SITE MANAGEMENT PLAN

BROOKLYN NAVY YARD
13-ACRE PARCEL SITE
OPERABLE UNIT 1
BROOKLYN, NEW YORK

NYSDEC SITE ID NO: 224019A

Prepared for:
New York City Department of Sanitation
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1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at the Brooklyn Navy Yard, 13-Acre Parcel (hereinafter referred to as the "Site") under the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program administered by the New York State Department of Environmental Conservation (NYSDEC). The site will be remediated in accordance with an Order on Consent (Consent Order) [File Number D2-0001-9403], Site # 224019A, which was executed on October 12, 2006.

1.1.1 General

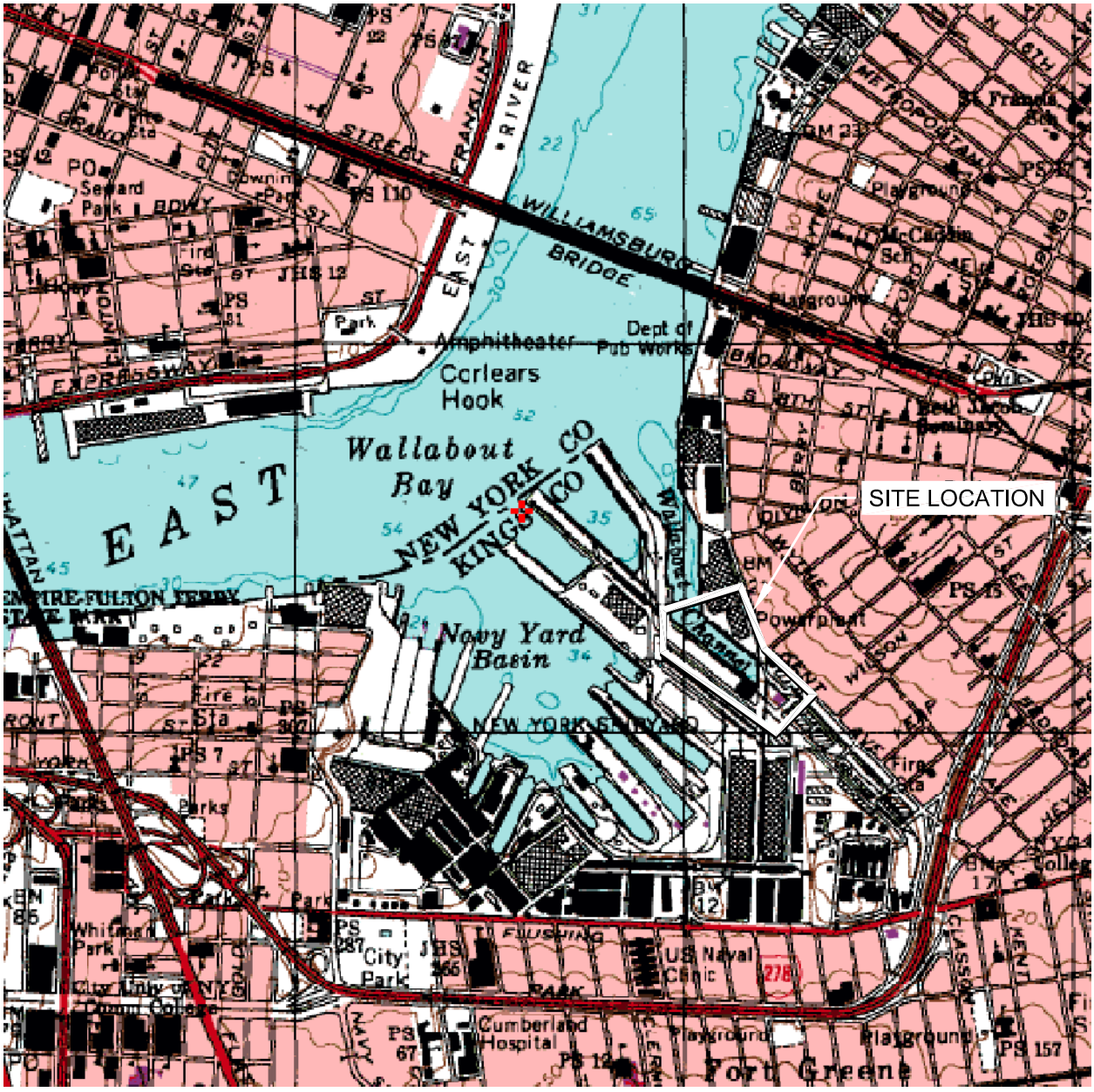
The New York City Department of Sanitation (DSNY) entered into a Consent Order with the NYSDEC to remediate 9.5 acres of the Brooklyn Navy Yard 13-acre parcel located in Brooklyn, Kings County, New York (Operable Unit 1). The Consent Order required the Remedial Party, the DSNY, to investigate and remediate contaminated media at the site. The remaining 3.5 acres of the Brooklyn Navy Yard 13-acre parcel will be remediated under a separate Consent Order by Keyspan Energy Corporation (d/b/a National Grid). A figure showing the site location and boundaries of the 9.5-acre area subject to this plan is provided in Figure 1-1.

After completion of the remedial work described in the Record of Decision (ROD) and the Remedial Design Work Plan (RDWP), some contamination will be left in the subsurface at the site, which is hereafter referred to as "remaining contamination." This Site Management Plan (SMP) was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with Environmental Conservation Law (ECL) Article 71, Title 36. All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by HydroQual Environmental Engineers & Scientists, P.C., on behalf of the DSNY, in accordance with the requirements in the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that will be required by the Environmental Easement for the site.

1.1.2 Purpose

The site will contain contamination left after completion of the remedial action. This SMP describes the ECs that have been incorporated into the site remedy to control exposure to remaining contamination during the future use of the site in order to properly manage residual contamination and to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Kings County Clerk, will require compliance with this SMP and all ECs and ICs placed on the site. The ICs place restrictions on site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and



HydroQual HYDROQUAL ENVIRONMENTAL ENGINEERS & SCIENTISTS, P.C. 1200 MACARTHUR BOULEVARD MAHWAH, NEW JERSEY 07430	Site Management Plan City of New York Department of Sanitation	Figure 1-1 Site Location Map

ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs that will be required by the Environmental Easement for contamination that remains at the site. This plan has been approved by the NYSDEC, and compliance with this plan will be required by the grantor of the Environmental Easement and the grantor's successors and assignees. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the site after completion of the Remedial Action, including: (1) implementation and management of all ECs and ICs; (2) media monitoring; (3) performance of periodic inspections, certification of results, and submittal of Periodic Review Reports; and (4) defining criteria for termination of treatment system operations, as applicable and appropriate.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of site monitoring; and (3) an Operation and Maintenance Plan.

This plan also includes a description of Periodic Review Reports for the submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that will be required by the Environmental Easement. Failure to properly implement the SMP will be a violation of the Environmental Easement, which will be grounds for revocation of the Certificate of Completion (COC);

- Failure to comply with this SMP will also be a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the Consent Order (File Number D2-0001-9403, Site # 224019A) for the site, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's Project Manager. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

1.2.1 Site Location and Description

The site is located in Brooklyn, Kings County, New York and is identified as Block 2023 and Lot 1 on the Kings County tax map. The Brooklyn Navy Yard 13-acre parcel site is located in the northeast portion of the Brooklyn Navy Yard Development Corporation Industrial Park and is operated by the DSNY. The site is bordered by the Wallabout Channel and the East River on

the north and west, by Kent Avenue on the east, and by the remainder of the Brooklyn Navy Yard Industrial Park on the south.

The Brooklyn Navy Yard 13-acre parcel site includes a barge basin, the Former Building 419 transformer substation, two former drum storage areas, a former boat shop area and a former gasification plant area. The surrounding area includes industrial, commercial and residential uses.

Operable Unit No. 1 (OU-1), which is the subject of this document, consists of approximately 9.5 acres of the 13-acre site and includes two former drum storage areas, a railroad siding area, the Former Building 419 transformer station and the Department of Citywide Administrative Services (DCAS) area, the treed area along Kent Avenue and the DSNY staging area. The remaining operable unit for this site is the "Former Brooklyn Navy Yard Manufactured Gas Plant (MGP)" site (a.k.a., OU-2 or the "Nassau Works MGP" site), which occupies approximately 3.5 acres of the 13-acre parcel. This portion of the site formerly housed the Nassau Works Manufactured Gas Plant and is currently the responsibility of Keyspan Energy Corporation (d/b/a National Grid) and is being investigated for contamination related to that use. Wastes associated with OU-2 of the 13-acre parcel are not subject to this proposed plan and will be addressed in a separate SMP in the future.

1.2.2 Site Characteristics

The following sections describe the present conditions and uses of each area within OU-1.

1.2.2.1 Railroad Siding Area

The Railroad Siding Area can be characterized primarily as a paved surface. The area is currently used for vehicle parking. The area is immediately adjacent to the barge basin, approximately 100 feet in width, and includes an inactive railroad track. The top of the rail is at or just below the surrounding ground surface. There is a significant quantity of debris and vegetation that will be removed to prepare surface for application of cover. The area is segregated into smaller areas through the use of large (30" x 30" x 30") concrete blocks arranged in rows.

1.2.2.2 Former Building 419 and Surrounding Area

Former Building 419 and Surrounding Area is primarily used for vehicle storage and staging for the DSNY and the DCAS. It is composed of three areas:

- DCAS Area
- Former Drum Storage Area A
- DSNY Staging Area

1.2.2.3 Department of Citywide Administrative Services Area

The DCAS area is located at the eastern end of the project site, adjacent to Kent Avenue. The area is currently used by DCAS for staging and storage of vehicles destined for auction. The DCAS area includes an office trailer and a guard shack that serve the operations of the site. Much of the surface area of the lot has recently received a thin topcoat of asphalt. The area is surrounded by a chain link fence topped with three courses of barbed wire. Much of the area which will require proper cover is underlain by concrete slabs and foundation walls. Creation of the site-wide cover in areas where concrete structures are encountered will entail excavation around the concrete and placement of the required depth of materials. An existing soil mound located behind the office trailer in the DCAS area is to be excavated to ground level and vegetation re-established.

This area includes Former Building 419 which consists of the exterior brick walls of the structure, the floor slab and its foundation. Trees have grown inside and immediately around the building. Former Building 419 will be demolished and a localized area will be remediated. Areas outside the fence will be covered with a gravel surface. Once the building is demolished, the fence will be restored following a straight line connecting the existing fence.

The area also includes the treed area along the property line, adjacent to Kent Avenue. This area consists of approximately 16 trees within a 8' wide stretch of vegetated ground to an existing curb within the DCAS area. There are two large (40" x" 40" x 6") concrete slabs found along this stretch of vegetated ground along with sporadic groups of rock and boulder. This area will require 12" of existing soil to be removed and replaced with clean fill, with all concrete structures to be removed.

1.2.2.4 Former Drum Storage Area A

Former Drum Storage Area A is located beneath the resurfaced site road known as Jay Avenue. There are utilities beneath the roadway including storm sewer, steam and water. In order to remediate the localized area associated with Former Drum Storage Area A, part of the road will have to be excavated and removed. Traffic using the road will need to be managed during the construction work.

1.2.2.5 New York City Department of Sanitation Staging Area

The staging area is adjacent to Kent Avenue and across Washington Avenue from the DCAS area. The area is currently used for DSNY vehicle storage and parking and services a salt shed which is located on OU-2. Much of the area consists of a layer of gravel/historic fill over a slab of concrete which is approximately 6.5-inches in thickness. Inactive railroad tracks run through the area with the top of rail approximately at ground surface level.

1.2.3 Site History

In 1637, a Dutchman from the adjoining settlement of Breuckelen (Brooklyn) purchased the land on which the Brooklyn Navy Yard is located. At the time of the purchase, the land consisted mostly of mud flats, swamps and creeks. In 1678, John Jackson purchased the

property and established a shipyard on the property called the Broldest Industry. In 1801, the United States Navy purchased the land, which officially became the nation's largest government-owned shipyard. The shipyard, commonly referred to as the Brooklyn Navy Yard, contained 270 buildings, in which approximately 71,000 men and women worked during World War II. The Brooklyn Navy Yard was virtually abandoned by the federal government in the 1960s and was officially closed in 1965. The federal government then sold the Brooklyn Navy Yard to the City in 1968. The property has since been leased from the City by the Brooklyn Navy Yard Development Corporation.

A comparison of historical maps for the Brooklyn Navy Yard shows that the Wallabout Channel shoreline, located within the site, changed between 1801 and the 1950s as a result of various site improvement activities; much of the Brooklyn Navy Yard is underlain by fill material which was used to build up the swamp land to create the present day configuration.

1.2.3.1 Operational/Disposal History

OU-1 of the 13-acre parcel contains the following distinct areas of investigation: Former Drum Storage Area A; the Railroad Siding Area; Former Building 419 and the surrounding area. Former Drum Storage Area B has been successfully remediated and is not part of this SMP. The following is a brief operational and disposal history of each area covered by this SMP:

Former Drum Storage Area A:

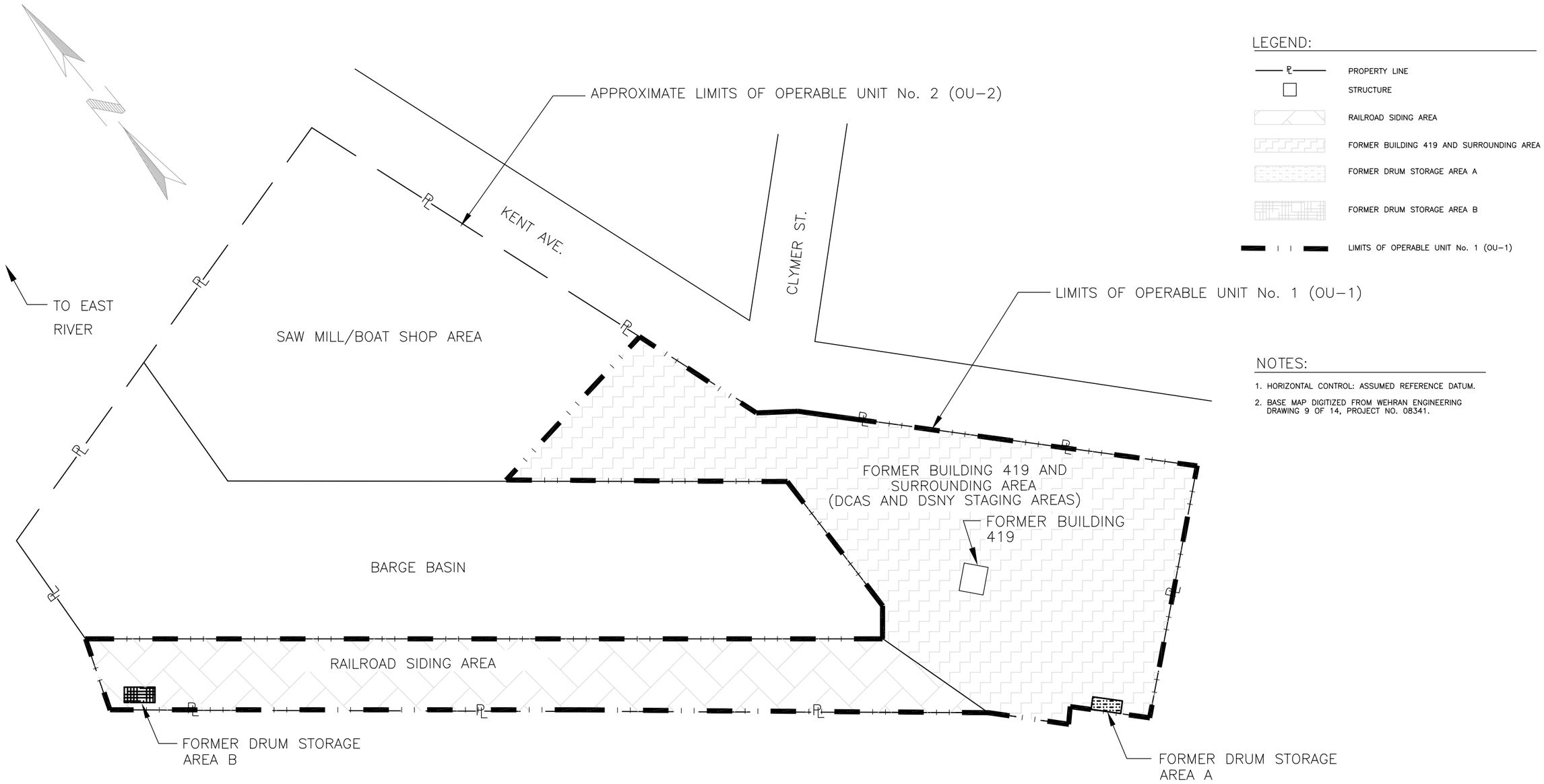
Former Drum Storage Area A is located in the southeastern corner of the site and was reportedly used to store a roll-off container filled with five-gallon drums that were labeled as containing various solvents, lubricating oils and cutting oils. The exact location of Former Drum Storage Area A is uncertain, however, a 1988 Environmental Assessment report placed it in the area shown on Figure 1-2. The concern at this area was that drums of hazardous materials may have leaked and caused contamination to soils underlying pavement.

Former Building 419 and the Surrounding Area:

A primary contaminant leading to the listing of this site on the Registry of Inactive Hazardous Waste Sites was polychlorinated biphenyls (PCBs) released during a 1986 transformer fire at Former Building 419, which was an enclosure formerly used as a transformer substation. The “building” has no roof and the “floor” consists of individual concrete slabs, on which the transformers were formerly located, separated by exposed earth and gravel. In June 1986, there was an explosion and subsequent fire at one of the PCB-containing transformers located within Former Building 419. Former Building 419 was decontaminated, and contaminated soils were removed from the immediate vicinity of the transformer. The investigation of this area focused on identifying PCB contamination remaining following the earlier cleanup.

Railroad Siding Area:

The Railroad Siding Area is located along the southwestern portion of the site and runs in a northwest to southeast direction. Sampling in this area initially occurred during the 1988



LEGEND:

- PROPERTY LINE
- STRUCTURE
- RAILROAD SIDING AREA
- FORMER BUILDING 419 AND SURROUNDING AREA
- FORMER DRUM STORAGE AREA A
- FORMER DRUM STORAGE AREA B
- LIMITS OF OPERABLE UNIT No. 1 (OU-1)

NOTES:

1. HORIZONTAL CONTROL: ASSUMED REFERENCE DATUM.
2. BASE MAP DIGITIZED FROM WEHRAN ENGINEERING DRAWING 9 OF 14, PROJECT NO. 08341.

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Figure 1-2

Site Areas

BACK OF FIGURE 1-2

Environmental Assessment and indicated the presence of PCBs at low concentrations in a single composite sample collected. This resulted in further exploratory borings and test pits in the area to investigate the potential presence of PCBs, as well as lead and semivolatile organic compounds. The investigation of this area focused on confirming earlier results, as well as filling data gaps.

The site has been the subject of several investigations. Work plans results of these were reported in the following documents:

- "Environmental Assessment Report," November 1988, prepared by Wehran Engineering for Wheelabrator Environmental Services Incorporated;

- "Work Plans for a Thirteen-Acre Parcel of The Brooklyn Navy Yard, Part I – Interim Remedial Measures [IRM] Work Plan," July 1996, prepared by HDR for DSNY;

- "Work Plans for a Thirteen-Acre Parcel of the Brooklyn Navy Yard, Part II – Supplementary Site Assessment [SSA] Work Plan," March 1997, prepared by HDR for DSNY;

- "Final Interim Remedial Measures Report, The Brooklyn Navy Yard," September 1997, prepared by HDR for DSNY;

- "Final Supplementary Site Assessment Report for a 13-Acre Parcel of the Brooklyn Navy Yard," June 1998, prepared by HDR for the DSNY;

- January 26,1999 HDR letter to the NYSDEC providing supplemental information related to the SSA;

- "Meeting with Federal Agencies; Summary of Water Quality, Aquatic Ecology, and Sediment Sampling Results; Brooklyn Navy Yard Nearshore Confined Disposal Facility," January 2001, prepared by PB in Association with Anchor and EEA, for BNYDC;

- April 13, 2004 Quay Consulting, LLC letter to the NYSDEC providing soil sample data results for areas that will be occupied by proposed new roadways for future use of the property;

- October 2004 Data Usability Summary Report, The Brooklyn Navy Yard Parcel, prepared by HDR and December 2004 addendum; and

- Supplementary Site Investigation [SSI] Work Plan, The Brooklyn Navy Yard Parcel, New York, Site ID No. 224019A, HDR and HydroQual Environmental Engineers and Scientists, P.C., August 2005.

The information contained in the above noted documents was compiled for the site as a whole and constitutes the complete data set that was used in the preparation of the "Remedial Investigation Report [RI Report], The Brooklyn Navy Yard Parcel, Brooklyn, New York, Site ID No. 224019A," HydroQual Environmental Engineers and Scientists, P.C., September 2006.

Additional details of the prior site investigations and IRMs performed at Former Building 419 in response to the transformer fire are presented in the RI Report.

1.2.4 Geologic Conditions

The site is generally comprised of 2 to 6 inches of concrete, asphalt or gravel with a minimum of 8 to 12 inches of millings beneath.

The uppermost shallow aquifer underlying the site includes the surficial fill unit and, in places, portions of the silt and silty sand horizons. The uppermost "shallow" aquifer contains water under unconfined conditions. The "deep" aquifer exists within the sandy outwash deposits that underlie the Gardiners Clay. The Gardiners Clay is a continuous confining unit, which presents an effective barrier between the "shallow" and "deep" aquifers on site, which are the regional glacial aquifer, and underlying regional water supply aquifers, such as the Jameco and Magothy Aquifers of pre-Wisconsin and Upper Cretaceous ages, respectively.

The general pattern of groundwater flow is from the northeast to the southwest, from Kent Avenue toward the Barge Basin. The estimated horizontal flow for the shallow aquifer is 6.25×10^{-6} centimeters per second (cm/sec) or 0.018 feet/day (6.5 feet/year). The estimated horizontal groundwater flow for the deep sand aquifer is 2.60×10^{-6} cm/sec or 7.4×10^{-3} feet/day (2.69 feet/year).

Historic water table elevations ranged from 5.95 feet above mean sea level (MSL) to 1.23 feet above MSL. The groundwater elevations for the deep aquifer ranged from 3.02 feet above MSL to 2.55 feet above MSL. The maximum measured hydraulic gradient for the deep aquifer is 0.001. The water in both the shallow and deep aquifers discharge into the Barge Basin. A groundwater flow figure is shown on Figure 1-3.

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

A Remedial Investigation (RI) was performed to characterize the nature and extent of contamination at the site. The results of the RI are described in detail in the following reports:

- Remedial Investigation (RI) Report, The Brooklyn Navy Yard Parcel, Brooklyn, New York, NYSDEC Site ID No. 224019A, September 2006

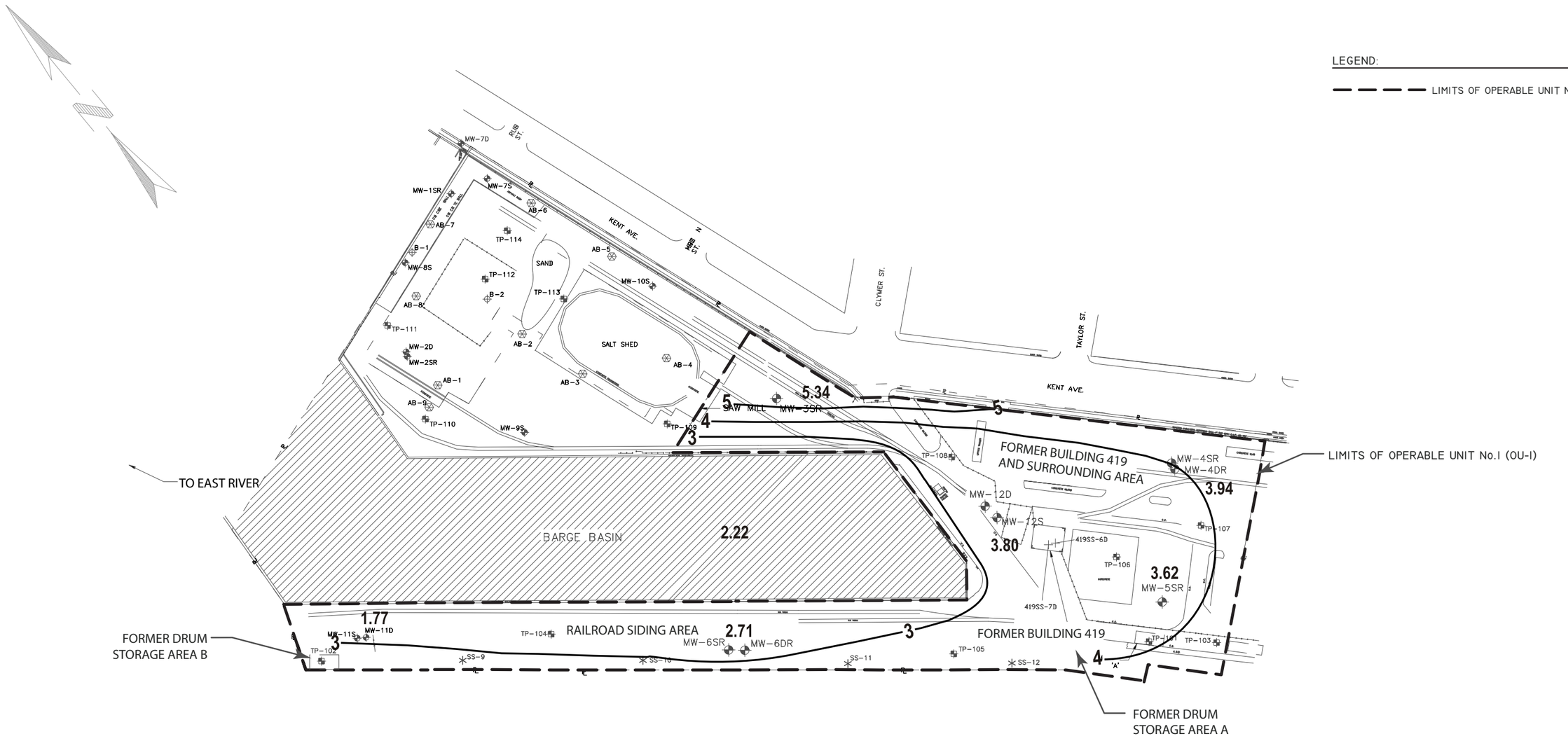
- Feasibility Study, The Brooklyn Navy Yard Parcel, Brooklyn, New York, NYSDEC Site ID No. 224019A, September 2007

- Proposed Remedial Action Plan, Brooklyn Navy Yard 13-Acre Parcel Operable Unit No. 1, Brooklyn, Kings County, New York, Site ID No. 224019A, February 2009

- Record of Decision, Brooklyn Navy Yard 13-Acre Parcel Site Operable Unit No. 1, Brooklyn, Kings County, New York, Site ID No. 224019A, March 2009

LEGEND:

LIMITS OF OPERABLE UNIT No.1 (OU-I)



LIMITS OF OPERABLE UNIT No.1 (OU-I)

GROUNDWATER NOTES:

ELEVATIONS ARE IN FEET ABOVE ARBITRARY DATUM AND ARE NOT CORRECTED FOR TIDAL INFLUENCE.

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Figure 1-3

Groundwater Flow

INSERT BACK OF FIGURE 1-3

Generally, the RI determined the following:

- PCBs were present at concentrations above cleanup criteria within and immediately adjacent to Former Building 419 and Former Drum Storage Area B. The horizontal and vertical extent of PCBs above criteria has been fully defined at Former Building 419. AtFormer Drum Storage Area B, the extent of PCB concentrations above cleanup criteria was delineated within the site to the north and extended to the property line where a paved roadway, which predates the use of the location for drum storage, provided a boundary.

- Lead concentrations above Technical and Administrative Guidance Memorandum (TAGM) cleanup criteria were observed at a number of locations across the site. Elevated lead concentrations do not appear to have any obvious spatial distribution and were within the range observed for historic fill. Similarly variable distributions were observed for concentrations of other metals such as arsenic and copper above cleanup criteria, yet within the typical range for historic, urban fill. Elevated levels of these metals are most likely related to the historic, urban fill used to raise the site above MSL as opposed to subsequent site activities. Two samples in Former Drum Storage Area A exceeded the Toxicity Characteristics Leaching Procedure (TCLP) criterion for lead.

- Semivolatile organic compounds (SVOCs), specifically several polycyclic aromatic hydrocarbons (PAHs) at concentrations above both TAGM 4046 and Brownfield criteria, were also observed throughout the site. These values did not display clear patterns in distribution horizontally or with depth. Concentrations were consistent with those observed in urban fill. The distribution and concentrations observed supports the interpretation that the source of these SVOCs was not historic site activity, but the historic fill used to create the site.

- Detectable concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) compounds, as well as several other volatile organic compounds (VOCs), were observed in soil gas vapor samples. The reported BTEX compounds were consistent with the generally low VOC concentrations observed in soil and groundwater at the site, and the observed use of a majority of the site for vehicle and construction material storage. Soil gas exposure controls will be incorporated into remedial actions, as necessary.

- Sediment sampling in the barge basin adjacent to the site yielded concentrations of SVOCs and metals consistent with or lower than those observed in samples previously collected from the center of the barge basin and typically of what would be expected in urban waterways. These data did not show a correlation with contamination from the site. Sediments were not considered further in the feasibility study.

- Groundwater at the site was observed to have levels of a small number of metals, SVOCs and one VOC moderately elevated above NYSDEC criteria, consistent with the urban fill material and the nature of the Site. Overall, groundwater quality was consistent with the conclusion that groundwater impacts are restricted to OU-2. Therefore, groundwater was not considered further in the feasibility study.

- Potential exposure to soils is a complete pathway and potential exposure to soil vapor is a potential future complete pathway. Potential exposure to groundwater is considered an incomplete pathway, and groundwater will be investigated further as a part of OU-2 and is not the subject of this SMP.

Below is a summary of site conditions when the RI was performed between February 2005 and September 2006:

Surface Soil

Former Drum Storage Area A: This area is located beneath an improved asphalt surface and does not readily support vegetation, and therefore does not contain "surface soil." All soil samples collected in this area will be considered "Subsurface Soil," and are discussed in a separate section.

Former Drum Storage Area B: This area is generally covered by a layer of compacted gravel and does not readily support vegetation, and therefore does not contain "surface soil." All soil samples collected in this area will be considered "Subsurface Soil," and are discussed in a separate section.

Railroad Siding Area: This area is currently covered by either compacted gravel or asphalt and does not readily support vegetation, and therefore does not contain "surface soil." All soil samples collected in this area will be considered "Subsurface Soil," and are discussed in a separate section.

Former Building 419 and Surrounding Area: Former Building 419 is currently the only area with exposed soils. A total of 43 surface soil samples (i.e., soils within the top two or three inches) were taken and analyzed primarily for PCBs. However, of those samples, five were analyzed for a broader suite of compounds, including VOCs, SVOCs, pesticides and metals for further characterization of the area. PCBs were found to be above one part per million in soils within this area and were determined to be the contaminant of concern at this location.

Figure 1-4 and Tables 1-1 through 1-4 provide details on the analytical results for this area.

Subsurface Soil

Former Drum Storage Area A: The subsurface soil investigation of Former Drum Storage Area A consisted of eight samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as an additional eight samples that targeted lead only. Most compounds detected were at concentrations below those in historic fill at other areas of the Brooklyn Navy Yard; however, one sample within the area did reveal leachable lead at levels that are considered hazardous. The highest total lead concentration within this area was 1,100 parts per million (ppm), which is well above the unrestricted use criteria of 63 ppm, but only marginally above the commercial cleanup goal of 1,000 ppm (see 6 NYCRR 375-6.8). No PCBs were detected above one part per million in the area.

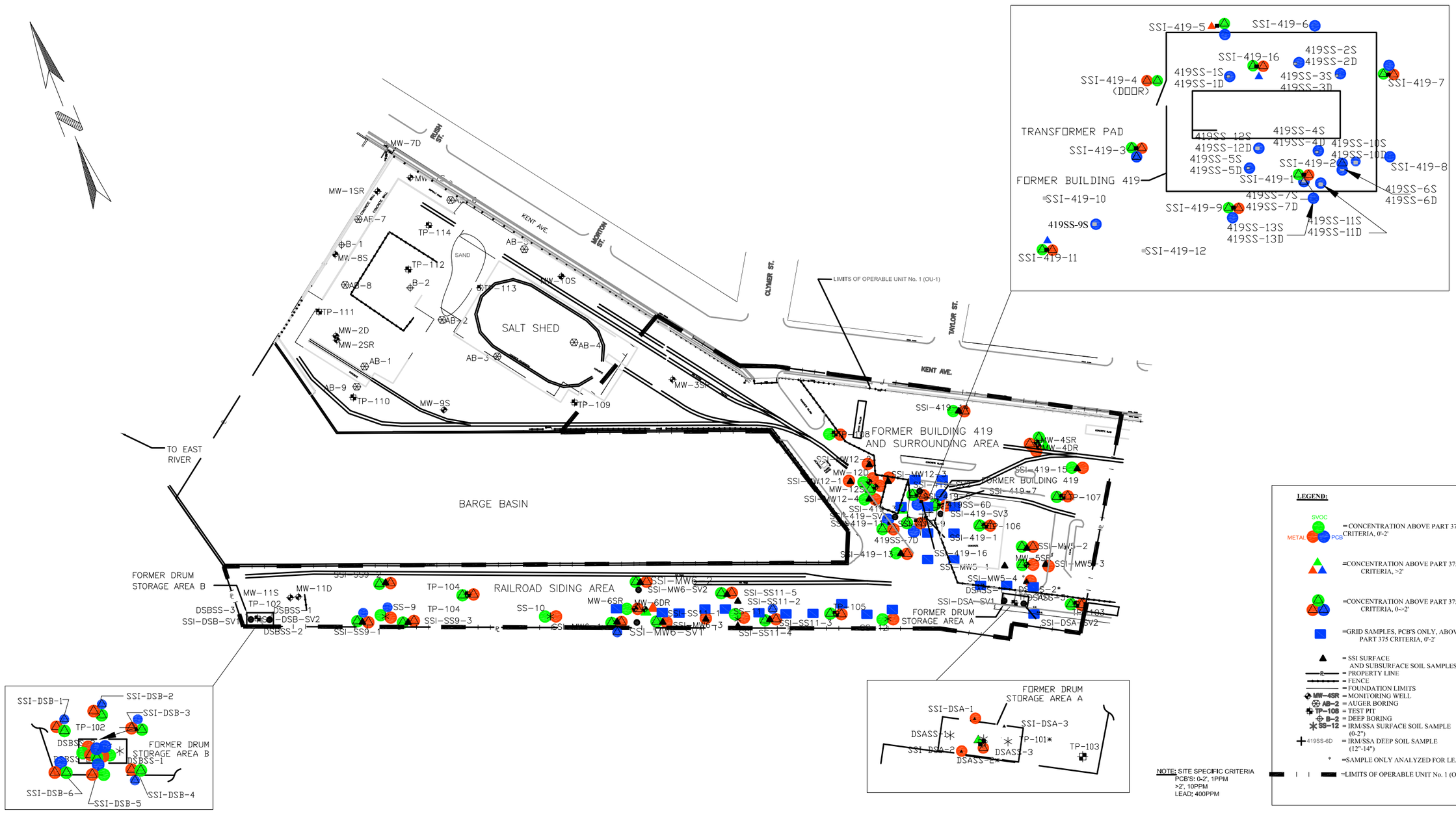

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Figure 1-4

Site Plan of
Analytical Results
Above Part 375-6
Unrestricted Use Criteria

BACK OF FIGURE 1-4

Table 1-1. Former Drum Storage Area A
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Semivolatile Organic Compounds (SVOCs)	Benzo(a)anthracene	0.043J – 1.1	1	1 of 8	5.60	0 of 8
	Chrysene	0.048J of 1.1	1	1 of 8	56	0 of 8
	Benzo(b)fluoranthene	0.037J – 1.5	1	1 of 8	5.60	0 of 8

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Inorganic Compounds	Arsenic	1.5B – 17.9	13	1 of 8	16	1 of 8
	Chromium	11.8 – 31.6	30	1 of 8	1,500	0 of 8
	Copper	29.9 – 135	50	5 of 8	270	0 of 8
	Lead	38 – 1,100	63	15 of 20	1,000	1 of 20
	Mercury	0.24 – 0.69	0.18	3 of 8	2.8	0 of 8
	Selenium	0.88J – 4.6J	3.9	1 of 8	1,500	0 of 8
	Zinc	65.9 - 519	109	5 of 8	10,000	0 of 8

(1) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Unrestricted Use (Table 375-6.8(a)).
(2) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Restricted Commercial Use (Table 375-6.8(b))

Table 1-2. Former Drum Storage Area B
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Semivolatile Organic Compounds (SVOCs)	Phenol	0.054J – 2.93	0.330	1 of 37	500	0 of 32
	Naphthalene	0.358J – 28.3	1.2	1 of 37	500	0 of 32
	Pentachlorophenol	2.50 – 2.50	0.80	1 of 37	6.70	0 of 32
	Anthracene	0.064J – 7.44	100	1 of 36	500	0 of 32
	Benzo(a)anthracene	0.039J – 8.26	1	8 of 36	5.60	1 of 32
	Chrysene	0.037J – 6.99	1	12 of 36	56	0 of 32
	Benzo(b)fluoranthene	0.040 – 7.73	1	15 of 36	5.60	1 of 32
	Benzo(k)fluoranthene	0.110J – 2.67J	0.80	6 of 37	56	0 of 32
	Benzo(a)pyrene	0.037J – 5.78	1	8 of 36	1	8 of 32
	Indenol(1,2,3-cd)pyrene	0.042J – 2.87J	0.50	13 of 37	5.60	0 of 32
	Dibenzo(a,h)anthracene	0.042J - .880J	0.330	5 of 37	.56	3 of 32

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
PCB/Pesticides	Total PCBs	0.04 – 27	0.10	21 of 23	1.0	8 of 23

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Inorganic Compounds	Arsenic	0.38J – 44J	13	4 of 109	16	3 of 32
	Barium	14J – 590	350	2 of 32	400	2 of 32
	Beryllium	0.086J - 20	7.2	5 of 32	590	0 of 32
	Cadmium	0.091 – 14	2.5	2 of 32	9.3	1 of 32
	Chromium	6.4J – 150	30	16 of 32	1,500	0 of 32
	Copper	14 – 1,450	50	30 of 32	270	14 of 32
	Lead	8.2 – 5,300	63	31 of 32	1,000	5 of 32
	Mercury	0.1 – 5.4	0.18	18 of 32	2.8	8 of 32
	Nickel	8.5J – 330	30	20 of 32	310	1 of 32
	Selenium	0.4J – 14	3.9	1 of 32	1,500	1 of 32
	Silver	0.23J – 13	2	2 of 32	1,500	0 of 32
	Zinc	34 – 7,400	109	31 of 32	10,000	0 of 32

(1) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Unrestricted Use (Table 375-6.8(a)).
(2) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Restricted Commercial Use (Table 375-6.8(b))

Table 1-3. Railroad Siding Area
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Volatile Organic Compounds (VOCs)	Acetone	0.004 - 0.190J	0.05	2 of 18	500	0 of 18
	Benzene	0.001 - 0.069	0.06	1 of 22	44	0 of 22
Semivolatile Organic Compounds (SVOCs)	Phenol	0.042J – 3.05	0.33	2 of 56	500	0 of 56
	Acenaphthene	0.044J – 30.8	20	1 of 56	500	0 of 56
	Fluorene	0.039J – 31.9	30	1 of 56	500	0 of 56
	Pentachlorophenol	2.38 – 4.98	0.80	2 of 56	6.70	0 of 56
	Anthracene	0.045J – 157	100	1 of 56	500	0 of 56
	Fluoroanthene	0.056J – 162	100	1 of 56	500	0 of 56
	Benzo(a)anthracene	0.041J – 20.6	1	11 of 56	5.60	2 of 56
	Chrysene	0.037J – 17.2J	1	11 of 56	56	0 of 56
	Benzo(b)fluoranthene	0.047J – 11.3	1	13 of 56	5.60	2 of 56
	Benzo(k)fluoranthene	0.057J – 4.31J	0.80	6 of 56	56	0 of 56
	Benzo(a)pyrene	0.041J – 6.69J	1	9 of 56	1	9 of 56
	Indeno(1,2,3-cd)pyrene	0.062J – 4.26	0.50	9 of 56	5.60	0 of 56
	Dibenzo(a,h)anthracene	0.042J – 1.35J	0.33	4 of 56	.56	1 of 56
PCB/ Pesticides	Dieldrin	0.020 - 0.021	0.005	1 of 22	1.4	0 of 22
	4,4’ – DDE	0.003J - 0.018	0.003	4 of 22	62	0 of 22
	Endrin	0.022 - 0.022	0.014	1 of 22	89	0 of 22
	4,4’ – DDD	0.008J - 0.046	0.003	5 of 22	200	0 of 22
	4,4’ – DDT	0.015 - 0.026	0.003	4 of 22	47	0 of 22
	Total PCBs	0.018 – 2.50	0.10	21 of 51	1.0	4 of 51

Table 1-3. Railroad Siding Area
(Continued)
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Inorganic Compounds	Arsenic	1.1J – 170	13	7 of 56	16	7 of 56
	Barium	10J – 510	350	3 of 56	400	2 of 56
	Beryllium	0.11J – 11	7.2	2 of 56	590	0 of 56
	Cadmium	0.051 – 13.6	2.5	5 of 56	9.3	3 of 56
	Chromium	3.7J – 100	30	8 of 56	1,500	0 of 56
	Copper	9.7 – 1,500	50	32 of 56	270	6 of 56
	Lead	4.4 – 2,070	63	36 of 70	1,000	4 of 70
	Manganese	29 – 1,900	1,600	1 of 56	10,000	0 of 56
	Mercury	0.1 – 2.8	0.18	20 of 56	2.8	0 of 56
	Nickel	4.3J – 210J	30	11 of 56	310	0 of 56
	Selenium	0.57J – 11	3.9	2 of 56	1,500	0 of 56
	Silver	0.23B – 45.9	2	29 of 56	1,500	0 of 56
	Zinc	19 – 3,800	109	29 of 56	10,000	0 of 56

(1) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Unrestricted Use (Table 375-6.8(a)).
(2) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Restricted Commercial Use (Table 375-6.8(b))

Table 1-4. Former Building 419 and Surrounding Area
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Semi-Volatile Organic Compounds (SVOC)	Acenaphthene	0.045J - 0.045J	20	0 of 5	500	0 of 5
	Fluorene	47J – 51J	30	0 of 5	500	0 of 5

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
PCB/ Pesticides	Aldrin	0.001J - 0.001J	0.005	0 of 5	0.68	0 of 5
	Endosulfan 1	0.001J - 0.001J	24	0 of 5	200	0 of 5
	Total PCBs	0.001J - 210	0.10	26 of 43	1	11 of 43

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Inorganic Compounds	Arsenic	7.2 – 25.2	13	2 of 5	16	2 of 5
	Cadmium	1.5 – 3.7	2.5	4 of 5	9.3	0 of 5
	Chromium	34.5 – 116	30	5 of 5	1,500	0 of 5
	Copper	176 – 837	50	5 of 5	270	4 of 5
	Lead	236 – 4,440	63	5 of 5	1,000	1 of 5
	Mercury	0.25 – 1.4	0.18	5 of 5	2.8	0 of 5
	Nickel	41.2J – 129	30	5 of 5	310	0 of 5
	Selenium	0.94J – 5.1	3.9	2 of 5	1,500	0 of 5
	Silver	0.61B – 3.1	2	2 of 5	1,500	0 of 5
	Zinc	410 – 1,850J	109	5 of 5	10,000	0 of 5

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Volatile Organic Compounds (VOCs)	Methylene Chloride	0.005J - 0.077B	0.05	4 of 31	500	0 of 31
	Acetone	0.013 - 0.081	0.05	4 of 27	500	0 of 31

Table 1-4. Former Building 419 and Surrounding Area
(Continued)
Nature and Extent of Contamination
Range of Sampling Dates: October 1996 – December 2005

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Semivolatile Organic Compounds (SVOCs)	Phenol	9.26 – 9.26	0.33	1 of 44	500	0 of 44
	Benzo(a)anthracene	0.042J – 16.1	1	17 of 43	5.6	7 of 43
	Chrysene	0.15J – 16.8	1	15 of 44	56	0 of 44
	Benzo(b)fluoranthene	0.052J – 25.3	1	21 of 43	5.60	7 of 43
	Benzo(k)fluoranthene	0.150J – 6.22	0.80	12 of 44	5.60	0 of 44
	Benzo(a)pyrene	0.042J – 15.6	1	17 of 43	1	17 of 43
	Indeno(1,2,3-cd)pyrene	0.091J – 7.88	0.50	18 of 44	5.6	3 of 44
	Dibenzo(a,h)anthracene	0.074J – 2.51	0.33	11 of 44	0.56	9 of 44

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
PCB/ Pesticides	Dieldrin	0.049 - 0.061	0.005	2 of 31	1.40	0 of 31
	4,4' - DDE	0.007 - 0.014	0.003	2 of 31	62	0 of 31
	4,4' – DDT	0.006 - 0.050	0.003	5 of 31	47	0 of 31
	Total PCBs	0.021 - 54	0.1	29 of 73	1	13 of 73

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)[a]	Unrestricted SCG[b(1)] (ppm)[a]	Frequency of Exceeding Unrestricted SCG	Restricted Commercial SCG[b(2)] (ppm)[a]	Frequency of Exceeding Restricted Commercial SCG
Inorganic Compounds	Arsenic	1.1J – 56	13	11 of 44	16	7 of 44
	Barium	11J – 667	350	1 of 44	400	1 of 44
	Cadmium	0.056J – 10	2.5	7 of 44	9.3	1 of 44
	Chromium	4.5J – 130	30	7 of 44	1,500	0 of 44
	Copper	8.8 – 600	50	29 of 44	270	6 of 44
	Lead	6.6 – 5,200	63	50 of 73	1,000	2 of 73
	Manganese	140 – 790	1,600	0 of 44	10,000	0 of 44
	Mercury	0.099 – 4.7	0.18	24 of 44	2.8	1 of 44
	Nickel	3.5J – 120	30	9 of 44	310	0 of 44
	Selenium	0.86J – 4.1J	3.9	1 of 44	1,500	0 of 44
	Silver	0.22J – 8.6J	2	22 of 44	1,500	0 of 44

(1) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Unrestricted Use (Table 375-6.8(a)).
(2) Criteria taken from NYSDEC Part 375 Soil Cleanup Objectives table for Restricted Commercial Use (Table 375-6.8(b))

Former Drum Storage Area B: The subsurface soil investigation of Former Drum Storage Area B consisted of nine samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as an additional 23 samples that targeted SVOCs, PCBs and metals only. This area contained concentrations of lead and PCBs considerably higher than those in historic fill at other areas of OU-1, with PCB levels as high as 27 ppm and lead levels as high as 550 ppm. SVOCs were also found at relatively high levels in some samples from within this area, but were generally less significant than the elevated lead and PCB values.

An Interim Remedial Measure (IRM) was undertaken at Former Drum Storage Area B in the summer of 2008 in an effort to address the soil contamination identified. The IRM is further discussed in Section 1.4.

Railroad Siding Area: The subsurface soil investigation of the Railroad Siding Area consisted of 21 samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as an additional 33 samples that targeted SVOC and metals only. No pesticide or VOCs were detected, and PCBs were not found in this area at levels generally considered a concern (e.g., only one PCB sample, with a concentration of 1.5 ppm, was above the unrestricted reuse and commercial standards of 0.1 and 1 ppm, respectively). Metals and SVOC contamination were detected above commercial and unrestricted soil cleanup objectives at several sample locations; however, the distribution was sporadic and not indicative of a "release," but more likely representative of sampling within an area that consists of historic fill.

Former Building 419 and Surrounding Area: The subsurface soil investigation of the Former Building 419 and surrounding area consisted of 31 samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as additional rounds of sampling targeting a more select suite of compounds (e.g., 44 additional samples for PCBs only, 30 additional samples for lead only, as well as 11 more samples each for SVOCs and metals). Results indicated that VOCs and pesticides were not of concern, with only minor excursions above cleanup criteria established for unrestricted reuse. Metals (predominantly lead) and SVOCs were often above unrestricted criteria; however, when assigned against commercial cleanup criteria, the exceedances are sporadic and do not appear indicative of a "release," but are more likely representative of sampling within an area that consists of historic fill. PCBs are present at levels above unrestricted and commercial use criteria within the former substation, with the highest subsurface result for total PCBs being 81 ppm.

Figure 1-4 and Tables 1-1 through 1-4 provide details on the analytical results for this area.

Groundwater

During the final stages of the RI, groundwater samples were collected from up-gradient and down-gradient monitoring wells to supplement previously existing groundwater data. Wells were sampled and analyzed for the full Target Compound List (VOCs, SVOCs, pesticides/PCBs and metals including cyanide).

Analytical results exceeding groundwater quality criteria are summarized in Table 1-5. These results represent groundwater contained within the urban fill material and are consistent with the analytical results obtained from these fill deposits as described in the previous sections.

Table 1-5. Groundwater
Nature and Extent of Contamination
Range of Sampling Dates: April 1997 – February 2006

Groundwater	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a(2)]	Frequency of Exceeding SCG[(1)]
Volatile Organic Compounds (VOCs)	Benzene	2.93J – 2.93J	1	1 of 14
	Xylenes(total)	10U – 41.36	5	2 of 14

Groundwater	Contaminants of Concern	Concentration Range Detected (ppb)[4]	SCG[b] (ppb)[a(2)]	Frequency of Exceeding SCG[(1)]
Semivolatile Organic Compounds (SVOCs)	2,4-Dimethylphenol	2.76J – 2.76J	1	1 of 14

Groundwater	Contaminants of Concern	Concentration Range Detected (ppb)[4]	SCG[b] (ppb)[a(2)]	Frequency of Exceeding SCG[(1)]
Inorganic Compounds	Antimony	3J – 14.9J	3	5 of 14
	Arsenic	10J – 165	25	1 of 14
	Cadmium	0.3J – 7.6	5	1 of 14
	Chromium	1J – 109	50	1 of 14
	Copper	2.9J – 467	200	1 of 14
	Iron	1,890 – 48,200	300	14 of 14
	Lead	2J – 689	25	4 of 14
	Iron and Manganese	2,660 – 48,949	500	14 of 14
	Manganese	260 – 5,200	300	13 of 14
	Mercury	0.17J – 2.4	0.7	1 of 14
	Potassium	11,000 – 328,000	NC	NC
	Selenium	12J – 26J	10	3 of 14
	Sodium	98,200 – 5,370,000	20,000	14 of 14

Notes:
ND A standard defined by the symbol "ND" means not detectable by the analytical tests specified or approved pursuant to Part 700 of the NYSDEC regulations.
(1) For samples where an analyte was detected below the method detection limit and the concentration is estimated (J qualified) and the level is above the SCG, an exceedance was counted. Otherwise, U qualified data (i.e., ND) not counted as an exceedance.
(2) Criteria from Part 703: Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations for GA classification.
Where a compound does not have a numerical standard in Part 703, 50 µg/L was used as the SCG per 10 NYCRR Part 5 of the Sanitary Code.

As described further below, both the groundwater and urban fill contain metals and a limited number of SVOCs. No pesticides or PCBs were observed above criteria in groundwater. With respect to VOCs, only xylene was above NYSDEC Part 703 criteria (ranging from 21-41 ppb) in one well (MW-6SR). Metals observed above their respective criteria included antimony, lead, iron, manganese, selenium and sodium. Levels of some metals observed during the earlier stages of the RI may be related to high particulate matter in the water sample. For example, recently collected groundwater samples in replacement well MW-5SR had considerably lower metals concentrations than previously observed in the original well at that location, and this is believed to be attributable to better sampling technique and well construction than was used in the past. Further support for the conclusion that high particulate matter in samples was the cause of elevated concentrations of metals in groundwater can be found by comparing filtered and unfiltered groundwater samples. For example, lead concentrations above criteria were observed in the unfiltered sample while only low concentrations were observed in the filtered sample. A small number of SVOCs were also observed to have concentrations moderately above screening criteria.

In general, observed concentrations of contaminants in groundwater do not indicate a significant source of groundwater contamination due to a release or waste management at OU-1. However, there does appear to be minor impact to groundwater on the OU-1 parcel, presumably due to historic operations at the site, as well as the presence of historic fill. No source area contamination relative to these minor groundwater impacts was found during the investigation.

Sediments

To investigate whether surface runoff from OU-1 had contaminated sediment in the adjoining waterway, three sediment samples were collected on the perimeter of the barge basin and compared to sediment quality data collected previously from the center of the basin. Concentrations of metals in the new samples were similar to or lower than those observed in samples collected near the center of the basin, indicating that overland flow of contaminants was not significantly impacting sediments.

Additionally, concentrations of contaminants observed within the barge basin were not found to be significantly different from those prevalent throughout the region. Both metal and SVOC concentrations in the barge basin sediments were generally comparable to a background sample collected near the mouth of the East River, as well as to samples collected from nearby Wallabout Basin, indicating that observed contaminant concentrations reflect the urban nature of local waterways rather than impacts from the site. Table 1-6 provides greater detail on the analytical data for this area.

No site-related sediment contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for the sediment.

Table 1-6. Sediments
Nature and Extent of Contamination
Range of Sampling Dates: October 2000 – December 2005

Sediments	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a(2,3)]	Frequency of Exceeding SCG[(4)]
Semivolatile Organic Compounds (SVOCs)	Naphthalene	67 – 280	ER-L – 160 (76)	2 of 14
	2-Methylnaphthalene	72 – 270	ER-L – 70 (69)	11 of 14
	Acenaphthylene	69 – 510	ER-L – 44 (680)	14 of 14
	Acenaphthene	37J – 280J	ER-L – 16 (67)	11 of 14
	Fluorene	34J – 190	ER-L – 19 (73)	12 of 14
	Phenanthrene	220 – 2,990	ER-L – 240 (1,660)	13 of 14
	Phenanthrene	220 – 2,990	ER-M – 1,500 (1,660)	3 of 14
	Anthracene	75 – 390	ER-L – 85.3 (680)	13 of 14
	Fluoroanthene	320 – 3,330	ER-L – 600 (2,480)	13 of 14
	Pyrene	300 – 2,310	ER-L – 665 (2,720)	10 of 14
	Benzo(a)anthracene	290 – 1,280	ER-L – 261 (1,870)	14 of 14
	Chrysene	210 – 1,060	ER-L – 384 (1,120)	11 of 14
	Benzo(a)pyrene	91 – 830	ER-L – 430 (170)	8 of 14
	Dibenzo(a,h)anthracene	37J – 280J	ER-L – 63.4 (32)	8 of 14
	Dibenzo(a,h)anthracene	37J – 280J	ER-M – 260 (32)	1 of 14

Sediments	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a(2,3)]	Frequency of Exceeding SCG[(4)]
PCB/Pesticides	4,4' – DDE	8.74 – 18.4	ER-L – 2.2 (0.34)	7of 14
	4,4' – DDD	3.05 – 28.5	10	1 of 14
	4,4' – DDT	0.29 – 5.15	ER-L – 1.58	2 of 14
	Total PCB Congeners	113 – 376	ER-L – 22.7 (38.5)	13 of 14
	Total PCB Congeners	113 - 376	ER-M – 180 (38.5)	4 of 14

Sediments	Contaminants of Concern	Concentration Range Detected (ppm)[a]	SCG[b] (ppm)[a(1)(3)]	Frequency of Exceeding SCG[(4)]
Inorganic Compounds	Aluminium	6,100J – 6,600J	ER-L - NC	NC
			ER-M - NC	NC
	Antimony	1.3J – 1.6J	ER-L – NC	NC
			ER-M - NC	NC
	Arsenic	2.3J – 12.4	ER-L – 8.2 (8.73)	6 of 14
			ER-M – 70	0 of 14
	Barium	42J – 50J	ER-L – NC	NC
			ER-M – NC	NC
	Beryllium	0.087J – 0.51J	ER-L – NC	NC
			ER-M - NC	NC
	Cadmium	0.71 – 4.7	ER-L – 1.2 (2.52)	11 of 14
			ER-M – 9.6 (2.52)	0 of 14
	Calcium	7,600 – 24,000	ER-L – NC	NC
			ER-M - NC	NC
	Chromium	30.7 - 125	ER-L – 81	2 of 14
			ER-M - 370	0 of 14

Table 1-6. Sediments
Nature and Extent of Contamination
Range of Sampling Dates: October 2000 – December 2005
(Continued)

Sediments	Contaminants of Concern	Concentration Range Detected (ppb)[a]	SCG[b] (ppb)[a(2,3)]	Frequency of Exceeding SCG[(4)]
Inorganic Compounds	Cobalt	6.71 – 7.1	ER-L - NC	NC
	Copper	84 - 193	ER-L – 34 (79.2)	14 of 14
			ER-M – 270 (79.2)	0 of 14
	Iron	17,000 – 19,000	ER-L – NC	NC
			ER-M – NC	NC
	Lead	78.4 - 301	ER-L – 46.7 (88.3)	14 of 14
			ER-M – 218 (88.3)	2 of 14
	Magnesium	6,300 – 7,200	ER-L – NC	NC
			ER-M – NC	NC
	Manganese	180 – 200	ER-L – NC	NC
			ER-M – NC	NC
	Mercury	0.43J – 2.75	ER-L – 0.15 (1.34)	14 of 14
			ER-M – 0.71 (1.34)	11 of 14
	Nickel	16.8 – 27.7	ER-L – 20.9 (20.9)	10 of 14
			ER-M – 51.6 (20.9)	0 of 14
	Potassium	1,800 – 2,000	ER-L – NC	NC
			ER-M – NC	NC
	Selenium	2.8J – 3.2J	ER-L – NC	NC
			ER-M - NC	NC
	Silver	0.1 – 2.5	ER-L – 1 (0.82)	6 of 14
			ER-M – 3.7 (0.82)	0 of 14
	Sodium	10,000 – 14,000	ER-L – NC	NC
			ER-M – NC	NC
	Thallium	11 – 13J	ER-L – NC	NC
			ER-M – NC	NC
	Vanadium	21 - 26	ER-L – NC	NC
			ER-M – NC	NC
	Zinc	146 - 464	ER-L – 150 (150)	13 of 14
			ER-M – 410 (150)	2 of 14
	Cyanide	1.5 – 1.5	ER-L – NC	NC
			ER-M – NC	NC

Notes:
(1) SCG taken from NYSDEC document titled, "Technical Guidance for Contaminated Sediments" – For marine sediments. Appendix 4, Table 3 used for inorganics.
(2) SCG taken from NYSDEC document titled, "Technical Guidance for Contaminated Sediments" for saltwater samples. Appendix 4, Table 4 values used when applicable. If a constituent was not in Table 4, then per guidance, values from Table 1 were used. The lowest criteria value from Human Health Bioaccumulation (HHB), Benthic Aquatic Life Chronic Toxicity (BALCT), or Wildlife Bioaccumulation (WB) was used as the SCG for comparison when Table 1 was used.
(3) Background level shown in SCG column in parentheses for reference. Background data taken from the sample labeled "PB REF SURF COMP."
(4) For samples where an analyte was detected below the method detection limit at an estimated concentration (J qualified) that was above the criteria value, an exceedance was counted. Otherwise, U qualified data (i.e., ND) not counted as an exceedance.
ER-L = Effect Range Low and ER-M = Effect Range – Moderate
NC = No Criteria

Site-Related Soil Vapor Intrusion

To assess the potential Soil Vapor Intrusion (SVI) pathway (there are currently no habitable structures on the site), a screening-level soil vapor investigation was performed at the site. Two soil vapor samples were collected in each of the former drum storage areas in the vicinity of monitoring well MW-6 within the Railroad Siding Area, and three soil vapor samples were collected in the vicinity of Former Building 419.

Soil gas results revealed three constituents detected in soil gas (methylene chloride, tetrachloroethene, and trichloroethene) at levels above New York State Department of Health (NYSDOH) guidance values. These contaminants were also reported at low levels in several soil samples. Table 1-7 provides greater detail on the analytical data for this area.

1.4 SUMMARY OF REMEDIAL ACTIONS

1.4.1 Remedial History

In June of 1986, a transformer within the Former Building 419 enclosure ruptured and caught fire. A partial cleanup of that release occurred shortly thereafter, however, documentation of that cleanup is not complete. No other cleanups are documented to have occurred within the boundaries of Former Building 419.

In 2001, the NYSDEC listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

The site was remediated in accordance with the NYSDEC-approved Interim Remedial Measure Work Plan dated March 2007 and the Remedial Action Work Plan dated August 24, 2009. The following is a summary of the Interim Remedial Measures (IRM) performed at the site:

An IRM soil removal was performed in the vicinity of Former Drum Storage Area B during the summer of 2008 in an effort to ready the area for planned commercial development. The IRM targeted anomalously high lead and PCB concentrations in soil found during the RI. Contaminated soils were excavated and disposed of off-site in accordance with state and federal law. Following the initial removal, samples were taken from the side walls and bottom of the excavation and results were compared to the cleanup objectives established for the IRM (i.e., 0.1 ppm PCB and 400 ppm lead). End point samples were determined to have achieved the goals of the IRM, and an IRM closeout report was submitted to the NYSDEC in December 2008. The IRM is considered to have successfully removed the most contaminated soils in the Former Drum Storage Area B portion of the site.

Table 1-7. Soil Vapor
Nature and Extent of Contamination
Range of Sampling Dates: December 22 – 23, 2005

Soil Vapor	Contaminants of Concern	Concentration Range Detected ($\mu g/m^3$)[a]	SCG[b(2)] ($\mu g/m^3$)[a]	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Bromodichloromethane	10 – 137	14	1 of 10
	1,3-Butadiene	1.4 – 6.2	0.9	6 of 10
	Chloroform	2.6 – 27	11	1 of 10
	1,1,2,2- Tetrachloroethane	6.1 – 12	4.2	2 of 10
	Tetrachloroethylene (PCE)	16 – 144	<100[(1)]	2 of 10
	Trichloroethylene (TCE)	3.3 - 18	<5[(1)]	1 of 10

Notes:

(1) SCG taken from Matrix 1 or Matrix 2 from "Guidance for Evaluating Soil Vapor Intrusion in the State of New York." Indoor air concentration assumed to be <0.25 μg/m3 and level indicates the threshold between No Further Action or Monitor/Mitigate.

(2) SCG taken from EPA Shallow Soil Vapor Target Value, 0.1 Attenuation Factor, $1x10^{-5}$ Risk unless otherwise noted. These values were assigned since NYSDOH values were not available (per guidance in the document titled "Guidance for Evaluating Soil Vapor Intrusion in the State of New York").

[a] ppb = parts per billion, which is equivalent to micrograms per liter, μg/L, in water;
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
$\mu g/m^3$ – micrograms per cubic meter

[b] SCG = standards, criteria, and guidance values;

[c] ER-L = Effect Range – Low and ER-M = Effect Range – Moderate. A sediment is considered to be contaminated if either of these criteria is exceeded. If both criteria are exceeded, the sediment is severely impacted. If only the ER-L is exceeded, the impact is considered to be moderate.

The following is a summary of the Remedial Actions that will be performed at the site:

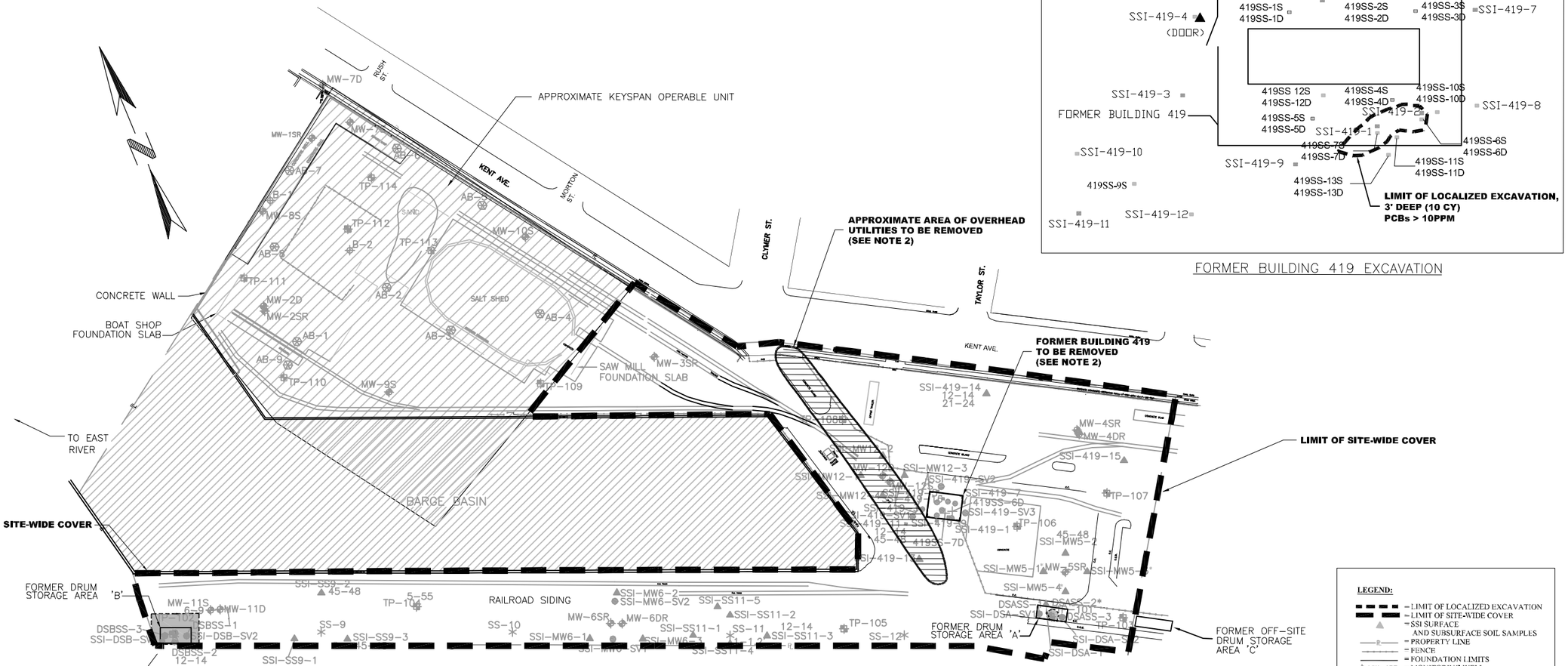
1) Excavation of soils containing PCBs greater than 10 ppm and soils with lead concentration in the TCLP extract of greater than 5 mg/L. The estimated areas and depths of excavation are indicated in Figure 1-5 and will be located in the areas of Former Building 419 and Former Drum Storage Area A. Post-excavation samples will be collected to confirm the limits of excavation to the PCB and TCLP lead criteria. Excavated soils will be analyzed for appropriate disposal and managed in accordance with applicable regulations. Former Drum Storage Area B has been remediated pursuant to an IRM and no further action is anticipated in connection with that area.

2) Site-wide cover. The limits of the excavation and cover areas are shown on Figure 1-5. The cover will be a combination of existing or new soil, pavement, or concrete. Where vegetated surfaces will remain, a soil cover will be constructed or existing cover, if adequate would be used (e.g., gravel covered surfaces with less than 10% passing the number 100 sieve – fine sand and finer fraction). The soil cover will consist of one foot of soil underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. The indicator material location and depth may vary based on the use of existing materials. For example, if existing pavement were to remain, it would not be practicable to install the indicator. Or, if some portion of existing stone were used, the indicator layer may be positioned at a depth other than the base of the cover. The top six inches of soil will be suitable to support vegetation, unless the area is used for vehicle traffic (e.g., gravel areas). Cover soil will meet the Division of Environmental Remediation's criteria for backfill, as per 6 NYCRR Part 375-6.7. Where gravel is used for final cover it will comply with typical aggregate gradations (ASTM D448 or NYSDOT Specifications Tables 703-4 and 703-5) and be of a size suitable as a wearing surface. Where the final surface will be pavement (e.g., roadways, parking lots) or concrete (e.g., building slab) the cover will consist of a paving system or concrete slab system at least six inches thick, either constructed or existing.

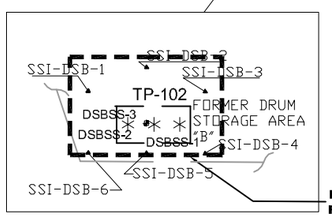
3) Imposition of an IC in the form of an Environmental Easement that will require: (a) limiting the use and development of the property to commercial use, which will also permit industrial use; (b) compliance with the approved SMP; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the NYSDEC a periodic certification of ICs and ECs. Regarding the Periodic Certification, it will:

    - Be prepared and submitted by a Professional Engineer licensed in New York State or such other expert approved by the NYSDEC until the NYSDEC notifies the property owner in writing that the certification is no longer needed;

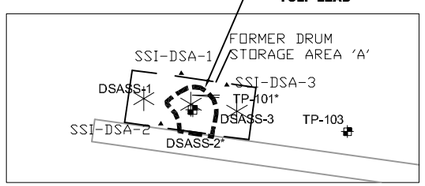
    - Contain a certification that the ICs and ECs remain in place and are either unchanged from the previous certification or are compliant with the NYSDEC-approved modifications;



FORMER BUILDING 419 EXCAVATION



FORMER DRUM STORAGE AREA "B" EXCAVATION



FORMER DRUM STORAGE AREA "A" EXCAVATION

LEGEND:

- = LIMIT OF LOCALIZED EXCAVATION
- = LIMIT OF SITE-WIDE COVER
- = SSI SURFACE AND SUBSURFACE SOIL SAMPLES
- = PROPERTY LINE
- = FENCE
- = FOUNDATION LIMITS
- MW-4SR = MONITORING WELL
- AB-2 = AUGER BORING
- TP-108 = TEST PIT
- B-2 = DEEP BORING
- SS-12 = IRM/SSA SURFACE SOIL SAMPLE (0-2')
- 419SS-6D = IRM SSA DEEP SOIL SAMPLE (12"-14")

NOTES:

1. Total Cap Area = 5.6 Acres
2. Structures Shown to be Removed for Remedy Implementation are Typical.

0 75 150
SCALE IN FEET

HydroQual
HYDROQUAL ENVIRONMENTAL ENGINEERS AND SCIENTISTS, P.C.
1200 MACARTHUR BOULEVARD
MAHWAH, NEW JERSEY 07430

Site Management Plan

City of New York
Department of Sanitation

Figure 1-5

Selected Remedy Site Plan

BACK OF FIGURE 1-5

- Allow the NYSDEC access to the site; and

- State that the ECs remain protective of public health and the environment, and remain in compliance with the SMP or any NYSDEC-approved modifications thereof.

4) A SMP which will include the following ICs and ECs:

   (a) Management of the cover system to restrict excavation below the site-wide cover's demarcation layer (and identification of specific areas where the demarcation layer may be an alternative material such as the pavement itself), pavement, or buildings, and procedures for proper management of soils and appropriate health and safety requirements should excavation occur;

   (b) Provisions for evaluation of the potential for SVI into buildings developed on the site, including the mitigation of impacts identified;

   (c) Identification of use restrictions on the site; and

   (d) Provisions for the continued proper operation and maintenance of the components of the remedy.

5) A Long-Term Monitoring Plan. The key components of this plan will include the periodic inspection of the cover system, the necessary inspections to support periodic certification of the site use restrictions, and the periodic monitoring of any future sub-slab depressurization systems (SSDS).

1.4.2 Removal of Contaminated Materials from the Site

Materials will be removed from this site and disposed of at an appropriate disposal location in accordance with applicable rules and regulations based upon the results of the soil sampling analyses.

1.4.3 Site-Related Treatment Systems

No long-term treatment systems will be installed as part of the site remedy.

1.4.4 Remaining Contamination

As part of the site-wide cover, new soil, pavement or concrete will be placed on top of any remaining contamination left at the site after remediation has been completed. Where vegetated surfaces will remain, a site-wide cover will be constructed or existing cover, if adequate, would be used (e.g., gravel covered surfaces with less than 10 percent passing the number 100 sieve – fine sand and finer fraction). The site-wide cover will consist of one foot of soil underlain by an indicator, such as an orange plastic snow fence, to demarcate the cover soil from the remaining contaminated soil beneath. The indicator material location and depth may

vary based on the use of existing materials. For example, if existing pavement were to remain, it would not be practicable to install the indicator. Or, if some portion of the existing stone were used, the indicator layer may be positioned at a depth other than the base of the cover. Where the final cover will be pavement (e.g., roadways, parking lots) or concrete (e.g., building slab) the cover will consist of a paving system or concrete slab system at least six inches thick, either constructed or existing.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Since remaining contaminated soil and soil vapor exist beneath the site, Engineering Controls and Institutional Controls (EC/ICs) are required to protect human health and the environment. This EC/IC Plan describes the procedures for the implementation and management of all EC/ICs at the site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all EC/ICs on the site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs that will be set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan (EWP) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the site remedy, as determined by the NYSDEC.

2.2 ENGINEERING CONTROLS

2.2.1 Engineering Control Systems

2.2.1.1 Site-Wide Cover

Exposure to remaining contamination in soil/fill at the site will be prevented by a site-wide cover. This cover system will be comprised of a minimum of 12 inches of clean soil or 6 inches of an asphalt paving system. An EWP that appears in Appendix A outlines the procedures required to be implemented in the event the site-wide cover is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for

the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4 of this SMP.

2.2.1.2 Sub-Slab Depressurization System

At the current time, an SSDS is not required at the Brooklyn Navy Yard OU-1 site. If, however, one is required based on the results of future testing, an addendum to this document will be issued.

2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10.

2.2.2.1 Composite Cover System

The composite cover system will be a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity.

2.3 INSTITUTIONAL CONTROLS

A series of ICs is required by the ROD to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and (3) limit the use and development of the site to commercial use, which will also permit industrial use, only. Adherence to these ICs on the site will be required by the Environmental Easement and will be implemented under this SMP.

These ICs are:

- Limiting the use and development of the property to commercial use, which will also permit industrial use;
- Compliance with the approved SMP;
- Restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH;
- The property owner to complete and submit to the NYSDEC a periodic certification of ICs and ECs.
- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assignees;
- All ECs must be operated and maintained as required by this SMP;

- All ECs on the Controlled Property must be inspected at a frequency and in a manner required by the SMP;

- Soil vapor and other environmental or public health monitoring must be performed as required by this SMP; and

- Data and information pertinent to the Site Management of the Controlled Property must be reported at the frequency and in a manner required by this SMP.

ICs that will be identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The site has a series of ICs in the form of site restrictions. Adherence to these ICs will be required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may only be used for commercial use, which will also permit industrial use, provided that the long-term ECs/ICs included in this SMP are employed.

- The property may not be used for a higher level of use, such as unrestricted (residential, etc.) use without additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC.

- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP.

- The use of the groundwater underlying the property is prohibited without treatment rendering it safe for intended use.

- The potential for SVI must be evaluated for any buildings developed in the vicinity of Former Drum Storage Area A, the Railroad Siding Area and Former Building 419 and the surrounding area, and any potential impacts that are identified must be monitored for mitigated.

- Vegetable gardens and farming on the property are prohibited.

- The site owner, designated representative or a Professional Engineer licensed to practice in New York State will submit to the NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls are employed at the Controlled Property and are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and the environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternative period of time that the NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable.

2.3.1 Excavation Work Plan

The site will be remediated for restricted commercial use and will also permit industrial use. Any future intrusive work that will penetrate the site-wide cover, or encounter or disturb the remaining contamination, including any modifications or repairs to the site-wide cover will be performed in compliance with the EWP that is attached as Appendix A to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the site. A HASP is attached as Appendix B to this SMP that is in compliance with applicable federal, state and local regulations. Based on future changes to state and federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section A-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Periodic Review Reporting Plan (see Section 5).

The site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation dewater, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The site owner will ensure that site development activities will not interfere with, or otherwise impair or compromise, the ECs described in this SMP.

2.3.2 Soil Vapor Intrusion Evaluation

Prior to the construction of any enclosed structures located over areas that contain remaining contamination where the potential for SVI has been identified, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure(s). Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive SSDS that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH "Guidance for Evaluating Vapor Intrusion in the State of New York." Measures to be employed to mitigate potential SVI will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

The work plan will require that preliminary (unvalidated) SVI sampling data be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as mitigation. In addition, SVI sampling results, evaluations, and follow-up actions will be summarized in the next Periodic Review Report.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections of all remedial components installed at the site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive site-wide inspection will be conducted annually, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- If site records are complete and up to date; and
- Necessary changes to the remedial or monitoring system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5). In the event of an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the EC/ICs implemented at the site by a Professional Engineer licensed to practice in New York State as determined by the NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the Consent Order, 6 NYCRR Part 375, and/or Environmental Conservation Law.
- 15-day advance notice of any proposed ground-intrusive activities pursuant to the EWP.
- Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other ECs and likewise any action to be taken to mitigate the damage or defect.

- Notice within 48-hours of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, including a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the Consent Order, and all approved work plans and reports, including this SMP.

- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance, the Owner or Owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to the DSNY and HydroQual Environmental Engineers & Scientists, P.C. These emergency contact lists must be maintained in an easily accessible location at the site.

Table 2-1. Emergency Contact Numbers

Medical, Fire, and Police	911
One Call Center	(800) 272-4480 (3 day notice required for utility markout)
Poison Control Center	(800) 222-1222
Pollution Toxic Chemical Oil Spills	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

Table 2-2. Contact Numbers*

Marshah-Reaff Barrett	DSNY Project Manager	(646) 885-4776 (Office)
Nicholas Mann	BNYDC Contact	(845) 721-0284 (Office)
Barry Cheney, P.E.	HydroQual Project Manager	(201) 529-5151 x7122 (Office)
Kevin Fitzpatrick	HydroQual Project Leader	(201) 529-5151 x7102 (Office)
Gary Grey	HydroQual Health and Safety Officer	(201) 529-5151 x7167 (Office) (201) 538-0201 (Cell)
Sergey Shpits	HydroQual Field Team Leader	(201)529-5151 x7225 (Office) (201) 832-0968 (Cell)
Wilfred Dunne	HydroQual Field Team	(201) 529-5151 x7212 (Office) (201) 832-0546 (Cell)
* Contact numbers subject to change and should be updated as necessary		

2.5.2 Map and Directions to Nearest Health Facility

Site Location: Brooklyn Navy Yard
63 Flushing Avenue
Brooklyn, New York 11205

Nearest Hospital Name: The Brooklyn Hospital Center

Hospital Location: 121 Dekalb Avenue
Brooklyn, New York 11211

Hospital Telephone: (718) 250-8075

Directions to the Hospital:

1. Head towards the intersection of Kent Avenue and Clymer Street, turn right onto Kent Avenue and continue southeast (0.4 miles).
2. Turn slight right onto Williamsburg Place (0.1 miles).
3. Turn slight right onto Williamsburg Street West (0.1 miles).
4. Turn right onto Flushing Avenue (0.3 miles).
5. Turn left onto Washington Avenue (0.6 miles).
6. Turn right onto Dekalb Avenue (0.6 miles).
7. The Brooklyn Hospital Center will be on the right.

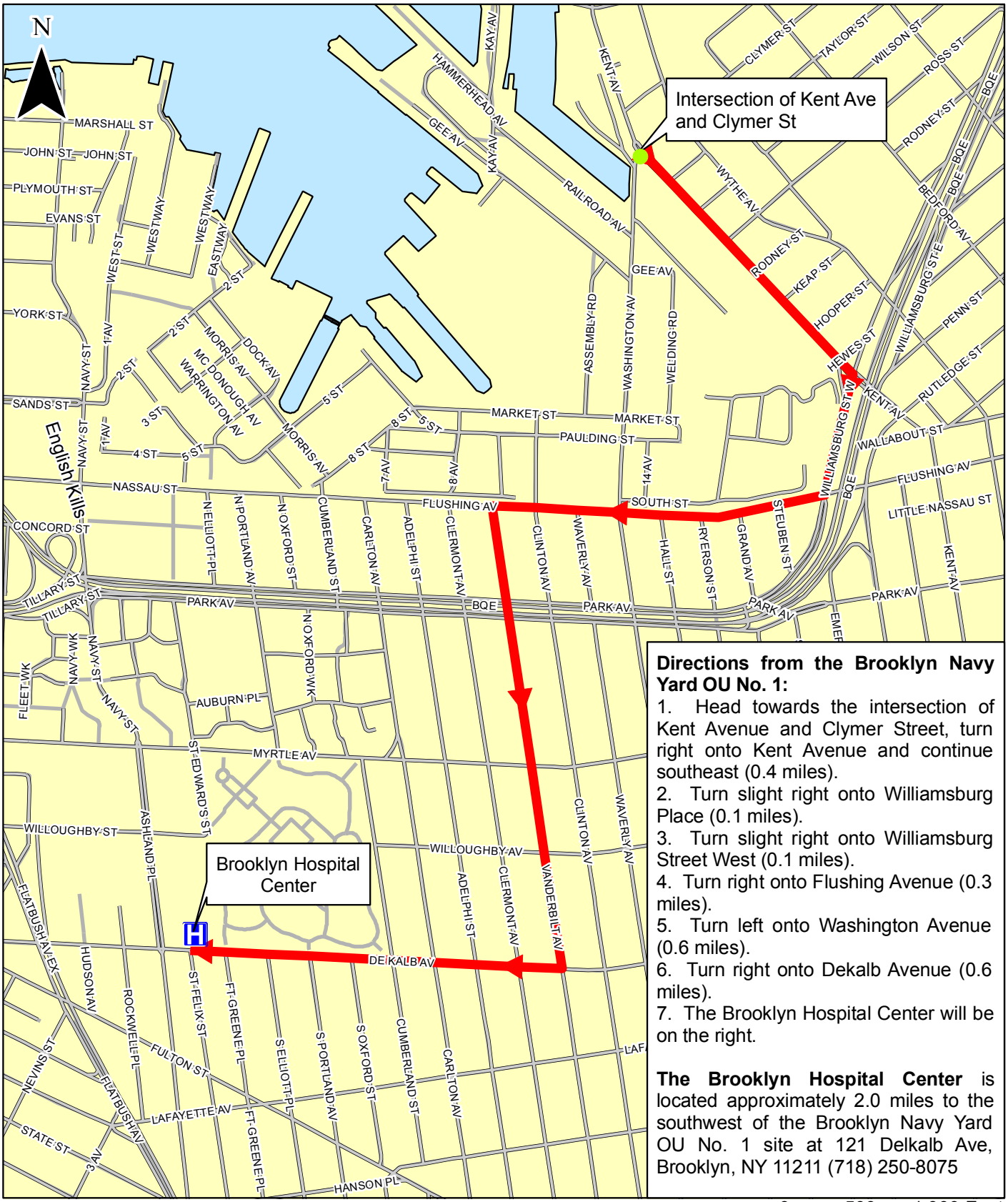
Total Distance: 1.98 miles

Total Estimated Time: 6 minutes

A map showing the route from the site to the Hospital is attached as Figure 2-1.

2.5.3 Response Procedures

As appropriate, the fire department and other emergency response groups will be notified immediately by telephone of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (Table 2-1). The list will also be posted prominently at the site and made readily available to all personnel at all times.



Directions from the Brooklyn Navy Yard OU No. 1:

1. Head towards the intersection of Kent Avenue and Clymer Street, turn right onto Kent Avenue and continue southeast (0.4 miles).
2. Turn slight right onto Williamsburg Place (0.1 miles).
3. Turn slight right onto Williamsburg Street West (0.1 miles).
4. Turn right onto Flushing Avenue (0.3 miles).
5. Turn left onto Washington Avenue (0.6 miles).
6. Turn right onto Dekalb Avenue (0.6 miles).
7. The Brooklyn Hospital Center will be on the right.

The Brooklyn Hospital Center is located approximately 2.0 miles to the southwest of the Brooklyn Navy Yard OU No. 1 site at 121 Delkalb Ave, Brooklyn, NY 11211 (718) 250-8075

Base Map Source: NYC Dept. of Information Technology & Telecommunications, 2004

0 500 1,000 Feet

HydroQual
HYDROQUAL ENVIRONMENTAL ENGINEERS & SCIENTISTS, P.C.
1200 MACARTHUR BOULEVARD
MAHWAH, NEW JERSEY 07430

Site Management Plan

City of New York
Department of Sanitation

Figure 2-1

Hospital Route

3.0 SITE MONITORING PLAN

3.1 INTRODUCTION

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the site-wide cover and all affected site media identified below. Since the remedy will result in untreated hazardous waste remaining at the site, a long-term monitoring program will be instituted. The key components of the program include the periodic monitoring of the cover system and the necessary inspections to support periodic certification of the site use restrictions. Periodic monitoring of other ECs, such as any future SSDS, will be described in Chapter 4, Operation, Monitoring and Maintenance Plan once they become effective and this SMP is updated to reflect those changes. This program will allow the effectiveness of the remedy to be monitored and will be a component of the long-term management of the site. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

This Monitoring Plan provides information about the periodic monitoring of the site-wide cover and the necessary inspections to support periodic certification of the site use restrictions.

Annual monitoring of the site-wide cover will be conducted on or before May 30 for a period that will be determined by the NYSDEC. Monitoring and inspection programs are summarized in Table 3-1 and outlined in detail in Section 3.2.

Table 3-1. Monitoring Schedule

Monitoring Program	Frequency*	Matrix	Analysis
Site-Wide Cover System Monitoring	Annually on or before May 30	Site-Wide Cover	Visual inspection; Determination whether maintenance is required
* The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH			

3.2 SITE-WIDE COVER SYSTEM MONITORING

Monitoring of the site-wide cover will be performed on an annual basis to assess the condition of the site-wide cover at the time of inspection. As part of the monitoring, the site-wide cover will be inspected to evaluate if the cover is still in place and has not been disturbed or is compliant with NYSDEC-approved modifications. In addition, the monitoring will verify that excavation has not occurred on site below the site-wide cover's demarcation layer, pavement or buildings.

Any subsequent activities that result in excavation to build structures on the site would result in additional monitoring as required by the NYSDEC and would require notification to NYSDEC with specific information about the work to be performed. At that time, this SMP would be modified accordingly.

3.3 MEDIA MONITORING PROGRAM

No media monitoring will occur as part of the Brooklyn Navy Yard OU-1 remedy until a structure is constructed. Monitoring and the evaluation of the potential for SVI would be required to evaluate the presence of soil vapor in any buildings developed on the site. Any impacts that are identified would be mitigated in accordance with a plan approved by the NYSDEC. The SMP will be modified and approved by NYSDEC in the event that the monitoring of SVI or other media will be required.

3.4 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs. During these inspections, an inspection form will be completed (Appendix C). The form will compile sufficient information to assess the following:

- Visual inspection of the site-wide cover;
- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of inspection;
- The site management activities being conducted; and
- Confirm that site records are up to date.

3.5 MONITORING AND INSPECTION REPORTING REQUIREMENTS

Forms and any other information generated during monitoring and inspections will be kept on file on-site. All forms, and other relevant reporting formats used during the monitoring and inspection events, will be (1) subject to approval by the NYSDEC and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

A letter report will be prepared and submitted to the NYSDEC as part of the Periodic Review Report, subsequent to the completion of each monitoring and inspection event. The Site-Wide Investigation Form will be presented as an attachment to the letter report. The letter report will include, at a minimum:

- Date of event;

- Name and company of personnel conducting inspections;
- Current use of the site;
- Description of site-wide cover;
- Evaluation of whether ground disturbance has occurred;
- Excavation work on site is prohibited without prior notification of DSNY. In the event that any ground disturbance is requested of either BNYDC or DSNY on the property, the Project Manager at the DSNY and the BNYDC representative will be notified. The Project Manager at the DSNY will be responsible for contacting the NYSDEC and the BNYDC as applicable and appropriate. In the event that evidence of ground disturbance is observed during the annual review all three parties will be notified.
- The presence of any structures on the site;
- A determination of the need for maintenance of the remedy;
- Any additional observations, conclusions, or recommendations; and
- A determination as to whether site-wide cover conditions have changed since the last reporting event.

Data will be reported in hard copy or digital format as determined by the NYSDEC. Any maintenance of the remedy that is identified during the monitoring and inspections will be reported to the NYSDEC and corrected by the DSNY within 30 days of the completion of the monitoring and inspection report. A summary of the monitoring and inspection program deliverables are summarized in Table 3-2 below.

Table 3-2. Schedule of Monitoring and Inspection Report

Task	Reporting Frequency*
Submit Monitoring and Inspection Report to NYSDEC	Annually on or before June 30
* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC	

4.0 OPERATION AND MAINTENANCE PLAN

An Operation and Maintenance Plan will describe the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site in the event that buildings are constructed at the site and the potential for SVI into the buildings need to be monitored. In the event that buildings are constructed on the site and an Operation and Maintenance Plan becomes necessary, the SMP will be amended at that time.

In addition, the Operation and Maintenance Plan will also describe the measures that will be used to monitor and maintain the site-wide cover as part of the selected remedy. Monitoring of the site-wide cover is described in Section 3.2. Inspections will be conducted annually on or before May 30 and are described in detail in Section 5 of this SMP.

5.0 INSPECTIONS, REPORTING, AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan of this SMP. At a minimum, a site-wide inspection will be conducted annually. Inspections of remedial components will also be conducted whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

5.1.2 Inspection Forms and Maintenance Reports

All inspections will be recorded on the appropriate form that is contained in Appendix C. All forms are subject to NYSDEC revision and approval.

All applicable inspection forms and other records generated for the site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented;
- Operation and maintenance activities are being conducted properly; and, based on the above items;
- The site remedy continues to be protective of public health and the environment and is performing as designed in the ROD, RDWP and Final Engineering Report (FER).

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare the following certification:

For each IC or EC identified for the site, I certify that all of the following statements are true:

- The inspection of the site to confirm the effectiveness of the ECs/ICs required by the remedial program was performed under my direction;

- The IC and/or EC employed at this site is unchanged from the date the control was put in place, or last approved by the NYSDEC;

- Nothing has occurred that would impair the ability of the control to protect the public health and environment;

- Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;

- Access to the site will continue to be provided to the NYSDEC to evaluate the remedy, including access to evaluate the continued maintenance of this control;

- If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;

- Use of the site is compliant with the Environmental Easement;

- The EC systems are performing as designed and are effective;

- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices;

- The information presented in this report is accurate and complete; and

- 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 210.4 of the Penal Law. I, [state your name], of [business address], am certifying as the [Owner or Owner's Designated Site Representative] for the site.

The signed certification will be included in the Periodic Review Report described below.

5.3 PERIODIC REVIEW REPORT

A Periodic Review Report will be prepared in accordance with the NYSDEC DER-10 and submitted to the NYSDEC on or before June 30 of each year. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site. Investigation results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site;

- Excavation work on site is prohibited without prior notification of DSNY. In the event that any ground disturbance is requested of either BNYDC or DSNY on the property, the Project Manager at the DSNY and the BNYDC representative will be notified. The Project Manager at the DSNY will be responsible for contacting the NYSDEC and the

BNYDC as applicable and appropriate. In the event that evidence of ground disturbance is observed during the annual review all three parties will be notified.

- Results of the required annual site inspections and severe condition inspections, if applicable;

- All applicable inspection forms and other records generated for the site during the reporting period in electronic format;

- A site evaluation, which includes the following:

    - The compliance of the remedy with the requirements of the site-specific ROD, and/or RDWP;

    - The operation and the effectiveness of the site-wide cover, including identification of any needed repairs or modifications;

    - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;

    - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and

    - The overall performance and effectiveness of the remedy.

In the event that buildings are constructed on the site and SVI monitoring and reporting becomes a necessary component of this SMP, the SMP will be modified accordingly and the following information will be included in the Periodic Review Report:

- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;

- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;

The Periodic Review Report will be submitted, in hard-copy format, to the NYSDEC Central Office and Regional Office in which the site is located, and in electronic format to the NYSDEC Central Office, Regional Office and the NYSDOH Bureau of Environmental Exposure Investigation.

5.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

APPENDIX A

EXCAVATION WORK PLAN

Environmental
Engineers & Scientists

APPENDIX A

EXCAVATION WORK PLAN

A-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the New York State Department of Environmental Conservation (NYSDEC). Currently, this notification will be made to:

Jonathan Greco
New York State Department of Environmental Conservation
625 Broadway, 12th Floor
Albany, NY 12233-7016

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this Excavation Work Plan (EWP);
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

A-2 SOIL SCREENING METHODS

Visual, olfactory and photoionization detector (PID) soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC).

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, materials that can be returned to the subsurface, and material that can be used as cover soil.

A-3 STOCKPILE METHODS

Protecting the stockpile from erosion will follow the recommendations presented in the *New York Standards and Specifications for Erosion and Sediment Control (August 2005).* Soil stockpiles will be located where erosion and sediment hazards are low. The side slope of the stockpile will be maintained at a ratio of 2:1 (H:V) or flatter. Stockpiles will be kept covered at all times with appropriately anchored tarps. When in use, contractors will access the soil stockpile area from up grade to ensure the drainage path of any runoff from the stockpile area will have constant erosion and sediment controls in place.

When not in use, soil stockpiles will be continuously encircled with a berm and/or silt fencing at the toe of the slope to prevent washout. Hay bales are to be used as a secondary filtering method after the silt fencing around any soil stock piles or in place of a silt back insert to the catch basins on site to prevent any sediment from reaching the existing stormwater conveyance system. They are not to be used to redirect stormwater runoff from reaching the existing system.

Stockpiles will be inspected at a minimum once each week and after every storm event that generates 0.5 inches or greater of rain as required by NYSDEC standards for erosion and sediment control. Damaged tarp covers will be promptly replaced. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by NYSDEC in accordance with all applicable rules and regulations.

A-4 MATERIALS EXCAVATION AND LOAD OUT

A Professional Engineer licensed to practice in New York State or where appropriate a Qualified Environmental Professional will oversee all invasive work and the excavation and load-out of all excavated material. The owner of the property and its contractors are solely responsible for safe execution of all excavation and other work performed under this plan. The locations of site utilities and easements will be investigated to determine whether they pose a risk or impediment to work planned under the Site Management Plan (SMP).

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements). If deemed necessary, a truck wash will be operated on-site. A qualified environmental professional will ensure that all outbound trucks will be washed at the truck wash before leaving the site until the intrusive work is complete.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking. All egress points for truck and equipment transport leaving the site will be kept clean of dirt and other materials derived from the site during intrusive excavation activities. Adjacent streets will be cleaned, as necessary, to keep them free of site-derived materials.

A-5 MATERIALS TRANSPORT OFF-SITE

All soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6 NYCRR Part 360) and Federal regulations. Haulers will be appropriately licensed and trucks properly placarded. The contractor will determine the truck-transport route; however, the contractor will attempt to limit the transport of materials through residential areas and past sensitive sites while maintaining overall transport safety. Trucks will be prohibited from stopping and idling in the neighborhood outside the project site. Egress points for trucks and equipment leaving the site will be kept clean of dirt and other materials during excavation activities at the site. Trucks will be queued on-site to minimize off-site disturbance. Off-site queuing will be prohibited. Materials transported by trucks leaving the site will be secured with tight-fitting covers. Loose-fitting canvas-type covers will be prohibited. If loads contain wet materials capable of producing free liquid, truck liners will be used. If necessary, all trucks will be washed before leaving the site.

A-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, state (including 6 NYCRR Part 360) and federal regulations. If disposal of soil/fill from this site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposed), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition (C&D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at a minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted soil cleanup objectives (SCOs) is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

A-7 MATERIALS REUSE ON-SITE

Excavated material may be reused at the same location unless it exhibits signs of gross contamination. Assuming no signs of contamination, no laboratory analyses are required provided one foot of clean fill or a six-inch paving system is placed atop it.

Staged materials, including historic fill and contaminated soil that will be used at locations other than the site of excavation will be sampled and analyzed prior to reuse. The sampling frequency for the reuse will be consistent with Table 5.4(e)10 Recommended Number

of Samples for Soil Imported To or Exported From a Site (DER-10). The samples will be analyzed to determine the suitability for use as backfill. The analytical results will be compared to the Commercial or Industrial Use concentrations of the Allowable Constituent Levels for Imported Fill or Soil table found in Appendix 5 of DER-10. Any soils that meet the criteria of DER-10 may be reused on-site below the demarcation layer or impervious surface, but will not be reused within a cover soil layer, within landscaping berms or as backfill for subsurface utility lines. A Professional Engineer or where appropriate a Qualified Environmental Professional will be responsible for procedures defined for material reuse in this SMP are followed and that unacceptable material will not remain on-site.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

A-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including excavation dewatering (if necessary) will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Dewatering or other fluids will not be recharged back to the land surface or subsurface of the site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit, which will be obtained if applicable and appropriate.

A-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Record of Decision. The demarcation layer, consisting of orange snow fencing material or equivalent material will be replaced to provide a visual reference to the top of the 'Remaining Contamination Zone,' the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), as discussed in Section 1.4.4 of the SMP, this will constitute a modification of the cover element of the remedy and the upper surface of the 'Remaining Contamination Zone.' A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the SMP.

A-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the Professional Engineer licensed to practice in New York State or where appropriate a Qualified Environmental Professional and will be in compliance with provisions in this SMP prior to receipt at the site. Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site. All materials brought on-site for fill material will meet the levels established in the 'Commercial or Industrial Use' column of the 'Allowable Constituent Levels for Imported Fill or Soil' table that can be found in Appendix 5 of DER-10.

Sampling requirements for soils brought to the site will be based on the soil quantity in cubic yards as presented in DER-10 in Table 5.4(e)10 'Recommended Number of Samples for Soil Imported To or Exported From A Site.'

Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC. Solid waste will not be imported onto the site. Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

A-11 STORMWATER POLLUTION PREVENTION

All excavations, including remedial work on the site, will be performed in accordance with all applicable permits, including Stormwater Pollution Prevention permits, as necessary. An Erosion and Sediment Control Plan, prepared by a state licensed Professional Engineer or Landscape Architect, or a Certified Professional in Erosion and Sediment Control (CPESC) , will be implemented by the Contractor during all excavation activities. In accordance with the SPDES General Permit for Stormwater Discharges, an application will be made under the SPDES permit program for stormwater pollution prevention by filing a Notice of Intent supported by a Stormwater Pollution Prevention Plan including an erosion and sediment control plan in satisfaction of all substantive technical requirements. The maintenance on site is limited to standard New York City street cleaning rules.

A-12 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development-related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment, and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes, Target Analyte List (TAL) metals, Target Compound List (TCL) volatile and semivolatile organics, TCL pesticides, and polychlorinated biphenyls (PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will also be included in the periodic reports prepared pursuant to Section 5 of the SMP.

A-13 COMMUNITY AIR MONITORING PLAN

OVERVIEW

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each

designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements will be reviewed for each situation in consultation with New York State Department of Health (NYSDOH) to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

COMMUNITY AIR MONITORING PLAN

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the Work Zone will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

- **Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

- **Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs must be monitored at the downwind perimeter of the immediate work area (e.g., Work Zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the Work Zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the Work Zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the Work Zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the Work Zone, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the Work Zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (NYSDEC and NYSDOH) and County Health personnel to review.

A-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site. Specific odor control methods to be used on a routine basis will include keeping a record of odor complaints, minimizing the time that odor-emitting soils or other media are stockpiled and maximize the distance of the storage area from off-site properties. If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the Engineer or Contractor, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

A-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

A-16 OTHER NUISANCES

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX B

WORKER AND COMMUNITY HEALTH AND SAFETY PLAN AND NEW YORK STATE DEPARTMENT OF HEALTH COMMUNITY AIR MONITORING PLAN

Environmental
Engineers & Scientists

HYDROQUAL SITE SPECIFIC HEALTH AND SAFETY PLAN

SECTION 1: GENERAL INFORMATION & DISCLAIMER	
CLIENT NAME: New York City Department of Sanitation (DSNY)	PROJECT NAME: Brooklyn Navy Yard Implementation of Remedial Design at Operable Unit No. 1
PROJECT MANAGER: Marshah-Reaff Barrett, DSNY Barry Cheney, HydroQual	
PROJECT LEADER: Kevin Fitzpatrick	
SITE HEALTH & SAFETY OFFICERS: Sergey Shpits /Wilfred Dunne / Kevin Fitzpatrick / Barry Cheney	
PREPARED BY: Tara A. Santimauro	DATE: April 20, 2011
NOTE: This Site Specific Health and Safety Plan (HASP) has been prepared for use by HydroQual employees for work at the site referenced below. HydroQual is not responsible for its use by others. The plan is written for the specific site conditions, purposes, tasks, dates and personnel specified and must be amended and reviewed by those named in Section 16 if these conditions change.	

SECTION 2: PROJECT INFORMATION

(1) SITE INFORMATION

Site Name:	Brooklyn Navy Yard	Site Project Client Contact:	Marshah-Reaff Barrett, DSNY
Address:	63 Flushing Avenue	Phone No.:	(646) 885-4776
	Brooklyn, NY 11205	Site Health & Safety Contact:	Person to be identified at a later date
		Phone No.:	To be identified at a later date

(2) SITE CLASSIFICATION (check, highlight or circle all that apply)

Hazardous (RCRA)		Hazardous (CERCLA/State)	X	UST/LUST	
First Entry		Manufacturing		Municipal POTW	
Previously Characterized		C and D Landfill		Construction	
Industrial	X	Sanitary Landfill		Other	
Active		Inactive	X		

Explanations/Details:

See Attachment 2-1 for Explanations/Details.

(3) HYDROQUAL TASKS & OJECTIVES (attach additional sheet if necessary):

The work covered by this HASP includes oversight of the localized shallow excavation (less than 2 feet deep) in areas where previously completed sampling data indicated impacts from prior site activities and the installation of a site-wide cover. This work will be conducted with the assistance of excavation equipment which will be operated by a contractor yet to be selected. Former Building 419 has been identified as being impacted by Polychlorinated biphenyls (PCBs) from historic operations. In addition, since lead concentrations exceeded Toxicity Characteristic Leaching Procedure (TCLP) criterion in Former Drum Storage Area A, the area was characterized as having characteristic hazardous waste. The localized PCB and TCLP lead areas (Former Drum Storage Area A and Former Building 419) will be addressed through excavation while the contamination on the remainder of the site will be addressed using a site-wide cover. Once soils above the TCLP lead criterion and the PCB soil cleanup criteria have been excavated, post-excavation confirmatory soil sampling would be conducted. Samples would be collected from both the excavation bottom and from the excavation sidewalls and analyzed for TCLP lead or PCBs. These excavations will be shallow (less than 2 feet) and will not require specific trenching and excavation health and safety protocols. If work in deeper excavations is deemed necessary, that work will not be conducted until an appropriate addendum to this HASP is prepared and approved. If a sample result exceeds the TCLP lead criterion or the PCB cleanup criteria, the excavation limits would be expanded and re-sampled until the sample results for the excavation sidewall and excavation bottom samples are below the relevant criteria.

This HASP applies to HydroQual personnel working at the Brooklyn Navy Yard site and addressees emergency on-site procedures and health and safety related procedures for specific work activities, and additional requirements in accordance with 29 CFR 1910.120.

TASKS PERFORMED BY OTHERS:

Additional contractors will perform the site clearing, excavation, installation of the site-wide cover, building sub-slab depressurization systems (applicable when buildings are constructed on the site), site restoration and soil disposal. All contractors are required to have their own HASP in accordance with 29 CFR 1910.120 requirements.

(4) PROJECT ORGANIZATION AND COORDINATION – The following personnel are designated to carry out the stated project job functions on site. (Note: One person may carry out more than one job function, not all positions must be filled for each project.)

Job Function	Company	Phone
PROJECT MANAGER	Marshah-Reaff Barrett, DSNY Barry Cheney, P.E., HydroQual	(646) 885-4776 (201) 529-5151 ext. 7122
SITE SAFETY OFFICER	Sergey Shpits, HydroQual	(201) 832-0968 (cell)
ALTERNATE SITE SAFETY OFFICER	Wilfred Dunne, HydroQual	(201) 832-0546 (cell)
PUBLIC INFORMATION OFFICER	Marshah-Reaff Barrett, DSNY	(646) 885-4776 (office)
SITE RECORDKEEPER	Sergey Shpits, HydroQual	(201) 832-0546 (cell)
ON-SITE PERSONNEL WITH CPR/FA		
FIELD TEAM LEADER	Sergey Shpits, HydroQual	(201) 832-0546 (cell)
FIELD TEAM MEMBERS	Sergey Shpits, HydroQual Wilfred Dunne, HydroQual Kevin Fitzpatrick, HydroQual	(201) 832-0968 (cell) (201) 832-0546 (cell) (201) 529-5151 Ext. 7102 (office)
ON-SITE CLIENT CONTACT		
VISITORS:	FEDERAL AGENCY REPS (i.e., EPA, OSHA)	None
	STATE AGENCY REPS	None
	LOCAL AGENCY REPS	None
SUBCONTRACTORS:	SUBCONTRACTOR(S) SITE SAFETY OFFICERS	SUBCONTRACTOR SHASP (X) YES _____ NO____X___
None	Not Applicable	

All personnel arriving or departing the site should log in and out with the Recordkeeper.

(5) ONSITE CONTROL (Prevailing wind directions, Work Zones, etc.) (attach additional sheet if necessary)

A Work Zone will be established by the Contractor around each area where remediation activities will occur. One work zone will be established in the area of Former Drum Storage Area A and Former Building 419.

SECTION 3: PHYSICAL HAZARDS INFORMATION

(1) IDENTIFY POTENTIAL PHYSICAL HAZARDS TO WORKERS

	Confined Space	X	Steep/uneven terrain		Surface Water
X	Heavy Equipment	X	Heat Stress		Drum Handling
X	Moving Parts	X	Extreme Cold		Noise
X	Heavy Lifting		Ionizing Radiation		Non-Ionizing Radiation
	Electrical		Traffic		Elevated Work Surface
	Overhead Hazards		Marine/Open Water Navigation		Trenching
	Underground Utilities		Biological Hazards		Sewage

(2) SAFETY EQUIPMENT REQUIRED FOR HYDROQUAL EMPLOYEES

	Explosimeter		Barrier Tape		Lights
	Fall Protection Equipment		Traffic Cones		Lights – emergency
	Confined Space Equipment		A-B-C Fire Extinguisher	X	Communications – On Site
	Ladder		Tick Repellant		Communications - Off
X	First Aid Kit		Snake Bite Kit		Lockout/Tagout
	Eye Wash		Floatation Device (USCG)		
	Emergency Shower		Emergency Air Horn		

Other: ____ A personal data (hand-held) RAM meter for dust monitoring ____ Other
____ A TSI air velocity meter for logging wind speed
____ A wind sock for wind direction

Comment:

See Attachment 3-1 for Physical Hazard Analysis.

SECTION 4: CHEMICAL HAZARDS INFORMATION

(1) IDENTIFIED CHEMICAL HAZARDS

Data obtained from previous environmental site investigations and the Remedial Investigation (RI) have identified the following chemical hazards:

- PCBs are present at concentrations above cleanup criteria within and immediately adjacent to Former Building 419 and at Former Drum Storage Area A.
- Lead concentrations above Technical and Administrative Guidance Memorandum (TAGM) cleanup criteria were observed at a number of locations across the site. Elevated lead concentrations are within the range observed for historic fill. Concentrations of other metals, such as arsenic and copper, were observed above cleanup criteria, but were within the typical range for historic, urban fill. Elevated levels of these metals are most likely related to the historic, urban fill used to raise the site above mean sea level as opposed to subsequent site activities. Two samples in Former Drum Storage A exceeded the TCLP criterion for lead.
- Semivolatile organic compounds (SVOCs), specifically several polycyclic aromatic hydrocarbons (PAHs) at concentrations above both TAGM 4046 and Brownfield criteria, were also observed throughout the site. Concentrations were consistent with those observed in historic fill. The distribution and concentrations observed supports the interpretation that the source of these SVOCs is not historic site activity but the historic fill used to create the site.
- Detectable concentrations of BTEX compounds (benzene, toluene, ethylbenzene and xylene), as well as several other VOCs, were observed in soil gas vapor samples. The reported BTEX compounds are consistent with the generally low VOC concentrations observed in soil and groundwater at the site, and the observed use of a majority of the site for vehicle and construction material storage. These concentrations, however, are below the OSHA permissible exposure limits (PEL) and would not be considered a hazard.

Attachment 4-1 summarizes the range of metals, SVOC, VOC, and pesticide/PCB concentrations found in site soils during the RI.

Media	Substances Involved	Characteristics	Estimated Concentrations	PEL

(2) DESCRIBE POTENTIAL FOR CONTACT WITH EACH MEDIA TYPE FOR EACH OF THE TASKS LISTED IN SECTION 2.4

The potential routes of exposure to the chemicals that may be present in the soils include: 1) direct dermal (skin) contact or absorption of contaminants; 2) ingestion by hand-to-mouth transfer of contaminants; and 3) inhalation of dust during construction activities.

For direct dermal contact or absorption, prevention of exposure is accomplished by the proper selection of protective clothing. Section 5 presents PPE requirements for this project.

For ingestion, prevention is accomplished through good hygiene practices, frequent hand washing, and enforcement of rules regarding eating, drinking and smoking.

For inhalation, prevention of exposure is accomplished by using appropriate vapor control measures, such as half-face dust respirator with HEPA cartridges.

The Site Safety Officer will brief the HydroQual field team on symptoms and signs of overexposure to chemical hazards.

SECTION 5: PROTECTIVE EQUIPMENT LIST

TASK	RESPIRATORS & CARTRIDGE	USE	CLOTHING	GLOVES	BOOTS	OTHER
Oversight of Site Clearing, Excavation, Site Restoration, Site Cap Installation Activities	P-100 respirator for dust	Cont	T		S, O	H, N
Oversight of Post-Excavation Soil Confirmatory Sampling	P-100 respirator for dust	Cont	T		S, O	H, S/G, N

RESPIRATORS	APR CARTRIDGES	USE	CLOTHING	GLOVES	BOOTS	OTHERS
B = SCBA	O = Organic Vapor	Cont = Continuous	T = Tyvek	B = Butyl	F = Firemans	F = Face Shield
APR = APR	G = Organic vapor/acid gas	UP = Upgrade	P = PE Tyvek	L = Latex	L = Latex	G = Goggles
D = N/A	A = Asbestos		S = Saranex	N = Neo	N = Neo	H = Hard hat
E = Escape	P = Particulate		C = Cover-alls	T = Nitrile	S = Safety	S = Safety glasses
AL = Airline	C = Combination organic vapor & particulate			V = Viton	O = Overboots	N = Hearing Protection
	OTH = Other			CN = Cotton		
				P = PVC		
				PA = Polyvinyl		
				SS = Silver shield		

SECTION 6: HAZARD COMMUNICATION PROGRAM

If chemicals are introduced to the site by HydroQual (e.g., decontamination liquids, preservatives, etc.), bring a copy of the HydroQual Hazard Communication Program to the Site and attach Material Safety Data Sheets (MSDSs). The Site Safety Officer will review this information with field personnel prior to the start of the project. The Comprehensive List of Chemicals for this site is:

Not Applicable

SECTION 7: ENVIRONMENTAL MONITORING

(1) The following environmental monitoring instruments shall be used on site at the specified intervals.

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for particulates at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The intent of the CAMP is to provide a measure of protection for the downwind community from airborne contaminants due to site activities. See Attachment 7-1 for the CAMP.

(2) Monitoring equipment is to be calibrated according to manufacturers' instructions. Record calibration data and air concentrations in the Health and Safety on-site log book.

See Attachment 7-1 for the CAMP

(3) Recommended Action Levels for Upgrade or Downgrade of Respiratory Protection or Site Shutdown and Evacuation.

See Attachment 7-1 for the CAMP.

SECTION 8: HEALTH AND SAFETY TRAINING AND MEDICAL MONITORING PROGRAM

The project staff is included in the HydroQual Health and Safety training and medical monitoring programs. (See the Health and Safety Procedures Manual, Sections 3, 4 and 5). A current list, including training dates can be found at \\Meadowlands\1091\Corporate_H&S\Employee_Certifications_current.xls

HAZWOPER TRAINING

Name	MEDICAL (Date)	INITIAL (Hrs./Date)	REFESHER (Date)	SUPV (Date)	CPR/FA/BBP (Dates)	FIT TEST (Make/Size/Type/Date)
Sergey Shpits	3/22/2004	7/21/2004	10/11/2009			9/22/2008
Wilfred Dunne	8/13/2008	1/1/1991	1/7/2010	3/1/1994	3/1/2001	
Kevin Fitzpatrick	11/20/2009	4/22/2010				4/2010
Barry Cheney, P.E.	2/25/2003	1987	9/22/2008	3/1/1990	3/2009	

SECTION 9: PERSONAL MONITORING

The following personal monitoring will be in effect on site: Not Applicable

Personal exposure sampling:

Medical monitoring:

A copy of personal monitoring results (if collected) is to be sent to Corporate Health and Safety.

SECTION 10: CONFINED SPACE ENTRY

(1) WILL CONFINED SPACE ENTRY TAKE PLACE? Yes _____ No X

If yes, attach **Confined Space Entry Program** available from the Health and Safety Coordinator.

SECTION 11: COMMUNICATIONS PROCEDURES

The following standard hand signals will be used in case of failure of radio communications:

	Grip partner's wrist or both hands around wrist	Leave area immediately
	Hands on top of head	Need assistance
X	Air horn sounded 3 times	Notification for injury. Personnel should assemble at designated location.
X	Thumbs up	OK, I am all right, I understand
X	Thumbs down	No, negative

SECTION 12: DECONTAMINATION PROCEDURES

Personnel and equipment leaving the Work Zone shall be decontaminated. The Site Safety Officer is responsible for monitoring adherence with the decontamination plan described below: Attach sketch of decontamination area as appropriate.

See Attachment 12-1 for details

(1) _____

(2) _____

(3) _____

Other _____

The following decontamination equipment is required:

Potable water

_____

_____

SECTION 13: EMERGENCY PROCEDURES

(1) The following standard emergency procedures will be used by onsite personnel. The Site Safety Officer shall be notified of any onsite emergencies and be responsible for checking that the appropriate procedures are followed. See Section 14 for specific emergency information.

Personnel Injury in the Work Zone: Upon notification of an injury in the Work Zone, the designated emergency signal – an air horn shall be sounded three times. Site personnel shall assemble at a location designated by the Site Safety Officer. The Site Safety Officer and Field Team Leader should evaluate the nature of the injury. The Site Safety Officer shall call 911, if applicable, or the designated emergency number for the site as listed in Section 14. No persons shall enter/reenter the Work Zone until the cause of the injury or symptoms is determined and eliminated or controlled.

Personal Protective Equipment Failure: If any site worker experiences a failure or alteration of protective equipment that affects the protection factor, that person and others within the Work Zone shall immediately leave the Work Zone. Reentry shall not be permitted until the equipment has been repaired or replaced.

Fire/Explosion: Upon notification of a fire or explosion on site, the designated emergency signal – an air horn sounded three times, shall be sounded and site personnel shall assemble at a location designated by the Site Safety Officer. The Site Safety Officer (or others in a life threatening situation) shall call 911 or the designated emergency number for the site as listed in Section 14 and personnel moved to a safe distance from the involved area. If others make the emergency call, the Site Safety Officer shall be notified immediately thereafter.

Other Equipment Failure: If any other safety equipment on site fails to operate properly, the Field Team Leader and Site Safety Officer shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, personnel shall leave the Work Zone until the situation is evaluated and appropriate actions taken.

The following emergency escape routes are designated for use in those situations where egress from the Work Zone can not occur through the decontamination line (attach map, if available):

Not Applicable

(2) In situations when an onsite emergency results in evacuation of the Work Zone, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed by the Site Safety Officer.
3. The Site Safety Plan has been reviewed by the Site Safety Officer and Corporate Health and Safety Manager.
4. Site personnel have been briefed on any changes in the Site Safety Plan by the Site Safety Officer.

(3) Accident/Incident Reports – The following information will be conveyed by the Site Safety Officer to the Project Manager immediately and followed up as soon as possible with a written Accident/Incident report (Attachment 13-2)

A brief description of the emergency
The location, time and date of the event/accident/injury
The number of persons injured and the severity of the injuries
The name(s), company and positions of the injured person(s)
The name and location of the medical facility where the injured person(s) were taken
The name of the person reporting the event/accident/injury.

SECTION 14. EMERGENCY INFORMATION

TO BE POSTED IN SITE-TRAILER/OFFICE AND/OR IN FIELD VEHICLES

(1) LOCAL RESOURCES

Ambulance (name):	FDNY	Phone:	911
Hospital (name):	The Brooklyn Hospital Center	Phone:	911 or (718) 250-8075
Police (local or state):	84th Precinct	Phone:	911 or (718) 963-5311
Fire Dept. (name):	Engine 211 Ladder 119	Phone:	911
HAZ MAT Responder:		Phone:	
Nearest phone:	Cell Phones		
On-Site CPR/FA(s):			

The hospital is 6 minutes from the site.

(2) DIRECTIONS TO NEAREST HOSPITAL – ATTACH MAP: See Attachment 14-1

DIRECTIONS TO NEAREST POLICE STATION: See Attachment 14-2

(3) CORPORATE RESOURCES

(4) WHOM TO NOTIFY IN CASE OF ACCIDENT:
Project Managers:
Marshah-Reaff Barrett, DSNY
Office: (646) 885-4776

Barry Cheney, P.E., HydroQual
Office: (201) 529-5151 ext. 7122
Cell: (201) 317-6484

SECTION 15: SAFE WORK PRACTICES

THE FOLLOWING PRACTICES MUST BE FOLLOWED BY PERSONNEL ON SITE

1. Smoking, eating, chewing gum or tobacco, or drinking are forbidden except in designated areas.
2. Ignition of flammable liquids within or through improvised heating devices (e.g., barrels) is forbidden.
3. Contact with samples, excavated materials, or other contaminated materials must be minimized.
4. Use of contact lenses is prohibited at all times.
5. If drilling or other electrical or mechanical equipment is involved, know where the 'kill switch' is.
6. All electrical equipment used in outside locations, wet areas or near water must be plugged into ground fault circuit interrupter (GFCI) protected outlets.
7. Good housekeeping practices are to be maintained.
8. In the event of extreme or hazardous weather-related working conditions (i.e., thunderstorm, limited visibility, extreme cold or heat) field tasks will be suspended at the discretion of the Site Safety Officer until conditions improve or appropriate protection from the elements is provided.

Site Specific Safe Work Practices:

The following site specific work practices shall be followed:

1. Always remain in visual contact with the operator of heavy equipment.
2. Never work or walk into the path of operating heavy equipment.
3. Know emergency communication signals used and recognized by heavy equipment operators.
4. Sampling will only take place when heavy equipment is not in motion.

SECTION 16: EMPLOYEE ACKNOWLEDGEMENTS

PLAN REVIEWED BY: DATE:

Corporate Health & Safety: Gary M. Grey _____

Project Manager: Barry J. Cheney, P.E. _____

Project Leader: Kevin D. Fitzpatrick _____

I acknowledge that I have read the information on this Site Safety Plan Short Form and the attached Material Safety Data Sheets (MSDSs). I understand the site hazards as described and agree to comply with the contents of this Plan.

EMPLOYEE (print name)	SIGNATURE	DATE
_____	_____	_____
_____	_____	_____
_____	_____	_____

ATTACHMENT 2-1

EXPLANATIONS/DETAILS

The Brooklyn Navy Yard 13-Acre Parcel site is located on the northeast portion of the Brooklyn Navy Yard Development Corp. (BNYDC) Industrial Park and is operated by the New York City Department of Sanitation (DSNY). The site is bordered by the East River on the north and west, by Kent Avenue on the east, and by the remainder of the BNYDC industrial park on the south. The site includes a barge basin, the Former Building 419 transformer substation, two former drum storage areas, a former boat shop area and a former coal gasification plant area.

The Brooklyn Navy Yard 13-acre parcel site includes a barge basin, the Former Building 419 transformer substation, two former drum storage areas, a former boat shop area and a former gasification plant area. The surrounding area includes industrial, commercial and residential uses.

Operable Unit No. 1 (OU-1), which is the subject of this HASP, consists of approximately 9.5 acres of the 13-acre site and includes two former drum storage areas, a railroad siding area, the Former Building 419 transformer substation, the Department of Citywide Administrative Services (DCAS) area, the treed area along Kent Avenue and DSNY staging areas. The remaining operable unit for this site is the "Former Brooklyn Navy Yard Manufactured Gas Plant (MGP)" site (a.k.a.OU-2 or the "Nassau Works MGP" site), which occupies approximately 3.5 acres of the 13-acre parcel. This portion of the site formerly housed the Nassau Works Manufactured Gas Plant and is currently the responsibility of Keyspan Energy Corporation (d/b/a National Grid) and is being investigated for contamination related to that use and is not part of this FSP/QAPP.

A primary contaminant leading to the listing of this site on the *Registry of Inactive Hazardous Waste Sites* was polychlorinated biphenyls (PCBs) released during a 1986 transformer fire at Former Building 419, which is an enclosure formerly used as a transformer substation. The "building" has no roof and the "floor" consists of individual concrete slabs, on which the transformers were formerly located, separated by exposed earth and gravel. In June 1986, there was an explosion and subsequent fire at one of the PCB-containing transformers located within Former Building 419. Former Building 419 was decontaminated, and contaminated soils were removed from the immediate vicinity of the transformer. The investigation of this area focused on identifying PCB contamination following the earlier cleanup.

The Railroad Siding Area is located along the southwestern portion of the site and runs in a northwest to southeast direction. Sampling in this area initially occurred during a 1988

Environmental Assessment and indicated the presence of PCBs at low concentrations in a single composite sample collected. This resulted in further exploratory borings and test pits in the area to investigate the potential presence of PCBs, as well as lead and semivolatile organic compounds (SVOCs). The investigation of this area focused on confirming earlier results, as well as filling in data gaps.

The DSNY and the City of New York entered into a Consent Order for OU-1 on October 12, 2006. The Consent Order obligates the responsible party to implement a full remedial program.

A remedial investigation/feasibility study (RI/FS) was conducted to evaluate the alternatives for addressing the significant threats to human health and/or the environment. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between February 2005 and September 2006. The field activities and findings of the investigation are described in the RI report. As described in the RI repot, many soil, groundwater, soil gas, and surface water/sediment samples were collected to characterize the nature and extent of contamination.

SURFACE SOIL

Former Drum Storage Area A: This area is generally covered by a layer of compacted gravel and does not readily support vegetation, and therefore does not contain "surface soil."

Former Drum Storage Area B: This area is generally covered by a layer of compacted gravel and does not readily support vegetation, and therefore does not contain "surface soil."

Railroad Siding Area: This area is currently covered by a layer of compacted gravel and does not readily support vegetation, and therefore does not contain "surface soil."

Former Building 419 and the Surrounding Area: Former Building 419 is currently the only area with exposed soils. A total of 43 surface soil samples (i.e., soils within the top two or three inches) were taken and analyzed primarily for PCBs, however, of those samples, five were analyzed for a broader suite of compounds, including volatile organic compounds (VOCs), SVOCs, pesticides and metals for further characterization of the area. PCBs were found to be above one part per million in soils within this area and were determined to be the contaminant of concern at this location.

SUBSURFACE SOIL

Former Drum Storage Area A: The subsurface soil investigation of Former Drum Storage Area A consisted of eight samples for a broad suite of compounds, including VOCs, SVOCs,

pesticides, PCBs and metals, as well as an additional eight samples that targeted lead only. Most compounds detected were at concentrations below those in historic fill at other areas of the Brooklyn Navy Yard, however, one sample within the area did reveal leachable lead at levels that are considered hazardous. The highest total lead concentration within this area was 1100 parts per million (ppm), which is well above the unrestricted use criteria of 63 ppm, but only marginally above the commercial cleanup goal of 1000 ppm. No PCBs were detected above one part per million in the area.

Former Drum Storage Area B: The subsurface soil investigation of Former Drum Storage Area B consisted of nine samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as an additional 23 samples that targeted SVOCs, PCBs and metals only. This area contained concentrations of lead and PCBs considerably higher than those in historic fill at other areas of the Brooklyn Navy Yard, with PCB levels as high as 27 ppm and lead levels as high as 550 ppm. SVOCs were also found at relatively high levels in some samples from within this area, but were generally less significant than the elevated lead and PCB values.

Railroad Siding Area: The subsurface soil investigation of the Railroad Siding Area consisted of 21 samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as an additional 33 samples that targeted SVOC and metals only. No pesticide or VOCs were detected, and PCBs were not found in this area at levels generally considered a concern (e.g., only one PCB sample, with a concentration of 1.5 ppm, was above the unrestricted reuse and commercial standards of 0.1 and 1 ppm, respectfully). Metals and SVOC contamination were detected above commercial and unrestricted soil cleanup objectives at several sample locations; however, the distribution was sporadic and not indicative of a "release," but more likely representative of sampling within an area that consists of historic fill.

Former Building 419 and Surrounding Area: The subsurface soil investigation of the Former Building 419 area consisted of 31 samples for a broad suite of compounds, including VOCs, SVOCs, pesticides, PCBs and metals, as well as additional rounds of sampling targeting a more select suite of compounds (e.g., 44 additional samples for PCBs only, 30 additional samples for lead only, as well as 11 more samples each for SVOCs and metals). Results indicated that VOCs and pesticides were not of concern, with only minor excursions above cleanup criteria established for unrestricted reuse. Metals (predominantly lead) and SVOCs were often above unrestricted criteria; however, when assigned against commercial cleanup criteria, the exceedences are sporadic and do not appear indicative of a "release," but more likely representative of sampling within an area that consists of historic fill. PCBs are present at levels above unrestricted and commercial use criteria within the former substation, with the highest subsurface result for total PCBs being 81 ppm.

GROUNDWATER

During the final stages of the RI, groundwater samples were collected in up-gradient and down-gradient monitoring wells to supplement previously existing groundwater data. Wells were sampled and analyzed for the full Target Compound List (TCL) (VOCs, SVOCs, pesticides/PCBs and metals including cyanide).

Analytical results exceeding groundwater quality criteria results contained within the urban fill material and are consistent with the analytical results obtained from these fill deposits as described in the previous sections. As described further below, both the groundwater and urban fill contain metals and a limited number of SVOCs. No pesticides or PCBs were observed above criteria in groundwater. With respect to VOCs, only xylene was above New York State Department of Environmental Conservation (NYSDEC) Part 703 criteria (ranging from 21-41 ppb) in one monitoring well. Metals observed above their respective criteria included antimony, lead, iron, manganese, selenium and sodium. Levels of some metals observed during the earlier stages of the RI may be related to high particulate matter in the water sample. For example, recently collected groundwater samples had considerably lower metals concentrations than previously observed in the original well at that location, and this is believed to be attributable to better sampling technique and well construction than was used in the past. Further support for the conclusion that high particulate matter in samples was the cause of elevated concentrations of metals in groundwater can be found by comparing filtered and unfiltered groundwater samples. For example, lead concentrations above criteria were observed in the unfiltered sample while only low concentrations were observed in the filtered sample. A small number of SVOCs were also observed to have concentrations moderately above screening criteria.

In general, observed concentrations of contaminants in groundwater do not indicate a significant source of groundwater contamination due to a release or waste management at OU-1. However, there does appear to be minor impact to groundwater on the OU-1 parcel, presumably due to historic operations at the site, as well as the presence of historic fill. No source area contamination relative to these minor groundwater impacts was found during the investigation.

SEDIMENTS

To investigate whether surface runoff from the Brooklyn Navy Yard has contaminated sediment in the adjoining waterway, three sediment samples were collected on the perimeter of the barge basin and compared to sediment quality data collected previously from the center of the basin. Concentrations of metals in the new samples were similar to or lower than those observed in samples collected near the center of the basin, indicating that overland flow of contaminants was not significantly impacting sediments.

Additionally, concentrations of contaminants observed within the barge basin were not found to be significantly different from those prevalent throughout the region. Both metal and SVOC concentrations in the barge basin sediments were generally comparable to a background sample collected near the mouth of the East River, as well as to samples collected from nearby Wallabout Basin, indicating that observed contaminant concentrations reflect the urban nature of local waterways rather than impacts from the site.

No site-related sediment contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives were evaluated for the sediment.

SOIL VAPOR INTRUSION

To assess the potential vapor intrusion pathway (there are currently no inhabitable structures on the site), a screening-level soil vapor investigation was performed at the site. Two soil vapor samples were collected in each of the former drum storage areas within the Railroad Siding Area, and three soil vapor samples were collected in the vicinity of Former Building 419.

Soil gas results revealed three constituents detected in soil gas (methylene chloride, tetrachloroethene, and trichloroethene) at levels above New York State Department of Health (NYSDOH) guidance values. These contaminants were also reported at low levels in several soil samples.

An Interim Remedial Measure (IRM) soil removal was performed in the vicinity of Former Drum Storage Area B during the summer of 2008 in an effort to ready the area for planned commercial development. The IRM targeted anomalously high lead and PCB concentrations in soil found during the RI. Contaminated soils were excavated and disposed of off-site in accordance with state and federal law. Following the initial removal, samples were taken from the side walls and bottom of the excavation and results were compared to the cleanup objectives established for the IRM (i.e., 0.1 ppm PCB and 400 ppm lead). End point samples were determined to have achieved the goals of the IRM, and an IRM closeout report was submitted to the NYSDEC in December 2008. The IRM is considered to have successfully removed the most contaminated soils within Former Drum Storage Area B. No further remedial activities are planned to occur in this portion of the site.

To eliminate or mitigate the threats identified above, an excavation of hot spots will occur and a protective cover will be placed over the site. The following is a summary of the Remedial Actions that will be performed at the site:

1) Excavation of soils containing PCBs greater than 10 ppm and soils with lead concentration in the TCLP extract of greater than 5 mg/L. The estimated areas and

depths of excavation are located in the areas of Former Building 419 and Former Drum Storage Area A. Post-excavation samples will be collected to confirm the limits of excavation to the PCB and TCLP lead criteria. Excavated soils will be analyzed for appropriate disposal and managed in accordance with applicable regulations. Former Drum Storage Area B has been remediated pursuant to an IRM and no further action is anticipated in connection with that area.

2) A site-wide cover. The cover will be a combination of existing or new soil, pavement, or concrete. Where vegetated surfaces will remain, a soil cover will be constructed of existing cover if adequate would be used (e.g., gravel covered surfaces with less than 10% passing the number 100 sieve – fine sand and finer fraction). The soil cover will consist of one foot of soil underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. The indicator material location and depth may vary based on the use of existing materials. For example, if existing pavement were to remain, it would not be practicable to install the indicator. Or, if some portion of existing stone were used, the indicator layer may be positioned at a depth other than the base of the cover. The top six inches of soil will be suitable to support vegetation, unless the area is used for vehicle traffic (e.g., gravel areas). Cover soil will meet the NYSDEC, Division of Environmental Remediation criteria for backfill, as per 6 NYCRR Part 375-6.7. Where gravel is used for final cover it will comply with typical aggregate gradations (ASTM D448 or NYSDOT Specifications Tables 703-4 and 703-5) and be of a size suitable as a wearing surface. Where the final surface will be pavement (e.g., roadways, parking lots) or concrete (e.g., building slab) the cover will consist of a paving system or concrete slab system at least six inches thick, either constructed or existing.

3) Imposition of an institutional control in the form of an environmental easement that will require: (a) limiting the use and development of the property to commercial use, which will also permit industrial use; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner (or in this case BNYDC as the agent of the owner) to complete and submit to the NYSDEC a periodic certification of institutional and engineering controls. Regarding the periodic certification, it will:

    - Be prepared and submitted by a professional engineer or such other expert approved by the NYSDEC until the NYSDEC notifies the property owner in writing that the certification is not longer needed;

- Contain a certification that the institutional and engineering controls remain in place and are either unchanged from the previous certification or are compliant with the NYSEC-approved modifications;

- Allow the NYSDEC access to the site; and

- State that the engineering controls remain protective of public health and the environment, and remain in compliance with the site management plan or any NYSDEC-approved modifications thereof.

4) A Site Management Plan (SMP) which will include the following institutional and engineering controls: (a) management of the cover system to restrict excavation below the soil cover's demarcation layer (and identification of specific areas where the demarcation layer may be an alternative material such as the pavement itself), pavement, or buildings, and procedures for proper management of soils and appropriate health and safety requirements should excavation occur; (b) provisions for evaluation of the potential for vapor intrusion into buildings developed on the site, including the mitigation of impacts identified; (c) identification of use restrictions on the site; and (d) provisions for the continued proper operation and maintenance of the components of the remedy.

5) A long-term monitoring plan. The key components of this plan will include the periodic inspection of the cover system, the necessary inspections to support periodic certification of the site use restrictions, and the periodic monitoring of any future sub-slab depressurization systems.

ATTACHMENT 3-1

PHYSICAL HAZARD ANALYSIS

The following are potential hazards that may be encountered at the site during field operations and the appropriate procedure for each.

SEVERE WEATHER

If severe weather occurs that may affect the safety of site workers, the Site Safety Officer or designee will stop affected field operations. All field operations will be suspended while lightning is present or recently observed. The Site Safety Officer or designee will give the approval to resume operations when weather conditions improve.

HEAT STRESS/COLD STRESS

HydroQual field personnel will be cognizant of weather conditions and monitor weather reports so that they can dress appropriately. Field personnel should bring supplies of non-caffeinated fluids such as water, to the job site daily.

Workers will monitor each other's actions, speech, and appearance for signs and symptoms of heat-related illnesses or injury, including heat exhaustion and heat stroke. Physical signs and symptoms of heat exhaustion include headache, nausea, vertigo, weakness, thirst, and giddiness. Heat exhaustion may progress to heat stroke if a worker is unable to cool and re-hydrate their body. The primary signs and symptoms of heat stroke are confusion, irrational behavior, loss of consciousness, convulsions, lack of sweating (usually), hot, dry skin, and an abnormally high body temperature. Workers should be aware of the key differences between the signs and symptoms of heat stroke and those of heat exhaustion, such as the lack of sweating, the color of the skin (red), and the rise in body temperature. Heat stroke is a medical emergency that requires immediate medical attention.

Field personnel should dress appropriately with adequate insulating dry clothing to maintain core body temperatures above 98.6°F when air temperatures are below 40°F. If continuous work is to be performed at air temperatures below 20°F, frequent short breaks will be taken to keep warm.

During cold weather, workers will monitor each other's actions, speech, and appearance for signs and symptoms of cold-related illnesses or injury including hypothermia, chilblains and frostbite. The first symptoms of hypothermia are uncontrollable shivering and the sensation of

cold. Cool skin, muscle rigidity and low blood pressure, slowed or irregular pulse and apparent exhaustion and fatigue after rest manifest as hypothermia progresses and the core body temperature falls. Chilblains and frostbite can occur without hypothermia when extremities do not receive sufficient heat from central body stores. Chilblains occur when small blood vessels constrict during cold, moist conditions, then leak blood into surrounding tissues upon re-warming. Chilblains usually affect the extremities, ears and cheeks. Damage from chilblains is generally not considered serious, but discomfort can be severe and the risk of secondary infection does exist. Frostbite occurs when the fluids around the tissue cells freeze. Frostbite usually affects the extremities, nose and cheeks. Damage from frostbite can result in tissue death. Therefore, frostbite requires immediate medical attention.

SLIP, TRIP AND FALL HAZARDS

As in any work area, it is expected that the ground may be uneven, the surface may be uneven, debris may be present and wet or muddy areas may exist. Excavation and other subcontractor equipment may also be present during sampling activities. Therefore, the potential for slipping, tripping and falling is present. Severe slip or trip hazards will be identified prior to commencement of project activities and demarcated by flags or caution tape.

HEAVY LIFTING

There is the potential for back strain associated with lifting heavy equipment. Back strain can be prevented by employing proper lifting and bailing techniques. Heavy equipment will be lifted using proper lifting procedures. Lifting with the legs will be employed, and when needed, additional help may be requested.

USE OF HAND AND POWER TOOLS

Hand and/or power tools are often used for light construction and assembly in the field. However, hand and/or power tool safety is sometimes not being paid enough attention to. Each year hundreds of workers in the workforce are seriously injured while using hand or power tools; thousands experience minor injuries. The injuries consist of bruises, cuts, punctures, eye injuries, and amputations. The infrequent deaths are from electrocution and severe lacerations.

When using hand or power tools, the following factors should be given emphasis:

- Use the proper tool for the task.
- Store the tools properly.
- Tools should be kept in good condition.
- Wear goggles when there is a risk of flying particles or other debris.

- Keep tools free of grease or oil, which would cause them to slip.
- Use tools in a manner so that a slip or miss does not result in a cut or hit to the user.
- Use a vise or clamps to hold small objects while working with them.
- Practice good housekeeping in all work areas and wear slip-resistant shoes.
- Provide or ensure that there is adequate lighting.
- A hard hat, gloves and other protective equipment might be required for certain tasks and some locations. Make certain that this equipment is available and worn. See Section 5 for more information about PPE.

With electrical power tools there are a few other important "musts". They are as follows:

- Electrical tools must always protect the user from electrical shock or electrocution. This can be done by providing "double-insulated" tools, three-wired cords with the ground wire connected, and/or by use of a ground fault circuit interrupter.
- Avoid working with electrical power tools in damp or wet areas. If this cannot be avoided, always wear gloves and footwear designed for use when working with electricity.
- Never carry tools by the cord; never disconnect them by "yanking" on them.
- Always disconnect tools when not in use and before servicing them or charging accessories.
- Damaged electrical power tools must be removed from service and be tagged "Do not use."

Gasoline-powered tools (such as generators) also require the use of personal protective equipment, attention to storage, conditions and safe use. Refueling is a special concern: 1) make sure the engine has cooled before refueling; 2) refuel in well-ventilated areas; 3) replace the tank cap and wipe up spills before restarting the engine.

There are some other safety practices, however, which apply to all power tools, electric- or gasoline-powered. The most important of these are:

- Read and heed the operator's manual.
- Read and heed all safety decals on the equipment.
- Keep all guards and shields in place at all times.
- Do not by-pass, disconnect, or in any manner void any of the safety features built into the equipment.

- Keep power equipment away from personnel not trained in the safe and proper use of the equipment.
- Do not use electrical equipment (such as generators) in the rain.

HEAVY EQUIPMENT

HydroQual field personnel may be working in the vicinity of excavation equipment. The excavation contractor will operate the excavation equipment in a safe manner. HydroQual personnel will be conscious of the excavation operations and abide by the operators instructions. All field personnel will stay out of operating range of all heavy equipment at the site. Field personnel shall not walk behind operating equipment or out of view of the equipment operator. Operating equipment should remain in the field of vision of field personnel at all times. Sampling will only take place when heavy equipment is not in motion. All field personnel will be familiar with the heavy equipment operators emergency communication signals.

WORKING ADJACENT TO WATERWAYS

When conducting work adjacent to the Barge Basin, the Contractor will be responsible for the placement of a barrier that will prevent site personnel from falling into the waterway. In the event a barrier cannot be placed adjacent to the waterway, personnel will be required to wear a U.S. Coast Guard-approved life jacket or buoyant work vest at all times when situated adjacent to the waterway. Caution should be exercised to avoid slips, trips and falls when in proximity to the waterway. A ring buoy with at least 90 feet of line or a throwbag will be available and kept close to the Barge Basin when work is being conducted near the water.

CONTRACTOR HASP

All hazards identified in the contractor's HASP will be acknowledged and followed by HydroQual field personnel.

ATTACHMENT 4-1

Category	Parameter	Range on Site (Min, Max)		OSHA PEL/NIOSH REL Exposure Limits
Metals (ppm)	Arsenic	0.38	170	0.010 mg/m^3 (TWA)/0.002 mg/m^3 [15-minutes]
	Barium	7	590	0.5 mg/m^3 /NA
	Beryllium	0.1	20	0.005 mg/m^3 (TWA)/0.002 mg/m^3 (TWA)
	Cadmium	0.1	14	0.005 mg/m^3 (TWA)/NA
	Calcium	520	210000	NA
	Chromium	4	150	1 mg/m^3 (TWA)/0.5 mg/m^3 (TWA)
	Cobalt	2	140	0.1 mg/m^3 TWA/0.05 mg/m^3 TWA, 20 mg/m^3 IDLH
	Copper	9	1500	1 mg/m^3 (TWA)/1 mg/m^3 (TWA)
	Iron	3400	68000	10 mg/m^3 (TWA)/5 mg/m^3 (TWA)
	Lead	4	5300	0.050 mg/m^3 (TWA)/0.050 mg/m^3 (TWA) (8-hour)
	Magnesium	56	66000	NA
	Mercury	0.10	5.4	0.1 mg/m^3 (TWA) [skin]/0.05 mg/m^3 [skin]
	Nickel	4	330	1 mg/m^3 (TWA)/0.015 mg/m^3 (TWA)
	Selenium	0.3	14	0.2 mg/m^3 (TWA)/0.2 mg/m^3 (TWA)
	Sodium	18	11901	NA
	Zinc	19	7400	NA
Semi-Volatile Organics (ppb)	Phenol	42	9260	5 ppm (TWA)/5 ppm (TWA)
	Naphthalene	35.8	28300	10 ppm (TWA) (50 mg/m^3)/10 ppm (TWA) (50 mg/m^3)
	Dibenzofuran	40.5	15100	NA
	Anthracene	43.4	2E+05	0.2 mg/m^3 (TWA)/0.1 mg/m^3 (TWA)
	Fluoroanthene	42.1	2E+05	NA
	Butylbenzylphthalate	42.5	79400	NA
	Benzo(a)anthracene	39.1	20600	NA
	Chrysene	37	17200	0.2 mg/m^3 (TWA)/0.1 mg/m^3 (TWA)
	Benzo(b)fluoranthene	47.2	25300	NA
	Benzo(k)fluoranthene	57.3	7400	NA
	Benzo(a)pyrene	38	15600	0.2 mg/m^3 (TWA), 0.80 mg/m^3 (IDLH)/0.1 mg/m^3 (TWA)
	Indeno(1,2,3-cd)pyrene	41.9	7880	NA
	Dibenzo(a,h)anthracene	47.9	2510	NA
Volatile Organics (ppb)	Benzene	11	69	1 ppm (TWA)/0.1 ppm (TWA)
Pesticide/PCB (ppb)	Heptachlor epoxide	1.8	29.2	NA
	gamma-BHC (Lindane)	1.8	17	0.5 mg/m^3 (TWA)/0.5 mg/m^3 (TWA)
	Dieldrin	1.8	60.9	0.25 mg/m^3 (TWA) [skin]/0.25 mg/m^3 (TWA) [skin]
	PCBs	33	2E+05	0.5 mg/m^3 (TWA) [skin]/0.001 mg/m^3 (TWA)

NA – None available

ATTACHMENT 7-1

COMMUNITY AIR MONITORING PLAN

OVERVIEW

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements will be reviewed for each situation in consultation with New York State Department of Health (NYSDOH) to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

COMMUNITY AIR MONITORING PLAN

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the Work Zone will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological

contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate NYSDEC/NYSDOH staff.

- **Continuous monitoring** will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

- **Periodic monitoring** for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs must be monitored at the downwind perimeter of the immediate work area (e.g., Work Zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the Work Zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the Work Zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the

total organic vapor level 200 feet downwind of the Work Zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the Work Zone, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the Work Zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (NYSDEC and NYSDOH) and County Health personnel to review.

ATTACHMENT 12-1

DECONTAMINATION/CLEAN-UP PROCEDURES

PERSONNEL DECONTAMINATION

It is anticipated that HydroQual personnel working on the site will be wearing Level D or modified Level D protection. Disposable PPE will be collected for proper disposal.

Personnel working at the site must wash their hands and face prior to eating, drinking or smoking and practice good personal hygiene. Potable water will be available at the site. Personal decontamination should be done at the designated decontamination.

EQUIPMENT DECONTAMINATION

Decontamination of equipment used by HydroQual field personnel will take place within the Work Zone, that will be identified by the Contractor, where work is being conducted (i.e., Former Drum Storage Area A or Former Building 419).

Field and/or sampling instruments will be decontaminated whenever they have come into contact with soil or groundwater. Soil will be removed using a dry brush daily or more frequently as needed. All instruments will be decontaminated using a potable water/Alconox mixture followed by a de-ionized water rinse and air drying. Decontamination residuals will be disposed of into a designated 55-gallon drum on site.

CLEAN-UP PROCEDURES

Work areas will be kept in a neat and orderly condition. Any debris generated will be disposed of in an appropriate manner in a refuse can or bag that will be provided on site.

ATTACHMENT I3-2

OCCUPATIONAL ACCIDENT/INCIDENT REPORT FORM

Date of Incident:_____ **Location of Incident:** _____

Time of Incident:_____ **Date of Report:** _____

Personal Injury:

_____
_____
_____
_____

Property Damage:

_____
_____
_____
_____

Description of Incident:

_____
_____
_____
_____

Additional Factors:

_____
_____
_____
_____

Corrective Actions:

Action	Responsibility	Date of Completion
_____	_____	_____
_____	_____	_____
_____	_____	_____

Investigated By: _____
_____

Written By: _____ **Date:** _____

Reviewed By:_____ **Date:** _____

MAPQUEST

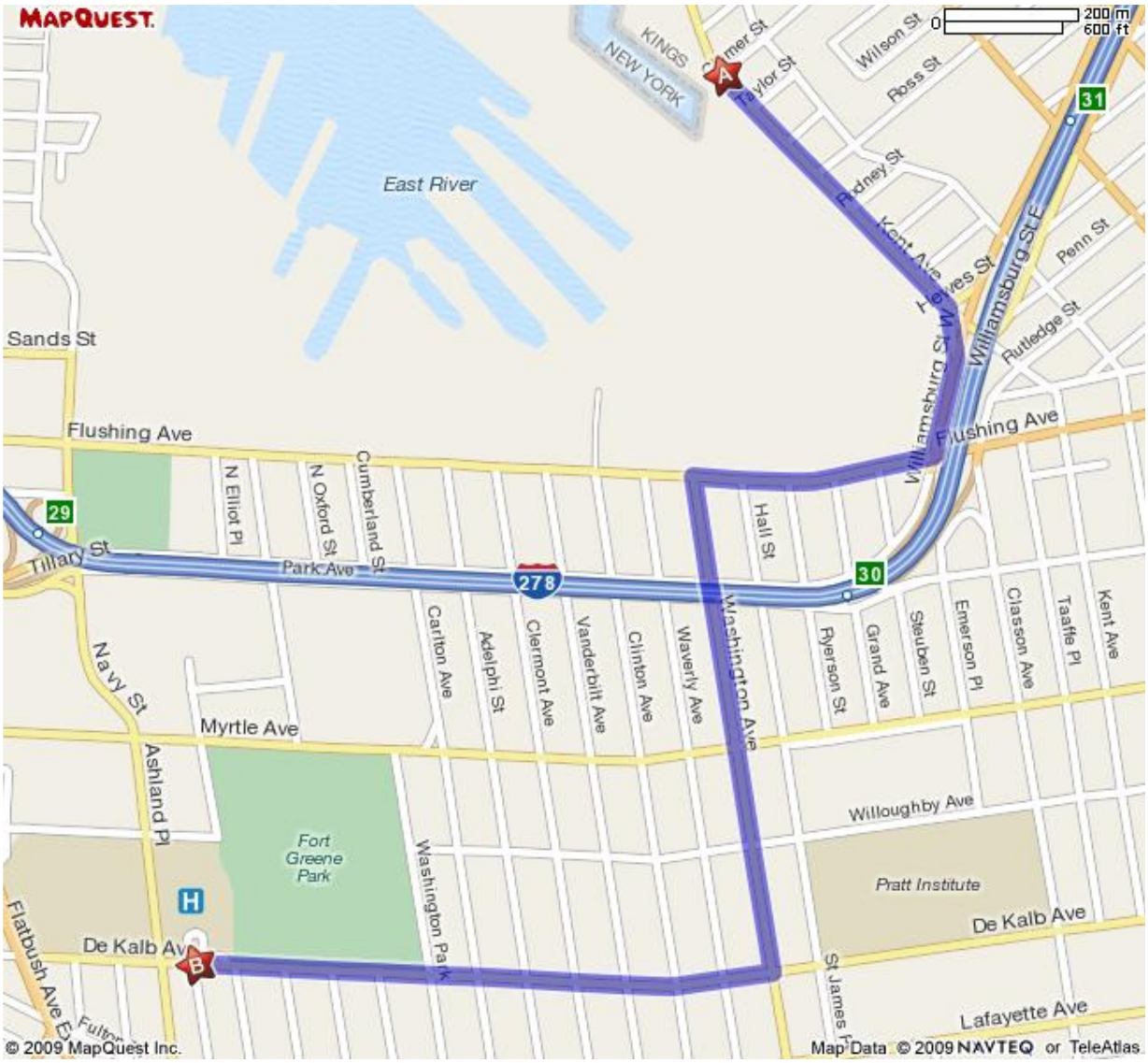
Total Travel Estimates: 6 minutes / 1.98 miles

A: Kent Ave & Clymer St, Brooklyn, NY 11211

START	1: Start out going **SOUTHEAST** on **KENT AVE** toward **TAYLOR ST**.	0.4 mi
	2: Turn **SLIGHT RIGHT** onto **WILLIAMSBURG PL**.	0.1 mi
	3: Turn **SLIGHT RIGHT** onto **WILLIAMSBURG ST W**.	0.1 mi
	4: Turn **RIGHT** onto **FLUSHING AVE**.	0.3 mi
	5: Turn **LEFT** onto **WASHINGTON AVE**.	0.6 mi
	6: Turn **RIGHT** onto **DE KALB AVE/DEKALB AVE**.	0.6 mi
END	7: **121 DEKALB AVE**.	0.0 mi

B: 121 Dekalb Ave, Brooklyn, NY 11201-5425

ATTACHMENT 14-1



ATTACHMENT 14-1

MAPQUEST

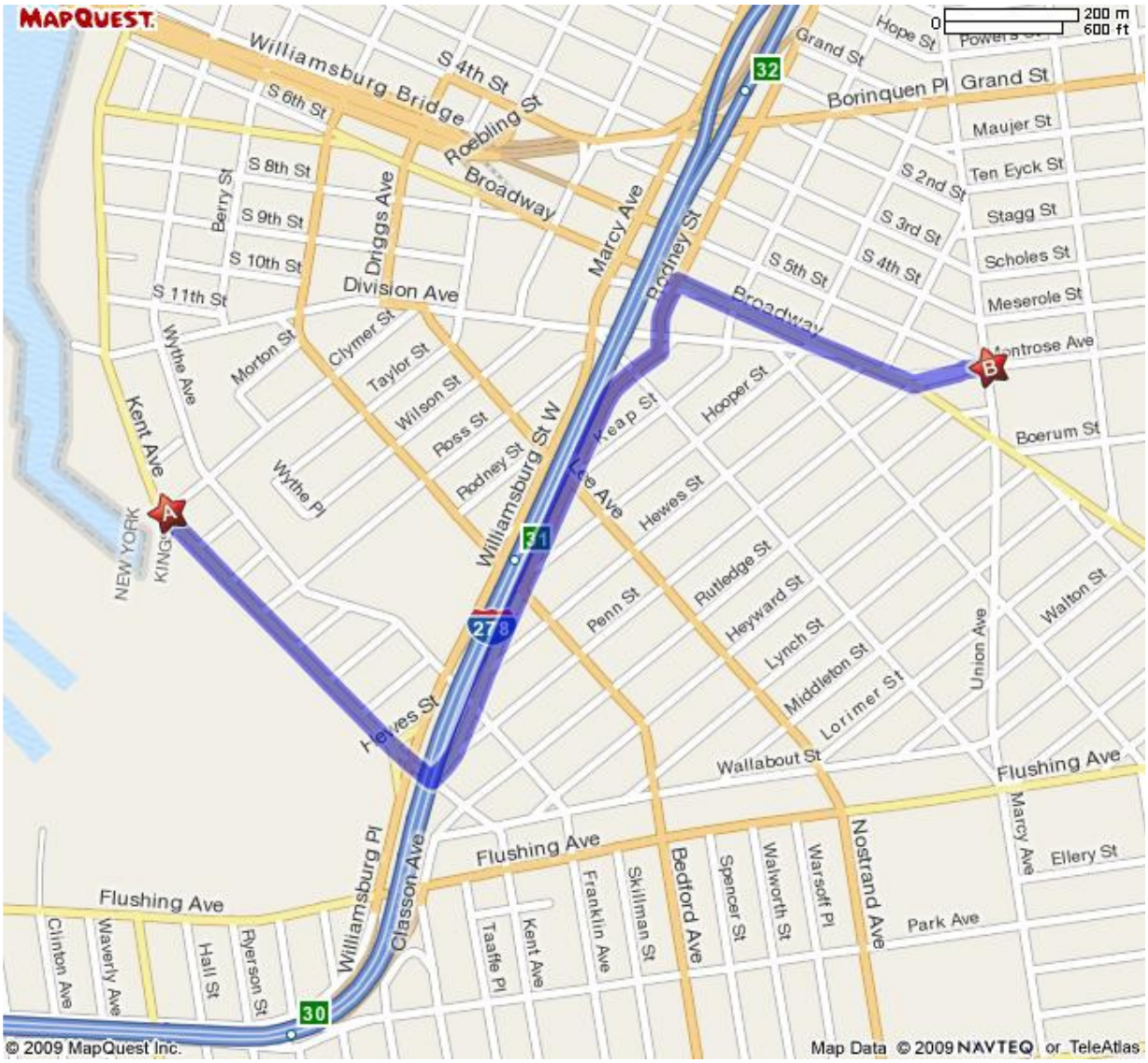
Total Travel Estimates: 5 minutes / 1.45 miles

A: Kent Ave & Clymer St, Brooklyn, NY 11211

START	1: Start out going **SOUTHEAST** on **KENT AVE** toward **TAYLOR ST**.	0.4 mi
	2: Turn **LEFT** onto **WILLIAMSBURG ST E**.	0.5 mi
	3: **WILLIAMSBURG ST E** becomes **RODNEY ST**.	0.1 mi
	4: Turn **LEFT** to stay on **RODNEY ST**.	0.1 mi
	5: Turn **RIGHT** onto **BROADWAY**.	0.3 mi
	6: Turn **SLIGHT LEFT** onto **MONTROSE AVE/NEW MONTROSE AVE**.	0.1 mi
	7: Turn **RIGHT** onto **UNION AVE**.	0.0 mi
END	8: **211 UNION AVE** is on the **RIGHT**.	0.0 mi

B: 211 Union Ave, Brooklyn, NY 11211-7417

ATTACHMENT 14-2



ATTACHMENT 14-2

APPENDIX C

INSPECTION FORM

Environmental
Engineers & Scientists

SITE-WIDE INSPECTION FORM

BROOKLYN NAVY YARD, OPERABLE UNIT 1
KINGS COUNTY
BROOKLYN, NEW YORK
NYSDEC SITE NUMBER 224019A

NAME OF INSPECTOR:_____

COMPANY OF INSPECTOR:_____

DATE OF INSPECTION:_____

CURRENT USE OF SITE:_____

HAS A CHANGE OF USE OCCURRED SINCE THE LAST CERTIFICATION?
_____ YES _____ NO
IF YES, THEN EXPLAIN:_____
_____
_____

GENERAL DESCRIPTION OF COVER:_____
_____
_____
_____
_____

HAS THE COVER BEEN PENETRATED? _____YES _____NO
IF YES, THEN EXPLAIN:_____
_____
_____
_____
_____

HAVE ANY STRUCTURES BEEN CONSTRUCTED ON THE SITE SINCE THE LAST INSPECTION? _____ YES _____NO
IF YES, THEN EXPLAIN:_____
_____
_____

HAVE COVER CONDITIONS CHANGED SINCE THE LAST INSPECTION?
_____YES _____NO

IF YES, THEN EXPLAIN:_____
_____
_____

IS ANY MAINTENANCE OF THE COVER REQUIRED?
_____YES _____NO

IF YES, THEN EXPLAIN:_____
_____
_____

ADDITIONAL OBSERVATIONS, CONCLUSIONS OR RECCOMMENDATIONS:
_____
_____
_____
_____

ANY CHANGES TO THE SITE OR REQUIRED MAINTENANCE SHOULD BE MARKED IN THE CORRESPONDING LOCATION ON THE ATTACHED MAP

CONTROL CERTIFICATION STATEMENT

For each Institutional or Engineering Control listed above, I certify that by checking "YES" that all of the following is true:

- The Institutional Control and/or Engineering Control employed at the site is unchanged from the date the control was put in place or last approved by the Department.
- Nothing has occurred that would impair the ability of such a control to protect public health and the environment.
- Nothing has occurred that would constitute a violation or failure to comply with any Site Management Plan for this control.
- Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control.
- Use of the site is compliant with the Environmental Easement.
- The EC systems are performing as designed and are effective.
- To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices.
- The information presented in this report is accurate and complete.

CONTROL CERTIFICATIONS

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements contained 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 _____ (print name), _____ (print business address), am certifying as _____ (Owner or Owner's Designated Site Representative) for the Brooklyn Navy Yard, Operable Unit 1.

_____ _____

Signature of Site Owner or Representative Rendering Certification Date

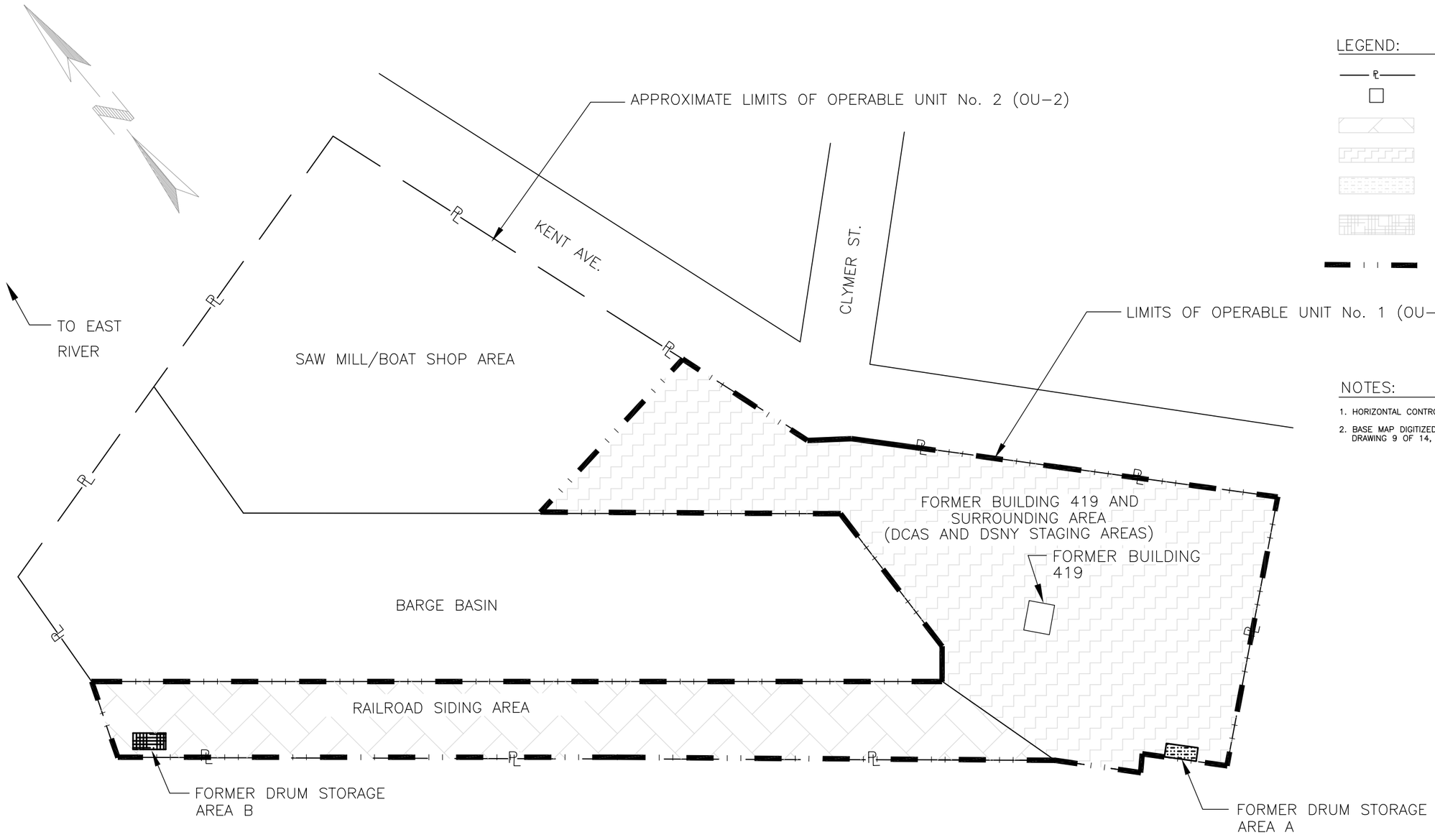
PROFESSIONAL ENGINEER SIGNATURE

I certify that all information and statements contained 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 _____ (print name), _____ (print business address), am certifying as a Professional Engineer licensed to practice in New York State for the _____ (Owner or Owner's Representative) for the Brooklyn Navy Yard, Operable Unit 1.

_____ _____

Signature and seal of Professional Engineer for the Owner or Owner's Representative, Rendering Certification Date



LEGEND:

- PROPERTY LINE
- STRUCTURE
- RAILROAD SIDING AREA
- FORMER BUILDING 419 AND SURROUNDING AREA
- FORMER DRUM STORAGE AREA A
- FORMER DRUM STORAGE AREA B
- LIMITS OF OPERABLE UNIT No. 1 (OU-1)

NOTES:

1. HORIZONTAL CONTROL: ASSUMED REFERENCE DATUM.
2. BASE MAP DIGITIZED FROM WEHRAN ENGINEERING DRAWING 9 OF 14, PROJECT NO. 08341.

HYDROQUAL ENVIRONMENTAL ENGINEERS & SCIENTISTS, P.C.
1200 MACARTHUR BOULEVARD
MAHWAH, NEW JERSEY 07430

Site Management Plan

City of New York
Department of Sanitation

Site-Wide Inspection Form

APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

Environmental
Engineers & Scientists

QUALITY ASSURANCE PROJECT PLAN

BROOKLYN NAVY YARD
13-ACRE PARCEL SITE
OPERABLE UNIT 1
BROOKLYN, NEW YORK

NYSDEC SITE ID NO: 224019A

Prepared for:
New York City Department of Sanitation
125 Worth Street
New York, NY 10013

Prepared by:
HydroQual Environmental Engineers & Scientists, P.C.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430

May 2011
Project No: NYCS.020.025

HydroQual

Environmental
Engineers & Scientists

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QUALITY ASSURANCE PROJECT PLAN

1.0 INTRODUCTION

The following is a Quality Assurance Project Plan (QAPP) prepared for the portion of Operable Unit No. 1 (OU-1) of the Brooklyn Navy Yard that includes Former Drum Storage Area A, Former Building 419 and the treed area along Kent Avenue, which are the areas of concern covered by the Site Management Plan created for this project. These are the only three areas where contaminated soil will be removed and confirmatory testing conducted. This QAPP presents the quality assurance and quality control (QA/QC) procedures to be followed for the collection of confirmatory samples and the analytical methods and procedures that will be followed to analyze the confirmatory samples collected from the areas identified above.

2.0 SITE DESCRIPTION

The site is located in Brooklyn, Kings County, New York and is identified as Block 2023 and Lot 1 on the Kings County tax map. The Brooklyn Navy Yard 13-acre parcel site is located in the northeast portion of the Brooklyn Navy Yard Development Corporation Industrial Park and is operated by the New York City Department of Sanitation (DSNY). The site is bordered by the Wallabout Channel and the East River on the north and west, by Kent Avenue on the east, and by the remainder of the Brooklyn Navy Yard Industrial Park on the south.

The Brooklyn Navy Yard 13-acre parcel site includes a barge basin, the Former Building 419 transformer substation, two former drum storage areas, a former boat shop area and a former gasification plant area. The surrounding area includes industrial, commercial and residential uses.

OU-1 consists of approximately 9.5 acres of the 13-acre site and includes two former drum storage areas, a railroad siding area, the Former Building 419 transformer substation, the Department of Citywide Administrative Services (DCAS) area, the treed area along Kent Avenue and DSNY staging area. Of these areas, the Former Drum Storage Area A and Former Building 419 are the only locations that will require sampling as part of the remedy and are the focus of this QAPP. The remaining operable unit for this site is the “Former Brooklyn Navy Yard Manufactured Gas Plant (MGP)” site (a.k.a.OU-2 or the “Nassau Works MGP” site), which occupies approximately 3.5 acres of the 13-acre parcel. This portion of the site formerly housed the Nassau Works Manufactured Gas Plant and is currently the responsibility of Keyspan Energy Corporation (d/b/a National Grid) and is being investigated for contamination related to that use and is not part of this QAPP.

3.0 SITE HISTORY

In 1637, a Dutchman from the adjoining settlement of Breuckelen (Brooklyn) purchased the land on which the Brooklyn Navy Yard is located. At the time of the purchase, the land consisted mostly of mud flats, swamps and creeks. In 1678, John Jackson purchased the property and established a shipyard on the property called the Broldest Industry. In 1801, the United States Navy purchased the land, which officially became the nation's largest government-

owned shipyard. The shipyard, commonly referred to as the Brooklyn Navy Yard, contained 270 buildings, in which approximately 71,000 men and women worked during World War II. The Brooklyn Navy Yard was virtually abandoned by the federal government in the 1960s and was officially closed in 1965. The federal government then sold the Brooklyn Navy Yard to the City in 1968. The property has since been leased from the City by the Brooklyn Navy Yard Development Corporation.

A comparison of historical maps for the Brooklyn Navy Yard shows that the Wallabout Channel shoreline, located within the site, changed between 1801 and the 1950s as a result of various site improvement activities; much of the Brooklyn Navy Yard is underlain by fill material which was used to build up the swamp land to create the present day configuration.

4.0 SITE BACKGROUND AND PREVIOUS INVESTIGATIONS

The Brooklyn Navy Yard is currently owned by the City of New York and managed by the Brooklyn Navy Yard Development Corporation (BNYDC). The site is a 13-acre parcel located within the larger 260-acre Brooklyn Navy Yard in Brooklyn, New York. The site is the subject of an Order on Consent (Consent Order) [File Number D2-0001-9403] with the New York State Department of Environmental Conservation (NYSDEC) governing remedial activities. In addition, the site was listed by the NYSDEC as an Inactive Hazardous Waste Site (Classification 2) in January 2002.

A coal gasification plant formerly occupied a portion of the site (approximately 3.5 acres) and was operated by Brooklyn Union Gas, now owned by Keyspan (d/b/a National Grid). Negotiations among DSNY, who is responsible for the site, National Grid, the New York City Law Department, and the NYSDEC resulted in an agreement that National Grid will be responsible for remediation of the 3.5-acre former coal gasification plant site and the associated plume of contaminants within groundwater originating from the 3.5 acre site. The site that is addressed as part of this FSP/QAPP is located on the remaining 9.5-acre DSNY parcel.

The site has been the subject of several investigations. Work plans and results of these were reported in the following documents:

- "Environmental Assessment Report," November 1988, prepared by Wehran Engineering for Wheelabrator Environmental Services Incorporated;
- "Work Plans for a Thirteen-Acre Parcel of The Brooklyn Navy Yard, Part I – Interim Remedial Measures [IRM] Work Plan," July 1996, prepared by HDR for DSNY;
- "Work Plans for a Thirteen-Acre Parcel of the Brooklyn Navy Yard, Part II – Supplementary Site Assessment [SSA] Work Plan," March 1997, prepared by HDR for DSNY;
- "Final Interim Remedial Measures Report, The Brooklyn Navy Yard," September 1997, prepared by HDR for DSNY;
- "Final Supplementary Site Assessment Report for a 13-Acre Parcel of the Brooklyn Navy Yard," June 1998, prepared by HDR for DSNY;

- January 26,1999 HDR letter to the NYSDEC providing supplemental information related to the SSA;

- "Meeting with Federal Agencies; Summary of Water Quality, Aquatic Ecology, and Sediment Sampling Results; Brooklyn Navy Yard Nearshore Confined Disposal Facility," January 2001, prepared by PB in association with Anchor and EEA, for BNYDC;

- April 13, 2004 Quay Consulting, LLC letter to the NYSDEC providing soil sample data results for areas that will be occupied by proposed new roadways for future use of the property;

- October 2004 Data Usability Summary Report, The Brooklyn Navy Yard Parcel, prepared by HDR and December 2004 Addendum; and

- Supplementary Site Investigation [SSI] Work Plan, The Brooklyn Navy Yard Parcel, New York, Site ID No. 224019A, HDR and HydroQual Environmental Engineers & Scientists, P.C., August 2005.

The information contained in the above noted documents was compiled for the site as a whole and constitutes the complete data set that was used in the preparation of the "Remedial Investigation Report [RI Report], The Brooklyn Navy Yard Parcel, Brooklyn, New York, Site ID No. 224019A," by HydroQual Environmental Engineers and Scientists, P.C., September 2006.

Additional details of the prior site investigations and IRMs performed at Former Building 419 in response to the transformer fire are presented in the RI Report.

5.0 PROJECT ORGANIZATION

HydroQual will have overall responsibility for overseeing the excavation of contaminated soils and collection of confirmatory soil samples by the selected Contractor in Former Drum Storage Area A and the location of Former Building 419 for the DSNY. The responsibilities of the various team members are presented below:

DSNY Project Manager: Marshah-Reaff Barrett

The DSNY Project Manager is responsible for managing the project for the DSNY and will be the DSNY contact person for HydroQual during the excavation and sampling activities.

HydroQual Project Manager: Barry Cheney, P.E.

The HydroQual Project Manager is responsible for managing and coordinating the project, overseeing the production of project deliverables and ensuring that the project objectives are met.

HydroQual Field Personnel: To be identified

The field personnel will be responsible for observing the field procedures identified in the Field Sampling Plan (FSP), which can be found in Appendix A of the Construction Quality Assurance Plan (CQAP). The field personnel will be responsible for overseeing the excavation of the soils and collection of samples by the Contractor, ensuring that sample custody is maintained, and documenting field activities in the field notes.

HydroQual Project QA Coordinator: Maureen Migliorini

The Project QA Coordinator will be responsible for reviewing the laboratory data deliverables, assessing that data quality for chemical analyses was maintained, performing data validation, and supervising project quality assurance coordination.

Construction Contractor (Contractor): To be identified

The selected Contractor will be responsible for conducting the excavation of the contaminated soils and for collecting the confirmatory samples following the procedures identified in the FSP. The Contractor will also be responsible for completing the chain of custody form and the packing and transport of the samples to the Analytical Laboratory.

Analytical Laboratory: To be identified

A certified Analytical Laboratory selected by the Contractor and approved by the DSNY will perform soil analyses. The New York State Department of Health (NYSDOH)-Environmental Laboratory Approval Program (ELAP) laboratory to be identified at a later date will perform all analyses. The laboratory will designate a Laboratory Project Manager. The Laboratory Project Manager will provide analytical support to this project and is responsible for ensuring that all laboratory analyses meet the project data quality objectives and other specifications detailed in this QAPP.

The Analytical Laboratory is expected to meet the following minimum requirements:

- Adhere to the methods outlined in the statement of work including those methods referenced for each analytical procedure;
- Deliver electronic data files as specified;
- Meet reporting requirements;
- Implement QA/QC procedures, including the QAPP data quality requirements, laboratory analysis plan requirements, and performance evaluation testing requirements;
- Allow the laboratory and data audits to be performed, if deemed necessary;

- Follow documentation, chain of custody, and sample logbook procedures; and
- Meet turnaround times for deliverables.

Changes in the laboratory procedures specified in the QAPP will not be permitted without written documentation of the intended change and the rationale. The Project QA Coordinator, as appropriate, must approve changes in advance.

6.0 SAMPLING OBJECTIVES

The objective of the FSP is to confirm that the remedial action of soil excavation has removed all soils with PCB concentrations greater than 10 ppm and all soils with a TCLP lead concentration greater than 5 mg/L. Field sampling will be conducted to achieve this objective.

The primary objective of this QAPP is to present the necessary information to assess and document the precision, accuracy, completeness, and representativeness of the data generated by this study.

7.0 METHODS OF ANALYSIS

Soil samples will be delivered to a NYSDOH ELAP-certified laboratory, under stringent chain of custody protocols. Soil samples will be analyzed for the following NYSDEC Analytical Service Protocol (ASP) parameters:

- Polychlorinated biphenyls (PCBs) following SW 846 Method 8082

- Toxicity Characteristic Leaching Procedure (TCLP) lead analyses using SW 846 Method 1311/6010.

The level of reporting will be Category B deliverables, Contract Laboratory Protocol (CLP) ASP. The parameters that will be used to specify data quality requirements and to evaluate the analytical system performance for the soil samples are precision, accuracy, representativeness, completeness, and comparability.

8.0 QUALITY ASSURANCE OBJECTIVES

The overall quality assurance objectives for this project are to develop and implement procedures that will ensure the collection of representative data of known, acceptable, and defensible quality.

The data quality parameters used to assess the acceptability of the data are precision, accuracy, representativeness, comparability, and completeness. These parameters are discussed below.

8.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Analytical precision is measured through matrix spike/matrix spike duplicate (MS/MSD) samples for organic analysis and through laboratory duplicate samples for inorganic analyses. Analytical precision measurements will be carried out on project specific samples at a minimum frequency of one per laboratory analysis group or one in twenty samples, whichever is more frequent, per matrix analyzed. Laboratory precision will be evaluated against quantitative relative percent difference (RPD) performance criteria.

Precision measurements can be affected by the nearness of a chemical concentration to the method detection limit, where the percent error (expressed as RPD) increases. The equation used to express precision is:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{\frac{C_1 + C_2}{2}}$$

Where:

RPD = relative percent difference

C_1 = larger of the two observed values

C_2 = smaller of the two observed values

8.2 Accuracy

Accuracy is a measure of the overall agreement of a measurement to a known value. Field accuracy is controlled by adherence to sample collection procedures outlined in the FSP.

"Spiking" samples with known standards (surrogates, laboratory control samples, and/or matrix spike) and measuring the percent recovery will assess analytical accuracy. Accuracy measurements on matrix spike samples will be carried out at a minimum frequency of one in 20 samples per matrix analyzed. Because MS/MSDs measure the effects of potential matrix interference of a specific matrix, the laboratory will perform MS/MSDs only on samples from this project and not from other projects. Surrogate recoveries will be determined for every sample analyzed for organics.

Laboratory accuracy will be evaluated against quantitative matrix spike and surrogate spike recovery performance criteria. Accuracy can be expressed as a percentage of the true or reference value, or as a percent recovery in those analyses where reference materials are not available and spiked samples are analyzed. The equation used to express accuracy is as follow:

$$\%R = 100\% \times (S-U)/C_{sa}$$

Where:

%R = percent recovery

S = measured concentration in the spiked aliquot

U = measured concentration in the unspiked aliquot

C_{sa} = actual concentration of spike added

8.3 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent an environmental condition. For this program, the analytes were selected based on NYSDEC requirements that were based on past sampling.

8.4 Comparability

Comparability expresses the confidence with which one data set can be evaluated in relation to another data set. This is not applicable to this sampling program.

8.5 Completeness

Completeness is a measure of the amount of data that is determined to be valid in proportion to the amount of data collected. Completeness will be calculated as follows:

$$C = \frac{(\text{Number of acceptable data points}) \times 100}{(\text{Total number of data points})}$$

The data quality objective for completeness for this project is 95 percent. Data that have been qualified as estimated because the quality control criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as rejected will not be considered valid for the purpose of assessing completeness.

9.0 QUALITY CONTROL CRITERIA

Sampling procedures for this investigation are described in detail in the FSP.

9.1 Field Sampling Quality Control

Sample Handling

Sample containers will be labeled with the client name, sample location number, sampling date and time, required analyses, and initials of the individual processing the sample. Field personnel will check all container labels, custody form entries, and logbook entries for completeness and accuracy at the end of sampling.

Sample Collection Documentation

Field Activities. A complete record of field activities will be maintained for the duration of the field phase of work. Documentation includes:

- Daily recordkeeping (including log book and field reports) by field personnel of field activities;
- Recordkeeping of samples collected by the Contractor for analysis; and
- Use of sample labels and tracking forms for samples collected for analysis.

The field personnel will maintain the field logbook. The field logbook will provide a description of sampling activities, sampling personnel, weather conditions, instrument calibration and a record of any modifications to the procedures and plans identified in the project plans. The field logbook is intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period. Daily field reports will also document field activities.

Field Sample Observations. Information to be collected for the soil samples includes a description of the soil including a visual description and a notation of any odors that may be present. After sample collection, the following information will be recorded on a sampling form:

- Date, time, and name of person logging sample;
- Weather conditions;
- Equipment used for sampling;
- Sample location number;
- Project designation;
- Physical description of soil;
- Documentation of any unusual observations; and
- Other significant comments.

Any deviations or additions to the FSP will be documented in the field report prepared upon completion of field activities.

Sample Chain of Custody Documentation

Soil samples will be collected by the Contractor in areas where soil excavation has been completed. Actual sampling locations may vary based upon field conditions and sample retrieval and recovery of soil samples. Both sidewall and bottom samples will be collected by hand digging to a depth of 12 inches to enable sufficient quantities of soils to be collected for

analysis. A total of five confirmatory soil samples (BS-01, SWS-01, SWS-02, SWS-03 and SWS-04) will be collected from the Former Drum Storage Area A and a total of five confirmatory soil samples (BS-02, SWS-05, SWS-06, SWS-07 and SWS-08) will be collected from Former Building 419. Three confirmatory samples will be collected from the bottom of the excavation (BS-03 through BS-05) and 20 confirmatory sidewall samples (SWS-09 through SWS-28) will be collected from the sidewalls at the treed area along Kent Avenue.

All samples will be screened for volatile organic compounds using a hand-held photoionization detector (PID) total organic vapor analyzer. Each 12-inch interval grab sample will be homogenized using a decontaminated stainless steel bowl and placed in laboratory-supplied sample containers, placed in coolers with ice to maintain a temperature of 4°C and transported to the Analytical Laboratory under stringent chain of custody procedures. Chain of custody procedures will be followed for all samples collected and will be completed each time custody of a sample is changed. Chain of custody forms will be shipped in each cooler and will contain the same sampling information (sample ID, date and time of collection, and analyses required) as on the sample bottles.

Sample Preservation

To control the quality of laboratory analysis of samples, established preservation and storage measures will be taken. Immediately after the sample jars are filled with sample, they will be placed in the appropriate coolers with a sufficient number of ice packs or ice to keep them cold until arrival at the laboratory

Sample Shipment

The Contractor will be responsible for all sample tracking and custody procedures in the field. The Contractor will be responsible for final sample inventory and will maintain sample custody documentation. At the end of each day, and prior to transfer, custody form entries will be made for all samples. All custody forms will be completed in indelible ink. Copies of all forms will be retained as appropriate and included as appendices to QA/QC reports to management. Finally, information on the sample labels will be checked against logbook entries and custody forms, and samples will be recounted. Custody forms will accompany all samples; the forms will be signed at each point of transfer and will include sample numbers.

Prior to shipping, sample containers will be securely packed inside the cooler with ice packs or ice. The original, signed custody forms will be transferred with the cooler. The cooler will be secured and appropriately sealed and labeled for delivery to the laboratory. Samples will be couriered on the day of sampling.

Sample Receipt

The laboratory will ensure that the custody forms are properly signed upon receipt of the samples and will note questions or observations concerning sample integrity on the custody forms. The laboratories will contact the Contractor or the Project QA Coordinator immediately if discrepancies are discovered between the custody forms and the sample shipment upon

receipt. The laboratory will specifically note any coolers that do not contain ice packs or are not sufficiently cold (4°C) upon receipt.

Intra-Laboratory Sample Transfer

The Laboratory Project Manager will ensure that a sample tracking record is maintained that follows each sample through all stages of laboratory processing. The sample tracking record must contain at a minimum the initials of responsible individuals performing the analyses, dates of sample extraction, preparation and analysis, and the type of analysis being performed.

10.0 CALIBRATION PROCEDURES AND FREQUENCY

10.1 Laboratory Calibration

The laboratory calibration procedures and frequency for the required analytical methods to be followed by the selected laboratory are specified in the NYSDEC ASP CLP Analytical Method Procedures (10/95). The selected laboratory's calibration schedule will adhere to all analytical method requirements.

10.2 Field Calibration

Trained field personnel will be familiar with the field calibration, operation, and maintenance of the equipment. They will perform field calibrations, checks, and instrument maintenance daily. A trained team member will perform daily field checks and instrument maintenance prior to use.

Maintenance, calibration, and equipment operation will follow the procedures outlined in the manufacturer's Operation and Field Manuals accompanying the respective instruments.

The field personnel will be responsible for keeping a master instrument calibration/maintenance form for each measuring device. Each form shall include at least the following information, where applicable:

- Name of device and/or instrument calibrated;
- Device/instrument serial and/or I.D. number;
- Frequency of calibration;
- Date of calibration;
- Results of calibration; and
- Name of person performing the calibration; and identification of the calibration standards.

11.0 LABORATORY QUALITY CONTROL PROCEDURES

11.1 Sample Analysis

The Laboratory Standard Operating Procedures (SOP) provided by the contracted analytical laboratory will describe in detail the chemical analyses for this study (PCBs and TLCP lead). These SOPs will be kept in the project file at the analytical laboratory and will include written protocols for the analytical methods to be used.

The laboratory will also calculate the method detection limit for each analyte and establish an initial calibration curve for all analytes.

11.2 Laboratory Quality Control Criteria

Results of the quality control samples from each sample group will be reviewed immediately after a sample group has been analyzed. The quality control sample results will then be evaluated to determine if control limits have been exceeded. If control limits are exceeded in the sample group, the Project QA Coordinator will be contacted immediately, and corrective action (e.g., method modifications followed by reprocessing the affected samples) will be initiated prior to processing a subsequent group of samples.

All primary chemical standards and standard solutions used in this project will be traceable to the National Institute of Standards and Technology, Environmental Resource Associates, National Research Council of Canada, or other documented, reliable, commercial sources. Standards will be validated to determine their accuracy by comparison with an independent standard. Any impurities found in the standard will be documented.

The following sections summarize the procedures that will be used to assess data quality throughout sample analysis.

Initial and Continuing Calibration

Multipoint initial calibration will be performed on each instrument at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet control criteria. Ongoing calibration will be performed daily for metals and organic analyses and with every sample batch for conventional parameters (when applicable) to track instrument performance.

Instrument blanks or continuing calibration blanks provide information on the stability of the baseline established. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at a frequency of one continuing calibration blank for every 10 samples analyzed at the instrument for inorganic analyses and every 21 hours for organic analyses. If the ongoing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

Field Blanks

Field blanks shall be taken to evaluate the cleanliness of sampling equipment, sample bottles, and the potential for cross-contamination of samples due to airborne contaminants present in the air at the site and handling of equipment and sample bottles. Field blank samples shall be performed on the sampling equipment used to collect the soil samples. The frequency of field blanks taken shall be one per decontamination event for each type of sampling equipment (e.g., a hand auger for soil sampling), at a minimum of one per equipment type per day.

Where required, field blanks shall be obtained prior to the occurrence of any analytical field sampling event by pouring laboratory-supplied water over a particular piece of sampling equipment and into a sample container. The Analytical Laboratory shall provide field blank water and sample jars with preservatives as required for the collection of all field blanks. Glass jars shall be used for organic blanks. The field blanks shall accompany field personnel to the sampling location. The field blanks shall be analyzed for the same analytes as the soil samples being collected that day and shall be shipped with the samples taken subsequently that day.

Field blanks shall be taken in accordance with the procedure described below:

- Decontaminate sampler using the procedures specified in this plan.
- Pour distilled/de-ionized water over the sampling equipment and collect the rinsate water in the appropriate sample bottles.
- The sample shall be immediately placed in a sample cooler and maintained at a temperature of 4°C until receipt by the laboratory.
- Fill out sample log, labels, and chain of custody forms, and record in field notebook.

Matrix Replicates

Analytical replicates provide information on the precision of the analysis and are useful in assessing potential sample heterogeneity and matrix effects. Analytical replicates are sub samples of the original sample that are prepared and analyzed as a separate sample. A minimum of one replicate will be analyzed per sample group or for every 20 samples, whichever is more frequent. When matrix spikes are not available or appropriate, a matrix triplicate will be analyzed per sample group or for every 20 samples, whichever is more frequent.

Matrix Spikes and Matrix Spike Duplicates

Analysis of matrix spike samples provides information on the extraction efficiency of the method on the sample matrix. By performing duplicate matrix spike analyses, information on the precision of the method is also provided for organic analyses. A minimum of one matrix spike will be analyzed for every sample group or for every 20 samples, whichever is more frequent, when possible.

Surrogate Spikes

The project samples analyzed for organic compounds will be spiked with appropriate surrogate compounds as defined in the analytical methods. The laboratories will report surrogate recoveries; however, no sample result will be corrected for recovery using these values.

Method Blanks

Method blanks are analyzed to assess possible laboratory contamination at all stages of sample preparation and analysis. A minimum of one method blank will be analyzed for every extraction batch or for every 20 samples (10 samples for conventional parameters), whichever is more frequent.

Sample Labeling

All sample containers will be labeled at the time of sampling clearly identifying the project name, sampler's initials, location number, sample number, analysis to be performed, date, and time.

Sample Handling

Soil samples obtained for chemical analyses will be placed in appropriate laboratory supplied containers. The Analytical Laboratory will provide pre-cleaned sample containers containing preservatives as required. Upon collection, samples will be placed in a cooler maintained at a temperature of approximately 4°C. Chain of custody and field log forms will be completed.

Prior to transport to the laboratory, sample containers will be appropriately packed and secured inside a cooler with ice packs or ice. The original signed custody forms will be transported with the cooler. The cooler will be secured by taping and sealing with a custody seal.

The laboratory will ensure that custody forms are properly signed upon receipt of the samples and note questions or observations concerning sample integrity on the custody forms. The laboratories will contact the Project QA Coordinator immediately if discrepancies between the custody forms and the sample shipment are discovered upon receipt. The laboratory will specifically note any coolers that do not contain ice packs or ice and are not sufficiently cold upon receipt. The laboratory will not dispose of the environmental samples for this project until notified by the Project QA Coordinator or the client in writing.

Sample Custody

It is essential that the possession of samples be traceable from the time they are collected through analysis. This section describes minimum program requirements for sample handling and chain of custody procedures.

Samples are considered to be in "custody" if they are:

- In the custodian's possession or view;

- Retained in a secured place (under lock) with restricted access; or
- Placed in a container and secured with an official seal(s) such that the sample cannot be reached without breaking the seal(s).

The principal documents used to identify samples and to document possession are custody records and seals, field logbooks, and field tracking forms. Custody procedures will be initiated during sample collection. A custody record similar to that shown on Figure 11-1 will accompany each sample. Each person who has custody of the samples will sign the form and ensure that the samples are not left unattended unless properly secured. Minimum documentation of sample handling and custody will include:

- Sample location, project name, and unique sample number;
- Sample collection date and time;
- Any special notations on sample characteristics or problems;
- Description of analysis to be performed;
- Initials of the person collecting the sample; and
- Date sample was sent to the laboratory.

The completed custody form will be placed in a plastic envelope that will accompany the ice chest containing the listed samples. The ice chest will be sealed with a custody seal. Upon transfer and receipt of samples at the laboratory, the shipping container custody seal will be broken. The persons transferring custody of the samples will sign the custody form. The receiver will record the condition of the samples. Custody records will be included in the analytical report prepared by the laboratory.

12.0 DATA DELIVERABLES

The laboratory will be responsible for internal checks on data reporting and will correct errors identified during the quality assurance review. Close contact will be maintained with the laboratories to resolve any quality control problems in a timely manner. The Analytical Laboratories will be required, where applicable, to report the following:

- **Project Narrative**. This summary, in the form of a cover letter, will discuss problems, if any, encountered during any aspect of analysis. This summary should discuss, but not be limited to, quality control, sample shipment, sample storage, and analytical difficulties. Any problems encountered, actual or perceived, and their resolutions will be documented in as much detail as necessary.
- **Chain of Custody Records.** Legible copies of the custody forms will be provided as part of the data package. This documentation will include the time of receipt and condition of each sample received by the laboratory. Additional internal tracking of sample custody by the laboratory will also be documented.

CHAIN OF CUSTODY RECORD

CUSTOMER INFORMATION

CUSTOMER: ______
ADDRESS: ______
TELEPHONE: ______
FAX: ______
PROJECT: ______
PROJECT MANAGER: ______
PROJECT LOCATION: ______
STATE: ______
PO NUMBER: ______

REPORT INFORMATION

SEND REPORT TO: ______

SEND INVOICE TO: ______

PROJECT INFORMATION

TURNAROUND
(CONFIRM RUSH TAT'S WITH LAB)
☐ STANDARD
☐ RUSH

☐ 24 HOURS 100%
☐ 48 HOURS 75%
☐ 72 HOURS 50%
☐ 1 WEEK 25%
☐ 10 DAYS 10%

DELIVERABLES
(PLEASE CHECK BOX)
☐ STANDARD ☐ FULL/CAT-B
☐ WASTE ☐ BUST
☐ NJ REDUCED ☐ CAT-A

ELECTRONIC DELIVERABLES
(PLEASE CHECK BOX)
☐ HAZSITE/CSV ☐ EXCEL-NJCC
☐ EQUIS ☐ EXCEL-NY TAGM
☐ CD ROM ☐ EXCEL-PA ACT II
☐ OTHER (SPECIFY)

ANALYTICAL REQUESTS

LAB SAMPLE NUMBER (LAB USE ONLY)	SAMPLE IDENTIFICATION	METHANOL BOTTLE #	DATE COLLECTED	TIME COLLECTED	SAMPLE TYPE: COMPOSITE (C)	SAMPLE TYPE: GRAB (G)	SAMPLE MATRIX	No. of Bottles: H2SO4	HNO3	HCl	NaOH	Zinc + NaOH	Ascorbic	None	Methanol	Other	ANALYSIS

SAMPLER CERTIFIES THAT EACH SAMPLE RECEIVED PROPER FIELD PRESERVATION (IF REQUIRED) (INITIALS)

SAMPLE HAZARDS: FLAMMABLE ☐ SKIN IRRITANT ☐ NON-HAZARD ☐ UNKNOWN ☐ NOXIOUS FUMES ☐

SPECIAL INSTRUCTIONS: TEMPERTURE UPON RECEIPT:

RELINQUISHED BY: AGENT OF:	DATE / TIME	RECEIVED BY: AGENT OF:	DATE / TIME
RELINQUISHED BY: AGENT OF:	DATE / TIME	RECEIVED BY: AGENT OF:	DATE / TIME

Sample Chain of Custody Record

HYDROQUAL ENVIRONMENTAL ENGINEERS & SCIENTISTS, P.C.
1200 MACARTHUR BOULEVARD
MAHWAH, NEW JERSEY 07430

Quality Assurance Project Plan

City of New York
Department of Sanitation

Figure 11-1

Sample Chain of Custody Record

- **Sample Results.** The data package will summarize the results for each sample analyzed. The summary will include the following information when applicable:

    - Field sample identification code;
    - Corresponding laboratory identification code;
    - Sample matrix;
    - Date of sample extraction;
    - Date and time of analysis;
    - Weight and/or volume used for analysis;
    - Final dilution volumes or concentration factor for the sample;
    - Percent moisture in the sediment sample;
    - Identification of the instrument used for analysis;
    - Method reporting and quantification limits;
    - Analytical results reported to three significant figures with reporting units identified;
    - All data qualifiers and their definitions; and
    - Computer diskettes with the data in Excel format.

- **Quality Assurance/Quality Control Summaries**. This section will contain the results of all QA/QC procedures. Each QA/QC sample analysis will be documented with the same information required for the sample results (see above). The laboratory will make no recovery or blank corrections. The required summaries are listed below; additional information may be requested.

- **Calibration Data Summary.** Report the concentrations of the initial calibration and daily calibration standards, and the date and time of analysis. List the response factor, percent difference, and retention time for each analyte as appropriate. Report results for standards to indicate instrument sensitivity.

- **Internal Standard Area Summary.** Report the stability of internal standard areas.

- **Method Blank Analysis.** Report the method blank analyses associated with each sample and the concentration of all compounds of interest identified in these blanks.

- **Surrogate Spike Recovery.** Report all surrogate spike recovery data for organic compounds. List the name and concentration of all compounds added, percent recoveries, and range of recoveries.

- **Matrix Spike Recovery.** Report all matrix spike recovery data for organic analyses. List the name and concentration of all compounds added, percent recoveries, and range of recoveries. Report the RPD for all duplicate analyses.

- **Matrix Duplicate.** Report the RPD for all matrix duplicate analyses.

- **Relative Retention Time.** Report the relative retention time of each analyte detected in the samples for both primary and conformational analyses.

- **Original Data.** Legible copies of the original data generated by the laboratory will include:

    - Sample refrigerator temperature log;
    - Sample extraction, preparation, and cleanup logs;
    - Instrument specifications and analysis logs for all instruments used on days of calibration and analysis;
    - Reconstructed ion chromatograms for all samples, standards, blanks, calibrations, spikes, replicates, and reference materials;
    - Enhanced spectra of detected compounds with associated best-match spectra for each sample;
    - Printouts and quantification reports for each instrument used, including reports for all samples, standards, blanks, calibrations, spikes, and replicates;
    - Original data quantification reports for each sample; and
    - Original data for blanks and samples not reported

  The laboratory will make no recovery or blank corrections.

13.0 DATA REDUCTION

Data reduction is the process by which original data (analytical measurements) are converted or reduced to a specified format or unit to facilitate analysis of the data. Data reduction requires that all aspects of sample preparation that could affect the test result (such as sample volume analyzed or dilutions required) be taken into account in the final result. It is the laboratory analyst's responsibility to reduce the data, which are subjected to further review by the Laboratory Project Manager, the Project Manager, and the Project QA Coordinator. Formulas used for calculating sample results are presented in the laboratory SOPs.

The laboratory analyst is responsible for ensuring that the analytical data are correct and complete, the appropriate SOPs have been followed, and the quality control results are within the acceptable limits. The Project QA Coordinator is responsible for confirming that all analyses are performed by the Analytical Laboratory and are correct, properly documented, complete, and satisfy the project data quality objectives for samples.

The laboratory will provide a data package that will allow independent validation of the sample identity and integrity, the laboratory measurement system, and to provide for validated quantitative and qualitative data.

14.0 DATA QUALITY CONTROL

Once data are received from the laboratory, a number of QC procedures will be followed to provide a prompt, accurate, and meaningful evaluation of the data. Specific routine procedures will be followed in assessing data precision, accuracy, and completeness.

14.1 Data Quality Review

The laboratory will deliver complete data packages for all chemical analyses. The data will be evaluated in accordance with the QAPP. Chemical data will be reviewed with regard to the following, as appropriate to the particular analysis:

- Chain of custody documentation;
- Holding times;
- Blanks;
- Detection limits;
- Surrogate recoveries;
- Matrix spike/matrix spike duplicate recoveries; and
- Laboratory and field duplicate relative percent differences.

14.2 Data Quality Summary

The data will be summarized in a quality assurance report. The quality assurance report will be included in the report of investigation. This summary will also include an evaluation of the QA/QC results reported by the laboratory.

Data are not considered final until validated. All data, including laboratory and field quality control sample results, will be summarized in a quality assurance report and submitted after validation. The quality assurance report will be included as an appendix to the data report. In addition, the data report will include a summary of the sampling event, deviations from this QAPP, and actions taken to address those deviations.

15.0 LABORATORY PERFORMANCE AND DATA MANAGEMENT

The laboratory and field performance audits, corrective action procedures, data management, data validation, and data reporting procedures described in the following sections apply to the laboratory analysis performed as part of the FSP.

15.1 Laboratory and Field Performance Audits

Laboratory and field performance audits consist of on-site reviews of quality assurance systems and equipment for sampling, calibration, and measurement. Laboratory and field audits will not be conducted as part of this study; however, all laboratory audit reports will be made available to the Project QA Coordinator upon request. The laboratory is required to have written procedures addressing internal QA/QC; these procedures will be submitted and reviewed by a Project QA Coordinator to ensure compliance with the QAPP. The Laboratory Project Manager

and QA Coordinator are required to ensure that all personnel engaged in sampling and analysis tasks have appropriate training.

15.2 Corrective Action Procedures

Corrective Action for Field Sampling

The field personnel, or their designees, will be responsible for correcting equipment malfunctions throughout the field sampling effort. The Project QA Coordinator will be responsible for resolving situations in the field that may result in nonconformance or noncompliance with the QAPP. Corrective measures will be immediately documented in the field logbook.

Corrective Action for Laboratory Analyses

The laboratory is required to submit and comply with the SOPs. The Laboratory Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. Laboratory personnel will be responsible for reporting problems that may compromise the quality of the data.

The Project QA Coordinator will be notified immediately if any quality control sample exceeds the project-specified control limits. The analyst will identify and correct the anomaly before continuing with the sample analysis. The Laboratory Project Manager will document the corrective action taken in a memorandum submitted to the Project QA Coordinator within five days of the initial notification. A narrative describing the anomaly, the steps taken to identify and correct the anomaly, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package in the form of a cover letter.

Data and Data Documentation

The original data and documentation generated by the laboratories will be kept in the project files after the data have been validated. Custody procedures will be followed for all laboratory data/documentation, whether in hard copy or electronic format. All data and data documentation are the responsibility of the Project Manager.