

June 2026

Final Data Summary Report

**Newtown Creek Site, Operable Unit 1, Supplemental Characterization of
Shallow Groundwater Discharge
Brooklyn and Queens, New York**



Prepared for:

United State Enviromental Protection Agency

EPA Contract No.: 68HE0318D0003

Task Order No.: 68HE0221F0065





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Acronyms and Abbreviations

amsl	above mean sea level
AOC	Administrative Order of Consent
CDM Smith	CDM Federal Programs Corporations
DO	dissolved oxygen
DQO	data quality objectives
DUAR	Data Usability Assessment Reviews
EPA	Environmental Protection Agency
FS	feasibility study
ft	feet
ft/day	feet per day
gpd	gallons per day
gpm	gallons per minute
HPFM	heat pulse flowmeter
LCS	laboratory control sample
LOQ	level of quantitation
MS	Microsoft Suite
NAD83	North American Datum 1983
NAPL	non-aqueous phase liquid
NAVD88	North American Vertical Datum 1988
NCG	Newtown Creek Group
NOAA	Oceanic and Atmospheric Administration
NTU	nephelometric turbidity units
NYCDEC	New York State Department of Environmental Conservation
NYCDEP	New York City Department of Environmental Protection
°C	degree Celsius
ORP	oxidation reduction potential
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PID	photoionization detector
psu	practical salinity units
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI	remedial investigation
RL	reporting limit
SMIA	Significant Maritime and Industrial Area
SOP	standard operating procedure
TAP	Technical Approach Plan
UGA	Upper Glacial aquifer

1.0 Introduction

CDM Federal Programs Corporation (CDM Smith) received Task Order 68HE0221F0065 under the Design and Engineering Services Contract (Contract No. 68HE0318D0003) to perform a supplemental investigation to characterize shallow lateral groundwater discharge to the Newtown Creek Superfund Site (the site) located in Brooklyn and Queens, New York. The investigation was performed along Newtown Creek and its five tributaries, together deemed the study area. Thirty study locations, within properties along the study area, were used in the investigation to establish a monitoring well network and perform hydraulic characterizations and water quality characterizations.

All work under this task order was performed in accordance with the Newtown Creek Site, Operable Unit (OU) 1 Technical Approach Plan (TAP) dated April 1, 2022, and Quality Assurance Project Plan (QAPP) dated June 17, 2022.

1.1 Site History

The Newtown Creek Superfund Site is located in Kings County and Queens County, New York City, New York. The creek is a 3.8-mile-long tidally influenced tributary to the Lower East River and forms a partial border between the boroughs of Queens and Brooklyn. The overall study area includes Newtown Creek and its five tributaries, including Whale Creek, Dutch Kills, East Branch, English Kills, and Maspeth Creek. **Figure 1** shows the location and extent of the study area. The site is within the Newtown Creek Significant Maritime and Industrial Area (SMIA)—one of six designated SMIA's in NYC. The Newtown Creek SMIA, encompassing more than 780 acres, is the largest SMIA in NYC and includes portions of the Greenpoint, Williamsburg, Long Island City, and Maspeth industrial areas.

Historically, Newtown Creek drained the uplands of western Long Island and flowed through wetlands and marshes. However, because of heavy industrial development and governmental activities dating from the 1800s, formerly wet areas are now filled. Newtown Creek has since been channelized, and its banks are now stabilized with bulkheads and riprap. Various contaminated sites along the creek have contributed to the contamination at Newtown Creek. In the mid-1800s, the area adjacent to the creek was one of the busiest industrial areas in New York City. Industrial facilities were located along its banks, including more than 50 oil refineries, petrochemical plants, fertilizer and glue factories, sawmills, and lumber and coal yards. Newtown Creek was crowded with commercial vessels, including large ships that imported raw materials and fuel and exported oil, chemicals, and metals. These heavy industrial development and governmental activities subsequently led to industrial pollution. Compounding the issue, in 1856 the city began discharging raw sewage directly into the water. During World War II, this creek was one of the busiest ports in the nation. The historic development changed the nature of Newtown Creek from a natural drainage condition to one that is governed largely by engineered and institutional systems. Today, factories and commercial and municipal facilities still operate along its banks.

The site was added to the Environmental Protection Agency (EPA) National Priorities List in 2010. In July 2011, a Consent Order was issued by EPA for the performance of a Remedial Investigation (RI) and Feasibility Study (FS) for a group of parties potentially responsible for the investigation and cleanup of the

site (to be conducted under EPA oversight). Initially, the site was addressed as one OU; in 2018, a second OU was added, with two others following. The current structure is as follows:

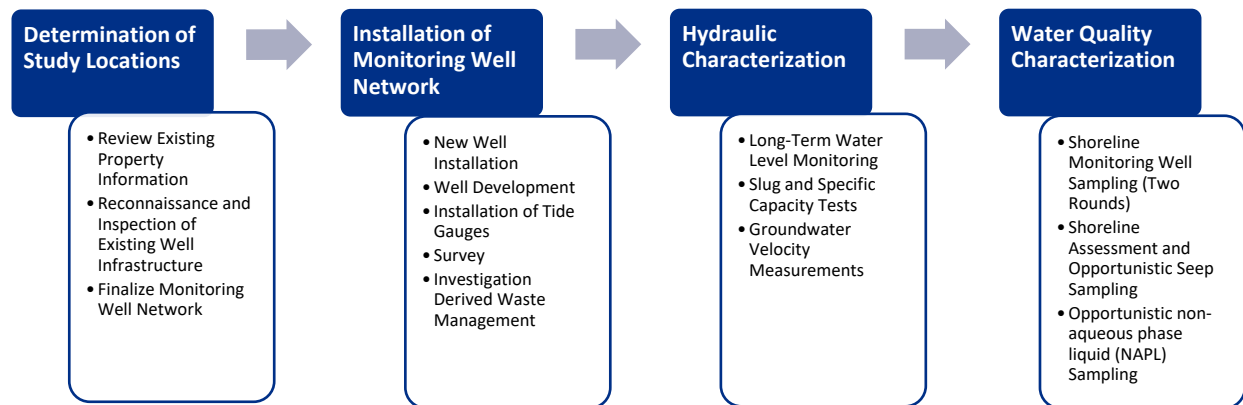
- **OU1** includes the entire study area, as defined in the 2011 Administrative Order on Consent (AOC) between EPA, the NYCDEP, and the five NCG respondents. A full RI/FS for OU1 is ongoing under EPA oversight with the NCG respondents responsible for collection of data and preparation of reports.
- **OU2** relates to current and reasonably anticipated future releases of Comprehensive Environmental Response, Compensation, and Liability Act hazardous substances from combined sewer overflow discharges to the study area, as described in a 2018 AOC between EPA and NYCDEP.
- **OU3** refers to the evaluation of a potential interim early action for creek mile (CM) 0-2 of the Study Area, as described in a 2019 AOC between EPA and the NCG (CERCLA Docket No. CERCLA-02-2019-2011). Note that EPA has determined that the selection of a remedy for this portion of the Creek should be deferred pending completion of the OU1 RI/FS; an EA was not conducted.
- **OU4** refers to the evaluation of an interim early action for the East Branch portion of OU1.

1.2 Purpose of the Data Summary Report

The primary objective of the investigation was to improve the understanding of and enhance the quantification of shallow lateral groundwater discharge into the study area. Specific objectives of the investigative activities are as follows:

- Improve characterization of shallow lateral groundwater contaminant loading to the study area, including discharge of contaminants of concern.
- Improve the conceptual site model for shallow lateral groundwater flow and contaminant discharge to the study area.
- Provide critical information regarding the shallow lateral groundwater flow characterization to support decisions for the feasibility study (FS).

Data collection efforts followed the general process illustrated below:



This Data Summary Report presents the data collected during the investigation and provides narrative of the field activities which involved installation of a monitoring well network, sampling and analysis of groundwater and seeps, and characterization of the hydrogeologic framework/ properties.

Four Interim Data Deliverables were submitted between May 31, 2023, and June 12, 2024. The submittals included the following:

- Interim Data Deliverable #1 – Submitted May 31, 2023. Included Soil Boring Logs, Monitoring Well Completion Logs, Monitoring Well Development Logs, and Geotechnical Soil Sampling Summary and Data.
- Interim Data Deliverable #2 – Submitted March 14, 2024. Included Round 1 Groundwater and Opportunistic Seep Sampling Summary memorandum, Sample Location Maps, Data Usability Assessment Review, and Round 1 Monitoring Well and Opportunistic Seep Sample Results.
- Interim Data Deliverable #3 – Submitted January 11, 2024. Included Slug Testing Summary and Data, Specific Capacity Testing Summary and Data, Groundwater Velocity Measurements Summary and Data, and Long-Term Groundwater Level Monitoring Summary and Data, Deviations Summary Tables, and Well Location Maps.
- Interim Data Deliverable #4 – Submitted June 12, 2024. Included Round 1 Groundwater and Opportunistic Seep Sampling Summary, Round 2 Groundwater Sampling Summary, Data Usability Assessment Review – Round 1 and 2, and Round 1 and 2 Monitoring Well and Opportunistic Seep Sample Results.

Anchor QEA on behalf of Newtown Creek Group (NCG), and New York City Department of Environmental Protection (NYCDEP) provided comments on Interim Data Deliverables #1, #2 and #3. Revisions have been made to the data packages and incorporated into the information presented in this Data Summary Report to reflect the comments provided by the various parties.

1.3 Data Quality Objectives

The primary objective of the investigation was to improve the understanding of and enhance the quantification of shallow lateral groundwater discharge into the study area. Specific data quality objectives (DQOs) for the investigation were developed in the Final QAPP (CDM Smith 2022b) to ensure that the quality of the data collected would meet the project's overall objectives. Generally, the investigation described within this report met the performance/acceptance criteria with deviations presented throughout the various subsections of the report. Comparison of the overall investigation to the performance/acceptance criteria developed in the QAPP is discussed in Section 5 and summarized on **Table 1**.

1.4 Report Organization

This Data Summary Report comprises the following four sections:

- **Section 1 – Introduction** provides a description of the site and a summary of the site history.
- **Section 2 – Installation of Monitoring Well Network** provides the details of the installation of the monitoring well network to be utilized to perform the study.
- **Section 3 – Monitoring Well and Opportunistic Seep Sampling** provides details of sampling of site media for analytical chemical analysis.
- **Section 4 – Hydrogeologic Testing** provides details of the testing of the monitoring wells for hydrogeologic properties and long-term observations of site groundwater and creek levels.



2.0 Installation of Monitoring Well Network

At each Study Location the following general processes were used to collect lithologic information and geotechnical information and install the necessary monitoring well infrastructure to perform the remainder of the Lateral Groundwater investigation. Deviations from the protocol defined in the QAPP are summarized in **Table 2**. These processes included:

- Lithologic Soil Boring Advancement - including the collection of grain size and Shelby tube samples
- Monitoring Well Installation – including survey of all new and existing monitoring wells
- Monitoring Well Development – including the development of new and existing monitoring wells

2.1 Monitoring Infrastructure

A minimum of two shallow monitoring wells were necessary for each study location — (1) a shoreline monitoring well location as close to the shoreline edge as possible, and (2) a paired inland shallow monitoring well location for characterizing representative inland shallow groundwater levels and hydraulic characteristics. Inland is defined as 50 to 100 feet (ft) upland (perpendicular to the shoreline) of the shoreline monitoring well location.

A paired deeper monitoring well was installed (or was existing) at eight of the shoreline monitoring well locations to characterize vertical gradients in various areas of the site and help quantify flow in areas with shallow or deep barriers.

The final monitoring infrastructure included 53 new and 16 existing monitoring wells. In addition, two staff gauges fitted with stilling wells were installed within Newtown Creek. Monitoring well and staff gauge locations are shown on **Figures 2a, 2b, and 2c**.

2.2 Lithologic Soil Boring Advancement

At each Study Location prior to determining the details for the Study Area monitoring well installations, a soil boring was advanced at each proposed shoreline monitoring well location. Soil boring logs documenting the field observations are included in **Appendix A-1**.

Each soil boring was advanced through fill and post-glacial formations into the upper glacial aquifer soils to provide a thorough understanding of the stratigraphic profile. Drilling was primarily conducted using a hollow stem auger drill rig to advance a nominal 6-inch diameter borehole and continuous soil samples were collected using 2-inch diameter split spoons. Soil lithology was logged continuously in the field and soil cores were scanned using a photoionization detector (PID) by onsite geologists. Due to field access constraints at some of the study locations a limited number of borings were completed using direct push technology, specifically Geoprobe® macrocores or mini-sonic soil coring tools. After advancement of each soil boring and subsequent determination of the well construction details intended for each boring, the soil boring annulus was backfilled with bentonite chips with a cap of #00 choke sand. The bentonite was allowed to hydrate prior to beginning to construct the monitoring well.

2.3 Geotechnical Sample Collection

During soil boring advancement (or during subsequent well installation if necessary) representative geotechnical samples (analyzed for grain size) were collected from each hydrogeologic unit encountered. Shelby tube samples for flexible wall vertical permeameter testing were also collected from fine grained soils (if a finer grained post-glacial unit was encountered) to provide information on vertical hydraulic conductivity. At Study Locations with planned deep well installations these samples were biased to evaluate the hydraulic conductivity of the zone between the shallow and deep well screens if it contained finer-grained materials.

A list of samples collected is provided on **Table 3**. The results of the grain size and flexible wall vertical permeameter testing are included in **Appendix A-2**.

2.4 Monitoring Well Installation

Monitoring wells were installed with 5 or 10 foot long 2-inch diameter pre-packed well screens to standardize monitoring well installations. The prepacked well screen assembly consists of a slotted PVC pipe (10-slot or 20-slot) surrounded by environmental grade sand contained within a stainless-steel wire mesh cylinder. Two slot sizes were employed to account for the fine and coarse grained lithologies encountered; “10 slot” (0.10”) for fine grained deposits and “20 slot” (0.20”) for coarse grained material. Lithologic conditions observed in the field were used to determine which screen size was installed. For further information of the prepacked screen assembly please refer to the Prepacked Screen Monitoring Wells Standard Operating Procedure in **Appendix A-3**.

To provide consistency between installations, facilitate adequate well development, and ensure representative hydraulic testing (slug and specific capacity tests), shallow wells were typically installed with 10-foot screen lengths set approximately 3 ft below the observed local low groundwater level. If the saturated thickness above a lower permeability layer (typically the post-glacial wetland deposits) was less than 10 ft, a shorter 5-foot well screen was used.

Deep monitoring wells were installed following review of the lithologic profile and were generally constructed with 10-foot screens targeting a zone not less than 5-ft below the paired shallow well and would not extend more than 15-ft below an adjacent barrier wall or profile of the adjacent shoreline.

Wells were completed with heavy-duty, 6-inch-diameter, flush-mount curb boxes or 4-foot stickup well completions and fitted with lockable compression plugs. Once complete all new and existing monitoring wells were surveyed by Kennon Surveying Services to determine the elevation of the top of inner casing and ground surface. The datum used for the survey were North American Vertical Datum 1988 (NAVD88) for the vertical datum and New York State Plane – Long Island North American Datum 1983 (NAD83) ft for the horizontal datum.

Details of the well installations are summarized on **Table 4** and monitoring well completion logs are included as part of **Appendix A-1**.

2.5 Monitoring Well Development

New monitoring wells were developed to remove sand, silt and water used during drilling from the well to provide a good hydraulic connection between the well and the aquifer materials. During the well development process turbidity, pH, temperature, conductivity, oxidation-reduction potential (ORP), and dissolved oxygen (DO) were monitored; and specific capacity was calculated at set intervals at consistent discharge rates to assist in determining if a monitoring well has been adequately developed.

Development was performed to the extent practicable until 1) a turbidity of 50 Nephelometric Turbidity units (NTU) is achieved or until all parameters have stabilized (within 10 percent for measurements on successive casing volumes); 2) monitored specific capacity has stabilized within 20 percent; 3) or as approved by the on-site geologist.

Monitoring well development is summarized on **Table 5** and monitoring well development logs are included in **Appendix A-4**.

The sixteen existing monitoring wells that were selected for use in this study were not redeveloped as part of this program. However, 11 of the 16 existing wells were included in the specific capacity testing program (described in Section 4.1), in which the wells were pumped for several hours, typically removing 10-30 well volumes, to stress the aquifer as part of the testing. Stressing the aquifer in this fashion is equivalent to over pumping the well, an accepted well development technique. The specific capacity testing program was conducted primarily between October 2022 and March 2023, which was only a few months prior to the start of the analytical sampling program in April 2023. Of the five remaining existing wells that were not part of the specific capacity testing program, only one (SL15-CMW-15) was part of the analytical sampling program.

2.6 Observations of NAPL and Other Contamination

If a non-aqueous phase liquid (NAPL) was encountered during boring advancement, the shallow well screen was set to straddle the water table with the screen interval extending approximately 3 ft above the water table. If the saturated thickness of the shallow unit was greater than 7 feet a longer well screen was installed to construct the saturated portion of the well consistent with other wells that did not have observed NAPL. Soil cores collected during soil boring advancement were evaluated for the presence of NAPL. If NAPL was suspected based on visual observations of contamination (sheen or staining) and/or elevated PID readings observed on soil cores then jar shake tests were performed consistent with the protocols prepared for the RI sampling detailed in the QAPP.

Jar shake tests positively identified NAPL in eight soil borings, all at different study locations. Photos were captured of the jar shake test results. In accordance with New York State Department of Environmental Conservation (NYSDEC) Spill Response Guidance Manual, the NAPL encountered at six of the eight study locations were called into NYSDEC Hotline. NYSDEC advised there was no requirement to call in NAPL observation at Study Locations #6 and #16, to NYSDEC Spill Response, as the study locations were already listed as a state site in the system.

Results of the shake tests, other observations of contamination, and other details of the spill notifications are summarized in **Table 6**. A log providing photos of the positive result Jar Shake Tests are provided in **Appendix A-5**.



3.0 Monitoring Well and Opportunistic Seep Sampling

Data collection efforts were initiated to collect analytical data from the groundwater and seeps samples within the study area. The following subsections provide a summary of the sample collection efforts.

3.1 Round 1 and Round 2 Groundwater Sampling

CDM Smith collected shallow groundwater samples from all 30 shoreline monitoring wells during the Round 1 sampling events. Twenty-eight samples were collected between April 17 to 27, 2023. Due to access constraints delaying the initial well installation samples were collected at two study locations (SL#2 and SL#8) on July 13, 2023. The Round 2 sampling event included sampling at all 30 shoreline monitoring wells between August 28 and September 14, 2023. Monitoring wells sampled are shown on attached **Figures 2a, 2b and 2c**.

Groundwater samples were collected using low-flow/low-stress purging and sampling methods in accordance with Technical Standard Operating Procedure (SOP) 1-12 (provided in the QAPP). Prior to purging each monitoring well, water/oil level and total depth measurements were collected using an electronic water level indicator (and oil water interface probe) and the headspace measured with a PID. Despite encountering NAPL in the soils at seven Study Locations during drilling, measurable NAPL was not detected at any of the monitoring well locations during groundwater sampling.

Prior to initiating low-flow purging and sampling procedures, at least one well volume was purged, and then the well was allowed to stabilize and return to equilibrium prior to continuing sampling efforts. The goal of this initial purge was to ensure stagnant water was removed from the well casing. This was utilized as a standard practice prior to sampling since the shallow wells are in urban/industrial areas (higher potential for disturbance), in extremely heterogeneous material, and the wells had been used for numerous rounds of hydrogeologic testing.

Once the monitoring wells returned to equilibrium, low-flow groundwater purging commenced and was continued until field parameters (including pH, ORP, DO, conductivity, salinity, and turbidity) had stabilized. Groundwater samples were then collected. Upon sample collection, samples were packed in coolers and shipped to the laboratories in accordance with Technical SOP 2-1. The analyses performed on each sample, as well as other sample details are presented on **Table 7a and 7b**. **Low-flow groundwater sampling logs are included in Appendix B-1.**

3.2 Opportunistic Seep Sampling

Following the Round 1 groundwater sampling event, CDM Smith began an opportunistic seep sampling effort that included reconnaissance of shoreline structures at times close to low tide to identify potential seep locations and collection of seep samples where active seepage was observed.

Seep samples were collected from the shorelines at nine locations as shown on **Figures 3a, 3b and 3c**. Seepage was collected in general conformance with the SOP for Opportunistic Seep Sampling (#39) from

the Field Sampling and Analysis Plan (Anchor QEA 2017). The analyses performed on each sample, as well as other sample details are presented on **Table 8**. Sampling logs which include sampling photos and field notes are included in **Appendix B-2**.

3.3 Data Validation

All data was validated per the most recent EPA validation protocols—to verify the data met the quality objectives for the study. The data validation evaluated and qualified the laboratory analytical data against predefined requirements outlined in the QAPP. Data validation reports are included in **Appendix C-1**. Once the data validation was completed all data was exported from the database into the full analytical data tables presented in **Appendix D**.



4.0 Hydrogeologic Testing

At each Study Location data was collected to assist in defining the hydrogeologic properties of the subsurface materials. Data collection included:

- **Hydrogeologic Testing** – including specific capacity tests and slug tests at the new and existing monitoring wells.
- **Groundwater Velocity Measurements** – consisting of Heat Pulse Flow Meter data collection used for estimating groundwater velocity at the new and existing monitoring wells at different stages of the tidal cycle.
- **Long-Term Water Level Monitoring** – including continuous pressure transducer measurements collected from new and existing monitoring wells for a period of up to one year.

With the exception of deviations noted in this Data Summary Report, all work performed is compliant with the CDM Smith Final QAPP dated June 17, 2022. Deviations from the protocol defined in the QAPP are summarized in **Table 9**.

4.1 Specific Capacity Tests

Following monitoring well installation and development activities, short-term specific capacity tests were performed in all deep and shallow shoreline monitoring wells. Testing was performed no sooner than 12 hours after well development. The tests were performed over a nominal four-hour period which included one hour of data collection prior to pumping (primarily for observing aquifer changes due to tidal changes), two hours of data collection during pumping (observing total drawdown), and one hour of data collection post pumping (observing recovery).

Each test was performed using submersible pumps or peristaltic pumps deployed within the monitoring well screen below a pressure transducer used to record water level readings. The type of pump and pumping rate used for each test was pre-determined by observations made during well development. Peristaltic pumps were used in monitoring wells with observably slow recovery rates and rotary pumps were used in monitoring wells with observably fast recovery rates. Using the pressure transducers, continuous water level changes and responses were recorded every two seconds pre-, post-, and across the duration and recovery of the specific capacity tests to provide a dataset to allow for post testing corrections made to the drawdown, as necessary.

Results of the specific capacity testing are summarized in **Table 10**. The details of the estimations, calculations, and corrections for specific capacity at each well and the raw data collected during testing are contained in **Appendix E**.

The following process was followed when assessing the results of each specific capacity test:

- 1) **Import Data:** import the pre-test, test, and post-test groundwater level and creek level data into a single workbook. Plot the groundwater level data. Transcribe all observations and well details from field logs into the workbook. Include raw data files as separate tabs.

- 2) Correct water levels for background impacts: make an assessment as to the background movement of the aquifer in response to the tide or other impacts and correct the change if possible. This was focused on a limited time window (typically 45 minutes) during the pre-pumping period as the tide-related change in head observed in the wells was significant enough that utilizing the full time period between start and end of pumping, and waiting for recovery, often made interpretation difficult as the testing period overlapped into different portions of the tidal cycle. (Note: this was only possible in wells where the drawdown was significantly greater than the background response to the tides).
- 3) Calculate Specific Capacity: if an estimated steady state draw-down was possible the monitoring wells specific capacity was calculated using the formula:

$$\text{Specific Capacity (gpm/ft)} = Q/S$$

Q = discharge in gallons per minute (gpm)

S = drawdown in feet

The specific capacity value can be used to estimate the transmissivity of the aquifer. Driscoll (1986) provides the following equations to estimate transmissivity.

$$T = 1500 \times Q/S \text{ (for unconfined aquifer)}$$

$$T = 2000 \times Q/S \text{ (for a confined aquifer)}$$

Q/S = specific capacity

T = transmissivity

After calculating transmissivity, hydraulic conductivity is calculated by the following equation.

$$K = T / b$$

K = hydraulic conductivity in gallons per day per cubic feet (gpd/ft³)

T = transmissivity in gallons per day per square feet (gpd/ft²)

b = aquifer thickness (ft)

In order to compare results, values for hydraulic conductivity were converted to feet per day as expressed in the equation below.

$$1 \text{ ft/day} = 7.4805 \text{ gpd/ft}^2$$

Table 11 provides a summary of the calculated hydraulic conductivity values, derived from initial specific capacity tests and provides a comparison of those results to a summary of the hydraulic conductivity values derived from slug tests as detailed below.

4.2 Slug Testing

Following the initial well installation phase, slug testing was performed at nearly every monitoring well included in the monitoring network. This included the shoreline, inland, and deeper (paired) monitoring wells. Slug tests were not performed on wells where NAPL was observed during drilling activities, or wells in which contaminants had caused pressure transducer failure during monitoring. When NAPL is present in a well, it can affect the pressure reading on a transducer. The NAPL sticks to the transducer and eventually can cause it to corrode and short out. As per the transducer manufacturer it is not recommended to place the transducer in a well with known or historic product.

The slug test data were used to generate estimates of horizontal hydraulic conductivity which are summarized on **Table 12** Slug testing was performed according to the guidelines in The Design, Performance, and Analysis of Slug Tests 2nd edition (Butler 2020), which includes elements such as testing each well with multiple initial displacements, evaluating normalized recovery curves prior, and performing the analysis based on aquifer and well type.

The Slug Testing Memorandum, which details the estimates of hydraulic properties of each well based on slug testing is included in **Appendix F**. It also includes the calculations, assumptions, raw and corrected datasets for each test.

4.3 Groundwater Velocity Measurements

Groundwater velocity measurements were performed using a Model 30 GeoFlo meter (heat pulse flowmeter [HPFM]) at a total of 18 Study Locations which included inland and shoreline monitoring wells. Results of the velocity measurements are summarized on in **Appendix G**.

Initially the groundwater velocity measurement program was going to include installation of passive flux meters at a subset of the monitoring wells. Passive flux meters are not typically used in wells impacted by tidal changes; therefore, locations would have been selected from wells where groundwater flow direction did not reverse direction. Based on review of the long-term water level measurements, there were no wells that clearly fit the parameters necessary for installation of the passive flux meters.

The data generated during this program suggests localized flow conditions, with turbulent flow likely due to tidal interactions and shoreline structures. This suggests that utilizing the data generated in a quantitative manner will likely misrepresent the overall discharge of groundwater into the system. Therefore, while this sub-section is included to summarize the methods utilized to collect this data, EPA recommends the use of the other data sets collected as part of this program (gradients, slug test data, etc.) to calculate groundwater discharge. This is described in further detail in Section 5.

4.3.1 Selection of Monitoring Wells

The probe of the flow meter is only suitable for 2-inch diameter wells and is sensitive to highly contaminated media. Therefore, monitoring wells with no reported NAPL that were constructed with 2-inch diameter Schedule 40 PVC casing, with either 0.010-inch or 0.020-inch slot prepacked screens (screens used during monitoring well installations), were selected for HPFM testing. At several site locations, existing monitoring wells (not installed by CDM Smith) contained standard 20-slot Johnson Screens and were targeted for velocity measurements as well. Calibration factors for the three different

types of monitoring well screen types were provided by Kerfoot Associates and are also included in the results summary table.

The data generated from the HPFM velocity measurements are presented in **Appendix G-1**. This includes a summary of the measurements and calculations performed for each well, the raw data collected during testing, and probe calibration information.

4.3.2 Heat Pulse Flow Meter Calibration

The flow meter was calibrated to provide accurate conversions of the meter readout to actual groundwater flow rates in feet per day (ft/day) and average direction from 0 to 360 degrees in magnetic declination. For calibration, Kerfoot Associates used a sample of the 0.010-inch and 0.020-inch slot width prepacked screens. The flowmeter probe was placed in a one-foot section of said prepacked screen sample inside a flow chamber, which allows the calibration of the flowmeter to translate the meter readouts into geological unit seepage. The electronic ground-water flow measurement is based upon thermal transmission within a porous solid (glass beads) under the influence of interstitial liquid flow. The field probe is surrounded by a fuzzy packer which contains small glass beads. The flowmeter creates a heat pulse which is transmitted through the porous matrix. Net movement of the interstitial water mass creates a thermal conductance bias which is linearly proportional to the rate of flow. To simplify corrections for the well screen resistance and hydraulic conductivity differences between the geological unit, the annular packing, and internal packing, a cross section of the well emplacement is constructed in the flow chamber, duplicating the field conditions as closely as possible. Given the various fill material encountered at the thirty site locations, the cross section constructed in the flow chamber contained media with an effective porosity of 30% with mixtures of medium sand saturated with water circulating at a known rate. Further details on the procedures and methods for calibrating the flowmeter is discussed in Groundwater Flowmeter System Operations and Maintenance Manual provided in **Appendix G-2**.

Results of the calibration were provided on a calibration curve (**See Appendix G-2**) for direct groundwater flow from machine reading at 2 minutes and 20 seconds for low flow conditions (0.1 ft/day to 14 ft/day). In the results, the three monitoring well screens calibrated for are 10-slot prepacked, 20-slot prepacked, and 10-slot standard Johnson well screen. Each of the three monitoring well screens have a calibration curve which runs through zero and has a single regression line. According to the results, the 20-slot prepacked screen has a calibration factor equal to 16.66 ft/day, the 10-slot prepacked screen has a calibration factor equal to 6.25 ft/day, and the Standard Johnson well screen has a calibration factor of 18 ft/day. According to Kerfoot Associates, the calibration factor for a 20-slot standard Johnson well screen would be double that of the 10-slot screen. Therefore, the calibration factor used for several existing monitoring wells was 36 ft/day. According to Kerfoot Associates, the 20-slot stainless steel prepacked mesh screen had a similar pattern to the conventional 20-slot Johnson Well Screen for low flow conditions between 0.1 ft/day to 14 ft/day. Based on calibration, Kerfoot Associates advised that measurements of flow velocity for 10-slot prepacked screens can be made down to 0.5 ft/day. However, direction from true north (corrected from magnetic) will enlarge from +/-7 degrees to +/-30 degrees below 0.5 ft/day. Taking repeat measurements and using means at a single depth could reduce this variation. However, CDM Smith determined it was not feasible to produce repeat measurements due to the time constraints imposed by meeting the targeted tidal observation windows.

4.3.3 Field Methods

Groundwater velocity measurements were collected in shallow shoreline wells during four tidal points which included: a flood current point, an ebb current point, a high tide point, and a low tide point. Where applicable, flow velocity measurements were also collected in shoreline deep wells at the same low tide point and high tide point as the paired shallow shoreline well. Flow velocity measurements were collected in all shallow inland wells during the same flood current point and ebb current point as the paired shallow shoreline wells.

Prior to performing the velocity tests in the selected wells, CDM Smith compared the long-term water level monitoring data collected from monitoring wells to the tide data provided by National Oceanic and Atmospheric Administration (NOAA) to determine the approximate tidal lag between The Battery, NY (station) and the shoreline wells adjacent to Newtown Creek. Understanding the approximate tidal lag between the NOAA tide station and the shoreline wells adjacent to Newtown Creek aided in predicting the tide points targeted during the flow velocity testing in the monitoring wells.

During field tests, the probe was deployed in each 2-inch monitoring well casing in accordance with ASTM STP 9623. Flow velocity measurements were performed in two midpoint intervals, starting at the bottom most midpoint interval coming up, with the length with the flow velocity probe oriented in the magnetic north direction during the first test and in the magnetic south direction during the second test. Orientation of the rods were verified with a compass mounted to the topmost rod. In monitoring wells with 10-foot screen lengths, measurements were taken at two midpoint intervals, starting at the bottommost midpoint interval coming up. As anticipated, when the probe was inserted below the static water level in each well, water would displace upward creating a displaced slug of water. This phenomenon is known as the “slug effect”. To compensate for the slug effect, a waiting period of approximately fifteen minutes was afforded until the water level was observed to return to static. Further details on the field methods for using the HPFM is discussed in Ground-Water Contamination: Field Methods, ASTM STP 963 and Groundwater Flowmeter System Operations and Maintenance Manual for Model 40L - Geoflo provided in **Appendix G-2**.

4.3.4 HPFM Test Analysis

Machine readouts collected in the field were recorded on the Groundwater Flow Worksheet. All data collected in the field was processed on PDF editor to QC field calculations and to accurately calculate the mean direction and velocity for each HPFM test. The process for calculating average flow rate and direction from the machine readouts included the following steps:

1. Utilized the 4-channel probe. Reviewed Model 40L Manual. Dated January 1989 and ASTM 963 (included in **Appendix G-2**)
2. In each orientation of readouts (North and South), subtract end values from start values and input results in columns C and S.
3. Subtract each value in the S column from each value in the C column, respective of the corresponding probe channel pair. Divide the difference by two. Input the quotient into column F.

4. Before graphing vectors, normalize the values in column F by dividing each of the four values by the highest absolute value in the column. Input the values into column G.
5. Using the corresponding probe channel pair normalized value, begin mapping the normalized values as vectors. Ensure the vectors are mapped in the appropriate directions based on positive or negative signs. Map the vectors to the normalized value on the diagram which is equivalent to the normalized value in column G.
6. As indicated on the Groundwater Flow Worksheets, a cosine test (referred to as flow uniformity test) can show uniform flow as vector end points will closely fit a circle inscribed about the longest vector. In most cases uniform flow was not apparent due to the nature and conditions of the studied monitoring wells being heavily influenced by tide conditions.
7. Flow uniformity Test - determine if flow is uniform
 - Plot the concentric circle around the longest vector (will always be 1 in normalized plot).
 - Determine if uniform flow exists (all vectors lie inside or on the circle)
 - Note result on log and proceed to next step
8. If flow is uniform, Vector resolution is performed to determine flow direction. Add each vector from tip to tail, working clockwise or from top to bottom in column G. Maintain the original length of each drawn vector to ensure accuracy of direction.
 - Once the four vectors are added tip to tail, draw a vector from the origin of the diagram running tangent to the last vector added. The approximate direction of groundwater flow is where this average vector intersects the outermost limit of the diagram.
 - To solve for flow rate, take the highest absolute value from column F and divide by the calibration factor. The calibration factor is based on the type of screen and screen size of the monitoring well.
 - Calibration Factor for 10-slot prepacked (CF-6.25 ft/day), 20-slot prepacked (CF-16.66 ft/day), 10-slot standard Johnson well screen (CF-18 ft/day) and 20-slot standard Johnson well screen (CF – 36 ft/day).
9. If flow is non-uniform, use alternate method using vector addition calculator.
 - VECTOR ADDITION CALCULATOR – machine readings in column F (always positive) are entered with the appropriate direction (always in 45-degree increments). If the machine reading is negative adjust to the appropriate angle that matches the channel angle:
 - Channels
 - 1/-6 – 0 degrees/ 180 degrees
 - 2/-7 – 45 degrees/ 225 degrees
 - 3/-8 - 90 degrees/ 270 degrees
 - 4/-9 – 135 degrees/ 315 degrees

- The resulting magnitude is the length of the mean vector. Divide this by the geometric constant of 2 (for 8 channel probe) to give you the machine reading in the plane of flow.
- To solve for flow rate divide the machine reading on the plane of flow by the calibration factor. The calibration factor is based on the type of screen and screen size of the monitoring well.
- Calibration Factor (provided by BK) for 10-slot prepacked (CF-6.25 ft/day), 20-slot prepacked (CF-16.66 ft/day), 10-slot standard Johnson well screen (CF-18 ft/day) and 20-slot standard Johnson well screen (CF – 36 ft/day).

4.3.5 Mean Velocity Calculations

As discussed in field methods section, several monitoring wells tested contained 10-foot screen lengths. This required data collection at two different equally spaced screen interval depths. Overall mean vectors were calculated to represent the flow direction and velocity for the entire monitoring well from the mean vectors of the upper and lower midpoint screen intervals. Groundwater velocity and direction were calculated using the following process:

1. On a new diagram, rescale the intervals to a range that would adequately fit the mean vectors from the upper and lower midpoint screen intervals previously calculated.
2. Copy and paste the mean vector from the upper and low midpoint screen interval calculations and rescale based on the rescaled diagram.
3. Add the lower midpoint interval mean vector to the upper midpoint interval mean vector tip to tail.
4. Draw a line from the origin of the diagram intersecting the tip of the low midpoint interval.
5. The mean direction is equivalent to where the new vector would intersect the outermost limit of the diagram.
6. The mean velocity is equivalent to the length of the new vector divided by the number of measurements made in the well screen (in this case 2).
7. This process was checked and the final result determined using a vector addition calculator.

It is important to note the method for calculating mean velocity and direction is based on the mean of vectors, which is different to an arithmetic mean. Field sheets with supplemental pages detailing final calculations and a summary of results table with direction corrected for magnetic declination can be found in **Appendix G-1**. Further details on the methods for calculating mean direction and velocity using the HPFM is discussed in Ground-Water Contamination: Field Methods, ASTM STP 963 Groundwater Flowmeter System Operations and Maintenance Manual for Model40L - Geoflo provided in **Appendix G-2**.

4.4 Long Term Water Level Monitoring

Pressure transducers were installed in a total of 70 monitoring wells and two stilling wells (attached to staff gauges) for monitoring groundwater and surface water elevations throughout a one-year monitoring period. The monitoring well and staff gauge locations are shown on **Figures 2a through 2c**.

4.4.1 Deployment and Monitoring

After each pressure transducer was deployed, a field reader was used to collect an instantaneous water level reading from the pressure transducer concurrently with an instantaneous depth to water reading using an oil-water interface probe to calculate the set depth of the transducer in the monitoring well. Using the calculated set depth of the transducer and the elevation survey data provided by Kennon Surveying a correction factor was applied to calculate water level elevation in NAVD88.

Pressure transducer calibration was also checked concurrently with hydrogeological testing and/or groundwater sampling events. During these events, pressure transducers deployed in monitoring wells that were tested or sampled were often removed. Once testing and/or sampling was complete, pressure transducers would be redeployed, and water level checks identical with the initial deployment were performed. The checks included confirming the pressure transducers were functioning properly and confirming the set depths of the pressure transducers using instantaneous readings with the field reader and oil-water interface probe. Pressure transducers were programmed to continue collecting water level data at five-minute intervals through April 2024. **Table 13** provides a detailed summary of each transducer's deployment period, as well as statuses regarding operation and/or any malfunction.

4.4.2 Data Output and Correction

The output of the data generated from the long-term water level measurements is presented in **Appendix H-1**. The attachment includes compiled MS Excel workbooks for each of the 30 Study Locations. Each workbook includes:

- Raw data from the transducers (freshwater equivalent water above transducer (feet), conductivity, and temperature) from the study locations monitoring wells, and concurrent tidal (stilling well) and barometric pressure monitoring
- Calculated data including percent salinity (%), water density (g/mL), density corrected elevation of transducer (feet NAVD88), and freshwater equivalent hydraulic head (feet NAVD88)
- Transducer setup information including the manual calculated groundwater elevation (feet above mean sea level), the freshwater equivalent feet of water above transducer during check (feet), and the corrections made to each measurement to provide the density corrected elevation of transducer (feet NAVD88)
- Hydrographs presenting the freshwater equivalent hydraulic head datasets

Additionally, the seasonal average freshwater equivalent hydraulic head for monitoring wells at each of the 30 Study Locations was calculated and is presented in **Appendix H-2**.

The process used to correct the raw datasets is included in the subsections below.

4.4.2.1 Salinity and Density Calculation

Electrical conductivity, collected from transducer sensor data, was converted to practical salinity units (psu) using an MS Excel formula derived from UNESCO Technical Papers in Marine Science – Algorithms for Computation of Fundamental Properties of Seawater and from Hill et al. 1986 – The Extension of the Practical Salinity Scale 1978 to Low Salinities. The MS calculation is valid over temperature ranges from -2°C to 40°C, and practical salinity ranges from 0 to 42 psu.

The conductivity ratio to salinity conversion is $C(S,t,p)$ is electrical conductivity of seawater at salinity (S) (PSS-78), temperature (t) (IPTS-68) and pressure (p) decibars, the conductivity ratio is defined to be:

$$R = C(s,t,p)/C(35,15,0)$$

Where $C(35,15,0)$ is the conductivity of standard seawater of practical salinity 35, at 15 degree Celsius (°C) and atmospheric pressure, defined to be equal to the conductivity of a reference solution of potassium chloride at the same temperature and pressure. This equation is defined in UNESCO Technical Paper in Marine Science – Algorithms for Computation of Fundamental Properties of Seawater for salinity ranges of 2-42 psu. The Extension of the Practical Salinity Scale 1978 to Low Salinities provides the principles to extending the validity of the equations defining the scale to the entire 0-42 psu range. The equations for converting electrical conductivity to practical salinity, percent salinity, and groundwater density are provided in all Microsoft Suite (MS) workbooks for Long Term Water Level Monitoring data which are provided in **Appendix H-1**.

4.4.2.2 Density Corrected Elevation of Transducer Calculation

The process to calculate the density corrected elevation of the transducer is summarized below and is summarized on the “Transducer Setup and Checks” tab in the worksheets provided in **Appendix H-1**. The first step to determine the density corrected elevation for each transducer during transducer setup and checks is to manually measure the depth to water and then calculate the groundwater elevation.

Kennon Surveying Services performed surveys on monitoring wells from June 21, 2023 to June 27, 2023, and September 14, 2023, to determine the elevation of the top of inner casing and ground surface. The datum used for the survey were NAVD88 feet for the vertical datum and New York State Plane NAD83 feet for the horizontal datum. Using inner casing elevation data provided by Kennon Surveying, the following calculations were performed to find the calculated groundwater elevation:

$$\text{Calculated Groundwater Elevation (feet NAVD88)} = \text{Top of Inner Casing Elevation (feet NAVD88)} - \text{Depth to Water (feet)}$$

Where, *Top of Inner Casing* is the vertical elevation provided by Kennon Surveying in each monitoring well. *Depth to Water* is the measurement of the water level depth (in feet) from the top of inner casing. This reading was taken at a specific time and date during the calibration check which included collecting an instantaneous reading of the water column height (in feet) above the transducer and the water level depth from the top of inner casing. This calibration check confirms the depth of the transducer in the monitoring well.

The next step to determine the density corrected elevation of each transducer is to correct the instantaneous reading of the fresh-water equivalent feet of water above transducer at the time of a calibration check for the density of the water. This provides the density corrected actual feet of water above transducer during check. This was calculated using the following equation:

$$\text{Density Corrected Actual Feet of Water Above Transducer During Check (feet)} = \text{Freshwater Equivalent Feet of Water Above Transducer During Check (feet)} / \text{Water Density During Check (g/mL)}$$

The final step to calculate the density corrected elevation of each transducer is shown in the following equation:

$$\text{Density Corrected Elevation of Transducer (feet NAVD88)} = \text{Calculated Groundwater Elevation (feet NAVD88)} - \text{Density Corrected Actual Feet of Water Above Transducer During Check (feet)}$$

4.4.2.3 Calculation of Freshwater Equivalent Hydraulic Head

Freshwater equivalent hydraulic head was calculated to account for the differences in density in transducer measurements. The value provides a common frame of reference in which to compare groundwater levels between wells and measurements of differing salinity.

Typically, the measured feet of water above transducer would have to be corrected for density changes based on salinity and temperature. However, the Solinst Levellogger 5 transducers provided auto compensation of the measured water column above the transducer. The value provided in the transducer output listed as “LEVEL” is the freshwater equivalent water above transducer (in feet). Therefore, a density correction was not applied to the freshwater equivalent hydraulic head calculations.

To calculate the freshwater equivalent hydraulic head from the transducer output of freshwater equivalent water above transducer the following equation was utilized:

$$\text{Freshwater Equivalent Hydraulic Head (feet NAVD88)} = \text{Density Corrected Elevation of Transducer (feet NAVD88)} + \text{Freshwater Equivalent Water Above Transducer (feet)}$$

The calculated freshwater equivalent hydraulic head shown above are provided in all MS workbooks for Long Term Water Level Monitoring data provided in **Appendix H-1**.

4.4.3 Calculation of Seasonal Average Freshwater Equivalent Hydraulic Head

Using the calculated freshwater equivalent hydraulic head values a seasonal average freshwater-equivalent hydraulic head was calculated for each monitoring well. The results are presented on **Table 14**. The process to calculate this value included targeting and plotting a one-month period, of 30 days, in each of the four seasons (spring, summer, fall and winter). The seasonal average freshwater equivalent hydraulic head for each monitoring well can be compared within the monitoring well network at each Study Location and are provided as MS workbooks in **Appendix H-2**. This includes the calculations, hydrographs, and plots of the average freshwater-equivalent head for each season.

The MS workbooks were compiled by the following process:

- Targeting a one-month period in each of the four seasons throughout the year – spring, summer, fall and winter.
- Analyzing the available data for each site location and considering periods throughout the year when the transducers were functional and operating at the same time. **Table 13** shows the status of the transducers between October 2022 and March 2024, which was considered when compiling the seasonal average freshwater-equivalent head at each of the 30 site locations.
- Once the four ideal months were targeted for each Study Location, the calculated equivalent freshwater head values from the long-term water level monitoring data were processed to provide a single value for the average freshwater-equivalent head in each one-month period.
- The single value for the average freshwater-equivalent head was plotted against the existing hydrograph for all inland, shoreline and deep monitoring wells of a given period.



5.0 Data Quality and Usability Summary

This report compiles the final data sets generated during the lateral groundwater study. The data generated are expected to be used by various parties to update the site conceptual site model and inform future modeling of shallow groundwater flow, discharge, and contaminant loading to Newtown Creek. These updates should be described in future documents, such as the FS, probabilistic long-term equilibrium model memorandum(a), and other project documents in which the data are used. These future reports will need to document how the data in this report are used and provide details on any assumptions, qualifications, or data use (or exclusion) decisions.

As such, this data quality and usability summary section has been included to facilitate future use of these data. Additionally, this section summarizes deviations that require consideration when determining how to use and interpret the hydrogeologic and analytical data generated from this investigation and monitoring well network.

5.1 Data Quality Objectives

As noted in Section 1.3, this investigation's primary objective was to improve the understanding of and enhance the quantification of shallow lateral groundwater discharge into the study area. This data collection program was developed to provide complimentary datasets, which will mitigate the types of uncertainties inherent to collecting hydrogeologic and analytical data in such a complex program.

Generally, the investigation met the performance/acceptance criteria, with any deviations noted in this report. **Table 1** summarizes the comparison of the overall investigation to the performance/acceptance criteria developed in the QAPP. The subsections that follow provide additional detail regarding the topics summarized in **Table 1**.

5.2 Hydrogeologic Data Quality Summary

This section summarizes deviations noted during the lateral groundwater investigation field program, which should be considered when using and interpreting data collected during this event, and any data collected from the monitoring wells during future events. The deviations include those observed during monitoring well installation, monitoring well development, hydraulic conductivity testing, HPFM testing, and long-term water level monitoring. These are discussed in more detail below and presented in **Table 2** and **Table 9**.

5.2.1 Monitoring Well Installation/Construction Deviations

Several monitoring well installation deviations were required to construct monitoring wells to meet the program goals. In addition, some of the existing monitoring wells selected for testing did not fully meet the well construction guidelines. **Table 2** summarizes these deviations, which were generally necessary because of physical constraints such as the subsurface lithology, depth to the groundwater table, and other factors that did not allow the well installation guidelines to be completely followed. Deviations included the following:

- **Monitoring Wells Screened Across the Groundwater Table** – As detailed in the QAPP, to standardize monitoring well installations, pre-packed monitoring well screens were selected for the project. To facilitate installation of the pre-packed well screens, which were manufactured in 5- or 10-foot-long sections, several monitoring wells needed to be screened across the groundwater table. In some cases, monitoring wells were constructed in this fashion to capture the full range of tidal fluctuations while balancing the goal of screen placement across only the upper fill unit (applies to six new and eight existing monitoring wells). Other monitoring wells were installed across the water table because of the discovery of NAPL in the subsurface during drilling (applies to four monitoring wells). Installing the well screens to be partially submerged in these situations was necessary and consistent with the approach outlined in the QAPP. Scenarios where monitoring well screens were not fully saturated, or when monitoring wells only partially penetrated the aquifer, were considered during the interpretation of slug testing data, which is discussed in **Section 4.2** of this report.
- **Monitoring Wells Screened Across Multiple Lithostratigraphic Units** – To facilitate installation of 5- and 10-foot-long sections of pre-packed well screens, several monitoring wells were screened across multiple lithostratigraphic units. This included 4 of the 53 new monitoring wells installed by EPA and at least 3 of the 16 existing monitoring wells that were installed by others. In most cases, the monitoring wells were screened across only a small portion of the unit below the fill layer (1 to 2 feet). These seven wells were MW-SL24-A, MW-SL27-B, MW-SL28-B, MW-SL31-B, SL15-MW-63, SL16-MW-10, and SL26-EB082MW. **Table 2** summarizes the installation deviations. The lithologic units screened were considered during interpretation of the slug testing data, which is discussed in **Section 4.2** of this report.
- **Monitoring Well Upper Seal Thickness** – Six existing and four newly installed monitoring wells were constructed with upper annular bentonite seals that were 1 foot or less in vertical thickness. Given the height of the groundwater table at these locations, construction of the wells in this fashion was unavoidable. Generally, the bentonite seal sits above the filter pack and well screen and below a cement/bentonite grout that fills the annular space to the ground surface. The monitoring well is finished at the surface with a protective surface casing. If the surficial finish cracks or fails at these locations, the installed bentonite seal has a higher likelihood of failing than a thicker, more robust seal, if such a seal could be accommodated during well construction (which at these locations it could not). Surficial finish failures may provide a pathway for surface water to enter the monitoring well and aquifer. This could affect the water quality at the monitoring well and the analytical results for future groundwater samples collected from those wells by potentially introducing surficial contamination or diluting contaminant concentrations, depending on the nature of the surface water.

To mitigate the risk of this issue, the monitoring wells were purged of one full well volume prior to beginning low-flow purging and sampling. Only 5 (SL4-MW-22R, SL15-CMW-15, SL16-MW-13, MW-SL24-A, and SL26-EBMW081) of the 10 monitoring wells discussed here were sampled as part of this program. The expected impact of these deviations is low, as there was no sign of damage to the surficial completions and turbidity was only elevated in one of these wells (MW-SL24-A) during sampling.

- **Monitoring Well Filter Pack and Seal** – The minor deviations that follow could potentially create slightly elevated turbidity in monitoring wells installed in fine grained materials. However, these deviations are not expected to create data usability concerns for the two rounds of samples that were collected for this investigation. These deviations include the following:
 - The base of the monitoring well screen was installed at the bottom of the borehole annular space due to drilling refusal or other placement constraints. This occurred in one of the newly installed monitoring wells (MW-SL17-A) that was sampled. The concern of potential filter pack failure in this well is minimal because the pre-packed well screens include a primary filter pack that is tightly wrapped around the well screen. Two existing wells that were sampled (SL4-MW-22R and SL16-MW-13) were also documented to have been installed in this fashion. These deviations do not appear impactful, as measured turbidity during sampling in these three wells was less than 1 NTU.
 - The top of the borehole filter pack was set less than 2 feet above the top of the well screen due to monitoring well screen placement constraints. This occurred in six of the newly installed monitoring wells that were sampled (MW-SL2A-A, MW-SL14-A, MW-SL20-A, MW-SL23-A, MW-SL24-A, and MW-SL27-A). The concern of potential filter pack failure in these wells is minimal because the pre-packed well screens included a primary filter pack that is tightly wrapped around the well screen. Four existing wells that were sampled (SL4-MW-22R, SL15-CMW-15, SL16-MW-13, and SL22-GPEC-MW03WT) also had filter packs that were documented to extend less than 2 feet above the well screen. These deviations do not appear impactful, as measured turbidity during sampling in these four wells was less than 6 NTU.
- **Lithologic Soil Boring Backfill** – After advancement of each soil boring and subsequent determination of the planned well construction details at each boring location, the soil boring annulus was backfilled with bentonite chips and capped with #00 choke sand. The monitoring wells were then installed above the filled borehole to screen the targeted portion of the fill unit. In six monitoring wells (MW-SL5-A, MW-SL12-A, MW-SL23-A, MW-SL27-A, MW-SL28-A, and MW-SL31-A), the #00 sand cap filling the abandoned portion of the borehole extended from a lower lithologic unit up into the fill unit where the monitoring well was installed. This may allow for some hydraulic communication between the filter pack and well screen above the filled borehole and the lithologic unit below. Five of the six boreholes penetrated the top of the Upper Glacial aquifer; however, the depth of penetration only ranged from 1 to 4.5 feet. It should be noted that the fill and Upper Glacial units were often not separated by a lower permeability layer that would inhibit communication between the two units. This limited connection would not create a preferential pathway for flow, but there is potential for hydraulic communication at these six locations.

In summary, some minor well specification deviations were necessary during the construction of a small number of the 53 monitoring wells installed by EPA. However, the monitoring well construction process met the needs of the investigation, and the estimated hydrogeologic properties and analytical results derived from these wells are considered reasonable when used with the dataset as a whole.

5.2.2 Monitoring Well Development Deviations

This section summarizes deviations noted during the monitoring well development program that should be considered when using and interpreting data collected during this and future events.

Monitoring wells were developed to provide good hydraulic connection between the monitoring well and the surrounding aquifer. Inadequate development can lead to poor hydraulic connection, elevated turbidity, low groundwater yield, questionable water quality data, inaccurate estimation of hydrogeologic properties (e.g., transmissivity, hydraulic conductivity, storativity), and samples that do not accurately reflect actual aquifer conditions. The sections that follow discuss deviations encountered during monitoring well development.

EPA-Installed Monitoring Well Development

EPA installed and developed 53 monitoring wells between October 2022 and June 2023. During well development, water quality readings of the purged groundwater were collected for turbidity, pH, temperature, conductivity, ORP, and DO. Estimated specific capacity was also calculated at set intervals at consistent discharge rates to assist in determining whether a monitoring well had been adequately developed.

Development was performed in accordance with the QAPP until the following conditions were met:

1. Turbidity levels reached 50 NTUs or less, or all parameters had stabilized (within 10 percent for measurements on successive casing volumes).
2. Monitored specific capacity had stabilized within 20 percent.
3. Or if the on-site geologist made a field decision to suspend well development.

As summarized in **Table 2**, monitoring well development of 14 of the 53 monitoring wells did not completely meet the well development goals as follows:

- **Specific Capacity Goal** – The monitoring well development goal to have specific capacity stabilized to within 20 percent (between successive measurements during development cycles) was not met during the development of 13 monitoring wells (MW-SL3-A, MW-SL5-B, MW-SL9-A, MW-SL9-B, MW-SL12-B, MW-SL13-B, MW-SL16-D, MW-SL17-A, MW-SL20-A, MW-SL24-A, MW-SL24-B, MW-SL25-A, and MW-SL25-B). During well development, specific capacity could not always be accurately measured in the timeframe allotted. This was typically due to the large, rapid fluctuations in the groundwater table due to daily tidal cycling. The tidally driven groundwater fluctuations obscured accurate drawdown measurements in seven wells screened in high-permeability materials, where the well development pumps could not draw down the water levels in the wells rapidly enough for the change to be discernible from the tidal response. The remaining six wells that did not meet the specific capacity development goal were screened in low-permeability materials, and the specific capacity could not be calculated as the purge rate and water-level drawdown could not be stabilized to be accurately measured. These specific capacity measurements were only utilized for assessing effectiveness of well development. Additional hydraulic conductivity testing including specific capacity testing and slug testing was utilized for estimation of aquifer parameters.

- **Turbidity Goal** – The monitoring well development turbidity goal of 50 NTUs was not met during the development of four monitoring wells (MW-SL9-B at 51.2 NTU, MW-SL25-A at 92.7 NTU, MW-SL25-B at 145 NTU, and MW-SL31-A at 160 NTU). Turbidity levels could not be reduced below 50 NTU during well development because of low well yield. Low well yield is not uncommon in monitoring wells installed in certain geologic formations or where aquifer production is limited.

Only two of these wells were part of the sampling program (MW-SL25-A and MW-SL31-A). The elevated turbidity observed in these two monitoring wells during development was not observed during either round of groundwater sampling, indicating that the elevated turbidity was not as significant an issue when the monitoring wells were sampled at a lower discharge rate (low-flow sampling). The final development turbidity and the final sampling turbidity measurements for these two impacted wells that were sampled were:

- **MW-SL25-A**
 - Developed turbidity: 92.7 NTU
 - Final turbidity (Round 1): 25.1 NTU
 - Final turbidity (Round 2): 7.34 NTU
- **MW-SL31-A**
 - Developed turbidity: 160 NTU
 - Final turbidity (Round 1): 11 NTU
 - Final turbidity (Round 2): 31.2 NTU

Existing Monitoring Well Development

Sixteen existing monitoring wells were selected to supplement the 53 monitoring wells that were installed by EPA. The 16 existing monitoring wells that were selected for use in this study were not redeveloped as part of this program. These monitoring wells were used in both the hydrogeologic testing program (12 of the 16 wells) and the analytical sampling program (8 of the 16 wells). It is unclear how recently the 16 monitoring wells were previously tested or sampled, or whether redevelopment would have benefited EPA's program.

Eleven of the 16 monitoring wells were included in the specific capacity testing program (described in **Section 4.1**), during which the wells were pumped for several hours, generally removing between 10 to 30 well volumes to stress the aquifer. Stressing the aquifer in this fashion can have the same effect as over-pumping the well, an accepted well development technique. Therefore, any concerns regarding the condition of these wells would be minimal. The specific capacity testing program was conducted primarily between October 2022 and March 2023, prior to the start of the groundwater sampling program in April 2023, allowing adequate time for the aquifer to equilibrate prior to sampling.

Regarding the five remaining monitoring wells that were not redeveloped or purged as part of the specific capacity testing program, only one (SL15-CMW-15) was sampled as part of the analytical program. The turbidity measured at this well during the two groundwater sampling events was 5.7 NTU or lower.

In summary, any potential impacts to groundwater data quality or hydrogeologic property estimates that may result from incomplete monitoring well development or an absence of redevelopment are expected to be minimal, as final turbidity levels above 50 NTU were only observed during either round of monitoring

well sampling in 2 of the 30 monitoring wells that did not fully meet the well development goals discussed in this section.

5.2.3 Hydraulic Conductivity Testing

Hydraulic conductivity testing was completed on all wells in the monitoring well network to characterize the hydraulic properties of the subsurface materials at each of the 30 study locations. Testing included both slug tests (all wells) and short-term specific capacity tests (shoreline wells).

During the hydraulic conductivity testing, tidal changes significantly affected the water levels in many of the shoreline wells. The tidal influences affected both slug testing and specific capacity testing. For the longer-term specific capacity testing, the tidal fluctuations in the monitoring wells were significant enough that the drawdown data were corrected for the background changes because of the tidal schedule. The length of the pre-testing time used to calculate the background tidal change was dependent on the response of the groundwater system to the tides and often was shortened because of rapid tidal responses. The estimated specific capacity values generated from these short-term tests were subsequently used in an empirical equation to calculate a rough estimate of aquifer hydraulic conductivity. Combining the estimation method with the uncertainty because of the need to correct the dataset indicates that the final specific capacity dataset should be considered estimated.

The hydraulic conductivity estimates from the specific capacity testing were provided as a complementary dataset to the slug testing program to help assess the overall hydrogeologic properties of representative upland properties. The permeability values calculated through the slug testing program should be considered the primary dataset.

5.2.4 Heat Pulse Flowmeter Testing

HPFM testing was performed to provide empirical data to quantify groundwater flow rates and direction. Review of the data has indicated that localized flow conditions are complicated and that most of the HPFM results show turbulent flow, likely because of tidal interactions and shoreline structures. This suggests that use of the data in a quantitative manner will likely misrepresent the overall discharge of groundwater into the system. EPA recommends using the other datasets collected as part of this program (e.g., hydraulic gradients and slug test data) to calculate groundwater discharge and not the HPFM data.

5.2.5 Long-Term Water Level Monitoring

Continuous long-term water level monitoring was performed to analyze and estimate shallow groundwater flow directions and gradients, the effects of tidal variations, seasonal changes, and the impacts of remediation systems. Several deviations in the data collection efforts should be noted:

- **Transducer Malfunctions:** Because of the nature of the environment in which the monitoring wells were installed (i.e., industrial facilities), there was a higher-than-expected number of failures and other issues with the transducers. This unfortunately led to incomplete and noncomparable datasets at some locations. In lieu of calculating year-long long-term average groundwater elevations, EPA decided to select representative time periods for well pairs that included a full month of data during each of the four seasons. While EPA chose to represent the data as monthly averages, users can employ the full dataset as necessary, provided that proper supporting justification is included.

- **Well Screen Placement:** As discussed in **Section 5.2.1**, monitoring well construction deviations that included the placement of monitoring well screens at a depth that was partially hydraulically connected to a lower hydrostratigraphic unit were unavoidable at some locations. These minor deviations have been noted but should not discount use of the data from these monitoring wells.

5.3 Environmental Sampling Data Quality Summary

This section summarizes sampling deviations and specific situations encountered during environmental sample collection. These deviations include elevated turbidity in groundwater samples, anomalous groundwater geochemistry, and the likely presence of contamination (e.g., NAPL and sheen) in the groundwater and seep samples. Each of these has the potential to impact the analytical data; therefore, this information should be considered when using and interpreting the data generated from these samples. The sections that follow detail these observations.

5.3.1 Groundwater Turbidity Levels

Turbidity in aqueous samples can introduce uncertainty about how well a sample represents groundwater flowing through and discharging from an aquifer. Turbidity, which is often caused by suspended solids like clay, silt, and organic matter, can significantly affect the accuracy of a sample's analytical results (Puls and Barcelona 1996) because the results may be associated with contaminant sorption to the suspended solids. Therefore, there is potential for misrepresentation of dissolved contaminant concentrations. High turbidity in water samples can lead to an overestimation of certain analytes, such as metals or hydrophobic organic compounds. When the sample is acidified as part of the preservation or sample analysis process, sorbed contaminants can desorb from suspended solids and dissolve, leading to false positive indications of dissolved contaminants.

Assuming that analytical results from turbid samples are invalid or biased high is not always a correct interpretation of the data. Understanding how each analytical result reflects contaminant transport is essential for appropriately using these data in future evaluation efforts. This includes considering the total mobile contaminant loading (dissolved and naturally suspended particles such as colloids), if that is what is discharging to an adjacent surface water body.

Elevated turbidity readings (defined here as greater than 50 NTU) were observed during groundwater sampling in the monitoring wells listed in the subsequent bullet points. These readings exceeded EPA's low-flow sampling turbidity goal of 5 NTU or less, as detailed in SOP 1-12; however, this goal is preferred for this project, not required.

- **Round 1 Groundwater Sampling:** Two of the 30 monitoring wells sampled reported final turbidity levels greater than 50 NTU: MW-SL20-A (73.7 NTU) and MW-SL28-A (76.7 NTU). Sixteen additional monitoring wells exhibited final turbidity levels between 5 and 50 NTU.
- **Round 2 Groundwater Sampling:** Five of the 30 monitoring wells sampled reported final turbidity levels greater than 50 NTU: MW-SL1-A (131 NTU), MW-SL20-A (239 NTU), MW-SL23-A (123 NTU), MW-SL24-A (513 NTU), and MW-SL28-A (97.7 NTU). Seven additional monitoring wells exhibited final turbidity levels between 5 and 50 NTU.

The sampling logs (Appendix B) and Tables 7a, 7b, and 8 detail the turbidity levels recorded during groundwater sampling.

5.3.2 Geochemistry

Aqueous samples collected from monitoring wells exhibiting anomalous geochemical chemistry may introduce uncertainty in understanding how representative a sample may be of the groundwater moving through and discharging from an aquifer. During both rounds of groundwater sampling, several monitoring wells exhibited chemistries that should be considered when using the data.

- **pH Levels in Groundwater:** Two shoreline wells, MW-SL12-A and MW-SL14-A (Study Locations 12 and 14), reported pH values ranging from 11 to 13 S.U., respectively. This range is outside the normal range for groundwater systems and outside the range of the other monitoring wells sampled during this program. Elevated pH readings can impact the analytical results for certain contaminants of concern, such as metals. Both wells were reported with elevated pH during both sampling rounds.
- **Tidal Impacts:** This groundwater sampling program focused on the collection of data from shallow shoreline monitoring wells. The timing of the sampling, and the limited access schedules at certain commercial/industrial properties, made it impossible to only sample within one low tide window. It is preferred to sample during a low tide window, as it limits tidal impacts on upland groundwater quality. A monitoring well's sensitivity to tidal impacts (represented by salinity) is largely related to its distance from the shoreline and the permeability of the subsurface material between Newtown Creek and the monitoring well. Not unexpectedly, the salinity during sampling ranged from 20.6 (saline) to 0.23 parts per trillion (fresh). When using the data generated from this sampling, the user will need to consider the potential mixing of saline water from Newtown Creek with the (relatively) fresh groundwater in the system. This mixing has the potential to bias results toward the concentrations observed in Newtown Creek.

5.3.3 Presence of NAPL or Sheens

Contamination in the form of NAPL or sheens was observed during the drilling or sampling of 7 of the 30 shoreline monitoring wells and at 1 of the 9 seep samples collected as part of the groundwater sampling program. Observations included:

- NAPL observed at MW-SL2A-A, MW-SL14-A, MW-SL12-A, SL6-MW-S96, SL16-MW-13, and MW-SL32-A
- Sheen observed during drilling at MW-SL20-A
- Sheen observed during sampling of SP-5

While measurable NAPL was not detected in any of the monitoring wells prior to sampling, it is possible that NAPL blebs or other non-dissolved-phase contamination was entrained within the water. The presence of NAPL can bias contaminant concentrations in dissolved-phase samples.

5.4 Analytical Data Usability

This section summarizes the data validation and data usability assessments of the analytical data generated as part of this program, including any uncertainties associated with the data. This information is discussed in more detail in the Data Usability Assessment Reviews (DUARS) included in **Appendix C-2**. When evaluating the usability of the data, the following factors were considered: field sampling techniques, laboratory analytical methods and techniques, data validation reports, and QAPP-listed data quality objectives and criteria.

The environmental sampling program included groundwater samples collected during two sampling events in April and September 2023, and seep samples collected during the April 2023 event. Samples were shipped to subcontract laboratories—SGS North America in Wilmington, North Carolina, and Advanced Environmental Laboratories, Inc. in Jacksonville, Florida—and lower-tier laboratories—ALS Environmental in Kelso, Washington, and GEL Laboratories, LLC in Charleston, South Carolina—for analysis.

Data generated during the investigation are considered definitive data produced under an EPA-approved QAPP, using EPA analytical methods and validated according to the following criteria:

- Final QAPP (CDM Smith 2022b)
- QAPP Addendum (CDM Smith 2023c)
- EPA's National Functional Guidelines for Data Review, November 2020

Validata Chemical Services Inc. validated data collected during the first round of groundwater sampling, while CDM Smith personnel not associated with the sample collection activities validated data collected during the second round of groundwater sampling. **Appendix C-1** provides the data validation reports. Data that did not meet quality control criteria were appropriately qualified during data validation activities with one or more of the following qualifiers:

- J The analyte was positively identified, and the associated numerical value is the approximate concentration of the analyte in the sample.
- J+ The result is an estimated quantity, but the result may be biased high.
- J- The result is an estimated quantity, but the result may be biased low.
- U The analyte was analyzed for but was not detected at a level greater than or equal to the detection/reporting limit (RL).
- UJ The analyte was analyzed for but was not detected; the RL is approximate and may be inaccurate or imprecise.
- R The sample results are unusable because of deficiencies in meeting QC criteria. The analyte may or may not be present in the sample at the reported concentration.

In summary, the usable data for both sampling rounds exceeded the completeness goal of 90%. The validated datasets for both sample rounds are suitable for project use and are acceptable to support project decisions. Sample results that are qualified as estimated are usable. However, rejected sample results are not considered usable for project decisions. One sample result from the Round 1 dataset and

17 sample results from the Round 2 dataset were rejected because of various QC failures. The subsections that follow provide additional details on the rejected and qualified data.

5.4.1 Rejected Data

The following summarizes the rejected data from both sampling events:

- Round 1 Groundwater and Seep Sample Data
 - Less than 1% of the extractable petroleum hydrocarbon (EPH) results were rejected. This includes:
 - One groundwater EPH result (C9-C18) because of low surrogate recoveries.
- Round 2 Groundwater Data
 - Less than 1% of the alkylated polycyclic aromatic hydrocarbon (PAH) results were rejected. This includes:
 - Ten alkylated PAH results because of low laboratory control sample (LCS) recoveries.
 - Less than 1% of the polychlorinated biphenyl (PCB) congener results were rejected. This includes:
 - Three PCB congener results because of low surrogate/labeled standard recoveries.
 - Less than 1% of the per- and polyfluoroalkyl substances (PFAS) results were rejected. This includes:
 - Four PFAS results because of low surrogate and internal standard recoveries.

The rejected data should not be used for project decisions.

5.4.2 Data Qualification Based on Method and Equipment Blank Contamination – Extractable Petroleum Hydrocarbons

EPH results (including C19-C36 aliphatic hydrocarbons) were evaluated for both equipment and laboratory blank detections. EPH sample result fractions detected in the laboratory method blanks were qualified with a “B” qualifier by the laboratory, indicating the analyte was also detected in associated laboratory method blank samples.

EPH was detected in the laboratory method blanks in each of the laboratory reports in Round 1 and Round 2 of analysis. Seven EPH results were detected in 12 equipment blank samples during the first round of sampling, and three EPH results were detected in two equipment blank samples during the second round of sampling. The associated validation reports were reviewed, and blank validation procedures were consistent and followed appropriate guidelines. As detailed on the individual data validation reports in **Appendix C-1** all sample results for the laboratory and equipment blanks were evaluated, and the associated sample results were qualified using the following criteria:

- Sample results greater than the RL/level of quantitation (LOQ) and greater than five times the method or equipment blank concentration did not require any qualification.

- Sample results less than the RL/LOQ but greater than five times the method or equipment blank concentration did not require qualification.
- Sample results greater than the RL/LOQ but less than five times the blank concentration were qualified biased high (J+). Twelve C19-C36 aliphatic hydrocarbon results were qualified J+ biased high based on the method and/or equipment blank detections.
- Sample results less than the RL/LOQ and less than five times the blank concentration were qualified nondetect (U) at the RL/LOQ. Thirty-two C19-C36 aliphatic hydrocarbon results were qualified nondetect at the RL/LOQ based on the method and/or equipment blank detections.

The “B” qualifiers applied by the laboratory were removed during the data validation process. Applicable validation qualifiers were applied if required following the preceding process. Sample results that are qualified as estimated or nondetect based on blank criteria are usable. The estimated sample concentration may be approximate, but the result is usable for project decisions.

5.4.3 Data Qualification Based on Equipment Blank Contamination – PCB Congeners

Multiple PCB congeners were detected in three equipment blanks collected during the Round 2 groundwater sampling event (EB-MW-1-R2, EB-MW-3-R2, EB-MW-4-R2). To identify the source of contamination, equipment blanks were reevaluated for PCB congener contamination. The analytical sequencing of the equipment blanks was reviewed, and there was no identifiable carryover from samples that had detected concentrations analyzed before the specific equipment blanks. Field sample collection and decontamination procedures were also reviewed, but no deficiencies were able to be identified. Based on the review of the elevated PCB congener equipment blank results and the possible effect to the associated sample results, the following conservative validation process was followed:

- If the sample concentration was equal to or greater than one-half the equipment blank concentration, the sample result was qualified estimated biased high (J+). There were 290 PCB congener results that were qualified J+ biased high based on the method and/or equipment blank detections.
- If the sample concentration was less than one-half the blank concentration and below or equal to the LOQ/RL, the sample result was qualified non-detect (U) at the LOQ/RL. Thirteen PCB congener results were qualified non-detect (U) at the LOQ/RL based on the method and/or equipment blank detections.
- If the sample concentration was less than one-half the blank concentration and greater than the LOQ/RL, the sample result was qualified non-detect (U) at the sample detected level. Five PCB congener results were qualified nondetect (U) at the sample detected level based on the method and/or equipment blank detections.

Applicable data validation qualifiers were applied as needed following the preceding process. Sample results qualified as estimated or nondetect based on blank criteria are usable. The estimated sample concentration may be approximate, but the result is usable for project decisions.

5.4.4 Estimated Maximum Potential Concentrations Qualification

The laboratory assigns Estimated Maximum Potential Concentration (EMPC) qualifiers to dioxin/furan and PCB congener results to indicate that the value is an estimate of the maximum possible concentration that may be present in the sample. The EMPC qualifier is applied to data when the quantitation and/or confirmation ions(s) have signal-to-noise ratios greater than three but do not meet the ion ratio identification criteria. EMPC qualifiers indicate a lack of confidence in the identification and quantification of the analyte and are reported as estimated values. The J-EMPC qualified results are usable for intended project needs but should be considered estimated results. There were 75 dioxin/furan results and 2,066 PCB congener results that were qualified by the laboratory as EMPC values, and each of the results was evaluated under these criteria.



6.0 References

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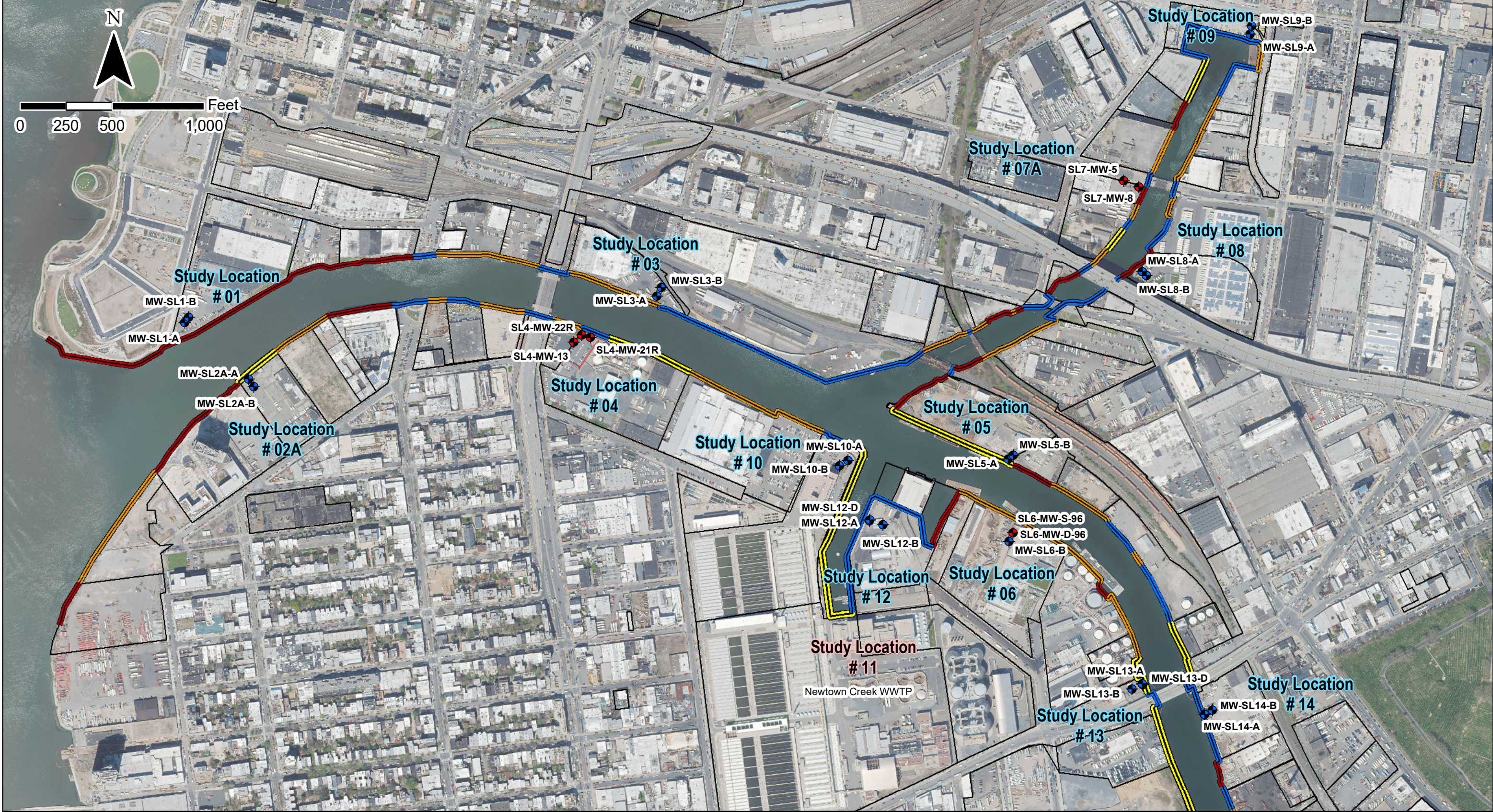
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Figures



Figure 1
Site Location Map
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Study Locations (30 total)

- Study Location Monitoring Well (new)
- Study Location Monitoring Well (existing)
- Staff Gauge

Bulkhead Classification

- Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
- Riprap
- Steel sheetpile
- Vertical Wood; Vertical wood
- GW Remediation Wall

Notes:

- Each study location consists of 2 or 3 monitoring wells within a transect perpendicular to the shoreline.
- Bulkhead Classification Data layer provided by Anchor QEA
- Study location #11 was abandoned due to the viability of installing wells in the area.

Acronyms:

GW - Groundwater
MW - Monitoring Well
SG - Staff Gauge

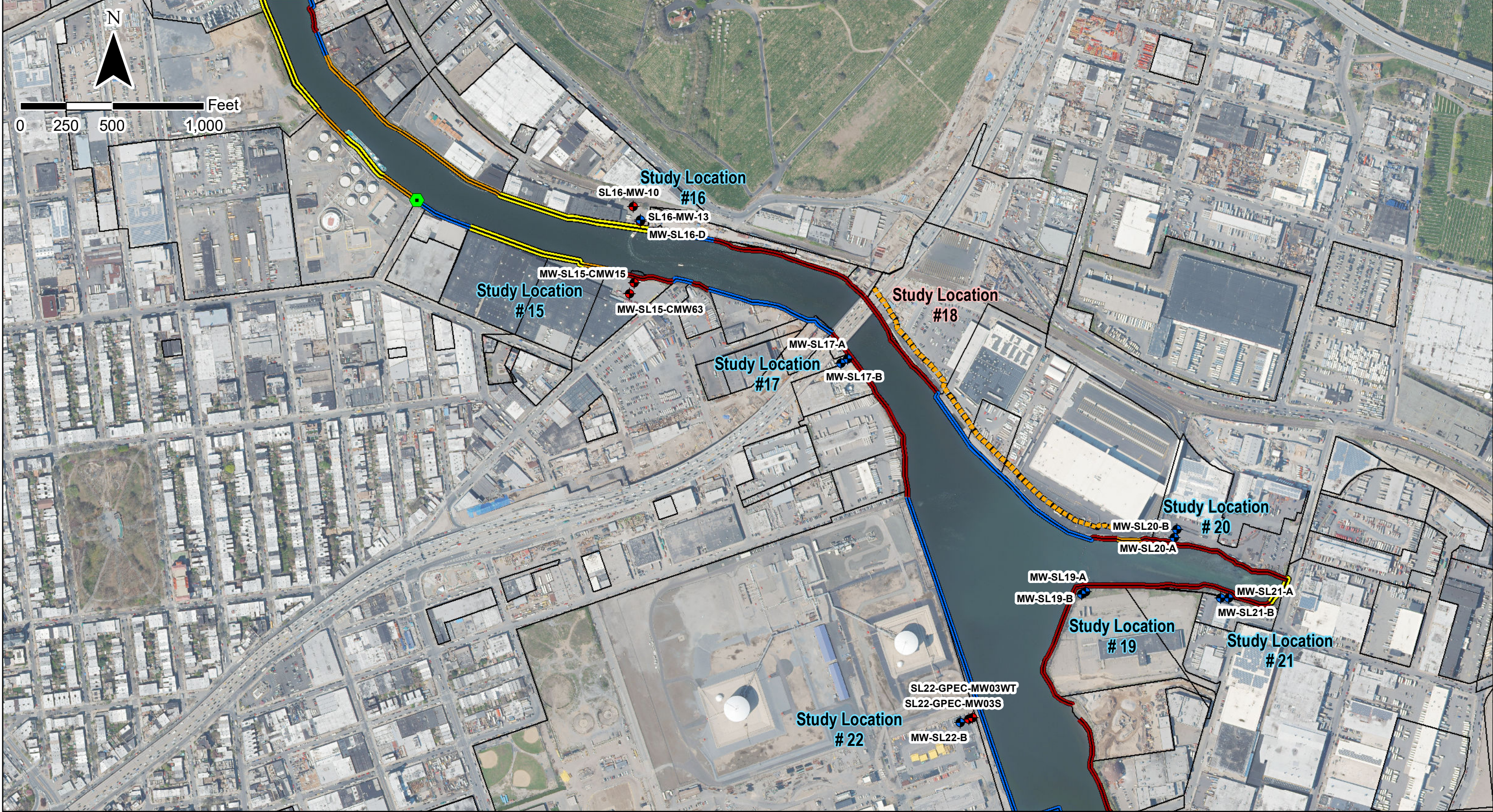
Figure 2a

Study Area Monitoring Well and Staff Gauge Locations- View A

Newtown Creek Superfund Site

Brooklyn and Queens, New York

CDM Smith



Study Locations (30 total)

- Study Location Monitoring Well (new)
- Study Location Monitoring Well (existing)
- Staff Gauge

Bulkhead Classification

- Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
- Riprap
- Steel sheetpile
- Vertical Wood; Vertical wood
- GW Remediation Wall

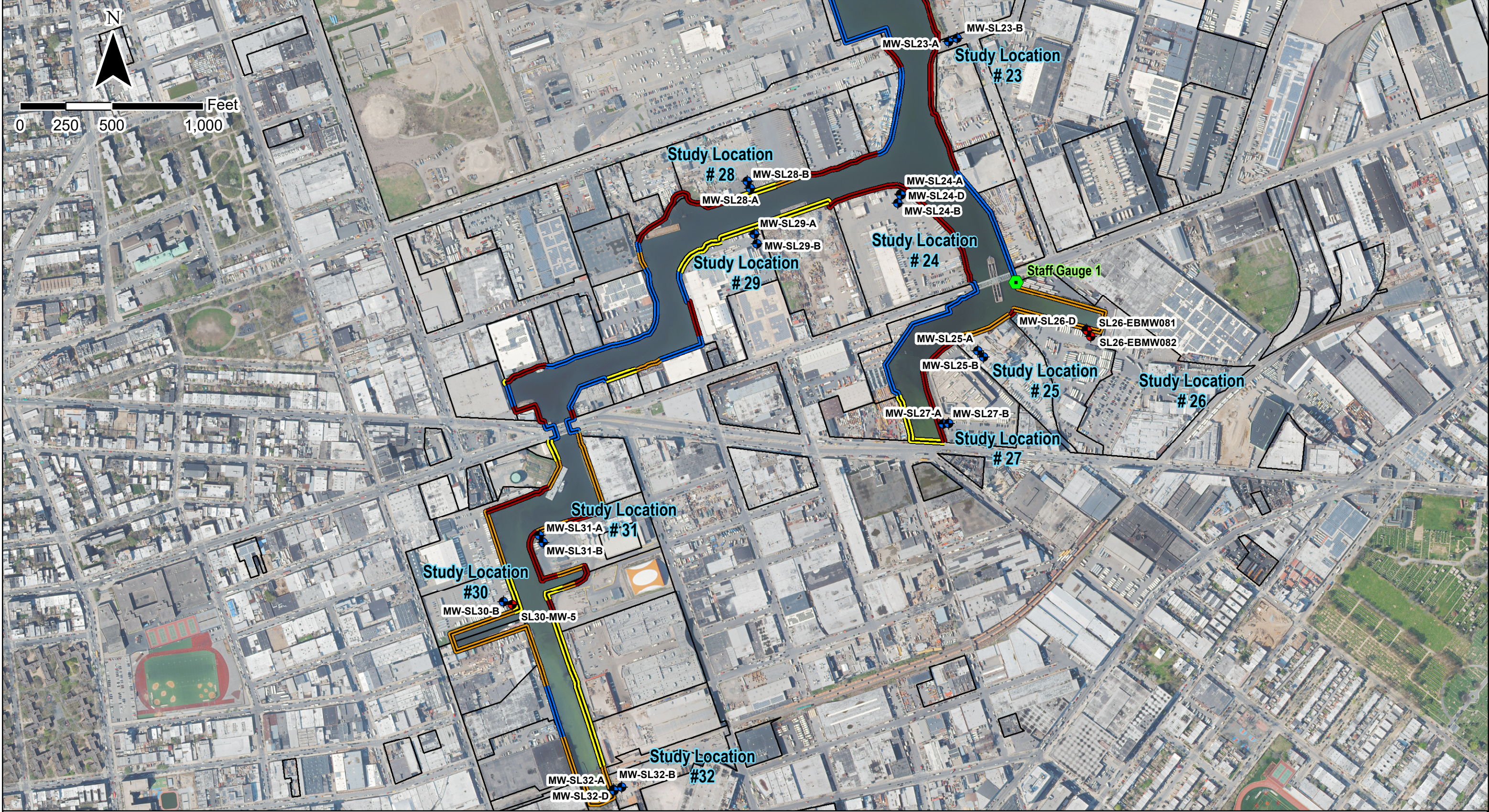
Notes:

- Each study location consists of 2 or 3 monitoring wells within a transect perpendicular to the shoreline.
- Bulkhead Classification Data layer provided by Anchor QEA
- Study location #18 was abandoned due to the viability of installing wells in the area.

Acronyms:

- GW - Groundwater
- MW - Monitoring Well
- SG - Staff Gauge

Figure 2b
Study Area Monitoring Well and Staff Gauge Locations- View B
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Study Locations (30 total)

- Study Location Monitoring Well (new)
- Study Location Monitoring Well (existing)
- Staff Gauge

Bulkhead Classification

- Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
- Riprap
- Steel sheetpile
- Vertical Wood; Vertical wood
- GW Remediation Wall

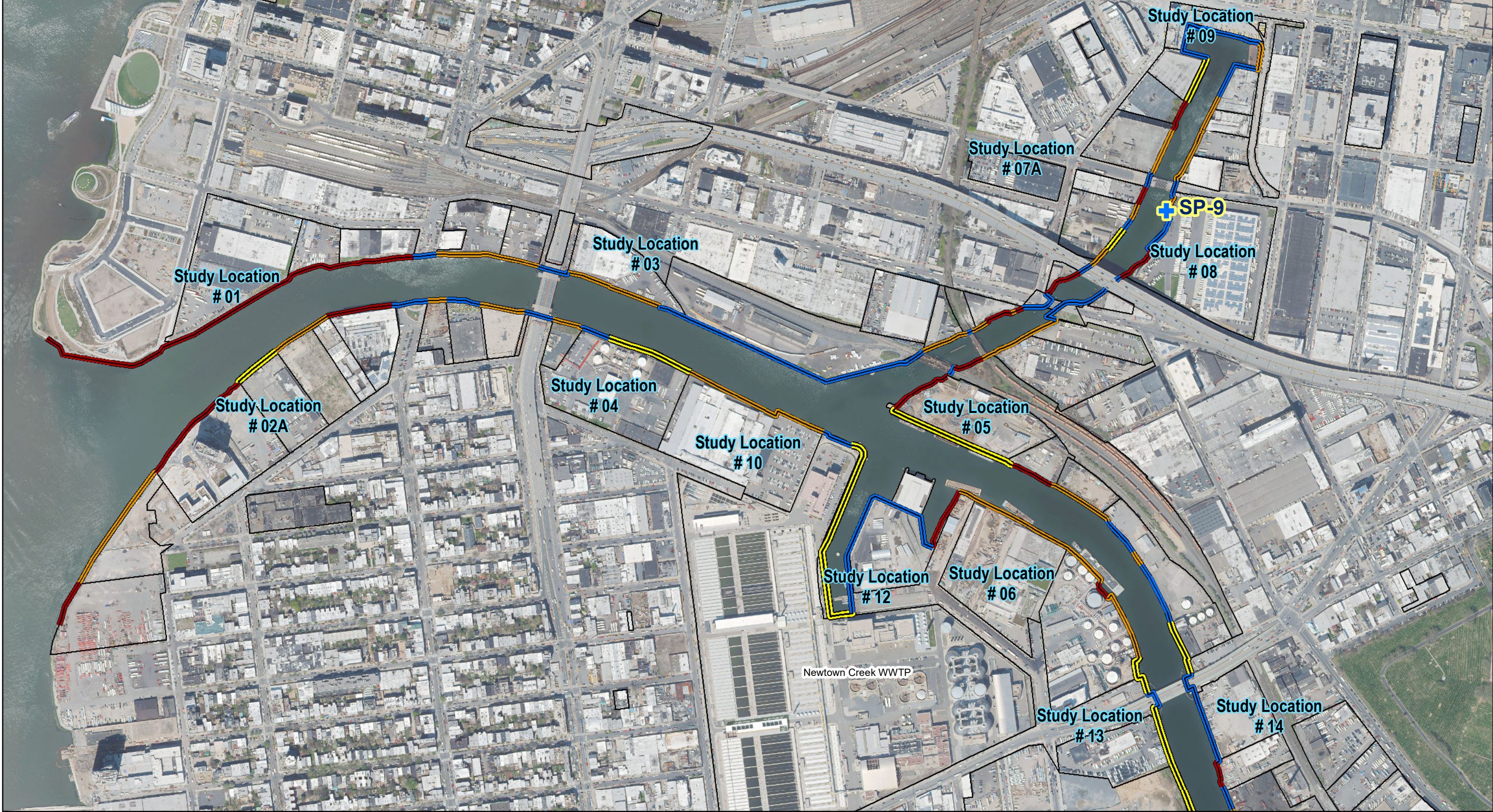
Notes:

- Each study location consists of 2 or 3 monitoring wells within a transect perpendicular to the shoreline.
- Bulkhead Classification Data layer provided by Anchor QEA

Acronyms:

- GW - Groundwater
- MW - Monitoring Well
- SG - Staff Gauge

Figure 2c
Study Area Monitoring Well and Staff Gauge Locations- View C
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Sample Locations

 Opportunistic Seep Sample

Bulkhead Classification

-  Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
-  Riprap
-  Steel sheetpile
-  Vertical Wood; Vertical wood
-  GW Remediation Wall

Notes:

- Seep sample locations were surveyed using a GPS with approximately 3 meter accuracy.
- Data layers provided by Anchor QEA and NYCDEP

Acronyms:

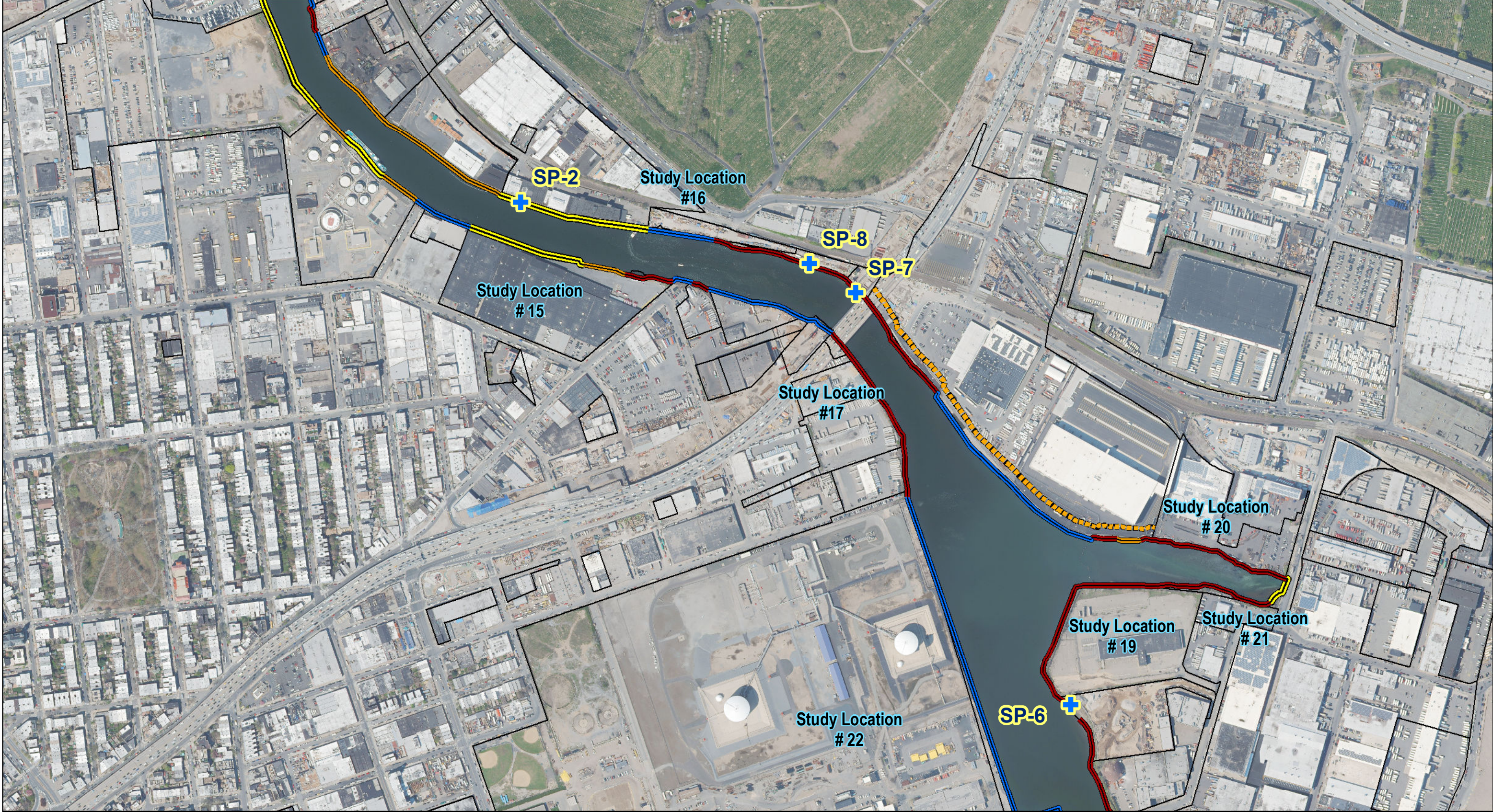
NYCDEP - New York City Department of Environmental Conservation
SP - Seep

N



0 250 500 1,000 Feet

Figure 3a
Opportunistic Seep Sample Locations - View A
Lateral Groundwater Study
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Sample Locations

 Opportunistic Seep Sample

Bulkhead Classification

-  Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
-  Riprap
-  Steel sheetpile
-  Vertical Wood; Vertical wood
-  GW Remediation Wall

Notes:

1. Seep sample locations were surveyed using a GPS with approximately 3 meter accuracy.
2. Data layers provided by Anchor QEA and NYCDEP

Acronyms:

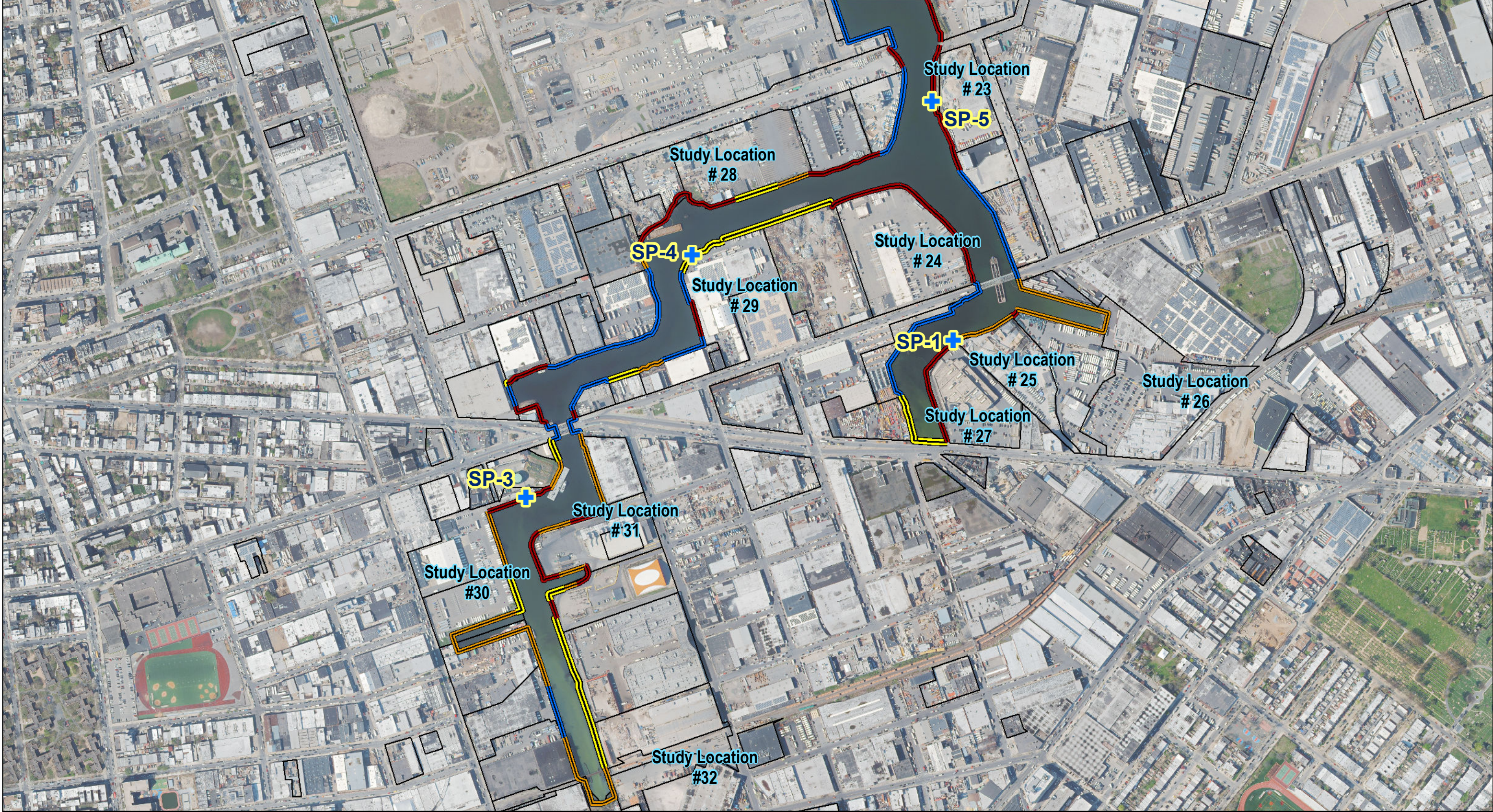
NYCDEP - New York City Department of Environmental Conservation
SP - Seep

N



0 250 500 1,000 Feet

Figure 3b
Opportunistic Seep Sample Locations - View B
Lateral Groundwater Study
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Sample Locations

 Opportunistic Seep Sample

Bulkhead Classification

-  Pile-supported concrete; Precast concrete; Vertical concrete; Vertical concrete with wood facing
-  Riprap
-  Steel sheetpile
-  Vertical Wood; Vertical wood
-  GW Remediation Wall

Notes:

1. Seep sample locations were surveyed using a GPS with approximately 3 meter accuracy.
2. Data layers provided by Anchor QEA and NYCDEP

Acronyms:

NYCDEP - New York City Department of Environmental Conservation
SP - Seep

N



0 250 500 1,000 Feet

Figure 3c
Opportunistic Seep Sample Locations - View C
Lateral Groundwater Study
Newtown Creek Superfund Site
Brooklyn and Queens, New York



Tables

Table 1
Data Quality Objectives
Lateral Groundwater Study
Newtown Creek Superfund Site

Information Inputs		Performance or Acceptance Criteria		Pass/Fail	Notes
Category	Input				
Systematic, unbiased data	Data (the following information input categories) from a systematic, unbiased monitoring well network with well spacing providing an adequate representation of conditions with a reasonable number of study locations.	Study Locations	The target spatial density calculated 32 initial shoreline study locations defined as: - One study location per each 0.4 mile of main stem shoreline from creek mile (CM) 0 to CM 2.8 (the confluence of East Branch and English Kills) - At least one study location on each side of each tributary, located halfway along tributaries less than 0.8 mile long (all tributaries except English Kills) and at locations 0.4 mile apart for English Kills - One study location near the upstream extent of each tributary	Pass with exceptions	Monitoring well installed or existing monitoring wells utilized at 30 of the 32 proposed study locations. The two study locations, SL #10 and SL #18, were not selected for well installation. Existing infrastructure at both locations made them unsuitable for monitoring. Deviations to the planned monitoring well installation approach are summarized on Table 2.
		Well Placement and Construction	Approximately 64 shallow monitoring wells (shoreline and paired inland) -Shallow monitoring wells will be installed with 10-foot screen lengths set approximately 3 feet below the observed local low groundwater level -If the saturated thickness above a low permeability layer (confining or semi-confining) is less than 10 feet, a 5-foot screen will be used -If NAPL is encountered during boring advancement, the shallow well screen will be set to straddle the water table with the screen interval extending approximately 3 feet above the water table Approximately 8 deep (30 to 40 feet below ground surface) monitoring wells -Deep well screens will be set a minimum of 5 feet below the bottom of adjacent shallow well screens -Maximum depths of deep well screens should not extend more than 15 feet below adjacent barrier walls or 15 feet below the mudline of Newtown Creek	Pass with exceptions	Deviations to the planned monitoring well installation approach are summarized on Table 2.
	Perform monitoring well development to ensure wells are adequately connected to the aquifer, operating efficiently, and producing representative samples of the formation water.	Monitoring Well Development	Perform monitoring well development until specific capacity stabilizes.	Pass with exceptions	Deviations to the planned monitoring well installation approach are summarized on Table 2.
			The turbidity goal for monitoring well development is 5 NTU, with 50 NTU being acceptable.		
	Review of existing study location information as available to assist in identification of existing wells that are viable for use.	Existing monitoring wells	Review existing data (e.g., monitoring well construction) to the extent feasible to determine viability for inclusion in the study as indicated in the acceptance criteria for well placement and construction.	Pass	16 existing monitoring wells were selected from 8 study locations to be used for the monitoring well network. No existing data was selected for use from those wells.
Hydrogeologic Data	Hydraulic conductivity using results from slug tests, specific capacity tests, and flexible wall permeameter tests together to ensure estimates of hydraulic conductivity are accurate.	Slug Tests	Perform slug tests after well development, but do not perform on wells with measureable NAPL.	Pass with exceptions	Deviations noted in Table 9 – Hydrogeological Testing and Deviations Summary.
		Short-term Specific Capacity Tests	Conduct short-term specific capacity tests during and at the end of well development.	Pass with exceptions	Deviations noted in Table 9 – Hydrogeological Testing and Deviations Summary.
			Begin short-term specific capacity testing when the water table is at static conditions with consideration of the tides.		
		Flexible wall permeameter tests – vertical hydraulic conductivity	Collect Shelby tubes during the well installation program if fine grained geologic layers are encountered.	Pass with exceptions	Shelby tube cores collected and analyzed from 16 of 30 properties. Shelby tubes were not collected from the 8 study locations where existing wells were not utilized. Other 6 study locations where shelby tubes were not collected due to either the material encountered or field constraints.
	Groundwater velocity and seepage rate data collected during HPFMs and PFMs to provide a check on the other hydraulic data collected.	HPFMs	Utilize HPFMs to collect discrete velocity measurements within the monitoring wells over entire tidal cycles at a subset of the monitoring well locations.	Pass with exceptions	Deviations noted in Table 9 – Hydrogeological Testing and Deviations Summary. Data quality uncertain due to turbulent flow conditions encountered. Data not recommended for quantitative use.
		PFMs	PFMs may be deployed in locations where HPFM monitoring has been performed over a complete tidal cycle	Fail	PFMs were not deployed. Following review of initial long-term water level monitoring data and the HPFM data, it was determined that groundwater direction changed during the tidal cycle, which invalidates data generated by a PFM.
			Locate the top of the PFM sock just below the top of the screened interval to minimize the impact of rising tides contributing to measured total groundwater flow.		
	Groundwater and creek surface water elevation data collected from continuous and synoptic groundwater and creek elevation measurements.	Water level measurements	Collect both continuous and synoptic groundwater and creek surface water elevations to confirm that water elevations are accurate by installing transducers in the entire monitoring well network and staff gauges.	Pass with exceptions	Data was collected with some gaps in data collection due to transducer failure. The gaps are summarized in Table 14 - Transducer Status Summary and deviations noted in Table 9 – Hydrogeological Testing and Deviations Summary.
			Monitor and collect measurements of groundwater and creek surface water elevations over 8 months to gather sufficient data to ensure seasonal changes are captured in the dataset.		
	Weather data	NOAA data	Obtain data from the LaGuardia Airport (LGA) NOAA meteorological station.	Pass with exceptions	Barotroll utilized to collect barometric data at the field facility. Other weather data is available for download as needed.

Table 1
Data Quality Objectives
Lateral Groundwater Study
Newtown Creek Superfund Site

Information Inputs		Performance or Acceptance Criteria		Pass/Fail	Notes
Category	Input				
Lithologic Data	Visual lithologic observations during well/soil boring installations	Continuous lithologic samples	Continuous lithologic samples collected during monitoring well installation in accordance with standard lithologic identification and logging methods/procedures.	Pass with exceptions	Deviations to the planned monitoring well installation investigation are summarized on Table 2.
	Grain size data from geotechnical laboratory	Grain size	Grain size samples collected from lithologic units encountered at each study location.	Pass with exceptions	150 grain size samples collected from soil borings advanced at 27 study locations. Samples were not collected from 3 study locations where only existing wells were utilized.
Contaminant Characterization Data	COC concentration data from shallow groundwater	Analytical data	Collect groundwater samples during 2 rounds of groundwater sampling from the monitoring well network performed 6 months apart.	Pass	All samples collected.
			Groundwater samples collected are representative of shallow groundwater that may be discharging to Newtown Creek.	Pass with exceptions	Elevated turbidity, high pH, and presence of NAPL or other contaminants found in some of the groundwater samples may bias the sampling results and create some uncertainty in the dataset. This is discussed further in Section 5.
	COC concentration data from shoreline seeps		Opportunistic seep sampling performed following reconnaissance as part of the round 1 groundwater sampling event. Sample if seeps are observed.	Pass	Sufficient sample volume was collected; therefore, all analysis listed in the QAPP for aqueous seeps samples was performed.
	COC concentration and characterization from NAPL		Opportunistic NAPL sampling performed during groundwater and seep sampling activities. Sample if sufficient NAPL is recoverable.	NA	No measureable/ sampleable NAPL observed during these activities.
	All characterization analytical data		SOPs and laboratory methods for the analyses scoped in Step 5 provide performance criteria. Use data validation and data assessment to confirm data quality is suitable for the intended uses.	Pass	See data usability assessment included in Appendix C.

Acronyms:
COC - contaminant of concern
HPFMs - heat-pulse flowmeters
LGA - Laguardia Airport
NA - not applicable
NAPL - Non-Aqueous Phase Liquid
NOAA - National Oceanic and Atmospheric Administration
NTU - Nephelometric turbidity units
PFMs - passive flux meters
SL - study location

Table 2
Monitoring Well Installation and Development Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #1	MW-SL1-A	YES	YES	N/A	N/A
	MW-SL1-B	YES	YES	N/A	N/A
SL #2A	MW-SL2A-A	NO	YES	Well screen placement: Due to NAPL observations, the well was constructed with a 15-foot screen beginning at 4 feet bgs to straddle water table. Given shallow well construction, sand pack only extended 1 foot above screen to allow space for seal and backfill.	N/A
	MW-SL2A-B	YES	YES	N/A	N/A
SL #3	MW-SL3-A	YES	NO	Specific capacity goal not met: Due to the significant tidal influence on the water level in the well, it was difficult to determine if a well had recovered from pumping. Therefore, measuring a stable specific capacity was difficult between the various monitoring periods. The second and third measurements had a variance of approximately 22%. Based on stable water quality parameters and stable discharge of the monitoring well, well development was deemed complete.	N/A
	MW-SL3-B	YES	YES	N/A	N/A
SL #4	SL4-MW-21R*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screens not fully submerged.	N/A
	SL4-MW-22R*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screens not fully submerged.	N/A
	SL4-MW-13*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screens not fully submerged.	N/A
SL #5	MW-SL5-A	NO	YES	Well screen placement: Field observations during boring advancement indicated water was observed around 7 feet bgs based on moisture content of the soil sample. During investigations at other site locations, groundwater table had been observed to be approximately two feet higher post well installation than assumed based soil moisture. Monitoring well was installed to screen 6.5 to 16.5 feet bgs based on field discretion. Water level readings during subsequent site visits indicate screen is fully saturated.	Did not encounter low permeability post glacial soils. Shelby tube not collected.
	MW-SL5-B	NO	NO	Well screen placement: Auger refusal encountered at 8.5 feet bgs. Due to NAPL observations, the well was constructed with a 5-foot screen beginning at 3.5 feet bgs to straddle water table. NAPL was observed between 10 to 15 feet bgs. Given shallow well construction, sand pack and seal thickness deviated from criteria. Specific capacity goal not met: Difficulty achieving stable specific capacity due to time constraints at property. Effort was focused on stabilizing water quality parameters. Water quality parameters deemed stable and additional specific capacity run was not performed. Last two specific capacity runs had a variance of approximately 23%. Third run was performed for 34 minutes and discharge had stabilized.	Did not encounter low permeability post glacial soils. Shelby tube not collected.
SL #6	SL6-MW-S-96*	YES	N/A	N/A	N/A
	SL6-MW-D-96*	YES	N/A	N/A	N/A
	MW-SL6-B	NO	YES	Well screen placement: Due to NAPL observations and shallow depth to post-glacial clays (9.5 feet bgs), the well was constructed with a 5-foot screen beginning at 4 feet bgs to straddle water table. Given shallow well construction, sand pack and seal thickness deviated from criteria.	NAPL in soil reported during drilling. To avoid further migration of NAPL into deeper units, Shelby Tube was not collected.

Table 2
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Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #7	SL7-MW-8*	NO	N/A	Well screen placement: Existing shallow well. Water table encountered within the 15-foot well screen; well screen not fully submerged.	N/A
	SL7-MW-5*	NO	N/A	Well screen placement: Existing shallow well. Water table encountered within the 15-foot well screen; well screen not fully submerged.	N/A
SL #8	MW-SL8-A	YES	YES	N/A	N/A
	MW-SL8-B	YES	YES	N/A	N/A
SL #9	MW-SL9-A	YES	NO	Specific capacity goal not met: Could not generate enough drawdown to accurately measure specific capacity in the tidally influenced well. Well was initially pumped at 1 gpm and minimal drawdown was observed. Well was purged continuously for 75 minutes and total drawdown of only 0.19 feet was observed. Due to stable water quality parameters and little confidence in measured drawdown, well development was deemed complete.	N/A
	MW-SL9-B	YES	NO	Specific capacity goal not met: Due to low discharge of well (well going dry/drawing down quickly), accurate specific capacity measurements could not be collected. Water quality readings were recorded until stable. Additional specific capacity runs were not performed due to time constraints. A total of 9 well volumes were purged from monitoring well. Turbidity goal not met: Turbidity goal of 50 NTU was not met; the final turbidity was measured at 51.2 NTU.	N/A
SL #10	MW-SL10-A	YES	YES	N/A	N/A
	MW-SL10-B	NO	YES	Well screen placement: Water table observed during drilling at approximately 7 feet bgs. Screen set at 9.5 to 19.5 feet bgs. Pre-packed screens only offered in increments of 5 feet. Opted for 10 foot screen to better screen fill material and match construction of shoreline well. This left bottom 2-feet of well screened in the top of the post-glacial clay unit.	N/A
SL #11	--	--	--	Following initial review of subsurface construction in the area of the proposed SL #11, it was determined that no viable location could be utilized for a set of wells at the head of Whale Creek.	N/A
SL #12	MW-SL12-A	YES	NO	Specific capacity goal not met: Due to the significant tidal influence on the water level in the well, measuring a stable specific capacity was difficult. Well was initially purged at 3 gpm continuously for 90 minutes with fluctuating drawdown observed. Based on water quality parameters and the minimal drawdown observed during the purge time with significant flow rate, development was deemed complete.	Did not encounter low permeability post glacial soils. Shelby tube not collected.
	MW-SL12-B	YES	NO	Specific capacity goal not met: Due to low discharge of well (well going dry/drawing down quickly), accurate specific capacity measurements could not be collected. Slow recharge observed after multiple development techniques. Water quality parameters recorded until stable.	Did not encounter low permeability post glacial soils. Shelby tube not collected.
	MW-SL12-D	NO	YES	Well screen placement: Deep well installed with top of screen 5-feet below bottom of paired shallow wells screen due to lack of any post-glacial low permeability materials.	Did not encounter low permeability post glacial soils. Shelby tube not collected.

Table 2
Monitoring Well Installation and Development Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #13	MW-SL13-A	YES	YES	N/A	N/A
	MW-SL13-B	YES	NO	Specific capacity goal not met: Due to low discharge of well (well going dry/drawing down quickly), accurate specific capacity measurements could not be collected. Slow recharge observed after multiple development techniques. Based on recharge rates and water quality parameters, well development was deemed complete.	N/A
	MW-SL13-D	YES	YES	N/A	N/A
SL #14	MW-SL14-A	YES	YES	N/A	N/A
	MW-SL14-B	YES	YES	N/A	N/A
SL #15	SL15-CMW-15*	YES	N/A	N/A	N/A
	SL15-MW-63*	YES	N/A	N/A	N/A
SL #16	SL16-MW-13*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screen not fully submerged.	N/A
	SL16-MW-10*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screen not fully submerged.	N/A
	MW-SL16-D	NO	NO	Well screen placement: Lithologic boring was not advanced into the Upper Glacial unit due to NAPL observed in soils. In an effort to avoid contaminant migration, the boring was terminated at 23 feet bgs before advancing beyond lower permeability soils. Well was installed at the base of the fill at the minimum 5 feet below the bottom of the adjacent shoreline well. Specific capacity goal not met: Due to the significant tidal influence on the water level in the well, coupled with the low permeable unit resulting in slower recovery rate, measuring a stable specific capacity was difficult between the various monitoring periods. Based on relatively close variance between two low specific capacity values and stable water quality parameters, well development was deemed complete.	NAPL reported in soil during drilling. To avoid further migration of NAPL into deeper units, shelby tube was not collected.
SL #17	MW-SL17-A	NO	NO	Well screen placement: Boring refusal encountered at 17 feet bgs. Pre-packed screens only available in 5-foot increments. Five-foot screen installed from 12 to 17 feet bgs, which left top of screen at the observed water table of 12 feet bgs. Water level observed lower at low tide. Specific capacity goal not met: Due to the significant tidal influence on the water level in the well and the limited water column, measuring a stable specific capacity was difficult. Development efforts were focused on stabilizing water quality readings.	Did not encounter low permeability post-glacial soils. Refusal encountered at 17 feet bgs. Shelby tube not collected.
	MW-SL17-B	YES	YES	N/A	Did not encounter low permeability post-glacial soils. Refusal encountered at 21.5 feet bgs. Shelby tube not collected.
SL #18	--	--	--	Due to the existence of the Phelps Dodge remediation system near the shoreline, well placement was not viable to perform the investigation as scoped. Decision was made to not include this proposed study location.	N/A

Table 2
Monitoring Well Installation and Development Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #19	MW-SL19-A	YES	YES	N/A	N/A
	MW-SL19-B	YES	YES	N/A	Well installed using 3.75" direct push casing due to difficult geology encountered while drilling with hollow stem augers.
SL #20	MW-SL20-A	NO	NO	Well screen placement: Pre-packed screens available in five-foot increments. Ten-foot screen length was selected to target a greater extent of the permeable zone which resulted in the screen being approximately 2 feet below observed water table. Specific capacity goal not met: Due to the significant tidal influence on the water level in the well and the low permeable unit resulting in slower recovery rate, measuring a stable specific capacity was difficult between the various monitoring periods. Based on relatively close variance between two low specific capacity values and stable water quality parameters, well development was deemed complete.	N/A
	MW-SL20-B	YES	YES	N/A	N/A
SL #21	MW-SL21-A	YES	YES	N/A	Did not encounter low permeability post-glacial soils. Refusal encountered at 25 feet bgs. Shelby tube not collected.
	MW-SL21-B	YES	YES	N/A	Two-foot layer of peat encountered. Due to site conditions (construction work), efforts to reposition sonic drill rig in an offset location was not feasible. Opportunity for shelly tube collection was missed. No shelly tube sample collected.
SL #22	SL22-GPEC-MW03S*	YES	N/A	N/A	N/A
	SL22-GPEC-MW03WT*	No	N/A	Well screen placement: Existing shallow well. Water table encountered within the well screen; well screen not fully submerged.	N/A
	MW-SL22-B*	YES	YES	N/A	N/A
SL #23	MW-SL23-A	YES	YES	N/A	Post-glacial soils were noted as having significant sand content and/or gravel content making shelly tube collection efforts difficult. No shelly tube sample collected.
	MW-SL23-B	NO	YES	Well screen placement: Water table observed at 7 feet bgs; however, lower permeability soils were observed at approximately 13 feet bgs. Pre-packed screens only available in five-foot increments; therefore, opted for five-foot screen in order to screen shallow permeable zone. Well screen was not 3 feet below water observed water table. Due to tidal fluctuations, well screen may not be saturated during low tide.	Two-foot layer of post-glacial soils encountered during drilling. Opportunity to collect shelly tube sample was missed. No shelly tube sample collected.

Table 2
Monitoring Well Installation and Development Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #24	MW-SL24-A	NO	NO	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table was at 2.5 feet bgs. A ten-foot screen was selected and set from 4 to 14 feet bgs. Due to limitations imposed by options in screen length, bottom of screen was partially set 1 foot into lower clay unit to avoid exposing screen above fluctuating water table. Specific capacity goal not met: Due to the significant tidal influence on the water level in the well (rising during this period), measuring a stable specific capacity was difficult between the various monitoring periods. Based on first two runs, specific capacity was assumed to be close to stable, and tide conditions may have had greater influence on the variance going forward. After three runs of specific capacity and stable water quality parameters, well development was deemed	N/A
	MW-SL24-B	NO	NO	Well screen placement: Pre-packed screens available in five-foot increments. A ten-foot screen was selected and set from 4 to 14 feet bgs. This resulted in the top of screen less than three feet below water table. Specific capacity goal not met: Due to low discharge of well (well going dry/drawing down quickly), accurate specific capacity measurements could not be collected. Slow recharge observed after multiple development techniques. Based on recharge rates and water quality parameters, well development was deemed complete.	N/A
	MW-SL24-D	YES	YES	N/A	N/A
SL #25	MW-SL25-A	YES	NO	Water quality paramter stabilization not met: Difficulty achieving stable water quality parameters. Dissolved oxygen parameter was unable to stabilize after multiple development techniques. May be attributed to obvious contaminant impacts to groundwater. Groundwater observed to be amber in color. Turbidity goal not met: Turbidity goal of 50 NTU was not met; the final turbidity was measured at 92.7 NTU.	N/A
	MW-SL25-B	YES	NO	Specific Capacity goal not met: Due to low discharge of well (well going dry/drawing down quickly), accurate specific capacity measurements could not be collected. Slow recharge observed after multiple development techniques. Based on recharge rates and water quality parameters, well development was deemed complete. Turbidity goal not met: Turbidity goal of 50 NTU was not met; the final turbidity was measured at 145 NTU.	N/A
SL #26	SL26-EBMW081*	YES	N/A	N/A	N/A
	SL26-EBMW082*	YES	N/A	N/A	N/A
	MW-SL26-D	YES	YES	Well screen placement: Deep monitoring well was installed to screen 19 to 29 feet bgs. From 29 to 51 feet bgs, lower permeability post-glacial material was observed. Upper glacial unit was not encountered until 51 feet bgs. The TAP indicated the deep well should not extend more than 15 feet below adjacent barrier wall or profile of adjacent shoreline. It was assumed that the adjacent shoreline structure or base of creek does not extend to 51 feet bgs. Therefore, field observations determined 19 to 29 feet bgs was the most optimal zone to target the screen depth.	N/A

Table 2
Monitoring Well Installation and Development Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #27	MW-SL27-A	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table was at 5 feet bgs. A ten-foot screen was selected and set from 6 to 16 feet bgs. Due to limitations imposed by options in screen length, bottom of screen was partially set 1 foot into lower clay unit to avoid exposing screen above fluctuating water table.	Shelby tube was collected. Mistakenly logged as MW-SL29-A. Corrected in lab sheets.
	MW-SL27-B	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table during drilling was at 7 feet bgs. Being the inland well (primarily used for water level measurements) and due to the potential for a small saturated zone and significant tidal fluctuations, a ten-foot screen was selected and set from 6 to 16 feet bgs to avoid potential for a dry well. Due to limitations imposed by options in screen length, bottom of screen was set 5 feet into lower clay unit to avoid exposing screen above fluctuating water table.	N/A
SL #28	MW-SL28-A	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table during drilling was at 4 feet bgs. A ten-foot screen was selected and set from 5 to 15 feet bgs. This resulted in the top of screen less than 3 feet below water table.	N/A
	MW-SL28-B	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table was at 4 feet bgs. A ten-foot screen was selected and set from 5 to 15 feet bgs. Due to limitations imposed by options in screen length, bottom of screen was partially set 2 feet into lower clay unit to avoid exposing screen above fluctuating water table.	N/A
SL #29	MW-SL29-A	YES	YES	N/A	N/A
	MW-SL29-B	YES	YES	N/A	N/A
SL #30	SL30-MW-5*	YES	N/A	N/A	N/A
	MW-SL30-B	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table during drilling was at 11 feet bgs. A five-foot screen was selected and set from 12 to 17 feet bgs. This resulted in the top of screen less than 3 feet below water table.	N/A
SL #31	MW-SL31-A	NO	NO	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table during drilling was at 7 feet bgs. A ten-foot screen was selected and set from 12 to 22 feet bgs. This resulted in the top of screen being 5 feet below water table. Turbidity goal not met: Turbidity goal of 50 NTU was not met; the final turbidity was measured at 160 NTU.	Layer of post-glacial peat was too thin to capture in shelby tube. Shelby tube sample was not collected.
	MW-SL31-B	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table was at 8 feet bgs. A ten-foot screen was selected and set from 12 to 22 feet bgs. Due to limitations imposed by options in screen length, bottom of screen was partially set 1 foot into lower permeability peat unit to avoid exposing screen above fluctuating water table.	Layer of post-glacial peat had substantial gravel content making shelby tube collection difficult. Shelby tube sample was not collected.

Table 2
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Newtown Creek Superfund Site

Study Location	Well ID	Well Construction Criteria Met (Yes/No)	Well Development Criteria Met (Yes/No)	Descriptions of Deviations	Notes
SL #32	MW-SL32-A	NO	YES	Well screen placement: Pre-packed screens available in five-foot increments. Observed water table during drilling was at 5 feet bgs. A ten-foot screen was selected and set from 10 to 20 feet bgs. This resulted in the top of screen being 5 feet below water table.	Did not encounter post-glacial clay unit. Refusal encountered at 17 feet bgs. Shelby tube not collected.
	MW-SL32-B	YES	YES	N/A	NAPL reported in soil during drilling. To avoid further migration of NAPL into deeper units, shelby tube was not collected.
	MW-SL32-D	YES	YES	N/A	Layer of post glacial fines was thin and noted as having non-plastic consistency making shelby tube collection difficult. Shelby tube sample was not collected.

Acronyms:
bgs - below ground surface
N/A - not applicable
NAPL - Non-Aqueous Phase Liquid
TAP - Technical Approach Plan
* Pre-Existing Well

Table 3
Geotechnical Sample Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Sample ID	Location	Matrix	Analyses	Sample Date	Sample Depth Top (feet bgs)	Sample Depth Bottom (feet bgs)
SL #1	SL1A-0-8	MW-SL1-A	Soil	Grain Size	10/24/2022	0	8
	SL1A-24-29		Soil	Grain Size	10/24/2022	24	29
	SL1A-29-32		Soil	Grain Size	10/24/2022	29	32
	SL1A-32-36		Soil	Grain Size	10/24/2022	32	36
	SL1A-8-9		Soil	Grain Size	10/24/2022	8	9
	SL1A-9-22		Soil	Grain Size	10/24/2022	9	22
	SL1B-10-15	MW-SL1-B	Soil	Grain Size	10/25/2022	10	15
	SL1B-15-20		Soil	Grain Size	10/25/2022	15	20
SL #2A	SL2AA-0-5	MW-SL2A-A	Soil	Grain Size	11/7/2022	0	5
	SL2AA-11-15		Soil	Grain Size	11/7/2022	11	15
	SL2AA-15-27		Soil	Grain Size	11/7/2022	15	27
	SL2AA-27-30		Soil	Grain Size	11/7/2022	27	30
	SL2AA-5-7		Soil	Grain Size	11/7/2022	5	7
	SL2AA-7-11		Soil	Grain Size	11/7/2022	7	11
	SL2AB-11-17	MW-SL2A-B	Soil	Grain Size	11/8/2022	11	17
	SL2AB-29-33		Soil	Grain Size	11/8/2022	29	33
	SL2AB-7-11		Soil	Grain Size	11/8/2022	7	11
SL #3	SL3A-0-21	MW-SL3-A	Soil	Grain Size	3/6/2023	0	21
	SL3A-21-27		Soil	Grain Size	3/6/2023	21	27
	SL3A-27-35		Soil	Grain Size	3/6/2023	27	35
	SL3B-10-20	MW-SL3-B	Soil	Grain Size	3/7/2023	10	20
SL #5	SL5A-0-16	MW-SL5-A	Soil	Grain Size	1/30/2023	0	16.5
	SL5A-16-5-20		Soil	Grain Size	1/30/2023	16.5	20
	SL5B-3-5-8	MW-SL5-B	Soil	Grain Size	2/1/2023	3.5	8.5
SL #6	SL6B-4-9	MW-SL6-B	Soil	Grain Size	2/6/2023	4	9
SL #8	SL8A-0-13	MW-SL8-A	Soil	Grain Size	6/20/2023	0	13
	SL8A-13-30		Soil	Grain Size	6/20/2023	13	30
	SL8A-30-35		Soil	Grain Size	6/20/2023	30	35
	SL8B-8-13	MW-SL8-B	Soil	Grain Size	6/20/2023	8	13
SL #9	SL9A-20-24	MW-SL9-A	Soil	Grain Size	3/13/2023	20	24.5
	SL9A-24-5-30		Soil	Grain Size	3/13/2023	24.5	30
	SL9A-7-20		Soil	Grain Size	3/13/2023	7	20
	SL9B-8-18	MW-SL9-B	Soil	Grain Size	3/14/2023	8	18
SL #10	SL10A-0-11	MW-SL10-A	Soil	Grain Size	12/6/2022	0	11
	SL10A-11-15		Soil	Grain Size	12/12/2022	11	15
	SL10A-15-19		Soil	Grain Size	12/12/2022	15	19
	SL10A-19-25		Soil	Grain Size	12/12/2022	19	25
	SL10A-25-35		Soil	Grain Size	12/12/2022	25	35
	SL10A-35-39		Soil	Grain Size	12/12/2022	35	39
	SL10B-9-19	MW-SL10-B	Soil	Grain Size	12/12/2022	9	19
SL #12	SL12A-0-5	MW-SL12-A	Soil	Grain Size	1/3/2023	0	5
	SL12A-11-27		Soil	Grain Size	1/3/2023	11	27
	SL12A-5-11		Soil	Grain Size	1/3/2023	5	11
	SL12B-7-11	MW-SL12-B	Soil	Grain Size	1/5/2023	7	11
	SL12D-22-27	MW-SL12-D	Soil	Grain Size	1/6/2023	22	27

Table 3
Geotechnical Sample Summary
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Study Location	Sample ID	Location	Matrix	Analyses	Sample Date	Sample Depth Top (feet bgs)	Sample Depth Bottom (feet bgs)
SL #13	SL13A-0-5	MW-SL13-A	Soil	Grain Size	10/14/2022	0	5
	SL13A-21-23		Soil	Grain Size	10/14/2022	21	23
	SL13A-5-9		Soil	Grain Size	10/14/2022	5	9
	SL13A-9-21		Soil	Grain Size	10/14/2022	9	21
	SL13B-7-17	MW-SL13-B	Soil	Grain Size	10/18/2022	7	17
	SL13D-25-27	MW-SL13-D	Soil	Grain Size	10/17/2022	25	27
	SL13D-27-29		Soil	Grain Size	10/17/2022	27	29
	SL13D-29-31		Soil	Grain Size	10/17/2022	29	31
	SL13D-31-33		Soil	Grain Size	10/17/2022	31	33
	SL13D-33-35		Soil	Grain Size	10/17/2022	33	35
SL #14	SL14A-0-7	MW-SL14-A	Soil	Grain Size	11/29/2022	0	7
	SL14A-19-21		Soil	Grain Size	12/5/2022	19	21
	SL14A-7-19		Soil	Grain Size	12/5/2022	7	19
	SL14B-11-19	MW-SL14-B	Soil	Grain Size	12/6/2022	11	19
	SL14B-4-11		Soil	Grain Size	12/6/2022	4	11
SL #16	SL16D-0-5	MW-SL16-D	Soil	Grain Size	11/11/2022	0	5
	SL16D-19-23		Soil	Grain Size	11/11/2022	19	23
	SL16D-5-19		Soil	Grain Size	11/11/2022	5	19
SL #17	SL17A-0-9	MW-SL17-A	Soil	Grain Size	10/28/2022	0	9
	SL17A-11-17		Soil	Grain Size	10/28/2022	11	17
	SL17B-11-21	MW-SL17-B	Soil	Grain Size	10/31/2022	11	21
	SL17B-6-10		Soil	Grain Size	10/31/2022	6	10
SL #19	SL19A-0-23	MW-SL19-A	Soil	Grain Size	1/16/2023	0	23
	SL19A-23-25		Soil	Grain Size	1/16/2023	23	25
	SL19B-15-20	MW-SL19-B	Soil	Grain Size	1/19/2023	15	20
SL #20	SL20A-0-9	MW-SL20-A	Soil	Grain Size	11/14/2022	0	9
	SL20A-15-17		Soil	Grain Size	11/14/2022	15	17
	SL20A-17-19		Soil	Grain Size	11/14/2022	17	19
	SL20A-19-23		Soil	Grain Size	11/14/2022	19	23
	SL20A-23-29		Soil	Grain Size	11/14/2022	23	29
	SL20A-9-15		Soil	Grain Size	11/14/2022	9	15
	SL20B-5-15	MW-SL20-B	Soil	Grain Size	11/15/2022	5	15
SL #21	SL21A-15-20	MW-SL21-A	Soil	Grain Size	1/12/2023	15	20
	SL21B-0-25	MW-SL21-B	Soil	Grain Size	3/6/2023	0	25
	SL21B-25-27		Soil	Grain Size	3/6/2023	25	27
	SL21B-27-31		Soil	Grain Size	3/6/2023	27	31
SL #22	SL22B-15-16	MW-SL22-B	Soil	Grain Size	11/21/2022	15	16
SL #23	SL23A-0-5	MW-SL23-A	Soil	Grain Size	10/10/2022	0	5
	SL23A-13-15		Soil	Grain Size	10/10/2022	13	15
	SL23A-15-19		Soil	Grain Size	10/10/2022	15	19
	SL23A-19-25		Soil	Grain Size	10/10/2022	19	25
	SL23A-25-29		Soil	Grain Size	10/10/2022	25	29
	SL23A-29-31		Soil	Grain Size	10/10/2022	29	31
	SL23A-5-13		Soil	Grain Size	10/10/2022	5	13
	SL23B-7-12	MW-SL23-B	Soil	Grain Size	10/11/2022	7	12

Table 3
Geotechnical Sample Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Sample ID	Location	Matrix	Analyses	Sample Date	Sample Depth Top (feet bgs)	Sample Depth Bottom (feet bgs)
SL #24	SL24A-15-21	MW-SL24-A	Soil	Grain Size	12/12/2022	5	21
	SL24A-5-15		Soil	Grain Size	12/12/2022	5	15
	SL24A-0-5		Soil	Grain Size	12/13/2022	0	5
	SL24B-0-11	MW-SL24-B	Soil	Grain Size	12/14/2022	0	11
	SL24B-11-15		Soil	Grain Size	12/14/2022	11	15
	SL24D-0-5	MW-SL24-D	Soil	Grain Size	12/13/2022	0	5
	SL24D-11-30		Soil	Grain Size	12/13/2022	11	30
	SL24D-5-11		Soil	Grain Size	12/13/2022	5	11
SL #25	SL25A-0-13	MW-SL25-A	Soil	Grain Size	12/19/2022	0	11
	SL25A-13-21		Soil	Grain Size	12/19/2022	13	21
	SL25A-21-29		Soil	Grain Size	12/19/2022	21	29
	SL25B-8-13	MW-SL25-B	Soil	Grain Size	12/20/2022	8	13
SL #26	SL26D-0-11	MW-SL26-D	Soil	Grain Size	11/28/2022	0	11
	SL26D-11-17		Soil	Grain Size	11/28/2022	11	17
	SL26D-19-21		Soil	Grain Size	11/28/2022	19	21
	SL26D-21-23		Soil	Grain Size	11/28/2022	21	23
	SL26D-27-29		Soil	Grain Size	11/28/2022	27	29
	SL26D-31-35		Soil	Grain Size	11/29/2022	31	35
	SL26D-35-41		Soil	Grain Size	11/29/2022	35	41
	SL26D-41-47		Soil	Grain Size	11/29/2022	41	47
	SL26D-47-51		Soil	Grain Size	11/29/2022	47	51
	SL26D-51-55		Soil	Grain Size	11/29/2022	51	55
SL #27	SL27A-0-15	MW-SL27-A	Soil	Grain Size	9/26/2022	0	15
	SL27A-15-19		Soil	Grain Size	9/26/2022	15	19
	SL27A-19-21		Soil	Grain Size	9/26/2022	19	21
	SL27A-21-25		Soil	Grain Size	9/26/2022	21	25
	SL27B-14-16	MW-SL27-B	Soil	Grain Size	9/26/2022	14	16
	SL27B-5-7		Soil	Grain Size	9/26/2022	5	7
	SL27B-7-9		Soil	Grain Size	9/26/2022	7	9
	SL27B-9-14		Soil	Grain Size	9/26/2022	9	14
SL #28	SL28A-0-5	MW-SL28-A	Soil	Grain Size	9/30/2022	0	5
	SL28A-15-21		Soil	Grain Size	9/30/2022	15	21
	SL28A-21-23		Soil	Grain Size	9/30/2022	21	23
	SL28A-23-25		Soil	Grain Size	9/30/2022	23	25
	SL28A-25-29		Soil	Grain Size	9/30/2022	25	29
	SL28A-29-31		Soil	Grain Size	9/30/2022	29	31
	SL28A-31-35		Soil	Grain Size	9/30/2022	31	35
	SL28A-5-15		Soil	Grain Size	9/30/2022	5	15
	SL28B-11-15	MW-SL28-B	Soil	Grain Size	10/4/2022	11	15
	SL28B-5-11		Soil	Grain Size	10/4/2022	5	11

Table 3
Geotechnical Sample Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Sample ID	Location	Matrix	Analyses	Sample Date	Sample Depth Top (feet bgs)	Sample Depth Bottom (feet bgs)
SL #29	SL29A-0-5	MW-SL29-A	Soil	Grain Size	9/19/2022	0	5
	SL29A-15-17		Soil	Grain Size	9/19/2022	15	17
	SL29A-19-21		Soil	Grain Size	9/19/2022	19	21
	SL29A-21-25		Soil	Grain Size	9/19/2022	21	25
	SL29A-5-15		Soil	Grain Size	9/19/2022	5	15
	SL29B-11-13	MW-SL29-B	Soil	Grain Size	9/20/2022	11	13
	SL29B-7-9		Soil	Grain Size	9/20/2022	7	9
	SL29B-9-11		Soil	Grain Size	9/20/2022	9	11
SL #30	SL30B-0-12	MW-SL30-B	Soil	Grain Size	3/9/2023	0	12
	SL30B-12-17		Soil	Grain Size	3/9/2023	12	17
	SL30B-17-23		Soil	Grain Size	3/9/2023	17	23
	SL30B-23-31		Soil	Grain Size	3/9/2023	23	31
SL #31	SL31A-0-25	MW-SL31-A	Soil	Grain Size	2/16/2023	0	25
	SL31A-25-29		Soil	Grain Size	2/16/2023	25	29
	SL31B-12-22	MW-SL31-B	Soil	Grain Size	2/17/2023	12	22
SL #32	SL32A-10-20	MW-SL32-A	Soil	Grain Size	2/13/2023	10	20
	SL32B-5-20	MW-SL32-B	Soil	Grain Size	2/14/2023	5	20
	SL32D-0-21	MW-SL32-D	Soil	Grain Size	2/10/2023	0	21
	SL32D-21-23		Soil	Grain Size	2/10/2023	21	23
	SL32D-23-35		Soil	Grain Size	2/10/2023	23	35
SL #1	SL1A-26-28	MW-SL1-A	Soil	Flexible Wall Permeameter	10/24/2022	26	28
SL #2A	SL2AB-21-23	MW-SL2A-B	Soil	Flexible Wall Permeameter	11/8/2022	21	23
SL #3	SL3A-23-25	MW-SL3-A	Soil	Flexible Wall Permeameter	2/27/2023	23	25
SL #8	SL8A-15-17	MW-SL8-A	Soil	Flexible Wall Permeameter	6/20/2023	15	17
SL #9	SL9B-23-25	MW-SL9-B	Soil	Flexible Wall Permeameter	3/14/2023	23	25
SL #10	SL10A-27-29	MW-SL10-A	Soil	Flexible Wall Permeameter	12/12/2022	27	29
SL #13	SL13D-23-25	MW-SL13-D	Soil	Flexible Wall Permeameter	10/17/2022	23	25
	SL13D-35-37		Soil	Flexible Wall Permeameter	10/17/2022	35	37
SL #14	SL14B-19-21	MW-SL14-B	Soil	Flexible Wall Permeameter	12/6/2022	19	21
SL #19	SL19A-18-20	MW-SL19-A	Soil	Flexible Wall Permeameter	9/21/2022	18	20
SL #20	SL20B-18-20	MW-SL20-B	Soil	Flexible Wall Permeameter	11/15/2022	18	20
SL #24	SL24D-9-11	MW-SL24-D	Soil	Flexible Wall Permeameter	12/13/2022	9	11
SL #25	SL25B-19-21	MW-SL25-B	Soil	Flexible Wall Permeameter	12/20/2022	19	21
SL #26	SL26D-29-31	MW-SL26-D	Soil	Flexible Wall Permeameter	11/28/2022	29	31
SL #27	SL27A-17-19	MW-SL27-A	Soil	Flexible Wall Permeameter	9/26/2022	17	19
SL #28	SL28A-16-18	MW-SL28-A	Soil	Flexible Wall Permeameter	10/4/2022	16	18
SL #30	SL30B-23-25	MW-SL30-B	Soil	Flexible Wall Permeameter	3/9/2023	23	25

Notes

bgs - below ground surface

Table 4
Monitoring Well Construction Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Monitoring Well	Date Installed	Longitude -X ¹	Latitude - Y ¹	Ground Surface (feet NAVD88)	Top of Inner Casing (feet NAVD88)	Protective Casing	Protective Casing Length (feet)	Well Diameter (inches)	Borehole Depth (feet bgs)	Bottom of Boring Backfill (#00 Sand and Bentonite) (feet bgs)	Bottom of Boring Borehole Collapse (feet bgs)	Bottom of Boring Backfill (Bentonite) (feet bgs)	Bottom of Boring Backfill (#00 Sand) (feet bgs)	Screen Length (feet)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Screen Slot Size (inches)	Sand Filter Pack Interval (feet bgs)	Upper Seal Interval (feet bgs)
MW-SL1-A	10/21/2022	208436.6	995417.1	7.46	12.18	Stick-up	4	2	36	20-36	--	24-36	20-24	10	10	20	0.020	8.0-20.0	5.0-8.0
MW-SL1-B	12/25/2022	208464.7	995437.9	6.83	10.81	Stick-up	4	2	23	20-23	--	--	20-23	10	10	20	0.020	8.0-20.0	6.0-8.0
MW-SL2A-A	11/7/2022	208127.8	995765.0	7.99	7.64	Flushmount	0	2	30	19-30	28-30	23-28	19-23	15	4	19	0.020	3.0-19.0	1.0-3.0
MW-SL2A-B	11/8/2022	208089.0	995793.4	8.10	7.61	Flushmount	0	2	33	17-33	--	20-33	17-20	10	7	17	0.020	8.0-20.0	3.0-5.0
MW-SL3-A	2/27/2023	208579.1	997982.9	6.84	6.31	Flushmount	0	2	35	20-35	30-35	23-30	20-23	10	10	20	0.020	8.0-20.0	6.0-8.0
MW-SL3-B	2/28/2023	208626.8	998006.7	7.65	7.17	Flushmount	0	2	21	20-21	--	--	20-21	10	10	20	0.020	8.0-20.0	6.0-8.0
SL4-MW-21R*	2/23/2010	208357.0	997620.2	6.32	5.49	Flushmount	0	4	13	NA	NA	NA	NA	10	2.5	12.5	0.020	2.0-13.0	1.0-2.0
SL4-MW-22R*	2/24/2010	208369.0	997574.4	6.80	9.50	Stick-up	4	4	9	NA	NA	NA	NA	7	2	9	0.020	2.0-9.0	1.0-2.0
SL4-MW-13*	10/30/1986	208329.1	997530.4	7.49	9.16	Stick-up	4	4	14	NA	NA	NA	NA	10	1.5	11.5	0.020	1.0-14.0	0.5-1.0
MW-SL5-A	1/30/2023	207695.7	999890.8	7.18	6.84	Flushmount	0	2	21	16.5-21	--	--	16.5-21	10	6.5	16.5	0.020	4.5-16.5	2.5-4.5
MW-SL5-B	2/1/2023	207715.3	999919.2	7.39	7.19	Flushmount	0	2	20	8.5-20	--	13-20	8.5-13	5	3.5	8.5	0.020	2.5-8.5	1.5-2.5
SL6-MW-S-96*	10/10/2012	207299.9	999919.9	5.14	4.78	Flushmount	0	4	25	***	***	***	***	10	10	20	0.020	8.0-20.0	6.0-8.0
SL6-MW-D-96*	2/5/2013	207292.5	999917.2	5.03	5.10	Flushmount	0	4	70	***	***	***	***	15	29	44	0.020	25.0-44.0	23.0-25.0
MW-SL6-B	2/6/2023	207246.3	999895.6	5.07	4.39	Flushmount	0	2	11	9-11	--	--	9-11	5	4	9	0.020	3.0-11.0	2.0-3.0
SL7-MW-8*	11/21/2018	209173.2	1000600.6	12.64	12.45	Flushmount	0	2	19.5	***	***	***	***	14.46	5	19.46	NA	***	***
SL7-MW-5*	11/21/2018	209206.1	1000518.7	13.48	13.11	Flushmount	0	2	20	***	***	***	***	15	5	20	NA	***	***
MW-SL8-A	6/20/2023	208713.9	1000619.8	8.51	7.92	Flushmount	0	2	35	13-35	--	18-35	13-18	5	8	13	0.020	6.0-13.0	4.0-6.0
MW-SL8-B	6/20/2023	208692.2	1000642.2	7.95	7.29	Flushmount	0	2	17	13-17	--	--	13-17	5	8	13	0.020	6.0-13.0	4.0-6.0
MW-SL9-A	3/13/2023	210004.3	1001206.5	11.48	11.06	Flushmount	0	2	30	18-30	--	20-30	18-20	10	8	18	0.020	6.0-18	4.0-6.0
MW-SL9-B	3/14/2023	210047.6	1001213.6	11.78	11.37	Flushmount	0	2	30	18-30	--	20-30	18-20	10	8	18	0.020	6.0-18.0	4.0-6.0
MW-SL10-A	12/12/2022	207685.9	999020.2	9.72	9.05	Flushmount	0	2	39	21-39	35-39	25-35	21-25	10	11	21	0.020	9.0-21.0	7.0-9.0
MW-SL10-B	12/15/2022	207658.7	998973.7	8.50	8.13	Flushmount	0	2	21	19.5-21	--	--	19.5-21	10	9.5	19.5	0.020	8.5-19.5	5.5-8.5
MW-SL12-A	1/3/2023	207358.5	999137.0	8.25	8.00	Flushmount	0	2	27	17-27	--	20-27	17-20	10	7	17	0.020	5.0-17.0	3.0-5.0
MW-SL12-B	1/5/2023	207336.4	999210.3	8.22	7.85	Flushmount	0	2	17	--	--	--	--	10	7	17	0.020	5.0-17.0	3.0-5.0
MW-SL12-D	1/4/2023	207363.2	999138.9	8.19	7.78	Flushmount	0	2	28	NA	NA	NA	NA	5	22	27	0.020	20.0-27.0	18.0-20.0
MW-SL13-A	10/14/2022	206468.0	1000622.1	6.27	5.93	Flushmount	0	2	23	17-23	--	20-23	17-20	10	7	17	0.020	5.0-17.0	3.0-5.0
MW-SL13-B	10/18/2022	206443.8	1000563.5	7.07	6.81	Flushmount	0	2	17	NA	NA	NA	NA	10	7	17	0.020	5.0-17.0	3.0-5.0
MW-SL13-D	10/18/2022	206472.4	1000619.9	6.22	5.84	Flushmount	0	2	37	34-37	--	--	34-37	10	24	34	0.020	22.0-34.0	20.0-22.0
MW-SL14-A	12/5/2022	206307.2	1000958.5	9.22	8.58	Flushmount	0	2	21	19-21	--	--	19-21	15	4	19	0.020	4.0-19.0	2.0-4.0
MW-SL14-B	12/6/2022	206329.4	1001000.9	10.19	9.79	Flushmount	0	2	21	19-21	--	--	19-21	15	4	19	0.020	4.0-19.0	2.0-4.0
SL15-CMW-15*	7/22/2006	204551.2	1002781.0	9.49	9.24	Flushmount	0	4	20	15.5-25	--	15.5-25	--	10	4.5	14.5	0.020	3.5-15.0	2.5-3.5
SL15-MW-63*	9/27/2004	204492.9	1002756.0	10.96	10.28	Flushmount	0	4	24	19-24	--	19-24	--	14	5	19	0.050	4.0-19.0	2.0-4.0
SL16-MW-13*	3/31/2009	204885.0	1002814.2	8.02	7.77	Flushmount	0	4	8	NA	NA	NA	NA	7	1	8	0.020	0.5-8.0	0-0.5
SL16-MW-10*	3/18/2009	204967.0	1002775.2	11.15	10.58	Flushmount	0	4	25	13-15	15-25	13-15	--	10	3	13	0.020	2.5-13.0	0.5-2.5
MW-SL16-D	11/11/2022	204895.3	1002814.5	8.39	8.11	Flushmount	0	2	23	18-23	--	--	18-23	5	13	18	0.020	12.0-18.0	9.0-12.0
MW-SL17-A	10/31/2022	204139.9	1003941.5	14.89	14.27	Flushmount	0	2	17	NA	NA	NA	NA	5	12	17	0.010	8.0-17.0	8.0-10.0
MW-SL17-B	11/1/2022	204115.0	1003903.5	14.96	14.63	Flushmount	0	2	21.5	NA	NA	NA	NA	15	6	21	0.010	5.0-21.5	2.0-5.0
MW-SL19-A	1/16/2023	202874.1	1005234.4	13.28	14.06	Stick-up	4	2	25	20-25	--	--	20-25	5	15	20	0.020	13.0-20.0	11.0-13.0
MW-SL19-B	1/18/2023	202860.0	1005211.8	13.29	13.79	Stick-up	4	2	20	NA	NA	NA	NA	5	15	20	0.020	13.0-20.0	11.0-13.0
MW-SL20-A	11/14/2022	203167.1	1005715.3	4.33	3.64	Flushmount	0	2	29	15-29	--	19-29	15-19	10	5	15	0.020	4.0-15.0	2.0-4.0
MW-SL20-B	11/15/2022	203211.1	1005729.4	5.44	5.18	Flushmount	0	2	20	15-20	--	--	15-20	10	5	15	0.020	4.0-15.0	2.0-4.0
MW-SL21-A	1/12/2023	202840.2	1006011.6	14.48	14.20	Flushmount	0	2	25	20-25	--	--	20-25	5	15	20	0.020	13.0-20.0	11.0-13.0
MW-SL21-B	3/6/2023	202837.7	1005967.3	14.82	16.39	Stick-up	4	2	31	20-31	--	23-31	20-23	5	15	20	0.020	13.0-20.0	11.0-13.0
SL22-GPEC-MW03S*	4/23/2009	202179.9	1004599.2	6.99	6.48	Flushmount	0	2	42	NA	NA	NA	NA	15	25	40	0.020	23.0-42.0	22.0-23.0
SL22-GPEC-MW03WT*	6/10/2010	202188.1	1004619.2	6.55	6.37	Flushmount	0	2	107	15.5-107	--	15.5-107	--	10	3	13	0.020	2.5-15.5	1.0-2.5
MW-SL22-B***	9/21/2022	202163.0	1004552.2	7.62	7.51	Flushmount	0	2	20	16-20	--	--	16-20	10	6	16	0.010	4.0-16.0	2.0-4.0
MW-SL23-A	10/10/2022	201625.4	1005428.5	7.56	10.66	Stick-up	4	2	33	17-33	--	21-33	17-21	10	7	17	0.020	6.0-17.0	3.0-6.0
MW-SL23-B	10/11/2022	201644.6	1005475.4	8.07	7.62	Flushmount	0	2	19	12-19	--	15-19	12-15	5	7	12	0.020	7.0-12.0	3.0-7.0
MW-SL24-A	12/12/2022	200795.5	1005166.4	5.04	4.69	Flushmount	0	2	21	14-21	--	18-21	14-18	10	4	14	0.020	3.0-14.0	2.0-3.0
MW-SL24-B	12/14/2022	200747.0	1005151.4	5.96	5.63	Flushmount	0	2	15	14-15	--	--	14-15	10	4	14	0.020	3.0-14.0	2.0-3.0
MW-SL24-D	12/13/2022	200791.3	1005169.4	5.08	4.84	Flushmount	0	2	30	NA	NA	NA	NA	10	20	30	0.020	18.0-30.0	16.0-18.0
MW-SL25-A	12/19/2022	199944.4	1005587.9	8.86	8.26	Flushmount	0	2	29	13-29	25-29	16-25	13-16	5	8	13	0.020	6.0-13.0	4.0-6.0
MW-SL25-B	12/20/2022	199909.3	1005618.4	8.40	8.03	Flushmount	0	2	21	13-21	--	--	13-21	5	8	13	0.020	6.0-13.0	4.0-6.0
SL26-EBMW081*	11/18/2019	200053.7	1006185.8	4.67	4.39	Flushmount	0	2	27	15-27	--	15-27	--	10	4.5	14.3	0.010	2.0-15.0	1.0-2.0
SL26-EBMW082*	11/19/2019	200021.5	1006204.1	4.06	3.74	Flushmount	0	2	15	NA	NA	NA	NA	10	4.5	14.3	0.010	2.0-15.0	1.0-2.0
MW-SL26-D	11/28/2022	200056.7	1006179.1	4.76	4.49	Flushmount	0	2	55	29-55	45-55	34-45	29-34	10	19	29	0.020	17.0-29.0	15.0-17.0
MW-SL27-A	9/26/2022	199545.6	1005398.3	6.84	6.11	Flushmount	0	2	23	16-23	--	20-23	16-20	10	6	16	0.020	5.0-16.0	2.0-5.0
MW-SL27-B	9/27/2022	199548.2	1005428.2	7.27	6.91	Flushmount	0	2	17	16-17	--	--	16-17	10	6	16	0.020	5.0-16.0	2.0-5.0

Table 4
Monitoring Well Construction Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Monitoring Well	Date Installed	Longitude -X ¹	Latitude - Y ¹	Ground Surface (feet NAVD88)	Top of Inner Casing (feet NAVD88)	Protective Casing	Protective Casing Length (feet)	Well Diameter (inches)	Borehole Depth (feet bgs)	Bottom of Boring Backfill (#00 Sand and Bentonite) (feet bgs)	Bottom of Boring Borehole Collapse (feet bgs)	Bottom of Boring Backfill (Bentonite) (feet bgs)	Bottom of Boring Backfill (#00 Sand) (feet bgs)	Screen Length (feet)	Top of Screen (feet bgs)	Bottom of Screen (feet bgs)	Screen Slot Size (inches)	Sand Filter Pack Interval (feet bgs)	Upper Seal Interval (feet bgs)
MW-SL28-A	9/30/2022	200827.9	1004347.4	6.08	8.67	Stick-up	4	2	35	15-35	27-35	21-27	15-21	10	5	15	0.020	3.0-15.0	1.0-3.0
MW-SL28-B	10/3/2022	200866.4	1004331.4	11.07	10.34	Flushmount	0	2	15	NA	NA	NA	NA	10	5	15	0.020	3.0-15.0	2.0-4.0
MW-SL29-A	9/19/2022	200578.6	1004370.6	5.00	4.60	Flushmount	0	2	25	11-25	--	20-25	11-20	5	6	11	0.010	4.0-11.0	2.0-4.0
MW-SL29-B	9/20/2022	200527.0	1004383.9	4.99	4.59	Flushmount	0	2	25	12-25	20-25	14-20	12-14	5	7	12	0.010	4.0-12.0	3.0-5.0
SL30-MW-5*	2/10/2007	198563.0	1003049.8	12.43	12.28	Flushmount	0	2	19	***	***	***	***	10	9**	19**	0.020	***	***
MW-SL30-B	3/9/2023	198577.4	1003002.4	11.34	11.04	Flushmount	0	2	31	17-31	30-31	20-30	17-20	5	12	17	0.020	10.0-17.0	8.0-10.0
MW-SL31-A	2/18/2023	198940.2	1003197.4	8.57	8.02	Flushmount	0	2	29	22-29	--	--	22-29	10	12	22	0.020	10.0-22.0	8.0-10.0
MW-SL31-B	2/19/2023	198899.2	1003218.6	8.08	7.77	Flushmount	0	2	23	22-23	--	--	22-23	10	12	22	0.020	10.0-22.0	8.0-10.0
MW-SL32-A	2/13/2023	197556.7	1003603.0	7.89	7.54	Flushmount	0	2	21	20-21	--	--	20-21	10	10	20	0.020	8.0-20.0	6.0-8.0
MW-SL32-B	2/14/2023	197569.4	1003646.6	10.08	9.64	Flushmount	0	2	21	20-21	--	--	20-21	15	5	20	0.020	4.0-20.0	2.0-4.0
MW-SL32-D	2/10/2023	197549.8	1003605.2	7.87	7.56	Flushmount	0	2	35	NA	NA	NA	NA	10	25	35	0.020	23.0-35.0	21.0-23.0
Staff Gauge 1	NA	200315.1	1005796.0	NA	4.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Staff Gauge 2	NA	205002.2	1001601.4	NA	4.62	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Acronyms:
bgs - below ground surface
NA - Not Applicable
* Pre-existing Well
** Assumed based on measured depth of well (18.7 feet previously) and log noting 10-foot well screen.
*** Information not included on pre-existing log.

Table 5
Monitoring Well Development Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Location	Date	Time	Volume Purged (gallons)	Depth to Water (feet TIC)	Flow Rate (mL/min)	Drawdown (feet TIC)	Final Measured Specific Capacity (gpm/ foot drawdown)	pH	Specific Conductivity	Dissolved Oxygen (mg/L)	Temperature (°C)	Redox Potential (mV)	Turbidity (NTU)
MW-SL1-A	10/26/2022	13:30	17.5	6.89	0.48	5.97	0.08	8.49	21.4	3.20	17.19	-126	30.8
MW-SL1-B	10/26/2022	12:53	40.0	7.46	1.30	0.46	2.83	8.64	17.5	0.63	18.3	-244	11.8
MW-SL2A-A	11/9/2022	9:05	11.0	6.10	1.80	8.39	0.21	7.78	23	3.47	15.39	140	0.0
MW-SL2A-B	11/9/2022	12:40	11.0	5.89	0.12	5.59	0.02	8.37	0.828	1.89	14.45	1	40.5
MW-SL3-A	3/1/2023	9:40	125.0	5.75	2.00	6.94	0.29	6.93	25	13.11	19.01	-227	0.0
MW-SL3-B	3/1/2022	12:45	120.0	5.63	2.00	0.38	5.26	6.87	2.53	5.68	20.41	0	0.0
MW-SL5-A	2/2/2023	10:14	88.0	5.11	2.20	1.07	2.06	6.79	1.58	2.7	15.37	6	21.7
MW-SL5-B	2/2/2023	12:42	27.0	4.98	0.50	0.74	0.68	9.53	0.245	1.83	17.41	-3	49.5
MW-SL6-B	2/7/2023	11:51	15.1	4.57	0.50	0.25	2.00	7.24	43	5.29	14.34	-240	26.5
MW-SL8-A	6/21/2023	10:00	150.0	5.44	2.00	2.04	0.98	7.32	4.24	0.00	20.49	-97	0.0
MW-SL8-B	6/21/2023	12:00	150.0	5.38	2.00	3.13	0.64	7.22	5.33	0.00	19.92	-108	0.0
MW-SL9-A	3/15/2023	10:45	70.0	11.12	1.00	0.19	5.26	6.87	0.89	0.74	10.31	-29	6.5
MW-SL9-B	3/15/2023	12:25	2.0	10.92	0.25	1.29	0.19	7.75	0.45	1.7	13.89	106	51.2
MW-SL10-A	12/14/2022	10:25	75.0	8.76**	2.00	3.89	0.51	7.80	51.2	1.2	21.00	-67	12.3
MW-SL10-B	12/14/2022	12:20	35.0	6.95	0.33	0.28	1.11	8.53	36.3	1.18	19.76	-45	7.5
MW-SL12-A	1/6/2023	9:30	270.0	4.66	3.00	0.58	5.17	11.94	1.28	0.71	12.84	-31	32.6
MW-SL12-B	1/6/2023	13:20	24.0	5.30	0.20	2.22	0.09	10.15	1.35	0.55	11.98	28	35.5
MW-SL12-D	1/6/2023	12:10	140.0	4.47	2.00	0.95	2.11	8.87	2.44	0.69	15.34	-110	30.1
MW-SL13-A	10/19/2022	8:10	93.0	6.30	3.80	0.03	126.70	9.41	33	0.00	17.20	-83	0.0
MW-SL13-B	10/19/2022	12:25	6.5	5.37	0.20	9.34	0.02	7.88	9.28	2.78	18.69	-24	35.8
MW-SL13-D	10/19/2022	9:49	130.0	5.69	3.50	5.27	0.66	9.50	32.8	0.05	13.83	-173	0.0
MW-SL14-A	12/7/2022	13:10	135.0	4.35	1.40	2.53	0.55	7.14	0.779	1.49	22.58	-36	45.2
MW-SL14-B	12/7/2022	11:20	135.0	6.25	0.50	0.34	1.47	6.90	0.717	1.38	23.85	-29	44.5
MW-SL16-D	11/18/2022	12:36	29.5	7.76	0.25	1.59	0.16	7.88	21.7	7.86	22.00	-246	4.9
MW-SL17-A	11/2/2022	13:15	1.5	14.90	0.13	0.35	0.37	8.27	30.1	5.35	19.26	116	0.0
MW-SL17B	11/2/2022	14:15	77.5	13.06	2.50	0.56	4.46	8.70	26.1	1.32	20.76	-46	0.0
MW-SL19A	1/18/2022	13:00	45.0	13.74	1.00	0.77	1.30	9.31	36	3.28	10.49	114	17.6
MW-SL19B	1/18/2022	10:30	75.0	15.01	3.00	0.59	5.08	8.89	63.4	2.51	10.29	47	7.9
MW-SL20-A	11/16/2022	13:48	56.3	2.33	0.27	3.16	0.09	8.14	2.81	4.75	21.11	10	12.4
MW-SL20-B	11/16/2022	13:13	180.0	3.50	2.20	1.68	1.31	7.66	1.62	4.15	26.76	-75	35.5
MW-SL21-A	1/13/2023	12:10	55.0	11.45	2.00	2.00	1.00	9.00	32.2	4.21	17.84	-82	29.8
MW-SL21-B	3/7/2023	10:30	100.0	13.50	2.00	1.34	1.49	9.22	33.5	2.07	9.86	124	33.4
MW-SL23-A	10/12/2023	11:00	62.5	10.72	0.30	5.15	0.06	7.24	9.18	0.69	20.47	-11	49.2
MW-SL23-B	10/12/2023	14:55	6.0	6.91	0.10	4.74	0.02	7.83	8.7	0.19	19.49	110	48.7
MW-SL24-A	12/15/2022	9:30	74.0	3.34	1.00	9.99	0.10	7.57	5.98	6.17	11.11	-94	34.0
MW-SL24-B	12/15/2022	15:25	16.5	4.90	0.25	-9.06	NA	7.55	2.19	2.19	11.40	-61	29.6
MW-SL24-D	12/15/2022	11:31	37.0	3.61	1.50	13.21	0.11	8.29	12.6	2.81	12.46	-119	38.7
MW-SL25-A	12/21/2022	11:15	77.5	5.50	0.36	2.64	0.14	7.89	2.25	0.68	14.48	-106	92.7
MW-SL25-B	12/21/2022	14:00	11.5	3.15	0.25	9.20	0.03	10.93	0.874	2.9	13.14	85	145.0

Table 5
Monitoring Well Development Summary
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Location	Date	Time	Volume Purged (gallons)	Depth to Water (feet TIC)	Flow Rate (mL/min)	Drawdown (feet TIC)	Final Measured Specific Capacity (gpm/ foot drawdown)	pH	Specific Conductivity	Dissolved Oxygen (mg/L)	Temperature (°C)	Redox Potential (mV)	Turbidity (NTU)
MW-SL26-D	11/30/2022	11:45	120.0	2.95	1.40	6.30	0.22	8.07	14	1.09	14.09	-144	41.6
MW-SL27-A	9/28/2022	10:08	49.0	5.50	1.00	0.27	3.70	7.67	16.1	3.65	23.65	-258	2.8
MW-SL27-B	9/28/2022	12:40	47.0	6.15	1.00	1.25	0.80	7.55	5.88	2.64	23.85	-101	21.1
MW-SL28-A	10/6/2023	13:50	4.2	5.05	0.09	6.74	0.01	7.73	1.4	1.3	19.34	-80	18.7
MW-SL28-B	10/5/2023	12:40	124.5	4.30	0.50	0.22	2.27	7.58	0.893	3.7	17.39	-43	35.7
MW-SL29-A	9/22/2023	12:20	31.0	6.15	0.50	2.15	0.23	7.37	28.1	6.76	22.65	-16	29.9
MW-SL29-B	9/22/2023	13:55	30.5	3.10	0.50	3.24	0.15	7.45	6.74	7.24	22.25	-105	24.0
MW-SL30-B	3/10/2023	9:45	160.0	10.18	2.00	1.07	1.90	8.54	9.13	3.75	14.30	-104	38.1
MW-SL31-A	2/20/2023	10:35	105.0	5.80	1.00	4.69	0.21	7.52	35.7	11.97	20.15	-38	160.0
MW-SL31-B	2/20/2023	13:17	74.0	5.52	2.00	3.29	0.61	7.44	25.7	8.57	22.30	-186	33.7
MW-SL32-A	2/15/2023	11:15	175.0	7.80	2.50	0.06	41.70	7.36	5.34	7.89	20.02	-146	15.4
MW-SL32-B	2/15/2023	13:25	60.0	8.10	1.00	10.73	0.09	7.42	1.46	7.59	21.35	-49	35.5
MW-SL32-D	2/15/2023	9:26	100.0	5.2	2.50	0.62	4.03	7.49	1.230	14.28	20.91	-13	39.6

Notes:

1. Final water quality parameters collected during well development are presented on this table.

Acronyms:

°C - degrees Celsius

gpm - gallons per minute

L - liter

mg - milligram

min - minute

mL - milliliter

mV - millivolt

NA - not applicable

NTU - Nephelometric Turbidity Unit

SL - site location

TIC - top of inner casing

Table 6
NAPL Observations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Property Name	Property Owner	Date Observed	Property Address	Property Tax Map ID (Block/Lot)	Boring Location	Approximate Depth of Observed Impacts (feet bgs)	Visual Core Observation	Shake Test Observation	Notes	Spill Status	Spill Number	Contents of Discharge Reported
SL #2A	NYC Transit Authority - Tranist Lot	NYC Tranist Authority	11/7/2022	65 Commercial Street Brooklyn, NY	Brooklyn: 2472/425	MW-SL2A-A	11 to 13	Apparent NAPL observed in core	Positive: Black blebs	NAPL observed in split spoon sample at 11 to 13 feet bgs in boring for monitoring well MW-SL2A-A. NAPL positively identified in shake test. NAPL not observed in monitoring well during development. At the time, there was also no measurable NAPL in the well (by oil/water interface probe).	Called In	2207584	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.
SL #3	JPN Associates	JPN Associates	2/27/2023	53-01 11th Street Long Island City, NY 11101	Queens: 65/56	MW-SL3-A	27 to 29	Sheen on core	Negative	Presence of contamination observed on 27-29 feet bgs core. Sheen, elevated PID readings, and creosote odor noted. Shake test performed was negative.	N/A	N/A	N/A
SL #5	Sims Metal	Sims Metal East LLC - Queens Plant	2/1/2023	Sims Metal 30-27 Greenpoint Ave Long Island City, NY 11101	Queens: 234/360	MW-SL5-B	10 to 15	Staining in core	Positive: Black blebs	NAPL observed in core sample between 10 to 15 feet bgs in boring for monitoring well MW-SL5-B. NAPL positively identified in shake test. NAPL not observed in monitoring well during development. At the time, there was no measurable NAPL in the well (by oil/water interface probe).	Called in	2209022	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.
SL #6	Exxon-Mobil – Former Allocca Recycling	King's Land Realty Associates, LLC	2/6/2023	520 Kingsland Avenue, Brooklyn, NY 11222	Brooklyn: 2517/27	MW-SL6-B	5 to 9.5	Apparent NAPL observed in core	Positive: Black blebs	NAPL observed in soil sample (7-9 feet bgs) at boring for inland monitoring well MW-SL6-B. NAPL positively identified shake test. Elevated PID, staining, and odors noted from 5 to 9.5 feet bgs.	Per NYSDEC, this is a state site and no need to call in spill. Property owner was notified.	N/A	N/A
SL #12	NYC Department of Sanitation – Greenpoint	NYC Department of Sanitation	1/4/2023	1 Kingsland Avenue Brooklyn, NY 11222	Brooklyn: 2508/1	MW-SL12-D	17 to 19	Apparent NAPL observed in core	Positive: Black blebs	Visual and olfactory signs of contamination beginning at 10 feet bgs. NAPL observed in split spoon sample between 17 to 19 feet bgs in boring for monitoring well MW-SL12-D. NAPL positively identified in shake test. NAPL not observed in monitoring well during development. At the time, there was no measurable NAPL in the well (by oil/water interface probe).	Called in	2208345	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.
SL #14	New York Paving	New York Paving, Inc. Anthony Bartone CEO	12/5/2022	37-18 Railroad Avenue Long Island City, NY 11101	Queens: 312/2	MW-SL14-A	9 to 11	Apparent NAPL observed in core	Positive: Dark brown blebs	NAPL observed in split spoon sample at 9 to 11 feet bgs in boring for monitoring well MW-SL14-A. NAPL positively identified in shake test. NAPL and sheens present throughout fill material to as deep as 19 feet bgs. NAPL not observed in monitoring well during development. At the time, there was also no measurable NAPL in the well (by oil/water interface probe).	Called In	2207592	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.
SL #16	Exxon-Mobil –Former Pratt Oil Works (Parcel B of 38-42 and 39-14 Review Avenue, Queens, NY 11101)	Steel Equities	11/11/2022	Parcel B: 38-42 and 39-14 Review Avenue Queens, NY 11101	Queens: 312/309	MW-SL16-D	9 to 11	Apparent NAPL and silvery sheen observed in core	Positive: Dark brown blebs	NAPL observed in split spoon sample at 9 to 11 feet bgs in boring for monitoring well MW-SL16-D. NAPL positively identified in shake test. NAPL, silvery sheens, and staining observed throughout fill material to as deep as 19 feet bgs. Blebs observed in monitoring well during inital development. At the time of sampling, there was no measurable NAPL in the well (by oil/water interface probe).	As per NYSDEC, this is a state site and no need to call in spill. Property owner was notified.	N/A	N/A
SL #17	Empire Transit Mix/ Brooklyn Ready Mix	Fred Carillo	11/1/2022	462 Scott Avenue Brooklyn, NY 11222	Brooklyn: 2809/50	MW-SL17-B	17 to 19	Apparent NAPL observed in core	Positive: Dark brown blebs	NAPL observed in split spoon sample at 17 to 19 feet bgs in boring for monitoring well MW-SL17-B. NAPL positively identified in shake test. Blebs observed in monitoring well during inital development. At the time of sampling, there was no measurable NAPL in the well (by oil/water interface probe).	Called In	2207583	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.
SL #20	Ferguson Enterprises	Ferguson Enterprises	11/14/2022	57-22 57th Avenue Queens, NY 11378	Queens: 2554/55	MW-SL20-A	7 to 9	Odor	No Test	Faint petro like odor at 7 to 9 feet bgs. No staining, sheen, or elevated PID observed. No shake test performed.	N/A	N/A	N/A
SL #25	Former Maspeth Concrete Corp	QM Realty LLC	12/19 and 12/20/2022	46-73 Metropolitan Avenue Ridgewood, NY 11385	Queens: 2611/35	MW-SL25-A and MW-SL25-B	5 to 7	Odor	Negative	Petroleum-like odor and slightly elevated PID observed at both borings from 7 to 9 feet bgs. Jar shake tests both negative.	N/A	N/A	N/A
SL #32	Waste Management	Waste Management	2/14/2023	117-115 Varick Ave, Brooklyn, NY 11237	Brooklyn: 2974/112	MW-SL32-B	9 to 11	Apparent NAPL observed in core	Positive: Black blebs	NAPL observed in split spoon sample at 9 to 11 feet bgs in boring for monitoring well MW-SL32-B. NAPL positively identified in shake test. NAPL, sheens, and staining observed throughout fill material to as deep as 21 feet bgs. Blebs observed in monitoring well during inital development. At the time of sampling, there was no measurable NAPL in the well (by oil/water interface probe).	Called in	2209443	Historical release of a petroleum product observed in subsurface soil while installing monitoring wells.

Notes:
bgs- below ground surface
ID - identification
NAPL - non-aqueous phase liquids

N/A - not applicable
NYSDEC - New York State Department of Environmental Conservation

Table 7a
Round 1 Groundwater Sampling Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Sample Information						Analytical Samples Collected												Final Field Parameters							
Study Location	Sample Name	Matrix	Sample Type	Parent Sample	Sample Date	Alkylated PAHs	MADEP-EPH	MADEP-VPH	SVOCs	PCB Congeners, Dioxin Furans	TAL Metals, Hg	TAL Metals, Hg (filtered)	Cyanide	TOC	DOC-Filtered	Chloride, Fluoride	TSS, TDS	pH	Specific Conductivity (mS/cm ³)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Temperature ³ (°C)	Redox Potential (mV)	Turbidity (NTU)	
Monitoring Well Samples																									
SL# 1	MW-SL1-A-R1	Groundwater	Field Sample		4/20/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.53	26.90	16.49	0.00	20.91	-105	38.2	
SL #2A	MW-SL2A-A-R1	Groundwater	Field Sample		7/13/2023	X	X	x	X	X	X	X	X	X	X	X	X	7.15	23.60	14.09	0.80	21.59	-6	8.6	
SL #3	MW-SL3-A-R1	Groundwater	Field Sample		4/21/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.66	15.10	8.72	0.01	15.00	-286	0	
SL #4	SL4-MW-22R-R1	Groundwater	Field Sample		4/27/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.69	3.51	1.83	0.00	13.44	-265	0	
SL #5	MW-SL5-A-R1	Groundwater	Field Sample		4/25/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.77	0.79	0.39	0.00	12.99	-85	15.1	
SL #6	SL6-MW-S96-R1	Groundwater	Field Sample		4/24/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.76	31.60	19.45	3.45	13.40	-237	0	
	MW-901-R1	Groundwater	Field Duplicate	S-96-R1	4/24/2023	X	X	X	X	X	X	X	X	X	X	X	X	--	--	--	--	--	--	--	
SL #7	SL7-MW-8-R1	Groundwater	Field Sample		4/22/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.09	16.40	9.50	0.00	13.02	-13	12.5	
SL #8	MW-SL8-A-R1	Groundwater	Field Sample		7/13/2023	X	X	x	X	X	X	X	X	X	X	X	X	7.44	6.41	3.50	0.00	21.11	-81	0	
	MW-902-R1	Groundwater	Field Duplicate	MW-SL8-A	7/13/2023	X	X	X	X	X	X	X	X	X	X	X	X	--	--	--	--	--	--	--	
SL #9	MW-SL9-A-R1	Groundwater	Field Sample		4/19/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.62	1.91	0.96	0.00	14.54	-32	7.6	
	MW-900-R1	Groundwater	Field Duplicate	MW-SL9-A	4/19/2023	X	X	X	X	X	X	X	X	X	X	X	X	--	--	--	--	--	--	--	
SL #10	MW-SL10-A-R1	Groundwater	Field Sample		4/20/2023	X	X	X	X	X	X	X	X	X	X	X	X	8.48	27.70	16.81	0.37	13.17	-70	0	
SL #12	MW-SL12-A-R1	Groundwater	Field Sample		4/20/2023	X	X	X	X	X	X	X	X	X	X	X	X	12.6	0.49	0.23	0.00	15.46	-46	24.4	
SL #13	MW-SL13-A-R1	Groundwater	Field Sample		4/21/2023	X	X	X	X	X	X	X	X	X	X	X	X	8.19	29.50	18.08	2.82	14.14	187	0	
SL #14	MW-SL14-A-R1	Groundwater	Field Sample		4/25/2023	X	X	X	X	X	X	X	X	X	X	X	X	13.79	1.36	0.68	0.00	14.71	-78	11.7	
SL #15	SL15-CMW-15-R1	Groundwater	Field Sample		4/27/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.39	8.71	4.83	0.00	15.64	-77	5.7	
SL #16	SL16-MW-13-R1	Groundwater	Field Sample		4/24/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.61	1.02	0.50	1.02	18.64	-115	0.9	
SL #17	MW-SL17-A-R1	Groundwater	Field Sample		4/26/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.09	24.20	14.51	1.86	13.27	76	0	
SL #19	MW-SL19-A-R1	Groundwater	Field Sample		4/19/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.79	28.70	17.48	6.51	12.73	113	9.7	
SL #20	MW-SL20-A-R1	Groundwater	Field Sample		4/17/2023	X	X	X	X	X	X	X	X	X	X	X	X	8.42	28.80	17.50	0.00	13.63	90	73.7	
SL #21	MW-SL21-A-R1	Groundwater	Field Sample		4/19/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.86	28.30	17.20	2.43	12.60	101	9.1	
SL #22	SL22-MW-GPECMW03WT-R1	Groundwater	Field Sample		4/20/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.46	8.88	4.90	2.86	12.13	169	0.2	
SL #23	MW-SL23-A-R1	Groundwater	Field Sample		4/19/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.17	11.20	6.29	0.00	15.74	48	34.1	
SL #24	MW-SL24-A-R1	Groundwater	Field Sample		4/25/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.75	5.03	2.68	0.03	13.52	-107	15.1	
SL #25	MW-SL25-A-R1	Groundwater	Field Sample		4/21/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.63	2.52	1.30	1.73	15.70	-86	25.1	
SL #26	SL26-EB081MW-R1	Groundwater	Field Sample		4/18/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.39	12.70	7.24	0.00	13.66	-10	0.43	
SL #27	MW-SL27-A-R1	Groundwater	Field Sample		4/18/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.36	4.00	2.10	0.00	13.80	103	11.9	
SL #28	MW-SL28-A-R1	Groundwater	Field Sample		4/18/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.66	0.74	0.40	6.57	15.25	117	76.7	
SL #29	MW-SL29-A-R1	Groundwater	Field Sample		4/17/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.82	30.40	18.60	2.19	13.73	27	0	
SL #30	SL30-MW-5-R1	Groundwater	Field Sample		4/25/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.05	12.90	7.37	0.54	14.90	-130	5.6	
SL #31	MW-SL31-A-R1	Groundwater	Field Sample		4/24/2023	X	X	X	X	X	X	X	X	X	X	X	X	6.99	20.60	12.23	0.45	14.49	213	11	
SL #32	MW-SL32-A-R1	Groundwater	Field Sample		4/24/2023	X	X	X	X	X	X	X	X	X	X	X	X	7.31	5.50	2.96	0.18	15.58	-251	4.3	

Table 7a
Round 1 Groundwater Sampling Summary
Lateral Groundwater Study
Newtown Creek Superfind Site

Sample Information						Analytical Samples Collected												Final Field Paramaters							
Study Location	Sample Name	Matrix	Sample Type	Parent Sample	Sample Date	Alkylated PAHs	MADEP-EPH	MADEP-VPH	SVOCs	PCB Congeners, Dioxin Furans	TAL Metals, Hg	TAL Metals, Hg (filtered)	Cyanide	TOC	DOC-Filtered	Chloride, Flouride	TSS, TDS	pH	Specific Conductivity (mS/cm ³)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Temperature ³ (°C)	Redox Potential (mV)	Turbidity (NTU)	
Quality Control Samples																									
---	EB-MW-1-R1	Blank	Equipment Blank		4/17/2023	X	X	X	X	X	X	X	X		X				N/A						
---	EB-MW-2-R1	Blank	Equipment Blank		4/18/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-3-R1	Blank	Equipment Blank		4/19/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-4-R1	Blank	Equipment Blank		4/20/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-5-R1	Blank	Equipment Blank		4/21/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-6-R1	Blank	Equipment Blank		4/24/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-7-R1	Blank	Equipment Blank		4/25/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-8-R1	Blank	Equipment Blank		4/26/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-9-R1	Blank	Equipment Blank		4/27/2023	X	X	X	X	X	X		X						N/A						
---	EB-MW-10-R1	Blank	Equipment Blank		7/13/2023	X	X	X	X	X	X		X						N/A						
---	TB-MW-01	Blank	Trip Blank		4/17/2023			X											N/A						
---	TB-MW-02	Blank	Trip Blank		4/18/2023			X											N/A						
---	TB-MW-03	Blank	Trip Blank		4/19/2023			X											N/A						
---	TB-MW-04	Blank	Trip Blank		4/20/2023			X											N/A						
---	TB-MW-05	Blank	Trip Blank		4/21/2023			X											N/A						
---	TB-MW-06	Blank	Trip Blank		4/24/2023			X											N/A						
---	TB-MW-07	Blank	Trip Blank		4/25/2023			X											N/A						
---	TB-MW-08	Blank	Trip Blank		4/26/2023			X											N/A						
---	TB-MW-09	Blank	Trip Blank		4/27/2023			X											N/A						
---	TB-MW10-R1	Blank	Trip Blank		7/11/2023			X											N/A						

Acronyms

DOC - Dissolved Organic Carbon
EB - Equipment Blank
EPH - Extractable Petroleum Hydrocarbons
ft - feet
L - liter
MADEP - Massachusettes Department of Environmental Protection
mg/L - milligrams per liter
mS/cm³ - milliSiemens per cubic centimeter
mV - millivolt
NTU - Nephelometric Turbidity Unit
PAHs - Polycyclic Aromatic Hydrocarbons

PCB - Polychlorinated biphenyl
ppt - parts per trillion
SVOCs - Semi-Volatile Organic Compounds
TAL - Target Analyte List
TB - Trip Blank
TDS - Total Dissolved Solids
TOC - Total Organic Carbon
TSS - Total Suspended Solids
VPH - Volatile Petroleum Hydrocarbons
°C - degrees Celsius

Laboratories

Alkylated PAHs	ALS KELSO
Chloride, Flouride	AEL Laboratories Inc.
DOC-Filtered	AEL Laboratories Inc.
TAL Metals, Hg	AEL Laboratories Inc.
TAL Metals, Hg (filtered)	AEL Laboratories Inc.
TOC	AEL Laboratories Inc.
TSS, TDS	AEL Laboratories Inc.
SVOCs	AEL Laboratories Inc.
MADEP-EPH	GEL Laboratories LLC
MADEP-VPH	GEL Laboratories LLC
Cyanide	GEL Laboratories LLC
PCB Congeners, Dioxin Furans	SGS North America

Table 7b
Round 2 Groundwater Sampling Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Sample Information						Analytical Samples Collected															Final Field Parameters						
Study Location	Sample Name	Matrix	Sample Type	Parent Sample	Sample Date	Alkylated PAHs	MADEP-EPH	MADEP-VPH	SVOCs	PCB Congeners, Dioxin Furans	TAL Metals, Hg	TAL Metals, Hg (filtered)	Cyanide	TOC	DOC-Filtered	Chloride, Fluoride	TSS, TDS	PAHs	PFAS	VOCs	pH	Specific Conductivity (mS/cm ³)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Temperature ³ (°C)	Redox Potential (mV)	Turbidity (NTU)
Monitoring Well Samples																											
SL #1	MW-SL1-A-R2	Groundwater	Field Sample		9/11/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.46	22.70	13.70	0.00	22.91	-148	131
SL #2A	MW-SL2A-A-R2	Groundwater	Field Sample		8/30/2023	X	X	x	X	X	X	X	X	X	X	X	X	X	X		7.30	6.87	3.80	0.00	22.68	-177	0
SL #3	MW-SL3-A-R2	Groundwater	Field Sample		9/6/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.73	15.20	8.86	2.49	21.83	-334	0
	MW-900-R2	Groundwater	Field Duplicate	MW-SL3-A-R2	9/6/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		--	--	--	--	--	--	--
SL #4	SL4-MW-22R-R2	Groundwater	Field Sample		8/30/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.85	0.72	0.40	0.00	22.95	-178	0.68
SL #5	MW-SL5-A-R2	Groundwater	Field Sample		9/6/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.34	0.86	0.40	0.26	24.97	-81	0
SL #6	SL6-MW-S96-R2	Groundwater	Field Sample		9/8/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.24	30.30	18.70	0.00	20.35	-329	0
SL #7	SL7-MW-8-R2	Groundwater	Field Sample		9/9/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.79	23.00	13.80	0.08	22.06	-128	17.1
SL #8	MW-SL8-A-R2	Groundwater	Field Sample		8/29/2023	X	X	x	X	X	X	X	X	X	X	X	X	X	X		7.17	3.38	1.80	1.53	22.63	-146.0	0
SL #9	MW-SL9-A-R2	Groundwater	Field Sample		9/6/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.58	2.41	1.20	0.00	21.65	-162	0
SL #10	MW-SL10-A-R2	Groundwater	Field Sample		8/31/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.84	26.60	16.20	0.13	19.21	-173	0
SL #12	MW-SL12-A-R2	Groundwater	Field Sample		8/31/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		11.63	0.52	0.30	0.16	24.10	-175	0
SL #13	MW-SL13-A-R2	Groundwater	Field Sample		9/7/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	8.92	33.00	20.60	0.00	26.14	-108	0
SL #14	MW-SL14-A-R2	Groundwater	Field Sample		9/7/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		12.68	0.78	0.40	0.00	23.82	-309	13.9
SL #15	SL15-CMW-15-R2	Groundwater	Field Sample		9/11/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	6.80	6.90	4.00	2.51	23.18	-177	0
	MW-901-R2	Groundwater	Field Duplicate	CMW-15-R2	9/11/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	--	--	--	--	--	--	--
SL #16	SL16-MW-13-R2	Groundwater	Field Sample		8/29/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.22	1.10	0.50	0.00	26.25	-82	0
SL #17	MW-SL17-A-R2	Groundwater	Field Sample		9/7/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	7.50	31.80	19.80	0.00	24.56	49	0
SL #19	MW-SL19-A-R2	Groundwater	Field Sample		8/30/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.38	23.30	14.06	2.20	21.55	-6	10.2
SL #20	MW-SL20-A-R2	Groundwater	Field Sample		8/28/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.49	21.40	12.80	5.39	24.81	-178	239
SL #21	MW-SL21-A-R2	Groundwater	Field Sample		8/30/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		8.02	20.00	11.92	2.10	24.74	-207	15
SL #22	SL22-MW-GPECMW03WT-R2	Groundwater	Field Sample		9/7/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	7.39	4.89	2.62	5.04	23.62	116	0
SL #23	MW-SL23-A-R2	Groundwater	Field Sample		8/29/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.58	8.92	5.00	0.00	21.59	-21	123
SL #24	MW-SL24-A-R2	Groundwater	Field Sample		9/14/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.92	5.39	2.90	2.25	24.79	-113	513
SL #25	MW-SL25-A-R2	Groundwater	Field Sample		9/8/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.63	2.39	1.20	0.00	20.74	-164	7.34
SL #26	SL26-EB081MW-R2	Groundwater	Field Sample		8/29/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.07	22.20	13.40	0.02	24.17	-100	0
SL #27	MW-SL27-A-R2	Groundwater	Field Sample		9/11/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.09	4.28	2.30	0.15	25.42	-21.0	0
SL #28	MW-SL28-A-R2	Groundwater	Field Sample		9/11/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	7.24	1.22	0.60	0.29	25.05	-90	97.7
SL #29	MW-SL29-A-R2	Groundwater	Field Sample		8/28/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.95	27.80	17.10	0.07	23.58	-107	6.03
SL #30	SL30-MW-5-R2	Groundwater	Field Sample		9/7/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	7.21	15.20	8.87	3.50	21.60	-190	0
SL #31	MW-SL31-A-R2	Groundwater	Field Sample		8/31/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		6.96	18.00	10.60	2.59	24.01	173	31.20
SL #32	MW-SL32-A-R2	Groundwater	Field Sample		8/31/2023	X	X	X	X	X	X	X	X	X	X	X	X	X	X		7.36	7.33	4.02	2.93	20.00	-274	0

Table 7b
Round 2 Groundwater Sampling Summary
Lateral Groundwater Study
Newtown Creek Superfind Site

Study Location	Sample Name	Matrix	Sample Type	Parent Sample	Sample Date	Alkylated PAHs	MADEP-EPH	MADEP-VPH	SVOCs	PCB Congeners, Dioxin Furans	TAL Metals, Hg	TAL Metals, Hg (filtered)	Cyanide	TOC	DOC-Filtered	Chloride, Flouride	TSS, TDS	PAHs	PFAS	VOCs	pH	Specific Conductivity (mS/cm ³)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Temperature ³ (°C)	Redox Potential (mV)	Turbidity (NTU)
Quality Control Samples																											
---	EB-MW-1-R2	Blank	Equipment Blank		8/28/2023	X	X	X	X	X	X	X	X		X			X		X							
---	EB-MW-2-R2	Blank	Equipment Blank		8/30/2023														X								
---	EB-MW-3-R2	Blank	Equipment Blank		9/7/2023	X	X	X	X	X	X	X	X		X			X	X	X							
---	EB-MW-4-R2	Blank	Equipment Blank		9/11/2023	X	X	X	X	X	X		X					X	X	X							
---	TB-MW-01-R2	Blank	Trip Blank		8/28/2023			X																			
---	TB-MW-02-R2	Blank	Trip Blank		8/29/2023			X																			
---	TB-MW-03-R2	Blank	Trip Blank		8/30/2023			X																			
---	TB-MW-04-R2	Blank	Trip Blank		8/31/2023			X																			
---	TB-MW-05-R2	Blank	Trip Blank		9/6/2023			X																			
---	TB-MW-06-R2	Blank	Trip Blank		9/7/2023			X													X						
---	TB-MW-07-R2	Blank	Trip Blank		9/8/2023			X																			
---	TB-MW-08-R2	Blank	Trip Blank		9/11/2023			X													X						
---	TB-MW-09-R2	Blank	Trip Blank		9/14/2023			X																			

Acronyms

DOC - Dissolved Organic Carbon
EB - Equipment Blank
EPH - Extractable Petroleum Hydrocarbons
ft - feet
L - liter
MADEP - Massachusetts Department of Environmental Protection
mg/L - milligrams per liter
mS/cm³ - milliSiemens per cubic centimeter
mV - millivolt
N/A - not applicable
NTU - Nephelometric Turbidity Unit

PAHs - Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated biphenyl
ppt - parts per trillion
SVOCs - Semi-Volatile Organic Compounds
TAL - Target Analyte List
TB - Trip Blank
TDS - Total Dissolved Solids
TOC - Total Organic Carbon
TSS - Total Suspended Solids
VPH - Volatile Petroleum Hydrocarbons
°C - degrees Celsius

Laboratories

Alkylated PAHs	ALS KELSO
Chloride, Flouride	AEL Laboratories Inc.
DOC-Filtered	AEL Laboratories Inc.
TAL Metals, Hg	AEL Laboratories Inc.
TAL Metals, Hg (filtered)	AEL Laboratories Inc.
TOC	AEL Laboratories Inc.
TSS, TDS	AEL Laboratories Inc.
SVOCs	AEL Laboratories Inc.
MADEP-EPH	GEL Laboratories LLC
MADEP-VPH	GEL Laboratories LLC
Cyanide	GEL Laboratories LLC
PCB Congeners, Dioxin Furans	SGS North America

Table 8
Opportunistic Seep Sampling Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Sample Name	Matrix	Sample Type	Parent Sample	Sample Date	Sample Method	Alkylated PAHs	MADEP-EPH	MADEP-VPH	SVOCs	PCB Congeners, Dioxin Furans	TAL Metals, Hg	TAL Metals, Hg (filtered)	Cyanide	TOC	DOC-Filtered	Chloride, Fluoride	TSS, TDS
Seep Samples																		
East Branch	SP-1-R1	Aqueous	Field Sample	---	5/1/2023	Pumped from seepage point into 5-gallon bucket then transferred to sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Newtown Creek	SP-2-R1	Aqueous	Field Sample	---	5/2/2023	Directly into sample bottle/ware from seep	X	X	X	X	X	X	X	X	X	X	X	X
English Kills	SP-3-R1	Aqueous	Field Sample	---	5/2/2023	Composited into 5-gallon HDPE bucket then pumped into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
English Kills	SP-903-R1	Aqueous	Field Duplicate	SP-3-R1	5/2/2023	---	X	X	X	X	X	X	X	X	X	X	X	X
English Kills	SP-4-R1	Aqueous	Field Sample	---	5/3/2023	Composited into 5-gallon HDPE bucket then pumped into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
English Kills	SP-4-R1-R*	Aqueous	Field Sample	---	5/10/2023	Composited into 5-gallon HDPE bucket then pumped into sample bottle/ware		X	X					X				
Newtown Creek	SP-5-R1	Aqueous	Field Sample	---	5/3/2023	Pumped from seepage point into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Newtown Creek	SP-5-R1-R*	Aqueous	Field Sample	---	5/10/2023	Pumped from seepage point into sample bottle/ware		X	X					X				
Newtown Creek	SP-6-R1	Aqueous	Field Sample	---	5/4/2023	Pumped from seepage point into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Newtown Creek	SP-7-R1	Aqueous	Field Sample	---	5/4/2023	Pumped from seepage point into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Newtown Creek	SP-8-R1	Aqueous	Field Sample	---	5/11/2023	Pumped from seepage point into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Dutch Kills	SP-9-R1	Aqueous	Field Sample	---	5/12/2023	Pumped from seepage point into sample bottle/ware	X	X	X	X	X	X	X	X	X	X	X	X
Quality Control Samples																		
---	EB-SP-01-R1	Blank	Equipment Blank	---	5/11/2023		X	X	X	X	X	X		x				

Acronyms

DOC - Dissolved Organic Carbon
EB - Equipment Blank
EPH - Extractable Petroleum Hydrocarbons
HDPE - High-density polyethylene
MADEP - Massachusetts Department of Environmental Protection
PAHs - Polycyclic Aromatic Hydrocarbons
PCB - Polychlorinated biphenyl
SVOCs - Semi-Volatile Organic Compounds
TAL - Target Analyte List
TB - Trip Blank
TDS - Total Dissolved Solids
TOC - Total Organic Carbon
TSS - Total Suspended Solids
VPH - Volatile Petroleum Hydrocarbons

Laboratories

Alkylated PAHs
Chloride, Fluoride
DOC-Filtered
TAL Metals, Hg
TAL Metals, Hg (filtered)
TOC
TSS, TDS
SVOCs
MADEP-EPH
MADEP-VPH
Cyanide
PCB Congeners, Dioxin Furans

ALS KELSO
AEL Laboratories Inc.
AEL Laboratories Inc.
AEL Laboratories Inc.
AEL Laboratories Inc.
AEL Laboratories Inc.
AEL Laboratories Inc.
AEL Laboratories Inc.
GEL Laboratories LLC
GEL Laboratories LLC
GEL Laboratories LLC
SGS North America

Additional Notes

*Due to shipment delays with courier, certain analytes fell out of hold time in original sample shipment. Locations were resampled for those analytes.

Table 9
Hydrogeological Testing and Deviations Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Slug Testing Performed	Specific Capacity Testing Performed	Flow Velocity Measurements Performed	Water Level Monitoring Performed	Descriptions of Deviations with Corrections
SL #1	MW-SL1-A	Yes	Yes	Yes	Yes	Flow Velocity Testing: Missed high tide window due to complications during set up. Incoming and outgoing tide windows were captured.
	MW-SL1-B	No	N/A	No	Yes	Slug Testing: Unable to perform slug testing in monitoring well due to obstruction encountered at depth likely due to damage to well by property owners construction activities. Flow Velocity Testing: Unable to perform velocity testing in monitoring well due to obstruction encountered at depth likely due to damage during construction activities. Water Level Monitoring: Monitoring well was damaged during construction activities by the property owner. Transducer data was downloaded on 5/12/2023. Attempts to recover transducer during monitoring well abandonment were unsuccessful. MW-SL1-B was reinstalled at an offset location and surveyed in June 2023. A replacement transducer was deployed in newly installed MW-SL1-B on 10/20/2023 resulting in a data gap from 10/25/2022 to 10/20/2023. Current data set is from 10/20/2023 to 2/25/2024.
SL #2	MW-SL2A-A	Yes	Yes	No	Yes	Specific Capacity Testing: Difficulty achieving stable drawdown attributed to significant increase in water level in response to the tide level which overwhelmed measurements of drawdown. Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed. Water Level Monitoring: Transducer cable malfunction caused no communication with transducer and field reader. Transducer and cable were removed 8/30/2023. Replacement cable and transducer deployed on 10/19/2023 resulting in a data gap between 8/30/2023 and 10/19/2023.
	MW-SL2A-B	Yes	N/A	No	Yes	N/A
SL #3	MW-SL3-A	Yes	Yes	Yes	Yes	Slug Testing: Pneumatic pressure gauge was broken. H(0)* derived from displacement data.
	MW-SL3-B	Yes	N/A	Yes	Yes	Slug Testing: Pneumatic pressure gauge was broken. H(0)* derived from displacement data.
SL #4	SL4-MW-21R	Yes	Yes	N/A	Yes	Slug Testing: One of the three pneumatic rising head tests was interrupted prior to completion. Three completed tests are preferred.
	SL4-MW-22R	Yes	Yes	N/A	Yes	Water Level Monitoring: Transducer malfunctioned. Replacement transducer deployed on 4/27/2023. Data between 1/27/2023 and 4/27/2023 was lost resulting in a data gap.
	SL4-MW-13	Yes	N/A	N/A	Yes	N/A
SL #5	MW-SL5-A	Yes	Yes	No	Yes	Velocity Testing: Inland well was reported to have NAPL during well installation activities. Did not introduce sensitive meter into well. No flow velocity testing performed.
	MW-SL5-B	Yes	N/A	No	Yes	Slug Testing: NAPL was present and the water column was too short to conduct a slug test. Velocity Testing: Inland well was reported to have NAPL during well installation activities. Did not introduce sensitive meter into well. No flow velocity testing performed.
SL #6	SL6-S96	Yes	Yes	N/A	Yes	Specific Capacity Testing: Test is of low quality and should be considered a rough estimate. Slug Testing: Tests are of low quality due to the high K nature of the formation/difficulty collecting noise-free response data. Pneumatic testing was not possible on 4-inch well casing during testing. Full test response was difficult to assess.
	SL6-D96	Yes	Yes	N/A	Yes	N/A
	MW-SL6-B	Yes	N/A	N/A	Yes	N/A
SL #7	SL7-MW-5	Yes	Yes	No	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred. Of the two valid tests (rising only), Test 4 did not equilibrate to 90% of displacement (88%) due to the slow nature of the tests.
	SL7-MW-8	Yes	N/A	No	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred. Of the two valid tests (rising only), Test 2 did not equilibrate to 90% of displacement (85%) due to the slow nature of the tests.
SL #8	MW-SL8-A	Yes	Yes	Yes	Yes	N/A
	MW-SL8-B	Yes	N/A	Yes	Yes	N/A
SL #9	MW-SL9-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer malfunctioned. Replacement transducer deployed on 10/19/2023. Data from 6/29/2023 to 10/19/2023 was lost.
	MW-SL9-B	Yes	N/A	Yes	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred. Of the two valid tests (rising only), Test 4 did not equilibrate to 90% of displacement (81%) due to the slow nature of the tests.
SL #10	MW-SL10-A	Yes	Yes	Yes	Yes	Slug Testing: All tests are of low quality due to small initial displacement and low transducer resolution.
	MW-SL10-B	Yes	N/A	Yes	No	Water Level Monitoring: Transducer was removed due to malfunction in communication with field reader. Later diagnostics revealed transducer was functioning normal but the cable was defective. Once replacement cables were procured, transducers were redeployed resulting in a data gap from 8/31/2023 to 10/19/2023.
SL #12	MW-SL12-A	Yes	Yes	No	No	Slug Testing: All tests are of low quality due to small initial displacement and low transducer resolution. Flow Velocity testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed.
	MW-SL12-B	Yes	N/A	No	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred. Rising head tests were of poor quality. Of the two assessed tests, Test 1 did not equilibrate to 90% of displacement (89%) due to the slow nature of the tests.
	MW-SL12-D	Yes	Yes	No	Yes	Slug Testing: Only two rising head tests were performed. Three tests are preferred. Response data was clean but did not match pressure gauge. Response data was used to derive H(0)*. Water Level Monitoring: Transducer malfunctioned on 3/15/2023. Transducer data downloaded on 6/19/2023 during slug testing event. Transducer recalibrated and redeployed on 6/19/2023. Data gap between 3/15/2023 to 6/19/2023. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were

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Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Slug Testing Performed	Specific Capacity Testing Performed	Flow Velocity Measurements Performed	Water Level Monitoring Performed	Descriptions of Deviations with Corrections
SL #13	MW-SL13-A	Yes	No	Yes	Yes	Slug Testing: Mechanical and pneumatic tests were attempted, but a usable dataset was not able to be collected due to the extremely rapid response of the water level. Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/9/2023. Data between 6/26/2023 and 7/9/2023 was lost causing data gap. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were removed 9/7/2023. Replacement cable and transducer deployed on 10/19/2023 causing data gap between 9/7/2023 to 10/19/2023. Transducer malfunctioned during deployment period after 10/19/2023. Data was unrecoverable. Data between 10/19/2023 to 2/24/2024. Specific Capacity Testing: No specific capacity testing performed due to little to no drawdown observed during high pumping rate.
	MW-SL13-B	Yes	N/A	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/9/2023. Data between 6/26/2023 and 7/9/2023 was lost resulting in a data gap. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were removed 9/7/2023. Replacement cable and transducer deployed on 10/19/2023 resulting in a data gap between 9/7/2023 to 10/19/2023.
	MW-SL13-D	Yes	Yes	Yes	Yes	Slug Testing: Pneumatic pressure gauge was broken. H(0)* derived from displacement data. Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/9/2023. Data between 6/26/2023 and 7/9/2023 was lost resulting in a data gap. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were removed 9/7/2023. Replacement cable and transducer deployed on 10/19/2023 resulting in a data gap between 9/7/2023 to 10/19/2023.
SL #14	MW-SL14-A	Yes	Yes	No	Yes	Flow Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed.
	MW-SL14-B	Yes	N/A	No	Yes	Flow Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed. Water Level Monitoring: Transducer malfunctioned after 11/23/2023. Data gap present from 11/23/2023 to 2/23/2024.
SL #15	SL15-CMW-15	No	No	N/A	Yes	Slug Testing: Slug test not permitted by access agreement. Specific Capacity Testing: Testing not permitted by access agreement.
	SL15-CMW-63	No	N/A	N/A	Yes	Slug Testing: Slug test not permitted by access agreement. Water Level Monitoring: Transducer slipped from tether and was observed to be at bottom of the well during inspection on 10/24/2023. Transducer was redeployed at proper depth on 10/24/2023. Specific Capacity Testing: Testing not permitted by access agreement. Flow Velocity Measurements: Testing not permitted by access agreement.
SL #16	SL16-MW-13	No	No	No	Yes	Slug Testing: NAPL was present. Specific Capacity Testing: Unable to determine drawdown from pumping cycle due to significant drawdown observed in shallow water column. Flow Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed. Water Level Monitoring: Transducer cable malfunctioned causing no communication between transducer and field reader. Transducer and cable removed on 8/29/2023. Replacement cable deployed with transducer on 10/19/2023. Data gap from 8/29/2023 to 10/19/2023.
	SL16-MW-10	No	N/A	No	Yes	Slug Testing: NAPL was present.
	MW-SL16-D	No	Yes	No	Yes	Slug Testing: NAPL was present. Water Level Monitoring: Transducer cable malfunctioned causing no communication between transducer and field reader. Transducer and cable removed on 7/10/2023. Replacement cable deployed with transducer on 10/19/2023. Data gap from 7/10/2023 to 10/19/2023.
SL #17	MW-SL17-A	Yes	No	N/A	Yes	Slug Testing: Slug test not completed due to low water level. Specific Capacity Testing: Unable to produce a measurable stable drawdown due to small water column and significant tidal response in well. A full tidal cycle was captured in data set which depicted the shoreline and inland monitoring well being heavily influenced by Newtown Creek.
	MW-SL17-B	Yes	N/A	N/A	Yes	Water Level Monitoring: Post slug testing on 6/30/2023, transducer appeared to have slipped to the bottom of the well upon redeployment event causing error in readings. Transducer was checked and downloaded on 9/20/2023. Transducer was redeployed at proper depth. Data gap from 6/30/2023 to 9/20/2023.
SL #19	MW-SL19-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/11/2023. Data between 6/26/2023 and 7/11/2023 was lost resulting in a data gap.
	MW-SL19-B	Yes	No	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/9/2023. Data between 6/26/2023 and 7/9/2023 was lost resulting in a data gap.
SL #20	MW-SL20-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer malfunctioned on 8/28/2023. Replacement transducer deployed 10/24/2023. Data gap from 8/28/2023 to 10/24/2023.
	MW-SL20-B	Yes	N/A	Yes	Yes	N/A
SL #21	MW-SL21-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/8/2023. Data between 6/26/2023 and 7/8/2023 was lost causing data gap.
	MW-SL21-B	Yes	N/A	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/8/2023. Data between 6/26/2023 and 7/8/2023 was lost causing data gap.
SL #22	SL22-GPEC-03WT	Yes	Yes	N/A	Yes	N/A
	SL22-GPEC-03D	Yes	Yes	N/A	Yes	N/A
	MW-SL22-B	Yes	N/A	N/A	Yes	N/A

Table 9
Hydrogeological Testing and Deviations Summary
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Study Location	Well ID	Slug Testing Performed	Specific Capacity Testing Performed	Flow Velocity Measurements Performed	Water Level Monitoring Performed	Descriptions of Deviations with Corrections
SL #23	MW-SL23-A	Yes	Yes	Yes	Yes	N/A
	MW-SL23-B	Yes	N/A	Yes	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred. Only rising head tests are suitable for analysis in a well screened across the water table. Both of the two usable tests did not equilibrate to 90% of displacement (79% and 87% for Tests 2 and 4, respectively) due to the slow nature of the tests.
SL #24	MW-SL24-A	Yes	Yes	Yes	No	Water Level Monitoring: Transducer malfunctioned and did not activate on 12/16/2022. Transducer activated on 6/26/2023.
	MW-SL24-B	Yes	N/A	Yes	No	Water Level Monitoring: Transducer malfunctioned and did not activate on 12/16/2022. Transducer activated on 6/26/2023. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were removed 7/31/2023. Replacement cable and transducer deployed on 9/20/2023 causing data gap from 7/31/2023 to 9/20/2023.
	MW-SL24-D	Yes	Yes	Yes	No	Specific Capacity Testing: Testing was performed in 2-minute interval readings rather than 2-second interval readings. However, drawdown was determinable and specific capacity was calculated. Water Level Monitoring: Transducer malfunctioned and did not activate on 12/16/2022. Transducer activated on 6/26/2023. Transducer cable malfunction causing no communication with transducer and field reader. Transducer and cable were removed 7/31/2023. Replacement cable and transducer deployed on 9/20/2023 causing data gap from 7/31/2023 to 9/20/2023.
SL #25	MW-SL25-A	Yes	Yes	No	Yes	Flow Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed.
	MW-SL25-B	Yes	Yes	No	Yes	Slug Testing: Only two tests each were performed for falling and rising tests. Three tests are preferred.
SL #26	SL26-EBMW081	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/11/2023. Data between 6/26/2023 and 7/11/2023 was lost resulting in a data gap.
	SL26-EBMW082	Yes	N/A	Yes	Yes	Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/11/2023. Data between 6/26/2023 and 7/11/2023 was lost resulting in a data gap.
	MW-SL26-D	Yes	Yes	Yes	Yes	Slug Testing: Two of the four tests (Tests 1 and 2) appear to have been disrupted or produced a stepped curve. Three tests are preferred. Water Level Monitoring: Transducer downloaded 6/26/2023 prior to slug testing and reset post slug testing on 7/11/2023. Data between 6/26/2023 and 7/11/2023 was lost resulting in a data gap.
SL #27	MW-SL27-A	Yes	No	Yes	Yes	Slug Testing: One of the three tests (Test 1) appears to have been disrupted and is noisy. Three tests are preferred. Specific Capacity Testing: Due to time constraints and slow recovery of monitoring well, team was unable to collect full recharge data post pumping cycle.
	MW-SL27-B	Yes	N/A	Yes	Yes	Slug Testing: Pneumatic pressure gauge was broken. H(0)* derived from displacement data.
SL #28	MW-SL28-A	Yes	No	Yes	Yes	Water Level Monitoring: Transducer downloaded 4/29/2023 during groundwater sampling event. Transducer was reset post slug testing on 6/14/2023 without data download. Data from 4/29/2023 to 6/14/2023 was lost resulting in a data gap. Specific Capacity Testing: Due to limitations in available equipment, monitoring was only performed in shoreline well (pumped well). No monitoring was performed in inland well (observation well) at the time of test. Only Microdiver was available for use at the time, readings are shown in centimeters of water (cmH2O). Converted cmH2O to feet for final calculation of specific capacity. Also, due to time constraints and slow production of monitoring well, team was unable to collect full recharge data post pumping cycle.
	MW-SL28-B	Yes	N/A	Yes	Yes	N/A
SL #29	MW-SL29-A	Yes	No	Yes	Yes	Slug Testing: One of the three tests (Test 1) appears to have been disrupted. Three tests are preferred. Specific Capacity Testing: At the time monitoring wells (MW-SL29-A and MW-SL29-B) were installed, the team did not have the transducers procured to monitor specific capacity data. Testing was completed on 4/17/2023 concurrent with groundwater sampling in the monitoring well. Total drawdown was captured and specific capacity was calculated. Due to transducer data being downloaded before pumping cycle ended, full recharge data post pumping cycle was not captured. Flow Velocity Testing: Due to time constraints and access limitations, testing could not be performed in the evening for the low tide point on 8/17/2023. Two tests were performed for outgoing tide. Last test on outgoing tide was approximately 30 minutes prior to anticipated low tide point.
	MW-SL29-B	Yes	N/A	Yes	No	Water Level Monitoring: Transducer reset 4/17/2023 during groundwater sampling event. Subsequently, it was observed that transducer malfunctioned post reset. Transducer was removed. Replacement transducer deployed 10/19/2023.
SL #30	SL30-MW-5	Yes	Yes	Yes	Yes	Water Level Monitoring: Transducer monitoring was not activated during original deployment. Transducer was activated post slug testing on 6/29/2023. Data gap from 3/10/2023 to 6/29/2023.
	SL30-MW-6	Yes	No	No	No	Slug Testing: Pneumatic pressure was not allowed enough time to equilibrate prior to initiating test.
	MW-SL30-B	Yes	N/A	Yes	Yes	N/A
SL #31	MW-SL31-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Data downloaded 6/26/2023 prior to slug testing. Transducer reset on 7/1/2023 without download. Data gap from 6/26/2023 to 7/1/2023.
	MW-SL31-B	Yes	N/A	Yes	Yes	Water Level Monitoring: Data downloaded 6/26/2023. Transducer malfunction sometime after. Replacement transducer deployed 10/19/2023. Data gap from 6/26/2023 to 10/19/2023.

Table 9
Hydrogeological Testing and Deviations Summary
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Study Location	Well ID	Slug Testing Performed	Specific Capacity Testing Performed	Flow Velocity Measurements Performed	Water Level Monitoring Performed	Descriptions of Deviations with Corrections
SL #32	MW-SL32-A	Yes	Yes	Yes	Yes	Water Level Monitoring: Original data downloaded 6/26/2023 prior to slug testing. Transducer reset on 6/30/2023 post slug testing without download. Data gap from 6/26/2023 to 7/1/2023. Specific Capacity: Unable to determine drawdown of the monitoring well during pumping cycle due to the aquifer being heavily influenced by Newtown Creek tide cycle.
	MW-SL32-B	Yes	N/A	No	Yes	Water Level Monitoring: Original data downloaded 6/26/2023 prior to slug testing. Transducer reset on 6/30/2023 post slug testing without download. Data gap from 6/26/2023 to 7/1/2023. Flow Velocity Testing: NAPL observed. Did not introduce sensitive meter into well. No flow velocity testing performed.
	MW-SL32-D	Yes	Yes	Yes	No	Slug Testing: Pneumatic pressure gauge was broken. H(0)* derived from displacement data. Water Level Monitoring: Data downloaded 6/26/2023 prior to slug testing. Transducer reset on 7/1/2023 without download. Data gap from 6/26/2023 to 7/1/2023. Flow Velocity Testing: Measurements in MW-SL32-D were taken on different days than MW-SL32-A, due to severe weather conditions during initial testing in MW-SL32-A. Testing in MW-SL32-D was performed on 8/23/2023 at high tide and low tide points. HPFM device was malfunctioning during upper midpoint screen interval testing at high tide. Therefore only lower midpoint screen interval was measured at high tide.
Newtown Creek	Staff Gauge 1	N/A	N/A	N/A	Yes	Water Level Monitoring: Staff gauge was moved to a different location on 3/18/2023 due to transducer being exposed at low low tide. Staff gauge location prior to 3/18/2023 was never surveyed. Water level data is compensated for barometric pressure but not corrected for actual elevation. Elevation was surveyed at new location on 7/6/2023.
	Staff Gauge 2	N/A	N/A	N/A	Yes	Water Level Monitoring: Staff gauge was observed to be damaged during check on 7/5/2023 and removed. Staff gauge reinstalled on 7/18/2023 and resurveyed for actual elevation on 9/28/2023. Data gap from 7/5/2023 to 7/18/2023.

Notes:
1. Standard testing approach was defined in the CDM Smith Final Quality Assurance Project Plan dated June 17, 2022, with the exception of deviations noted in this table.

Acronyms:
H(0)" - initial displacement
N/A - not applicable

Table 10
Specific Capacity Testing Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Specific Capacity Testing Performed	Estimated Specific Capacity (gallons per minute/foot of drawdown)	Notes
SL #1	MW-SL1-A	Yes	0.092	N/A
	MW-SL1-B	N/A	N/A	N/A
SL #2	MW-SL2A-A	Yes	N/C	Encountered difficulty achieving stable drawdown which caused significant noise in the data set. May have been attributed to pump issues and/or significant influence from the creek on aquifer. Estimated specific capacity was not calculated.
	MW-SL2A-B	N/A	N/A	N/A
SL #3	MW-SL3-A	Yes	1.780	N/A
	MW-SL3-B	N/A	N/A	N/A
SL #4	SL4 MW-21R	Yes	Step 1 - 0.580 Step 2 - 0.530	Two stage step test performed.
	SL4 MW-22R	Yes	Step 1 - 0.710 Step 2 - 0.620	Two stage step test performed.
	SL4 MW-13	N/A	N/A	N/A
SL #5	MW-SL5-A	Yes	0.840	N/A
	MW-SL5-B	N/A	N/A	N/A
SL #6	SL6-MW-S96	Yes	36.965	Significant noise observed in background aquifer changes. Did not allow for correction to be applied total drawdown. Likely attributed to heavy influence from tidal changes in Newtown Creek. Calculated specific capacity is a very rough estimate based on short time frame of discernable pumping influence.
	SL6-MW-D96	Yes	0.225	N/A
	MW-SL6-B	N/A	N/A	N/A
SL #7	SL7-MW-5	N/A	N/A	N/A
	SL7-MW-8	Yes	0.005	Monitored recharge for one hour. Monitoring well did not fully recharge in that time.
SL #8	MW-SL8-A	Yes	0.644	N/A
	MW-SL8-B	N/A	N/A	N/A
SL #9	MW-SL9-A	Yes	Step 1 - 2.04 Step 2 - 1.94	Two stage step test performed.
	MW-SL9-B	N/A	N/A	N/A
SL #10	MW-SL10-A	Yes	13.544	N/A
	MW-SL10-B	N/A	N/A	N/A
SL #12	MW-SL12-A	Yes	6.304	N/A
	MW-SL12-B	N/A	N/A	N/A
	MW-SL12-D	Yes	2.201	N/A

Table 10
Specific Capacity Testing Summary
Lateral Groundwater Study
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Study Location	Well ID	Specific Capacity Testing Performed	Estimated Specific Capacity (gallons per minute/foot of drawdown)	Notes
SL #13	MW-SL13-A	No	N/C	No drawdown was observed at this well during development at much higher pumping rate. Specific capacity testing was not performed due to inability to pump at a higher rate. Monitoring well water levels highly influenced by tidal changes.
	MW-SL13-B	N/A	N/A	N/A
	MW-SL13-D	Yes	Test 1 - 0.725 Test 2 - 0.637	Two tests performed due to battery malfunction during first test. Utilize 2nd test
SL #14	MW-SL14-A	Yes	0.695	Battery failure during first test however total drawdown was determined based on relatively stable drawdown observed in data set.
	MW-SL14-B	N/A	N/A	N/A
SL #15	SL15-CMW-15	No	N/A	Access agreement precluded any intrusive testing in well.
	SL15-CMW-63	No	N/A	
SL #16	SL16-MW-13	Yes	N/C	Pumping rate was difficult to maintain. Water level in well dropped below transducer initially and pumping rate was lowered to allow sufficient recharge. In later phase of the test, water level drew down below transducer again. Second attempt at test was abandoned as drawdown continued to be too significant. Recharge data was not recorded for one hour. Sufficient data was not present to determine stable drawdown and calculate an estimated specific capacity.
	SL16-MW-10	N/A	N/A	N/A
	MW-SL16-D	Yes	0.144	
SL #17	MW-SL17-A	No	N/C	Significant influence from Newtown Creek tidal changes were observed in the monitoring well water levels. This tidal influence obscured the testing drawdown. An estimated specific capacity could not be calculated.
	MW-SL17-B	N/A	N/A	N/A
SL #19	MW-SL19-A	Yes	0.980	N/A
	MW-SL19-B	No	N/A	N/A
SL #20	MW-SL20-A	Yes	0.017	N/A
	MW-SL20-B	N/A	N/A	N/A
SL #21	MW-SL21-A	Yes	0.573	N/A
	MW-SL21-B	N/A	N/A	N/A
SL #22	SL22-GPEC-03WT	Yes	0.055	N/A
	SL22-GPEC-03D	Yes	Step 1 - 0.184 Step 2 - 0.187	Two stage step test performed.
	MW-SL22-B	N/A	N/A	N/A
SL #23	MW-SL23-A	Yes	0.042	N/A
	MW-SL23-B	N/A	N/A	N/A

Table 10
Specific Capacity Testing Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Specific Capacity Testing Performed	Estimated Specific Capacity (gallons per minute/foot of drawdown)	Notes
SL#24	MW-SL24-A	Yes	0.891	N/A
	MW-SL24-B	N/A	N/A	N/A
	MW-SL24-D	Yes	0.225	Testing was inadvertently performed with transducer set at 2-minute interval readings. Stable drawdown was still determinable in data set and estimated specific capacity was calculated.
SL #25	MW-SL25-A	Yes	0.110	N/A
	MW-SL25-B	N/A	N/A	N/A
SL #26	SL26-EBMW081	Yes	0.381	N/A
	SL26-EBMW082	N/A	N/A	N/A
	MW-SL26-D	Yes	0.228	N/A
SL #27	MW-SL27-A	Yes	1.767	No correction factor applied using background aquifer changes as background aquifer changes were not representative of aquifer conditions during the drawdown phase. Difficulty maintaining pumping rate due to drop in head pressure on pump. Sufficient data available to determine stable drawdown and calculate an estimated specific capacity.
	MW-SL27-B	N/A	N/A	N/A
SL #28	MW-SL28-A	Yes	0.004	Solinst Levellogger 5 devices were not available at the time of this test. Therefore, monitoring was only performed in pumped monitoring well. MicroDiver was used which records in centimeters of water (cmH2O). Unit conversion was made to total drawdown to calculate estimated specific capacity. Two tests were performed due to monitoring well conditions. Water level drew down significantly during first attempt exposing transducer. Second test was performed at a very low pumping rate. Due to low discharge of monitoring well, there was difficulty achieving a stable drawdown at very low pumping rate. Sufficient data was present to determine stable drawdown and calculate estimated specific capacity. Recharge data was not recorded for one hour due to time constraints imposed by testing complications.
	MW-SL28-B	N/A	N/A	N/A
SL #29	MW-SL29-A	Yes	0.448	Data was downloaded prior to recording recharge data. Therefore recharge data was not recorded during this test.
	MW-SL29-B	N/A	N/A	N/A
SL #30	SL30-MW-5	Yes	1.884	N/A
	SL30-MW-6	N/A	N/A	N/A
	MW-SL30-B	N/A	N/A	N/A
SL #31	MW-SL31-A	Yes	0.206	N/A
	MW-SL31-B	N/A	N/A	N/A

Table 10
Specific Capacity Testing Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Well ID	Specific Capacity Testing Performed	Estimated Specific Capacity (gallons per minute/foot of drawdown)	Notes
SL #32	MW-SL32-A	Yes	N/C	Significant influence from Newtown Creek tidal changes were observed in the monitoring well water levels. This tidal influence obscured the testing drawdown. An estimated specific capacity could not be calculated.
	MW-SL32-B	N/A	N/A	N/A
	MW-SL32-D	N/A	4.577	N/A

Notes:

1. Standard testing approach was defined in the CDM Smith Final Quality Assurance Project Plan dated June 17, 2022, with the exception of deviations noted in this table.

Acronyms:

bgs - below ground surface

N/A - not applicable

N/C - not calculated

NAPL - Non-Aqueous Phase Liquid

Table 11
Hydraulic Conductivity Comparisons
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Location (Well ID):	Aquifer thickness	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity Calculated from Specific Capacity Testing (gpd/ft ²)	Hydraulic Conductivity Calculated from Specific Capacity Testing (ft/day)	Hydraulic Conductivity Calculated from Slug Testing (ft/day)	Comments
SL #1	MW-SL1-A	16.91	0.09	138	8.2	1.1	1.5	
	MW-SL1-B	--	--	--	--	--	--	Well damaged before testing could be performed.
SL #2A	MW-SL2A-A	17.91	NC	NC	NC	NC	1.6	Specific capacity could not be calculated due to lack of consistent drawdown during test.
	MW-SL2A-B	13.5	--	--	--	--	1.5	
SL #3	MW-SL3-A	14.03	1.77	2,655	189.2	25.3	72.0	
	MW-SL-3B	14.81	--	--	--	--	>60	
SL #4	SL4-MW-22R	3.85	0.62	926	240.4	32.1	13.0	Reported step 2 in specific capacity test
	SL4-MW-21R	5.69	0.53	795	139.7	18.7	23.0	Reported step 2 in specific capacity test
	SL4-MW-13	5.79	--	--	--	--	10.0	
SL #5	MW-SL5-A	11.61	0.84	1,263	108.8	14.5	21.0	
	MW-SL5-B	--	--	--	--	--	--	Not tested due to presence of NAPL.
SL #6	SL6-MW-S-96	16.13	36.97	55,448	3437.5	459.5	>520	Significant noise observed in background aquifer changes. Did not allow for correction to be applied total drawdown. Likely attributed to heavy influence from tidal changes in Newtown Creek. Calculated specific capacity is a very rough estimate based on short time frame of discernable pumping influence.
	SL6-MW-D-96	24	0.23	450	18.8	2.5	1.0	
	MW-SL6-B	5.3	--	--	--	--	85.0	
SL #7	SL7-MW-8	8.02	0.005	8	0.9	0.125	0.160	
	SL7-MW-5	7.33	--	--	--	--	0.220	
SL #8	MW-SL8-A	6.87	0.64	966	140.6	18.8	16.0	
	MW-SL8-B	7.72	--	--	--	--	15.0	
SL #9	MW-SL9-A	8.79	1.94	2,910	331.1	44.3	22.0	Reported step 2 in specific capacity test
	MW-SL9-B	12.63	--	--	--	--	0.60	
SL #10	MW-SL10-A	18.28	13.54	20,316	1111.4	148.6	>15	Specific capacity value considered rough estimate. Minimal drawdown was observed at 3.0 gpm.
	MW-SL10-B	9.89	--	--	--	--	21.0	
SL #12	MW-SL12-A	12.37	6.30	9,456	764.4	102.2	106.0	
	MW-SL12-B	14	--	--	--	--	0.09	
	MW-SL12-D	22.4	2.20	3,302	147.4	19.7	38.9	
SL #13	MW-SL13-A	16.11	NC	NC	NC	NC	NC	No drawdown was observed at this well during development at much higher pumping rate. Specific capacity testing was not performed due to inability to pump at a higher rate. Hydraulic conductivity could not be estimated from slug testing as data set was not useful.
	MW-SL13-B	11.2	--	--	--	--	>1.8	
	MW-SL13-D	4	0.64	1,274	318.5	42.6	36.7	2nd test
SL #14	MW-SL14-A	13.83	0.70	1,043	75.4	10.1	3.0	
	MW-SL14-B	12.52	--	--	--	--	9.0	
SL #15	SL15-CMW-15	--	--	--	--	--	--	No testing allowed per access agreement
	SL15-CMW-63	--	--	--	--	--	--	No testing allowed per access agreement
SL #16	SL16-MW-13	7	0.12	174	24.9	3.3	NC	Specific capacity value considered rough estimate. Difficulty maintaining stable drawdown during specific capacity test. Slug testing not performed due to contaminated in well that may impacted rented pressure transducer and associated equipment.
	SL16-MW-10	--	--	--	--	--	NC	Slug testing not performed due to contamination in well that may impacted rented pressure transducer and associated equipment.
	MW-SL16-D	9	0.14	216	24.0	3.2	NC	Slug testing not performed due to contamination in well that may impacted rented pressure transducer and associated equipment.
SL #17	MW-SL17-A	6.5	NC	NC	NC	NC	NC	Significant influence from Newtown Creek tidal changes were observed in the monitoring well water levels. This tidal influence obscured the testing drawdown. An estimated specific capacity could not be calculated. Slug testing could not be performed due to little water column.
	MW-SL17-B	6.82	--	--	--	--	660.0	

Table 11
Hydraulic Conductivity Comparisons
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Location (Well ID):	Aquifer thickness	Specific Capacity (gpm/ft)	Transmissivity (gpd/ft)	Hydraulic Conductivity Calculated from Specific Capacity Testing (gpd/ft2)	Hydraulic Conductivity Calculated from Specific Capacity Testing (ft/day)	Hydraulic Conductivity Calculated from Slug Testing (ft/day)	Comments
SL #19	MW-SL19-A	11.18	0.98	1,470	131.5	17.6	68.0	
	MW-SL19-B	8.8	--	--	--	--	>216	
SL #20	MW-SL20-A	12.64	0.017	26	2.0	0.3	22.0	
	MW-SL20-B	5.85	--	--	--	--	99.0	
SL #21	MW-SL21-A	12.49	0.57	860	68.8	9.2	39.0	
	MW-SL21-B	13.62	--	--	--	--	87.0	
SL #22	SL22-GPEC-MW03S	34.84	0.19	281	8.1	1.1	1.1	Reported step 2 in specific capacity test
	SL22-GPEC-MW03WT	9.04	0.06	281	31.0	4.1	2.6	
	MW-SL22-B	10.11	--	--	--	--	0.36	
SL #23	MW-SL23-A	10.2	0.04	63	6.2	0.8	0.6	
	MW-SL23-B	5.44	--	--	--	--	0.3	
SL #24	MW-SL24-A	9.34	0.89	1,337	143.1	19.1	6.6	
	MW-SL24-B	9.74	--	--	--	--	>3.3	
	MW-SL24-D	10	0.23	338	33.8	4.5	3.6	
SL #25	MW-SL25-A	8.48	0.11	165	19.5	2.6	2.9	
	MW-SL25-B	11.99	--	--	--	--	0.5	
SL #26	SL26-EBMW081	11.36	0.38	572	50.3	6.7	6.5	
	SL26-EBMW082	4.06	--	--	--	--	16.0	
	MW-SL26-D	25.83	0.23	342	13.2	1.8	>7	According to slug test data the analysis may be biased low, with actual early recovery due to filter pack drainage.
SL #27	MW-SL27-A	9.96	1.77	2,651	266.1	35.6	34.0	Difficulty achieving stable drawdown likely attributed to the creek influence on aquifer at incoming tide conditions.
	MW-SL27-B	6.33	--	--	--	--	3.0	
SL #28	MW-SL28-A	13.17	0.004	6.00	0.5	0.1	0.4	
	MW-SL28-B	6.63	--	--	--	--	5.4	
SL #29	MW-SL29-A	13.57	0.45	672	49.5	6.6	5.6	
	MW-SL29-B	11.55	--	--	--	--	9.6	
SL #30	SL30-MW-5	7.84	1.88	2,826	360.5	48.2	45.0	
	SL30-MW-6	6.76	--	--	--	--	>12	
	MW-SL30-B	6.65	--	--	--	--	190.0	
SL #31	MW-SL31-A	18.1	0.21	309	17.1	2.3	15.0	
	MW-SL31-B	14.73	--	--	--	--	24.0	
SL #32	MW-SL32-A	12.57	NC	NC	NC	N/A	300 - 460	Significant influence from Newtown Creek tidal changes were observed in the monitoring well water levels. This tidal influence obscured the testing drawdown. An estimated specific capacity could not be calculated.
	MW-SL32-B	12.36	--	--	--	--	25.0	
	MW-SL32-D	12	4.58	6,866	572.1	76.5	160.0	

Notes:

ft - feet

gpd - gallons per day

gpm - gallons per minute

NAPL - non-aqueous phase liquid

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #1	SL #2		SL #3		SL #4		SL #5	
Monitoring Well ID					MW-SL1-A	MW-SL2A-A	MW-SL2A-B	MW-SL3-A	MW-SL3-B	SL4-MW-13	SL4-MW-21R	SL4-MW-22R	MW-SL5-A
Slug Test Location ID					SL1-A	SL2-A	SL2-B	SL3-A	SL3-B	SL#4 MW-13	SL#4 MW-21R	SL#4 MW-22R	SL5-A
Lithology of Screened Interval					Sandy silt w/gravel	Sandy silt w/gravel, silty gravel	Sandy silt w/gravel	Sandy silt w/gravel	Sandy silt w/gravel	Sand with Gravel	Sand and Gravel, silty clay/peat below 10 feet	Sandy Gravel	Poorly graded sand, silt with sand
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Test Initiation Type					Mechanical	Mechanical	Mechanical	Pneumatic	Pneumatic	Mechanical	Mechanical	Mechanical	Mechanical
Tests Performed					6	6	6	4	4	6	6	6	6
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	7.46	7.99	8.10	6.84	7.65	7.49	6.32	6.80	7.18
TIC Elevation		feet amsl		O	12.18	7.64	7.61	6.31	7.17	9.16	5.49	9.5	6.84
Stickup		Feet	X	O	4.72	-0.35	-0.49	-0.53	-0.48	1.67	-0.83	2.7	-0.34
Total Well Depth (bottom of screen)		feet bgs		O	20	19	17	20	20	11.5	12.5	9	16.5
Depth to Water		feet TIC		F	10.44	7.32	5.01	6.44	5.71	7.38	3.48	7.85	5.05
Water Level Elevation		feet msl	X	O	1.74	0.32	2.6	-0.13	1.46	1.78	2.01	1.65	1.79
Depth to Water		feet bgs	X	O	7.09	7.09	5.50	6.97	6.19	5.71	4.31	5.15	5.39
Well Screen Below and Across Water Table?			X	O	Below	Across	Below	Below	Below	Across	Across	Across	Below
Can pneumatic method be used/can we use convention falling heads tests?			X	O	Yes	No	Yes	Yes	Yes	No	No	No	Yes
Category (per Midwest Geo Guide)			X	O	Cat I	Cat II	Cat I	Cat I	Cat I	Cat II	Cat II	Cat II	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	12.91	11.91	11.50	13.03	13.81	5.79	8.19	3.85	11.11
Bottom of Upper Confining Unit		Feet bgs		O	-	-	-	-	-	-	-	-	-
Top of Lower Confining Unit		Feet bgs		O	24.0	25.0	19.0	21.0	21.0	-	10.0	9.0	17.0
Aquifer Top		Feet bgs	X	O	7.09	7.09	5.50	6.97	6.19	5.71	4.31	5.15	5.39
Aquifer Bottom		Feet bgs	X	O	24	25	19	21	21	11.5	10	9	17
Aquifer Thickness	B	Feet	X	O	16.91	17.91	13.50	14.03	14.81	5.79	5.69	3.85	11.61
Anisotropy Ratio	Kz/Kr	----		O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	10	4	7	10	10	1.5	2.5	2	6.5
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	2.91	0.00	1.50	3.03	3.81	0.00	0.00	0.00	1.11
Screen Length	L	Feet	X	O	10	15	10	10	10	10	10	7	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	10	11.91	10	10	10	5.79	5.69	3.85	10
Effective Screen Length Revision Rationale				O	NA	Well is screened across the water table.	NA	NA	NA	Well is screened across the water table.	Well is screened across the water table.	Well is screened across the water table.	NA
Transducer Depth (height of water column above transducer)	T	Feet	X	F	16.41	17.41	13.00	13.53	14.31	5.29	5.19	3.35	11.11
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	4	4	4	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.167	0.167	0.167	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.375	0.375	0.375	0.500	0.500	0.500	0.375
Borehole diameter		Inches		O/F	9	9	9	9	9	12	12	12	9
Fully or partially penetrating?				O	Partially	Fully	Partially	Partially	Partially	Fully	Fully	Fully	Partially
Observed maximum displacement	H(0)	feet		F	1.5*	0.85	0.95	2.68	1.56	0.26	0.5*	0.25*	2*
Expected maximum displacement	H(0)*	feet		F	1.5	1	1	2.68	1.56	0.25	0.5	0.25	2
Tidal Correction Performed					Yes	Yes	No	Yes	No	No	No	No	Yes
Which test analyzed?				O	Test 4	Test 2	Test 1	Test 3	Test 2	Test 6	Test 4	Test 6	Test 3
Test Selection Rationale					The normalized data does not coincide. Tests 2 and 4 are coincident. Test 4 recovers closer to static. All tests have early time noise. Test 4 was chosen for analysis.	The normalized data for rising head tests coincide. Test 2 is the most rapid and noise free.	The normalized data does not coincide. All tests except Test 1 have a lower observed maximum displacement than Expected maximum displacement. Test 1 displaced the expected volume of water and is the most rapid.	The normalized data does not coincide. Test 3 has the least amount of noise.	The normalized data coincides. Test 2 has low noise.	Test 6 started after the most equilibrated falling test. The normalized data coincides.	The normalized data coincides. Test 4 has the least noise.	The normalized data coincides. Test 6 has low noise.	All tests have early time noise. Test 3 is the steepest. Test 1 is of low quality. Tests 2,4,6 water levels went down into the screen. The normalized data coincides.
Analytical Method					Bouwer-Rice	Peres et al	Bouwer-Rice	Bouwer-Rice	KGS	Cooper et al	Bouwer-Rice	Bouwer-Rice	Cooper et al
Analytical Method Rationale					Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide and are not oscillatory. The well is screened across water table; go to Figure 12.4. No drainage of the filter pack; go to Figure 12.3. H(0) does not equal H(0)*, apply effective casing radius correction, Analyze with Cooper et al, storativity is implausably low, fully penetrating; go to Figure 12.2B. Data is relatively noise free and run to completion, Analyze with Peres et al.	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Analyze late time data with Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. Analyze with KGS but curve matching is poor and Ss is implausably low; go to Figure 12.2B. Data is relatively noise free and fun to completion. Analyze with Peres et al, however due to curve matching difficulties in the late time data with Peres et al, analyze with KGS due to being partially penetrating.	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 no drainage of the filter pack; go to Figure 12.3 Assume H(0)=H(0)*, Analyze with Cooper et al.	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 Drainage of filter pack (double-straight line) present. Water Table is assumed to be a constant-head boundary. Analyze with Bouwer and Rice.	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 Drainage of filter pack (double-straight line) present. Water Table is assumed to be a constant-head boundary. Analyze with Bouwer and Rice.	Normalized data coincide, not oscillatory, well not screened across water table; go to Figure 12.3 Analyze with Cooper et al. S is plausible.
Result - Hydraulic Conductivity - feet/day					1.5	1.6	1.5	72	60**	10	23	13	21
Result - Transmissivity - feet ² /day						28				58			210
Result - Storativity (S)										5.7E-04			2.2E-04
Result - Specific Storage (Ss)						1.50E-04			5.3E-05				
Notes								Initial depth to water prior to testing is 6.44 feet TIC or 6.97 feet bgs. Maximum displacement is 3.03 feet (plus 0.25 feet tidal increase for Test 3) or 3.28 because then pneumatic pressure would encounter top of screen.	Despite being a Category I well, the response indicates filter pack drainage and the late time data is more representative of the formation response.				

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #6		SL #7		SL #8		SL #9		
Monitoring Well ID					SL6-S-96	SL6-D-96	MW-SL6-B	SL7-MW-5	SL7-MW-8	MW-SL8-A	MW-SL8-B	MW-SL9-A	MW-SL9-B
Slug Test Location ID					SL#6 S-96	SL#6 D-96	SL6-B	SL7 MW-5	SL7 MW-8	SL8-A	SL8-B	SL9-A	SL9-B
Lithology of Screened Interval					Sand and Gravel	Sand and Silt	Silt	Silty Clay	Silty Clay	Silty gravel	Silt and gravel	Sandy silt w/gravel, poorly graded sand w/gravel	Poorly graded sand and gravel
Aquifer Type: Confined or Unconfined					Unconfined	Confined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Test Initiation Type					Mechanical	Mechanical	Pneumatic	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Tests Performed					6	6	4	4	5	6	6	6	4
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	6.32	6.21	5.07	13.48	12.64	8.51	7.95	11.48	11.78
TIC Elevation		feet amsl		O	6.14	5.8	4.39	13.11	12.45	7.92	7.29	11.06	11.37
Stickup		Feet	X	O	-0.18	-0.41	-0.68	-0.37	-0.19	-0.59	-0.66	-0.42	-0.41
Total Well Depth (bottom of screen)		feet bgs		O	20	43	19	20	13	13	13	18	18
Depth to Water		feet TIC		F	3.69	2.74	3.02	11.3	11.79	5.54	4.62	10.79	9.96
Water Level Elevation		feet msl	X	O	2.45	3.06	1.37	1.81	0.66	2.38	2.67	0.27	1.41
Depth to Water		feet bgs	X	O	3.87	3.15	3.70	11.67	11.98	6.13	5.28	11.21	10.37
Well Screen Below and Across Water Table?			X	O	Below	Below	Below	Across	Across	Below	Below	Across	Across
Can pneumatic method be used/can we use convention falling heads tests?			X	O	Yes	Yes	Yes	No	No	Yes	Yes	No	No
Category (per Midwest Geo Guide)			X	O	Cat I	Cat I	Cat I	Cat II	Cat II	Cat I	Cat I	Cat II	Cat II
Static Water Column Height	H (Lw)	Feet	X	O	16.13	39.85	5.30	7.33	8.02	6.87	7.72	6.79	7.63
Bottom of Upper Confining Unit		Feet bgs		O	-	28.00	-	-	-	-	-	-	-
Top of Lower Confining Unit		Feet bgs		O	20.0	52.0	9.0	-	-	13.0	15.0	20.0	23.0
Aquifer Top		Feet bgs	X	O	3.87	28.00	3.70	11.67	11.98	6.13	5.28	11.21	10.37
Aquifer Bottom		Feet bgs	X	O	20	52	9	19	20	13	15	20	23
Aquifer Thickness	B	Feet	X	O	16.13	24.00	5.30	7.33	8.02	6.87	9.72	8.79	12.63
Anisotropy Ratio	Kz/Kr	----		O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	10	28	4	9	5	8	8	8	8
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	6.13	24.85	0.30	0.00	0.00	1.87	2.72	0.00	0.00
Screen Length	L	Feet	X	O	10	15	5	10	15	5	5	10	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	10	15	5	7.33	8.02	5	5	6.79	7.63
Effective Screen Length Revision Rationale				O	NA	NA	NA	Well is screened across the water table.	Well is screened across the water table.	NA	NA	Well is screened across the water table.	Well is screened across the water table.
Transducer Depth (height of water column above transducer)	T	Feet	X	F	15.63	23.50	4.80	6.83	7.52	6.37	9.22	8.29	12.13
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	4	4	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.167	0.167	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.333	0.333	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Borehole diameter		Inches		O/F	8	8	9	9	9	9	9	9	9
Fully or partially penetrating?				O	Fully	Partially	Partially	Fully	Fully	Fully	Partially	Fully	Fully
Observed maximum displacement	H(0)	feet		F	0.5*	0.41*	0.66	0.83	1.54	1.5*	1*	1*	1*
Expected maximum displacement	H(0)*	feet		F	0.5	0.38	0.66*	0.83	1.5	1.5	1	1	1
Tidal Correction Performed					Yes	Yes	Yes	No	Yes	No	No	No	No
Which test analyzed?				O	Test 4	Test 1	Test 2	Test 2	Test 4	Test 4	Test 1	Test 2	Test 2
Test Selection Rationale					4-inch diameter wells have low initial displacement and this well responds very quickly. Pneumatic testing was not possible due to casing size/location. Test 4 is relatively clean. Assume 6-inch initial displacement.	All Falling Head Tests are coincident. Test 1 recovers closest to static water level. Rising tests are coincident and offset.	Test 2 and Test 4 are coincident and have the same initial displacement. Test 2 has the lowest noise.	Test 2 and Test 4 are coincident. Tests 1 and 3 were disrupted and not fully submerged. Test 2 is more rapid.	Test 2 and Test 4 are not coincident. Test 4 has lower noise and a longer test.	Falling Tests 1,3, and 5 are coincident and Rising Tests 2,4, and 6 are coincident. Test 4 was chosen because it has the lowest amount of noise.	All tests are not coincident and have early time noise. Test 1 is most rapid.	Three rising head tests are coincident. Test 2 chosen because it is the lowest amount of noise.	Test 4 had a disruption to the transducer line during the first few seconds. Test 2 extends longer.
Analytical Method					Bouwer-Rice	Cooper et al.	Peres et al	Cooper et al	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Bouwer and Rice
Analytical Method Rationale					Test quality impacted by rapid formation response and equipment limitations. Use Bouwer-Rice as an order of magnitude estimate of hydraulic conductivity, with curve fit to recovery curve.	Normalized data coincide, not oscillatory, well is not screened across the water table, confined; go to 12.2A. Assume H(0)=H(0)*, Analyze with Cooper et al	Normalized data for Tests 2 and 4 coincide, cannot assess other tests due to contradictory H(0)*/screen depth, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. KGS has implausably low storativity; go to Figure 12.2B, analyze with Peres et al	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 no drainage of the filter pack; go to Figure 12. H(0)=H(0)*, Analyze with Cooper et al.	Normalized data do not coincide; go to Figure 12.1B. There is dependence on H(0)*. Assume there is not dependence on flow direction. Analyze with Bouwer-Rice.	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice.	Normalized data do not coincide; go toFigure 12.1B. There is not reporducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 Drainage of filter pack (double-straight line) present. Water Table may be a constant-head boundary. Analyze with Bouwer and Rice. Curve match to second straight line outside the recommended head range because of better representation of the formation response (Butler)	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 Drainage of filter pack (double-straight line) present. Water Table is assumed to be a constant-head boundary. Analyze with Bouwer and Rice
Result - Hydraulic Conductivity - feet/day					520**	1.0	85	0.22	0.16	16	15	22	0.6
Result - Transmissivity - feet ² /day						15	450	1.6					
Result - Storativity (S)						1.2E-04	2.6E-07	7.2E-03					
Result - Specific Storage (Ss)													
Notes							Due to low K formation, tests were not run to full recovery. Therefore displacement was calculated using initial static water level. Ho is 0.83 even though 1 foot of water was displaced.	Match curve to second straight line. Due to movement of transducer during testing and tidal change, two different static water levels were used for displacement calculation.					

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #10		SL #12		SL #13			
Monitoring Well ID					MW-SL10-A	MW-SL10-B	MW-SL12-A	MW-SL12-B	MW-SL12-D	MW-SL13-A	MW-SL13-B	MW-SL13-D
Slug Test Location ID					SL10-A	SL10-B	SL12-A	SL12-B	SL12-D	SL13-A	SL13-B	SL13-D
Lithology of Screened Interval					Poorly graded sand w/silt, sandy silt	Well graded sand	Poorly to well graded sand	Silt, sand/silt, fine gravel	Well graded clean sand	Poorly graded sand/gravel i/b silt	Silty sand	Poorly graded sand
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Confined
Test Initiation Type					Pneumatic	Mechanical	Pneumatic	Mechanical	Pneumatic	Mechanical and Pneumatic	Mechanical	Pneumatic
Tests Performed					3	6	4	4	2	?	3	3
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	9.72	8.50	8.25	8.22	8.19	6.27	7.07	6.22
TIC Elevation		feet amsl		O	9.05	8.13	8	7.85	7.78	5.93	6.81	5.84
Stickup		Feet	X	O	-0.67	-0.37	-0.25		-0.41	-0.34	-0.26	-0.38
Total Well Depth (bottom of screen)		feet bgs		O	21	19.5	17	17	17	17	17	34
Depth to Water		feet TIC		F	6.05	6.74	4.38	3	4.19	4.55	5.04	14.22
Water Level Elevation		feet msl	X	O	3	1.39	3.62	4.85	3.59	1.38	1.77	-8.38
Depth to Water		feet bgs	X	O	6.72	7.11	4.63	3.00	4.60	4.89	5.30	14.60
Well Screen Below and Across Water Table?			X	O	Below	Below	Below	Below	Below	Below	Below	Below
Can pneumatic method be used/can we use convention falling heads tests?			X	O	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category (per Midwest Geo Guide)			X	O	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	14.28	12.39	12.37	14.00	22.40	12.11	11.70	19.40
Bottom of Upper Confining Unit		Feet bgs		O	-	-	-	-	-	-	-	29.00
Top of Lower Confining Unit		Feet bgs		O	25.0	17.0	-	-	-	21.0	16.5	33.0
Aquifer Top		Feet bgs	X	O	6.72	7.11	4.63	3.00	4.60	4.89	5.30	29.00
Aquifer Bottom		Feet bgs	X	O	25	17	17	17	27	21	16.5	33
Aquifer Thickness	B	Feet	X	O	18.28	9.89	12.37	14.00	22.40	16.11	11.20	4.00
Anisotropy Ratio	Kz/Kr	----		O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	11	9.5	7	7	22	7	7	24
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	4.28	2.39	2.37	4.00	17.40	2.11	1.70	0.00
Screen Length	L	Feet	X	O	10	10	10	10	5	10	10	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	10	7.5	10	10	5	10	9.5	4
Effective Screen Length Revision Rationale				O	NA	NA	NA	NA	NA	NA	NA	10-foot well screen installed across two low-permeability layers.
Transducer Depth (height of water column above transducer)	T	Feet	X	F	17.78	9.39	11.87	13.50	21.90	15.61	10.70	3.50
d/b>2?			X	O	NO	NO	NO	NO	YES	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Borehole diameter		Inches		O/F	9	9	9	9	9	9	9	9
Fully or partially penetrating?				O	Partially	Partially	Partially	Partially	Partially	Partially	Partially	Fully
Observed maximum displacement	H(0)	feet		F	0.03	1*	1.64	0.71	2.53		0.67*	0.80*
Expected maximum displacement	H(0)*	feet		F	NA	1	1.58	1	2.53*		0.67	0.8
Tidal Correction Performed					No	Yes	No	No	No	Yes	Yes	No
Which test analyzed?				O	Test 1	Test 5	Test 4	Test 1	Test 2		Test 3	Test 2
Test Selection Rationale					Test quality impacted by rapid formation response and equipment limitations. Additionally, there was a small initial displacement and low transducer resolution. The recovery curve is best observed in Test 1	Rising head tests are significantly slower in response than the falling head tests. The falling head tests are relatively coincident, although the higher displacement test responded more slowly. Test 5 chosen.	Due to difficulty with the pneumatic gauge, initial displacements do not match the expected maximum displacements consistently. All tests are reletively clean, rapid, and coincident after initial displacement. Analyze Test 4 based on closest agreement of observed maximum displacement and expected maximum displacement.	Due to a slow response, only two rising head and two falling head tests were performed. Tests were not allowed to recover to >90%, but both falling head tests recovered to >80% recovery. Rising head tests are of poor quality and were not assessed. Test 1 is selected for analysis because it recovered 89%, was more rapid in response, and was unaffected by previous tests that did not recover fully.	Tests 1 and 2 are coincident. Test 2 was chosen. In both tests, expected maximum displacement is difficult to determine due to a discrepancy in gauge readings and field notes. Assume H(0)=H(0)*	See Analytical Methods Rationale below.	Tests 1 and 3 are coincident with different initial displacements. Test 2 is also assumed to be coincident due to early time noise and tide variables. Test 3 recovered completed to static.	All tests are coincident. Test 2 was chosen because it is slightly more rapid.
Analytical Method					Bouwer and Rice	Dagan	Peres et al.	Bouwer-Rice	Peres et al.		KGS	Cooper et al.
Analytical Method Rationale					Test quality impacted by rapid formation response and equipment limitations. Use Bouwer-Rice as an order of magnitude estimate of hydraulic conductivity, with curve fit to recovery curve.	Normalized data do not coincide; go to Figure 12.1B. There is assumed reproducible dependence on H(0)*, there is reproducible dependence on flow direction, H(0) is assumed to equal H(0)*, analyze with Dagan.	Normalized data coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. Present range of KGS unconfined and confined models, implausably low storativity; go to Figure 12.2B data is relatively noise free and run to near completion, analyze with Peres et al.	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. Present range of KGS unconfined and confined models, implausably low storativity; go to 12.2B data is relatively noise free and run to near completion, analyze with Peres et al.	Very high K - Cannot collect useful dataset; attempted pneumatic and conventional; specific capacity test had no drawdown at 7gpm	Normalized data coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. KGS has implausably low storativity, however presenting KGS result of mid-time data due to implausible curve matching of Peres et al, and partial penetration of the aquifer.	Normalized data coincide, not oscillatory, well is not screened across the water table, confined; go to Figure 12.2A. Assume H(0)=H(0)*, Analyze with Cooper et al
Result - Hydraulic Conductivity - feet/day					15**	21	106	0.09	38.9		1.8**	36.7
Result - Transmissivity - feet ² /day							1310		872			147
Result - Storativity (S)									1.6E-10			1.30E-03
Result - Specific Storage (Ss)							6.8E-06				6.5E-12	
Notes					10 to 100 order of magnitude estimate			Four tests were performed however, rising head tests were not analyzed due to insufficient recovery.				Apply translation method due to clean, non-instantaneous start

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #14		SL #17	SL #19		SL #20		SL #21	
Monitoring Well ID					MW-SL14-A	MW-SL14-B	MW-SL17-B	MW-SL19-A	MW-SL19-B	MW-SL20-A	MW-SL20-B	MW-SL21-A	MW-SL21-B
Slug Test Location ID					SL14-A	SL14-B	SL17-B	SL19-A	SL19-B	SL20-A	SL20-B	SL21-A	SL21-B
Lithology of Screened Interval					Silty sand	Silty sand w/gravel, poorly graded sand w/silt and gravel	Sandy gravelly fill	Sandy silt w/gravel	Sandy silt	Silty sand, gravelly silt w/sand	Silty sand w/gravel, poorly graded gravel w/silt and sand	Poorly graded sand w/gravel	Sandy silt w/gravel
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Test Initiation Type					Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Tests Performed					6	8	6	6	6	6	8	6	6
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	9.22	10.19	14.96	13.28	13.29	4.33	5.44	14.48	14.82
TIC Elevation		feet amsl		O	8.58	9.79	14.63	14.06	13.79	3.64	5.18	14.2	16.39
Stickup		Feet	X	O	-0.64	-0.4	-0.33	0.78	0.5	-0.69	-0.26	-0.28	1.57
Total Well Depth (bottom of screen)		feet bgs		O	19	19	21	20	20	15	15	20	20
Depth to Water		feet TIC		F	4.53	6.08	13.85	12.6	14.7	1.67	8.89	12.23	12.95
Water Level Elevation		feet msl	X	O	4.05	3.71	0.78	1.46	-0.91	1.97	-3.71	1.97	3.44
Depth to Water		feet bgs		O	5.17	6.48	14.18	11.82	14.20	2.36	9.15	12.51	11.38
Well Screen Below and Across Water Table?			X	O	Across	Across	Across	Below	Below	Below	Across	Below	Below
Can pneumatic method be used/can we use convention falling heads tests?			X	O	No	No	No	Yes	Yes	Yes	No	Yes	Yes
Category (per Midwest Geo Guide)			X	O	Cat II	Cat II	Cat II	Cat I	Cat I	Cat I	Cat II	Cat I	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	13.83	12.52	6.82	8.18	5.80	12.64	5.85	7.49	8.62
Bottom of Upper Confining Unit		Feet bgs		O	-	-	-	-	-	-	-	-	-
Top of Lower Confining Unit		Feet bgs		O	19.0	-	-	23.0	-	15.0	15.0	25.0	25.0
Aquifer Top		Feet bgs	X	O	5.17	6.48	14.18	11.82	14.20	2.36	9.15	12.51	11.38
Aquifer Bottom		Feet bgs	X	O	19	19	21	23	23	15	15	25	25
Aquifer Thickness	B	Feet	X	O	13.83	12.52	6.82	11.18	8.80	12.64	5.85	12.49	13.62
Anisotropy Ratio	Kz/Kr			O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	4	4	6	15	15	5	5	15	15
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	0.00	0.00	0.00	3.18	0.80	2.64	0.00	2.49	3.62
Screen Length	L	Feet	X	O	15	15	15	5	5	10	10	5	5
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	13.83	12.52	6.82	5	5	10	5.85	5	5
Effective Screen Length Revision Rationale				O	Well is screened across the water table.	Well is screened across the water table.	Well is screened across the water table.	NA	NA	NA	Well is screened across the water table.	NA	NA
Transducer Depth (height of water column above transducer)	T	Feet	X	F	13.33	12.02	6.32	10.68	8.30	12.14	5.35	11.99	13.12
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Borehole diameter		Inches		O/F	9	9	9	9	9	9	9	9	9
Fully or partially penetrating?				O	Fully	Fully	Fully	Partially	Partially	Partially	Fully	Partially	Partially
Observed maximum displacement	H(0)	feet		F	1.5*	1*	1*	1*	1*	1.02	1*	1.53	1.5*
Expected maximum displacement	H(0)*	feet		F	1.5	1	1	1	1	1	1	1.5	1.5
Tidal Correction Performed					No	No	Yes	Yes	Yes	Yes	No	Yes	Yes
Which test analyzed?				O	Test 4	Test 8	Test 4	Test 5	Test 2	Test 1	Test 2	Test 3	Test 4
Test Selection Rationale					Tests 4 and 6 coincide despite having different initial displacements. Test 2 was slower. Test 4 was the longest test and had the best recovery to static.	The tests are not coincident. Analyze Test 8 because it is relatively low noise and the estimated observed maximum displacement appears to best approximate expected maximum displacement, given the slope of the curve.	Normalized data are not coincident but difficult to determine, due to speed of the tests. Chose Test 4 due to lowest noise after 1 second.	Tests 1,3, and 5 falling head tests are coincident but are not coincident with rising head tests, which are slower. Test 5 is the fastest.	Tests 2 and 6 are coincident and low noise. Test 2 is potentially faster and has lower noise. Tests 1 and 3 are too noisy and/or oscillatory to determine if they are not coincident with 2 and 6.	The falling head tests are coincident but not with the rising head tests. Test 1 has the least noisy start.	The rising head tests are coincident. Test 2 is the most rapid.	The falling head tests are coincident, but they are not coincident with the rising head tests, which are much slower. Test 3 is most rapid.	The Normalized Tests coincide with the exception of noisy early time data. Test 4 had the least early time noise.
Analytical Method					Cooper et al	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	KGS	Bouwer-Rice	Springer-Gelhar	Bouwer-Rice	KGS
Analytical Method Rationale					Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4 no drainage of the filter pack; go to Figure 12.3 Assume H(0)=H(0)*, Analyze with Cooper et al.	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on Ho*. Analyze with Bouwer-Rice because it is an unconfined aquifer.	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well screened across water table, unconfined; go to Figure 12.3. Cooper et al. has implausably low Storativity, partially penetrating, d/b not >2. KGS has implausably low specific storage however, the curve match is good. Go to 12.2B, analyze with Peres et al. However, the Peres et al curve match was poor due to the late time concave up curve. Analyze with KGS due to partial penetration of the aquifer.	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, data is oscillatory; go toFigure 12.5. H(0) is assumed to equal H(0)*. Butler and Zhan. Change to Springer-Gelhar for unconfined model	Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well screened across water table; go to Figure 12.4 no drainage of the filter pack; go to Figure 12.3 H(0)= H(0)*. Analyze with Cooper et al. S is implausably low; go to Figure 12.2B. Data is not relatively noise free. Analyze with KGS for partially penetrating aquifer.
Result - Hydraulic Conductivity - feet/day					3.0	9	660	68	216**	22	99	39	87
Result - Transmissivity - feet ² /day					41								
Result - Storativity (S)					1.40E-02								
Result - Specific Storage (Ss)									1.8E-11				1.2E-11
Notes						Matched curve to second portion of double straight line instead of recommended head range to assess formation response instead of filter pack drainage.							

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #22			SL #24		SL #24		
Monitoring Well ID					SL22-GPEC-MW03S	SL22-GPEC-MW03WT	MW-SL22-B	MW-SL23-A	MW-SL23-B	MW-SL24-A	MW-SL24-B	MW-SL4-D
Slug Test Location ID					SL#22 GPEC-MW03S	SL#22 GPEC-MW03WT	SL#22 SL22-B	SL23-A	SL23-B	SL24-A	SL24-B	SL24-D
Lithology of Screened Interval					Unknown	Unknown	Unknown	Sandy silt	Sandy silt	Silt, sand, gravel	Gravelly silt	Poorly graded sand
Aquifer Type: Confined or Unconfined					Unconfined*	Unconfined*	Unconfined*	Unconfined	Unconfined	Unconfined	Unconfined	Confined
Test Initiation Type					Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical	Mechanical
Tests Performed					6	8	6	6	4	8	6	6
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	6.99	6.55	7.62	7.56	8.07	5.04	5.96	5.08
TIC Elevation		feet amsl		O	6.48	6.37	7.51	10.66	7.62	4.69	5.63	4.84
Stickup		Feet	X	O	-0.51	-0.18	-0.11	3.1	-0.45	-0.35	-0.33	-0.24
Total Well Depth (bottom of screen)		feet bgs		O	40	14	16	17	12	14	14	30
Depth to Water		feet TIC		F	4.65	4.78	5.78	9.9	7.11	3.31	3.93	3.11
Water Level Elevation		feet msl	X	O	1.83	1.59	1.73	0.76	0.51	1.38	1.7	1.73
Depth to Water		feet bgs	X	O	5.16	4.96	5.89	6.80	7.56	3.66	4.26	3.35
Well Screen Below and Across Water Table?			X	O	Below	Across	Below	Below	Across	Below	Across	Below
Can pneumatic method be used/can we use conventionation falling heads tests?			X	O	Yes	No	Yes	Yes	No	Yes	No	Yes
Category (per Midwest Geo Guide)			X	O	Cat I	Cat II	Cat I	Cat I	Cat II	Cat I	Cat II	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	34.84	9.04	10.11	10.20	4.44	10.34	9.74	26.65
Bottom of Upper Confining Unit		Feet bgs		O	-	-	-	-	-	-	-	20
Top of Lower Confining Unit		Feet bgs		O	-	-	-	17.0	13.0	-	-	-
Aquifer Top		Feet bgs	X	O	5.16	4.96	5.89	6.80	7.56	3.66	4.26	20.00
Aquifer Bottom		Feet bgs	X	O	40	14	16	17	13	14	14	30
Aquifer Thickness	B	Feet	X	O	34.84	9.04	10.11	10.20	5.44	9.34	9.74	10.00
Anisotropy Ratio	Kz/Kr			O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	25	4	6	7	7	4	4	20
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	19.84	0.00	0.11	0.20	0.00	0.34	0.00	5.00
Screen Length	L	Feet	X	O	15	10	10	10	5	10	10	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	15	9.04	10	10	4.44	9	9.74	10
Effective Screen Length Revision Rationale				O	NA	Well is screened across the water table.	NA	NA	Well is screened across the water table.	Well is screened one foot into a low permeability layer.	Well is screened across the water table.	NA
Transducer Depth (height of water column above transducer)	T	Feet	X	F	34.34	8.54	9.61	9.70	4.94	8.84	9.24	9.50
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.229	0.260	0.375	0.375	0.375	0.375	0.375	0.375
Borehole diameter		Inches		O/F	5.5	6.25	9	9	9	9	9	9
Fully or partially penetrating?				O	Partially	Fully	Partially	Partially	Fully	Partially	Fully	Partially
Observed maximum displacement	H(0)	feet		F	1.5*	1.51	1	1*	1.47	1*	1.47	1.42
Expected maximum displacement	H(0)*	feet		F	1.5	1.5	1	1	1.5	1	1.5	1.5
Tidal Correction Performed					Yes	Yes	No	No	Yes	No	No	No
Which test analyzed?				O	Test 4	Test 6	Test 2	Test 2	Test 4	Test 8	Test 4	Test 2
Test Selection Rationale					All tests are approximately coincident. The rising head tests recover closer to static water level. Test 4 is the most rapid initiation.	The rising head tests are considered since the water table is within the screened interval. All tests are not coincident. Test 6 is the most rapid/least noisy.	The tests are not coincident, but the falling head tests and rising head tests are relatively similar, respectively. Test 2 is the cleanest start.	Late time data is coincident, but early time data is not coincident. Test 2 is the fastest.	Tests 2 and 4 are coincident and low noise. Test 4 is more rapid.	All tests are not coincident and the 24-inch displacement tests may not have been fully submerged. Chose Test 8 because it is more noise free than Test 1 and still very rapid.	Test 1 observed maximum displacement does not make sense. Test 4 and 6 are coincident and Test 4 has better equilibration to static.	The rising head tests generally coincide, falling head tests generally coincide, but not with each other. Rising head tests have lower noise. Test 2 is the most rapid.
Analytical Method					Cooper et al	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Cooper et al	Bouwer-Rice	Cooper et al	Bouwer-Rice
Analytical Method Rationale					Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. H(0)=H(0)*, Analyze with Cooper et al.	Normalized data do not coincide; go to Figure 12.18. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data do not coincide; go to Figure 12.18. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data do not coincide; go to Figure 12.18. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. H(0)=H(0)*, Analyze with Cooper et al.	Normalized data do not coincide; go toFigure 12.18. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well screened across water table; go to Figure 12.4 no drainage of the filter pack; go to Figure 12.3 H(0)= H(0)*. Analyze with Cooper et al. S is implausably low, however late time data in Peres et al model makes curve match difficult. Present Cooper et al results due to full penetration of the aquifer.,	Normalized data do not coincide; go to Figure 12.18. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice
Result - Hydraulic Conductivity - feet/day					1.1	2.6	0.36	0.6	0.3	6.6	3.3**	3.6
Result - Transmissivity - feet ² /day					17				1.4		32	
Result - Storativity (S)					1.50E-02				1.00E-03		1.0E-10	
Result - Specific Storage (Ss)												
Notes												

Notes:

* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.

** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations

F - Field

feet amsl - feet above mean sea level

feet bgs - feet below ground surface

feet TIC - feet below top of inner casing

NA - not applicable

O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #25		SL #26			SL #27		SL #28	
Monitoring Well ID					MW-SL25-A	MW-SL25-B	SL26-EBMW081	SL26-EBMW082	MW-SL26-D	MW-SL27-A	MW-SL27-B	MW-SL28-A	MW-SL28-B
Slug Test Location ID					SL25-A	SL25-B	SL#26 EB081	SL#26 EB082	SL#26 SL26-D	SL27-A	SL27-B	SL28-A	SL28-B
Lithology of Screened Interval					Gravelly silt	Gravelly silt	Gravelly sand	Organic silt	Silty sand	Sandy silt	Sandy silt w/gravel	Sandy silt	Sandy silt
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Test Initiation Type					Pneumatic	Mechanical	Mechanical	Mechanical	Pneumatic	Pneumatic	Pneumatic	Mechanical	Mechanical
Tests Performed					4	4	6	6	4	3	4	6	6
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	8.86	8.40	4.67	4.06	4.76	6.84	7.27	6.08	11.07
TIC Elevation		feet amsl		O	8.26	8.03	4.39	3.74	4.49	6.11	6.91	8.67	10.34
Stickup		Feet	X	O	-0.6	-0.37	-0.28	-0.32	-0.27	-0.73	-0.36	2.59	-0.73
Total Well Depth (bottom of screen)		feet bgs		O	13	13	14.3	14.3	29	16	16	15	15
Depth to Water		feet TIC		F	3.92	2.64	4.06	2.82	2.9	4.31	4.31	4.42	5.64
Water Level Elevation		feet msl	X	O	4.34	5.39	0.33	0.92	1.59	1.8	2.6	4.25	4.7
Depth to Water		feet bgs	X	O	4.52	3.01	4.34	3.14	3.17	5.04	4.67	1.83	6.37
Well Screen Below and Across Water Table?			X	O	Below	Below	Below	Below	Below	Below	Below	Below	Across
Can pneumatic method be used/can we use convention falling heads tests?			X	O	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Category (per Midwest Geo Guide)			X	O	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat II
Static Water Column Height	H (Lw)	Feet	X	O	8.48	9.99	9.96	11.16	25.83	10.96	11.33	13.17	8.63
Bottom of Upper Confining Unit		Feet bgs		O	-	-	-	-	-	-	-	-	-
Top of Lower Confining Unit		Feet bgs		O	13.0	15.0	15.7	7.2	29.0	15.0	11.0	15.0	13.0
Aquifer Top		Feet bgs	X	O	4.52	3.01	4.34	3.14	3.17	5.04	4.67	1.83	6.37
Aquifer Bottom		Feet bgs	X	O	13	15	15.7	7.2	29	15	11	15	13
Aquifer Thickness	B	Feet	X	O	8.48	11.99	11.36	4.06	25.83	9.96	6.33	13.17	6.63
Anisotropy Ratio	Kz/Kr	----		O	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	8	8	4.5	4.5	19	6	6	5	5
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	3.48	4.99	0.16	1.36	15.83	0.96	1.33	3.17	0.00
Screen Length	L	Feet	X	O	5	5	9.8	10	10	10	10	10	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	5	5	9.8	2.7	10	9	5	10	6.63
Effective Screen Length Revision Rationale				O	NA	NA	NA	Well is screened 7.3 feet into a low permeability layer.	NA	Well is screened 1 foot into a low permeability layer.	Well is screened 5 feet into a low permeability layer.	NA	Well is screened two feet into a low permeability layer.
Transducer Depth (height of water column above transducer)	T	Feet	X	F	7.98	11.49	10.86	3.56	25.33	9.46	5.83	12.67	6.13
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.250	0.250	0.375	0.375	0.375	0.375	0.375
Borehole diameter		Inches		O/F	9	9	6	6	9	9	9	9	9
Fully or partially penetrating?				O	Partially	Partially	Partially	Partially	Partially	Partially		Partially	Fully
Observed maximum displacement	H(0)	feet		F	0.68	1.52	1*	0.99	0.38	0.79	0.36	1*	1.5*
Expected maximum displacement	H(0)*	feet		F	0.83	1.5	1	1.25	1	0.83	0.36*	1	1.5
Tidal Correction Performed					No	No	Yes	No	Yes	No	No	No	No
Which test analyzed?				O	Test 4	Test 4	Test 5	Test 1	Test 3	Test 3	Test 4	Test 6	Test 4
Test Selection Rationale					Tests 2 and 4 are coincident, but the other two tests are not coincident. Test 4 is the most rapid.	Tests 1,2 and 3,4 are each coincident, respectively, but all tests are not coincident. Test 4 is the most rapid.	All tests are coincident. Chose Test 5 because it best equilibrates to static water level.	Rising head tests are relatively coincident, but have an inflection point at ~10 seconds where recovery rate has slowed and then increases. Falling head tests are coincident. Chose Test 1 because it is the most rapid and has the least amount of noise.	Tests 1 and 2 appear to have been disrupted. Tests 3 and 4 are of good quality but observed displacement is much lower than the gauge reading on the pneumatic slug tests manifold. Test 3 is more rapid and has less noise.	Tests 1 and 2 are noisy and observed maximum displacement is significantly lower than the expected maximum displacement. Test 3 is low noise and H(0) is close to H(0)*. Test 3 is low noise and H(0) is close to H(0)*.	Test 1 has slow initiation, Tests 2 and 3 appear to have been disrupted. Test 4 is relatively noise free and pneumatic pressurization has best return to static prior to test initiation.	Tests are not coincident, rising head tests may have filter pack drainage obscured by early time noise. Test 6 best equilibrates to static.	Tests are approximately coincident, potentially due to different initiation rates. Test 4 is most rapid.
Analytical Method					Bouwer-Rice	Bouwer-Rice	Cooper et al	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice	Bouwer-Rice
Analytical Method Rationale					Normalized data do not coincide; go to Figure 12.1B. There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is reproducible dependence on H(0)*. There is not dependence on flow direction. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. H(0)=H(0)*, Analyze with Cooper et al.	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, not oscillatory, well screened across water table; go to Figure 12.4, drainage of filter pack (double-straight line) present with continuation of concave-up curve. Water Table may be a constant-head boundary. Analyze with Bouwer and Rice
Result - Hydraulic Conductivity - feet/day					2.9	0.5	6.5	16	7**	34	3.0	0.4	5.4
Result - Transmissivity - feet ² /day							64						
Result - Storativity (S)							6.70E-03						
Result - Specific Storage (Ss)													
Notes									Ho is significantly lower than H(0)*. This analysis may be biased low, with the actual early recovery due to filter pack drainage				

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #29		SL #30		SL #31		
Monitoring Well ID					MW-SL29-A	MW-SL29-B	SL30-MW-5	SL30-MW-6	MW-SL30-B	MW-SL31-A	MW-SL-31-B
Slug Test Location ID					SL29-A	SL29-B	SL#30 MW-5	SL#30 MW-6	SL30-B	SL31-A	SL31-B
Lithology of Screened Interval					Sandy silt, silty sand	Silty sand, poorly graded sand	Poorly graded sand (from SL30-B)	Poorly graded sand (from SL30-B)	Poorly graded sand	Sandy silt w/gravel	Sandy silt w/gravel
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined	Unconfined
Test Initiation Type					Pneumatic	Pneumatic	Mechanical	Pneumatic	Mechanical	Pneumatic	Pneumatic
Tests Performed					3	4	6	4	3	3	3
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value	Value	Value	Value	Value
Ground Elevation		feet amsl		O	5.00	4.99	12.43	10.4	11.34	8.57	8.08
TIC Elevation		feet amsl		O	4.6	4.59	12.28	10.22	11.04	8.02	7.77
Stickup		feet	X	O	-0.4	-0.4	-0.15	-0.18	-0.3	-0.55	-0.31
Total Well Depth (bottom of screen)		feet bgs		O	11	12	19	17	17	22	22
Depth to Water		feet TIC		F	3.03	3.05	11.01	10.06	10.05	5.85	5.96
Water Level Elevation		feet msl	X	O	1.57	1.54	1.27	0.16	0.99	2.17	1.81
Depth to Water		feet bgs	X	O	3.43	3.45	11.16	10.24	10.35	6.40	6.27
Well Screen Below and Across Water Table?			X	O	Below	Below	Below	Below	Below	Below	Below
Can pneumatic method be used/can we use conventionation falling heads tests?			X	O	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category (per Midwest Geo Guide)			X	O	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	7.57	8.55	7.84	6.76	6.65	15.60	15.73
Bottom of Lower Confining Unit		Feet bgs		O	-	-	-	-	-	-	-
Top of Lower Confining Unit		Feet bgs		O	17.0	15.0	-	-	17.0	24.5	21.0
Aquifer Top		Feet bgs	X	O	3.43	3.45	11.16	10.24	10.35	6.40	6.27
Aquifer Bottom		Feet bgs	X	O	17	15	19	17	17	24.5	21
Aquifer Thickness	B	Feet	X	O	13.57	11.55	7.84	6.76	6.65	18.10	14.73
Anisotropy Ratio	Kz/Kr			O	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Top of Screen		Feet bgs		O	6	7	14	12	12	12	12
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	2.57	3.55	2.84	1.76	1.65	5.60	5.73
Screen Length	L	Feet	X	O	5	5	5	5	5	10	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	5	5	5	5	5	10	9
Effective Screen Length Revision Rationale				O	NA	NA	NA	NA	NA	NA	Well is screened one foot into a low permeability layer.
Transducer Depth (height of water column above transducer)	T	Feet	X	F	13.07	11.05	7.34	6.26	6.15	17.60	14.23
d/b>2?			X	O	NO	NO	NO	NO	NO	NO	NO
Casing diameter		Inches		O	2	2	2	2	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083	0.083	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01		0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.250	0.250	0.375	0.375	0.375
Borehole diameter		Inches		O/F	9	9	6	6	9	9	9
Fully or partially penetrating?				O	Partially	Partially	Partially	Partially	Partially	Partially	Partially
Observed maximum displacement	H(0)	feet		F	0.43	0.83*	1*	0.08	1.3	0.31	0.43
Expected maximum displacement	H(0)*	feet		F	0.42	0.83	1	NA	NA	0.42	0.42
Tidal Correction Performed					No	No	Yes	No	No	No	No
Which test analyzed?				O	Test 3	Test 3	Test 2	Test 3	Test 2	Test 1	Test 1
Test Selection Rationale					Tests are not coincident. Chose Test 3 because it more closely achieved expected maximum displacement and was more rapid.	Test 4 is noisy. All four tests are coincident with filter pack drainage. Test 3 is chosen.	All six tests are coincident, rising head tests have less noise. Test 2 is the least noisy.	Test quality impacted by rapid formation response and equipment limitations. Additionally, the tests had small initial displacements and were initiated before the water pressure equilibrated. The recovery curve is best observed in Test 3.	Test 1 has some noise. Test 2 and 3 are good quality. Test 2 has more rapid response captured in the data.	Tests are not coincident. Observed displacement is significantly lower than expected displacement based on pressure gauge readings. Test 1 has the best observed displacement ratio and best equilibration to static water level.	Tests are not coincident. Observed displacement is significantly lower than expected displacement in all tests except Test 1. Chose Test 1.
Analytical Method					Bouwer-Rice	Bouwer-Rice	Cooper et al.	Bouwer-Rice	KGS	Bouwer-Rice	Bouwer-Rice
Analytical Method Rationale					Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized data coincide, not oscillatory, well not screened across water table; go to Figure 12.3 Ho assumed to equal H(0)*, Analyze with Cooper et al. Poor fit but not implausible low storativity. Double straight line effect present indicating drainage of filter pack. Analyze with Bouwer-Rice.	Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Assume H(0)=H(0)*, Analyze with Cooper et al.	Test quality impacted by rapid formation response and equipment limitations. Use Bouwer-Rice as an order of magnitude estimate of hydraulic conductivity, with curve fit to recovery curve.	Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Assume H(0)=H(0)*, Analyze with Cooper et al, S is implausably low. Partially penetrating, D/B is not greater than 2. KGS confined has implausible Storativity. KGS unconfined has plausible Specific Storage. Present KGS unconfined result since it is screened in an unconfined formation.	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized tests do not coincide; go to Figure 12.1B There is not a reproducible dependence on H(0)*. Analyze with Bouwer-Rice
Result - Hydraulic Conductivity - feet/day					5.6	9.6	45	12**	190	15	24
Result - Transmissivity - feet ² /day							223				
Result - Storativity (S)							4.70E-04				
Result - Specific Storage (Ss)									1.10E-05		
Notes					Three tests were performed, however Test 1 was interrupted and therefore not included in the assessment for analysis.			The ground elevation, top of screen, and borehole diameter measurements are estimated because this is an existing well with no provided information.			

Notes:

* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.

** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations

F - Field

feet amsl - feet above mean sea level

feet bgs - feet below ground surface

feet TIC - feet below top of inner casing

NA - not applicable

O - Office

Table 12
Slug Testing Results
Newtown Creek Superfund Site OU1
Brooklyn and Queens, New York

Study Location					SL #32		
Monitoring Well ID					MW-SL32-A	MW-SL32-B	MW-SL32-D
Slug Test Location ID					SL32-A	SL32-B	SL32-D
Lithology of Screened Interval					Gravelly silt	Gravelly silt	Poorly graded sand
Aquifer Type: Confined or Unconfined					Unconfined	Unconfined	Confined
Test Initiation Type					Mechanical	Mechanical	Pneumatic
Tests Performed					6	6	3
Parameter	Variable	Units	Calculated?	Source	Value	Value	Value
Ground Elevation		feet amsl		O	7.89	10.08	7.87
TIC Elevation		feet amsl		O	7.54	9.64	7.56
Stickup		Feet	X	O	-0.35	-0.44	-0.31
Total Well Depth (bottom of screen)		feet bgs		O	20	20	35
Depth to Water		feet TIC		F	7.08	7.2	4.83
Water Level Elevation		feet msl	X	O	0.46	2.44	2.73
Depth to Water		feet bgs	X	O	7.43	7.64	5.14
Well Screen Below and Across Water Table?			X	O	Below	Across	Below
Can pneumatic method be used/can we use conventionation falling heads tests?			X	O	Yes	No	Yes
Category (per Midwest Geo Guide)			X	O	Cat I	Cat II	Cat I
Static Water Column Height	H (Lw)	Feet	X	O	12.57	12.36	29.86
Bottom of Upper Confining Unit		Feet bgs		O	-	-	23.00
Top of Lower Confining Unit		Feet bgs		O	-	-	-
Aquifer Top		Feet bgs	X	O	7.43	7.64	23.00
Aquifer Bottom		Feet bgs	X	O	20	20	35
Aquifer Thickness	B	Feet	X	O	12.57	12.36	12.00
Anisotropy Ratio	Kz/Kr			O	0.1	0.1	0.1
Top of Screen		Feet bgs		O	10	5	25
Depth to top of Screen, d (from static water level or aquifer top)	d	Feet	X	O	2.57	0.00	19.86
Screen Length	L	Feet	X	O	10	15	10
Effective Screen Length (see Midwest Geo Field Guide for definition)	Le, b	Feet	X	O	10	12.36	10
Effective Screen Length Revision Rationale				O	NA	Well is screened across the water table.	NA
Transducer Depth (height of water column above transducer)	T	Feet	X	F	12.07	11.86	11.50
d/b>2?			X	O	NO	NO	NO
Casing diameter		Inches		O	2	2	2
Inside Radius of Casing (inside of which the water level changes occur)	r (c)	Feet	X	O/F	0.083	0.083	0.083
Radius of Equipment (transducer wire)	r (eq)	Feet		F	0.01	0.01	0.01
Radius of Well (often includes filter pack)	r (w)	Feet	X	O/F	0.375	0.375	0.375
Borehole diameter		Inches		O/F	9	9	9
Fully or partially penetrating?				O	Partially	Fully	Partially
Observed maximum displacement	H(0)	feet		F	0.34	1.04	0.51
Expected maximum displacement	H(0)*	feet		F	1.5	1	0.51*
Tidal Correction Performed					Yes	Yes	Yes
Which test analyzed?				O	Test 5	Test 2	Test 1
Test Selection Rationale					Mechanical tests 4,5,8, and 9 are mostly coincident. Tests 6 and 7 are a off in timing, probably due to test initiation speed. Rising tests 5 and 9 are both good. Pneumatic tests were performed but not assessed due to equipment limitations and rapid formation response .	All tests are relatively noise free. Rising head tests have less noise and falling head tests are within the screen. Test 2 has the least noisy initiation.	All tests are relatively noise free, rapid, and coincident. Chose Test 1.
Analytical Method					Springer-Gelhar	Bouwer-Rice	Bouwer-Rice
Analytical Method Rationale					Normalized data coincide, data is oscillatory; go to Figure 12.5. H(0) does not equal H(0)*. Butler and Zhan. Change to Springer-Gelhar for unconfined model	Normalized tests do not coincide; go to Figure 12.18 There is not reproducible dependence on H(0)*. Analyze with Bouwer-Rice	Normalized Tests coincide, not oscillatory, well not screened across water table, unconfined; go to Figure 12.3. Assume H(0)=H(0)*, Analyze with Cooper et al, S is implausably low. Partially penetrating, D/B is not greater than 2. Present KGS confined and unconfined. Both have implausible specific storage ; go to Figure 12.28, data is reletively noise free and run to completion. Analyze with Peres et al, but curve cannot be matched due to negative slope. Analyze with Bouwer-Rice.
Result - Hydraulic Conductivity - feet/day					300 to 460	25	160
Result - Transmissivity - feet ² /day							
Result - Storativity (S)							
Result - Specific Storage (Ss)							
Notes					The oscillatory response type is clearly indicated in the dataset. Visual curve matching allows for matches of response wave amplitude or period during the first cycle but does not propagate at the expected period in the model. An approximate range of matches is presented.		

Notes:
* - assumed. H(0) is assumed to equal H(0)* due to early time noise in the displacement data and/or pressure gauge not working for pneumatic tests.
** - conservative or lower-bound estimate of hydraulic conductivity due to data limitations
F - Field
feet amsl - feet above mean sea level
feet bgs - feet below ground surface
feet TIC - feet below top of inner casing
NA - not applicable
O - Office

Table 13
Transducer Status Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Monitoring Wells	Transducer Serial No.	Fall 2022		Winter 2023			Spring 2023			Summer 2023			Fall 2023			Winter 2024			Notes
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	
SL #1	MW-SL1-A	1091021																		
	MW-SL1-B	1091031																		Monitoring well damaged during construction activities. Transducer was unrecoverable.
		1091041																		
SL #2A	MW-SL2A-A	1091041																		Transducer malfunctioned.
		1093091																		Replacement transducer.
	MW-SL2A-B	1090879																		
SL #3	MW-SL3-A	1091728																		
	MW-SL3-B	1091718																		
SL #4	SL4-MW-21R	1091454																		
	SL4-MW-22R	1091116																		Transducer malfunctioned.
		1092272																		Replacement transducer.
	SL4- MW-13	1091457																		
SL #5	MW-SL5-A	1091732																		
	MW-SL5-B	1091110																		
SL #6	SL6-MW-S96	1091739																		Transducer reached full memory and stopped logging in January 2024.
	SL6-MW-D96	1091725																		Transducer reached full memory and stopped logging in January 2024.
	MW-SL6-B	1091809																		Transducer reached full memory and stopped logging in January 2024.
SL #7	SL7-MW-5	1092271																		
	SL7-MW-8	1092275																		
SL #8	MW-SL8-A	1091464																		Monitoring well was installed in June 2023.
	MW-SL8-B	1092269																		Monitoring well was installed in June 2023.
SL #9	MW-SL9-A	1091027																		Transducer malfunctioned.
		1093098																		Replacement transducer.
	MW-SL9-B	1091093																		
SL #10	MW-SL10-A	1091103																		
	MW-SL10-B	1091097																		Transducer malfunctioned. Diagnostics performed. Transducer and new communication cable deployed.
SL #12	MW-SL12-A	1091738																		
	MW-SL12-B	1091468																		
	MW-SL12-D	1091740																		Transducer malfunctioned.
		1091097																		Replacement transducer.
SL #13	MW-SL13-A	1091028																		Communication cables malfunctioned. Transducer redeployed. Observed to have malfunctioned after latest download.
	MW-SL13-B	1091029																		Communication cables malfunctioned. Transducer redeployed.
	MW-SL13-D	1091022																		Communication cables malfunctioned. Transducer redeployed.
SL #14	MW-SL14-A	1091114																		
	MW-SL14-B	1091136																		Malfunction observed after final download.
SL #15	SL15-CMW-15	1092273																		Communication cables malfunctioned. Transducer redeployed after diagnostics performed.
	SL15-CMW-63	1092270																		Communication cables malfunctioned. Transducer redeployed after diagnostics performed.
SL #16	SL16-MW-13	1091100																		Communication cable malfunctioned. Transducer redeployed after diagnostics performed.
	MW-SL16-D	1091113																		
		1091112																		Transducer malfunctioned and removed.
		1093096																		Replacement transducer deployed.
SL #17	MW-SL17-A	1091030																		
	MW-SL17-B	1091039																		Transducer was repositioned on 9/20/2023 after discovering it had slipped from tether to the bottom of the well.
SL #19	MW-SL19-A	1091096																		
	MW-SL19-B	1091127																		
SL #20	MW-SL20-A	1091043																		Transducer malfunctioned and subsequently removed.
		1093090																		Replacement transducer.
	MW-SL20-B	1091102																		
SL #21	MW-SL21-A	1091802																		
	MW-SL21-B	1091810																		
SL #22	SL22-MW-GPEC03WT	1091730																		
	SL22-MW-GPEC03D	1091737																		
	MW-SL22-B	1091736																		
SL #23	MW-SL23-A	1091032																		
	MW-SL23-B	1091044																		

Table 13
Transducer Status Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Study Location	Monitoring Wells	Transducer Serial No.	Fall 2022		Winter 2023			Spring 2023			Summer 2023			Fall 2023			Winter 2024			Notes
			Oct-22	Nov-22	Dec-22	Jan-23	Feb-23	Mar-23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	
SL #24	MW-SL24-A	1091028																		Transducer deployed in December 2022 but had a false start and never activated.
	MW-SL24-B	1091029																		Transducer deployed in December 2022 but had a false start and never activated. Transducer malfunctioned 7/31/2023, subsequently removed on 9/20/2023.
		1091099																		
	MW-SL24-D	1091022																		Transducer deployed in December 2022 but had a false start and never activated.
SL #25	MW-SL25-A	1091104																		
	MW-SL25-B	1091108																		
SL #26	SL26-EBMW081	1091115																		
	SL26-EBMW082	1091139																		
	MW-SL26-D	1091111																		
SL #27	MW-SL27-A	1090491																		
	MW-SL27-B	1090483																		
SL #28	MW-SL28-A	1091025																		Transducer was never reactivated after download. Reactivated in June 2023.
	MW-SL28-B	1091138																		
SL #29	MW-SL29-A	1090484																		
	MW-SL29-B	1090476																		Transducer malfunctioned and subsequently removed.
		1093100																		Replacement transducer.
SL #30	SL30-MW-5	1091098																		Transducer was deployed in March 2023 but had a false start and never activated.
	MW-SL30-B	1091105																		
SL #31	MW-SL31-A	1091804																		
	MW-SL31-B	1091812																		Transducer malfunctioned and subsequently removed.
		1093089																		Replacement transducer.
SL #32	MW-SL32-A	1091727																		
	MW-SL32-B	1091721																		
	MW-SL32-D	1091724																		
Staff Gauge	Staff Gauge 1	1091042																		Initially installed in November 2022 but relocated in March 2023 due to poor data.
	Staff Gauge 2	1091036																		

Notes:

	Not installed and/or transducer removed
	Malfunction in monitoring well, some and/or no data available
	Installed/activated, some data may be available during the month
	Data downloaded and may be missing some data and/or last data set in file for the month
	Operating and data mostly available

Table 14
Long Term Water Level Monitoring Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Well Information					Spring		Summer		Fall		Winter	
Location	Study Location	Longitude - X ¹	Latitude - Y ¹	Top of Inner Casing (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)
MW-SL1-A	SL #1	208436.6	995417.1	12.18	Apr 2023	0.63	Jul 2023	1.07	Nov 2023	1.30	Jan 2024	1.40
MW-SL1-B	SL #1	208464.7	995437.9	10.81	Apr 2023	**	Jul 2023	**	Nov 2023	1.06	Jan 2024	1.29
MW-SL2A-A	SL #2	208127.8	995765	7.64	Apr 2023	1.40	Jul 2023	1.79	Nov 2023	1.48	Jan 2024	1.50
MW-SL2A-B	SL #2	208089	995793.4	7.61	Apr 2023	2.28	Jul 2023	2.51	Nov 2023	2.47	Jan 2024	2.54
MW-SL3-A	SL #3	208579.1	997982.9	6.31	Apr 2023	0.71	Jul 2023	0.74	Nov 2023	0.74	Jan 2024	0.78
MW-SL3-B	SL #3	208626.8	998006.7	7.17	Apr 2023	1.45	Jul 2023	1.61	Nov 2023	1.76	Jan 2024	1.28
SL4-MW-21R*	SL #4	208357	997620.2	5.49	May 2023	1.93	Jul 2023	2.63	Nov 2023	2.31	Jan 2024	2.53
SL4-MW-22R*	SL #4	208369	997574.4	9.5	May 2023	1.81	Jul 2023	2.33	Nov 2023	2.09	Jan 2024	2.20
SL4-MW-13*	SL #4	208329.1	997530.4	9.16	May 2023	2.21	Jul 2023	2.35	Nov 2023	1.88	Jan 2024	2.54
MW-SL5-A	SL #5	207695.7	999890.8	6.84	Apr 2023	1.61	Jul 2023	2.06	Nov 2023	2.00	Jan 2024	2.29
MW-SL5-B	SL #5	207715.3	999919.2	7.19	Apr 2023	2.31	Jul 2023	2.53	Nov 2023	2.65	Jan 2024	3.18
SL6-MW-S96*	SL #6	207299.9	999919.9	4.78	Apr 2023	0.52	Jul 2023	0.57	Nov 2023	0.57	Dec 2023	0.48
SL6-MW-D96	SL #6	207292.5	999917.2	5.1	Apr 2023	1.98	Jul 2023	2.06	Nov 2023	1.77	Dec 2023	1.69
MW-SL6-B	SL #6	207246.3	999895.6	4.39	Apr 2023	1.14	Jul 2023	1.41	Nov 2023	1.00	Dec 2023	0.86
SL7-MW-8*	SL #7	209173.2	1000600.6	12.45	Apr 2023	1.16	Jul 2023	1.37	Nov 2023	1.44	Jan 2024	1.54
SL7-MW-5*	SL #7	209206.1	1000518.7	13.11	Apr 2023	1.91	Jul 2023	2.19	Nov 2023	2.38	Jan 2024	2.60
MW-SL8-A	SL #8	208713.9	1000619.8	7.92	Apr 2023	**	Jul 2023	2.53	Nov 2023	2.59	Jan 2024	2.78
MW-SL8-B	SL #8	208692.2	1000642.2	7.29	Apr 2023	**	Jul 2023	2.53	Nov 2023	2.53	Jan 2024	2.73
MW-SL9-A	SL #9	210004.3	1001206.5	11.06	Apr 2023	0.23	Jul 2023	**	Nov 2023	**	Jan 2024	1.09
MW-SL9-B	SL #9	210047.6	1001213.6	11.37	Apr 2023	1.38	Jul 2023	1.81	Nov 2023	1.89	Jan 2024	2.07
MW-SL10-A	SL #10	207685.9	999020.2	9.05	Apr 2023	1.49	Jul 2023	1.47	Nov 2023	1.63	Jan 2024	1.74
MW-SL10-B	SL #10	207658.7	998973.7	8.13	Apr 2023	1.62	Jul 2023	1.74	Nov 2023	1.81	Jan 2024	1.91
MW-SL12-A	SL #12	207358.5	999137	8	Apr 2023	3.59	Jul 2023	3.79	Nov 2023	3.44	Jan 2024	3.41
MW-SL12-B	SL #12	207336.4	999210.3	7.85	Apr 2023	5.34	Jul 2023	5.45	Nov 2023	5.08	Jan 2024	5.09
MW-SL12-D	SL #12	207363.2	999138.9	7.78	Apr 2023	**	Jul 2023	3.84	Nov 2023	3.41	Jan 2024	3.38
MW-SL13-A	SL #13	206468	1000622.1	5.93	Apr 2023	1.40	Jul-Aug 2023	1.80	Nov 2023	**	Jan 2024	**
MW-SL13-B	SL #13	206443.8	1000563.5	6.81	Apr 2023	1.09	Jul-Aug 2023	1.60	Nov 2023	1.45	Jan 2024	1.62
MW-SL13-D	SL #13	206472.4	1000619.9	5.84	Apr 2023	0.86	Jul-Aug 2023	1.37	Nov 2023	0.89	Jan 2024	0.87
MW-SL14-A	SL #14	206307.2	1000958.5	8.58	Apr 2023	4.41	Jul 2023	5.74	Oct 2023	5.30	Jan 2024	5.28
MW-SL14-B	SL #14	206329.4	1001000.9	9.79	Apr 2023	4.06	Jul 2023	4.60	Oct 2023	4.68	Jan 2024	**
SL15-CMW-15*	SL #15	204551.2	1002781	9.24	May 2023	2.48	Jul 2023	3.11	Sept 2023	3.13	Jan 2024	2.97
SL15-MW-63*	SL #15	204492.9	1002756	10.28	May 2023	2.31	Jul 2023	2.84	Sept 2023	2.92	Jan 2024	2.93
SL16-MW-13*	SL #16	204885	1002814.2	7.77	Apr 2023	5.72	June 2023	5.82	Nov 2023	5.02	Jan 2024	4.92
SL16-MW-10*	SL #16	204967	1002775.2	10.58	Apr 2023	1.88	June 2023	2.12	Nov 2023	2.41	Jan 2024	2.55
MW-SL16-D	SL #16	204895.3	1002814.5	8.11	Apr 2023	0.78	June 2023	1.17	Nov 2023	1.28	Jan 2024	1.31
MW-SL17-A	SL #17	204139.9	1003941.5	14.27	Apr 2023	0.43	Jul 2023	0.50	Nov 2023	0.57	Jan 2024	0.60
MW-SL17-B	SL #17	204115	1003903.5	14.63	Apr 2023	0.90	Jul 2023	**	Nov 2023	0.66	Jan 2024	0.66
MW-SL19-A	SL #19	202874.1	1005234.4	14.06	Apr 2023	1.31	Jul-Aug 2023	1.64	Nov 2023	1.23	Jan 2024	1.21
MW-SL19-B	SL #19	202860	1005211.8	13.79	Apr 2023	1.41	Jul-Aug 2023	1.71	Nov 2023	1.31	Jan 2024	1.30
MW-SL20-A	SL #20	203167.1	1005715.3	3.64	Apr 2023	0.78	Jul 2023	0.98	Nov 2023	0.99	Jan 2024	0.87
MW-SL20-B	SL #20	203211.1	1005729.4	5.18	Apr 2023	1.60	Jul 2023	1.58	Nov 2023	1.60	Jan 2024	1.78
MW-SL21-A	SL #21	202840.2	1006011.6	14.2	Apr 2023	1.85	Jul-Aug 2023	1.98	Nov 2023	1.93	Jan 2024	1.98
MW-SL21-B	SL #21	202837.7	1005967.3	16.39	Apr 2023	1.88	Jul-Aug 2023	1.99	Nov 2023	1.90	Jan 2024	1.92

Table 14
Long Term Water Level Monitoring Summary
Lateral Groundwater Study
Newtown Creek Superfund Site

Well Information					Spring		Summer		Fall		Winter				
Location	Study Location	Longitude - X ¹	Latitude - Y ¹	Top of Inner Casing (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)	Time Frame	Seasonal Average Freshwater Equivalent Hydraulic Head (feet NAVD88)			
SL22-GPEC-MW03S*	SL #22	202179.9	1004599.2	6.48	Apr 2023	1.45	Jul 2023	1.92	Nov 2023	1.72	Jan 2024	2.78			
SL22-GPEC-MW03WT*	SL #22	202188.1	1004619.2	6.37	Apr 2023	0.99	Jul 2023	1.39	Nov 2023	1.05	Jan 2024	1.21			
MW-SL22-B***	SL #22	202163	1004552.2	7.51	Apr 2023	1.67	Jul 2023	1.98	Nov 2023	1.86	Jan 2024	2.01			
MW-SL23-A	SL #23	201625.4	1005428.5	10.66	Apr 2023	0.97	Jul 2023	1.19	Nov 2023	1.09	Jan 2024	1.11			
MW-SL23-B	SL #23	201644.6	1005475.4	7.62	Apr 2023	0.58	Jul 2023	0.79	Nov 2023	0.75	Jan 2024	0.82			
MW-SL24-A	SL #24	200795.5	1005166.4	4.69	Apr 2023	**	Jul 2023	1.69	Nov 2023	1.79	Jan 2024	2.03			
MW-SL24-B	SL #24	200747	1005151.4	5.63	Apr 2023	**	Jul 2023	1.99	Nov 2023	1.97	Jan 2024	2.12			
MW-SL24-D	SL #24	200791.3	1005169.4	4.84	Apr 2023	**	Jul 2023	1.19	Nov 2023	1.58	Jan 2024	1.79			
MW-SL25-A	SL #25	199944.4	1005587.9	8.26	Apr 2023	3.64	Jul 2023	3.42	Nov 2023	4.00	Jan 2024	4.59			
MW-SL25-B	SL #25	199909.3	1005618.4	8.03	Apr 2023	4.97	Jul 2023	5.00	Nov 2023	5.46	Jan 2024	5.98			
SL26-EBMW081*	SL #26	200053.7	1006185.8	4.39	Apr 2023	0.83	Jul-Aug 2023	0.86	Nov 2023	0.98	Jan 2024	1.00			
SL26-EBMW082*	SL #26	200021.5	1006204.1	3.74	Apr 2023	0.67	Jul-Aug 2023	0.99	Nov 2023	0.99	Jan 2024	1.04			
MW-SL26-D	SL #26	200056.7	1006179.1	4.49	Apr 2023	2.01	Jul-Aug 2023	2.08	Nov 2023	3.29	Jan 2024	3.28			
MW-SL27-A	SL #27	199545.6	1005398.3	6.11	Apr 2023	1.36	Jul 2023	1.60	Sept 2023	1.93	Jan 2024	1.62			
MW-SL27-B	SL #27	199548.2	1005428.2	6.91	Apr 2023	1.59	Jul 2023	1.81	Sept 2023	1.67	Jan 2024	1.73			
MW-SL28-A	SL #28	200827.9	1004347.4	8.67	Apr 2023	3.57	Jul 2023	3.39	Nov 2023	3.60	Jan 2024	4.46			
MW-SL28-B	SL #28	200866.4	1004331.4	10.34	Apr 2023	4.59	Jul 2023	4.09	Nov 2023	4.58	Jan 2024	5.50			
MW-SL29-A	SL #29	200578.6	1004370.6	4.6	Apr 2023	0.98	Jul 2023	1.15	Nov 2023	1.04	Jan 2024	1.08			
MW-SL29-B	SL #29	200527	1004383.9	4.59	Apr 2023	**	Jul 2023	**	Nov 2023	1.58	Jan 2024	1.75			
SL30-MW-5*	SL #30	198563	1003049.8	12.28	Apr 2023	**	Jul 2023	1.15	Nov 2023	1.13	Jan 2024	1.23			
MW-SL30-B	SL #30	198577.4	1003002.4	11.04	Apr 2023	1.02	Jul 2023	1.21	Nov 2023	1.25	Jan 2024	1.29			
MW-SL31-A	SL #31	198940.2	1003197.4	8.02	Mar 2023	1.08	Jul 2023	1.31	Nov 2023	1.46	Jan 2024	1.50			
MW-SL31-B	SL #31	198899.2	1003218.6	7.77	Mar 2023	1.82	Jul 2023	**	Nov 2023	1.93	Jan 2024	2.04			
MW-SL32-A	SL #32	197556.7	1003603	7.54	Apr 2023	0.89	Jul 2023	1.70	Nov 2023	0.86	Jan 2024	0.88			
MW-SL32-B	SL #32	197569.4	1003646.6	9.64	Apr 2023	2.58	Jul 2023	2.61	Nov 2023	2.95	Jan 2024	3.11			
MW-SL32-D	SL #32	197549.8	1003605.2	7.56	Apr 2023	3.06	Jul 2023	2.90	Nov 2023	3.22	Jan 2024	3.30			
					Monthly Average Freshwater Equivalent Staff Gauge Elevation (feet NAVD88)										
			Month:	Mar 23	Apr 23	May 23	Jun 23	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23	Jan 24	Feb 24
Staff Gauge 1	NA	200315.05	1005796	0.48	0.79	0.71	1.02	0.97	0.92	1.14	1.16	0.99	0.89	0.97	1.18
Staff Gauge 2	NA	205002.2	1001601.36	0.80	0.79	0.71	1.30	1.07	0.81	1.68	1.55	0.92	0.83	0.92	0.88

Notes:
1. Survey location information is presented in State Plane NAD83 (US Feet) - horizontal, and NAVD88 (US Feet) - vertical
2. Timeframes were selected to roughly represent seasonality by Study Location to ensure average head measurements were comparable. Transducer malfunctions did cause some shifts between the time periods selected.
* Existing wells, not installed by EPA.
** See Table 13 and Appendix H for notes regarding timeframes where transducers failed.

Acronym:
NA - Not Applicable



Appendices (fly sheets only)



Appendix A Monitoring Well Installation



A-1 Soil Boring Logs and Well Construction Logs



A-2 Geotechnical Data



A-3 Prepacked Well Screen SOP



A-4 Monitoring Well Development Logs



A-5 NAPL Observations



Appendix B Groundwater and Opportunistic Seep Sampling



B-1 Groundwater Sampling Logs and COCs



B-2 Seep Sampling Logs and COCs



Appendix C Data Validation and Usability



C-1 Data Validation Reports



C-2 Data Usability Assessment Review



Appendix D Analytical Data Tables



D-1 Analytical Data Tables



Appendix E Specific Capacity Testing



E-1 Specific Capacity Tests



Appendix F Slug Testing



Appendix G Heat Pulse Flow Metering



G-1 Flow Velocity Worksheets and Results



G-2 HPFM Calibration and SOPs



Appendix H Long Term Water Level Monitoring



H-1 Long Term Water Level Monitoring



H-2 Season Average Freshwater Head