Former Clifton MGP Site Operable Unit 2
Richmond County, New York

Construction Completion Report

NYSDEC Site Number: 2-43-023

Prepared for:

National Grid, USA

287 Maspeth Avenue, Brooklyn, NY

Prepared by:

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CERTIFICATIONS

I, Mike Gardner, am currently a registered professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program activities, and I certify that the Remedial Design was implemented and that all construction activities were completed in substantial conformance with the Department-approved Remedial Design Work Plan and the Remedial Design.

I certify that all documents generated in support of this report have been submitted in accordance with the DER's electronic submission protocols and have been accepted by the Department.

I certify that all data generated in support of this report have been submitted in accordance with the Department's electronic data deliverable and have been accepted by the Department.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Mike Gardner, of AECOM, am certifying as Owner's Designated Site Representative for the site.

089344	2/27/14	Michael Gardner
NYS Professional Engineer #	Date	Signature

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List of Acronyms

ACM	Asbestos Containing Materials
AHS	Air Handling System
AOC	Administrative Order of Consent (National Grid, 1998)
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
CERP	Community and Environmental Response Plan
CFM	cubic feet per minute
CFR	Code of Federal Regulations
CHASP	Contractor's Site Specific Health and Safety Plan
C&D	Construction and Demolition
DER-10	Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation
DNAPL	Dense Nonaqueous Phase Liquid
DUSR	Data Usability Summary Report
EPA	Environmental Protection Agency
GAC	Granulated Activated Carbon
GEI	GEI Consultants, Inc.
GGBFS	Ground Granulated Blast Furnace Slag
gpm	gallons per minute
HEPA	High efficiency particulate air
IRM	Interim Remedial Measure
lb	pounds
LKD	Lime Kiln Dust
MSL	Mean Sea Level
MGP	Manufactured Gas Plant
MSDS	Material Safety Data Sheets
NAPL	Nonaqueous Phase Liquid
National Grid	National Grid, USA
NGVD	National Geodectic Vertical Datum
NYC	New York City

NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCDOT	New York City Department of Transportation
NYCRR	New York Code, Rules, and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOL	New York State Department of Labor
NYSDOT	New York State Department of Transportation
OSHA	Occupational Safety and Health Administration
OU-2	Operable Unit 2 of the former Clifton MGP Site
PAHs	Polycyclic Aromatic Hydrocarbon
PCBs	Polychlorinated biphenyl
P.E.	Professional Engineer
PID	Photo Ionization Detector
PM	Particulate Matter
PPE	Personal Protective Equipment
ppm	parts per million
psi	pounds per square inch
PS&S	Paulus, Sokolowski, and Sartor, LLC
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RA	Remedial Action
RAOs	Remedial Action Objectives
RD Work Plan	Remedial Design Work Plan (AECOM, 2010)
RIR	Remedial Investigation Report (GEI, 2005)
RD	Remedial Design
ROD	Record of Decision (NYSDEC, 2006)
ROW	Right of Way
SCB	Slag Cement Bentonite
SCGs	Standards, Criteria, and Guidance
SCOs	Soil Cleanup Objectives
SIRTOA	Staten Island Rapid Transit Operating Authority

SIRR	Staten Island Railroad
Site	25 Willow Avenue and 89 Willow Avenue
SOP	Site Operations Plans
SEQRA	State Environmental Quality Review Act
SPDES	State Pollution Discharge Elimination System
S.U.	Standard Units
SVOCs	Semi Volatile Organic Compounds
SWPPP	Storm-water Pollution Prevention Plan
TAGM	Technical Administrative Guidance Memorandum
TCLP	Toxicity Characteristics Leaching Procedure
TEP	Technical Execution Plan
TFS	Temporary Fabric Structure
TVOCs	Total Volatile Organic Compounds
UCS	Unconfined Compression Strength
VOCs	Volatile Organic Compounds
WWTP	Wastewater Treatment Plant

1.0 Background and Site Description

AECOM, on behalf of National Grid, USA (National Grid) has prepared this Construction Completion Report (CCR) for the former Clifton Manufactured Gas Plant (MGP) Site - Operable Unit Number 2 [(OU-2), (Site)] located at 25 and 89 Willow Avenue in Clifton, Richmond County, New York. The Site location is shown in Figure 1-1. The New York State Department of Environmental Conservation (NYSDEC), in consultation with the New York State Department of Health (NYSDOH), has selected the remedy for the Site, as established in the Record of Decision (ROD) for the Site (NYSDEC, 2006). The Remedial Action (RA) detailed within this CCR was completed as per the ROD, the NYSDEC approved Remedial Design Work Plan [(RD Work Plan), (AECOM, 2010)], and as a part of the Administrative Order on Consent [Index No. D2-0001-98-04, (AOC), (NYSDEC, 1998)] between Brooklyn Union (now National Grid) and NYSDEC.

This CCR presents the approach by which the RA was completed at the Site in order to satisfy the remedial objectives specified in the ROD. As per the ROD, the top two feet of the Site was remediated to unrestricted use while the Site (except the on-site storm sewer buffer area) was remediated to restricted residential use and will be used for commercial use.

1.1 Site Location and Description

The Site is located at the northwest corner of the intersection of Bay Street and Willow Avenue in the Clifton section of Staten Island in the County of Richmond, New York and is identified as Block 2841 and Lots 91 and 138 on the City of New York Tax Map. The Site is situated on an approximately 4-acre area bounded by the Staten Island Rapid Transit Operating Authority (SIRTOA) railroad tracks to the north, Willow Avenue to the south, Bay Street to the east, and commercial property to the west (see Figure 1-2). OU-2 is the focus of this report and includes the following parcels: 25 and 89 Willow Avenue, and a small triangular shaped parcel located east of 25 Willow Avenue between Bay Street and Edgewater Street. OU-2 also encompasses the right-of-way (ROW) of Willow Avenue, Edgewater Street and Bay Street adjacent to the 25 Willow Avenue parcel, as well as the property located at One Edgewater Street.

The Site prior to the RA was improved with an unoccupied single-story, multi-bay, commercial building. The building was formerly utilized as an automotive repair and new car preparation facility. Automotive repair operations were conducted within the building and included the storage and handling of petroleum products (*i.e.,* motor oil, gasoline, diesel fuel, *etc*.). With the exception of a small landscaped strip of land that separated the Site building from the adjacent Bay Street, the remainder of the Site was surfaced with bituminous pavements and utilized for automobile parking. The single-story commercial building was demolished as part of the RA.

The 25 and 89 Willow Avenue parcels are currently zoned for manufacturing. The area surrounding it is characterized by a combination of urban residential and commercial uses. Commercial parcels are located on Greenfield Avenue to the northwest of the 25 Willow Avenue Parcel. A vacant lot, currently utilized for parking, is located to the northeast between Bay and Edgewater Streets.

1.1.1 Site Topography and Drainage

The Site is located in a locally topographic low, bowl shaped area that gently slopes to the northwest towards the railroad embankment and appears to be associated with the historic stream that flowed on the northern portion of the 25 Willow Avenue Parcel. The surface drainage is consistent with the bowl like topography of the Site, with surface water flowing away from the higher elevations towards lower elevations as presented in the Remedial Investigation Report [(RIR), GEI, 2005]. The elevations ranging from approximately 8 feet above mean sea level (msl) in the southwestern part of the Site to approximately 10 feet above msl in the northeastern part of the Site. During heavy rain, storm water accumulates at low points, particularly in the southwestern portion of the Site and along Willow Avenue. Northeast and south of the Site, along Bay Street and Willow Avenue (respectively), storm water catch basins connect to storm sewers that convey flow to the northeast and ultimately discharge to the New York Harbor.

1.1.2 Site Geology and Hydrogeology

Four major stratigraphic units were identified underlying the Site during Remedial Investigation (RI) activities. These units are, in order of increasing depth:

1) Imported fill material made up of silt, sand and gravel mixed with slag, coal, brick, concrete, metal, ash, and clinkers. This unit ranges in thickness from a few inches to approximately nine feet. The majority of this unit was removed during the RA;

2) Alluvial/marsh deposits beneath the layer of fill. This unit ranges up to 20 feet thick;

3) Glacial deposits beneath the alluvial deposits; and

4) A weathered bedrock layer known as saprolite. The top of the saprolite was encountered at depths of 114 to 123 feet.

No surface water bodies are currently located on or immediately adjacent to the Site. However, a stream formerly traversed the Site. Currently, a storm sewer line follows the approximate trace of the historic stream and extends along the northwestern border of the 25 Willow Avenue Parcel within the Site. The storm sewer empties into the New York City (NYC) storm sewer system approximately 500 feet to the northeast.

Two aquifers have been identified underlying the Site: a shallow, unconfined aquifer (water table) and a deep confined aquifer. In addition, a water-bearing zone was also identified within the semi-confining units and displays artesian conditions. This shallow groundwater aquifer is located in the fill, alluvial/marsh and shallow glacial deposits. The water table elevations (shallow aquifer) ranged from approximately 4.02 to 8.99 feet National Geodetic Vertical Datum (NGVD). The deep aquifer is under confining pressure; wells installed in this aquifer exhibited flowing artesian conditions. These wells were screened in the stratified silty-sand and gravelly-sand layers located with the glacial deposits located above the bedrock. Static head elevations in this aquifer ranged from 9.89 feet to 13.88 feet NGVD. The dense silt ground moraine and harbor till terminal moraine form a semi-confining layer separating the water table aquifer from the deep aquifer. The water-bearing unit located within the semi-confined aquifer is under confining pressure and exhibited higher elevations than nearby wells screened in the water table aquifer.

Additional information regarding the site geology and hydrogeology of the site is presented in the RIR and the ROD.

An electronic copy of this CCR with all supporting documentation is included as Appendix A.

2.0 Summary of Site Remedy

2.1 Remedial Action Objectives

Based on the results of the RI and as per the ROD, the following Remedial Action Objectives (RAOs) were identified for this Site.

2.1.1 Groundwater RAOs

- Eliminate or reduce, to the extent practicable, the source of contamination to the groundwater with a goal of reduction in the groundwater contamination over time.

2.1.2 Soil RAOs

- Eliminate or reduce, to the extent practicable, direct contact with contaminated surface and subsurface soil at concentrations exceeding New York State (NYS) Standards, Criteria, and Guidance (SCGs).

- Eliminate or reduce, to the extent practicable, ingestion of contaminated surface and subsurface soil at concentrations exceeding SCGs.

- Eliminate or reduce, to the extent practicable, the migration of nonaqueous phase liquids (NAPL) in the subsurface soils.

2.2 Description of Selected Remedy

The Site was remediated in accordance with the remedy selected by the NYSDEC in the ROD and described in the RD Work Plan.

The factors considered during the selection of the remedy are those listed in 6 New York Codes, Rules and Regulations (NYCRR) 375-1.8. The following are the components of the selected remedy:

1. Demolition of the existing building on the Site to allow for the excavation of the contamination located beneath the building.

2. Removal of former MGP-related structures including their foundations which contain coal tar.

3. Excavation of approximately 38,300 cubic yards of grossly contaminated soils, down to an approximate depth of ten (10) feet below ground surface (bgs).

4. Backfill of the excavated areas with clean fill from an off-site location. Visually clean material from on-site building demolition may be used to backfill the lower portion of the excavated areas. The top two (2) feet will consist of clean soil capable of supporting vegetation.

5. Installation of vertical cutoff walls in the subsurface to prevent off-site migration of dense nonaqueous phase liquids (DNAPL) from the Site.

6. Installation of recovery wells to allow for collection, treatment and disposal of DNAPL that remains at depth in the subsurface after the excavation work is complete.

7. A site management plan and environmental easement.

2.3 Selected Remedy Implementation

As per the NYSDEC approved RD Work Plan, the selected remedy was implemented in four phases:

- The first phase of the remedy included completion of the Pre-Design Investigation activities and development and submittal of 60% and 90% Design drawings and specifications to the NYSDEC. This first phase of the remedy is more fully described in the RD Work Plan. The final design for the Site was approved by the NYSDEC on March 31, 2011. Additionally, a Community and Environmental Response Plan [(CERP), AECOM, 2011] was submitted and approved by the NYSDEC on November 17, 2011.
- The second phase involved the field implementation of the excavation and containment designs. Field activities consisted of single-story commercial building demolition, installation of two barrier walls to prevent further migration of on-site impacts, dewatering and construction water treatment, removal of subsurface former MGP structures, excavation and off-site disposal of soils saturated with NAPL at thermal treatment facilities pre-approved by National Grid, DNAPL recovery well installation, and Site restoration. Remedial activities started in February 2012 and were substantially completed in May 2013.
- In the third phase of the remedy, a DNAPL recovery program was implemented to remove potentially mobile DNAPL from the subsurface.
- Finally, in accordance with the AOC and the ROD, institutional controls will be imposed as the fourth phase of the remedy. These controls will be documented in a Site Management Plan, which will include a schedule for operation, maintenance, and monitoring of components of the remedy and for the submission of the periodic certification of the institutional and engineering controls.

3.0 Interim Remedial Measures

An Interim Remedial Measure (IRM) was previously performed on the 89 Willow Avenue property. The objective of the IRM was to remove residual MGP impacted soils. The IRM was performed in 2010 by Creamer Environmental Inc. to remove residual MGP impacted soils in accordance with the Revised Interim Remedial Measure Scope of Work (Paulus, Sokolowski and Sartor, LLC [PS&S], 2008). The details of the IRM are included in the NYSDEC approved Remedial Action Completion Report for 89 Willow Avenue (PS&S, 2008).

4.0 Description of Remedial Actions Performed

RA completed at the Site was conducted in accordance with the NYSDEC-approved RD Work Plan and final Remedial Design for the Site. All deviations from the final Remedial Design are noted in Section 4.5.

To achieve the remedial goals described in the RD Work Plan and the RAOs described in Section 2 of this report, the proposed overall approach for remediation included demolition of the single-story commercial building, installation of vertical cutoff barrier walls to prevent DNAPL migration, removal via excavation and off-site disposal of impacted soils and subsurface structures, installation of DNAPL recovery wells, and backfill and restoration. The area proposed for remediation in the final Remedial Design is shown in Figure 4-1A.

Based on the proximity of the soil excavation area to surrounding buildings and streets and the presence of a shallow water table, engineering controls including benching, structural shoring and a dewatering system were required. In locations where the shoring wall coincided with the vertical barrier wall described in the ROD, the vertical barrier was constructed to provide structural support for the excavation. At all other locations, the excavation was sloped to provide sidewall stability. Dewatering, using localized sumps, was conducted to allow excavation in the dry. Details on the shoring wall and dewatering activities are provided in the following discussion.

A 650 feet long and 3 feet wide Slag Cement Bentonite (SCB) Slurry Wall was installed to a maximum depth of 50 feet bgs as the vertical barrier walls in two areas of the Site to prevent migration of DNAPL off the Site. The SCB Slurry Wall was also constructed as a buttress wall at the perimeter of the excavation area to provide excavation wall stability as well as reduce the amount of lateral groundwater infiltration into the excavations. The buttress wall was constructed by widening the SCB Slurry trench by an additional 6 feet to a depth of 13 feet bgs for total buttress wall dimensions of 9 feet wide and 13 feet deep.

Temporary benching was used to support excavation at significant depth in the central portions of the Site especially around the former tar tank gasometer (15 feet bgs) and the former relief holder (20 feet bgs).

Localized dewatering systems were installed to lower the water table across the excavation area to prevent groundwater infiltrations into the excavations. A 500 gallons per minute (gpm) water treatment system was also constructed and connected to the NYC storm drain, which discharged to the Upper Bay of New York Harbor. To control vapor migration all excavation was carried out under a temporary fabric structure (TFS) except for the tar separator removal and limited shallow excavations approved by the NYSDEC and shown on Figure 4-1A.

DNAPL recovery/monitoring wells were installed immediately upgradient and downgradient of the barrier walls to ensure recovery of DNAPL collecting behind the vertical barrier walls, as well as any significant DNAPL that may be present immediately outside of the walls. A total of 23 DNAPL recovery wells were installed.

The Site was restored by backfilling with clean fill and gravel and installation of permanent security fence and lights.

Thus, the RA included the following elements:

- Mobilization and Site preparation;
- Demolition of the single-story warehouse building and debris crushing for Site re-use;
- Construction of the SCB Slurry Wall (barrier and buttress) at the southern and eastern Site boundary;
- Erection of a TFS for vapor containment and control over areas with significant impacts and potential for odor generation;
- Community air monitoring to evaluate potential fugitive emissions;
- Noise, Vibration, and settlement monitoring to protect structures, roadways, and community;
- Dewatering, water treatment, and discharge;
- Excavation of impacted soils and subsurface former MGP structures;
- Transportation and management of impacted material at an off-site permitted thermal treatment facility;
- Installation of DNAPL recovery wells; and
- Surveying, backfilling, site restoration, and demobilization.

The following sections describe the governing documents that ensured the remedial goals were met, provide details of the RA elements, and describe the means and methods used for the implementation of the RA.

All deviations from the RD Work Plan are noted in Section 4.5 below.

4.1 Governing Documents

The following governing documents were implemented during the RA.

4.1.1 Contractor's Site Specific Health & Safety Plan

All remedial work performed under this RA was in full compliance with governmental requirements, including Site and worker safety requirements mandated by Federal Occupational Safety and Health Administration (OSHA). Worker health and safety was addressed during all phases of the RA by the general contractor (Sevenson Environmental Services, Inc.). All work was conducted in compliance with the industry standards for work at hazardous waste sites presented in 29 (Code of Federal Regulations) CFR 1910.120 and industry standards for the construction industry presented in 29 CFR 1926.

The Contractor's Site Specific Health and Safety Plan (CHASP) was developed for the RA. Procedures outlined in the CHASP provided requirements for daily health and safety review meetings, proper use of safety equipment, proper mechanical equipment use, and other policies. At a minimum, the Personal Protective Equipment (PPE) to be worn on Site included safety glasses, hard hat, reflective vest, and steel-toed shoes or boots. The subjects covered in the CHASP included:

- Health & Safety Risk Analysis;
- Safety and Health Training;
- PPE;
- Medical Surveillance Program;
- OSHA Air Monitoring & Action Levels;
- Accident Prevention Procedures;
- Site Control;
- Hygiene and Decontamination;
- Emergency Contingency Plan;
- Lockout/Tagout;
- Heavy Equipment Operations;
- Demolition;
- Slurry Wall Installation;
- Excavation and Trenching;
- DNAPL Recovery Well Installation;
- Material Safety Data Sheets; and
- Health and Safety Records and Reports.

4.1.1.1 Training and Health Monitoring Requirements

Copies of current OSHA 40-Hour Hazardous Waste Operations training and eight hour refresher course certificates were required of all personnel prior to working. Proof of participation in an annual medical surveillance program and documentation of a successful respirator fit test within the past 12 months for the appropriate type of respirator needed for on-site work were also required for each employee.

4.1.1.2 Worker Safety Air Monitoring

The air quality in work areas was routinely monitored on a real-time basis for volatile organic compounds (VOCs) using a photo ionization detector (PID) during RA activities by the contractor. Air monitoring results were used to determine the level and type of PPE required for protection of personnel working in specified areas. In the event PID readings within the work area indicated the presence of VOCs in excess of 5 parts per million (ppm) above background for a sustained five minute period, colorimetric tubes (Dräeger) were used to measure benzene and naphthalene concentrations in the work area breathing zone. If the colorimetric tubes indicated benzene in concentrations above 1 ppm or naphthalene concentrations above 10 ppm in the breathing zone, then

respirators fitted with combination organic-vapor/High efficiency particulate air (HEPA) cartridges were worn by all personnel working within the work area.

4.1.1.3 General Site Conditions and Hazards

All personnel assigned to the Site were advised of the hazards associated with RA and the plans to mitigate those hazards. Hazard information was made available in the CHASP and included material safety data sheets (MSDS), chemical/physical hazards, PPE, and hazardous materials labeling. In addition, the CHASP presented an overview of hazards associated with demolition, slurry wall installation, excavation and trenching, heavy equipment operation and operator awareness, truck traffic, electrical power, lockout/tagout requirements, heat stress, drum handling, DNAPL recovery well installation, work around the waste water treatment plant, and eye and hearing protection. Each person working at the Site signed an acknowledgement form indicating that he had been informed and understood the procedures and protocols established in the CHASP. Tailgate health and safety meetings were held daily to review and present applicable safety protocols as well as to inform all personnel of changing project site conditions and address workers concerns.

4.1.1.4 Emergency Response/Contingency Plan

A map with routes to the nearest hospital, emergency contacts, and telephone numbers were posted in the field office near the telephone. A list of emergency equipment available on Site and in the CHASP was placed in a central location in the field office. A field first aid kit, eyewash station, and fire extinguishers were located on Site during all activities.

4.1.2 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) describes the specific policies, objectives, organization, functional activities and quality assurance/ quality control activities designed to achieve the project data quality objectives. The QAPP managed performance of the RA tasks through designed and documented Quality Assurance (QA)/Quality Control (QC) methodologies applied in the field and in the lab. The QAPP provided a detailed description of the observation and testing activities that were used to monitor construction quality and confirm that remedial construction was in conformance with the remediation objectives and specifications.

The following QA procedures and tests were implemented:

- SCB Slurry Wall sidewall stability was conducted and stamped by a NYS licensed Professional Engineer (P.E.);
- Determination of the SCB Slurry viscosity and density QC values based on sidewall stability analysis;
- Bench scale laboratory SCB Slurry mix treatability study to determine optimal slurry mix for the RA;
- Utility Protection
    - Discussions with Utility owners
    - Utility Protection Plans
    - Utility owner recommended setbacks from utilities
    - Utility owner oversight during adjoining RA

- TFS structural stability and anchoring plan stamped by a NYS licensed P.E.;
- Use of liners (minimum 6 millimeter thickness) and tarps for stockpile and covering impacted soil during transportation;
- Erosion and sedimentation controls;
- 11 feet high perimeter fence to minimize noise and vapor impacts;
- SCB Slurry Wall – Buttress for excavation sidewall stability; and
- Conservative and protective limits for Noise, Vibration, and Settlement monitoring.

The following QCs were performed during the RA:

- QC during the SCB Slurry Wall construction included
    - Checks for Slurry additive proportions and Batch mixing times at the Batch Plant;
    - Density, Viscosity, and pH testing of the Slurry Mix at the Batch Plant;
    - Density, Viscosity, and pH testing, and visual inspection of the In-Trench Slurry Mix;
    - Slurry Trench depth sounding;
    - In-Trench Slurry level inspections;
    - Inspection for cave-in's; and
    - Performance testing of SCB Slurry Wall (Unconfined Compressive Strength and Permeability)
- Utility
    - Use of socks to cover overhead electric lines; and
    - Re-evaluation of SCB Slurry Wall alignment to account for proximity to high pressure gas line;
- Oversight by a NYS licensed P.E. during TFS moves;
- Submittal of weigh tickets for all earthen materials transported to or from the Site;
- Submittal, prior to the work, of sieve analyses for all imported earthen materials;
- Evaluation of the proposed borrow source(s) for imported earthen materials including collection of analytical samples to verify clean fill and comparison to NYSDEC imported backfill standard for unrestricted use;
- Surveying of the work limits as necessary;
- Survey verification of excavation and placed material depths, areas, and volumes;
- Field observations and survey verification of excavation limits;
- Erosion and sediment control inspections;
- Noise, vibration, and settlement monitoring; and
- Testing of treated water prior to discharge according to the requirements of the State Pollution Discharge Elimination System (SPDES) permit equivalent.

4.1.3 Contract Documents

The Technical Specifications and Drawings (Contract Documents) were approved by the NYSDEC on March 31, 2011. The Contract Documents ensured that the RA was implemented according to the approved RD Work Plan.

The NYSDEC approved SCB Slurry Wall installation and excavation design as shown in Figure 4-1A was modified prior to and during construction. These changes included –

- The original design (Figure 4-1A) called for the removal and replacement of the storm drain located on Site and removal of soils adjacent and below the storm drain. The original design was modified to allow the storm drain to be protected in place and excavation limited to a 15 feet buffer around the storm drain as shown in Figure 4-1B. Approximately 2,000 cubic yards of soil will be excavated at a future time as a result of this change. The slope of the buffer zone was lined to prevent contamination of clean fill placement in the excavation areas. The change also resulted in installation of a concrete block that encapsulated the storm drain intersecting the SCB Slurry Wall along Bay Street. The concrete block ensured an uninterrupted SCB Slurry Wall and protected the storm drain from cracks and breaks. The top 2 feet of the storm drain buffer were excavated and backfilled with clean fill in accordance with the ROD.

- The SCB Slurry Wall alignment along Willow Avenue was moved 5 feet south of the original alignment as shown in Figure 4-1C. The Tar separator location was adjusted north based on field verification. As a result, the SCB Slurry was re-aligned to allow installation south of the Tar Separator rather than through the structure.

- The eastern portion of the SCB Slurry Wall along Willow Avenue was realigned north of the original alignment as shown in Figure 4-1D to prevent damage to an 8-inch high pressure gas main. Significant sloughing of sands (likely pipe bedding material) from the southern side of the excavation wall adjacent to the gas main was observed during the pre-trenching operations along an 8-inch gas main on Willow Avenue. The SCB Slurry Wall alignment was revised to prevent any damage to the 8-inch gas main and gas valve.

The above changes to the final Remedial Design were implemented upon approval by the NYSDEC and are included in Appendix B.

4.1.4 Storm-Water Pollution Prevention Plan

The remediation activities disturbed an area greater than one acre in size. Therefore, the work was conducted as per the substantive requirements of a SPDES Phase II Construction Storm Water Permit. The erosion and sediment controls for all remedial construction were performed in conformance with requirements presented in the NYS Guidelines for Urban Erosion and Sediment Control and the site-specific Storm Water Pollution Prevention Plan (SWPPP).

The storm water control measures were installed to minimize erosion, control transport of sediment, and minimize the amount of water entering active work areas.

Erosion was minimized by:

- Minimizing exposed soil;

- Preserving existing vegetative cover where possible;
- Diverting run-on water away from disturbed areas; and
- Stabilizing disturbed areas soon after final grading.

Transport of sediment was controlled by:

- Preventing soil from leaving the Site through the use of silt fences, hay bales, and/or stone (as necessary);
- Keeping run-off velocities low; and
- Reducing sedimentation by utilizing erosion control practices on Site.

The amount of water entering active work areas was minimized by:

- Berms, temporary swales, and trenches used to re-direct surface water run off/run-on away from open excavations areas.

Silt filters were placed in all storm sewer inlets within and adjacent to the Site to minimize the transport of sediment into storm sewers. Silt fencing was used to minimize the transport of sediment in storm water runoff and was installed down-slope of all intrusive work areas and down-slope of all soil stockpile areas. Silt fence was installed and maintained in active work areas and down-slope of re-vegetated areas until an adequate stand of vegetation was established. Berms, temporary swales, and trenches were used to re-direct surface water run-off/run-on away from open excavation areas and completed Site work. Areas where land disturbing activities were ceased for more than 21 days, temporary seeding or other erosion and sediment control measures (such as mulch or coconut fiber blankets) were implemented within 14 days.

Any storm-water that came in contact with impacted soils was diverted to the temporary water treatment system. Onsite decontamination pads were used to remove mud from truck tires and prevent tracking of mud and impacted soil onto the streets.

4.1.5 Community Air Monitoring Plan

AECOM's Draft Community Air Monitoring Plan [(CAMP), Appendix A of the CERP (AECOM, 2011)], dated August 2011, was implemented during pre-construction baseline monitoring. GEI Consultants, Inc. (GEI) developed a revised CAMP in February 2012 that was implemented during RA. During the last three weeks of the project (April 4 to April 19, 2013), the six fixed air monitoring stations were de-energized and tripod-mounted air monitoring was conducted upwind and downwind of remedial operations which consisted of installation of DNAPL recovery wells.

The purpose of the CAMP was to provide an early warning system to alert National Grid that concentrations of total volatile organic compounds (TVOCs), particulates (*i.e.*, dust), or odors in ambient air were approaching alert levels or action levels due to Site activities. The early detection of emissions and associated contingency measures was intended to expedite any necessary mitigation measures and to reduce the potential for the community to be exposed to constituents at levels above accepted regulatory limits and recommended guidelines.

4.1.5.1 Continuous Monitoring

Continuous real-time air monitoring for TVOCs and particulates was conducted at six continuous real-time air monitoring stations along the perimeter of the Site during ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Air monitoring station locations are shown in Figure 2 of the CAMP Report (see Appendix C).

4.1.5.2 Supplemental Periodic Monitoring

Supplemental chemical-specific air monitoring for benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds associated with MGP-related contamination was conducted at four continuous real-time air monitoring stations located along Willow Avenue and Bay Street if continuous monitoring detected VOCs exceeded the alert level or action level.

Supplemental periodic air monitoring for TVOCs, particulates, odor, and hydrogen cyanide was conducted at the perimeter of the work area on an as-needed basis using hand-held monitoring equipment.

4.1.5.3 Time-Weighted Average VOC Analysis

Supplemental twenty-four hour time-weighted average VOC samples were collected at the perimeter of the Site at one location upwind and one location downwind, on a weekly basis, to demonstrate that the real-time air monitoring stations were effective in measuring concentrations of the target VOCs. The samples were collected in 6-liter SUMMA vacuum canisters and submitted for laboratory analysis by The United States Environmental Protection Agency (EPA) Methods TO-15 to Air Toxics Ltd., Folsom, California, an EPA-approved laboratory.

Category B laboratory data deliverables pursuant to Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) sections 2.2 and 2.3 and Appendix 2B were reviewed in accordance with the EPA Contract Laboratory Program National Functional Data Validation Standard Operating Procedures for Data Evaluation and Validation to support completion of a Data Usability Summary Report (DUSR) for each data package that addresses the data quality objectives describe in the work plan. DUSRs are compiled in Appendix C of the CAMP report (Appendix C) and the red-lined Form 1s and chain-of-custody forms are compiled as Appendix D of the CAMP Report (Appendix C).

Validated analytical results were submitted to NYSDEC in an electronic data deliverable format that complies with the NYSDEC's Electronic Data Warehouse Standards per the Electronic Submissions section 1.15 of DER-10.

4.1.5.4 Pre-Construction Baseline Monitoring

Pre-construction baseline monitoring was conducted prior to RA from December 21 through 23, 2011, and from January 16 through 18, 2012. The monitoring included continuous monitoring for TVOCs and particulates at six perimeter locations, twenty-four hour time-weighted average VOC samples, and an odor survey conducted on Site and in the neighborhoods adjacent to the Site. Results from the odor survey are shown in Figure 3 of the CAMP Report (Appendix C).

4.1.5.5 Contingency Plan

As outlined in the CAMP, the air monitoring contingency plan used a three-tiered classification and warning system based on Action Levels to provide warning and mitigation procedures to prevent

emissions from the Site. Action level concentrations for TVOCs and particulate matter (PM-10) were developed in accordance with the generic NYSDOH CAMP (NYSDEC, 2010). The contingency plan's three-tiered warning system was based on real-time contaminant concentrations averaged over a fifteen-minute period.

The contingency plan was implemented when TVOC, particulates, or odors exceeded the alert levels or action levels. In the case of an alert level or action level exceedance, GEI notified the Construction Manager and the Construction Manager notified National Grid, NYSDEC, NYSDOH, the Engineer, and the Contractor. The Contractor implemented mitigation control measures to abate the emissions and reduce levels back below the action level.

Action Levels were monitored throughout the project. Mitigation control procedures based on these Action Levels were designed by NYSDOH to be protective of human health. These Action Levels were incorporated into the Site Condition 1 through Site Condition 3 criteria and are defined in the table below.

	Alert Level	**Action Level**	**Site Condition 1**	**Site Condition 2**	**Site Condition 3**
TVOC (15-minute)	3.7 ppm	5.0 ppm	< 3.7 ppm	≥ 3.7 ppm, < 5.0 ppm	≥ 5.0 ppm
TVOC (1-minute)	NA	25 ppm	< 25 ppm	NA	≥ 25 ppm
PM-10 (15-minute)	100 µg/m^3	150 µg/m^3	< 100 µg/m^3	≥ 100 µg/m^3, < 150 µg/m^3	≥ 150 µg/m^3
Odor (15-minute)	Odors/ Complaints	NA	No odors	NA	3 (n-butanol)
HCN (15-minute)	Visual Detection	NA	< 0.6 ppm	≥ 0.6 ppm (4-gas meter)	≥ 0.6 ppm (Draeger tube)
Naphthalene (15-minute)	NA	NA	< 440 µg/m^3	≥ 330 µg/m^3, < 440 µg/m^3	≥ 440 µg/m^3

Notes:
Alert Levels for TVOCs are not established by the NYSDOH or NYSDEC and are internally established concentration levels for TVOCs. Alert Levels are set below the levels established by the NYSDOH so that actions can be taken prior to exceeding a NYSDOH threshold. An Alert Level serves as a screening tool to trigger contingent measures if necessary, to assist in minimizing off-site transport of contaminants during remedial activities
Alert Levels and Action Levels for PM-10, and Action Levels for TVOCs are defined in Appendix 1A of the New York State Department of Environmental Conservation *DER-10/Technical Guidance for Site Investigation and Remediation* (NYSDEC, 2010)
The ACGIH threshold limit value (TLV) for hydrogen cyanide is 4.7 ppm
µg/m^3 - micrograms per cubic meter
ppm - parts per million
ppmv - parts per million by volume
TVOC - total volatile organic compounds
PM-10 - particulate matter (i.e. dust) less than 10 microns in diameter
HCN - hydrogen cyanide
NA - not applicable

4.1.6 Contractors Site Operations Plans

The Remediation Engineer reviewed all plans and submittals for this remedial project (*i.e.*, those listed above plus contractor and subcontractor submittals) and confirmed that they were in compliance with the RD Work Plan and Contract Documents. The key Contractor submittals were as follows:

- Technical Execution Plan (TEP) – The TEP provides the Contractor's means and method to complete the RA in accordance with the Contract Documents. The TEP provided details on:
    - Key Contractor personnel
    - Project Staffing Plan
    - List of Subcontractors
    - List of major equipment, systems, and materials
    - Permitting Plan
    - Progress Schedule
    - Construction Facilities and Temporary Controls
    - Demolition Plan
    - Wastewater Treatment Plant and Water Storage
    - Dewatering Plan
    - Stormwater Management
    - SCB Slurry Wall Construction Plan
    - TFS
    - Excavation and Backfill
    - Tar Separation Excavation Plan
    - Stockpile Management and Loading Plan
    - Off-Site Transportation
    - Site Restoration
- Contractor's Health and Safety Plan – The CHASP ensured that the construction work completed as part of the RA complied with applicable Federal, State, and Local laws and regulations for Health and Safety.
- Storm Water Pollution Prevention Plan – The SWPPP ensured that necessary controls were identified and implemented and monitored per the SPDES Phase II Construction Storm Water Permit.
- Lead Based Paint Handling Plan – Developed prior to demolition and provided details for handling of lead based paint during demolition activities.
- Asbestos Abatement Plan – Developed prior to demolition and provided details for handling and abatement of asbestos encountered during demolition activities.

- Traffic Control Plan – Detailed the controls and measures implemented by the Contractor to ensure all transportation of material in and out of Site was in accordance with the Contract Documents and all Federal, State, and Local laws and regulations.

- SCB Slurry Wall Construction Plan for Willow Avenue – This plan was developed to ensure that the construction of the SCB Slurry Wall on Willow Avenue would not damage the high pressure 8-inch gas main located in Willow Avenue adjacent to the SCB Slurry Wall alignment. The plan included details of notifications, controls, and monitoring implemented during the SCB Slurry Wall construction including –
    - Oversight by a National Grid Gas Operations Site Manager
    - Training to identify potential hazardous/dangerous conditions
    - Minimum safe distances for performing the work
    - Stop Work conditions
    - Notifications in case of emergencies
    - Protocols to be followed during emergencies
    - Monitoring for cave-ins including settlement monitoring, level controls, and visual markers
- Temporary Wastewater Treatment Plant Design – The temporary Wastewater Treatment Plant (WWTP) design included details of the treatment design, equipment, and operations, maintenance and monitoring plan for the construction water generated during the implementation of the RA.
- Backfill Backhauling Plan – Detailed the Contractor's backfill backhaul production rates and QA/QC measures implemented to prevent cross contamination.

All remedial documents were submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

4.1.7 Community Environmental Response Plan

The CERP was developed to identify and address environmental impacts to the community resulting from the implementation of the RA. The CERP was approved by the NYSDEC in 2011 and included the following plans.

4.1.7.1 Odor, Vapor and Dust Control Plan

Odor, vapor, and dust control were required due to the immediate proximity of residential and commercial buildings. A three-tiered set of controls were implemented during the RA as per the NYSDEC approved Odor Vapor and Dust Control Plan (Appendix B of CERP [AECOM, 2011]). Details of the controls implemented as part of the Odor, Vapor, and Dust Control Plan are detailed in Section 4.4.7.

Level I

These controls were built into the design of the RA and included proactive measures to minimize the effect of fugitive emissions.

Level II

Level II controls included procedures that were implemented in response to specific increases in fugitive emissions, but were not likely to have a significant impact in the schedule of Site activities.

Level III

Level III controls included procedures that would have been initiated in response to specific increases in fugitive emissions that were likely to have a more significant impact on production schedule and site activities. Level III controls are required when Level II controls had been exhausted and ambient concentrations of emissions continued to exceed the site-specific action levels.

4.1.7.2 Noise Monitoring Plan

The Noise Monitoring Plan (Appendix C of the CERP [AECOM 2011]) approved by the NYSDEC described the procedure to monitor potential noise impacts resulting from the remedial construction activities. The Noise Monitoring Plan identified the receptors, the relevant criteria, the proposed monitoring locations, and the mitigation procedures for responding to observed exceedances of the noise thresholds. A pre-construction noise survey was conducted to establish background noise levels, which were used to compare noise levels during construction.

4.1.7.3 Vibration and Settlement Monitoring Plan

The Vibration and Settlement Monitoring Plan (Appendix D of the CERP [AECOM 2011]) approved by the NYSDEC described the procedure to monitor potential vibration and settlement impacts resulting from the RA. The Vibration and Settlement Monitoring Plan identified the receptors, the relevant damage criteria, monitoring equipment, the proposed monitoring locations, and the mitigation procedures for responding to observed exceedances of the vibration and settlement thresholds. Pre-construction vibration monitoring was conducted to establish baseline.

Vibration monitors were installed at seven locations as identified in the Vibration and Settlement Monitoring Plan to protect sensitive receptors including the on-site storm drain, nearby residences, gas station, and railroad. Five Instantel MiniMate Plus and two Minimate Pro with mounted triaxial geophones were used for continuous vibration monitoring. Each vibration monitor was setup with an event trigger corresponding to the site-specific Warning Action Limit. In cases when the limit was reached at that particular monitoring location, the vibration monitor recorded, saved and sent out the event report through an email message system to the monitoring staffs and field engineer. After each event the monitoring staff and field engineer evaluated potential sources causing such an event and defined a mitigation measure if necessary.

Settlement and horizontal monitoring was conducted along Willow Avenue and Bay Street during the SCB Slurry Wall construction. Settlement monitoring was also conducted along the sewer line passing through the Site during RA in the vicinity of the sewer.

4.1.7.4 Transportation Plan

The Transportation Plan (Appendix E of the CERP [AECOM, 2011]) approved by NYSDEC described the procedures and the specific offsite transportation routes that were followed to manage construction traffic during the RA in a manner that minimized disturbance to the community. The Transportation Plan was developed and modified based on discussions with the local and New York State Department of Transportation (NYSDOT).

4.1.8 Community Participation Plan

No changes were made to the approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC.

A website (www.cliftonmgpsite.com) was created and updated weekly with a full report on the week's activities, photographs of current work, a report and data presentation on the results of the CAMP and an outlook of upcoming remedial construction activities. A dedicated hotline was established and a response to all public comments/ complaints was provided within 48 hours. Regular updates on the RA were also provided to the Community Board.

Document repositories were established at the following locations for the duration of the project and contain all applicable project documents, including this CCR, after approval:

Staten Island Community Board # 1
One Edgewater Plaza, Room 217, Staten Island, New York 10305
(718) 981-6900
Hours: By appointment

4.2 Remedial Action Elements

The RA for the Site was completed from February 2012 through May 2013. The key milestones for the RA are detailed in the table below.

RA Element	Dates
Mobilization and Site Preparation	February 13, 2012 – May 2, 2012
SCB Slurry Wall Construction	May 15, 2012 – June 26, 2012
Single-Story Building Demolition	February 28, 2012 – July 19, 2012
Tar Separator Removal	June 13, 2012 – June 27, 2012
Shallow Excavations	May 7, 2012 – December 12, 2012
Enclosed Deep Excavations	July 9, 2012 – February 22, 2013
DNAPL Recovery Well Installations	February 28, 2013 – April 22, 2013
Demobilization	February 25, 2013 – May 17, 2013
OU-1 Restoration	November 19, 2012 – June 7, 2013
Restoration	July 11, 2012 – June 12, 2013

4.2.1 Contractors and Consultants

AECOM was contracted by National Grid as Project Engineer and on-site representative during the RA. De maximis, Inc. was contracted by National Grid to provide construction management services

during the RA. AECOM and de maximis personnel provided engineering and management of the remediation work to ensure general compliance with the RD Work Plan and the Contract Documents. AECOM also performed the noise and vibration monitoring and retained a subcontractor to perform settlement monitoring during the RA. GEI performed the perimeter air monitoring, recording, and reporting in accordance with the CAMP and CERP. The following companies completed the major tasks for this project:

- **Sevenson Environmental Services, Inc. of Niagara Falls, NY**. General contractor for the RA.
- **Geo-Con of Monroeville, PA**. SCB Slurry Wall specialty subcontractor.
- **Moretrench Services Rockaway, NJ**. Dewatering and DNAPL Recovery Well installation and development specialty subcontractor.
- **GEI Consultants, Inc.** CAMP implementation and reporting.
- **Enviroprobe Service, Inc. of Moorestown, NJ.** Level A Utility survey subcontractor.
- **Environmental, Inc. of Woodbridge, NJ.** Building demolition and asbestos abatement subcontractor.
- **Linco Electric Contracting and Maintenance, Inc. of Staten Island, PA.** Local electrician.
- **Allsite Structure Rentals of Las Vegas, NV.** TFS rental and installation subcontractor.
- **Minerva Enterprises, LLC. Of Waynesburg, OH.** Disposal facility for Asbestos Containing Material (ACM).
- **TTI Environmental, Inc. of Moorestown, NJ.** Third party air monitoring during asbestos abatement and building demolition.
- **Clean Earth, Inc of Southeast PA and Bayshore Recycling Corp. of Keasbey, NJ**. Non-hazardous soil and debris offsite thermal treatment facility.
- **Clean Earth, Inc. of New Jersey.** Hazardous MGP soil and debris disposal.
- **Waste Management –Tullytown/ G.R.O.W.S; Action Environmental Services of Newark, NJ; Balemet Recycling Metals, Inc. of Newark, NJ**. Construction and Demolition (C&D) debris disposal of non-hazardous waste.
- **Grasselli Point Industries of Linden, NJ and Bayshore Recycling Facility of Keasby, NJ.** Source of common fill material.
- **Modern Industries of Iselin, NJ with source at Stavola Construction Material's Chinmey Rock Quarry.** Source of gravel backfill material.
- **Kennon Surveying Services, Inc. / East Coast Surveying, LLC of Warren, NJ.** Final As-Built record drawing for the project.
- **Kelko Construction, Inc. of Commack, NY.** Planting subcontractor.
- **Munoz Trucking Corporation of Belleville, NJ and Shamrock Materials, LLC. Of Staten Island, NY.** Truckling subcontractor.
- **Consolidated Steel & Aluminum Fence Co., Inc. of Kenilworth, NJ**. Fencing subcontractor.

- **SOR Testing Laboratories, Inc. of Cedar Grove, NJ**. Geotechnical / compaction testing subcontractor.
- **H2M Labs, Inc of Melville, NY.** Analysis of quality assurance samples including treated construction water, backfill, and sand re-use samples.
- **Walter T. Gorman Engineering of Manhattan, NY.** Permit expeditor subcontractor.

Several supporting subcontractors and suppliers were used for specialty services such as:

- Liquid disposal
- Transportation
- Other Analytical laboratories
- Asphalt pavement and sidewalk replacement
- Landscaping
- Utility Installation

4.2.2 Mobilization and Site Preparation

An initial kick-off meeting was held on December 12, 2012 at the National Grid offices with representatives from National Grid, de maximis, AECOM, Sevenson Environmental Services, and NYSDEC. Sevenson mobilized to the Site on February 13, 2012 and initiated mobilization, Site management and Site preparation activities. The installation of trailers and temporary facilities was also initiated. The preparation for remedial activities began immediately upon mobilization of equipment and personnel. Site mobilization activities were completed on March 8, 2012 and Site preparation activities were completed on May 2, 2012, and included:

- Obtaining required permits, arranging for waste transportation, arranging for utility hook-ups (as needed), staging necessary equipment and personnel; preparing the CHASP, and holding an on-site health and safety training session.
- Establishing parking areas, haul routes, and work zones for authorized personnel.
- Removing existing fencing and guard rails and installation of temporary jersey barrier with chain link wood barrier around the southern and eastern site perimeter along the Willow Avenue and Bay Street.
- Constructing the decontamination facility.
- Installing the silt fencing and erosion controls in accordance with local, state, and federal regulations and the SWPPP. The erosion and sediment controls were maintained throughout the duration of the work.
- Establishing temporary construction offices on 40 Willow Avenue property.
- Closure of north sidewalk on Willow Avenue and west sidewalk on Bay Street adjoining the Site
- Clearing of vegetation within the remediation areas.
- Survey by a New York State-licensed surveyor for initial benchmarks and stakeout for the SCB Slurry Wall and excavation limits.

- Installing the waste water treatment system and associated influent and discharge pipelines.
- Installing perimeter air monitoring stations and notification system and performing baseline air monitoring.
- Noise and vibration monitoring setup and baseline monitoring.
- Level A Utility survey and Protection.
- Construction of staging and containment areas and construction entrance.
- Erection of TFS and air handling system.
- Traffic Control and Management.
- Presence of 24 hour security.
- A NYSDEC-approved project sign was erected at the project entrance and remained in place during all phases of the Remedial Action.

4.2.2.1 Permitting

Documentation of agency approvals required by the RD Work Plan included a SPDES Permit Equivalency Letter dated May 17, 2011 and a Notice of Intent under the SPDES General Permit # GP-0-10-001 dated March 09, 2012 which are included in Appendix D.

Other non-agency permits relating to the remediation action are provided in Appendix D and include:

- NYC Department of Environmental Protection (NYCDEP) Dewatering Permit
- NYCDEP Discharge Permit
- NYCDEP Noise Mitigation Plan
- NYCDEP Asbestos Project Notification
- NYC Department of Building (NYCDOB) Demolition Permit
- NYCDOB Construction Work (excavation, trenching, shoring, and soil removal) permit
- NYCDOB plumbing permit
- NYCDOB Electric Work permit
- NYCDOB Afterhours permit
- NYC Department of Transportation (NYCDOT) Sidewalk Occupancy Permit
- NYCDOT Fence Permit
- NYCDOT Temporary pedestrian walkway in street permit
- City of New York Parks and Recreation Tree Pruning Permit
- Fire Hydrant permit
- NYS Department of Labor (NYSDOL) Asbestos Project Notification

All State Environmental Quality Review Act (SEQRA) requirements and all substantive compliance requirements for attainment of applicable natural resource or other permits were achieved during this RA.

4.2.3 Single-Story Warehouse Building Demolition

The single-story warehouse building located on the Site was demolished from February 28, 2012 to July 19, 2012. Asbestos abatement was conducted from March 19, 2012 to April 2, 2012 prior to demolition. Universal waste consisted of:

- Mercury thermostats;
- Mercury thermometers;
- Light ballasts;
- Back up batteries;
- Fluorescent light bulbs;
- Sodium lamps;
- Lead-based paint;
- Polychlorinated biphenyl (PCB) impacted caulking
- ACM ceiling tiles
- ACM floor tiles
- ACM window caulking
- ACM joint caulking
- ACM roof flashing
- ACM fire safety doors
- ACM door caulk

Non-ACM universal waste consisting of the light ballasts, the fluorescent light bulbs, sodium light bulbs, and joint caulking were removed from inside the building prior to abatement. The remaining universal waste, with the exception of the ACM impacted and lead based paint waste was packaged and sent to Waste Management for offsite disposal.

Lead based paint was identified only on the steel staircase that led to the roof. The staircase was removed as one piece and shipped to be recycled at H&C Metals, as indicated in the Contractor's Lead Paint Handling Plan.

Once all of the non-ACM universal waste was properly removed and disposed, Envirocare Environmental, Inc. obtained the necessary New York State Department of Labor (NYSDOL) and NYCDEP approval and abatement was conducted in accordance with permit requirements as indicated in the Contractor's Asbestos Abatement Plan. All ACM waste was bagged / wrapped and placed into a lined dumpster for offsite disposal at Minerva Enterprises in Waynesburg, Ohio. TTI Environmental, Inc. performed a third party air monitoring during the abatement.

The building was demolished in a controlled manner by Sevenson between June 7 and June 12, 2012 in accordance with the NYCDOB permit. Dust control measures were employed during the controlled demolition of the building.

Upon completing the demolition of the roof and walls, building materials were segregated into piles to be crushed and reused as backfill or removed for offsite disposal / recycling. The brick and block

walls were crushed to pieces of less than 3-inches and placed in the bottom of the excavation, at least 5 feet below the final grade as common backfill. Deleterious material was picked out and removed from the crushed blocks. Figure 4-3 shows the building that was demolished during this event.

Approximately 2,000 cubic yards of visually clean sand fill was observed below the building foundation following demolition. The sand fill was sampled and analyzed in accordance with NYSDEC DER-10 and confirmed clean. The analytical data was submitted to the NYSDEC and approved following which the sand fill was reused as fill and placed below 5 feet bgs in the excavation.

365.69 tons of C&D debris was transported offsite for recycling and/or disposal.

4.2.4 Slag Cement Bentonite Slurry Wall Construction

SCB Slurry Wall construction activities were conducted from March 27, 2012 through July 5, 2012 and included mobilization of SCB Slurry Wall construction equipment, pre-trenching along the footprint to remove obstructions, removal of underground obstructions, identifying and abandoning underground pipes, locating and protecting storm sewer near Bay Street using 3000 pounds per square inch (psi) concrete encasement with rebar reinforcement, SCB Slurry Wall construction, spoils management and disposal, and demobilization. Geo-Con was retained by Sevenson to perform construction of the SCB Slurry Wall.

4.2.4.1 Pre-Trenching

Pre-trenching was conducted along the alignment of the SCB Slurry Wall to a depth to 15 feet bgs to remove obstructions and subsurface structures. Numerous pipes and structures were encountered during the pre-trenching. Structures within the alignment were removed to the extent possible and piping was cut and sealed via grout. The soil removed during pre-trenching was replaced back in the trench as fill except for debris (from subsurface structures and pipes) and heavily impacted soils. These were stockpiled within the TFS for offsite disposal. Pre-trenching was conducted from March 27, 2012 through to June 12, 2012.

4.2.4.2 Mobilization

SCB Slurry wall mobilization began on April 30, 2012. Equipment bought on Site included:

- Geo-Con's custom heavy duty long boom and stick assembly mounted on a Caterpillar 385.
- One 200 kVa generator to supply 3- phase 480 volt power.
- Three (3) five-cubic yard (approx. 1,000-gallon) slurry batch mixers.
- One deck scale utilized for quantifying Cement/bentonite slurry ingredients.
- One 20,000-gallon holding tank (frac tank), for storing finished Slurry.
- Two (2) 4 inch x 3 inch mission (25 HP) electric transfer-pumps to deliver Slurry between the two batch mixers.
- One (1) Moyno L-14 50 HP electric progressive cavity pump to deliver finished Slurry to the trench.

- One (1) slag silo - Ground Granulated Blast Furnace Slag (GGBFS) were delivered to the Site via tractor trailer and transferred to the silo pneumatically through a closed system.
- One (1) jumbo bag system - Bentonite clay was delivered to the site in 2,000 or 3,000 lb. super sacks. The sacks were hoisted above the storage silo with a high lift forklift where they were opened and the material placed into the silo.
- One (1) 150 ton cement pneumatic bulk storage "pig", with electric pneumatic blower.
- One (1) 185 cfm air compressor to run the pneumatic transfer apparatus on the silos.
- 8,000 lb. all-terrain forklift to transport materials and equipment.

4.2.4.3 Batch Plant

The SCB Slurry was prepared in the specially designed lightning mixer capable of producing fully hydrated slurry.

Bentonite-Water Slurry

The bentonite slurry was prepared by mixing water and bentonite. During initial loading of the bulk material silo, the 4,000 lb. jumbo sacks were opened and the material was placed in a custom built holding silo. The mixer was filled with water as powdered bentonite was fed into the mixer from the silo via screw type augers. Load cells beneath the mixer weighed proportions. The bentonite slurry was transferred into a holding tank where it continued to be circulated until it was needed to produce SCB Slurry. No slurry was made within the trench. The slurry was constantly agitated until slag and cement was added.

Slag Cement Bentonite Slurry

The SCB Slurry was prepared by blending the bentonite-water slurry with GGBFS and Type I/II Portland cement in a high-speed colloidal mixer. The bentonite slurry was transferred back to the mixer from the frac tank for the addition of cement. The slag was added from a bulk silo via screw feed auger as weighed by a mixer scale. A bag or portion of a bag of Portland cement was added to each batch by hand. The SCB Slurry was thoroughly blended until a homogeneous mix was achieved and the Slurry was fully hydrated. The SCB Slurry was stored in a holding tank separate from the bentonite-water slurry and continuously agitated prior to placement in the trench. Any SCB Slurry stored for more than 2 hours was wasted.

4.2.4.4 SCB Slurry Mix

Bench scale testing was performed by Geo Con to determine the optimum SCB Slurry mix prior to mobilizing on Site. A SCB Slurry mix consisting of 10.0% GGBFS, 3% sodium bentonite, and 0.5% Portland cement was selected by Geo Con and approved by AECOM for use. Prior to SCB Slurry Wall construction, Geo Con increased the GGBFS by 1.5% to account for sidewall stability uncertainty resulting from pre-trenching operations. This mix was further modified during the first week of SCB Slurry Wall construction resulting in a mix of 12.5% GGBFS, 3% sodium bentonite, and 0.5% Portland cement.

4.2.4.5 SCB Slurry Wall

As shown on Figure 4-4, the SCB Slurry Wall was constructed adjacent to Bay Street and Willow Avenue. The inner SCB Slurry Wall - Buttress Wall was constructed to primarily provide excavation wall support while the outer SCB Slurry Wall - Barrier Wall was constructed to prevent future DNAPL movement to downgradient areas.

The SCB Slurry Wall – Barrier wall was 36 inches wide and the SCB Slurry Wall – Buttress wall was 6 feet wide though due to sidewall cave-ins in the top 15 feet bgs, the trench width had expanded to approximately 15 feet wide at certain locations within the combined Willow Avenue SCB Slurry Wall. Both Barrier and Buttress Walls were constructed in one pass of a Caterpillar 385 excavator fitted with heavy duty long-reach stick and boom assembly. The SCB Slurry Wall trench was excavated in a series of approximately 30- to 50-foot long 'cuts'. The trench was filled with SCB slurry as it was excavated. Following the initial dry cut (2 to 3 feet deep) the SCB slurry level was maintained within two (2) feet of the work platform surface. To the extent possible, each cut of the SCB Slurry Wall was excavated to full depth before the excavator advanced to begin the next cut. The bottom of the trench was cleaned by passing the excavator arm into the previously excavated cut and scraping the bottom of the trench. This was done after each cut was completed to maintain continuity at the bottom of the trench. The SCB Slurry Wall trench was essentially vertical beyond 15 feet bgs.

Trench spoils were direct loaded into dump trucks for hauling to the TFS for management and disposal. A total of 13,967.96 tons of Site soils were removed as trench spoils, treated with lime kiln dust (LKD) to reduce moisture content, and transported off-Site to a thermal treatment facility.

As shown in Figure 4-4, 620 linear feet of SCB Slurry Wall – Barrier was constructed to a minimum depth of 35 feet bgs (northern portion along Bay Street) and a maximum depth of 50 feet bgs (along Willow Avenue) and 790 feet of SCB Slurry Wall – Buttress was constructed to a maximum depth of 13 feet bgs. Cross-section of the as-built SCB Slurry wall – Barrier and Buttress is shown in Figure 4-5.

4.2.5 Dewatering

After completing the construction of the SCB Slurry Wall, excavation of the MGP impacted material was initiated. Due to the depth of excavation and to ensure a dry excavation, groundwater infiltration was controlled by installation of localized dewatering sumps capable of drawing the water table down to below the excavation limits. A well point system was initially designed to dewater the excavation areas. Moretrench, a dewatering subcontractor, was retained by Sevenson to install the dewatering well point system. Moretrench had difficulty installing the well points due to subsurface obstructions and structures. Additionally due to uncharacteristic dry weather the water table was depressed to 8 to 12 feet bgs in certain areas of the Site. As a result the Dewatering Plan using well points was abandoned and dewatering was achieved via multiple localized sumps installed around and within the excavation areas.

The sumps consisted of slotted 12-inch pipe wrapped with geotextile fabric and 2-inch clean stone placed around the pipe. The sumps were plumbed to the WWTP constructed at the 40 Willow Avenue property. The sumps were removed and reinstalled as excavation progressed, along with the TFS moves. Extra sump pumps were used as necessary to maintain water level below the excavation depth. Excavation and backfill activities were conducted once the sump pumps had operated for a sufficient time to achieve the necessary drawdown.

Heavy infiltration of DNAPL into the sumps was observed at multiple locations within the Site. Two temporary DNAPL separation 20,000 gallon frac tanks were placed on the Site to remove DNAPL prior to discharge to the temporary wastewater treatment system.

4.2.6 Wastewater Treatment Plant

Water generated from construction activities were treated at a WWTP staged on 40 Willow Avenue. The treated water was discharged under the NYSDEC SPDES Permit Equivalency through a tie-in to a NYC storm sewer on the Willow Avenue which then discharged to the Upper New York Bay. The temporary water collection and treatment system was constructed on-site. The treatment system had a peak flow capacity of 500 gpm with average daily flow of 250 gpm. The system was run until the RA was complete. However, the system was not run continuously as the quantity of water encountered during construction was less than anticipated. The treatment system was designed to meet the limits stated by the NYSDEC SPDES permit equivalency. The collection and treatment system comprised of the following major subsystems:

- construction pit sump pump/vacuum pump/dewatering pumps;
- influent surge tanks;
- influent equalization tanks;
- influent feed pumps;
- sodium hypochlorite feed system;
- ferric sulfate feed system;
- polymer system;
- settling tanks;
- filter/granular activated carbon (GAC) feed pumps;
- dual media filers;
- GAC reactors;
- secondary bag filters;
- ion exchange vessels;
- effluent/backwash storage tanks;
- effluent/backwash pump; and
- effluent flow meter and totalizer.

4.2.7 Excavation

Most of the deep excavation was carried out under a 148-foot by 96-foot stressed membrane TFS except for the tar separator located along Willow Avenue on the southwest portion of the Site, 89 Willow Avenue property, and the northeastern portion of the Site near the Bay Street. Shallow excavation was carried out without the TFS as shown in Figure 4-1A. The TFS was designed and manufactured by AllSite Structure Rentals and was constructed on a steel H-pile frame that allowed it to be moved along with the excavation progress. Once erected, the building structure and frame were fully anchored using beam blocks to the ground to meet all local codes and requirements. After each move, the TFS was re-anchored.

4.2.7.1 Excavation and Temporary Fabric Structure

The excavation was divided into different areas based on the underground structures and depth of excavation. The TFS was moved 18 times during excavation activities to ensure that the deeper excavations, where MGP related soils and structures were expected, were carried out inside the TFS. Figure 4-6 details the different TFS locations and excavation areas. The TFS was erected in its first location, simultaneously with the single-story commercial building demolition and prior to construction of the SCB Slurry Wall. The TFS was first used to stage the spoils generated from the construction of the SCB Slurry Wall in May and June of 2012. The soils and structures with MGP impacts were excavated from within the TFS between July 2012 and February 2013 during 18 moves of the TFS. The TFS was heavily damaged during hurricane Sandy and was repaired on-site in November 2012.

Excavation and TFS locations were carried out on the following dates:

- Following the TFS move to its first location, excavation, off-site transportation, backfilling, and compaction activities were conducted from July 6, 2012 to July 25, 2012.
- The TFS was relocated to Location #2 on July 26, 2012. Silt fencing was installed around the previous TFS area and air handling unit was installed at the TFS Location #2. Excavation, off-site transportation, backfilling, and compaction activities were conducted from July 26, 2012 to August 8, 2012 under the TFS Location #2.
- The TFS relocation to Location #3 was conducted on August 9. Bin blocks were placed on the TFS frame for anchoring, fabric of the TFS was repaired, and air handling unit was installed at TFS Location #3 on August, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from August 13, 2012 to August 26, 2012 under the TFS Location #3.
- The TFS relocation and air handling system installation was completed at Location #4 on August 27, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from August 29, 2012 to September 4, 2012 under the TFS Location #4.
- The TFS was relocated to Location #5 on September 5, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from September 6, 2012 to September 14, 2012 under the TFS Location #5.
- The TFS was relocated to Location #6 on September 17, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from September 18, 2012 to September 28, 2012 under the TFS Location #6.
- The TFS was relocated to Location #7 on October 1, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from October 2, 2012 to October 9, 2012 under the TFS Location #7.
- The TFS was relocated to Location #8 on October 10, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from October 11, 2012 to November 8, 2012 under the TFS Location #8. Hurricane Sandy damaged the Site, including the TFS while it was situated at Location #8. The open portion of the excavation was filled with storm water, which was tested, pumped, treated and disposed. The excavation and backfilling work was halted between October 28, 2012 and November 5, 2012 in aftermath of Hurricane Sandy.

- The TFS was relocated to Location #9 on November 19, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from November 20, 2012 to December 4, 2012 under the TFS Location #9.
- The TFS was relocated to Location #10 on December 5, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from December 6, 2012 to December 14, 2012 under the TFS Location #10.
- The TFS was relocated to Location #11 on December 17, 2012. Excavation, off-site transportation, backfilling, and compaction activities were conducted from December 17, 2012 to January 3, 2013 under the TFS Location #11.
- The TFS was relocated to Location #12 on January 2, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from January 7, 2013 to January 15, 2013 under the TFS Location #12.
- The TFS was relocated to Location #13 on January 16, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from January 17, 2013 to January 21, 2013 under the TFS Location #13.
- The TFS was relocated to Location #14 on January 22, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from January 23, 2013 to January 29, 2013 under the TFS Location #14.
- The TFS was relocated to Location #15 on January 30, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from January 31, 2013 to February 7, 2013 under the TFS Location #15.
- The TFS was relocated to Location #16 on February 8, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from February 11, 2013 to February 13, 2013 under the TFS Location #16.
- The TFS was relocated to Location #17 on February 13, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from February 14, 2013 to February 18, 2013 under the TFS Location #17.
- The TFS was relocated to Location #18 on February 19, 2013. Excavation, off-site transportation, backfilling, and compaction activities were conducted from February 20, 2013 to February 27, 2013 under the TFS Location #18.

Shallow and open excavations were conducted concurrently with excavation within the TFs except for the shallow groundwater excavation on 89 Willow Avenue and removal of Tar Separator and Fuel Oil Tanks.

An as-built map of the areas where excavations were performed is shown in Figure 4-7. The TFS was cleaned and dismantled from February 27, 2013 through March 20, 2013. Shallow excavations outside the TFS were conducted between May 7, 2012 and March 7, 2013 as permitted by the project schedule and Site layout.

4.2.7.2 Removal of Former MGP Structures

Several subsurface concrete/brick/steel walls and foundations, monitoring wells, historic piping, abandoned utility lines, railroad ties, and other miscellaneous structures had to be demolished and removed from the excavation areas. These structures were broken up and transported offsite for disposal with the impacted soil or as C&D debris. Numerous DNAPL filled former MGP piping were

encountered during the RA. These pipes were removed in their entirety or cut and plugged with grout where removal was not possible due to engineering restrictions.

Structures excavated and removed as part of the RA are identified in the Figure 4-3, and include the following:

- Western Tar Separator – a rectangular brick and concrete structure approximately 40 feet long, 18 feet wide, and extending from the ground surface to 20 feet bgs. The tar separator was separated into six compartments via baffles. The foundation and walls of the structure were approximately 18 inches thick and made of reinforced concrete. The heavy reinforcement and thickness made the removal of the foundation and walls of the tar separator was very difficult. Additionally the walls provided structural stability to the SCB Slurry Wall trench, excavation, and to the storm drain located to the west of the tar separator. As a result the south wall, portions of the west wall, approximately 15 feet of the north wall, portions of three internal baffles, and approximately 20 feet by 10 feet of the foundation were left in place. The east wall, portion of the northern wall, and portions of the foundation of the Tar Separator were removed. Heavily impacted soil, DNAPL, and water mix were observed with the tar separator and were removed and transported offsite for disposal. No impacts were observed immediately below the foundation in areas where the bottom of tar separator was removed. This observation was consistent with the RI and pre-design investigation borings completed within the tar separator. The tar separator was removed without the use of a TFS.
- Fuel Oil Tanks – the foundations of the two fuel oil tanks were removed in their entirety. The southern smaller fuel oil tank foundation consisted of a concrete foundation capped by a steel plate. A special welder and cutter was used to remove the steel cap in pieces. The steel cap was stockpiled and transported offsite to a recycling facility. The southernmost Fuel Oil Tank was removed in the open without the use of a TFS.
- Tar Tank Gasometer – the tar tank gasometer was a subsurface circular brick structure with the foundation at approximately 13 feet bgs. The former structure was removed in its entirety along with heavily impacted soils within the structure. The excavation was extended beyond the foundation to remove visually impacted soils.
- Purifier Tanks, Purifier Houses – the various brick and concrete foundations of purifier tanks and houses were demolished and removed. Soil under these foundations contained among the most impacted materials observed during the RA. Excavation was extended deeper within the footprint of the purifier structures to remove visually impacted soils.
- Drip Wells – concrete and brick drip wells were encountered within the Relief Holder and the Gas Holder No. 2. These drip wells were filled with pumpable DNAPL and water mix. The DNAPL and water mix was pumped from these wells into DNAPL storage drums for disposal. All drip wells were removed in their entirety.
- Relief Holder – the Relief Holder was a 75 feet diameter subsurface structure with walls consisting of six to eight brick layers. A circular steel ring/wall was present on the inside circumference of the Relief Holder. The area between the wall and the circular steel ring contained DNAPL and water mix which was removed. The foundation, which was encountered 20 feet bgs, was sloped to the sides from the middle, and constructed of multiple brick layers. Heavily impacted DNAPL and soil mix was observed within the structure from 4 feet to 15 feet below grade. The soil at the bottom of the subsurface structure and above the foundation was relatively less impacted. The Relief Holder was

removed in its entirety. No visual impacts were observed in soil immediately below the Relief Holder foundation. To remove the Relief Holder the excavation was sloped to a depth of 20 feet bgs and the lateral bottom of excavation extended 5 feet beyond the walls (*i.e*., an 85 feet wide circular excavation).

- Gas Holder No. 2 – the entire concrete foundation of the Gas Holder No. 2 was removed. Visually impacted soils observed beneath the concrete foundation were removed by extending the excavation deeper as shown in Figure 4-7.
- Eastern Tar Separator, Tar Tanks, Tar Wells – circular and rectangular tar tanks, wells, and separator made of concrete and brick material were removed in their entirety. The subsurface structures were located within the deep excavation depth of ten feet.

The entire content of all the subsurface structures were removed and managed as soil and fill material, as discussed above. Pumpable DNAPL was pumped to DNAPL storage drums while DNAPL and water mix was pumped to the temporary DNAPL separation frac tanks. Heavily impacted and/or wet soils from the former MGP structures were amended with a drying agent (LKD) or mixed with drier, less impacted, Site soils before transportation offsite.

4.2.8 On-Site Reuse

Upon completion of the single-story commercial building demolition, various building materials were segregated in piles. Concrete from the bin blocks and building walls was reused as backfill material on-site. The material was crushed to 3-inch minus size and placed in the bottom of excavation as common backfill. No crushed brick or blocks were placed within top 5 feet of the final grade. If deleterious material was observed with bricks and blocks, it was picked out before placement of the backfill.

A layer of clean sand was also encountered below the building foundation following demolition. The soil was tested and approved to be used on-site as common backfill by DEC upon review of the analytical results.

4.2.9 Imported Backfill

Following excavation, the distributed areas were backfilled and compacted to final grade elevations. Delivery of common backfill began on June 15, 2012 and placement of backfill material commenced on June 20, 2012 in the tar separator area. The common backfill was placed in stages as excavation proceeded between July 11, 2012 and February 5, 2013. The backfill material was brought to the Site in tri-axle dump trucks and tandem trailers from the Grasseli Point Industries located in Linden, New Jersey and Bayshore Recycling Facility located in Keasby, New Jersey. The borrow source backfill material was tested prior to delivery to the Site for Metals, Polycyclic aromatic hydrocarbon (PAHs), Semi Volatiles (SVOCs), and VOCs, Pesticides, PCBs, and Herbicides. The laboratory analytical results are included in Appendix E. Table 4-1 summarizes chemical analytical results for backfill, in comparison to Unrestricted Use SCOs from Technical Administrative Guidance Memorandum 4046 (TAGM 4046). This fill was placed in the excavation areas using track mounted dozers and compacted in 12-inch lifts to greater than 95 percent standard proctor using a vibratory roller.

The final cover over the Site consisted of 6-inches of gravel, imported from the Stavola Construction Material's Chimney Rock Quarry. Following backfilling, grading activities were conducted from January 17, 2013 through May 9, 2013. The borrow source stone blend was tested prior to delivery to the Site and the analytical results are included in Appendix E. The material was tested for the following parameters: Metals, PAHs, SVOCs, VOCs, Pesticides, PCBs, and Herbicides.

A total of 46,265 cubic yards or 89,419 tons of backfill material (25,836 tons from Grasselli Point Industries and 63,583 tons from Bayshore Recycling) and 3,141 cubic yards or 5,470 tons of gravel backfill material was transported to the Site and placed in the excavated areas.

4.2.10 DNAPL Recovery Well Installation

Twenty-three DNAPL recovery wells were installed along the SCB Slurry Wall along Willow Avenue and Bay Street by Moretrench, subcontractor for Sevenson, using mud-rotary drill rig in March and April 2013. The recovery wells were 4-inch or 6-inch steel wells with 0.020 slot well screen and Schedule 80 Poly Vinyl Chloride (PVC) risers. Four-inch wells consisted of 3 feet sump at the bottom while 6-inch wells consisted of 5 feet sump for DNAPL accumulation. Each well was finished at the surface with a flush-mounted 2 feet by 2 feet concrete vault.

Geoprobe borings were completed at select locations to confirm RI and pre-design investigation observations. Based on the observations collected from these borings and from observations collected during the RA activities, the following modifications were made to the DNAPL Recovery Well Installation design:

- One shallow recovery well was removed from the eastern edge of the SCB Slurry Wall
- One intermediate recovery well was added in the vicinity of the former Purifier House footprint, north of the Willow Avenue SCB Slurry Wall based on observed impacts
- The depth to screen were modified for select recovery wells
- The screen length on the intermediate well south of the SCB Slurry wall on Willow Avenue was revised to 20 feet to account for observed DNAPL lenses outside of the ten feet screen length

Ten recovery wells were installed north of SCB Slurry Wall along Willow Avenue to capture any DNAPL accumulated due to presence of the wall. Three recovery wells were installed near the edges of the SCB Slurry Wall to capture any DNAPL that may be diverted by the wall. Two recovery wells were also installed south of the SCB Slurry Wall along Willow Avenue to capture downgradient DNAPL. Similarly, six recovery wells were installed west of the SCB Slurry Wall along Bay Street and two on the eastern or downgradient side of the SCB Slurry Wall to capture downgradient DNAPL.

Ten recovery wells were installed in the shallow zone with bottom of the screen ranging from 20 to 26 feet bgs. Nine of these ten recovery wells consisted of a 10 feet screen and one of 20 feet screen. Twelve recovery wells were installed in the intermediate zone with bottom of the screen ranging from 33 to 55 feet bgs and each consisted of a 10 foot screen. A deep well with the screen ending at 74 feet bgs was also installed north of the SCB wall along Willow Avenue. Well construction details are given in Table 4-2 and the installation logs are included in Appendix F. Each well was developed after installation and the well development logs are included in Appendix F.

4.2.11 Restoration

Topsoil was placed on a portion of the slope on railroad property on October 25, 2012 and was seeded after placement of erosion control mat on November 19, 2012. Grading and compaction of the 6-inch gravel layer across the Site continued from January 17, 2013 to May 9, 2013. The sidewalk replacement took place between December 6, 2012 and April 26, 2013. Permanent Site fence was installed on the perimeter of OU-2 parcel from March 14, 2013 and May 6, 2013.

Restoration activities at the Site were conducted from October 25, 2012 to June 12, 2013 and included:

- Final grading of common fill and placement of final 6-inch gravel layer;
- Placing of topsoil and seed on portions of the railroad property slope;
- Replacement of curbs and sidewalks;
- Permanent electric connection to the Site;
- Re-installation of light poles;
- Transfer of National Grid trailers to 25 Willow and 40 Willow Ave properties;
- Installation of permanent fence on the Site; and
- Final survey

Restoration activities at 40 Willow Avenue were conducted from November 19, 2012 to June 6, 2013 and included:

- Removal of temporary staging areas;
- Installation of guard rails around the containment cell pad;
- Relocation of electric panel for future use;
- Plantation of trees and shrubs around the containment cell pad,
- Installation of a sprinkler system; and
- Restoring areas of temporary water treatment facility by removing top soil and gradation.

A survey was completed to document that the final ground surface met the elevation and slope specified in the design documents and drawings. The entire Site was covered with at least 2 feet of common backfill and gravel backfill at the end of the remediation activities.

The final restored site condition is shown in the as-built Figure 4-8.

4.2.12 Demobilization

Demobilization activities were completed from February 25, 2013 to May 17, 2013 and included:

- Decontamination and removal of heavy equipment used for excavation and backfill activities;
- Plugging, via grout, of the subsurface pipes beneath Willow Ave used for transporting construction water from Site to 40 Willow Avenue for treatment;
- Removal of the water treatment system;
- Removal of jersey barrier and temporary fencing;
- Disassembly and demobilization of TFS; and
- Removal of temporary utilities and facilities.

4.2.13 Health and Safety

A total of 95,000 hours were worked during implementation of the RA, with no OSHA recordable incidents or lost work days. Five incidents occurred during the course of the RA, but didn't result in any injury. These included physical contact with falling debris during demolition, struck by manhole lid during erosion and sedimentation control placement, finger cut, tick bite, and chemical contact in eye through improper use of sunscreen. Sevenson's health and safety site inspections and weekly reports are provided in Appendix G.

4.2.14 Reporting

All RA activities were closely coordinated among National Grid, NYSDEC, AECOM, and Sevenson Environmental. A NYSDEC inspector was present for the entire duration of the RA and was provided with all the contract and governing documents. Project coordination included daily communications between on-site representatives, weekly conference calls conducted to update Site conditions and status, review of completed work, discussion of health and safety issues, and scheduling future activities. Daily documentation of field activities were recorded by AECOM personnel in a bound field book and by de maximis and Sevenson Environmental personnel on daily log sheets. Sevenson Environmental submitted daily and weekly reports detailing the remedial activities completed, quantity of waste managed, and schedule. Sevenson Environmental personnel were responsible for scheduling haul trucks and tracking manifests for soil disposal and Bills of Lading for backfill.

All daily and monthly reports are included in electronic format in Appendix H.

The digital photo log required by the RD Work Plan is included in electronic format in Appendix I.

4.3 Contaminated Materials Removal

Implementation of the RA resulted in the removal of several different types of waste: C&D debris, spoils from both SCB Slurry Wall and cured SCB Slurry Wall grading, hazardous soils impacted with lead, non-hazardous residual MGP-related soils, construction debris (hay bales, *etc*.), hazardous waste water generated during treatment system cleanup, NAPL drums, and treated water generated during construction, including groundwater, stormwater, and decon water.

4.3.1 Soil

Fill material was encountered in the top 8 to 10 feet bgs of the excavation followed by peat, and silt near the bottom of the excavation. Sandy material was observed below the peat/silt layer down to approximately 20 feet bgs. The groundwater level varied from 10 to 15 feet bgs on the western portion (except during 89 Willow Avenue excavation where groundwater was observed at 6 feet bgs) of the Site to 8 feet bgs on the eastern portion of the Site.

Contour maps of estimated cut and fill thicknesses for remedial activities at the site are included in Figures 4-7 and 4-8.

4.3.1.1 Disposal Details

A total of 13,968 tons of soils were generated during the construction of the SCB Slurry Wall and were shipped for thermal treatment to Bayshore Soil Management facility in Keasbey, New Jersey, from May 21, 2012 through July 6, 2012.

A total of 5,522 tons of 1,589 tons of non-hazardous, residual MGP-related soils were excavated and transported off-site for thermal treatment to Clean Earth of Philadelphia in Philadelphia, Pennsylvania between July 30, 2012 and August 7, 2012. A total of 90,872 tons of non-hazardous, residual MGP-related soils were excavated and transported off-site for thermal treatment to Bayshore Soil Management facility from May 7, 2012 through May 7, 2013. A total of 289 tons of residual MGP-related soils designated hazardous for lead were excavated and transported off-site for disposal to Clean Earth of New Jersey on June 14, 2012.

Table 4-3 shows the total quantities of each category of material removed from the Site and the disposal locations. A summary of the samples collected to characterize the waste, and associated analytical results were provided in the NYSDEC approved RD Work Plan.

Letters from Applicants to disposal facility owners and acceptance letters from disposal facility owners are attached in Appendix J.

Manifests and bills of lading are included in electronic format in Appendix K.

4.3.2 C&D Debris

C&D debris was generated during the demolition of surface and subsurface structures during the RA including the demolition of the single-story commercial building, various pavements, chain link fences, former MGP foundations, piping, and monitoring wells. Subsurface concrete foundations of former MGP structures, cable, pipe, brick, wood piles, and other miscellaneous metal debris were encountered within the excavation limits. All C&D debris that were not used on-site as backfill material, were broken up with an excavator bucket or a hoe ram device if needed, segregated from the soil, stockpiled, and shipped off-site for disposal as described in Section 4.4.4.1.

4.3.2.1 Disposal Details

A total of 185 tons of non-hazardous construction debris was disposed of at the Waste Management Tullytown, 346 tons at the Action Environmental Services, and 279 tons at the Balemet Recycling Metals facility through duration of the remedial activities.

Table 4-3 also shows the total quantities of C&D debris removed from the Site and disposal locations. Letters from Applicants to disposal facility owners and acceptance letters from disposal facility owners are attached in Appendix J.

Manifests and bills of lading are included in electronic format in Appendix K.

4.3.3 Water

Significant volumes of construction water were generated during the dewatering activities conducted to support excavation. Water containing MGP constituents was also generated during decontamination of debris, trucks, and equipment. Storm-water run-off from impacted areas was also collected.

4.3.3.1 Disposal Details

A total of 1,941,847 gallons of water were treated and discharged into the Upper New York Bay. An additional 41,980 gallons of benzene hazardous water was transported off-site for disposal to Clean Waters of New Jersey. Table 4-3 details the quantities of water treated and discharged during each discharge event.

Waste Manifests are included in electronic format in Appendix K.

4.4 Quality Assurance

4.4.1 Storm-Water Pollution Prevention Plan

SWPPP inspections were conducted weekly and noted in weekly reports. The results of the SWPPP inspections were discussed weekly and any action items were immediately mitigated. Appendix L includes the weekly SWPPP inspection reports.

4.4.2 SCB Slurry Wall QA/QC

QA/QC measures were implemented to ensure that the SCB Slurry Wall met design requirements and included visual monitoring as well as collection of real-time and analytical samples.

The following equipment was utilized for on-site quality control testing:

- Mud balances for density testing.
- Marsh funnels for slurry viscosity measurement.
- Sounding tape or cable for trench depth measurement.
- pH meter
- 3” by 6” cylinder molds

Field and analytical QA/QC samples were collected by the Contractor and AECOM respectively, from the batch plant and from the trench as shown in Table 4-4. Additionally the following QC was performed by the Contractor during the construction of the SCB Slurry Wall:

- The SCB Slurry level was kept at grade within the trench by construction of berms. The trench was visually inspected every hour during work hours and twice during non-work hours to ensure the SCB slurry level. The trench was promptly filled with additional slurry if the level was observed to have gone below grade.
- The field QC equipment was calibrated once a week.
- Slurry levels were noted at the end of the shift and compared to the levels at the beginning of the next shift to confirm there was no loss of slurry.

AECOM and the Contractor’s field QA/QC forms are included in Appendix M.

SCB Slurry for performance monitoring was collected from the trench at the top, mid-height, and bottom of the trench. Samples were collected using the long reach excavator bucket for both field and analytical testing.

The following QA was conducted by AECOM:

Step 1 – Verify Amounts of Additives Added to Each Batch Based on Depth of SCB Slurry Wall. Compliance with the approved slurry mixture was confirmed by measuring the amount of GGBFS, cement, bentonite, and water used for each batch of slurry. In addition to the contractor's measurements, AECOM verified pH, viscosity, and specific gravity of the slurry as mixed at the batch plant twice per day. These values were recorded on the Slurry Tracking Form. AECOM ensured that the slurry mixture meets requirements by verifying the QA/QC reports submitted by the Contractor.

Step 2 – Collect Depth-Representative Samples for Evaluation of Slurry. The Contractor collected depth-representative samples for every 250 cubic yards of trench section constructed. The location within the trench was randomly selected within each section to insure that no bias was introduced in the sampling. The long arm excavator was used to collect samples from the top, middle, and bottom of the trench.

Step 3 – Visually Inspect the Samples for Mixing and Consistency. After the samples are collected, they were placed in 5-gallon buckets and transported to the SCB Slurry Wall sampling area where they were evaluated. AECOM performed the evaluation by spreading the samples over a light-colored piece of plastic and inspecting them for their degree of mixing. To qualitatively and quantitatively evaluate the degree of mixing of the samples the following criteria were used: color, homogeneity, absence of saturated NAPL, and pH. These criteria are explained below.

Color: The color of the SCB Slurry Wall samples was grayish. A standard Munsell chart was used to determine the color of the samples for enhanced reproducibility.

Homogeneity: The treated material in each sample was inspected visually for overall mixing, *i.e.*, the slurry was a homogeneous mass free from large lumps or pockets of fines, sand or gravel. All samples were homogenous in nature.

Absence of Saturated NAPL: NAPL was observed during the inspection of some samples.

pH: The pH of the treated material from each depth interval was measured in the field using short (6-9) and medium (9-12) range pH strips. All samples had a pH greater than 10.5 standard units (S.U.).

Step 4 – Composite Samples. Once samples from a section had passed the evaluation in Step 3, they were considered uniformly mixed, indicating that samples from each depth were equivalent. AECOM then prepared a single composite sample made up of equal quantities of mixed soil from each level to generate a single sample representative of all depths of the sampled column. The samples were composited in a 10-gallon bucket. At least 6 molded specimens in 3-inch by 6-inch cylinders were made from the composite sample and archived for further testing at a later time as explained below.

Step 5 – Measure Permeability and Unconfined Compression. Following 14 days of curing, the samples prepared in Step 4 were sent to Geotesting Express, Inc., for geotechnical analysis. The geotechnical tests included Unconfined Compressive Strength (UCS) and permeability testing. Table 4-5 presents the Permeability and UCS results. The threshold value to pass the UCS was 50 psi and permeability was 10^{-6}cm/s. All samples passed the geotechnical criteria.

Each sample was photographed with a digital camera for documentation. The inspection forms are included in Appendix M. All the samples passed the field inspection criteria and no section had to be reconstructed.

4.4.3 Waste Management

4.4.3.1 Soil and C&D Debris

To the extent possible, wastes generated during excavation were loaded directly into trucks for off-site transportation. However, contaminated excavated soils were transported by loader from the excavation areas to the stockpile area within the TFS when necessary. To the extent practicable stockpile areas were located over areas to be excavated, negating the need for liners and berms. If stockpile areas were placed in unimpacted or restored areas, berms and liners were used to protect underlying materials from becoming impacted. The stockpiles were covered with weighted tarp at the end of each work day to prevent washing in unexpected rain event, spread of dust due to wind, and odors outside the perimeter of the Site. Odor suppressant foam was also used as needed. Spoils generated during the SCB Slurry Wall construction and soils that were excavated wet, such as following a heavy storm event or due to infiltration of groundwater in the excavation hole, were staged to remove excess moisture. Soils that were too wet for shipment (greater than approximately 20% moisture content) were amended with a drying agent (LKD) or staged on-site to allow the moisture content to be reduced to < 20% through draining or evaporation.

On-site storage occurred in accordance with all laws and regulations dealing with the type of waste being stored. Liquid wastes were stored in appropriate tanks or drums. Other (non-soil) solid materials were stored in roll-off containers or covered stockpiles. Debris generated during demolition and excavation was broken down or cut into pieces suitable for disposal. For subsurface structures, all debris greater than the acceptable to the thermal treatment facility, were segregated for disposal at the approved debris landfill. All debris of a size acceptable to the thermal treatment facility or smaller were excavated with the soil for transportation to the approved soil disposal facility.

Soils not meeting Toxicity Characteristics Leachability Protocol (TCLP) requirements for lead were shipped to a thermal treatment facility permitted to accept such soils. Soils shipped out of state were handled and disposed in compliance with the regulations of the receiving state.

Excavated materials were transported in dump trucks to the receiving facilities. Only permitted waste transporters in the State of New York were used. The trucks were inspected and lined with 6-mil polyethylene liner prior to placement of contaminated soils. The poly was then sealed at the top to make a burrito wrap to prevent dust or liquid from spreading along the transportation route. The trucks were power washed and decontaminated before leaving the Site to prevent spread of contamination on the roadways. Transportation of impacted materials from the Site was performed in accordance with all hazardous waste and transportation regulatory requirements and in accordance with the Odor, Vapor, and Dust Control Plan and the Transportation Plan detailed in Section 4.1.7. Hazardous waste shipments were documented using standard hazardous waste manifests as required by applicable hazardous waste regulations. Other waste materials that have no specific documentation requirements were documented using waste tracking forms, bills of lading, and receipts. All shipments of waste from the Site were documented, describing the type and amount of waste and the receiving facility.

Three facilities were used for the thermal desorption and disposal of impacted soil from the Site.

These included:

1. Bayshore Soil Management, LLC, located at 75 Crows Mill Rd., Keasbey, NJ 08832.
2. Clean Earth of Southeast Pennsylvania, 7 Steel Road East, Morrisville, PA 19067.
3. Clean Earth of North Jersey, 115 Jacobus Avenue, Kerney, NJ 07032

4.4.3.2 Construction Water

All construction water generated during this RA as a result of C&D debris decontamination, equipment and personnel decontamination, operation of a dewatering system to support saturated zone excavation, and removal of precipitation was collected, treated, and sampled prior to ultimate disposal to a storm sewer in accordance with the SPDES Permit Equivalency.

Water samples were collected and submitted to H2M Labs, Inc. for analysis to ensure that the treated water met the SPDES Permit Equivalency limits. A summary table of the water analytical results is presented as Table 4-6, and the laboratory analytical reports are included in Appendix E. A DUSR was prepared for the effluent sampling data generated and is included in Appendix E.

Following treatment, the water was sampled and discharged, in compliance with NYSDEC requirements via sewer connection to the Upper New York Bay. A total of 1,941,847 gallons of water was treated and discharged in accordance with the SPDES permit.

All sediment, coal tar residue, or other solid materials/sludge generated by water management was shipped with Site soils to an approved thermal treatment facility. 41,980 gallons of water that contained hazardous levels of benzene were transported and disposed of at the Clean Earth of North Jersey facility.

4.4.4 Traffic and Truck Management

The Transportation Plan, Appendix E of CERP [AECOM, 2011] was strictly adhered to during the RA.

The trucks were loaded directly from excavations, or from an on-site stockpile area to ensure impacted material did not spread throughout the Site. When excavation was performed inside the TFS, the trucks entered the structure for loading to prevent the release of odors. As per the requirements of the Transportation Plan, each truck was lined with 6-mil-thick polyethylene sheeting prior to loading. A plastic liner was also wrapped over loaded soils to minimize odors during transport. No soils with free liquids were shipped from the Site. Odor-suppressing foam was applied to the material on the trucks, when excavation and loading was performed outside the TFS. All trucks were covered with a tarpaulin prior to leaving the Site to ensure that no material was blown off the truck during transportation and to minimize the release of odors. Each truck was dispatched from the Site with the appropriate bill-of-lading or manifest, and followed the prescribed transportation route to its destination. After loading, all trucks entered a decontamination pad where pressure washing and wet decontamination ensured that any residual soil was removed from the truck body, wheels, and tires and impacted soils did not track onto the streets.

Trucks were not allowed to be staged on the streets adjoining the Site, or in other residential areas awaiting entrance into the loading area. Trucks were staged on the Site while waiting for loading if space was available. The Contractor coordinated careful arrival of truck to avoid congestion in the neighborhood.

Trucks were allowed to backhaul backfill following offloading of impacted soils. Frequent and surprise inspections were carried to ensure that each truck bed was cleaned prior to use for transportation of backfill. Backfill samples from the truck bed were collected to confirm there was no cross contamination.

A specific haul route to the disposal facilities was given to the transport company to eliminate truck traffic through the nearby residential areas. Haul routes were mapped and posted on the wall inside the site trailer.

The code of conduct detailed in the Transportation Plan was adhered to by all truck drivers.

4.4.5 CAMP Results

There were no measurements of particulates or odors above the action level for a 15-minute period that were associated with intrusive activities during remedial operations. There was one measurements of TVOC above the action level during ground intrusive trenching activity northwest of the TFS. The construction manager was notified and intrusive work activity in the trench was halted. The contractor tarped the bottom of the trench and applied foam, as a mitigation control measures to abate the emissions, which reduced TVOC levels back below the action level.

CAMP monitoring did measure a number of particulate detections that exceeded the action level for over a 15-minute period that were related to non-intrusive activities. These detections were associated with exhaust from construction equipment or off-site activities such as traffic along the Bay Street and Willow Avenue. The most frequent occurrences of the elevated particulate levels were measured at air monitoring stations located along Bay Street. A number of the detections also occurred at times when there were no remedial activities or were related to third party activities and not site operations. Thus, these detections appear to be common occurrences in the urban environment.

Laboratory testing of the ambient air showed that only low levels of VOCs common to both petroleum products and exhaust were detected. The laboratory results also confirmed the veracity of real-time fixed station and supplemental TVOC monitoring results.

A CAMP Summary Report for Remedial Activities which includes detailed discussion of the implementation of the CAMP and provides the air monitoring results of the CAMP are provided in Appendix C.

Copies of all field data sheets relating to the CAMP are provided in electronic format in Appendix C.

4.4.6 Odor, Vapor, and Dust Controls

A three-tiered set of controls were implemented during the remedial action as per the NYSDEC approved Odor Vapor and Dust Control Plan, Appendix B of CERP [AECOM, 2011].

4.4.6.1 Level I

Level 1 Controls implemented during the remedial action involved physical controls, site layout, and scheduling.

Physical Controls

The simplest form of physical control was the use of an 11 foot high temporary perimeter fence and placement of a visual barrier plywood or cloth on the temporary perimeter fencing. A temporary jersey barrier with chain link wood barrier was installed as the perimeter fence around the southern and eastern site perimeter along the Willow Avenue and Bay Street to help control dust, prevent horizontal migration of odors and noise, elevate the discharge point of emissions of vapors to facilitate dispersion, minimize effect of vapors on downwind receptors, and limit visibility of the RA. The resistance caused by the visual barrier elevated the discharge point of emissions leaving the Site to the top of the perimeter fence and promoted better mixing and dispersion.

Another form of simple physical control was the required use of 6-inch liners and tarps on trucks used to transport impacted material. All trucks used for off-site transport had liners and tarps in place to cover impacted material. On-site haul routes were routinely wetted to control dust using a hose, sprinkler, or dedicated water truck. All stockpiles of impacted material were covered, if left inactive for a period of more than 2 hours.

The most noticeable physical control used was the TFS which was an aluminum framed structure with a polyethylene fabric skin, much resembling a tent. Most of the excavation was carried out under TFS except for a limited area in the western and northern portion of the Site as shown on Figure 4-1A. The TFS provided VOCs, dust, and odor during excavation of impacted materials. Once erected, the TFS was equipped with an Air Handling System (AHS) designed and manufactured by Encotech, which consisted of two 10,000 cubic feet per minute (CFM) blower units and two 12,500 pounds (lb.) activated carbon vessels. The AHS allowed for six air changes per hour and maintaining a negative pressure within the TFS. The air contained within the TFS was removed from the structure and treated through activated carbon vessels prior to discharge to the atmosphere. The discharge from the carbon beds was monitored daily for VOCs to confirm that the treatment system is working properly. The exterior of the TFS was monitored for odor as the work was performed.

Engineering controls in the form of odor suppressant foam, small excavation areas, and polyethylene sheeting were utilized during the excavation of areas not performed under the TFS to control odor, vapor, and dust. The excavation was performed with minimal odor complaints from the nearby residents or businesses.

Site Layout

The dispersion of fugitive emissions was controlled by reducing their impact on the community by generally increasing the distance from the Site perimeter as well as adapting to meteorological conditions. The batch plant for SCB wall was located in the northeastern portion of the Site away from receptors as to reduce the potential for cement and bentonite dust to reach the perimeter fence line. Additionally, the bentonite loading silo was covered with a fabric to contain dust. Stockpile areas, when possible, were placed either downwind or significantly upwind of off-site receptors. The height of the stockpiles near the fence line (within 100 feet) were kept lower than the top of the perimeter fencing (11 feet) to utilize the benefit of the barrier cloth.

Scheduling

Every effort was made to minimize the amount of time that impacted material was staged on-site. Prior to mobilization, a full Site pre-characterization investigation was performed including sampling and analysis of soils, and approval from the facility for disposal. This allowed for direct loading of most soils and the minimization of stockpiling. Efficient scheduling/coordination of operations also limited the impact of active emission sources.

4.4.6.2 Level II

The following Level II controls were implemented during the remedial action:

Suppressing Agents

Odor suppressants for VOC mitigation and water spray for dust suppression were applied over emissions sources for controlling emissions. Odor suppressant foam, Rusmar AC-900, was created by the injection of air into a foam concentrate/water mixture using a Pneumatic Foam Unit. For open air excavations, a second odor suppressant, BioSolve, was also applied. The odor suppressants were applied via a hose to cover active SCB Slurry Wall construction activities, excavations/stockpiles, and during the loading of trucks to a depth of 3 to 6-inches to control VOC and odor emissions. An automated odor suppressant misting system was also utilized near the door of the TFS and at the perimeter of the Site as needed during active remediation to prevent odors from leaving the Site. The system was damaged in the Hurricane Sandy and not replaced.

Spray of water was used to minimize the amount of dust created.

Tarps

Tarps provided effective control for source areas that were likely to be inactive for extended periods of time. Rolls of 6 to 10-mil polyethylene were used to cover inactive stockpiles outside of the TFS as well as any open excavations. Tarps were also be used for covering exposed soils loaded into trucks. All trucks were lined with 6-mil polyethylene sheeting, the liners large enough to overlap and fully cover the top of the load. Additional automatic mesh tarps were used to secure the liners.

4.4.6.3 Level III

Level III controls were implemented when Level II controls were exhausted and ambient concentrations of emissions had potential to continue to exceed the site-specific action levels.

Level III procedures were employed during the tar separator excavation and following Hurricane Sandy.

Production/Schedule

The excavation rate was decreased to reduce the surface area of disturbed media during the removal of the tar separator contents. These activities resulted in smaller source areas that were more effectively controlled using Level II techniques.

Meteorological Conditions

The wind direction during the tar separator excavation was east west resulting in potential of odor migration to downgradient receptor. The entrance to the TFS was moved during the removal of tar separator contents to increase the distance between stockpiled impacted soils within the TFS to the nearest downwind receptor.

Relocation of Activities

Following Hurricane Sandy, implementation of Level I and Level II controls was not effective and the activities were halted. The remedial activities were ceased and moved to lesser impacted areas until the measures were taken to seal the TFS, operate the AHS, and keep the odor suppressant foam ready near the excavation.

4.4.7 Noise Monitoring Results

A total of six noise monitors were placed within and adjacent to the Site to monitoring noise resulting from the RA. No exceedances of the Noise Threshold Limits were recorded during the baseline conditions. Noise levels were not recorded above the Stop Action Limits at the noise monitors N1, N2, or N3, located near the Lyndhurst residences, Bay Street store building, and near 66 Willow Avenue, respectively. Noise levels above Stop Action Limit were recorded at monitor N4, located near 105 Willow Avenue on December 5, 2012 and December 13, 2012 during sidewalk restoration and/or due to truck traffic during restoration. Levels above Stop Action Limit were also recorded at monitor N5, located near Hess Gas Station on June 8, 2012, September 26, 2012, and October 12, 2012 during demolition activities of the one-story building, shallow excavation near the monitor, and relocation of the TFS, respectively. Noise levels above Stop Action Limit was recorded at monitor N6, located near the TFS On January 5, 16, 17, and 21, 2013 due to excavation within the TFS or during relocation of the TFS, and December 13, 2012 during sidewalk restoration and/or due to truck traffic during restoration.

Monitoring events exceeding Stop Action Limits are summarized Appendix N with the noted causes. These events are incidental and lasted for relatively short duration causing temporary effects. Moreover, because each monitor is placed along the property boundary, the places where human activities would occur are further away experiencing less noise effects.

4.4.8 Vibration and Settlement Monitoring Results

Five instantaneous events exceeded the Stop Action Limit as a result of the RA as summarized in Table 3 of Appendix N. Appendix N also summarizes all events recorded to exceed the Warning Limit over the entire monitoring period and provides histogram plots for all stop action vibration levels achieved during entire remedial work.

No measureable settlement was recorded on any street or storm drain during the RA implementation. Records of daily, weekly, and month settlement monitoring are provided in Appendix N.

4.4.9 Problems Encountered

No issues arose during the RA as a result of public complaints. The major problems faced during the RA include –

- Hurricane Sandy – The Site was located directly in the path of Hurricane Sandy and as result was flooded with 4 to 5 feet of water. The impact of the wind and flood water resulting in ripping of the TFS fabric cover, extensive damage to fence and equipment, and localized flooding. The construction schedule was delayed by six weeks as a result of Hurricane Sandy. The primary mitigation after the hurricane was to restore the Site security fence. This was followed by the repair of the TFS, removal of damaged equipment, and removal of localized flood waters.
- Permitting – the RA sequence and schedule was modified due to the delays in procurement of NYCDOB demolition permit and NYCDEP discharge permit. Demolition of the single-story commercial building, shallow excavation, and SCB Slurry Wall construction was carried out simultaneously to prevent extensive schedule delays.
- Utilities – special protection measures were implemented during excavation and SCB Slurry Wall construction to account for the proximity of the overhead electric lines, subsurface high pressure gas main, and storm drain.

4.5 Deviations from the Remedial Action Work Plan

The following major variations or deviations from the approved RD Work Plan and Contract Documents were implemented during the RA.

4.5.1 SCB Slurry Wall Alignment

- The original design (Figure 4-1A) called for the removal and replacement of the storm drain located on Site and removal of soils adjacent and below the storm drain. The original design was modified to allow the storm drain to be protected in place and excavation limited to a 15 feet buffer around the storm drain as shown in Figure 4-1B. Approximately 2,000 cubic yards of soil will be excavated at a future time as a result of this change. The slope of the buffer zone was lined to prevent contamination of clean fill placement in the excavation areas. The change also resulted in installation of a concrete block that encapsulated the storm drain intersecting the SCB Slurry Wall along Bay Street. The concrete block ensured an uninterrupted SCB Slurry Wall and protected the storm drain from cracks and breaks. The top 2 feet of the storm drain buffer were excavated and backfilled with clean fill in accordance with the ROD.

- The SCB Slurry Wall alignment along Willow Avenue was moved 5 feet south of the original alignment as shown in Figure 4-1C. The Tar separator location was adjusted north based on field verification. As a result, the SCB Slurry was re-aligned to allow installation south of the Tar Separator rather than through the structure.

- The eastern portion of the SCB Slurry Wall along Willow Avenue was realigned north of the original alignment as shown in Figure 4-1D to prevent damage to an 8-inch high pressure gas main. Significant sloughing of sands (likely pipe bedding material) from the southern side of the excavation wall adjacent to the gas main was observed during the pre-trenching operations along an 8-inch gas main on Willow Avenue. The SCB Slurry Wall alignment was revised to protect any damage to the 8-inch gas main and gas valve.

- The SCB Slurry Wall alignment along Willow Avenue was moved 3 feet north of the original Design alignment except for the southeastern potion which was realigned to avoid impact to underground gas lines. On May 29, 2012, National Grid's remediation subcontractor attempted installation of the Willow Avenue Barrier CBW, at the location shown on Figure 4-1D. This alignment was closer to Willow Avenue than the original alignment (shown on Figure 4-1A). As a result of the attempted Barrier CBW installation, a nearby electric pole shifted and a portion of the Willow Avenue sidewalk collapsed into the trench. The realignment was recommended by National Grid's subcontractor to prevent additional damage to City infrastructure.

The final SCB Slurry Wall alignment is shown on Figure 4-4.

4.5.2 SCB Slurry Wall Boulder

On May 21, 2012 the SCB Slurry Wall subcontractor encountered an obstruction along the northern limit of the Bay Street SCB Slurry Wall - Barrier. Based on the observations of the excavator operator, the obstruction appeared to be a large boulder. The boulder measured 12 feet tall by 8 feet long by approximately 12 feet wide. Multiple efforts were completed to remove the boulder. Due to the rigorous efforts associated with attempted obstruction removal, 1.5 feet of settlement occurred within

the excavator's working platform. Due to the settlement, the attempt to remove the obstruction was halted for the day.

On May 22, 2012, the subcontractor attempted to access and remove the boulder from 6 feet north of the northern limit of the SCB Slurry Wall - Barrier (Station -0+06 to 0+00). The excavator operator was able to locate the bottom of the boulder, but was still unable to remove it from the trench. Care was taken to not extend the SCB Slurry Wall - Barrier below the design elevation to avoid entering the Staten Island Railroad (SIRR) Zone of Influence. The excavator operator was able to remove material and install the SCB Slurry Wall below the boulder. The SCB Slurry Wall was completed to the design elevation to the south of the boulder, with additional SCB Slurry Wall installed to the north as shown in as-built Figures 4-4 and 4-5. As-built elevation measurements could not be collected below the boulder. Based on the excavator bucket positioning and the amount of soil removed from below the boulder, AECOM infers that the SCB Slurry Wall design elevation was achieved below the boulder.

4.5.3 Former Tar Separator Removal

The foundation and walls of the former Tar Separator located along Willow Avenue on the southwest portion of the Site were approximately 18 inches thick and made of reinforced concrete. The heavy reinforcement and thickness made the removal of the foundation and walls of the tar separator was very difficult. Additionally the walls provided structural stability to the SCB Slurry Wall trench, excavation, and to the storm drain located to the west of the tar separator. As a result the south wall, portions of the west wall, approximately 15 feet of the north wall, portions of three internal baffles, and approximately 20 feet by 10 feet of the foundation were left in place. The east wall, portion of the northern wall, and portions of the foundation of the Tar Separator were removed. The portions of the tar separator left in place were cleaned via pressure washing the walls and foundation with water and spraying of BioSolve^{tm}, a biodegradable surfactant, to remove any residual NAPL. Water and BioSolve^{tm} mix were pumped out from the tar separator and discharged to the on-site waste water treatment system for treatment.

4.5.4 Dewatering Wellpoint Installation

A well point system was initially designed to dewater the excavation areas. Moretrench, a dewatering subcontractor, was retained by Sevenson to install the dewatering well point system. Moretrench had difficulty installing the well points due to subsurface obstructions and structures. Additionally due to uncharacteristic dry weather the water table was depressed to 8 to 12 feet bgs in certain areas of the Site. As a result the Dewatering Plan using well points was abandoned and dewatering was achieved via multiple localized sumps installed around and within the excavation areas.

The sumps consisted of slotted 12-inch pipe wrapped with geotextile fabric and 2-inch clean stone placed around the pipe. The sumps were plumbed to a temporary waste water treatment plant constructed at the 40 Willow Avenue property. The sumps were removed and reinstalled as excavation progressed, along with the TFS moves. Extra sump pumps were used as necessary to maintain water level below the excavation depth. Excavation and backfill activities were conducted once the sump pumps had operated for a sufficient time to achieve the necessary drawdown.

4.5.5 Stormwater Bypass System

The original design (Figure 4-1A) called for the removal and replacement of the storm drain located on Site and removal of soils adjacent and below the storm drain. The original design was modified to allow the storm drain to be protected in place and excavation limited to a 15 feet buffer around the storm drain as shown in Figure 4-1B. As a result the stormwater bypass system specified in the

Remedial Design was no longer required. Instead two 6-inch pumps were installed for the bypass system. The bypass pumping system was to be utilized during rain events that created flood conditions at the western end of the project. The bypass pumping system was utilized on August 15th 2013 during an inclement rain event in an effort to reduce flooding onsite.

4.5.6 Extent of Excavation

As shown in Figure 4-7, the lateral and vertical limits of shallow excavation were extended on the northern and southeastern portion of the Site. The excavation was extent to remove visible impacts observed on the bottom and sidewall of the design excavations.

Additionally soils were over-excavated, to the extent possible, in deep excavation areas as shown in Figure 4-7 in areas where visual impacts were observed at the design excavation bottom. A total of 110, 651 tons of impacted soil were shipped off-site as opposed to the design volume of 100,178 tons.

4.5.7 Backfill Backhaul

Trucks were allowed to backhaul backfill following offloading of impacted soils at disposal facility. A Backfill Backhaul plan was developed that detailed the Contractor's backfill backhaul production rates and QA/QC measures implemented to prevent cross contamination.

Frequent and unannounced inspections were carried to ensure that each truck bed was cleaned prior to use for transportation of backfill. Backfill samples from the truck bed were collected to confirm there was no cross contamination.

4.5.8 Site Soil Reuse

Approximately 2,000 cubic yards of visually clean sand fill was observed below the building foundation following demolition. The sand fill was sampled and analyzed in accordance with NYSDEC DER-10 and confirmed clean. The analytical data was submitted to the NYSDEC and approved following which the sand fill was reused as fill and placed below 5 feet bgs in the excavation.

4.5.9 DNAPL Recovery Well

Geoprobe borings were completed in February 2013 at select locations to confirm RI and pre-design investigation observations. Based on the observations collected from these borings and from observations collected during the RA activities, the following modifications were made to the DNAPL Recovery Well Installation design:

- One shallow recover well was removed from the eastern edge of the SCB Slurry Wall
- One intermediate recovery well was added in the vicinity of the former Purifier House footprint based on observed impacts
- The screen locations were modified
- The screen length on the intermediate well south of the SCB Slurry wall on Willow Avenue was extended to 20 feet to account for observed DNAPL lenses outside of the ten feet screen length

The final location and well construction details as shown on Figure 4-9 and 4-10 and in Table 4-2.

All variations to the RD Work Plan and Remedial Design were approved by the NYSDEC prior to implementation.

5.0 Conclusions

In summary, former Clifton MGP Site OU-2 remediation was successfully completed in compliance with the requirements of the ROD, RD Work Plan and the RD. Some notable accomplishments during the project were:

- Over 650 linear feet of SCB Slurry Wall was constructed as DNAPL Barrier Wall to a maximum depth of 50 feet bgs.
- Over 110,000 tons of impacted soil and debris was removed from the Site and transported to thermal treatment facility.
- Over 1,940,000 gallons of construction water was treated and discharged to the New York Harbor.
- The single-story commercial building was demolished and over 5,000 cubic yards of C&D debris generated. Approximately 60% of the C&D debris from the demolition was recycled as Fill Material.
- All former MGP structures and their contents were completely removed to the extent possible.
- Over 3,000 cubic yards of debris was generated from subsurface structures removal and transported off-site for disposal.
- A total of 46,265 cubic yards or 89,419 tons of backfill material and 3,141 cubic yards or 5,470 tons of gravel backfill material was transported to the Site and placed in the excavated areas.
- The geotechnical data on the SCB Slurry Wall samples met or exceeded the performance criteria established for the RA.
- 23 DNAPL Recovery wells were installed and developed.
- Over 265 days or a total of 95,000 hours were worked during implementation of the RA, with no OSHA recordable incidents or lost work days.
- The CERP Plan successfully minimized community impacts during the RA.
- The Site was covered with 6-inch gravel cover and restored to final design elevations.

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6.0 References

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PS&S, 2008. Remedial Action Completion Report for the Clifton Operable Unit 2, Offsite Area (89 Willow Ave), Former MGP Site, Staten Island, Richmond County, New York. December 2008.

Tables

Table 4-1
Summary of Backfill Analytical Samples and Comparison to Unrestricted SCOs
Former Clifton MGP Site - OU2
Staten Island, New York

Constituent	Allowable Constituents Level for Imported Fill, mg/kg NYSDEC DER-10		Sample Results, mg/kg					Site Sand Reuse, mg/kg						Site Sand Reuse, mg/kg				
			Common Fill		Backfill	Common Fill												
	Unrestricted	Restricted Commercial or Industrial	Bayshore Recycling - 1-040512	Grasselli Point IND-1-040512	Grasselli	Amboy-1-011013	Amboy Stockpile 011013	Site Sand Reuse-1-062912	Site Sand Reuse-2-062912	Site Sand Reuse-3-062912	Site Sand Reuse-4-062912	Site Sand Reuse-5-062912	Site Sand Reuse-6-062912	Site Sand Reuse-7-062912	Site Sand Reuse-8-062912	Site Sand Reuse-9-062912	Site Sand Reuse-10-062912	Site Sand Reuse-11-062912
Date			4/5/2012	4/5/2012	9/20/2012	1/10/2013	1/10/2013	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012	6/29/2012
Semivolatile Organic Compounds																		
Acenaphthene	20	98	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	100	107	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**0.47**	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	1	1	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	1.10	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	1	1	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**0.91**	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	1	1.7	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	1.10	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	100	500	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**0.48**	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	0.8	1.7	< 0.33	< 0.40	< 0.36 C	< 0.35	< 0.35	**0.45**	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Chrysene	1	1	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	1.10	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	7	210	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	0.33	0.56	< 0.33	< 0.40	< 0.25 C	< 0.350	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	500	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**2.20**	< 0.36	**0.49**	< 0.35	NA	NA	NA	NA	NA	NA	NA
Fluorene	30	386	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	0.5	5.6	< 0.33	< 0.40	< 0.36 C	< 0.35	< 0.35	**0.46**	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	12	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NS	NS	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38		NA	NA	NA	NA	NA	NA	NA
3/4-Methylphenol	NS	NS	NA	NA	< 0.36	< 0.35	< 0.35	NA	NA	NA		NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	0.8	0.8	< 0.84	< 1.00	< 0.69 C	< 0.880	< 0.88	< 0.90	< 0.91	< 0.95	< 0.88	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	500	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**1.7**	< 0.36	**0.42**	< 0.35	NA	NA	NA	NA	NA	NA	NA
Phenol	0.33	0.33	< 0.33	< 0.40	< 0.25	< 0.350	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Pyrene	100	500	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	**1.8**	< 0.36	**0.54**	**0.43**	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds																		
1,1,1-Trichloroethane	0.68	0.68	< 0.01 CS	< 0.012 CS	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,1,2,2-Tetrachloroethane	NS	NS	< 0.01	< 0.012	NA	< 0.011 C	< 0.011 C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	0.27	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,1-Dichloroethene	0.33	0.33	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,2,4-Trichlorobenzene	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011 C	< 0.011 C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NS	NS	< 0.01 C	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	1.1	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,2-Dichloroethane	0.02	0.02	< 0.01	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
cis-1,2-Dichloroethene	0.25	0.25	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
trans-1,2-Dichloroethene	0.19	0.19	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,2-Dichloropropane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	2.4	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< NA	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,4-Dichlorobenzene	1.8	1.8	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< NA	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,4-Dioxane	0.1	0.1	< 0.25 C	< 0.30 C	< 0.28 C	< 0.27	< 0.27	< 0.32 C	< 0.31 C	< 0.26 C	< 0.28 C	< 0.32 C	< 0.31 C	< 0.31 C	< 0.31 CS	< 0.32 C	< 0.32 C	< 0.27 C
2-Butanone	NS	NS	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013 C	< 0.012 C	< 0.011 C	< 0.011 C	< 0.013 C	< 0.012 C	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
2-Hexanone	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	0.05	0.05	< 0.01 C	< 0.012 C	< 0.011 C	< 0.011 C	< 0.011 C	< 0.013 C	< 0.012 C	**0.021** C	< 0.011 C	**0.022** C	**0.028** C	**0.024** C	**0.015** C	**0.013** C	**0.013** C
Benzene	0.06	0.06	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Bromodichloromethane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzene	12	12	NA	NA	NA	NA	NA	NA	NA	NA	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.013	< 0.011
Carbon disulfide	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.76	0.76	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Chlorobenzene	1.1	1.1	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Chloroethane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	0.37	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013 C	< 0.012 C	< 0.011 C	< 0.011 C	< 0.013 C	< 0.012 C	< 0.012 C	< 0.012 C	< 0.013 C	< 0.013 C	< 0.011 C
Chloromethane	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011 C	< 0.011 C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	NS	NS	< 0.01 CS	< 0.012 CS	NA	< 0.011 C	< 0.011 C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	1	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Hexachlorobenzene	0.33	3.2	< 0.33	< 0.40	< 0.36	< 0.35	< 0.35	< 0.36	< 0.36	< 0.38	< 0.35	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl tert-butyl ether	0.93	0.93	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013 CS	< 0.012 CS	< 0.011 CS	< 0.011 CS	< 0.013 CS	< 0.012 CS	< 0.012 CS	< 0.012 CS	< 0.013 CS	< 0.013 CS	< 0.011 CS
Methylcyclohexane	NS	NS	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	0.05	< 0.01 C	< 0.012 C	< 0.011	< 0.011 C	< 0.011 C	< 0.013 C	< 0.012 C	< 0.011 C	< 0.011 C	< 0.013 C	< 0.012 C	< 0.012 C	< 0.012 C	< 0.013 C	< 0.013 C	< 0.011 C
n-Propylbenzene	3.9	3.9	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Sec-Butylbenzene	11	11	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Tert-Butylbenzene	5.9	5.9	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Styrene	NS	NS	< 0.01	< 0.012	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	1.3	< 0.01 CS	< 0.012 CS	< 0.011	< 0.011 C	< 0.011 C	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Toluene	0.7	0.7	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
trans-1,3-Dichloropropene	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	0.47	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,2,4-Trimethylbenzene	3.6	3.6	< 0.01 C	< 0.012 C	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
1,3,5-Trimethylbenzene	8.4	8.4	< 0.01 CS	< 0.012 CS	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Trichlorofluoromethane	NS	NS	< 0.01 C	< 0.012 C	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	0.02	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011
Total Xylenes	0.26	1.6	< 0.01	< 0.012	< 0.011	< 0.011	< 0.011	< 0.013	< 0.012	< 0.011	< 0.011	< 0.013	< 0.012	< 0.012	< 0.012	< 0.013	< 0.013	< 0.011

Notes:

Exceedance of Unrestricted Use
Exceedance of Restricted Commercial/Industrial
Detection Limit is greater than SCOs

mg/kg - milligrams per kilogram

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

C - Calibration acceptability criteria exceeded for this analyte

S - Recovery exceeded control limits for this analyte

+ - ELAP/NELAC does not offer certification for this analyte
NA - Not Analyzed
NS - No Standard

(1) Per DER-10, the SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.

SCO's for organic constituents (volatile organic compounds, semivolatile organic compounds, and pesticides) are capped at 100 ppm for residential use, 500 ppm for commercial use, 1000 ppm for industrial use. SCOs for metals are capped at 10,000 ppm.

Table 4-1
Summary of Backfill Analytical Samples and Comparison to Unrestricted SCOs
Former Clifton MGP Site - OU2
Staten Island, New York

Constituent	Allowable Constituents Level for Imported Fill, mg/kg NYSDEC DER-10		Sample Results, mg/kg					Site Sand Reuse, mg/kg										
			Common Fill		Backfill	Common Fill												
	Unrestricted	Restricted Commercial or Industrial	Bayshore Recycling - 1-040512	Grasselli Point IND-1-040512	Grasselli	Amboy-1-011013	Amboy Stockpile 011013	Site Sand Reuse-1-062912	Site Sand Reuse-2-062912	Site Sand Reuse-3-062912	Site Sand Reuse-4-062912	Site Sand Reuse-5-062912	Site Sand Reuse-6-062912	Site Sand Reuse-7-062912	Site Sand Reuse-8-062912	Site Sand Reuse-9-062912	Site Sand Reuse-10-062912	Site Sand Reuse-11-062912
Date			**4/5/2012**	**4/5/2012**	**9/20/2012**	**1/10/2013**	**1/10/2013**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**	**6/29/2012**
Metals																		
Aluminum	NS	NS	**15,100**	**17,000**	NA	**1,890**	**6,770**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NS	NS	< 6.1	< 7.3	NA	< 6.34	**0.02** J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	13	16	< 1.0	< 1.2	< 1.10	**2.13**	**1.45**	**1.37**	**1.33**	< 1.14	< 1.06	NA	NA	NA	NA	NA	NA	NA
Barium	350	400	**163**	**236**	**134**	< 21.1	**46.5**	< 21.7	< 22	< 22.9	< 21.3	NA	NA	NA	NA	NA	NA	NA
Beryllium	7.2	47	< 0.5	< 0.6	< 0.55	< 0.53	< 0.53	< 0.54	< 0.55	< 0.57	< 0.53	NA	NA	NA	NA	NA	NA	NA
Cadmium	2.5	7.5	< 0.5	< 0.6	< 0.55	< 0.53	< 0.53	< 0.54	< 0.55	< 0.57	< 0.53	NA	NA	NA	NA	NA	NA	NA
Chromium, Hexavalent[1]	1	19	< 1.0	< 1.2	< 1.1	< 1.1	< 1.0	**2.0**	< 1.1	< 1.1	< 1.1	NA	NA	NA	NA	NA	NA	NA
Chromium, Trivalent	30	1,500	**46** +	**54.7** +	**26**	**6.14** +	**11.6** +	**4.49** +	**4.47** +	**3.79** +	**3.4** +	NA	NA	NA	NA	NA	NA	NA
Calcium	NS	NS	**10,500**	**3,470**	NA	**3,490**	**6,830**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NS	NS	**46**	**54.7**	**26**	**6.14**	**11.6**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	NS	NS	**15.5**	**18.6**	NA	< 5.28	**7.61**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	50	270	**112**	**31.3**	**16.2**	< 2.11	**23.0**	**11.6**	< 2.76	**4.85**	**3.45**	NA	NA	NA	NA	NA	NA	NA
Cyanide, Total	27	27	< 0.51	< 0.60	< 0.54	< 0.52	< 0.52	< 0.54	< 0.55	< 0.57	< 0.53	NA	NA	NA	NA	NA	NA	NA
Iron	NS	NS	**26,300**	**29,700**	NA	**6,790**	**13,700**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	63	450	**5.9**	**5.7**	**14.6**	**3.69**	**2.92**	**29.9**	**1.3**	**4.81**	**3.18**	NA	NA	NA	NA	NA	NA	NA
Magnesium	NS	NS	**7,910**	**8,840**	NA	**1,150**	**3,910**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	1,600	2,000	**201**	**295**	**253**	**60.0**	**113**	**75.3**	**35.2**	**36.9**	**52.8**	NA	NA	NA	NA	NA	NA	NA
Mercury	0.18	0.73	< 0.20	< 0.24	< 0.22	< 0.21	0 J	< 0.22	< 0.22	< 0.23	< 0.21	NA	NA	NA	NA	NA	NA	NA
Nickel	30	130	**28.8**	**29.8**	**25.2**	< 4.23	**13.6**	**10.7**	< 4.41	< 4.58	< 4.25	NA	NA	NA	NA	NA	NA	NA
Potassium	NS	NS	**7,770**	**11,800**	NA	**671**	**2,110**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	3.9	4	< 0.5	< 0.6	< 0.55	< 0.53	**0.51** J	< 0.54	< 0.55	< 0.57	< 0.53	NA	NA	NA	NA	NA	NA	NA
Silver	2	8.3	< 1.0	< 1.2	< 1.10	< 1.06	< 1.06	< 1.09	< 1.1	< 1.14	< 1.06	NA	NA	NA	NA	NA	NA	NA
Sodium	NS	NS	< 506	< 604	NA	**703**	**974**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	NS	NS	< 1.0	< 1.2	NA	< 1.06	< 1.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	NS	NS	**45.7**	**56.6**	NA	**7.82**	**20.3**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	109	2,480	**79.4**	**84.6**	**63.2**	**14.2**	**30.3**	**23.8**	**12.1**	**12**	**10.1**	NA	NA	NA	NA	NA	NA	NA
PCBs/Pesticides																		
4,4'-DDE	0.003	17	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.003	47	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
4,4'-DDD	0.003	14	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
Aldrin	0.005	0.19	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	0.02	0.02	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Beta-BHC	0.036	0.09	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	**0.0026**	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.094	2.9	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	**0.027**	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	0.04	0.25	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.005	0.1	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	2.4	102	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	2.4	102	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	2.4	200	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
Endrin	0.014	0.06	< 0.0033	< 0.0040	< 0.0036	< 0.0035	< 0.0035	< 0.0036	< 0.0036	< 0.0038	< 0.0035	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.042	0.38	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	**0.0025**	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.1	0.1	< 0.0017	< 0.0021	< 0.0019	< 0.0018	< 0.0018	< 0.0018	< 0.0019	< 0.0019	< 0.0018	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NS	NS	< 0.0033	< 0.0040	< NA	< 0.0035	< 0.0035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NS	NS	< 0.0033	< 0.0040	< NA	< 0.0035	< 0.0035	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NS	NS	< 0.0017	< 0.0021	< NA	< 0.0018	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NS	NS	< 0.0017	< 0.0021	< NA	< 0.0018	< 0.0018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NS	NS	< 0.0017	< 0.0021	< NA	< 0.018	< 0.018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NS	NS	< 0.170	< 0.210	< NA	< 0.180	< 0.180	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polychlorinated biphenyls	0.1	1																
Aroclor 1016	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Aroclor 1221	NS	NS	< 0.068	< 0.081	< 0.0074	< 0.071	< 0.071	< 0.073	< 0.074	< 0.076	< 0.071	NA	NA	NA	NA	NA	NA	NA
Aroclor 1232	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Aroclor 1242	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Aroclor 1248	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Aroclor 1254	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Aroclor 1260	NS	NS	< 0.033	< 0.040	< 0.0036	< 0.035	< 0.035	< 0.036	< 0.036	< 0.038	< 0.035	NA	NA	NA	NA	NA	NA	NA
Herbicides																		
2,4,5-T	NS	NS	< 5.1	< 6.0	NA	< 0.0053	< 0.0053	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-TP (Silvex)	NS	NS	< 5.1	< 6.0	**63**	< 0.0053	< 0.0053	< 0.0054	< 0.0055	< 0.0057	< 0.0053	NA	NA	NA	NA	NA	NA	NA
2,4-D	NS	NS	< 10	< 12	NA	< 0.011	< 0.011	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dicamba	NS	NS	< 3.0	< 3.6	NA	< 0.0032	< 0.0032	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Exceedance of Unrestricted Use

Exceedance of Restricted Commercial/Industrial

Detection Limit is greater than SCOs

mg/kg - milligrams per kilogram

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

C - Calibration acceptability criteria exceeded for this analyte

S - Recovery exceeded control limits for this analyte

+ - ELAP/NELAC does not offer certification for this analyte

NA - Not Analyzed

NS - No Standard

(1) Per DER-10, the SCO for Hexavalent or Trivalent Chromium is considered to be met if the analysis for the total species of this contaminant is below the specific SCO for Hexavalent Chromium.

SCO's for organic constituents (volatile organic compounds, semivolatile organic compounds, and pesticides) are capped at 100 ppm for residential use, 500 ppm for commercial use, 1000 ppm for industrial use. SCOs for metals are capped at 10,000 ppm.

Table 4-2
DNAPL Recovery Well Construction Details
Former Clifton MGP Site OU-2
Staten Island, New York

DNAPL Recovery Well I.D.	Ground Surface Elevation *	Top of Vault Elevation	Top of Riser Pipe Elevation	Depth of Well (feet bgs)	Screen Interval	TOS (feet bgs)	BOS (feet bgs)	Diameter (inches)	TOS_elev	BOS_elev	Protective Casing	Riser Type	Screen Type	Screen slotted size/ diameter (inches)	Sump Type	Sump Length (feet)
RW-200S	9.2	9.57	NM	23	10.0 - 20.0	10	20	4.0	-0.8	-10.8	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-200I	9.2	9.58	NM	37	24.0 - 34.0	24	34	4.0	-14.8	-24.8	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-201S	9.2	9.57	8.77	29	14.0 - 24.0	14	24	6.0	-4.8	-14.8	Flush-Mount	PVC	Wire Wrap SS	0.02/6.0	SS	5.0
RW-201I	8.9	9.37	8.6	37.5	22.5-32.5	23	33	6.0	-13.6	-23.6	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	5.0
RW-202S	9.85	9.94	9.64	25	10.0 - 20.0	10	20	6.0	-0.2	-10.2	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	5.0
RW-202I	9.85	9.85	9.48	42	27.0 - 37.0	27	37	6.0	-17.2	-27.2	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	5.0
RW-203S	9.3	9.16	8.67	27	14.0 - 24.0	14	24	4.0	-4.7	-14.7	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-203I	9.3	9.14	8.54	37	24.0 - 34.0	24	34	4.0	-14.7	-24.7	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-204I	9.12	9.35	8.6	43	30.0 - 40.0	30	40	4.0	-20.9	-30.9	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-205D	8.75	8.82	8.18	77	64.0 - 74.0	64	74	4.0	-55.3	-65.3	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-206S	8.6	9.02	8.26	28	15.0 - 25.0	15	25	4.0	-6.4	-16.4	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-206IA	8.6	9.05	8.15	48	35.0 - 45.0	35	45	4.0	-26.4	-36.4	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-206IB	8.55	9.13	7.63	58	45.0 - 55.0	45	55	4.0	-36.5	-46.5	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-207S	8.5	8.8	8.15	23	10.0 - 20.0	10	20	4.0	-1.5	-11.5	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-207I	8.5	8.77	8.23	33	20.0 - 30.0	20	30	4.0	-11.5	-21.5	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-208S	8.27	8.53	7.81	23	10.0 - 20.0	10	20	4.0	-1.7	-11.7	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-208I	8.27	8.52	7.23	42	29.0 - 39.0	29	39	4.0	-20.7	-30.7	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-209S	8	8.48	7.63	30	15.0 - 25.0	15	25	6.0	-7.0	-17.0	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	5.0
RW-209I	8	8.28	7.69	40	25.0 - 35.0	25	35	6.0	-17.0	-27.0	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	5.0
RW-210S	7.6	7.85	7.3	28	15.0 - 25.0	15	25	4.0	-7.4	-17.4	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-210I	7.6	7.93	7.32	38	25.0 - 35.0	25	35	4.0	-17.4	-27.4	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-211S	8.5	8.74	7.15	29	6.0 - 26.0	6	26	4.0	2.5	-17.5	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0
RW-211I	8.5	8.76	7.23	43	30.0 - 40.0	30	40	4.0	-21.5	-31.5	Flush-Mount	PVC	Wire Wrap SS	0.02/4.0	SS	3.0

* - Derived from the nearest surface elevation from final as-built survey
NM - Not measured
ft bgs - feet below ground surface

= Shallow recovery wells
= Intermediate recovery wells
= Deep recovery wells

Table 4-3A
Remedial Action Waste Removal Summary
Former Clifton MGP Site OU-2
Staten Island, New York

Waste	Facility							Total
	Bayshore	CESP	CENJ	GROWS	Action	Balemet	EQ Detroit	
SCB Slurry Wall Soils								
# Trucks	455							455
Weight (tons)	13,968							13,968
MGP Soils								
# Trucks	3,233	258						3,491
Weight (tons)	90,872	5,522						96,394
Hazardous Lead Soil								
# Trucks			10					10
Weight (tons)			289					289
C&D Debris								
# Trucks				11	39	40		90
Weight (tons)				185	346	279		810
DNAPL Drums								
# Drums							1	1
Volume (gallons)							25	25
Hazardous Water (Benzene)								
# Trucks			8					8
Volume (gallons)			41,980					41,980
Corrosive Liquid UN3254								
# Drums							1	1
Volume (gallons)							55	55
Sodium Hydraide Solution								
# Drums							1	1
Volume (gallons)							55	55
Total Weight (Tons)	**104,840**	**5,522**	**289**	**185**	**346**	**279**		**111,461**
Total Volume (gallons)	**0**	**0**	**41,980**	**0**	**0**	**0**	**135**	**42,115**
Total Volume (gallons)Construction Water Treated and Discharged to New York Harbor								**1,941,847**

Notes:

Bayshore - Bayshore RecyclingCorp, 75 Crows Mill Rd., Keasbey, NJ 08832

CESP - Clean Earth of Southeast Pennsylvania, 7 Steel Road East, Morrisville, PA 19067

CENJ - Clean Earth of New Jersey,

GROWS - G.R.O.W.S Landfill, Morrisville, Pennsylvania

Action - Action Carting Environmental Services, Inc., 451 Frelinghuysen Avenue, Newark, NJ 07114

Balemet - Balemet Recycling Metal, Inc., 227 Clifford St, Newark, NJ 07105

EQ Detroit - Environmental Quality Company, 1923 Frederick St, Detroit, MI 48211

SCB - Slag Cement Bentonite

C&D - Construction and Demolition Debris

Table 4-3B
Remedial Action Waste Removal
Impacted Soil Removal and Off-Site Transportation Log
Former Clifton MGP Site OU-2
Staten Island, New York

Breakdown of Activities	Date	# Trucks	Weight (Tons)	Volume (Cubic Yards)	Disposal Facility
Pre-SCB Excavation	7-May-12	12	348.54	165.97	Bayshore Soil Management
	8-May-12	13	364.20	173.43	Bayshore Soil Management
	9-May-12	14	404.02	192.39	Bayshore Soil Management
	10-May-12	16	403.94	192.35	Bayshore Soil Management
	Sub Total	55	1,520.70	724.14	
SCB Spoils with LKD	21-May-12	4	107.45	51.17	Bayshore Soil Management
	22-May-12	4	103.11	49.10	Bayshore Soil Management
	23-May-12	4	108.08	51.47	Bayshore Soil Management
	24-May-12	16	482.40	229.71	Bayshore Soil Management
	29-May-12	24	753.00	358.57	Bayshore Soil Management
	30-May-12	8	239.85	114.21	Bayshore Soil Management
	1-Jun-12	24	744.12	354.34	Bayshore Soil Management
	4-Jun-12	22	657.69	313.19	Bayshore Soil Management
	11-Jun-12	6	183.00	87.14	Bayshore Soil Management
	12-Jun-12	14	468.72	223.20	Bayshore Soil Management
	13-Jun-12	16	584.38	278.28	Bayshore Soil Management
	15-Jun-12	18	617.13	293.87	Bayshore Soil Management
	18-Jun-12	17	528.48	251.66	Bayshore Soil Management
	19-Jun-12	17	579.69	276.04	Bayshore Soil Management
	20-Jun-12	18	613.94	292.35	Bayshore Soil Management
	21-Jun-12	20	643.39	306.38	Bayshore Soil Management
	22-Jun-12	16	511.90	243.76	Bayshore Soil Management
	25-Jun-12	21	672.15	320.07	Bayshore Soil Management
	26-Jun-12	20	614.75	292.74	Bayshore Soil Management
	27-Jun-12	23	704.84	335.64	Bayshore Soil Management
	28-Jun-12	24	694.75	330.83	Bayshore Soil Management
	29-Jun-12	24	714.94	340.45	Bayshore Soil Management
	2-Jul-12	24	668.84	318.50	Bayshore Soil Management
	3-Jul-12	23	638.23	303.92	Bayshore Soil Management
	5-Jul-12	24	648.31	308.72	Bayshore Soil Management
	6-Jul-12	24	684.82	326.10	Bayshore Soil Management
	SubTotal	455	13,967.96	6,651.41	
TFS #1	9-Jul-12	40	1,159.73	552.25	Bayshore Soil Management
	10-Jul-12	40	1,083.03	515.73	Bayshore Soil Management
	11-Jul-12	39	1,133.80	539.90	Bayshore Soil Management
	12-Jul-12	39	1,180.57	562.18	Bayshore Soil Management
	13-Jul-12	32	943.13	449.11	Bayshore Soil Management
	16-Jul-12	18	563.44	268.30	Bayshore Soil Management
	17-Jul-12	20	605.41	288.29	Bayshore Soil Management
	18-Jul-12	20	540.50	257.38	Bayshore Soil Management
	19-Jul-12	26	633.38	301.61	Bayshore Soil Management
	20-Jul-12	23	671.79	319.90	Bayshore Soil Management
	23-Jul-12	19	547.05	260.50	Bayshore Soil Management
	Sub Total	316	9,061.83	4,315.16	

Table 4-3B
Remedial Action Waste Removal
Impacted Soil Removal and Off-Site Transportation Log
Former Clifton MGP Site OU-2
Staten Island, New York

TFS #2	26-Jul-12	21	612.76	291.79	Bayshore Soil Management
	27-Jul-12	39	1,093.58	520.75	Bayshore Soil Management
	30-Jul-12	39	1,042.32	496.34	Clean Earth of Southeast PA
	31-Jul-12	40	807.35	384.45	Clean Earth of Southeast PA
	1-Aug-12	42	900.42	428.77	Clean Earth of Southeast PA
	2-Aug-12	40	805.92	383.77	Clean Earth of Southeast PA
	3-Aug-12	40	812.41	386.86	Clean Earth of Southeast PA
	6-Aug-12	30	613.72	292.25	Clean Earth of Southeast PA
	7-Aug-12	27	539.48	256.90	Clean Earth of Southeast PA
	Sub Total	318	7,227.96	3,441.89	
TFS #3	13-Aug-12	41	1,084.35	516.36	Bayshore Soil Management
	14-Aug-12	42	1,128.69	537.47	Bayshore Soil Management
	15-Aug-12	21	539.25	256.79	Bayshore Soil Management
	17-Aug-12	28	805.55	383.60	Bayshore Soil Management
	20-Aug-12	42	1,192.50	567.86	Bayshore Soil Management
	21-Aug-12	15	430.61	205.05	Bayshore Soil Management
	22-Aug-12	44	1,279.85	609.45	Bayshore Soil Management
	Sub Total	233	6,460.80	3,076.57	
TFS #4	29-Aug-12	40	1,242.59	591.71	Bayshore Soil Management
	30-Aug-12	32	942.78	448.94	Bayshore Soil Management
	Sub Total	72	2,185.37	1,040.65	
TFS #5	6-Sep-12	37	984.14	468.64	Bayshore Soil Management
	7-Sep-12	44	1,237.57	589.32	Bayshore Soil Management
	10-Sep-12	44	1,218.90	580.43	Bayshore Soil Management
	11-Sep-12	40	1,099.21	523.43	Bayshore Soil Management
	12-Sep-12	40	1,077.98	513.32	Bayshore Soil Management
	13-Sep-12	8	200.72	95.58	Bayshore Soil Management
	Sub Total	213	5,818.52	2,770.72	
TFS #6	17-Sep-12	8	205.31	97.77	Bayshore Soil Management
	18-Sep-12	32	804.41	383.05	Bayshore Soil Management
	19-Sep-12	38	1,097.84	522.78	Bayshore Soil Management
	20-Sep-12	36	1,044.66	497.46	Bayshore Soil Management
	21-Sep-12	41	1,249.40	594.95	Bayshore Soil Management
	24-Sep-12	44	1,311.46	624.50	Bayshore Soil Management
	25-Sep-12	44	1,299.47	618.80	Bayshore Soil Management
	26-Sep-12	20	593.47	282.60	Bayshore Soil Management
	27-Sep-12	20	584.63	278.40	Bayshore Soil Management
	28-Sep-12	32	855.43	407.35	Bayshore Soil Management
	Sub Total	315	9,046.08	4,307.66	
TFS #7	1-Oct-12	8	202.43	96.40	Bayshore Soil Management
	2-Oct-12	41	1,143.68	544.61	Bayshore Soil Management
	3-Oct-12	33	946.82	450.87	Bayshore Soil Management
	4-Oct-12	43	1,121.28	533.94	Bayshore Soil Management
	5-Oct-12	36	944.68	449.85	Bayshore Soil Management
	8-Oct-12	38	984.60	468.86	Bayshore Soil Management
	9-Oct-12	16	391.68	186.51	Bayshore Soil Management
	10-Oct-12	12	246.61	117.43	Bayshore Soil Management
	Sub Total	227	5,981.78	2,848.47	

Table 4-3B
Remedial Action Waste Removal
Impacted Soil Removal and Off-Site Transportation Log
Former Clifton MGP Site OU-2
Staten Island, New York

TFS #8	11-Oct-12	41	1,027.94	489.50	Bayshore Soil Management
	12-Oct-12	42	1,213.15	577.69	Bayshore Soil Management
	15-Oct-12	44	1,203.29	573.00	Bayshore Soil Management
	16-Oct-12	44	1,278.90	609.00	Bayshore Soil Management
	17-Oct-12	31	835.04	397.64	Bayshore Soil Management
	18-Oct-12	24	604.97	288.08	Bayshore Soil Management
	19-Oct-12	28	757.19	360.57	Bayshore Soil Management
	22-Oct-12	39	1,028.69	489.85	Bayshore Soil Management
	23-Oct-12	41	1,066.40	507.81	Bayshore Soil Management
	24-Oct-12	24	646.44	307.83	Bayshore Soil Management
	25-Oct-12	24	653.23	311.06	Bayshore Soil Management
	26-Oct-12	14	394.12	187.68	Bayshore Soil Management
	19-Nov-12	25	690.57	328.84	Bayshore Soil Management
	Sub Total	421	11,399.93	5,428.54	
TFS #9	20-Nov-12	40	1,113.67	530.32	Bayshore Soil Management
	21-Nov-12	24	709.62	337.91	Bayshore Soil Management
	26-Nov-12	30	886.48	422.13	Bayshore Soil Management
	27-Nov-12	19	558.62	266.01	Bayshore Soil Management
	28-Nov-12	20	570.94	271.88	Bayshore Soil Management
	29-Nov-12	8	253.13	120.54	Bayshore Soil Management
	30-Nov-12	16	442.22	210.58	Bayshore Soil Management
	3-Dec-12	19	501.29	238.71	Bayshore Soil Management
	4-Dec-12	20	472.78	225.13	Bayshore Soil Management
	5-Dec-12	12	260.28	123.94	Bayshore Soil Management
	Sub Total	208	5,769.03	2,747.16	
TFS #10	6-Dec-12	31	810.62	386.01	Bayshore Soil Management
	7-Dec-12	44	1,189.53	566.44	Bayshore Soil Management
	10-Dec-12	43	1,252.08	596.23	Bayshore Soil Management
	11-Dec-12	40	1,089.57	518.84	Bayshore Soil Management
	12-Dec-12	32	900.24	428.69	Bayshore Soil Management
	13-Dec-12	17	483.19	230.09	Bayshore Soil Management
	14-Dec-12	32	929.59	442.66	Bayshore Soil Management
	Sub Total	239	6,654.82	3,168.96	
TFS #11	17-Dec-12	23	721.38	343.51	Bayshore Soil Management
	18-Dec-12	24	715.35	340.64	Bayshore Soil Management
	19-Dec-12	21	632.60	301.24	Bayshore Soil Management
	20-Dec-12	32	1,012.52	482.15	Bayshore Soil Management
	Sub Total	100	3,081.85	1,467.55	
TFS #12	7-Jan-13	41	1,186.08	564.80	Bayshore Soil Management
	8-Jan-13	43	1,252.32	596.34	Bayshore Soil Management
	9-Jan-13	43	1,268.25	603.93	Bayshore Soil Management
	10-Jan-13	33	1,005.12	478.63	Bayshore Soil Management
	11-Jan-13	16	510.55	243.12	Bayshore Soil Management
	14-Jan-13	8	256.41	122.10	Bayshore Soil Management
	Sub Total	184	5,478.73	2,608.92	
TFS #13	17-Jan-13	20	549.98	261.90	Bayshore Soil Management
	18-Jan-13	16	460.10	219.10	Bayshore Soil Management
	21-Jan-13	8	257.06	122.41	Bayshore Soil Management
	Sub Total	44	1,267.14	603.40	

Table 4-3B
Remedial Action Waste Removal
Impacted Soil Removal and Off-Site Transportation Log
Former Clifton MGP Site OU-2
Staten Island, New York

TFS #14	23-Jan-13	39	1,000.38	476.37	Bayshore Soil Management
	24-Jan-13	38	976.70	465.10	Bayshore Soil Management
	25-Jan-13	38	1,139.19	542.47	Bayshore Soil Management
	28-Jan-13	43	1,182.67	563.18	Bayshore Soil Management
	29-Jan-13	33	951.41	453.05	Bayshore Soil Management
	Sub Total	191	5,250.35	2,500.17	
TFS #15	31-Jan-13	41	1,254.68	597.47	Bayshore Soil Management
	4-Feb-13	40	1,148.52	546.91	Bayshore Soil Management
	5-Feb-13	26	725.81	345.62	Bayshore Soil Management
	Sub Total	107	3,129.01	1,490.00	
TFS #16	11-Feb-13	38	1,216.76	579.41	Bayshore Soil Management
	12-Feb-13	12	385.03	183.35	Bayshore Soil Management
	Sub Total	50	1,601.79	762.76	
TFS #17	14-Feb-13	24	653.73	311.30	Bayshore Soil Management
	15-Feb-13	24	650.16	309.60	Bayshore Soil Management
	18-Feb-13	32	946.04	450.50	Bayshore Soil Management
	Sub Total	80	2,249.93	1,071.40	
TFS #18	20-Feb-13	24	667.71	317.96	Bayshore Soil Management
	21-Feb-13	32	886.14	421.97	Bayshore Soil Management
	22-Feb-13	12	382.74	182.26	Bayshore Soil Management
	28-Feb-13	3	95.86	45.65	Bayshore Soil Management
	4-Mar-13	4	115.58	55.04	Bayshore Soil Management
	5-Mar-13	4	107.95	51.40	Bayshore Soil Management
	27-Mar-13	2	23.02	10.96	Bayshore Soil Management
	Sub Total	81	2,279.00	1,085.24	
Continued Load Out of MGP Soils from OU-2 and under the WWTP Pad on OU-1	28-Mar-13	5	112.24	53.45	Bayshore Soil Management
	29-Mar-13	1	18.22	8.68	Bayshore Soil Management
	1-Apr-13	1	16.38	7.80	Bayshore Soil Management
	3-Apr-13	1	21.51	10.24	Bayshore Soil Management
	9-Apr-13	1	19.72	9.39	Bayshore Soil Management
	10-Apr-13	1	15.74	7.50	Bayshore Soil Management
	16-Apr-13	4	99.29	47.28	Bayshore Soil Management
	22-Apr-13	3	88.37	42.08	Bayshore Soil Management
	23-Apr-13	4	116.11	55.29	Bayshore Soil Management
	24-Apr-13	5	158.60	75.52	Bayshore Soil Management
	26-Apr-13	3	81.66	38.89	Bayshore Soil Management
	1-May-13	1	15.73	7.49	Bayshore Soil Management
	6-May-13	6	144.82	68.96	Bayshore Soil Management
	7-May-13	1	20.85	9.93	Bayshore Soil Management
	SubTotal	37	929.24	442.50	
	SCB Spoils	455	13,968	6,651	
	Total at Bayshore	3,688	104,840.20	49,923.90	
	Total at Cleanearth PA	258	5,521.62	2,629.34	
	Grand Total	**3,946**	**110,361.82**	**52,553.25**	

Table 4-4
SCB Slurry Wall Quality Assurance and Quality Controls
Former Clifton MGP Site OU-2
Staten Island, New York

QC Item	Company	Sample Frequency	Parameters	Location	QA/QC Value
Bentonite Water Slurry	Sevenson	2 times per day	Viscosity	Batch Plant	>=35 Marsh Funnel Seconds
			Density		>=63.5 pcf
			pH		6.5 to 10
SCB Slurry	Sevenson	1 per batch	Viscosity	Batch Plant	>=35 Marsh Funnel Seconds
			Density		69 pcf
			pH		6.5 to 10
SCB Slurry	AECOM	Random	Viscosity	Batch Plant	>=35 Marsh Funnel Seconds
			Density		69 pcf
			pH		6.5 to 10
Slurry Wall (Trench Slurry)	AECOM + Sevenson	1 per 250cy of trench	Hydraulic conductivity	Slurry Wall	10^{-6} cm/s
		1 per 250cy of trench	Unconfined compressive strength		50 psi
		3 per day	Density		77 pcf
		3 per day	Viscosity		>=35 Marsh Funnel Seconds
		3 per day	pH		6.5 to 10
Settlement/Side wall Stability	AECOM	Daily	Settlement Monitoring	Street and Electric Poles	Plump
Slurry Wall (Trench Slurry)	AECOM	3 per day	Color, Homogenity, and Free Product	Slurry Wall	
Excavation / Trench	AECOM + Sevenson	every 10 ft along centerline	Trench depth and width sounding	Trench	Design Depth
		every 10 ft along centerline	Slurry elevation before and after hardening		Surface
		Each section	Wetness		

Table 4-5
SCB Slurry Wall Performance Monitoring Results Summary
Former Clifton MGP Site OU-2
Staten Island, New York

AECOM SCB Slurry Wall Data							GECON Varification Data		KEMRON Varification Data	
AECOM Sample ID	Street	Station	Date	Curing Age, days	UCS psi	Permeability cm/sec	GECON Duplicate ID	Permeability cm/sec	UCS psi	Permeability cm/sec
				28	79.5	1.60E-05	B-01	8.00E-08	78.1	2.50E-07
ACM-BA-01	Bay	1+30	5/16/2012	76	NA	3.70E-07	NA	NA	NA	NA
ACM-BA-02	Bay	0+90	5/18/2012	28	82.9	2.50E-07	B-05	NA	139.9	4.80E-07
ACM-BA-03	Bay	0+40	5/22/2012	28	124	8.60E-07	B Sample 11 AECOM	NA	NA	NA
ACM-BA-04	Bay	0+20	5/21/2012	28	128	9.50E-07	B Sample 8 AECOM	NA	110.1	1.40E-06
ACM-BA-05	Willow	0+75	6/4/2012	28	125	7.80E-07	W Samp #24	NA	NA	NA
				28	94.6	1.80E-06	W Samp #26	1.10E-07	NA	NA
ACM-BA-06	Willow	1+20	6/5/2012	56	NA	2.70E-07	NA	NA	NA	NA
ACM-BA-07	Willow	1+80	6/7/2012	28	98	2.10E-08	W Samp #29	NA	NA	NA
ACM-BA-08	Willow	2+20	6/8/2012	28	93.5	3.00E-08	W Samp #31	NA	NA	NA
ACM-BA-09	Willow	2+45	6/11/2012	28	97.6	9.30E-07	W Samp #33	NA	NA	NA
ACM-BA-10	Willow	3+20	6/12/2012	28	93.1	2.50E-07	W Samp #25	NA	NA	NA
				28	93.1	2.70E-06	W Samp #37	1.40E-07	NA	NA
ACM-BA-11	Willow	3+50	6/12/2012	56	NA	2.40E-07	NA	NA	NA	NA
ACM-BA-12	Willow	3+90	6/13/2012	28	97.6	1.00E-06	W Samp #38	NA	NA	NA
				28	93.1	1.40E-06	W Samp #39	1.30E-07	NA	NA
ACM-BA-13	Willow	04+10	6/13/2012	56	NA	1.70E-06	NA	NA	NA	NA
				28	93.1	5.40E-06	W Samp #40	1.10E-07	NA	NA
ACM-BA-14	Willow	04+50	6/14/2012	56	NA	1.40E-06	NA	NA	NA	NA
ACM-BA-15	Willow	0+55	6/26/2012	28	155	3.90E-07	W Sample #BA-54	NA	NA	NA

Notes

UCS = Unconfined Compressive Strength
PSI = Pounds per square inch
cm/sec = centimeters per second
NA = Not Analyzed

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					SES - Effluent 04/04/12			Effluent-01-05-0112				Effluent-02-051512				Effluent-03-052412				Effluent-04-061112				Effluent-05-061312			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		4/4/2012			5/1/2012				5/15/2012				5/24/2012				6/11/2012				6/13/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result		Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter				100	gpm	0.0143	MGD	100	gpm	0.0227	MGD	150	gpm	0.0220	MGD	110	gpm	0.0165	MGD	210	gpm	0.0456	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	6.92	HF	SU	7	SU			6.98	SU			7.4	SU			7.4	SU			7.05	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	10	U	mg/l	< 10	mg/l	5.98E-01	lbs/day	< 10	mg/l	9.46E-01	lbs/day	< 10	mg/l	9.19E-01	lbs/day	< 10	mg/l	6.90E-01	lbs/day	< 10	mg/l	1.90E+00	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	0.080	U	ug/l	< 1.0	ug/l	5.99E-05	lbs/day	< 1.0	ug/l	9.47E-05	lbs/day	< 0.80	ug/l	7.36E-05	lbs/day	< 0.80	ug/l	5.53E-05	lbs/day	< 0.80	ug/l	1.52E-04	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	0.1	U	ug/l	< 1.0	ug/l	5.99E-05	lbs/day	< 1.0	ug/l	9.47E-05	lbs/day	< 1.0	ug/l	9.20E-05	lbs/day	< 1.0	ug/l	6.91E-05	lbs/day	< 1.0	ug/l	1.90E-04	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	0.18	J	ug/l	< 1.0	ug/l	5.99E-05	lbs/day	< 1.0	ug/l	9.47E-05	lbs/day	< 1.0	ug/l	9.20E-05	lbs/day	< 1.0	ug/l	6.91E-05	lbs/day	< 1.0	ug/l	1.90E-04	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	0.29	J	ug/l	< 1.0	ug/l	5.99E-05	lbs/day	< 1.0	ug/l	9.47E-05	lbs/day	< 1.0	ug/l	9.20E-05	lbs/day	< 1.0	ug/l	6.91E-05	lbs/day	< 1.0	ug/l	1.90E-04	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	0.15	U	ug/l	< 1.0	ug/l	5.99E-05	lbs/day	< 1.0	ug/l	9.47E-05	lbs/day	< 1.0	ug/l	9.20E-05	lbs/day	< 1.0	ug/l	6.91E-05	lbs/day	< 1.0	ug/l	1.90E-04	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	2.8	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	2.8	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	2.9	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	0.036	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 3.0	ug/l	2.76E-04	lbs/day	< 3.0	ug/l	2.07E-04	lbs/day	< 3.0	ug/l	5.71E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	0.048	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 0.020	ug/l	1.89E-06	lbs/day	< 0.020	ug/l	1.84E-06	lbs/day	< 0.020	ug/l	1.38E-06	lbs/day	< 0.020	ug/l	3.81E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	0.031	U	ug/l	< 5.0	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	2	U	ug/l	< 5.0	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	3.2	U	ug/l	< 5.0	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	3.3	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	2.9	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	0.15	U	ug/l	< 5.0	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	2.8	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0 s	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0 s	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	3.2	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	3	U	ug/l	< 5.0 s	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	4.74E-04	lbs/day	< 5.0	ug/l	4.60E-04	lbs/day	< 5.0	ug/l	3.45E-04	lbs/day	< 5.0	ug/l	9.52E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	3.7	U	ug/l	< 10.0	ug/l	5.99E-04	lbs/day	< 10.0	ug/l	9.47E-04	lbs/day	< 10.0	ug/l	9.20E-04	lbs/day	< 10.0	ug/l	6.91E-04	lbs/day	< 10.0	ug/l	1.90E-03	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	5	U	ug/l	< 40	ug/l	2.40E-03	lbs/day	< 40	ug/l	3.79E-03	lbs/day	< 40	ug/l	3.68E-03	lbs/day	< 40	ug/l	2.76E-03	lbs/day	< 40	ug/l	7.61E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	1.4	U	ug/l	< 10	ug/l	5.99E-04	lbs/day	< 10	ug/l	9.47E-04	lbs/day	< 10	ug/l	9.20E-04	lbs/day	< 10	ug/l	6.91E-04	lbs/day	< 10	ug/l	1.90E-03	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	NA			< 2.0	ug/l	1.20E-04	lbs/day	< 2.0	ug/l	1.89E-04	lbs/day	< 2.0	ug/l	1.84E-04	lbs/day	< 2.0	ug/l	1.38E-04	lbs/day	< 2.0	ug/l	3.81E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	0.37	J	NTU	< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					Effluent-06-061512				Effluent-07-061912				Effluent-08-062112				Effluent-09-062112*				Effluent-10-070912			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		6/15/2012				6/19/2012				6/21/2012				6/26/2012				7/9/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	140	gpm	0.0306	MGD	80	gpm	0.0172	MGD	80	gpm	0.0167	MGD	130	gpm	0.0283	MGD	90	gpm	0.0209	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.56	SU			7.77	SU			7.66	SU			8.2	SU			7.2	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	1.28E+00	lbs/day	< 10	mg/l	7.17E-01	lbs/day	< 10	mg/l	6.98E-01	lbs/day	< 10	mg/l	1.18E+00	lbs/day	< 10	mg/l	8.70E-01	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	1.02E-04	lbs/day	< 0.80	ug/l	5.75E-05	lbs/day	< 0.80	ug/l	5.59E-05	lbs/day					< 0.80	ug/l	6.97E-05	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.28E-04	lbs/day	< 1.0	ug/l	7.18E-05	lbs/day	< 1.0	ug/l	6.99E-05	lbs/day					< 1.0	ug/l	8.71E-05	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.28E-04	lbs/day	< 1.0	ug/l	7.18E-05	lbs/day	< 1.0	ug/l	6.99E-05	lbs/day					< 1.0	ug/l	8.71E-05	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.28E-04	lbs/day	< 1.0	ug/l	7.18E-05	lbs/day	< 1.0	ug/l	6.99E-05	lbs/day					< 1.0	ug/l	8.71E-05	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.28E-04	lbs/day	< 1.0	ug/l	7.18E-05	lbs/day	< 1.0	ug/l	6.99E-05	lbs/day					< 1.0	ug/l	8.71E-05	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	3.84E-04	lbs/day	< 3.0	ug/l	2.15E-04	lbs/day	< 3.0	ug/l	2.10E-04	lbs/day	< 3.0	ug/l	3.54E-04	lbs/day	< 3.0	ug/l	2.61E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	2.56E-06	lbs/day	< 0.020	ug/l	1.44E-06	lbs/day	< 0.020	ug/l	1.40E-06	lbs/day	< 0.020	ug/l	2.36E-06	lbs/day	< 0.020	ug/l	1.74E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	6.40E-04	lbs/day	< 5.0	ug/l	3.59E-04	lbs/day	< 5.0	ug/l	3.49E-04	lbs/day	< 5.0	ug/l	5.91E-04	lbs/day	< 5.0	ug/l	4.36E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	1.28E-03	lbs/day	< 10.0	ug/l	7.18E-04	lbs/day	< 10.0	ug/l	6.99E-04	lbs/day	< 10.0	ug/l	1.18E-03	lbs/day	< 10.0	ug/l	8.71E-04	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	5.12E-03	lbs/day	< 40	ug/l	2.87E-03	lbs/day	< 40	ug/l	2.80E-03	lbs/day	< 40	ug/l	4.72E-03	lbs/day	< 40	ug/l	3.48E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	1.28E-03	lbs/day	< 10	ug/l	7.18E-04	lbs/day	< 10	ug/l	6.99E-04	lbs/day	< 10	ug/l	1.18E-03	lbs/day	< 10	ug/l	8.71E-04	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	2.56E-04	lbs/day	< 2.0	ug/l	1.44E-04	lbs/day	< 2.0	ug/l	1.40E-04	lbs/day	< 2.0	ug/l	2.36E-04	lbs/day	< 2.0	ug/l	1.74E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	< 1.0	NTU			< 1.9	NTU			< 1.0	NTU			< 1.9 H	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					Effluent-11-071112				Effluent-12-071312				Effluent-13-071612				Effluent-14-071812				Effluent-15-071912*			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		7/11/2012				7/13/2012				7/16/2012				7/18/2012				7/20/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	110	gpm	0.0239	MGD	70	gpm	0.0144	MGD	150	gpm	0.0174	MGD	180	gpm	0.0246	MGD	150	gpm	0.0161	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	8.1	SU			6.85	SU			7.44	SU			7.46	SU			7.64	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	9.99E-01	lbs/day	< 10	mg/l	6.01E-01	lbs/day	< 10	mg/l	7.27E-01	lbs/day	< 10	mg/l	1.03E+00	lbs/day	< 10	mg/l	6.71E-01	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	8.00E-05	lbs/day	< 0.80	ug/l	4.82E-05	lbs/day	< 0.80	ug/l	5.82E-05	lbs/day	< 0.80	ug/l	8.22E-05	lbs/day	< 0.80	ug/l	5.38E-05	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.00E-04	lbs/day	< 1.0	ug/l	6.02E-05	lbs/day	< 1.0	ug/l	7.28E-05	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	6.72E-05	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.00E-04	lbs/day	< 1.0	ug/l	6.02E-05	lbs/day	< 1.0	ug/l	7.28E-05	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	6.72E-05	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.00E-04	lbs/day	< 1.0	ug/l	6.02E-05	lbs/day	< 1.0	ug/l	7.28E-05	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	6.72E-05	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.00E-04	lbs/day	< 1.0	ug/l	6.02E-05	lbs/day	< 1.0	ug/l	7.28E-05	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	6.72E-05	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	3.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 3.0	ug/l	2.18E-04	lbs/day	< 3.0	ug/l	3.08E-04	lbs/day	< 3.0	ug/l	2.02E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	2.00E-06	lbs/day	< 0.020	ug/l	1.20E-06	lbs/day	< 0.020	ug/l	1.46E-06	lbs/day	< 0.020	ug/l	2.06E-06	lbs/day	< 0.020	ug/l	1.34E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0 s	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.00E-04	lbs/day	< 5.0	ug/l	3.01E-04	lbs/day	< 5.0	ug/l	3.64E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	3.36E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	1.00E-03	lbs/day	< 10.0	ug/l	6.02E-04	lbs/day	< 10.0	ug/l	7.28E-04	lbs/day	< 10.0	ug/l	1.03E-03	lbs/day	< 10.0	ug/l	6.72E-04	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	4.00E-03	lbs/day	< 40	ug/l	2.41E-03	lbs/day	< 40	ug/l	2.91E-03	lbs/day	< 40	ug/l	4.11E-03	lbs/day	< 40	ug/l	2.69E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	1.00E-03	lbs/day	< 10	ug/l	6.02E-04	lbs/day	< 10	ug/l	7.28E-04	lbs/day	< 10	ug/l	1.03E-03	lbs/day	< 10	ug/l	6.72E-04	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	2.00E-04	lbs/day	< 2.0	ug/l	1.20E-04	lbs/day	< 2.0	ug/l	1.46E-04	lbs/day	< 2.0	ug/l	2.06E-04	lbs/day	< 2.0	ug/l	1.34E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	< 1.0	NTU			2.4 H	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					Effluent-16-072312				Effluent-17-073012				Effluent-Arsenic-1				Effluent-Arsenic-080812				Effluent-18-081412				Effluent-02B-081712			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		7/23/2012				7/30/2012				8/3/2012				8/8/2012				8/14/2012				8/17/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	130	gpm	0.0254	MGD	130	gpm	0.0275	MGD									110	gpm	0.0211	MGD	90	gpm	0.0170	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.35	SU			7.35	SU											7.7	SU				SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	1.06E+00	lbs/day	< 10	mg/l	1.15	lbs/day									< 10	mg/l	8.78E-01	lbs/day	< 10	mg/l	7.07E-01	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	8.49E-05	lbs/day	< 0.80	ug/l	9.20E-05	lbs/day									< 0.80	ug/l	7.04E-05	lbs/day	< 0.80	ug/l	5.67E-05	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.06E-04	lbs/day	< 1.0	ug/l	1.15E-04	lbs/day									< 1.0	ug/l	8.80E-05	lbs/day	< 1.0	ug/l	7.08E-05	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.06E-04	lbs/day	< 1.0	ug/l	1.15E-04	lbs/day									< 1.0	ug/l	8.80E-05	lbs/day	< 1.0	ug/l	7.08E-05	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.06E-04	lbs/day	< 1.0	ug/l	1.15E-04	lbs/day									< 1.0	ug/l	8.80E-05	lbs/day	< 1.0	ug/l	7.08E-05	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.06E-04	lbs/day	< 1.0	ug/l	1.15E-04	lbs/day									< 1.0	ug/l	8.80E-05	lbs/day	< 1.0	ug/l	7.08E-05	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	3.18E-04	lbs/day	< 3.0	ug/l	3.45E-04	lbs/day									< 3.0	ug/l	2.64E-04	lbs/day	< 3.0	ug/l	2.13E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	2.12E-06	lbs/day	< 0.020	ug/l	2.30E-06	lbs/day									< 0.020	ug/l	1.76E-06	lbs/day	< 0.020	ug/l	1.42E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	5.30E-04	lbs/day	< 5.0	ug/l	5.75E-04	lbs/day									< 5.0	ug/l	4.40E-04	lbs/day	< 5.0	ug/l	3.54E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	**28.5**	ug/l	3.02E-03	lbs/day	**33.8**	ug/l	3.89E-03	lbs/day	**19.0**	ug/l			**15.3**	ug/l			< 10.0	ug/l	8.80E-04	lbs/day	< 10.0	ug/l	7.08E-04	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	4.24E-03	lbs/day	< 40	ug/l	4.60E-03	lbs/day					< 40	ug/l			< 40	ug/l	3.52E-03	lbs/day	< 40	ug/l	2.83E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	1.06E-03	lbs/day	< 10	ug/l	1.15E-03	lbs/day									100	ug/l	8.80E-03	lbs/day	350	ug/l	2.48E-02	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	2.12E-04	lbs/day	< 2.0	ug/l	2.30E-04	lbs/day									**11**	ug/l	9.68E-04	lbs/day	< 10	ug/l	7.08E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	< 1.0	NTU			< 6.0	NTU											< 2.1	NTU			39	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					Btwnresandat-01-082012				EVENT02-EF01-082412				EVENT02-EF02-082712				EVENT02-EF03-082812				EVENT02-EF04-091112				EVENT02-EF05-091312			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		8/20/2012				8/24/2012				8/27/2012				8/28/2012				9/11/2012				9/13/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	0	gpm	0.0000	MGD	110	gpm	0.0425	MGD	150	gpm	0.0394	MGD	150	gpm	0.0265	MGD	150	gpm	0.0325	MGD	150	gpm	0.0221	MGD
pH (range)	6.5-8.5		SU	Daily	Grab		SU			7.72	SU			7.52	SU			7.45	SU			7.15	SU			7.11	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	0.00E+00	lbs/day	< 10	mg/l	1.77E+00	lbs/day	< 10	mg/l	1.64E+00	lbs/day	< 10	mg/l	1.11E+00	lbs/day	< 10	mg/l	1.36E+00	lbs/day	< 10	mg/l	9.23E-01	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	0.00E+00	lbs/day	< 0.80	ug/l	1.42E-04	lbs/day	< 0.80	ug/l	1.32E-04	lbs/day	< 0.80	ug/l	8.86E-05	lbs/day	< 0.80	ug/l	1.09E-04	lbs/day	< 0.80	ug/l	7.39E-05	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	0.00E+00	lbs/day	< 1.0	ug/l	1.77E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.36E-04	lbs/day	< 1.0	ug/l	9.24E-05	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	0.00E+00	lbs/day	< 1.0	ug/l	1.77E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.36E-04	lbs/day	< 1.0	ug/l	9.24E-05	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	0.00E+00	lbs/day	< 1.0	ug/l	1.77E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.36E-04	lbs/day	< 1.0	ug/l	9.24E-05	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	0.00E+00	lbs/day	< 1.0	ug/l	1.77E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.36E-04	lbs/day	< 1.0	ug/l	9.24E-05	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	0.00E+00	lbs/day	< 0.3	ug/l	5.32E-05	lbs/day	< 0.3	ug/l	4.93E-05	lbs/day	< 0.3	ug/l	3.32E-05	lbs/day	< 3.0	ug/l	4.08E-04	lbs/day	< 3.0	ug/l	2.77E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	0.00E+00	lbs/day	< 0.020	ug/l	3.55E-06	lbs/day	< 0.020	ug/l	3.29E-06	lbs/day	< 0.020	ug/l	2.22E-06	lbs/day	< 0.020	ug/l	2.72E-06	lbs/day	< 0.020	ug/l	1.85E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	0.00E+00	lbs/day	< 0.5	ug/l	8.87E-05	lbs/day	< 0.5	ug/l	8.22E-05	lbs/day	< 0.5	ug/l	5.54E-05	lbs/day	< 5.0	ug/l	6.80E-04	lbs/day	< 5.0	ug/l	4.62E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	0.00E+00	lbs/day	< 10.0	ug/l	1.77E-03	lbs/day	< 10.0	ug/l	1.64E-03	lbs/day	< 10.0	ug/l	1.11E-03	lbs/day	< 10.0	ug/l	1.36E-03	lbs/day	< 10.0	ug/l	9.24E-04	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	0.00E+00	lbs/day	< 40	ug/l	7.09E-03	lbs/day	< 40	ug/l	6.58E-03	lbs/day	< 40	ug/l	4.43E-03	lbs/day	< 40	ug/l	5.44E-03	lbs/day	< 40	ug/l	3.70E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	0.00E+00	lbs/day	< 10	ug/l	1.77E-03	lbs/day	< 10	ug/l	1.64E-03	lbs/day	< 10	ug/l	1.11E-03	lbs/day	< 10	ug/l	1.36E-03	lbs/day	< 10	ug/l	9.24E-04	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	0.00E+00	lbs/day	< 2.0	ug/l	3.55E-04	lbs/day	< 2.0	ug/l	3.29E-04	lbs/day	**42**	ug/l	4.65E-03	lbs/day	< 2.0	ug/l	2.72E-04	lbs/day	< 2.0	ug/l	1.85E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	12	NTU			4.1	NTU			4.1	NTU			5.5	NTU			27 D	NTU			18 D	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					EVENT02-EF06-091812				EVENT02-EF07-092012				EVENT02-EF08-092512				EVENT02-EF09-092812				EVENT02-EF10-100112*				EVENT02-EF11-101212			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		9/18/2012				9/20/2012				9/25/2012				9/28/2012				10/2/2012				10/12/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	140	gpm	0.0185	MGD	150	gpm	0.0253	MGD	110	gpm	0.0246	MGD	120	gpm	0.0353	MGD	150	gpm	0.0149	MGD	130	gpm	0.0412	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.44	SU			7.38	SU			7.48	SU			7.42	SU			7.45	SU			7.35	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	7.72E-01	lbs/day	< 10	mg/l	1.05E+00	lbs/day	< 10	mg/l	1.03E+00	lbs/day	< 10	mg/l	1.47E+00	lbs/day	10	mg/l	6.23E-01	lbs/day	< 10	mg/l	1.72E+00	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	6.18E-05	lbs/day	< 0.80	ug/l	8.44E-05	lbs/day	< 0.80	ug/l	8.23E-05	lbs/day	< 0.80	ug/l	1.18E-04	lbs/day	< 0.80	ug/l	4.99E-05	lbs/day	< 0.80	ug/l	1.38E-04	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.73E-05	lbs/day	< 1.0	ug/l	1.05E-04	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	1.47E-04	lbs/day	< 1.0	ug/l	6.24E-05	lbs/day	< 1.0	ug/l	1.72E-04	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.73E-05	lbs/day	< 1.0	ug/l	1.05E-04	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	1.47E-04	lbs/day	< 1.0	ug/l	6.24E-05	lbs/day	< 1.0	ug/l	1.72E-04	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.73E-05	lbs/day	< 1.0	ug/l	1.05E-04	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	1.47E-04	lbs/day	< 1.0	ug/l	6.24E-05	lbs/day	< 1.0	ug/l	1.72E-04	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.73E-05	lbs/day	< 1.0	ug/l	1.05E-04	lbs/day	< 1.0	ug/l	1.03E-04	lbs/day	< 1.0	ug/l	1.47E-04	lbs/day	< 1.0	ug/l	6.24E-05	lbs/day	< 1.0	ug/l	1.72E-04	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	2.32E-04	lbs/day	< 3.0	ug/l	3.16E-04	lbs/day	< 3.0	ug/l	3.09E-04	lbs/day	< 3.0	ug/l	4.42E-04	lbs/day	< 3.0	ug/l	1.87E-04	lbs/day	< 3.0 s	ug/l	5.16E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	1.55E-06	lbs/day	< 0.020	ug/l	2.11E-06	lbs/day	< 0.020	ug/l	2.06E-06	lbs/day	**0.100**	ug/l	1.47E-05	lbs/day	< 0.020	ug/l	1.25E-06	lbs/day	< 0.020	ug/l	3.44E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0 s	ug/l	8.60E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0	ug/l	8.60E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.86E-04	lbs/day	< 5.0	ug/l	5.27E-04	lbs/day	< 5.0	ug/l	5.14E-04	lbs/day	< 5.0	ug/l	7.37E-04	lbs/day	< 5.0	ug/l	3.12E-04	lbs/day	< 5.0 s	ug/l	8.60E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	7.73E-04	lbs/day	< 10.0	ug/l	1.05E-03	lbs/day	< 10.0	ug/l	1.03E-03	lbs/day	< 10.0	ug/l	1.47E-03	lbs/day	< 10.0	ug/l	6.24E-04	lbs/day	< 10.0	ug/l	1.72E-03	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	3.09E-03	lbs/day	< 40	ug/l	4.22E-03	lbs/day	< 40	ug/l	4.12E-03	lbs/day	< 40	ug/l	5.89E-03	lbs/day	< 40	ug/l	2.49E-03	lbs/day	< 40	ug/l	6.88E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	13	ug/l	1.00E-03	lbs/day	< 10	ug/l	1.05E-03	lbs/day	< 10	ug/l	1.03E-03	lbs/day	< 10	ug/l	1.47E-03	lbs/day	< 10	ug/l	6.24E-04	lbs/day	< 10	ug/l	1.72E-03	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	1.55E-04	lbs/day	< 2.0	ug/l	2.11E-04	lbs/day	< 2.0	ug/l	2.06E-04	lbs/day	< 2.0	ug/l	2.95E-04	lbs/day	< 2.0	ug/l	1.25E-04	lbs/day	< 2.0	ug/l	3.44E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	15 D	NTU			18 D	NTU			16 D	NTU			14 D	NTU			28 D	NTU			19 D	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					EVENT02-EF12-101612				EVENT02-EF13-102412				EVENT02-EF15-110212				EVENT02-EF16-110312				EVENT02-EF17-110512				EVENT02-EF18-111512			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		10/16/2012				10/24/2012				11/2/2012				11/3/2012				11/5/2012				11/15/2012			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	150	gpm	0.0441	MGD	110	gpm	0.0451	MGD	350	gpm	0.2311	MGD	290	gpm	0.2798	MGD	250	gpm	0.1423	MGD	170	gpm	0.0884	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.42	SU			7.18	SU			7.36	SU			7.44	SU			7.55	SU			7.75	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	1.84E+00	lbs/day	12	mg/l	2.26E+00	lbs/day	**28**	mg/l	2.70E+01	lbs/day	< 10	mg/l	1.17E+01	lbs/day	< 10	mg/l	5.94E+00	lbs/day	< 10	mg/l	3.69E+00	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	1.47E-04	lbs/day	< 0.80	ug/l	1.51E-04	lbs/day	< 0.80	ug/l	7.72E-04	lbs/day	< 0.80	ug/l	9.35E-04	lbs/day	< 0.80	ug/l	4.76E-04	lbs/day	< 0.80	ug/l	2.95E-04	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.84E-04	lbs/day	< 1.0	ug/l	1.88E-04	lbs/day	< 1.0	ug/l	9.65E-04	lbs/day	< 1.0	ug/l	1.17E-03	lbs/day	< 1.0	ug/l	5.95E-04	lbs/day	< 1.0	ug/l	3.69E-04	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0 s	ug/l	1.84E-04	lbs/day	< 1.0	ug/l	1.88E-04	lbs/day	< 1.0	ug/l	9.65E-04	lbs/day	< 1.0	ug/l	1.17E-03	lbs/day	< 1.0	ug/l	5.95E-04	lbs/day	< 1.0	ug/l	3.69E-04	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0 s	ug/l	1.84E-04	lbs/day	< 1.0	ug/l	1.88E-04	lbs/day	< 1.0	ug/l	9.65E-04	lbs/day	< 1.0	ug/l	1.17E-03	lbs/day	< 1.0	ug/l	5.95E-04	lbs/day	< 1.0	ug/l	3.69E-04	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.84E-04	lbs/day	< 1.0	ug/l	1.88E-04	lbs/day	< 1.0	ug/l	9.65E-04	lbs/day	< 1.0	ug/l	1.17E-03	lbs/day	< 1.0	ug/l	5.95E-04	lbs/day	< 1.0	ug/l	3.69E-04	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	5.53E-04	lbs/day	< 3.0	ug/l	5.65E-04	lbs/day	< 3.0	ug/l	2.90E-03	lbs/day	< 3.0	ug/l	3.51E-03	lbs/day	< 3.0	ug/l	1.78E-03	lbs/day	< 3.0	ug/l	1.11E-03	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	3.68E-06	lbs/day	< 0.020	ug/l	3.76E-06	lbs/day	**0.13**	ug/l	1.25E-04	lbs/day	< 0.020	ug/l	2.34E-05	lbs/day	< 0.020	ug/l	1.19E-05	lbs/day	< 0.020	ug/l	7.38E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	9.21E-04	lbs/day	< 5.0	ug/l	9.41E-04	lbs/day	< 5.0	ug/l	4.83E-03	lbs/day	< 5.0	ug/l	5.84E-03	lbs/day	< 5.0	ug/l	2.97E-03	lbs/day	< 5.0	ug/l	1.85E-03	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	1.84E-03	lbs/day	< 10.0	ug/l	1.88E-03	lbs/day	< 10.0	ug/l	9.65E-03	lbs/day	< 10.0	ug/l	1.17E-02	lbs/day	< 10.0	ug/l	5.95E-03	lbs/day	< 10.0	ug/l	3.69E-03	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	7.37E-03	lbs/day	< 40	ug/l	7.53E-03	lbs/day	< 40	ug/l	3.86E-02	lbs/day	< 40	ug/l	4.68E-02	lbs/day	< 40	ug/l	2.38E-02	lbs/day	< 40	ug/l	1.48E-02	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	1.84E-03	lbs/day	< 10	ug/l	1.88E-03	lbs/day	< 10	ug/l	9.65E-03	lbs/day	120	ug/l	1.40E-01	lbs/day	85	ug/l	5.05E-02	lbs/day	75.2	ug/l	2.78E-02	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	3.68E-04	lbs/day	< 2.0	ug/l	3.76E-04	lbs/day	2.0	ug/l	1.93E-03	lbs/day	3.0	ug/l	3.51E-03	lbs/day	< 2.0	ug/l	1.19E-03	lbs/day	< 2.0	ug/l	7.38E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	20 D	NTU			11 D	NTU			69 DH	NTU			< 1.0 H	NTU			< 1.0	NTU			1.8	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					EVENT02-EF19-112112				EVENT02-EF20-113012				EVENT02-EF21-121212				EVENT02-EF22-010213*				EVENT02-EF23-010313				EVENT02-EF24-010713			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		11/21/2012				11/30/2012				12/12/2012				1/2/2013				1/3/2013				1/7/2013			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	130	gpm	0.0336	MGD	140	gpm	0.0881	MGD	110	gpm	0.0513	MGD	50	gpm	0.0112	MGD	30	gpm	0.0072	MGD	70	gpm	0.0315	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.65	SU			8.01	SU			7.50	SU			7.51	SU			7.57	SU			7.51	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	1.40E+00	lbs/day	< 10	mg/l	3.68E+00	lbs/day	< 10	mg/l	2.14E+00	lbs/day	< 10	mg/l	4.65E-01	lbs/day	< 10	mg/l	2.99E-01	lbs/day	< 10	mg/l	1.31E+00	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	1.12E-04	lbs/day	< 0.80	ug/l	2.94E-04	lbs/day	< 0.80	ug/l	1.71E-04	lbs/day	< 0.80	ug/l	3.73E-05	lbs/day	< 0.80	ug/l	2.39E-05	lbs/day	< 0.80	ug/l	1.05E-04	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.40E-04	lbs/day	< 1.0	ug/l	3.68E-04	lbs/day	< 1.0	ug/l	2.14E-04	lbs/day	< 1.0	ug/l	4.66E-05	lbs/day	< 1.0	ug/l	2.99E-05	lbs/day	< 1.0	ug/l	1.31E-04	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.40E-04	lbs/day	< 1.0	ug/l	3.68E-04	lbs/day	< 1.0	ug/l	2.14E-04	lbs/day	< 1.0	ug/l	4.66E-05	lbs/day	< 1.0	ug/l	2.99E-05	lbs/day	< 1.0	ug/l	1.31E-04	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.40E-04	lbs/day	< 1.0	ug/l	3.68E-04	lbs/day	< 1.0	ug/l	2.14E-04	lbs/day	< 1.0	ug/l	4.66E-05	lbs/day	< 1.0	ug/l	2.99E-05	lbs/day	< 1.0	ug/l	1.31E-04	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.40E-04	lbs/day	< 1.0	ug/l	3.68E-04	lbs/day	< 1.0	ug/l	2.14E-04	lbs/day	< 1.0	ug/l	4.66E-05	lbs/day	< 1.0	ug/l	2.99E-05	lbs/day	< 1.0	ug/l	1.31E-04	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	4.21E-04	lbs/day	< 3.0	ug/l	1.10E-03	lbs/day	< 3.0	ug/l	6.43E-04	lbs/day	< 3.0	ug/l	1.40E-04	lbs/day	< 3.0	ug/l	8.98E-05	lbs/day	< 3.0	ug/l	3.94E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	2.81E-06	lbs/day	< 0.020	ug/l	7.36E-06	lbs/day	< 0.020	ug/l	4.29E-06	lbs/day	< 0.020	ug/l	9.32E-07	lbs/day	< 0.020	ug/l	5.99E-07	lbs/day	< 0.020	ug/l	2.63E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	7.02E-04	lbs/day	< 5.0	ug/l	1.84E-03	lbs/day	< 5.0	ug/l	1.07E-03	lbs/day	< 5.0	ug/l	2.33E-04	lbs/day	< 5.0	ug/l	1.50E-04	lbs/day	< 5.0	ug/l	6.57E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	1.40E-03	lbs/day	< 10.0	ug/l	3.68E-03	lbs/day	< 10.0	ug/l	2.14E-03	lbs/day	< 10.0	ug/l	4.66E-04	lbs/day	< 10.0	ug/l	2.99E-04	lbs/day	< 10.0	ug/l	1.31E-03	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	5.62E-03	lbs/day	< 40	ug/l	1.47E-02	lbs/day	< 40	ug/l	8.57E-03	lbs/day	< 40	ug/l	1.86E-03	lbs/day	< 40	ug/l	1.20E-03	lbs/day	< 40	ug/l	5.26E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	28.4	ug/l	3.99E-03	lbs/day	10.2	ug/l	3.75E-03	lbs/day	< 10	ug/l	2.14E-03	lbs/day	< 10	ug/l	4.66E-04	lbs/day	< 10	ug/l	2.99E-04	lbs/day	< 10	ug/l	1.31E-03	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	2.81E-04	lbs/day	3.0	ug/l	1.10E-03	lbs/day	< 2.0	ug/l	4.29E-04	lbs/day	< 2.0	ug/l	9.32E-05	lbs/day	< 2.0	ug/l	5.99E-05	lbs/day	< 2.0	ug/l	2.63E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	2.5	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					EVENT02-EF25-011013				EVENT02-EF26-011113				EVENT02-EF27-011613				EVENT02-EF28-012113				EVENT02-EF29-020113				EVENT02-EF30-021113			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		1/10/2013				1/11/2013				1/16/2013				1/21/2013				2/1/2013				2/11/2013			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	60	gpm	0.0182	MGD	30	gpm	0.0099	MGD	110	gpm	0.0162	MGD	90	gpm	0.0427	MGD	90	gpm	0.0266	MGD	90	gpm	0.0393	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.42	SU			7.57	SU			7.57	SU			7.59	SU			7.32	SU			7.64	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	7.60E-01	lbs/day	< 10	mg/l	4.14E-01	lbs/day	< 10	mg/l	6.75E-01	lbs/day	< 10	mg/l	1.78E+00	lbs/day	< 10	mg/l	1.11E+00	lbs/day	< 10	mg/l	1.64E+00	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	6.09E-05	lbs/day	< 0.80	ug/l	3.31E-05	lbs/day	< 0.80	ug/l	5.40E-05	lbs/day	< 0.80	ug/l	1.43E-04	lbs/day	< 0.80	ug/l	8.89E-05	lbs/day	< 0.80	ug/l	1.31E-04	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.61E-05	lbs/day	< 1.0	ug/l	4.14E-05	lbs/day	< 1.0	ug/l	6.75E-05	lbs/day	< 1.0	ug/l	1.78E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.61E-05	lbs/day	< 1.0	ug/l	4.14E-05	lbs/day	< 1.0	ug/l	6.75E-05	lbs/day	< 1.0	ug/l	1.78E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.61E-05	lbs/day	< 1.0	ug/l	4.14E-05	lbs/day	< 1.0	ug/l	6.75E-05	lbs/day	< 1.0	ug/l	1.78E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	7.61E-05	lbs/day	< 1.0	ug/l	4.14E-05	lbs/day	< 1.0	ug/l	6.75E-05	lbs/day	< 1.0	ug/l	1.78E-04	lbs/day	< 1.0	ug/l	1.11E-04	lbs/day	< 1.0	ug/l	1.64E-04	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	2.28E-04	lbs/day	< 3.0	ug/l	1.24E-04	lbs/day	< 3.0	ug/l	2.03E-04	lbs/day	< 3.0	ug/l	5.35E-04	lbs/day	< 3.0	ug/l	3.33E-04	lbs/day	< 3.0	ug/l	4.92E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	1.52E-06	lbs/day	< 0.020	ug/l	8.28E-07	lbs/day	< 0.020	ug/l	1.35E-06	lbs/day	< 0.020	ug/l	3.57E-06	lbs/day	< 0.020	ug/l	2.22E-06	lbs/day	< 0.020	ug/l	3.28E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	3.80E-04	lbs/day	< 5.0	ug/l	2.07E-04	lbs/day	< 5.0	ug/l	3.38E-04	lbs/day	< 5.0	ug/l	8.92E-04	lbs/day	< 5.0	ug/l	5.56E-04	lbs/day	< 5.0	ug/l	8.21E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	7.61E-04	lbs/day	< 10.0	ug/l	4.14E-04	lbs/day	< 10.0	ug/l	6.75E-04	lbs/day	< 10.0	ug/l	1.78E-03	lbs/day	< 10.0	ug/l	1.11E-03	lbs/day	< 10.0	ug/l	1.64E-03	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	< 40	ug/l	3.04E-03	lbs/day	< 40	ug/l	1.66E-03	lbs/day	40	ug/l	2.70E-03	lbs/day	< 40	ug/l	7.13E-03	lbs/day	< 40	ug/l	4.44E-03	lbs/day	< 40	ug/l	6.57E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	7.61E-04	lbs/day	< 10	ug/l	4.14E-04	lbs/day	< 10	ug/l	6.75E-04	lbs/day	< 10	ug/l	1.78E-03	lbs/day	< 10	ug/l	1.11E-03	lbs/day	< 10	ug/l	1.64E-03	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	1.52E-04	lbs/day	< 2.0	ug/l	8.28E-05	lbs/day	< 2.0	ug/l	1.35E-04	lbs/day	< 2.0	ug/l	3.57E-04	lbs/day	< 2.0	ug/l	2.22E-04	lbs/day	< 2.0	ug/l	3.28E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			< 1.0	NTU			1.0	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Table 4-6
Comparison of Treated Water Analytical Data to SPDES Permit Equivalency Limits
Former Clifton MGP Site OU-2
Staten Island, New York

Sample ID	SPDES Permit Equivalent					EVENT02-EF31-030113				EVENT02-EF32-030813				EVENT02-EF33-031413			
Date Sampled	Discharge Limitations			Minimum Monitoring Requirements		3/1/2013				3/8/2013				3/14/2013			
Parameter	Monthly Avg.	Daily Max	Units	Measurement Frequency	Sample Type	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units	Result	Units	Mass Loading	Units
Flow	Monitor	0.72	MGD	Continuous	Meter	120	gpm	0.0417	MGD	50	gpm	0.0235	MGD	100	gpm	0.0233	MGD
pH (range)	6.5-8.5		SU	Daily	Grab	7.60	SU			7.78	SU			7.01	SU		
TSS	Monitor	20	mg/l	Weekly (7)	Grab	< 10	mg/l	1.74E+00	lbs/day	< 10	mg/l	9.80E-01	lbs/day	< 10	mg/l	9.71E-01	lbs/day
Benzene	Monitor	5	ug/l	Weekly (7)	Grab	< 0.80	ug/l	1.39E-04	lbs/day	< 0.80	ug/l	7.85E-05	lbs/day	< 0.80	ug/l	7.78E-05	lbs/day
Ethylbenzene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.74E-04	lbs/day	< 1.0	ug/l	9.82E-05	lbs/day	< 1.0	ug/l	9.73E-05	lbs/day
o-Xylene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.74E-04	lbs/day	< 1.0	ug/l	9.82E-05	lbs/day	< 1.0	ug/l	9.73E-05	lbs/day
m/p-Xylene	Monitor	10	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.74E-04	lbs/day	< 1.0	ug/l	9.82E-05	lbs/day	< 1.0	ug/l	9.73E-05	lbs/day
Toluene	Monitor	5	ug/l	Weekly (7)	Grab	< 1.0	ug/l	1.74E-04	lbs/day	< 1.0	ug/l	9.82E-05	lbs/day	< 1.0	ug/l	9.73E-05	lbs/day
Acenaphthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Acenaphthylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Benz(a)anthracene	Monitor	10	ug/l	Weekly (7)	Grab	< 3.0	ug/l	5.23E-04	lbs/day	< 3.0	ug/l	2.95E-04	lbs/day	< 3.0	ug/l	2.92E-04	lbs/day
Benzo(a)pyrene	Monitor	0.09	ug/l	Weekly (7)	Grab	< 0.020	ug/l	3.49E-06	lbs/day	< 0.020	ug/l	1.96E-06	lbs/day	< 0.020	ug/l	1.95E-06	lbs/day
Benzo(b)fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Benzo(ghi)perylene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Chrysene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Fluoranthene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Fluorene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Indeno(1,2,3-cd)pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Naphthalene	Monitor	50	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Phenanthrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Pyrene	Monitor	10	ug/l	Weekly (7)	Grab	< 5.0	ug/l	8.72E-04	lbs/day	< 5.0	ug/l	4.91E-04	lbs/day	< 5.0	ug/l	4.86E-04	lbs/day
Arsenic	Monitor	10	ug/l	Weekly (7)	24 hr comp	< 10.0	ug/l	1.74E-03	lbs/day	< 10.0	ug/l	9.82E-04	lbs/day	< 10.0	ug/l	9.73E-04	lbs/day
Nickel	Monitor	80	ug/l	Weekly (7)	24 hr comp	50	ug/l	8.72E-03	lbs/day	40	ug/l	3.93E-03	lbs/day	50	ug/l	4.86E-03	lbs/day
Cyanide, Total	Monitor	Monitor	ug/l	Weekly (7)	Grab	< 10	ug/l	1.74E-03	lbs/day	< 10	ug/l	9.82E-04	lbs/day	< 10	ug/l	9.73E-04	lbs/day
Cyanide, Available	Monitor	10	ug/l	Weekly (7)	Grab	< 2.0	ug/l	3.49E-04	lbs/day	< 2.0	ug/l	1.96E-04	lbs/day	< 2.0	ug/l	1.95E-04	lbs/day
Turbidity	No increase that will cause a substantial visible contrast to Natural Conditions			Daily	Visual	< 1.0 H	NTU			< 1.0	NTU			< 1.0	NTU		

Notes:

Qualifiers

D - Results for dilution

H - Received/analyzed outside of analytical holding time

s - Recovery exceeded control limits for this analyte

< - The compound was not detected at the indicated concentration

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.

* Sample ID does not accurately reflect sampling date

NA - Not analyzed

Exceedances are highlighted in yellow

No data available due to bottle breakage during shipment

Mass loading calculations utilize half the value for all non-detect results

Figures

AECOM Environment
20 Exchange Place
New York, NY 10005
(212) 798-8500
www.aecom.com

Site Location Map
National Grid
Former Clifton Manufactured Gas Plant
Staten Island, New York

Data Source: USGS Topographic Quadrangle - Jersey City & The Narrows.

Scale:	Date:	Project Number:
1"=1000'	October 15, 2013	60137363

Figure Number:

1-1

LEGEND

- NATIONAL GRID PROPERTY LINE
- FENCE
- SIRTOA RAILWAY TRACKS
- BUTTRESS/SCB SHALLOW SLURRY WAL
- BARRIER/SCB SLURRY WAL
- EXISTING STORM DRAIN MANHOLE SURVEYED 4/2012*
- REMNANTS OF TAR SEPARATOR
- FUNDATION
- BARRIER CBW RECOVERY WELL LOCATION
- WATER
- OHE — OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- CATCH BASIN
- C.C. — CURB
- STREET LIGHT (METAL LIGHT)
- T — TRAFFIC SIGNAL
- F.A.B. — FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- E — ELECTRIC MANHOLE
- S — SEWER MANHOLE (UNKNOWN TYPE)
- D — STORM DRAIN MANHOLE
- S — SANITARY SEWER MANHOLE
- C — COMBINED SEWER MANHOLE
- Mh — MANHOLE (NO ID)
- W — WATER MANHOLE
- G — GAS MANHOLE
- T — TELEPHONE MANHOLE
- E — BECO or CTES MANHOLE
- U.B. — UTILITY BOX
- OFF-SITE PROPERTY LINE

30 0 60

GRAPHIC SCALE IN FEET

ACTIVE RAIL TRACKS

STATEN ISLAND RAILWAY

89 WILLOW AVENUE

25 WILLOW AVENUE

CROSS CUT PT. # 36

FENCE TIE-IN OLD/NEW

EDGEWATER STREET

RW-200S

RW-200I

RW-203S

RW-203I

RW-201 I

RW-201 S

RW-202S

RW-202I

BUTTRESS WALL

BARRIER WALL

EXISTING REGULATOR RIM(5.16) INV(-1.04)

CLEANOUT MH RIM(7.13) INV(-2.8)

20" STORM SEWER

(2) 18" STORM SEWER

MH-12 RIM(9.37) INV(4.15)

MH-11 RIM(9.06)

ELECTRIC CONDUIT

S 39°07'08" W 145.492'

STRAIGHT STREET

CAMDEN ST.

RW-209S

BUTTRESS WALL (TYP.)

RW-209I

RW-208S

RW-208I

RW-207S

RW-207I

RW-206S

RW-206IA

RW-206IA

RW-205D

RW-204 I

REMNANTS OF TAR SEPARATOR

ABANDONED BARRIER WALL SECTION

BARRIER WALL (TYP.)

RW-211S

RW-211I

RW-210S

RW-210I

WILLOW AVENUE

N 59°23'20" E 330.491'

N 61°52'33" E 68.543'

DRILL HOLE PT. # 4027

DRILL HOLE PT. # 2026

CROSS CUT PT. # 27

LANGERE PLACE

MH-09 RIM(7.30)

MH-08 RIM(12.31)

MH-07 RIM(7.50)

MH-06 RIM(7.62)

MH-05 RIM(7.41)

MH-04 RIM(3.81) INV(2.35)

MH-03 RIM(6.79) INV(3.39)

MH-02 RIM(6.14) INV(3.51)

MH-01 RIM(7.01) INV(5.18)

8" WATER MAIN

12" GAS MAIN

8" GAS MAIN

16" GAS MAIN

OHE

DRAFT

SITE LAYOUT MAP

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

DATE: 10/05/13 | DRWN: BcV

FIGURE 1-2

AECOM

File: V:\Clifton\60137363\CADD\COR\Figure 1-2 Site Layout Map.dwg Layout: 4-4 User: WeiX1 Plotted: Oct 17, 2013 - 2:37pm Xref's:

BARRIER CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING)	BOTTOM ELEVATION	TOP ELEVATION
BA-01	611,283.1	651,049.0	-25.0	8.4
BA-02	611,299.6	651,024.2	-25.0/-35.0	8.4
BA-03	611,368.2	650,920.7	-35.0	8.6
BA-04	611,456.8	650,658.2	-40.0	7.7
BA-05	611,254.2	650,538.8	-40.0	7.3
BA-06	611,055.1	650,421.9	-40.0	6.4

BUTTRESS CBW CONTROL POINTS				
POINT NUMBER	X(EASTING)	Y(NORTHING	BOTTOM ELEVATION	TOP ELEVATION
BU-01	611,275.6	651,044.0	-2.0	8.3
BU-02	611,325.8	650,968.3	-2.0	8.4
BU-03	611,326.7	650,967.1	-1.0	7.6
BU-04	611,360.7	650,915.7	-1.0	7.3
BU-05	611,452.3	650,666.0	-2.0	6.7
BU-06	611,249.6	650,546.7	-2.0	6.7
BU-07	611,093.5	650,454.9	-2.0	6.6
BU-08	611,090.3	650,453.1	-3.0	6.7
BU-09	611,003.1	650,401.7	-3.0	8.3
BU-10	610,999.0	650,399.2	1.0	8.8
BU-11	610,904.9	650,344.0	1.0	8.0
BU-12	610,909.7	650,336.3	1.0	8.1
BU-13	611,055.1	650,421.9	-3.0	7.0

LEGEND

EXISTING FEATURES

- EXISTING CONTOUR 1 FT
- EXISTING CONTOUR 5 FT
- NATIONAL GRID PROPERTY LINE
- RIGHT OF WAY LINE
- OFF-SITE PROPERTY LINE
- FENCE
- GAS
- SANITARY SEWER
- STORM DRAIN
- PARALLEL STORM DRAINS
- WATER
- TELEPHONE
- OHE OVER HEAD ELECTRIC
- UGE UNDERGROUND ELECTRIC
- UNK UNIDENTIFIED UTILITY
- CATCH BASIN
- FIRE HYDRANT
- GAS VALVE
- WATER VALVE
- TREE
- HEDGE
- CURB & CURB CUT
- STREET LIGHT (METAL LIGHT)
- TRAFFIC SIGNAL
- F.A.B. FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- SIGN
- GUY WIRE
- WOOD UTILITY POLE
- ELECTRIC MANHOLE
- SEWER MANHOLE (UNKNOWN TYPE)
- STORM DRAIN MANHOLE
- SANITARY SEWER MANHOLE
- COMBINED SEWER MANHOLE
- MANHOLE (NO ID)
- WATER MANHOLE
- GAS MANHOLE
- TELEPHONE MANHOLE
- BECO or CTES MANHOLE
- U.B. UTILITY BOX

- EXCAVATION LIMIT
- EXCAVATION CONTOUR 1 FT
- EXCAVATION CONTOUR 5 FT
- RESTORATION CONTOUR 1 FT
- RESTORATION CONTOUR 5 FT
- BUTTRESS CEMENT-BENTONITE WALL (CBW)
- BARRIER CEMENT-BENTONITE WALL (CBW)
- TEMPORARY FABRIC STRUCTURE (TFS) NUMBER INDICATES CONCEPTUAL LOCATION SEQUENCE
- SILT FENCE WITH HAYBALES
- JERSEY BARRIER WITH FENCE
- BA-03 BARRIER CBW CONTROL POINT
- BU-05 BUTTRESS CBW CONTROL POINT
- ES-03 SHALLOW EXCAVATION SPOT CONTROL POINT
- ED-03 DEEP EXCAVATION SPOT CONTROL POINT
- EF-03 DEEP FOUNDATION EXCAVATION SPOT CONTROL POINT
- EG-03 GROUNDWATER EXCAVATION SPOT CONTROL POINT
- CP-001 EXCAVATION AND FINAL GRADE GRID CONTROL POINT
- STATEN ISLAND RAILWAY TRACKS
- BOLLARD
- OPEN DRAINAGE DITCH (DU1)
- EXISTING UTILITY CORRIDOR
- SHALLOW EXCAVATION

GRAPHIC SCALE IN FEET 15 0 30

SHALLOW EXCAVATION

PROTECT EXISTING STORM DRAIN IN PLACE

EXCAVATION TO GROUNDWATER

DEEP EXCAVATION

BARRIER CBW

DEEP FOUNDATION

ACTIVE GAS OPERATION AREA

BUTTRESS CBW

SOUTH-WEST TAR SEPARATOR EXCAVATION

BARRIER CBW

BUTTRESS CBW

RAILWAY

STATEN ISLAND RAILWAY

BAY STREET

EDGEWATER STREET

CAMDEN

WILLOW AVENUE

LANGERE PL.

ISSUED FOR BID

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
0	BcV	07/08/11	ISSUED FOR BID				

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NATIONAL GRID
FORMER CLIFTON
MANUFACTURED GAS PLANT

PROJ. NO.: 60137363-420 DATE: 07/08/11

REMEDIAL DESIGN
EXCAVATION AND SCB
SLURRY WALL PLAN VIEW
- 100% ISSUED TO BID

DRAWING NUMBER:
Figure 4-1A
SHEET NUMBER:
REVISION 0

File: J:\Rem_Eng\Project Files\National Grid\Clifton NY\CAD\2014\FIGURE 4-1A REMEDIAL DESIGN EXCAVATION AND SCB SLURRY WALL PLAN VIEW - 100% ISSUED TO BID.dwg Layout: C-05 User: wroback Plotted: Jan 27, 2014 - 4:17pm Xref's:

BARRIER CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING)	BOTTOM ELEVATION	TOP ELEVATION
BA-01	611,283.1	651,049.0	-25.0	8.4
BA-02	611,299.6	651,024.2	-25.0/-35.0	8.4
BA-03	611,368.2	650,920.7	-35.0	8.6
BA-04	611,456.8	650,658.2	-40.0	7.8
BA-05	611,254.2	650,538.8	-40.0	7.3
BA-06	611,055.1	650,421.9	-40.0	6.0

BUTTRESS CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING)	BOTTOM ELEVATION	TOP ELEVATION
BU-01	611,275.6	651,044.0	-3.0	8.3
BU-02	611,360.7	650,915.7	-3.0	8.5
BU-03	611,452.2	650,665.9	-3.0	8.1
BU-04	611,249.6	650,546.7	-3.0	7.3
BU-05	611,091.8	650,453.9	-3.0	6.5
BU-06	611,090.3	650,453.0	-4.0	6.5
BU-07	611,003.0	650,401.7	-4.0	6.5
BU-08	610,996.6	650,397.9	1.0	6.6
BU-09	610,923.0	650,354.6	1.0	8.3
BU-10	610,904.9	650,344.0	1.0	8.8
BU-11	610,909.6	650,336.3	1.0	8.1

LEGEND

EXISTING FEATURES

EXISTING CONTOUR 1 FT
EXISTING CONTOUR 5 FT
NATIONAL GRID PROPERTY LINE
RIGHT OF WAY LINE
FENCE
GAS
SANITARY SEWER
STORM DRAIN
PARALLEL STORM DRAINS
WATER
TELEPHONE
OVER HEAD ELECTRIC
UNDERGROUND ELECTRIC
UNIDENTIFIED UTILITY
CATCH BASIN
FIRE HYDRANT
GAS VALVE
WATER VALVE
TREE
HEDGE
CURB & CURB CUT
STREET LIGHT (METAL LIGHT)
TRAFFIC SIGNAL
F.A.B. FIRE ALARM BOX
ROUND DRAIN
SQUARE DRAIN
SIGN
GUY WIRE
WOOD UTILITY POLE
ELECTRIC MANHOLE
SEWER MANHOLE (UNKNOWN TYPE)
STORM DRAIN MANHOLE
SANITARY SEWER MANHOLE
COMBINED SEWER MANHOLE
MANHOLE (NO ID)
WATER MANHOLE
GAS MANHOLE
TELEPHONE MANHOLE
BECO or CTES MANHOLE
U.B. UTILITY BOX

EXCAVATION LIMIT
EXCAVATION CONTOUR 1 FT
EXCAVATION CONTOUR 5 FT
RESTORATION CONTOUR 1 FT
RESTORATION CONTOUR 5 FT
BUTTRESS CEMENT-BENTONITE WALL (CBW)
BARRIER CEMENT-BENTONITE WALL (CBW)
TEMPORARY FABRIC STRUCTURE (TFS) NUMBER INDICATES CONCEPTUAL LOCATION SEQUENCE
SILT FENCE WITH HAYBALES
JERSEY BARRIER WITH FENCE
BA-03 BARRIER CBW CONTROL POINT
BU-05 BUTTRESS CBW CONTROL POINT
ES-03 SHALLOW EXCAVATION SPOT CONTROL POINT
ED-03 DEEP EXCAVATION SPOT CONTROL POINT
EF-03 DEEP FOUNDATION EXCAVATION SPOT CONTROL POINT
EG-03 GROUNDWATER EXCAVATION SPOT CONTROL POINT
CP-001 EXCAVATION AND FINAL GRADE GRID CONTROL POINT
STATEN ISLAND RAILWAY TRACKS
BOLLARD
OPEN DRAINAGE DITCH (OU1)
EXISTING UTILITY CORRIDOR

GRAPHIC SCALE IN FEET 15 0 30

ADDED NOTES 1

BUTTRESS CBW
DEEP EXCAVATION
EXISTING PIPE
PROTECT EXISTING STORM DRAINS DURING CBW INSTALLATION
STORM DRAIN TO REMAIN 1
BARRIER CBW
ACTIVE GAS OPERATION AREA
DEEP FOUNDATION
SHALLOW EXCAVATION
EXCAVATION GRID CONTROL POINT TABLE
PROTECT EXISTING STORM DRAINS IN PLACE
ADDED NOTE 1
PIPE LINER SEE NOTE 2.
STORM DRAIN TO REMAIN 1
GROUNDWATER EXCAVATION
STORM DRAIN TO REMAIN 1
BUTTRESS CBW
TAR SEPARATOR EXCAVATION (NOTE 5)
PROTECT EXISTING STORM DRAIN DURING CBW INSTALLATION
STORM DRAIN TO REMAIN 1
BARRIER CBW

RAILWAY AVENUE
STATEN ISLAND RAILWAY TRACKS
EDGEWATER STREET
BAY STREET
CAMDEN
WILLOW AVENUE
LANGERE PL.
10" CONC. SDWK.
9.5' WIDE CONC. SDWK.

ISSUED FOR CONSTRUCTION

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
1	BcV	02/14/12	ISSUED FOR CONSTRUCTION				
0	BcV	07/08/11	ISSUED FOR BID				

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NATIONAL GRID
FORMER CLIFTON
MANUFACTURED GAS PLANT

PROJ. NO.: 60137363-520
DATE: 02/14/12

REMEDIAL DESIGN EXCAVATION AND SCB SLURRY WALL PLAN VIEW - 100% ISSUED FOR CONSTRUCTION REV 1

DRAWING NUMBER: Figure 4-1B
SHEET NUMBER:
REVISION 1

File: V:\ORDen\60137363\CAD\COR\FIGURE 4-1B REMEDIAL DESIGN EXCAVATION AND SCB SLURRY WALL PLAN VIEW - 100% ISSUED FOR CONSTRUCTION REV 1.dwg Layout: C-05 User: wev1 Plotted: Oct 30, 2015 - 5:15pm wev1

BARRIER CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING	Bottom Elevation	Top Elevation
BA-01	611,283.1	651,049.0	-25.0	8.4
BA-02	611,299.6	651,024.2	-25.0/-35.0	8.4
BA-03	611,368.2	650,920.7	-35.0	8.6
BA-04	611,456.7	650,658.4	-40.0	7.9
BA-05	611,425.3	650,640.2	-40.0	7.7
BA-06	611,382.4	650,614.5	-40.0	7.6
BA-07	611,339.5	650,588.8	-40.0	7.4
BA-08	611,296.6	650,563.0	-40.0	7.4
BA-09	611,253.8	650,537.3	-40.0	7.3
BA-10	611,210.9	650,511.6	-40.0	7.2
BA-11	611,168.0	650,485.9	-40.0	7.0
BA-12	611,125.2	650,460.1	-40.0	6.7
BA-13	611,109.9	650,451.0	-40.0	6.6
BA-14	611,074.3	650,429.7	-40.0	6.4
BA-15	611,063.7	650,423.4	-40.0	6.3

BUTTRESS CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING	Bottom Elevation	Top Elevation
BU-01	611,275.6	651,044.0	-3.0	8.3
BU-01A	611,327.3	650,966.3	-3.0	8.3
BU-02	611,360.7	650,915.7	-3.0	8.5
ABU-02	611335.2	650,954.2	-3.0	8.5
BU-03	611,452.2	650,666.2	-3.0	8.0
BU-04	611,429.6	650,653.1	-3.0	7.9
BU-05	611,420.7	650,648.0	-3.0	7.9
BU-06	611,377.8	650,622.3	-3.0	7.6
BU-07	611,335.0	650,596.5	-3.0	7.4
BU-08	611,292.1	650,570.8	-3.0	7.4
BU-09	611,249.2	650,545.1	-3.0	7.3
BU-10	611,206.3	650,519.3	-3.0	7.2
BU-11	611,163.5	650,493.6	-3.0	7.0
BU-12	611,120.6	650,467.9	-3.0	6.7
BU-13	611,105.3	650,458.7	-3.0	6.6
BU-14	611,045.2	650,426.4	-4.0	6.2
BU-15	611,033.4	650,419.7	-4.0	6.3
BU-16	611,002.8	650,402.2	-4.0	6.5
BU-17	610,996.3	650,398.5	1.0	6.6
BU-18	610,958.6	650,376.9	1.0	7.4
BU-19	610,921.0	650,355.3	1.0	8.5
BU-20	610,904.2	650,345.7	1.0	8.9

LEGEND

EXISTING FEATURES

- EXISTING CONTOUR 1 FT
- EXISTING CONTOUR 5 FT
- NATIONAL GRID PROPERTY LINE
- RIGHT OF WAY LINE
- FENCE
- GAS
- SANITARY SEWER
- STORM DRAIN
- PARALLEL STORM DRAINS
- WATER
- TELEPHONE
- OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- UNIDENTIFIED UTILITY
- CATCH BASIN
- FIRE HYDRANT
- GAS VALVE
- WATER VALVE
- TREE
- HEDGE
- CURB & CURB CUT
- STREET LIGHT (METAL LIGHT)
- TRAFFIC SIGNAL
- F.A.B. FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- SIGN
- GUY WIRE
- WOOD UTILITY POLE
- E ELECTRIC MANHOLE
- S SEWER MANHOLE (UNKNOWN TYPE)
- D STORM DRAIN MANHOLE
- S SANITARY SEWER MANHOLE
- C COMBINED SEWER MANHOLE
- MH MANHOLE (NO ID)
- W WATER MANHOLE
- G GAS MANHOLE
- T TELEPHONE MANHOLE
- BECO or CTES MANHOLE
- U.B. UTILITY BOX

- EXCAVATION LIMIT
- EXCAVATION CONTOUR 1 FT
- EXCAVATION CONTOUR 5 FT
- RESTORATION CONTOUR 1 FT
- RESTORATION CONTOUR 5 FT
- BUTTRESS CEMENT-BENTONITE WALL (CBW)
- BARRIER CEMENT-BENTONITE WALL (CBW)
- TEMPORARY FABRIC STRUCTURE (TFS) NUMBER INDICATES CONCEPTUAL LOCATION - SEQUENTIAL
- SILT FENCE WITH HAYBALES
- JERSEY BARRIER WITH FENCE
- BA-03 BARRIER CBW CONTROL POINT
- BU-05 BUTTRESS CBW CONTROL POINT
- ES-03 SHALLOW EXCAVATION SPOT CONTROL POINT
- ED-03 DEEP EXCAVATION SPOT CONTROL POINT
- EF-03 DEEP FOUNDATION EXCAVATION SPOT CONTROL POINT
- EG-03 GROUNDWATER EXCAVATION SPOT CONTROL POINT
- CP-001 EXCAVATION AND FINAL GRADE GRID CONTROL POINT
- STATEN ISLAND RAILWAY TRACKS
- BOLLARD
- OPEN DRAINAGE DITCH (DU1)
- EXISTING UTILITY CORRIDOR

GRAPHIC SCALE IN FEET 15 0 30

2 REVISED CBW ALIGNMENT

2 ADDED NOTE

2 CORRECTED NOTE

2 DELETED NOTE

2 REVISED CBW ALIGNMENT

2 REVISED BUTTRESS CBW ALIGNMENT

2 REVISED CONTROL POINTS

2 REVISED SHALLOW EXCAVATION LIMIT & CONTROL POINTS

2 REVISED SHALLOW EXCAVATION LIMIT & CONTROL POINTS

2 REVISED CBW ALIGNMENT AND CONTROL POINTS

BUTTRESS CBW

DEEP EXCAVATION

PROTECT EXISTING STORM DRAINS DURING CBW INSTALLATION

STORM DRAIN PROTECTION BUFFER ZONE

BARRIER CBW

EXCAVATION

GROUNDWATER EXCAVATION

PROTECT EXISTING STORM DRAINS IN PLACE

STORM DRAIN COVER LINER (NOTE 6)

BUTTRESS CBW

PROTECT EXISTING STORM DRAIN DURING CBW INSTALLATION

TAR SEPARATOR EXCAVATION

BARRIER CBW

DEEP FOUNDATION

SHALLOW EXCAVATION

EDGEWATER STREET

BAY STREET

RAILWAY

STATEN ISLAND

WILLOW AVENUE

CAMDEN

LANGLEY PL.

N 59°23'20" E 330.49'

S 39°07'08" E 565.492'

S 63°52'33" E 68.543'

ISSUED FOR CONSTRUCTION - REV. 2

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
2	BcV	04/23/12	ISSUED FOR CONSTRUCTION				
1	BcV	02/14/12	ISSUED FOR CONSTRUCTION				
0	BcV	07/08/11	ISSUED FOR BID				

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NATIONAL GRID
FORMER CLIFTON
MANUFACTURED GAS PLANT

DATE: 04/23/12

PROJ. NO.: 60137363-520

REMEDIAL DESIGN
EXCAVATION AND SCB
SLURRY WALL PLAN VIEW
- 100% ISSUED FOR
CONSTRUCTION REV 2

DRAWING NUMBER:
Figure 4-1C

SHEET NUMBER:

REVISION 2

THIS DRAWING AND THE INFORMATION CONTAINED HEREIN IS THE PROPERTY OF AECOM AND SHALL NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF AECOM.

File: V:\Clifton\60137363\CAD\CDR\FIGURE 4-1C REMEDIAL DESIGN EXCAVATION AND SCB SLURRY WALL PLAN VIEW - 100% ISSUED FOR CONSTRUCTION REV 2.dwg Layout: C-05 User: wwu1 Plotted: Oct. 30, 2015 - 5:16pm wwu1

BARRIER CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING	Bottom Elevation	Top Elevation
BA-01	611,283.1	651,049.0	-25.0	8.4
BA-02	611,299.6	651,024.2	-25.0/-35.0	8.4
BA-03	611,368.2	650,920.7	-35.0	8.6
BA-04	611,451.3	650,667.8	-40.0	8.1
BA-05	611,416.7	650,647.3	-40.0	7.9
BA-06	611,393.5	650,621.2	-40.0	7.6
BA-07	611,339.5	650,588.8	-40.0	7.4
BA-08	611,296.6	650,563.0	-40.0	7.4
BA-09	611,253.8	650,537.3	-40.0	7.3
BA-10	611,210.9	650,511.6	-40.0	7.2
BA-11	611,168.0	650,485.9	-40.0	7.0
BA-12	611,125.2	650,460.1	-40.0	6.7
BA-13	611,109.9	650,451.0	-40.0	6.6
BA-14	611,074.3	650,429.7	-40.0	6.4
BA-15	611,063.7	650,423.4	-40.0	6.3

3 REVISED CBW ALIGNMENT

BUTTRESS CBW CONTROL POINTS				
POINT NUMBER	X (EASTING)	Y (NORTHING	Bottom Elevation	Top Elevation
BU-01	611,275.6	651,044.0	-3.0	8.3
BU-01A	611,327.3	650,966.3	-3.0	8.3
BU-02	611,360.7	650,915.7	-3.0	8.5
BU-02A	611335.2	650,954.2	-3.0	8.5
BU-03	611,446.8	650,675.6	-3.0	8.1
BU-04	611,427.9	650,664.5	-3.0	8.0
BU-05	611,411.3	650,654.6	-3.0	7.9
BU-06	611,387.7	650,628.2	-3.0	7.7
BU-07	611,335.0	650,596.5	-3.0	7.4
BU-08	611,292.1	650,570.8	-3.0	7.4
BU-09	611,249.2	650,545.1	-3.0	7.3
BU-10	611,206.3	650,519.3	-3.0	7.2
BU-11	611,163.5	650,493.6	-3.0	7.0
BU-12	611,120.6	650,467.9	-3.0	6.7
BU-13	611,105.3	650,458.7	-3.0	6.6
BU-14	611,045.2	650,426.4	-4.0	6.2
BU-15	611,033.4	650,419.7	-4.0	6.3
BU-16	611,002.8	650,402.2	-4.0	6.5
BU-17	610,996.3	650,398.5	1.0	6.6
BU-18	610,958.6	650,376.9	1.0	7.4
BU-19	610,921.0	650,355.3	1.0	8.5
BU-20	610,904.2	650,345.7	1.0	8.9

3 REVISED CBW ALIGNMENT

LEGEND

EXISTING FEATURES

- EXISTING CONTOUR 1 FT
- EXISTING CONTOUR 5 FT
- NATIONAL GRID PROPERTY LINE
- RIGHT OF WAY LINE
- FENCE
- GAS
- SANITARY SEWER
- STORM DRAIN
- PARALLEL STORM DRAINS
- WATER
- TELEPHONE
- OHE — OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- UNIDENTIFIED UTILITY
- CATCH BASIN
- FIRE HYDRANT
- GAS VALVE
- WATER VALVE
- TREE
- HEDGE
- CURB & CURB CUT
- STREET LIGHT (METAL LIGHT)
- TRAFFIC SIGNAL
- F.A.B. — FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- SIGN
- GUY WIRE
- WOOD UTILITY POLE
- E — ELECTRIC MANHOLE
- S — SEWER MANHOLE (UNKNOWN TYPE)
- D — STORM DRAIN MANHOLE
- S — SANITARY SEWER MANHOLE
- C — COMBINED SEWER MANHOLE
- MH — MANHOLE (NO ID)
- W — WATER MANHOLE
- G — GAS MANHOLE
- T — TELEPHONE MANHOLE
- E — BECO or CTES MANHOLE
- U.B. — UTILITY BOX

- EXCAVATION LIMIT
- EXCAVATION CONTOUR 1 FT
- EXCAVATION CONTOUR 5 FT
- RESTORATION CONTOUR 1 FT
- RESTORATION CONTOUR 5 FT
- BUTTRESS CEMENT-BENTONITE WALL (CBW)
- BARRIER CEMENT-BENTONITE WALL (CBW)
- 10 / 8 — TEMPORARY FABRIC STRUCTURE (TFS) NUMBER INDICATES CONCEPTUAL LOCATION SEQUENCE
- SILT FENCE WITH HAYBALES
- J B — JERSEY BARRIER WITH FENCE
- BA-03 — BARRIER CBW CONTROL POINT
- BU-05 — BUTTRESS CBW CONTROL POINT
- ES-03 — SHALLOW EXCAVATION SPOT CONTROL POINT
- ED-03 — DEEP EXCAVATION SPOT CONTROL POINT
- EF-03 — DEEP FOUNDATION EXCAVATION SPOT CONTROL POINT
- EG-03 — GROUNDWATER EXCAVATION SPOT CONTROL POINT
- CP-001 — EXCAVATION AND FINAL GRADE GRID CONTROL POINT
- STATEN ISLAND RAILWAY TRACKS
- BOLLARD
- OPEN DRAINAGE DITCH (OUT)
- EXISTING UTILITY CORRIDOR

GRAPHIC SCALE IN FEET (15 0 30)

BUTTRESS CBW

EDGEWATER STREET

BAY STREET

DEEP EXCAVATION

PROTECT EXISTING STORM DRAINS DURING CBW INSTALLATION

STORM DRAIN PROTECTION BUFFER ZONE

BARRIER CBW

CAMDEN

DEEP FOUNDATION

3 REVISED CBW ALIGNMENT AND EXCAVATION

SHALLOW EXCAVATION

RAILWAY

STATEN ISLAND RAILWAY

STORM DRAIN COVER LINER (NOTE 6)

EXCAVATION

GROUNDWATER EXCAVATION

PROTECT EXISTING STORM DRAINS IN PLACE

STORM DRAIN COVER LINER (NOTE 6)

BUTTRESS CBW

PROTECT EXISTING STORM DRAIN DURING CBW INSTALLATION

TAR SEPARATOR EXCAVATION

BARRIER CBW

LANGER PL.

WILLOW AVENUE

WILLOW

N 59°23'20" E 330.491'

N 63°52'33" E 68.543'

S 39°07'38" E 565.432'

ISSUED FOR CONSTRUCTION - REV. 3

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
5							
4	BcV	05/23/12	ISSUED FOR CONSTRUCTION				
3	BcV	04/23/12	ISSUED FOR CONSTRUCTION				
2	BcV	02/14/12	ISSUED FOR CONSTRUCTION				
1	BcV	07/08/11	ISSUED FOR BID				
0							

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NATIONAL GRID
FORMER CLIFTON
MANUFACTURED GAS PLANT

PROJ. NO.: 60137363-520 DATE: 05/23/12

REMEDIAL DESIGN
EXCAVATION AND SCB
SLURRY WALL PLAN VIEW
- 100% ISSUED FOR
CONSTRUCTION REV 3

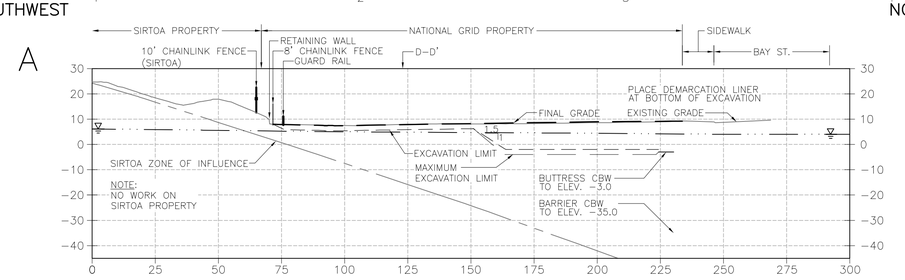
DRAWING NUMBER:
Figure 4-1D

SHEET NUMBER:

REVISION 3

File: V:\Clifton\60137363\CAD\FIGURE 4-1D REMEDIAL DESIGN EXCAVATION AND SCB SLURRY WALL PLAN VIEW - 100% ISSUED FOR CONSTRUCTION REV 3.dwg Layout: C-05 User: wwv1 Plotted: Oct 30, 2015 - 5:18pm wwv1

SOUTHWEST

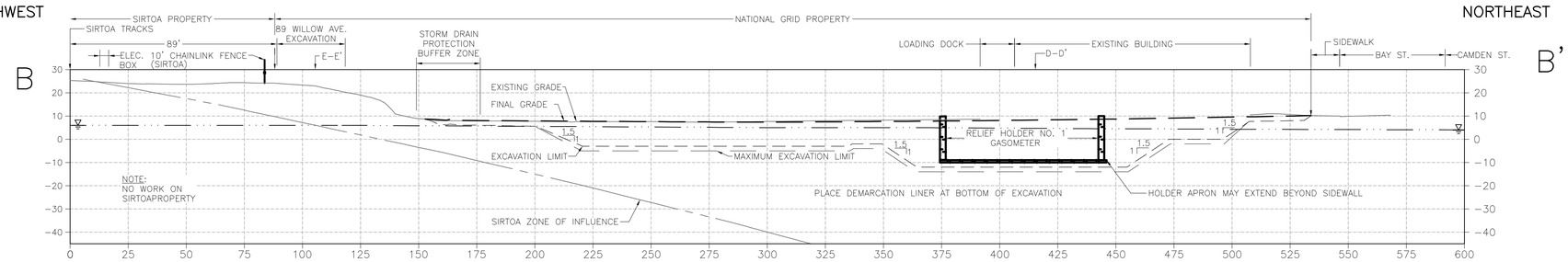


NORTHEAST

NOTES:

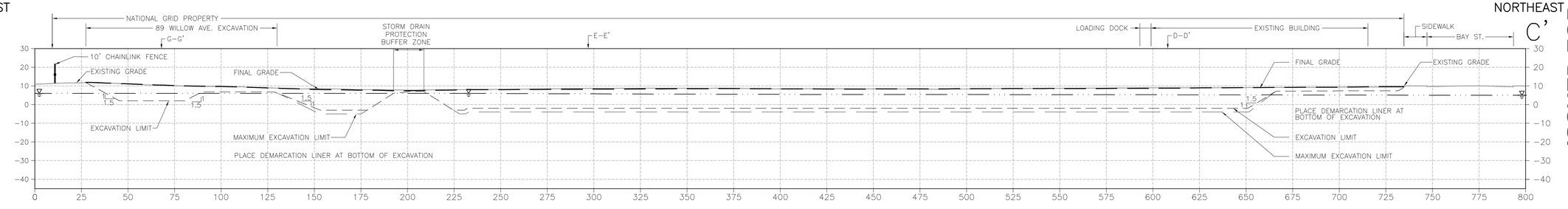
1. CONTRACTOR MAY BE DIRECTED BY CONSTRUCTION MANAGER TO EXTEND EXCAVATION TO MAXIMUM EXCAVATION LIMIT BASED ON OBSERVANCE OF IMPACTS.
2. INFORMATION PROVIDED FOR HISTORIC STRUCTURES IS FOR REFERENCE ONLY. ACTUAL LOCATIONS AND REMAINING SUBSURFACE FEATURES ARE TO BE FIELD VERIFIED BY CONTRACTOR.
3. ALL SUBSURFACE STRUCTURES IDENTIFIED WITHIN THE LIMITS OF EXCAVATION ARE TO BE REMOVED.
4. DEPICTED GROUNDWATER ELEVATION WAS INTERPRETED AND GENERALIZED BASED ON THE OCTOBER 1999 GAUGING EVENT, AND IS PROVIDED FOR REFERENCE ONLY. ACTUAL GROUNDWATER CONDITIONS MAY VARY AT TIME OF WORK. CONTRACTOR MAY ENCOUNTER AREAS OF PERCHED GROUNDWATER AT ELEVATIONS HIGHER THAN DEPICTED.
5. EXCAVATION ON 89 WILLOW AVENUE SHALL EXTEND TO THE GROUNDWATER TABLE AT THE TIME OF EXCAVATION.
6. THE CONTRACTOR SHALL MAINTAIN GROUNDWATER ELEVATION ONE FOOT BELOW EXCAVATION BOTTOM.

SOUTHWEST



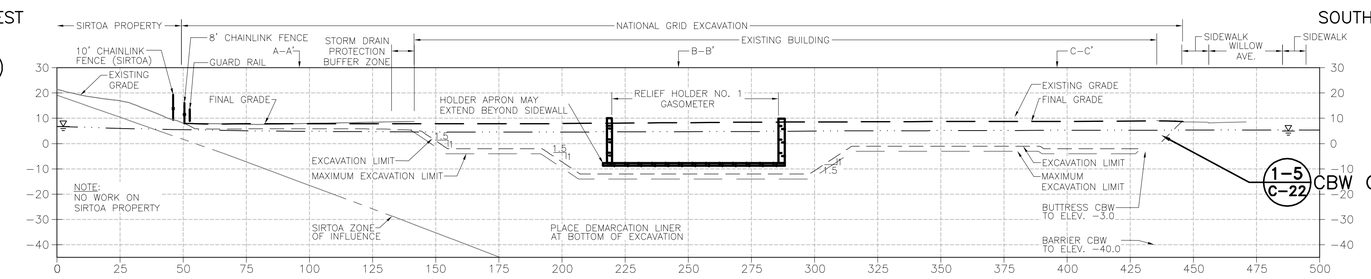
NORTHEAST

SOUTHWEST



NORTHEAST

NORTHWEST

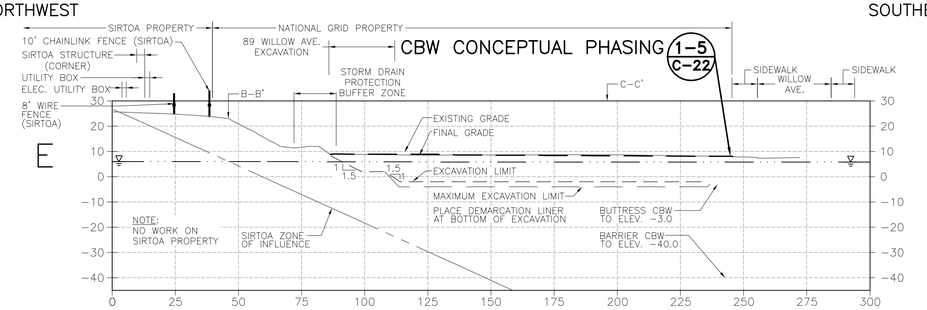


SOUTHEAST

4 REVISED FINAL GRADING ON ALL CROSS SECTIONS

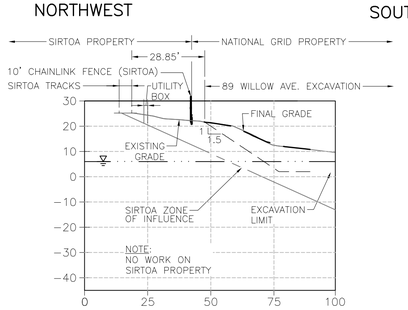
1-5 / C-22 CBW CONCEPTUAL PHASING

NORTHWEST



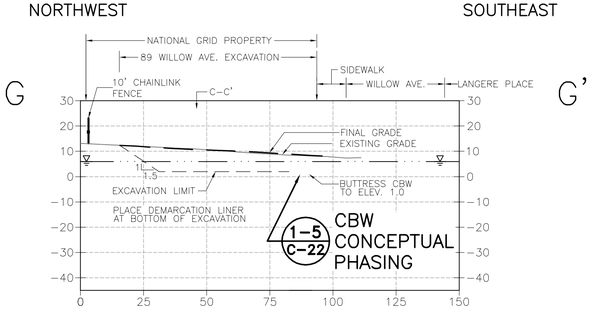
SOUTHEAST

NORTHWEST



SOUTHEAST

NORTHWEST



SOUTHEAST

ISSUED FOR CONSTRUCTION - REV. 4

NO.	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
7							
6							
5							
4	BcV	02/08/13	ISSUED FOR CONSTRUCTION				
3	BcV	05/23/12	ISSUED FOR CONSTRUCTION				
2	BcV	04/23/12	ISSUED FOR CONSTRUCTION				
1	BcV	02/14/12	ISSUED FOR CONSTRUCTION				
0	BcV	07/08/11	ISSUED FOR BID				

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FORMER CLIFTON
MANUFACTURED GAS PLANT

PROJ. NO.: 60137363-520

DATE: 02/08/13

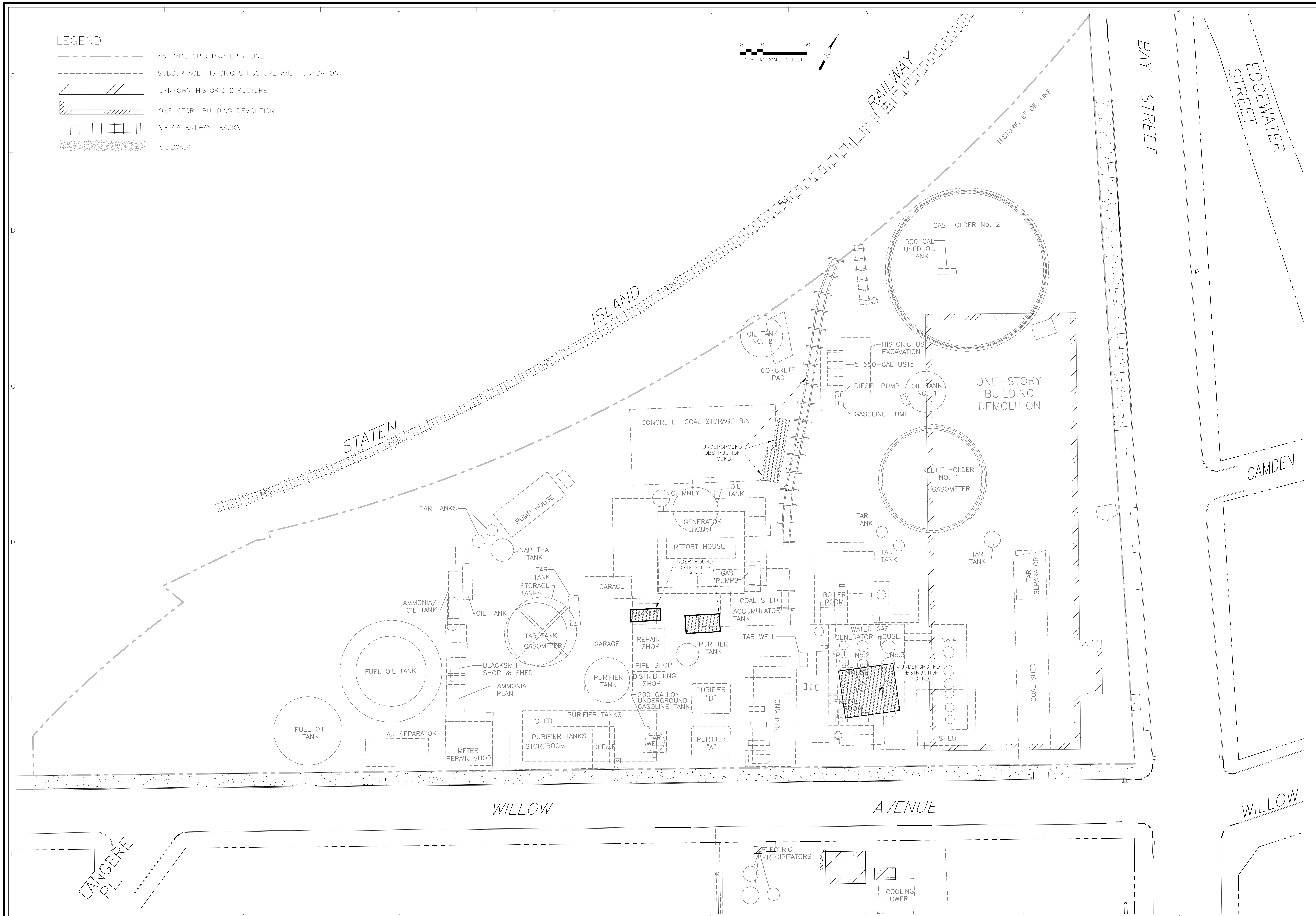
100% ISSUED TO BID
EXCAVATION AND SCB
SLURRY WALL
CROSS SECTIONAL VIEW

DRAWING NUMBER: 4-2

SHEET NUMBER:

REVISION 4

File: K:\Clifton\60137363\CAD\[CCR] Figure 4-2 and Figure 4-3.dwg Layout: Fig 4-2 User: wwv1 Plotted: Oct 30, 2013 - 3:47pm wwv1



LEGEND
NATIONAL GRID PROPERTY LINE
SUBSURFACE HISTORIC STRUCTURE AND FOUNDATION
UNKNOWN HISTORIC STRUCTURE
ONE-STORY BUILDING DEMOLITION
SIRTOA RAILWAY TRACKS
SIDEWALK
GRAPHIC SCALE IN FEET
STATEN ISLAND RAILWAY
HISTORIC 6" OIL LINE
BAY STREET
EDGEWATER STREET
CAMDEN
WILLOW AVENUE
WILLOW
LANGERE PL.
GAS HOLDER No. 2
550 GAL USED OIL TANK
OIL TANK NO. 2
CONCRETE PAD
HISTORIC UST EXCAVATION
5 550-GAL USTs
DIESEL PUMP
GASOLINE PUMP
OIL TANK NO. 1
ONE-STORY BUILDING DEMOLITION
CONCRETE COAL STORAGE BIN
UNDERGROUND OBSTRUCTION FOUND
RELIEF HOLDER No. 1 GASOMETER
PUMP HOUSE
TAR TANKS
CHIMNEY
OIL TANK
GENERATOR HOUSE
RETORT HOUSE
NAPHTHA TANK
TAR TANK
TAR TANK STORAGE TANKS
GAS PUMPS
GARAGE
COAL SHED
ACCUMULATOR TANK
AMMONIA OIL TANK
OIL TANK
STABLE
TAR SEPARATOR
BOILER ROOM
WATER GAS GENERATOR HOUSE
No. 1
No. 2
No. 3
No. 4
TAR TANK GASOMETER
REPAIR SHOP
PURIFIER TANK
TAR WELL
RETORT HOUSE
ENGINE ROOM
FUEL OIL TANK
BLACKSMITH SHOP & SHED
PIPE SHOP
PURIFIER TANK
DISTRIBUTING SHOP
AMMONIA PLANT
200 GALLON UNDERGROUND GASOLINE TANK
PURIFIER "B"
PURIFYING
COAL SHED
PURIFIER TANKS
SHED
FUEL OIL TANK
TAR SEPARATOR
PURIFIER TANKS STOREROOM
OFFICE
TAR WELL
PURIFIER "A"
METER REPAIR SHOP
ELECTRIC PRECIPITATORS
COOLING TOWER

NO	DRWN	DATE	REVISION	CHKD	DATE	APPVD	DATE
3	BcV	05/23/12	ISSUED FOR CONSTRUCTION				
2	BcV	04/23/12	ISSUED FOR CONSTRUCTION				
1	BcV	02/14/12	ISSUED FOR CONSTRUCTION				
0	BcV	07/08/11	ISSUED FOR BID				

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MANUFACTURED GAS PLANT

PROJ. NO.: 60137363-520
DATE: 02/08/13

REMEDIAL ACTION
DEMOLITION ACTIVIES

DRAWING NUMBER: 4-3
SHEET NUMBER:
REVISION 3

File: \\usnycs01\Environment\National Grid\Clifton\60137363\CADD\COR\FIGURE 4-4 SCB SLURRY WALL AS-BUILT PLAN VIEW.dwg Layout: 4-4 User: vershonb Plotted: Jan 27, 2014 - 3:20pm Xref's:

LEGEND

- NATIONAL GRID PROPERTY LINE
- FENCE
- SIRTOA RAILWAY TRACKS
- BUTTRESS/SCB SHALLOW SLURRY WAL
- BARRIER/SCB SLURRY WAL
- EXISTING STORM DRAIN MANHOLE SURVEYED 4/2012*
- REMNANTS OF TAR SEPARATOR
- FOUNDATION
- W — WATER
- OHE — OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- CATCH BASIN
- C.C. — CURB
- STREET LIGHT (METAL LIGHT)
- T — TRAFFIC SIGNAL
- F.A.B. — FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- E — ELECTRIC MANHOLE
- S — SEWER MANHOLE (UNKNOWN TYPE)
- D — STORM DRAIN MANHOLE
- S — SANITARY SEWER MANHOLE
- C — COMBINED SEWER MANHOLE
- Mh — MANHOLE (NO ID)
- W — WATER MANHOLE
- G — GAS MANHOLE
- T — TELEPHONE MANHOLE
- E — BECO or CTES MANHOLE
- U.B. — UTILITY BOX
- RA EXCAVATION BOUNDARY
- OFFSITE PROPERTY BOUNDARY

30 0 60

GRAPHIC SCALE IN FEET

ACTIVE RAIL TRACKS

RAILWAY

ISLAND

STATEN

EDGEWATER STREET

CROSS CUT PT. # 36

FENCE TIE-IN OLD/NEW

CAMDEN ST.

S 39°07'08" E 495.49' STREET

BUTTRESS WALL

BARRIER WALL

GRAVEL WALL

EXISTING REGULATOR RIM(5.10) INV(-1.04)

20" STORM SEWER

CLEANOUT MH RIM(5.08) INV(-2.82)

MH-12 RIM(5.37) INV(3.13)

MH-11 RIM(9.06)

MH-09 RIM(7.30)

MH-08 RIM(12.21)

MH-07 RIM(7.50)

MH-06 RIM(7.62)

MH-04 RIM(5.91) INV(3.45)

MH-03 RIM(6.76) INV(3.39)

MH-02 RIM(7.07) INV(5.18)

MH-01 RIM(8.14) INV(3.51)

BUTTRESS WALL (TYP.)

REMNANTS OF SOUTH-WEST TAR SEPARATOR

ABANDONED BARRIER WALL SECTION

BARRIER WALL (TYP.)

WILLOW AVENUE

N 59°23'20" E 330.491'

N 61°52'33" E 68.543'

DRILL HOLE PT. # 4027

DRILL HOLE PT. # 2026

CROSS CUT PT. # 27

LANGERE PLACE

DRAFT

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

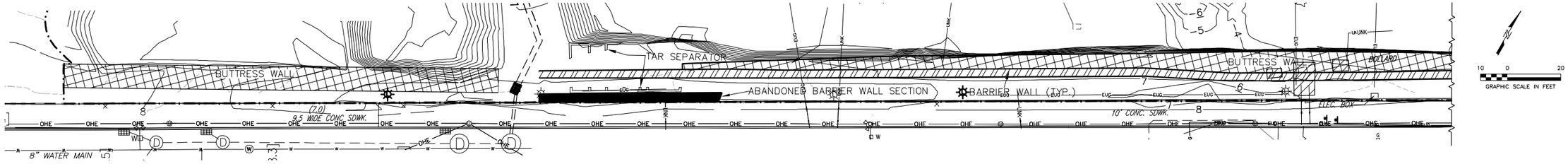
DRWN: BcV

DATE: 01/27/14

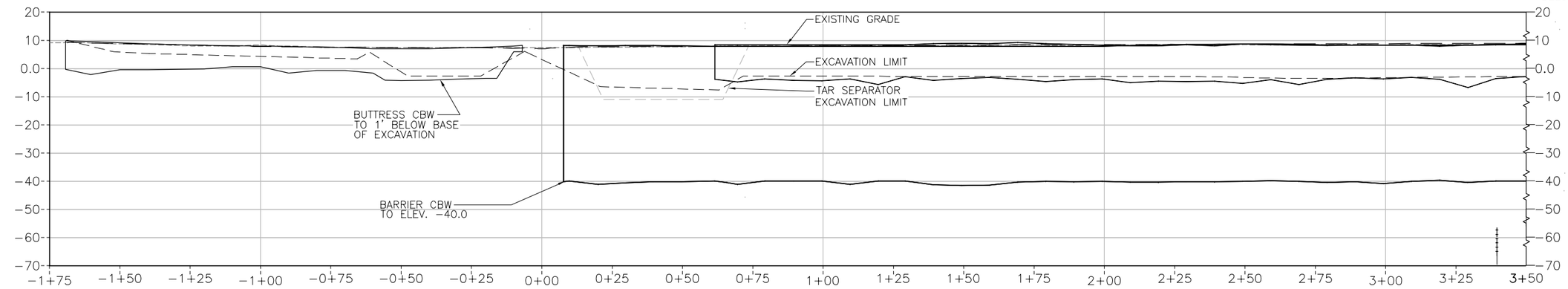
SCB SLURRY WALL AS-BUILT PLAN VIEW

FIGURE 4-4

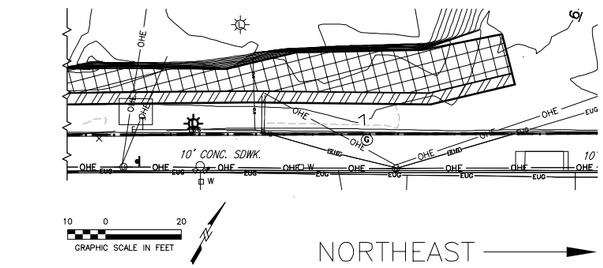
AECOM



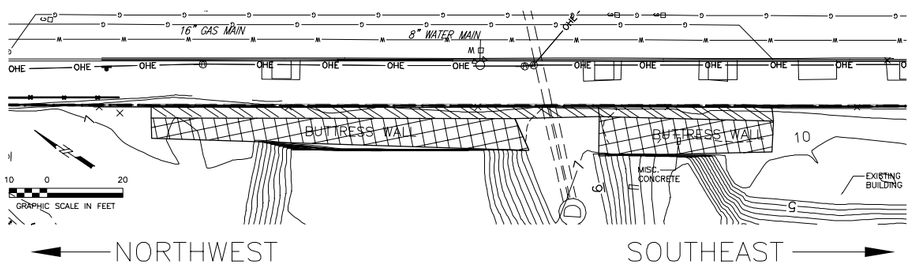
SOUTHWEST



WILLOW AVENUE SCB SLURRY WALL PLAN AND PROFILE

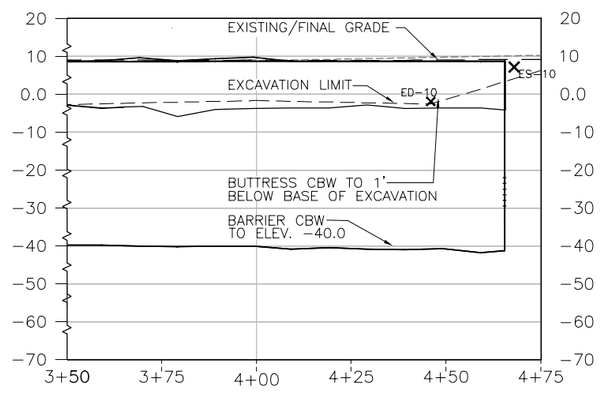


NORTHEAST

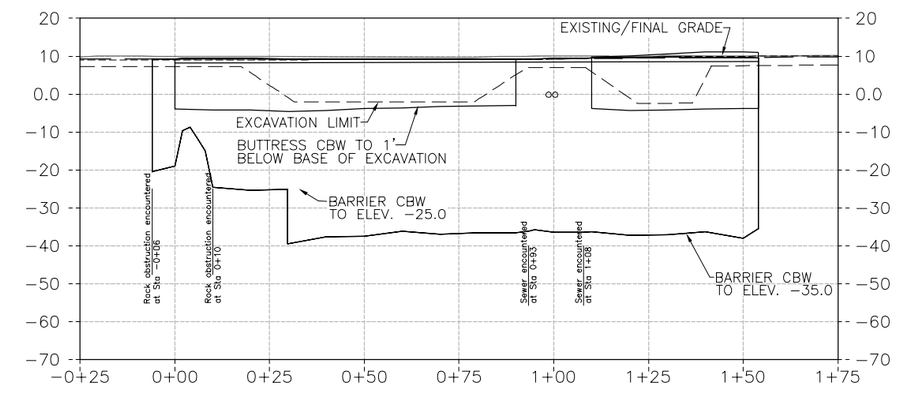


NORTHWEST — SOUTHEAST

FROM ABOVE RIGHT



WILLOW AVENUE SCB SLURRY WALL PLAN AND PROFILE



BAY STREET SCB SLURRY WALL PLAN AND PROFILE

LEGEND

- FINAL GRADE
- TOP OF BUTTRESS AND BARRIER CBW
- AS BUILT EXCAVATION LIMIT
- BOTTOM OF BUTTRESS CBW = BU

DRAFT

SCB SLURRY WALL AS-BUILT CROSS SECTIONAL VIEW

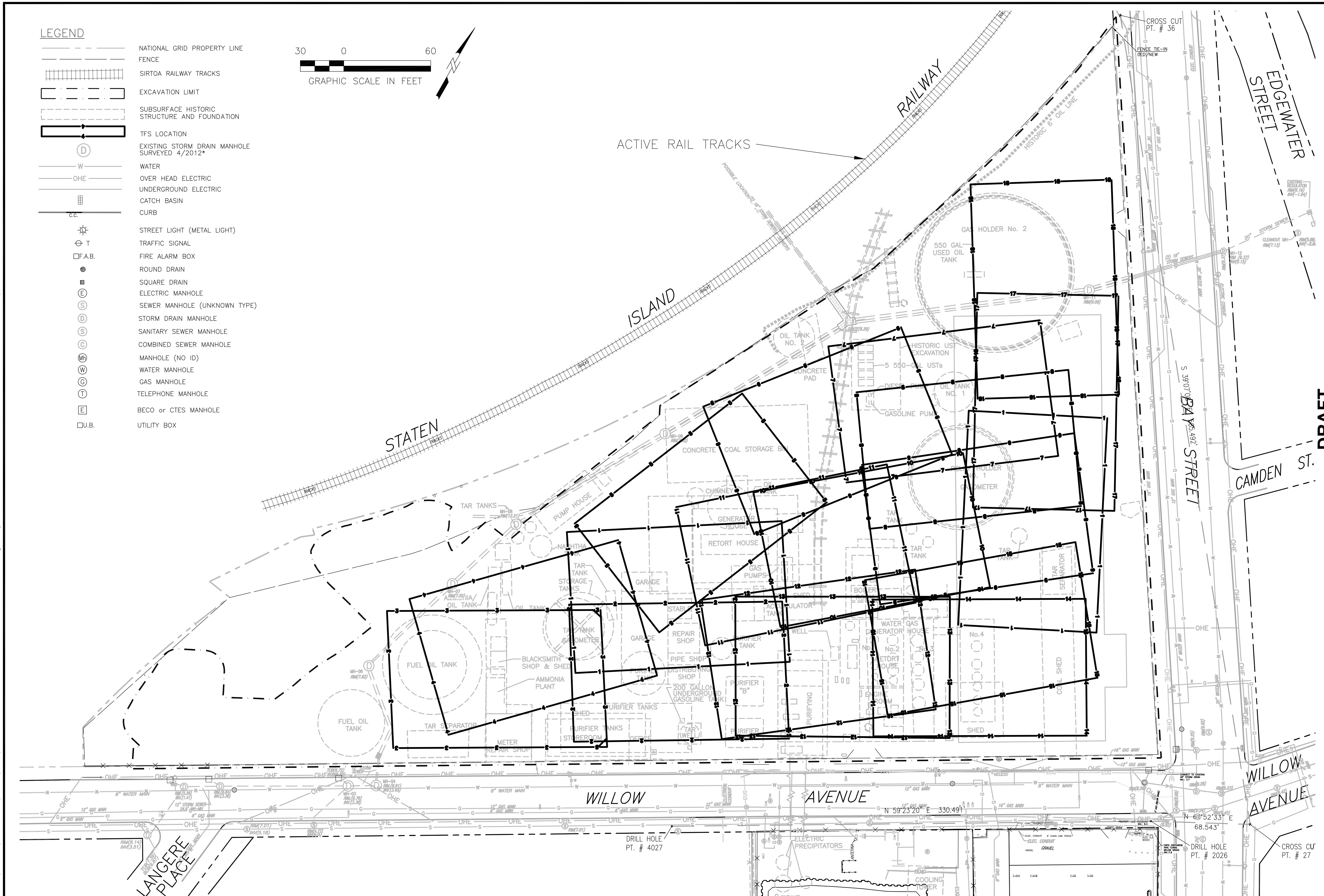
NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

DATE: 08/23/13 | DRWN: BcV

FIGURE 4-5

AECOM

File: V:\Clifton\60137363\CADD\CCR\FIGURE 4-5 SCB SLURRY WALL AS-BUILT CROSS SECTIONAL VIEW.dwg Layout: F 4-3 User: weix1 Plotted: Oct 30, 2013 - 3:27pm Xref's:


LEGEND
NATIONAL GRID PROPERTY LINE
FENCE
SIRTOA RAILWAY TRACKS
EXCAVATION LIMIT
SUBSURFACE HISTORIC STRUCTURE AND FOUNDATION
TFS LOCATION
EXISTING STORM DRAIN MANHOLE SURVEYED 4/2012*
WATER
OVER HEAD ELECTRIC
UNDERGROUND ELECTRIC
CATCH BASIN
CURB
STREET LIGHT (METAL LIGHT)
TRAFFIC SIGNAL
FIRE ALARM BOX
ROUND DRAIN
SQUARE DRAIN
ELECTRIC MANHOLE
SEWER MANHOLE (UNKNOWN TYPE)
STORM DRAIN MANHOLE
SANITARY SEWER MANHOLE
COMBINED SEWER MANHOLE
MANHOLE (NO ID)
WATER MANHOLE
GAS MANHOLE
TELEPHONE MANHOLE
BECO or CTES MANHOLE
UTILITY BOX
30 0 60
GRAPHIC SCALE IN FEET
N
ACTIVE RAIL TRACKS
STATEN ISLAND RAILWAY
CROSS CUT PT. # 36
EDGEWATER STREET
BAY STREET
CAMDEN ST.
WILLOW AVENUE
LANGERE PLACE
GAS HOLDER No. 2
550 GAL USED OIL TANK
OIL TANK No. 2
CONCRETE PAD
HISTORIC UST EXCAVATION
5 550-GAL USTs
OIL TANK No. 1
GASOLINE PUMP
CONCRETE COAL STORAGE BIN
PUMP HOUSE
TAR TANKS
CHIMNEY
GENERATOR HOUSE
RETORT HOUSE
GAS PUMPS
GARAGE
STABLE
REPAIR SHOP
PIPE SHOP
DISTRIBUTING SHOP
200 GALLON UNDERGROUND GASOLINE TANK
PURIFIER TANKS
PURIFIER "B"
PURIFYING
FUEL OIL TANK
TAR SEPARATOR
METER REPAIR SHOP
BLACKSMITH SHOP & SHED
AMMONIA PLANT
STOREROOM
OFFICE
TAR TANK
GASOMETER
WATER GAS GENERATOR HOUSE
ENGINE ROOM
COAL SHED
SHED
ELECTRIC PRECIPITATORS
COOLING TOWER
DRILL HOLE PT. # 4027
DRILL HOLE PT. # 2026
CROSS CUT PT. # 27
N 59°23'20" E 330.491'
N 61°52'33" E 68.543'
DRAFT

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

REMEDIAL ACTION
TFS LOCATIONS

FIGURE 4-6

DATE: 10/05/13

DRWN: BcV

AECOM

File: V:\Clifton\60137363\CADD\CCR\FIGURE 4-6 REMEDIAL ACTION TFS LOCATIONS.dwg Layout: 4-4 User: weix1 Plotted: Oct 30, 2013 - 3:55pm Xref's:

LEGEND

- NATIONAL GRID PROPERTY LINE
- FENCE
- SIRTOA RAILWAY TRACKS
- EXCAVATION CONTOUR 1 FT
- EXCAVATION CONTOUR 5 FT
- CONTOUR 1 FT
- CONTOUR 5 FT
- AREA OF OVER EXCAVATION
- 1 — 1–FOOT OVER EXCAVATED COMPARED TO THE DESIGN
- (D) — EXISTING STORM DRAIN MANHOLE SURVEYED 4/2012*
- REMNANTS OF TAR SEPARATOR
- FUNDATION
- WATER
- OHE — OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- CATCH BASIN
- C.C. — CURB
- STREET LIGHT (METAL LIGHT)
- T — TRAFFIC SIGNAL
- F.A.B. — FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- (E) — ELECTRIC MANHOLE
- (S) — SEWER MANHOLE (UNKNOWN TYPE)
- (D) — STORM DRAIN MANHOLE
- (S) — SANITARY SEWER MANHOLE
- (C) — COMBINED SEWER MANHOLE
- (Mh) — MANHOLE (NO ID)
- (W) — WATER MANHOLE
- (G) — GAS MANHOLE
- (T) — TELEPHONE MANHOLE
- [E] — BECO or CTES MANHOLE
- U.B. — UTILITY BOX
- OFF–SITE PROPERTY LINE

30 0 60

GRAPHIC SCALE IN FEET

ACTIVE RAIL TRACKS

RAILWAY

STATEN ISLAND

EDGEWATER STREET

BAY STREET

CAMDEN ST.

WILLOW AVENUE

LANGERE PLACE

89 WILLOW AVENUE

25 WILLOW AVENUE

FENCE TIE–IN OLD/NEW

FINAL SPOT GRADE (TYP.)

DRAFT

REMEDIAL ACTION AS-BUILT EXCAVATION

FIGURE 4-7

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

DRWN: BcV

DATE: 10/05/13

AECOM

File: \\usnycs01\Environment\National Grid\Clifton\60137363\CADD\CCR\FIGURE 4-7 REMEDIAL ACTION AS-BUILT EXCAVATION.dwg Layout: 4-4 User: pandyas Plotted: Feb 01, 2014 - 5:07am Xref's:

File: \\usnycs01\Environment\National Grid\Clifton\60137363\CADD\CCR\FIGURE 4-8 REMEDIAL ACTION AS-BUILT RESTORATION.dwg Layout: 4-4 User: pandyas Plotted: Feb 01, 2014 - 4:52am Xref's:

LEGEND

- NATIONAL GRID PROPERTY LINE
- FENCE
- SIRTOA RAILWAY TRACKS
- BUTTRESS/SCB SHALLOW SLURRY WAL
- BARRIER/SCB SLURRY WAL
- SIDEWALK
- CONTOUR 1 FT
- CONTOUR 5 FT
- TOPSOIL AREA
- WATER
- OHE — OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- CATCH BASIN
- C.C. — CURB
- STREET LIGHT (METAL LIGHT)
- T — TRAFFIC SIGNAL
- F.A.B. — FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- (E) — ELECTRIC MANHOLE
- (S) — SEWER MANHOLE (UNKNOWN TYPE)
- (D) — STORM DRAIN MANHOLE
- (S) — SANITARY SEWER MANHOLE
- (C) — COMBINED SEWER MANHOLE
- (Mh) — MANHOLE (NO ID)
- (W) — WATER MANHOLE
- (G) — GAS MANHOLE
- (T) — TELEPHONE MANHOLE
- [E] — BECO or CTES MANHOLE
- U.B. — UTILITY BOX
- TREE
- OFF-SITE PROPERTY LINE

30 0 60

GRAPHIC SCALE IN FEET

N

ACTIVE RAIL TRACKS

RAILWAY

ISLAND

STATEN

JOINT LINE

EDGEWATER STREET

CROSS CUT PT. # 36

FENCE TIE-IN OLD/NEW

RW-200S

RW-200I

RW-203S

RW-203I

RW-201 I

RW-201 S

RW-202S

RW-202I

BARRIER WALL

BAY STREET

CAMDEN ST.

WILLOW AVENUE

LANGERE PLACE

FINAL CONTOUR (TYP.)

FINAL SPOT GRADE (TYP.)

LIGHT POLE (TYP.)

BUTTRESS WALL (TYP.)

RW-209S

RW-209I

RW-208S

RW-208I

RW-207S

RW-207I

RW-206S

RW-206IA

RW-206IA

RW-205D

RW-204 I

REMNANTS OF TAR SEPARATOR

ABANDONED BARRIER WALL SECTION

BARRIER WALL (TYP.)

RW-211S

RW-211I

RW-210S

RW-210I

DRILL HOLE PT. # 4027

DRILL HOLE PT. # 2026

CROSS CUT PT. # 27

DRAFT

AECOM

REMEDIAL ACTION AS-BUILT RESTORATION

FIGURE 4-8

NATIONAL GRID

FORMER CLIFTON MANUFACTURED GAS PLANT

60137363-520

DRWN: BcV

DATE: 10/05/13

File: \\usnycs01\Environment\National Grid\Clifton\60137363\CADD\CCR\FIGURE 4-9 DNAPL RECOVERY WELL LOCATIONS.dwg Layout: 4-4 User: pandyas Plotted: Feb 01, 2014 - 4:43pm Xref's:

LEGEND

- NATIONAL GRID PROPERTY LINE
- FENCE
- SIRTOA RAILWAY TRACKS
- BUTTRESS/SCB SHALLOW SLURRY WAL
- BARRIER/SCB SLURRY WAL
- EXISTING STORM DRAIN MANHOLE SURVEYED 4/2012*
- REMNANTS OF TAR SEPARATOR
- FOUNDATION
- RW-209S BARRIER CBW RECOVERY WELL LOCATION
- WATER
- OHE OVER HEAD ELECTRIC
- UNDERGROUND ELECTRIC
- CATCH BASIN
- C.C. CURB
- STREET LIGHT (METAL LIGHT)
- T TRAFFIC SIGNAL
- F.A.B. FIRE ALARM BOX
- ROUND DRAIN
- SQUARE DRAIN
- (E) ELECTRIC MANHOLE
- (S) SEWER MANHOLE (UNKNOWN TYPE)
- (D) STORM DRAIN MANHOLE
- (S) SANITARY SEWER MANHOLE
- (C) COMBINED SEWER MANHOLE
- (Mh) MANHOLE (NO ID)
- (W) WATER MANHOLE
- (G) GAS MANHOLE
- (T) TELEPHONE MANHOLE
- [E] BECO or CTES MANHOLE
- U.B. UTILITY BOX
- OFF-SITE PROPERTY LINE

30 0 60

GRAPHIC SCALE IN FEET

RAILWAY

ACTIVE RAIL TRACKS

ISLAND

STATEN

EDGEWATER STREET

CROSS CUT PT. # 36

FENCE TIE-IN OLD/NEW

RW-200S TOP CAST 9.58

RW-200I CAST 9.57

RW-201I TOP CAST 9.37 TOP PVC 8.60

RW-201S TOP CAST 9.57 TOP PVC 8.77

RW-203S TOP CAST 9.14 TOP PVC 8.54

RW-203I TOP CAST 9.16 TOP PVC 8.61

RW-202S TOP CAST 9.85 TOP PVC 9.48

RW-202I TOP CAST 9.94 TOP PVC 9.64

BARRIER WALL

20" STORM SEWER

CLEANOUT MH-12 RIM(9.37) INV(4.15)

EXISTING REGULATOR RIM(9.45) INV(-1.04)

CLEANOUT MH-11 RIM(9.06)

20" WATER MAIN

EXISTING CONDUIT

S 39°07'08" W 45.492'

CAMDEN ST.

DRAFT

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

DRWN: BcV

DATE: 10/05/13

DNAPL RECOVERY WELL LOCATIONS

FIGURE 4-9

POSSIBLE LOCATION(S) OF STORM SEWER CROSSING

GRADE(6.28)

MH-09 RIM(7.30)

MH-08 RIM(12.01)

MH-07 RIM(7.56)

MH-06 RIM(7.62)

RW-209S TOP CAST 8.28 TOP PVC 7.69

BUTTRESS WALL (TYP.)

RW-209I TOP CAST 8.48 TOP PVC 7.63

RW-208S TOP CAST 8.52 TOP PVC 7.23

RW-208I TOP CAST 8.53 TOP PVC 7.81

RW-207S TOP CAST 8.80 TOP PVC 8.15

RW-207I TOP CAST 8.77 TOP PVC 8.23

RW-206S TOP CAST 9.13 TOP PVC 7.63

RW-206IA TOP CAST 9.05 TOP PVC 8.15

RW-206IA TOP CAST 9.02 TOP PVC 8.26

RW-205O TOP CAST 8.82 TOP PVC 8.18

RW-204 TOP CAST 9.35 TOP PVC 8.60

REMNANTS OF TAR SEPARATOR

BUTTRESS WALL

ABANDONED BARRIER WALL SECTION

BARRIER WALL (TYP.)

BARRIER WALL

RW-210S TOP CAST 7.93 TOP PVC 7.32

RW-210I TOP CAST 7.85 TOP PVC 7.30

RW-211S TOP CAST 8.74 TOP PVC 7.15

RW-211I TOP CAST 8.76 TOP PVC 7.23

WILLOW AVENUE

N 59°23'20" E 330.491'

N 61°52'33" E 68.543'

DRILL HOLE PT. # 4027

DRILL HOLE PT. # 2026

CROSS CUT PT. # 27

LANGERE PLACE

MH-04 RIM(9.91) INV(3.45)

MH-03 RIM(9.76) INV(3.76)

MH-02 RIM(9.24) INV(3.30)

MH-01 RIM(9.26) INV(1.41)

MH-10 RIM(9.72)

MH-05 RIM(7.01) INV(5.18)

MH-04A RIM(8.14) INV(3.51)

12" STORM SEWER 24.8' 180-181

8" WATER MAIN

12" GAS MAIN

8" GAS MAIN

16" GAS MAIN

6" GAS MAIN

OHE

ELECTRIC ACCESS

ELECTRIC ACCESS MH

ELECTRIC CONDUIT

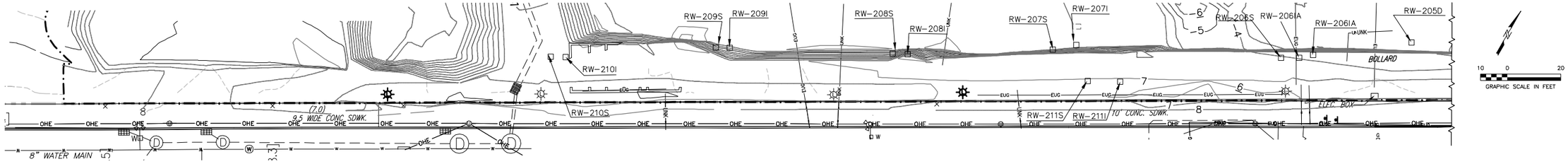
GRAVEL

PROPERTY LINE BETWEEN NATIONAL GRID AND NEW JERSEY TRANSIT

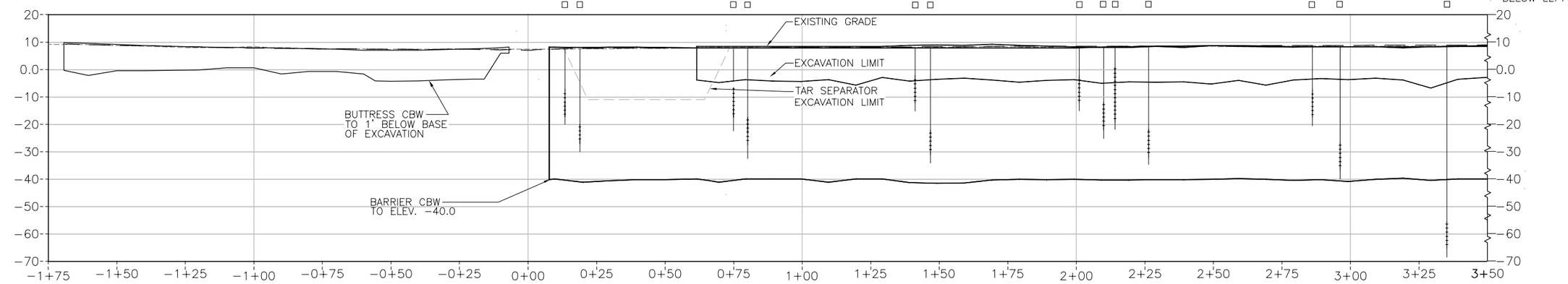
NEW JERSEY TRANSIT

9.38 9.72 9.37 9.53 9.01

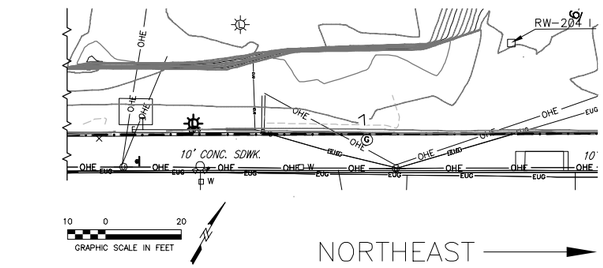
AECOM



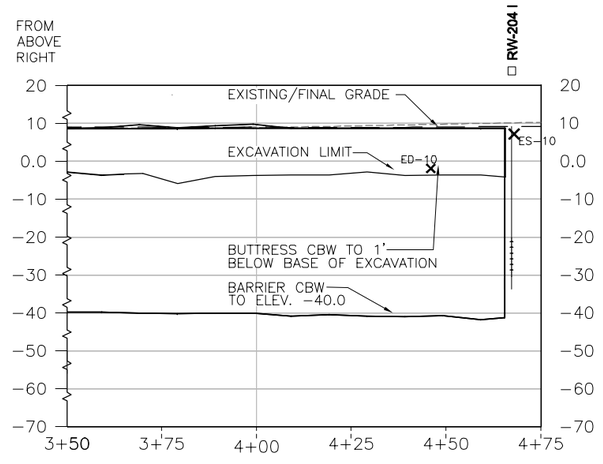
SOUTHWEST



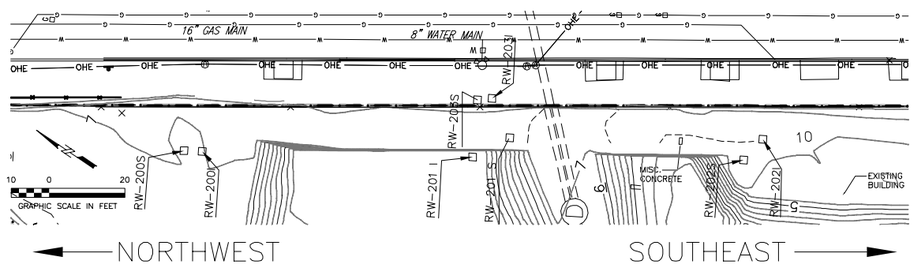
WILLOW AVENUE SCB SLURRY WALL PLAN AND PROFILE



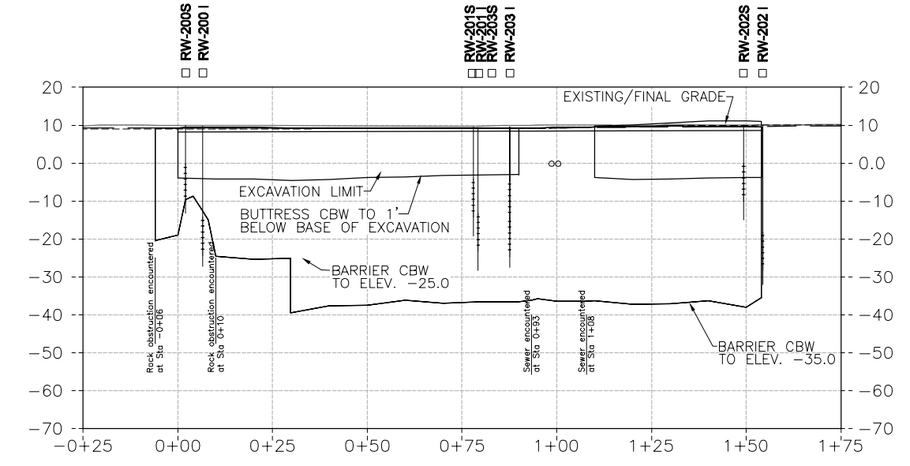
NORTHEAST



WILLOW AVENUE SCB SLURRY WALL PLAN AND PROFILE



NORTHWEST — SOUTHEAST



BAY STREET SCB SLURRY WALL PLAN AND PROFILE

LEGEND

- FINAL GRADE
- TOP OF BUTTRESS AND BARRIER CBW
- BOTTOM OF BUTTRESS CBW = BU
- RECOVERY/MONITORING WELL RISER
- RECOVERY/MONITORING WELL SCREEN
- RECOVERY/MONITORING WELL SUMP

DRAFT

NATIONAL GRID
FORMER CLIFTON MANUFACTURED GAS PLANT
60137363-520

DATE: 08/23/13 | DRWN: BcV

DNAPL RECOVERY WELL CROSS-SECTIONAL VIEW

FIGURE 4-10

AECOM

File: V:\Clifton\60137363\CADD\CCR\FIGURE 10 DNAPL RECOVERY WELL CROSS-SECTION VIEW.dwg Layout: F 4-3 User: weix1 Plotted: Oct 30, 2013 - 3:35pm Xref's:

Appendices

Appendix A

CCR Electronic Copy (DVD)

Appendix B

NYSDEC Design Variation Approvals

Appendix C

CAMP Report (Electronic Format Only)

Appendix D

Remedial Action Permits

Appendix E

DUSR and Analytical Laboratory Data Reports (Electronic Format Only)

Appendix F

DNAPL Recovery Well Construction Logs

Appendix G

Site Safety Daily Sheets and Incident Reports (Electronic Format Only)

Appendix H

Contractors Daily Reports (Electronic Format Only)

Appendix I

Remedial Action Photographic Log (Electronic Format Only)

Appendix J

Disposal Facility Applications and Letters of Acceptance

Appendix K

Disposal Manifests and Bills of Ladings (DVD Format Only)

Appendix L

SWPPP Weekly Inspection Reports (Electronic Format Only)

Appendix M

SCB Slurry Wall Construction QA/QC Forms

- **Engineers Quality Assurance Forms**
- **Contractor's SCB Slurry Wall Construction Report and Quality Control Forms**

Appendix N

Noise, Vibration, and Settlement Monitoring Reports (Electronic Format Only)