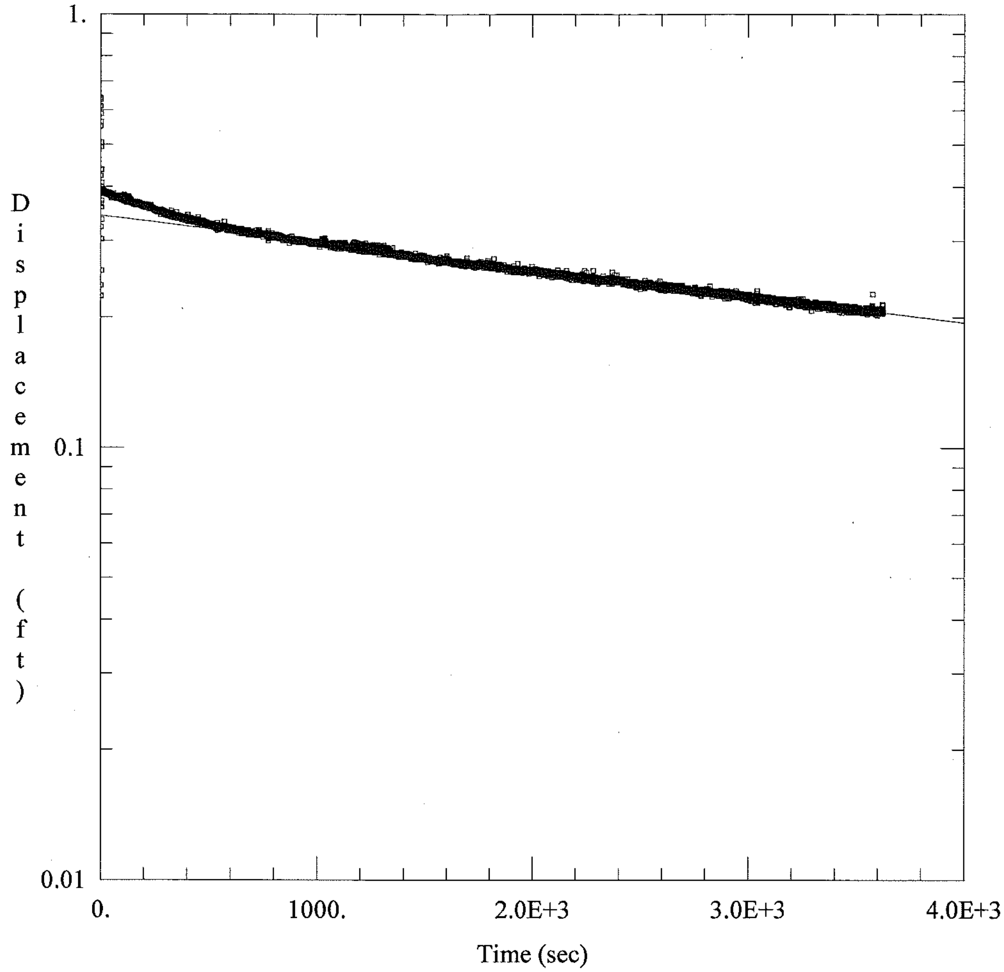
WELL DATA (MW-13)

Initial Displacement: 0.99 ft
Total Well Penetration Depth: 4.12 ft
Casing Radius: 0.167 ft
Static Water Column Height: 4.12 ft
Screen Length: 4.12 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 195.8 ft/day
y0 = 1.025 ft



MW-15: FALLING HEAD TEST 1

Data Set: L:\...\MW-15 (Test-1) FPOW.aqt
Date: 11/29/10 Time: 12:22:42

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-15
Test Date: 9/2/2010

AQUIFER DATA

Saturated Thickness: 102. ft
Anisotropy Ratio (Kz/Kr): 0.1

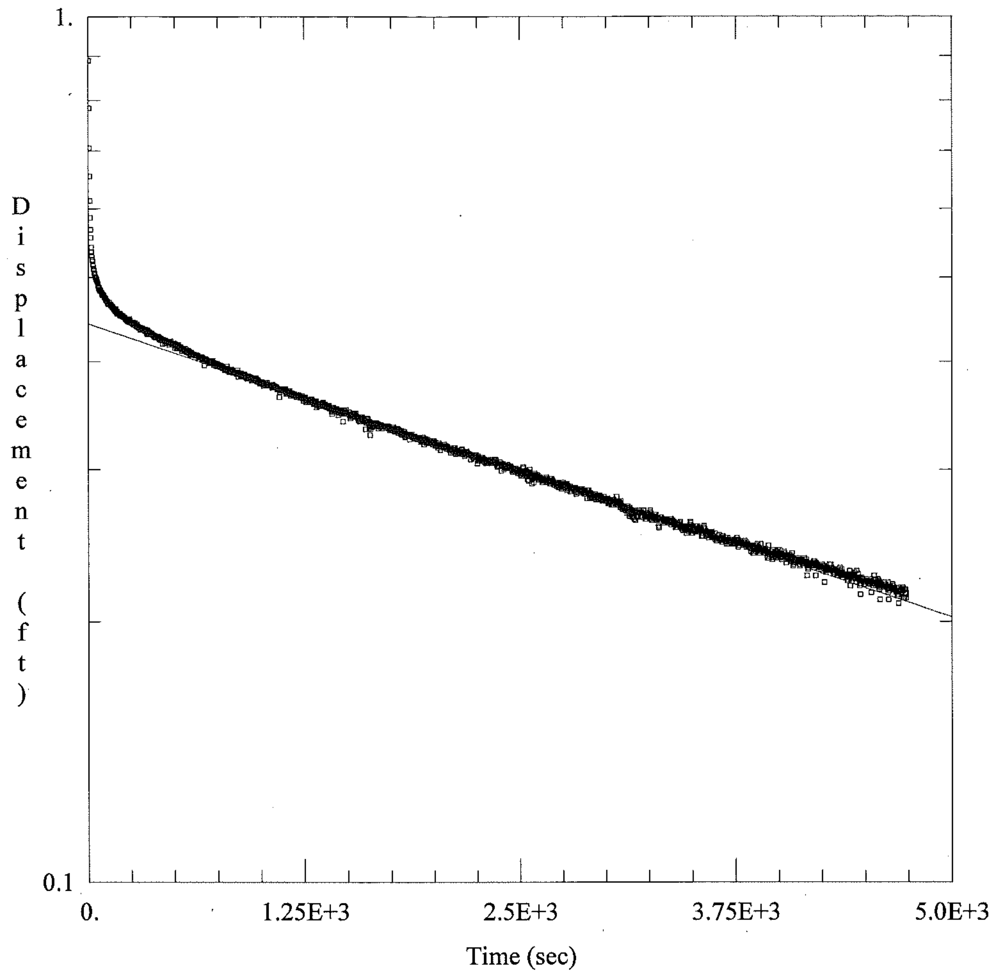
WELL DATA (MW-15)

Initial Displacement: 0.64 ft
Total Well Penetration Depth: 8.45 ft
Casing Radius: 0.167 ft
Static Water Column Height: 8.45 ft
Screen Length: 8.45 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1125 ft/day
y0 = 0.3432 ft



MW-15: RISING HEAD TEST 2

Data Set: L:\...\MW-15 (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:22:46

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-15
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 102. ft
Anisotropy Ratio (Kz/Kr): 0.1

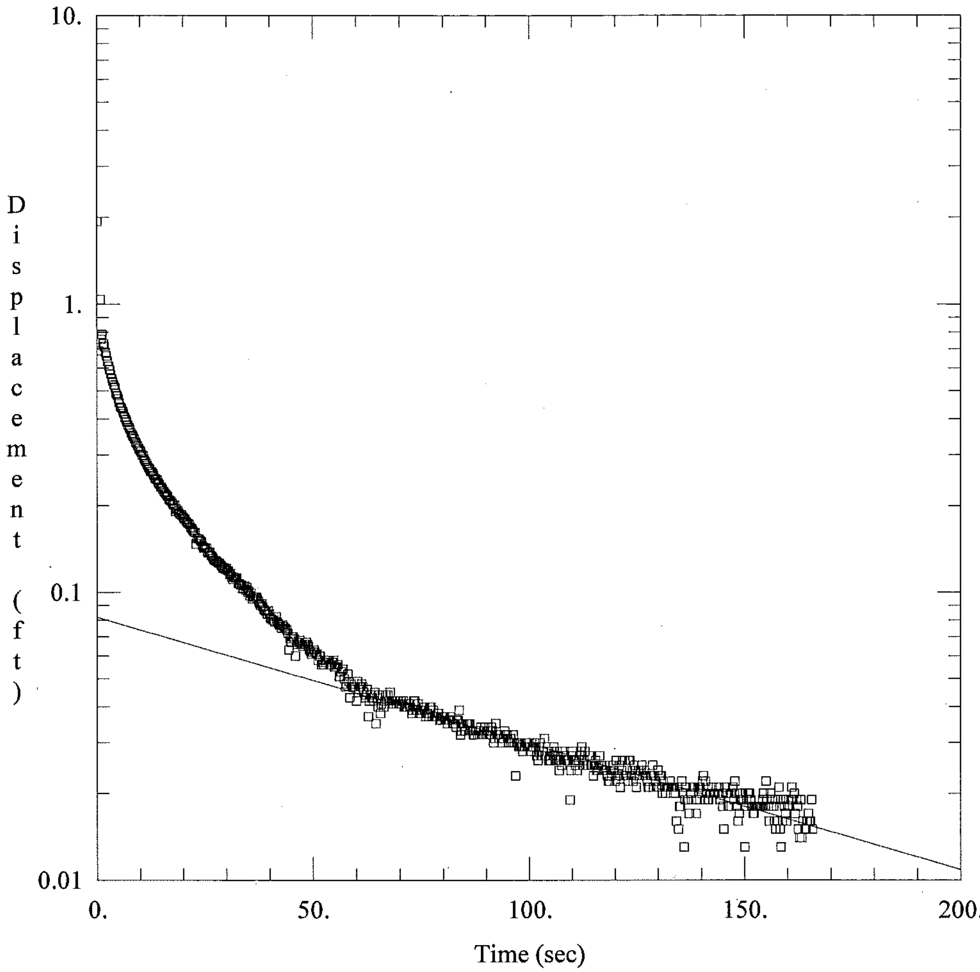
WELL DATA (MW-15)

Initial Displacement: 1.16 ft
Total Well Penetration Depth: 8.2 ft
Casing Radius: 0.167 ft
Static Water Column Height: 8.2 ft
Screen Length: 8.2 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.098 ft/day
y0 = 0.4421 ft



MW-16: RISING HEAD TEST 1

Data Set: L:\...\MW-16 (Test-1) FPOW.aqt
Date: 11/29/10
Time: 12:23:19

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-16
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 103. ft
Anisotropy Ratio (Kz/Kr): 0.1

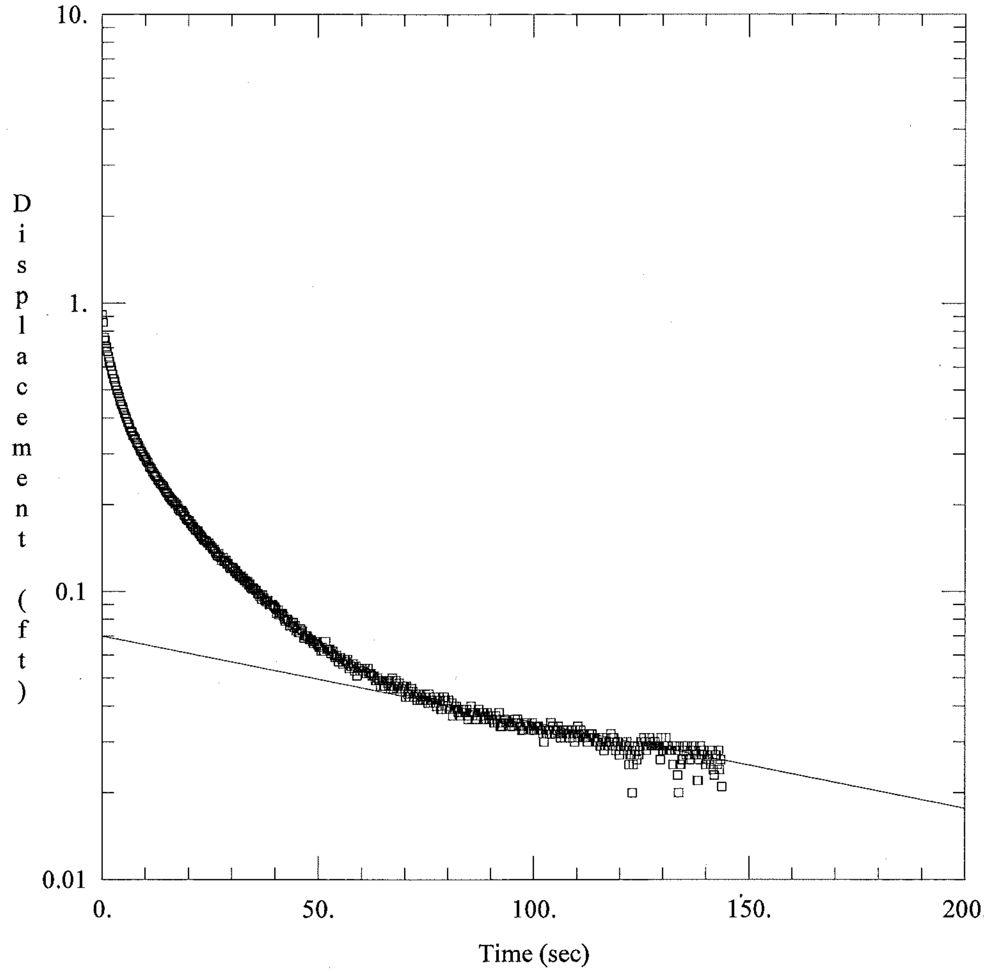
WELL DATA (MW-16)

Initial Displacement: 1.93 ft
Total Well Penetration Depth: 8.52 ft
Casing Radius: 0.167 ft
Static Water Column Height: 8.52 ft
Screen Length: 8.52 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 33.37 ft/day
y0 = 0.08177 ft



MW-16: RISING HEAD TEST 2

Data Set: L:\...\MW-16 (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:23:24

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-16
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 103. ft
Anisotropy Ratio (Kz/Kr): 0.1

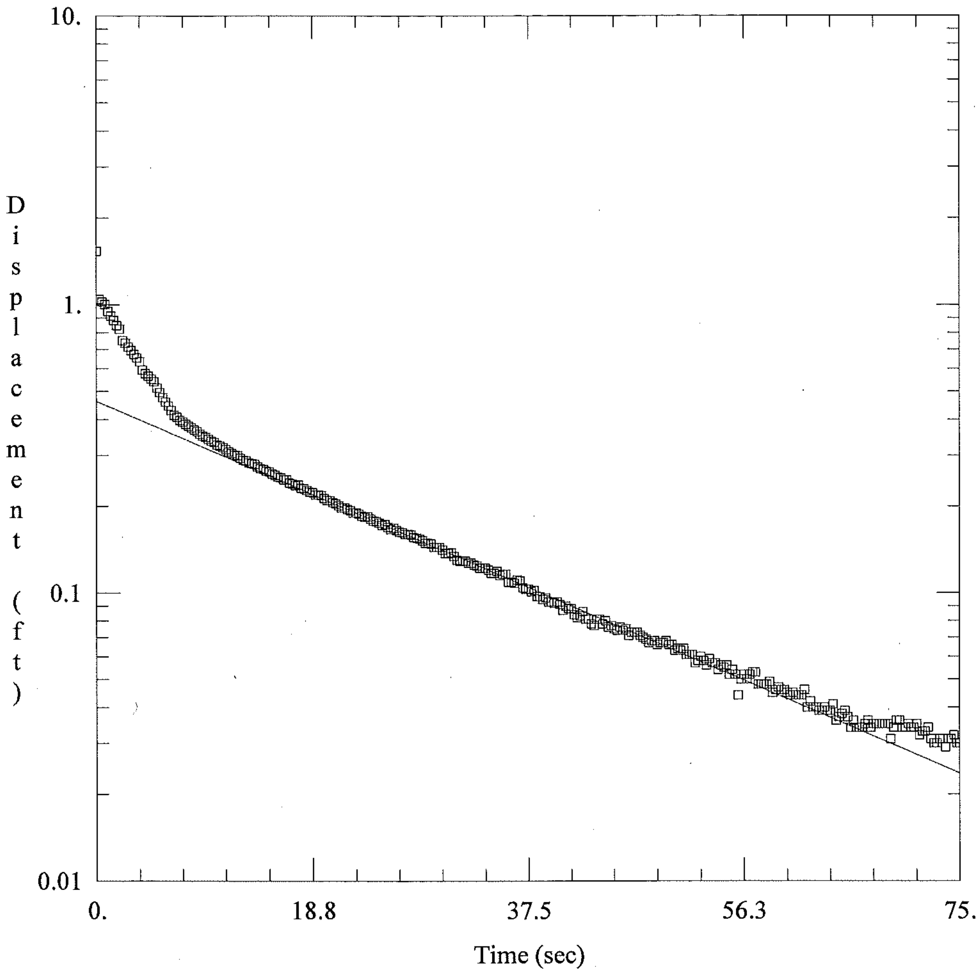
WELL DATA (MW-16)

Initial Displacement: 0.91 ft
Total Well Penetration Depth: 8.53 ft
Casing Radius: 0.167 ft
Static Water Column Height: 8.53 ft
Screen Length: 8.53 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 26.61 ft/day
y0 = 0.06993 ft



MW-16: RISING HEAD TEST 3

Data Set: L:\...\MW-16 (Test-3) FPOW.aqt
Date: 11/29/10 Time: 12:23:30

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-16
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 103. ft
Anisotropy Ratio (Kz/Kr): 0.1

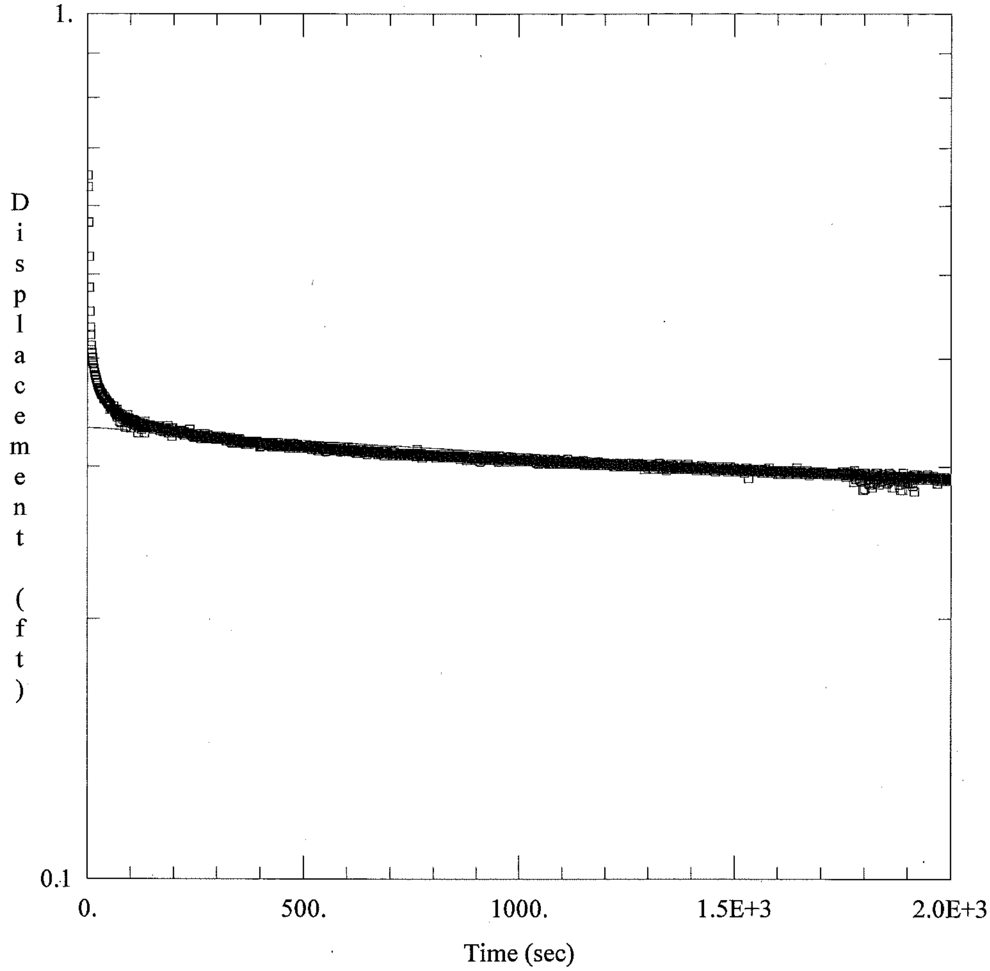
WELL DATA (MW-16)

Initial Displacement: 1.53 ft
Total Well Penetration Depth: 8.53 ft
Casing Radius: 0.167 ft
Static Water Column Height: 8.53 ft
Screen Length: 8.53 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 30.91 ft/day
y0 = 0.4624 ft



MW-20: RISING HEAD TEST 1

Data Set: L:\...\MW-20 (Test-1) FPOW.aqt
Date: 11/29/10 Time: 12:23:45

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-20
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 107. ft
Anisotropy Ratio (Kz/Kr): 0.1

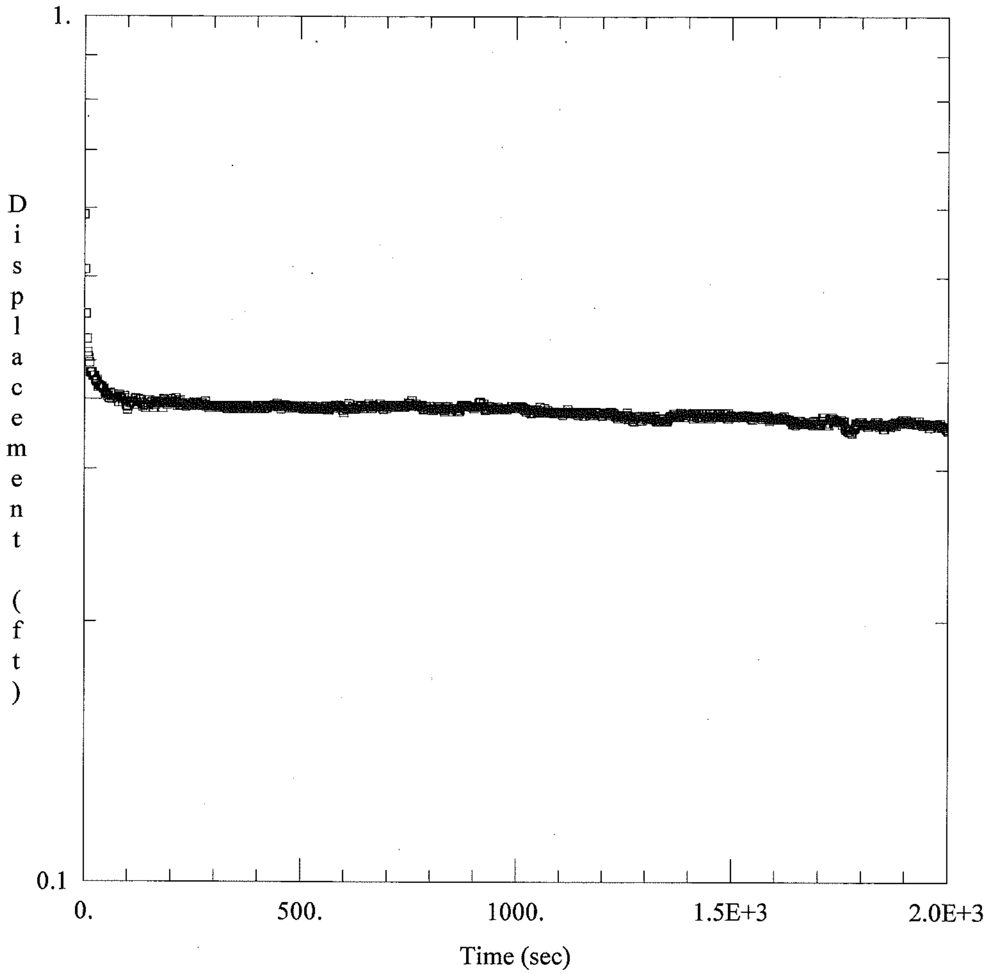
WELL DATA (MW-20)

Initial Displacement: 1.19 ft
Total Well Penetration Depth: 6.78 ft
Casing Radius: 0.167 ft
Static Water Column Height: 6.78 ft
Screen Length: 6.78 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.04274 ft/day
y0 = 0.3326 ft



MW-20: RISING HEAD TEST 2

Data Set: L:\...\MW-20 (Test-2) FPOW.aqt
Date: 11/29/10
Time: 12:23:48

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-20
Test Date: 9/9/2010

AQUIFER DATA

Saturated Thickness: 107. ft
Anisotropy Ratio (Kz/Kr): 0.1

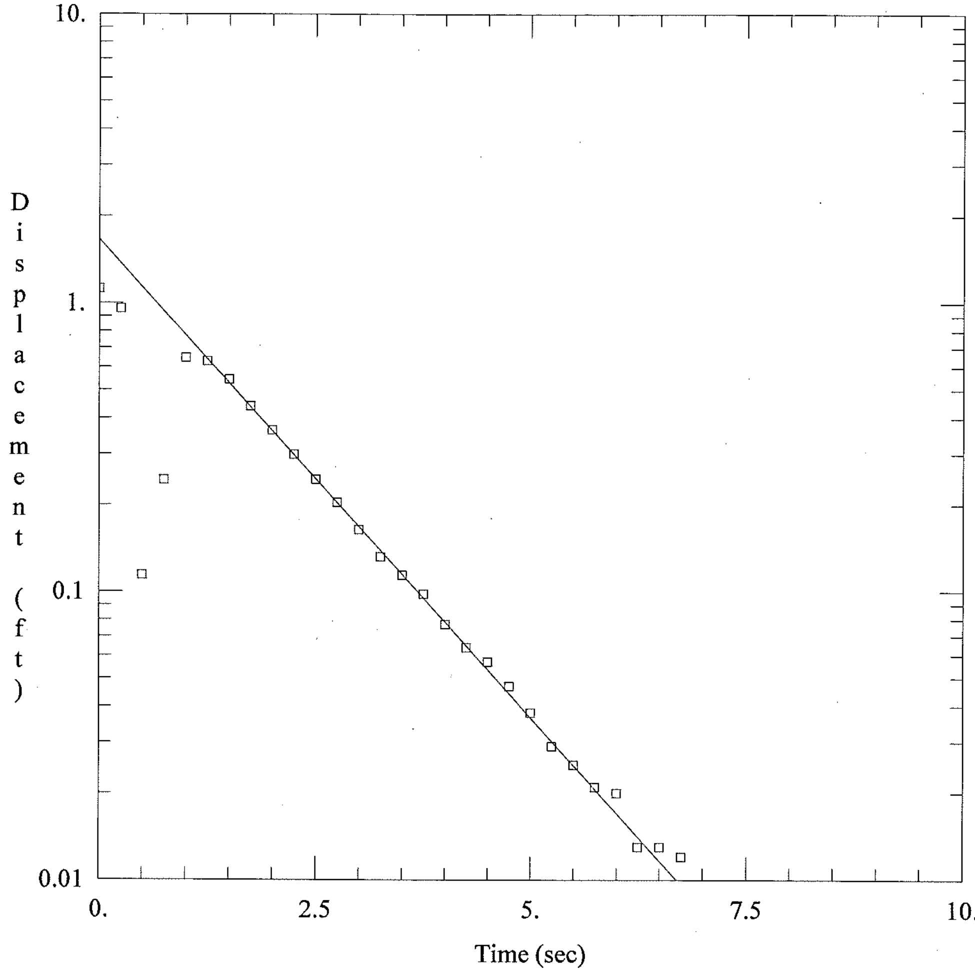
WELL DATA (MW-20)

Initial Displacement: 0.59 ft
Total Well Penetration Depth: 6.86 ft
Casing Radius: 0.167 ft
Static Water Column Height: 6.86 ft
Screen Length: 6.86 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.02003 ft/day
y0 = 0.3615 ft



MW-21: RISING HEAD TEST 1

Data Set: L:\...\MW-21 (Test-1) FPOW.aqt
Date: 11/29/10
Time: 12:24:06

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-21
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 10.81 ft
Anisotropy Ratio (Kz/Kr): 0.1

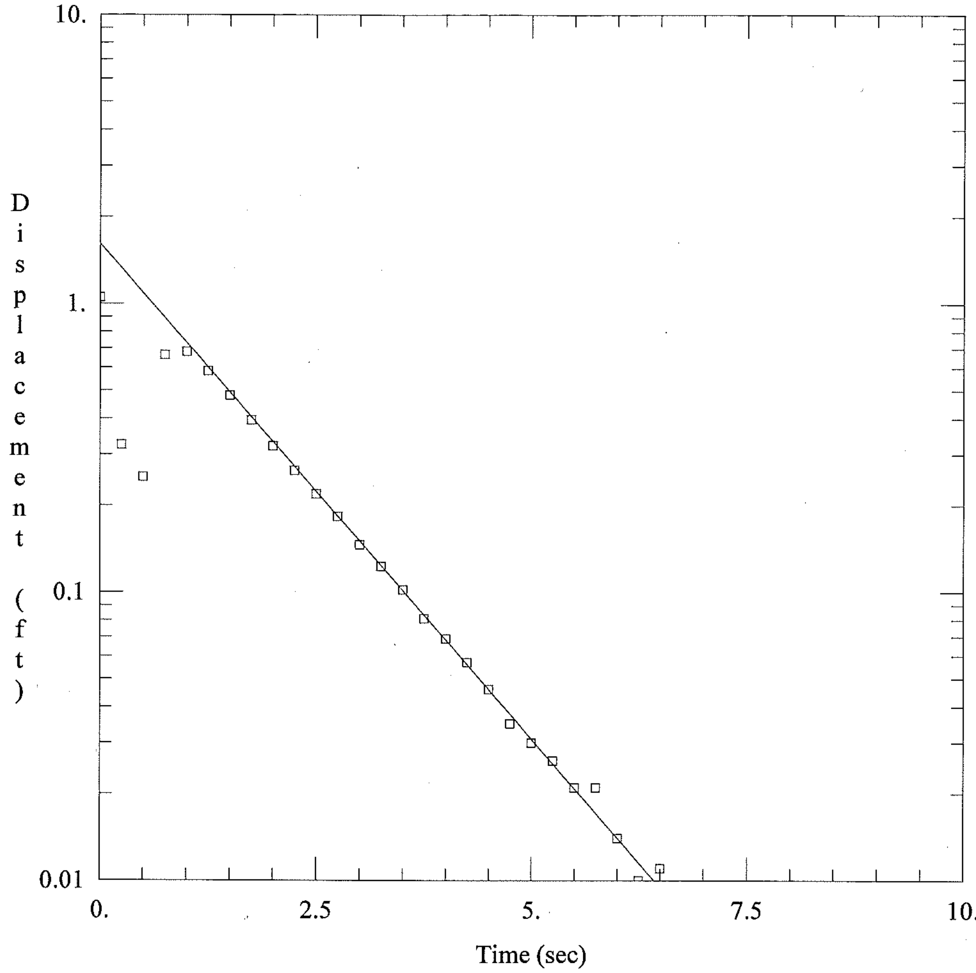
WELL DATA (MW-21)

Initial Displacement: 1.12 ft
Total Well Penetration Depth: 10.81 ft
Casing Radius: 0.167 ft
Static Water Column Height: 10.81 ft
Screen Length: 10.81 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 173.7 ft/day
y0 = 1.657 ft



MW-21: RISING HEAD TEST 2

Data Set: L:\...\MW-21 (Test-2) FPOW.aqt
Date: 11/29/10 Time: 12:24:10

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-21
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 10.81 ft
Anisotropy Ratio (Kz/Kr): 0.1

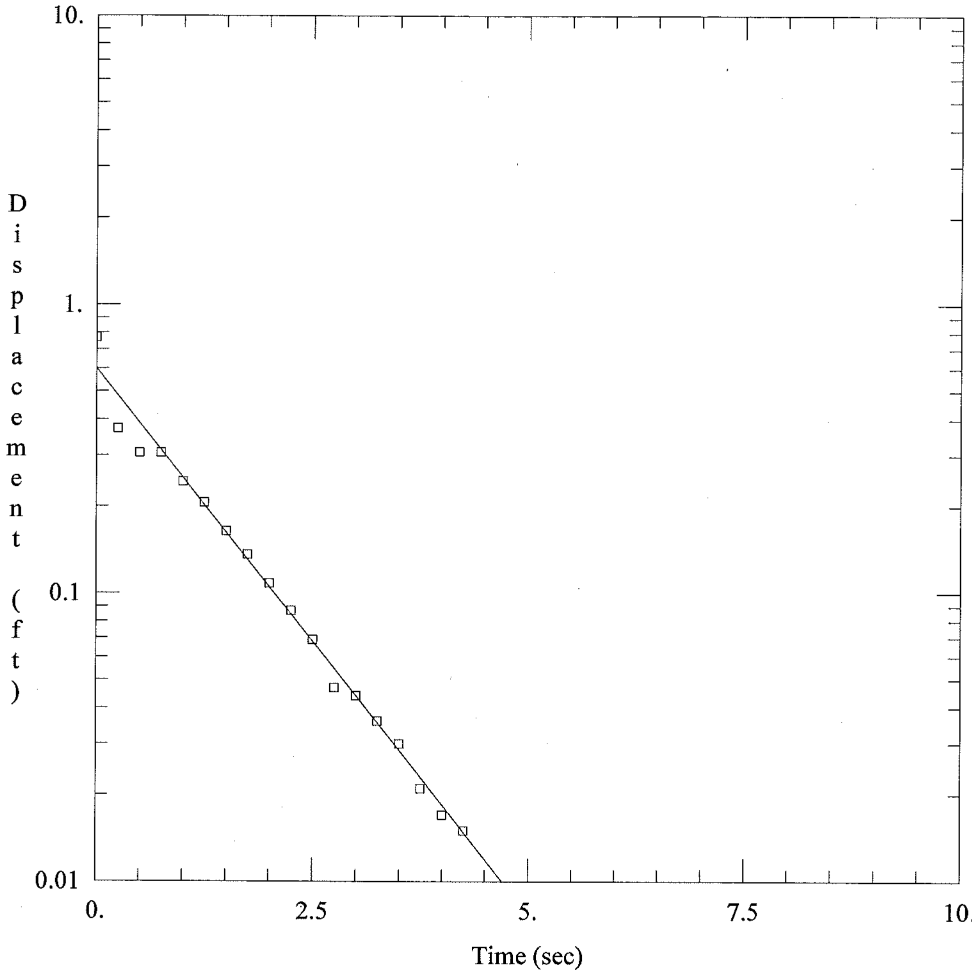
WELL DATA (MW-21)

Initial Displacement: 1.05 ft
Total Well Penetration Depth: 10.81 ft
Casing Radius: 0.167 ft
Static Water Column Height: 10.81 ft
Screen Length: 10.81 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 192. ft/day
y0 = 1.613 ft



MW-21: RISING HEAD TEST 3

Data Set: L:\...\MW-21 (Test-3) FPOW.aqt
Date: 11/29/10
Time: 12:24:16

PROJECT INFORMATION

Company: Kleinfelder East, Inc.
Client: Exxon Mobil Corporation
Project: FPOW
Location: Long Island City, NY
Test Well: MW-21
Test Date: 9/7/2010

AQUIFER DATA

Saturated Thickness: 10.81 ft
Anisotropy Ratio (Kz/Kr): 0.1

WELL DATA (MW-21)

Initial Displacement: 0.77 ft
Total Well Penetration Depth: 10.81 ft
Casing Radius: 0.167 ft
Static Water Column Height: 10.81 ft
Screen Length: 10.81 ft
Well Radius: 0.5 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 144.2 ft/day
y0 = 0.6 ft