

**MARINERS MARSH PARK  
3418 RICHMOND TERRACE  
STATEN ISLAND, NEW YORK**

**REMEDIAL ACTION PLAN  
FOR  
4.75-ACRE PARCEL  
IN FORMER ACTIVE RECREATION AREA**

**NOVEMBER 2012**

**Prepared for:**

**New York City Department of Parks and Recreation**

**Prepared by:**

LiRo Engineers, Inc.  
3 Aerial Way  
Syosset, New York 11791



**TABLE OF CONTENTS**

**1.0 SUMMARY AND PURPOSE OF THE PROPOSED PLAN ..... 1**

**2.0 SITE DESCRIPTION..... 2**

    2.1 Proposed Use ..... 2

**3.0 SITE HISTORY ..... 3**

**4.0 PHYSICAL SETTING ..... 4**

    4.1 Topography ..... 4

    4.2 Site and Regional Geology and Hydrology ..... 4

**5.0 PREVIOUS INVESTIGATIONS AND IDENTIFIED CONTAMINATION..... 5**

    5.1 Previous Studies for the Park ..... 5

        5.1.1 Limited Phase I ESA, 2001..... 5

        5.1.2 Limited Phase II Environmental Site Investigation, 2003 ..... 6

        5.1.3 Brownfields Phase II ESI, October 2007 ..... 7

        5.1.4 Soil and Groundwater Sampling Data Analysis and Possible Remedial  
            Approach, March 2009 ..... 9

        5.1.5 Supplemental Phase II ESI, August 2010 ..... 10

        5.1.6 Comparison of Analytical Results, April 2011 ..... 11

    5.3 Summary of Data for the 4.75-Acre Site..... 12

    5.4 Standards, Criteria, and Guidance (SCGs)..... 12

**6.0 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT ..... 14**

    6.1 Contaminant Sources and COPCs ..... 14

    6.2 Contaminant Release and Transport ..... 15

    6.3 Potentially Exposed Receptors..... 15

    6.4 Exposure Pathways..... 15

    6.5 Summary and Recommendations..... 16

**7.0 REMEDIAL OPTION..... 18**

**8.0 HEALTH AND SAFETY AND AIR MONITORING ..... 19**

**9.0 CONSTRUCTION MONITORING ..... 20**

**10.0 CLOSURE REPORT..... 21**

**11.0 OPERATIONS AND MAINTENANCE PLAN.....21**

**FIGURES**

- Figure 1 Site Aerial Map
- Figure 2 Site Location Plan
- Figure 3 Soil Sample Exceedances for the Former Active Recreation Area
- Figure 4 Groundwater Sample Exceedances for the Former Active Recreation Area
- Figure 5 Soil Sample Exceedances for Site
- Figure 6 Remedial Action Measure Plan

**APPENDICES**

- Appendix 1 Technical Specifications for Remedial Action

LiRo-Engineers, Inc.  
Parcel  
**RAP**

Mariners Marsh Park 4.75-Acre  
*3418 Richmond Terr., Staten Island, NY*

---

Appendix 2 Construction Health and Safety Plan

## **1.0 SUMMARY AND PURPOSE OF THE PROPOSED PLAN**

LiRo Engineers, Inc. (LiRo) has prepared this Remedial Action Plan (RAP) on behalf of the New York City Department of Parks and Recreation (NYCDPR) for a 4.75-acre area within Mariners Marsh Park, located at 3418 Richmond Terrace, Borough of Staten Island, New York City, New York. The 4.75-acre area is referred to as the “Site” throughout this report. The location of the Site is shown on Figure 1.

Investigation work at the Site has been conducted with the assistance of United States Environmental Protection Agency (USEPA) Brownfield grant funding. The RAP discussed in this document will remediate an area of the park for future public use.

Various subsurface investigations have been completed and have concluded that contaminated fill is exposed at the Site. This RAP was developed to mitigate potential exposure risks to contaminated fill. The RAP has been developed using guidelines established by the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) in Program Policy Document DER-10/Technical Guidance for Site Investigation and Remediation (May 2010) and the NYSDEC Brownfield Cleanup Program in 6 NYCRR Part 375 Environmental Remediation Programs (Part 375) effective December 14, 2006.

## **2.0 SITE DESCRIPTION**

The Site is an approximately 4.75-acre area along Richmond Terrace near the current northern entrance to Mariners Marsh Park. It is part of a 6-acre former Active Recreation Area. Mariners Marsh Park is located at 3418 Richmond Terrace, Staten Island, New York (Figure 1). The 107-acre park is situated on the north shore of the Port Ivory section of Staten Island, Richmond County. The Former Active Recreation Area is located in the north-central portion of Mariners Marsh Park. Environmental studies were performed in the Former Active Recreation Area under USEPA Brownfield Assessment Grants including the most recent targeted assessment completed in 2010. The 4.75-acre area is the subject of this RAP. The Site, the larger 6-acre Former Active Recreation Area, and the 107-acre Mariners Marsh Park in which both areas are located are shown in Figure 2.

Mariners Marsh Park is currently owned by the City of New York and is under the jurisdiction of the New York City Department of Parks and Recreation (NYCDPR). It is identified as Block 1318, Lot 9. The park is bounded by Richmond Terrace to the north, Arlington Yards to the south, residential and commercial properties to the east, and the former Proctor and Gamble factory to the west. The Site is bounded to the east, south, and west by other portions of the Mariners Marsh Park parcel and by Richmond Terrace to the north.

Currently, the entire Mariners Marsh Park, including the Site, is closed to the public. The larger Former Active Recreation Area had two baseball fields constructed prior to the establishment of the park. A gravel covered trail/road traverses the Former Active Recreation Area forming a loop. A gate is located along Richmond Terrace which provides authorized vehicle access to the park. The Site contains the undeveloped area within the looped path inside the Former Active Recreational Area and an area along Richmond Terrace that is currently overgrown with vegetation. Based on information provided by the New York State Department of Environmental Conservation and the USEPA, there is currently no federal- or state-designated wetland. No utility services are currently connected to the Site.

### **2.1 Proposed Use**

The proposed use for the Site is a passive recreation area possibly including a viewing garden with sitting areas and benches. The area will be capped with six inches of top soil underlying by two feet of screened sand. The area will have a fenced boundary that prevents access to the remainder of the park property. No structures, such as buildings or kiosks, are currently proposed for the Site.

### **3.0 SITE HISTORY**

The Phase I Environmental Site Assessment (Phase I ESA) conducted in 2001 for the Mariners Marsh Park reported that between 1903 and 1911, Mariners Marsh Park was the location of the Milliken Brothers Structural Iron Works and Rolling Mill. In 1917, the property was converted to the Downey Shipbuilding Yard, which remained in operation until 1931. Based on Sanborn mapping reviewed by LiRo, it appears that the industrial facilities were located in the Mariners Marsh Park area south and west of the Site. The Sanborn maps indicate that a reservoir occupied the Former Active Recreation Area and the southeastern portion of the Site during the time of the industrial operations.

According to the Phase I ESA report, property ownership between 1931 and the mid 1970s is unknown. Information provided by the NYC Department of Design and Construction (NYCDDC) states that NYC purchased the property on March 7, 1974 from American Export Industries Inc. The site reconnaissance conducted during the Phase I ESA identified the presence of concrete foundations, floor slabs, and other structures from the former Milliken Brothers Structural Iron Works and Rolling Mill at off-site locations in the western portion of Mariners Marsh Park. Remnants of several additional structures were also reportedly observed in the central and eastern portions of Mariners Marsh Park. Concrete, brick, and metal debris from building demolition was present near several of the building foundations. Four (4) former rail spurs were present along the southern park property boundary, running north into Mariners Marsh Park from Arlington Yards.

In 1997, NYC re-designated the land for use as a park and nature area. The NYCDPR manages the Site and the greater park parcel. As a result of a subsurface investigation completed at the Former Active Recreation Area in 2003 (see below), the entire Mariners Marsh Park was closed to the public in the fall of 2003 and remains closed.

## **4.0 PHYSICAL SETTING**

### **4.1 Topography**

Based on a review of the United States Geologic Survey (USGS) 7.5 Minute Quadrangle Map, Elizabeth NJ-NY, dated 1995, the elevation of the Site ranges from approximately 10 to 20 feet (ft) above mean sea level (msl). The topography of the Site is generally flat with the northern portion of the Site sloping slightly to the north-northeast towards Newark Bay.

### **4.2 Site and Regional Geology and Hydrology**

Staten Island is underlain by metamorphic, igneous, and sedimentary bedrock. Ordovician Serpentine, a metamorphosed portion of ocean crust, is found beneath the eastern and central portions of Staten Island. This rock also contains asbestos and can be hazardous if crushed into a fine powder. West of the serpentinite, Staten Island is underlain by Mesozoic igneous and sedimentary rocks. A Triassic diabase intrusion, known as the Palisades Sill, intruded the older Triassic sedimentary rocks of the Brunswick Formation which consists of sandstone, siltstone, mudstone, and arkose.

Unconsolidated sediments overlay bedrock over much of Staten Island. The eastern portion of the island is overlain by Cretaceous sediments of the Raritan Formation which consists of stream and coalescing delta deposits. The formation fines upwards representing a prograding shoreline. The formation has been divided into two (2) units, the Lloyd Sand Member and a conformable overlying clay unit (the Raritan Confining Unit).

Pleistocene glacial and glaciofluvial sediments as well as recent river, alluvium, and salt marsh deposits overly the bedrock and the Cretaceous sediments. These sediments consist of glacial till and moraine. A terminal moraine known as the "Harbor Hill Moraine" stretches from Staten Island through Brooklyn and Queens and out across Long Island to the tip of Montauk Point. The southern edges of the moraine are marked by hills and elevated areas. In Staten Island, Todt Hill (at 409 ft) is the highest point on the Atlantic seaboard south of Maine. Todt Hill is composed of glacial terminal moraine.

Other than on-site ponds, the nearest major surface water body is Newark Bay which is located approximately 0.1 miles north of the Site.

Based upon previous investigation work, the depth to groundwater appears to fluctuate significantly depending on the season and has been encountered at depths of less than one foot below ground surface in the spring to depths greater than 5 feet below ground surface in the summer. Groundwater flow direction was reported to be to the northeast. Groundwater within the Former Active Recreation Area is likely impacted by tidal fluctuations in Newark Bay.

## **5.0 PREVIOUS INVESTIGATIONS AND IDENTIFIED CONTAMINATION**

Various previous studies have been completed at the Former Active Recreation Area (including the 4.75-acre Site) and in the surrounding Mariners Marsh Park area. The previous investigation sampling has shown that historic fill is present at the Former Active Recreation Area to a depth of up to approximately 5 feet. Contaminants exceeding Part 375 Restricted Residential Soil Cleanup Objectives (SCOs) include metals and polycyclic aromatic hydrocarbons (PAHs). Figure 3 shows a summary of the soil samples and contaminant-specific exceedances of Part 375 Restricted Residential SCOs. Previous investigations concluded that there is no discernable pattern regarding the areal or vertical distribution of contamination in historic fill across the Former Active Recreation Area.

More detailed summaries of the previous studies are provided in the following sections of this RAP.

### **5.1 Previous Studies for the Park**

#### **5.1.1 Limited Phase I ESA, 2001**

A Phase I ESA was completed for Mariners Marsh Park in July 2001 by Lawler, Matusky, and Skelly Engineers, LLC (LMS). The purpose of this study was to identify and assess environmental conditions at the Park. This Phase I ESA included a summary of a memorandum that was issued in 1993 which included the results of a subsurface investigation that was completed at that time. Based on that subsurface investigation, heavy metals were detected in the eight soil samples collected at that time.

In addition to the heavy metals identified as an environmental concern, the following was also identified.

- Historical development/uses of the Mariners Marsh Park included: Milliken Brothers, a manufacturer of steel (1910 and 1917); a ship building company following 1917; and, various miscellaneous uses including a machine shop, blacksmith, steel construction, and shipping and storage. These former operations were powered by steam obtained from sources of fuel such as coal, coke, and gas.
- Historically, railroad tracks were located on and adjacent to the Mariners Marsh Park. Activities associated with railroad tracks often leads to contamination of Polycyclic Aromatic Hydrocarbons (PAHs), heavy metals, and Polychlorinated biphenyls (PCBs).
- An adjacent property included an underground petroleum pipeline.

### **5.1.2 Limited Phase II Environmental Site Investigation, 2003**

Metcalf and Eddy (M&E) prepared a *Limited Phase II Environmental Site Investigation (Phase II ESI) of Mariners Marsh Park, Block 1318 Lot 18, 3418 Richmond Terrace, Borough of Staten Island, City of New York* for NYC Economic Development Corporation (NYCEDC) and NYC Office of Environmental Coordination (NYCOEC), dated June 2003. This study focused on the six-acre Former Active Recreation Area and included the collection of soil and groundwater samples from borings located in areas suspected to have been impacted by former industrial operations. The purpose of this study was to obtain preliminary data relative to environmental conditions at the Former Active Recreation Area prior to the development of a Remedial Investigation as part of the overall redevelopment of the recreation area.

This Phase II ESI included the following activities:

- a limited geophysical survey in the area of suspect fill and the area of the former reservoirs identified on the Sanborn Maps;
- collection of subsurface soil samples from 15 soil borings;
- the installation of four temporary well points for the collection of groundwater samples; and,
- the collection of 10 surface soil samples.

The surface soil samples were collected from the Former Active Recreation Area from 0 to 1 foot below grade and were analyzed for the following.

- Target Compound List (TCL) semi-volatile organic compounds (SVOCs);
- PCBs; and,
- Target Analyte List (TAL) inorganic compounds (metals).

The subsurface soil samples collected from the Former Active Recreation Area were analyzed for the following:

- TCL VOCs;
- SVOCs;
- PCBs; and,
- TAL inorganic compounds (metals).

The groundwater samples collected from the temporary well points were analyzed for:

- VOCs;
- SVOCs;
- Total metals; and,
- Dissolved metals.

As per the USEPA, the soil sample analytical results were compared to NYSDEC Technical and Administrative Guidance Memorandum (TAGM) HWR 94-4046, dated 1994, revised per NYSDEC Memorandum dated December 20, 2000 and New Jersey Department of Environmental Protection (NJDEP) Soil Cleanup Criteria, Technical Requirements for Site Remediation (NJAC 7:26E), updated May 12, 1999. The groundwater results were compared to TAGM HWR 94-4046, dated 1994, revised per NYSDEC Memorandum dated December 20, 2000 (organic compounds only in groundwater), NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 Memorandum (Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations) (inorganic compounds only), and NJDEP Groundwater Quality Standards (NJAC 7:9-6), dated January 7, 1993.

Based on the results of this study, the following was concluded for the Former Active Recreation Area, which includes the 4.75-acre Site:

- Possible fill was detected through the geophysical survey in the northwestern and southwestern portions of the Former Active Recreation Area.
- Seven of the 10 surface soil samples revealed the presence of elevated SVOCs (mainly PAHs) and metals above applicable NYSDEC and NJDEP criteria. These samples included fill material consisting of ash and cinders.
- Ten of the 15 subsurface soil samples revealed the presence of elevated SVOCs (mainly PAHs) and metals above applicable NYSDEC and NJDEP criteria. These samples included fill material consisting of ash, cinders, and coal.
- All of the groundwater samples contained elevated levels of total and dissolved metals above applicable NYSDEC and NJDEP criteria. Inorganic compounds detected are likely related to ash, cinder, and coal within the Former Active Recreation Area. Figure 4 shows a summary of the groundwater samples with exceedances of TOGS.

### **5.1.3 Brownfields Phase II ESI, October 2007**

M&E also prepared a *Brownfields Phase II ESI of Mariners Marsh Park, 3418 Richmond Terrace, Staten Island, New York* for NYCDDC Bureau of Environmental and Geotechnical Services (BEGS), dated October 2007. This study addressed the entire Mariners Marsh Park area and included the collection of soil, sediment, and groundwater samples from borings located in areas suspected to have been impacted by former industrial operations. The purpose of this study was to further assess site conditions as a result of the industrial nature of the historic site usage.

This Phase II ESI included the following activities:

- collection of 138 soil samples from 102 soil borings;
- collection of six (6) sediment samples from four (4) on-site ponds; and,
- the installation of 15 permanent groundwater monitoring wells for the collection of groundwater samples.

Depending on the location of the surface soil samples collected, they were analyzed for the following:

- TCL VOCS;
- SVOCs;
- PCBs;
- TAL inorganic compounds (metals);
- cyanide;
- phenolics; and/or,
- Total Petroleum Hydrocarbons (TPHCs).

The subsurface soil samples collected on-site were analyzed for the following:

- TCL VOCs;
- SVOCs;
- PCBs;
- TAL inorganic compounds (metals);
- cyanide; and/or,
- phenolics.

The groundwater samples collected from the temporary well points were analyzed for:

- VOCs;
- SVOCs;
- Total metals;
- Dissolved metals;
- PCBs;
- cyanide; and/or,
- phenolics

The soil sample analytical results were compared to:

- NYSDEC TAGM No. 4046;
- Spill Technology and Remediation Series (STARS) Memo No. 1, Toxicity Characteristic Leachate Procedure (TCLP) Alternative Guidance Values;
- Characteristics of Hazardous Waste published in RCRA and NYSDEC Part 371;
- NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC);
- NJDEP Non-Residential Direction Soil Cleanup Criteria (NRDCSCC); and,
- NJDEP Impact to Groundwater Soil Cleanup Criteria (IGWSCC).

The groundwater results were compared to:

- TOGS;
- Characteristics of Hazardous Waste published in RCRA and NYSDEC Part 371; and,
- NJ Higher of Practical Quantitation Level (PQLs) and Groundwater Quality Standards (GQS).

Based on the results of this study, the following was concluded.

- Historic fill within the Former Active Recreation Area is approximately two (2) to five (5) feet thick and consists of sand with gravel, brick, concrete, ash, and cinder.
- Discolored sands, brick, concrete, ash, and/or ash cinder are also located within the foundations of some of the former buildings.
- Coal tar contamination was observed within the approximate 5,000-square foot Coal Tar Area and to the north, south, and east of the Coal Tar Area. The coal tar ranges from one (1) to three (3) feet thick.
- Elevated concentrations of TCL VOC, SVOC, TAL metals, PCB, cyanide, and TPHC were detected within the soil samples collected at the Mariners Marsh Park. In general, the areas of impacts included the Coal Tar Area (VOCs, SVOCs, metals, PCBs, and cyanide) and the Trails/Former Rail Spur (PCBs and cyanide).
- Elevated TPHC concentrations were detected in 27 soil samples above NJDEP criterion.
- Elevated concentrations of TCL VOC, SVOC, total and dissolved TAL metals, and cyanide were detected within the groundwater samples collected at Mariners Marsh Park. PCBs and phenolics were not detected above the method detection limits (MDLs).
- Coal tar was present at or below the groundwater table in several borings in and around the Coal Tar area.

#### **5.1.4 Soil and Groundwater Sampling Data Analysis and Possible Remedial Approach, March 2009**

The NJIT prepared the *Analysis of Available Soil and Groundwater Sampling Data and Possible Remedial Approach, Mariners Marsh Park, Recreation Area, Staten Island, New York*, dated March 2009. This evaluation included the 6-acre Former Active Recreation Area portion of the Mariners Marsh Park only, which is the north-central portion of the greater park parcel, and which contains the 4.75-acre Site.

Based on NJIT's evaluation of the data collected to date, NJIT noted the following relative to on-site soils.

- Approximately 30 soil samples were tested for metals and PAHs.
- Soil cores were field screened for VOCs with a PID.
- Most soil borings averaged five feet deep.
- Fill material including cinders, ash, and coal pieces was present to depths ranging from 2.5 to 4 feet.
- Analysis indicated the presence of PAH and metals impacts in soils between zero (0) and three (3) feet.
- The PAH and metals concentrations are typical of those found in historic fill material.
- No VOC impacts were identified within the Former Active Recreation Area.

NJIT noted the following relative to the groundwater.

- The groundwater table is shallow with a depth at 3 feet.
- VOC impact was detected in groundwater in the former Coal Tar Area.
- Metals impacts (minimal) were detected with higher concentrations in the 2003 study than in the 2007 study (likely due to sampling technique and well construction).
- No SVOCs or PCBs detected in groundwater.
- Groundwater flow direction appears to be from southwest to northeast.
- While freshwater wetlands exist on the Mariners Marsh Park parcel, none appear to be located within the Former Active Recreation Area.

Based on these findings, NJIT recommended management of the historic fill that underlies the Former Active Recreation Area including the 4.75-acre Site through the placement of an engineered cover prior to park improvements

### **5.1.5 Supplemental Phase II ESI, August 2010**

ATC Associates, Inc. (ATC) prepared a *Supplemental Phase II ESI for Mariner's Marsh Park Proposed Recreation Area, 3418 Richmond Terrace, Staten Island, New York 10303* for NYCDDC BEGS, dated August 23, 2010.

ATC reviewed and summarized the findings of the 2003 and 2007 M&E studies and the NJIT analysis as part of this Phase II ESI. Based on these previous studies, the objectives of this subsurface investigation were determined to include the following:

- Assess waste materials in the area of MW-11 (the Coal Tar Area).
- Confirm that groundwater is not being impacted from historic fill or the Coal Tar Area.
- Confirm that there is no risk from vapor intrusion within the Former Active Recreation Area.

- Confirm that no wetlands are present within the Former Active Recreation Area.

Based on the objective of the ATC study, the following was concluded.

- No VOC or PCB impacts detected in historic operations or fill including the 4.75-acre Site addressed by this RAP.
- Chlorinated VOCs were detected in four (4) of the nine (9) park-wide groundwater samples at concentrations above applicable standards but below those detected by M&E in 2007. Such exceedances were mainly on the northern portion of the Site. This difference in concentration could be due to natural attenuation and/or different sampling techniques.
- DCA, TCE, and VC were identified in the groundwater samples and TCE and DCA in soil vapor samples near the Site; however, no structures are planned on the Site after remedial action is complete therefore there is no potential for vapor intrusion.
- Elevated metals concentrations were detected within the on-site monitoring wells which are likely due to background levels and/or historic fill placed at the Site. Such elevated metals are not anticipated to impact future use..
- Five (5) emergent wetland areas were described on or near the Former Active Recreation Area.
- Drill cuttings and well development water did not exhibit hazardous waste characteristics.

### **5.1.6 Comparison of Analytical Results, April 2011**

ATC prepared a *Memorandum, Comparison of Analytical Results for Metals in Soil Samples Collected During Phase II ESIs at Mariner's Marsh Park by M&E in 2003 and 2007 to Current NYSDEC Soil Cleanup Objectives* for the NYCDDC BEGS, dated April 12, 2011. The objectives of this comparison were to determine whether the previously detected metal concentrations exceed the current NYSDEC Subpart 375-6 Restricted Residential Use SCOs and to provide recommendations for remedial alternatives regarding the potential future use of the Former Active Recreation Area. Soil and groundwater analytical data for the Former Active Recreation Area is summarized in Figures 3 and 4, respectively.

Based on ATCs review of the data, the following findings were noted.

- Fourteen of the 32 samples plus duplicate samples collected in 2003 and 2007 exceeded the current NYSDEC Subpart 375-6 Restricted Residential Use SCOs in the Former Active Recreation Area for TAL metals.
- The following seven (7) metals exceeded the Subpart 375 Restricted Residential Use SCOs: arsenic; barium; cadmium; chromium; copper; lead; and mercury.
- Metals were detected above the Subpart 375 Restricted Residential SCOs in eight of the 11 samples collected on the southern portion of the Former Active

Recreation Area and four of the 16 samples collected on the northern portion of the Former Active Recreation Area, including the 4.75-acre Site addressed by this RAP.

ATC concluded that there is no discernable pattern regarding the areal or vertical distribution of elevated levels of metals across the Former Active Recreation Area and the 4.75-acre Site. Therefore, ATC recommended that to prevent public exposure to the soil contamination at the Former Active Recreation Area, a two-foot cap of clean soil should be installed as a barrier.

### **5.3 Summary of Data for the 4.75-Acre Site**

Soil samples located within the Site boundary showed that fill was present to a depth of at least four feet. Contaminants exceeding NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives (SCOs) were observed in the surface soil samples for metals (arsenic, barium, cadmium, chromium, copper, lead, manganese, and mercury) and PAHs (Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Chrysene, Phenanthrene, Fluoranthene, Pyrene, and Indeno(1,2,3-cd)pyrene) as shown on Figure 5.

Individual PAH and metal concentrations were slightly elevated compared to the applicable Restricted Residential SCOs. Overall, the soil quality data from the Site is consistent with that from the remainder of the Former Active Recreation Area. Elevated metal and PAH concentrations are consistent with typical findings for historic fill and are comparable to the reported chemistry of historic fill on hundreds of properties throughout New York City. These results are unremarkable and do not suggest the need for a removal action and consequent of disposal of hazardous or petroleum waste, or the presence of a significant contamination source area.

Monitoring wells were installed within the Site. Groundwater sample results showed that several VOCs (cis-1,2-dichloroethylene, trichloroethylene, and dichloroethane) were detected at concentrations slightly above the applicable NYSDEC groundwater quality guidance values. These compounds were not detected in the soil samples and are independent of the historic fill. Based on the limited impact of historic fill in groundwater quality elsewhere in the park and the limited thickness of fill materials found on Site, the Site does not present a risk to groundwater quality. No structures are currently planned on this portion of the property and, therefore; there is no risk of soil vapor intrusion. The potential for groundwater contamination at the Site is relatively low.

### **5.4 Standards, Criteria, and Guidance (SCGs)**

For this project, standards, criteria, and guidance (SCGs) are numerical contaminant concentration values that are used to support decisions regarding remedial alternatives for the Site. The current standards, criteria, and/or guidance for the Site includes the NYSDEC Subpart 375-6 Restricted Residential SCOs, dated December 2006 for soils, and NYSDEC Technical and

Operation Series (TOGS) 1.1.1 Memorandum - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations for groundwater.

The analytical data collected during the previous subsurface investigations were compared to different standards which were applicable at that time. The previous soil standards, criteria, and/or guidance included the following:

- NYSDEC TAGM HWR 94-4046, dated 1994, revised per NYSDEC Memorandum dated December 20, 2000;
- NJDEP Soil Cleanup Criteria, Technical Requirements for Site Remediation (NJAC 7:26E), updated May 12, 1999;
- STARS Memo No. 1, TCLP Alternative Guidance Values;
- Characteristics of Hazardous Waste published in RCRA and NYSDEC Part 371;
- NJDEP RDCSCC;
- NJDEP NRDCSCC; and,
- NJDEP IGWSCC.

The groundwater results were previously compared to:

- TAGM HWR 94-4046, dated 1994, revised per NYSDEC Memorandum dated December 20, 2000 (organic compounds only in groundwater);
- NYSDEC TOGS 1.1.1 Memorandum (Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations) (inorganic compounds only);
- NJDEP Groundwater Quality Standards (NJAC 7:9-6), dated January 7, 1993;
- Characteristics of Hazardous Waste published in RCRA and NYSDEC Part 371; and,
- NJ Higher of PQLs and GQS.

## **6.0 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT**

The qualitative human health exposure assessment (EA) presented in this section was prepared in accordance with the NYSDEC Environmental Restoration Program requirements and the Draft DER-10 Guidance Document (December, 2002). In particular, the EA meets the requirements set forth in DER-10 Appendix 3B entitled “New York State Department of Health Qualitative Human Health Exposure Assessment”.

The objective of the EA is to evaluate the presence of completed or potential exposure pathways in order to determine if the Site contamination poses an existing or potential hazard to current or future Site users. The EA will identify the potential for human exposures, if any, associated with chemical constituents detected in soil and groundwater at the Site. The EA will address on-site and off-site receptors for current use, future site construction, and future use scenarios. The anticipated future use of the Site is for passive recreation.

The EA consists of five elements to document exposure pathways (listed below). An exposure pathway is complete when all five elements are documented; a potential exposure pathway exists when one or more of the elements is not documented.

- Identified contaminant sources, affected media, and chemicals of potential concern (COPCs) from site-specific data collected during site investigations.
- Identified contaminant release and transport mechanisms (e.g., vaporization, migration, etc.).
- Identified points of exposure for current and future site use (e.g., on-site soil, potable wells, etc.).
- Identified exposure routes (i.e., inhalation, ingestion, dermal contact).
- Identified receptor population(s) (e.g., construction workers, future site workers).

Following the identification and documentation of the exposure pathways, the EA will recommend the need for mitigation and/or remedial measures to reduce potential exposures.

### **6.1 Contaminant Sources and COPCs**

Historic investigation data indicate that contaminated fill is present within the Former Active Recreation Area including the 4.75-acre Site. Residual affected media include soil and groundwater.

COPCs for soil and groundwater were identified based on exceedances of Part 375 Restricted Residential SCOs and TOGS 1.1.1 groundwater criteria, respectively. COPCs are shown on Figure 3 (soil) and Figure 4 (groundwater), and address the Site and the larger Former Active Recreation Area. COPCs include:

- Metals: arsenic, barium, cadmium, chromium, copper, lead, manganese, and mercury.
- VOCs: 1,1-Dichloroethane, Dichloroethylene, and Trichloroethylene.
- PAHs: Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Chrysene, Phenanthrene, Fluoranthene, Pyrene, and Indeno(1,2,3-cd)pyrene.

## **6.2 Contaminant Release and Transport**

Metals and PAHs in soil are the COPCs identified at the Site and are attributed to the historic fill material. The primary mechanism for soil transport would be through dust production, and overland runoff. Since the Site is vegetated, dust and runoff transport rates are low, if present at all. Groundwater impacts were localized within the Former Active Recreation Area. The VOCs detected in groundwater samples collected from three monitoring wells in 2010 exceeded the applicable groundwater quality standard very slightly.

## **6.3 Potentially Exposed Receptors**

Planned future use of the Site is for passive recreation. There are no personnel currently working at the Site. The property is partially fenced, and the area is closed, however, access can be obtained as the fencing and gates can be breached. Residences are located in areas adjacent to the Site.

Under the current use scenario, potentially exposed receptors include trespassers and nearby residents. In the absence of remediation, the Site would remain closed and potentially exposed receptors for future use scenarios are the same as those for the current use scenario and include trespassers and nearby residents, in both cases, vegetation at the Site minimizes production and off-site transport of dust and runoff.

During the remedial action, on-site workers associated with the remedial action are considered potentially exposed receptors. However, this exposure will be minimized by the adherence of these workers to the health and safety plan and procedures established for site remediation and site contaminants. Under future use conditions, cover would be required to eliminate potential exposure of future Site recreational users to soil and groundwater. No onsite structures are planned and there is no potential for soil vapor intrusion.

Groundwater is not utilized for potable purposes and is not exposed at the Site. All residents nearby the Site obtain their potable water from municipal sources, obtained outside of New York City. Therefore, under the current and future use scenarios, there are no potentially exposed groundwater receptors at the Site.

## **6.4 Exposure Pathways**

Under the current use scenario, trespassers on the Site would have a potentially complete pathway through dermal contact or ingestion of contaminated soil. Nearby residents could potentially be exposed through inhalation from wind dispersion of fugitive dust from the Site to off-site areas, in both cases, vegetation at the Site minimizes potential exposures.

Under the future use scenario with no remedial action, trespassers on the Site would have a potentially complete pathway through dermal contact and ingestion of contaminated fill. Nearby residents could potentially be exposed through inhalation of wind dispersion of fugitive dust from the Site to off-site areas.

During the remedial action, exposure pathways are completed for onsite workers and nearby residents, due to the potential for direct contact and dust transport. However, implementation of the Health and Safety Plan, dust and storm water control measures, and other remedial management measures will minimize the potential for exposures. Under future use conditions, a soil cover will eliminate all potential direct contact and secondary exposures to dust and stormwater runoff.

Under the current and future use scenarios, groundwater is prohibited for use as potable supply under the New York City law; therefore, the groundwater ingestion exposure pathway is considered incomplete.

## **6.5 Summary and Recommendations**

The following completed potential exposure pathways have been identified for the Site.

- Under the current and remedial action scenarios, exposure via inhalation of fugitive dust and contact with stormwater runoff is considered a potentially complete exposure pathway for nearby residents.
- Under the current and remedial action scenarios, exposure via dermal contact and ingestion of soil is a potentially complete exposure pathway for trespassers, and onsite workers.
- Under the future use scenario without remedial measures, exposure via dermal contact and ingestion of soil is a potentially complete exposure pathway for Site maintenance workers and park users.
- Under the future passive recreational use scenario with a remedial action that includes a protective cover, exposure pathways are eliminated.

Potential exposure pathways for remedial workers could be readily mitigated through appropriate health and safety measures implemented during construction activities. These measures might include air monitoring during excavation activities to limit exposure, protective clothing to limit dermal contact, and training/good work practices to limit incidental ingestion. Remedial measures such as wetting and/or foaming the soil may be used to limit the generation of fugitive dust.

Remedial measures should be undertaken at the Site to mitigate exposure pathways associated with the future passive recreational use scenario.

## **7.0 REMEDIAL OPTION**

NJIT is preparing an Analysis of Brownfield Cleanup Alternatives (ABCA) which is to be submitted under separate cover. Based on the analytical data collected during previous studies and the ABCA, the most practical and economical remedial option for the Site includes the installation of a 2.5-foot thick layer of topsoil underlying by screened sand above the existing grade. The installation of this cap will prevent exposure of the limited on-site impacts to the public.

The size of the 4.75-acre Site undergoing remedial action has been scaled to enable completion of all remedial action using available remedial funding. Future phases of park remedial action are anticipated as funding becomes available. This initial remedial action will focus on the area closest to the Richmond Terrace access point to the park. The proposed remedial action area is shown in detail on Figure 6. The area will join to Richmond Terrace to the north and to the existing gravel-covered parking area to the west. The remedial action will consist of the following components.

- Clearing and grubbing of existing vegetation.
- Covering of the 4.75-acre Site with six inches of top soil underlying by two feet of screened sand.
- Seeding to stabilize the new cover soil.
- Realignment of the existing fence to allow access to the Site and prevent access to other portions of the park.
- Implementation of institutional control, such as a deed notice.
- Implementation of an Operations and Maintenance Plan.

Technical specifications for the remedial action work are included in Appendix A of this RAP.

## **8.0 HEALTH AND SAFETY AND AIR MONITORING**

LiRo has prepared a generic Construction Health and Safety Plan (CHASP) which is provided in Appendix B. The CHASP includes a Community Air Monitoring Plan (CAMP) which will be implemented during the field work to assure and document that any excavation activities do not impact nearby off-site residents or businesses. The Remedial Action Contractor will be responsible to develop a Health and Safety Plan (HASP) which meets the requirements of the CHASP and which will be provided to the NYCDPR for approval prior to commencement of field activities. A member of the contractor's field team will be designated to serve as the Site Health and Safety Officer (Site HSO) and will monitor the health and safety activities throughout the Site activities.

The Contractor shall provide all equipment, monitoring instruments, materials, and personnel necessary to protect the contractor's on-site personnel from physical injury and adverse health effects due to exposure to hazardous materials and/or conditions. All other on-site personnel are required to comply with the CHASP and all applicable local, state, and federal regulations.

## **9.0 CONSTRUCTION MONITORING**

A properly trained environmental consultant overseeing the work will be on-Site on a full-time basis to document the daily activities. Such documentation will include at a minimum, the following.

- Daily reports of field activities.
- CAMP results.
- Photographs.
- Sketches.
- Perimeter security inspections.
- Street sweeping and other “housekeeping” inspections.

Standard daily reporting procedures will include preparation of a daily report and, when appropriate, problem identification and corrective measures reports. Information that may be included on the daily report form includes the following.

- Processes and locations of construction under way.
- Equipment and personnel working in the area, including subcontractors.
- On-Site backfill and rough grading activities.
- Air monitoring data.
- The completed reports will be submitted as part of the Final Report.

## **10.0 CLOSURE REPORT**

Details of the completed work activities will be documented in a Closure Report. The Report will include, at a minimum, the following.

- Text describing the activities performed; a description of any deviations from the RAP and associated corrective measures taken and other pertinent information necessary to document that Site activities were carried out in accordance with this RAP.
- A Site Map showing the work areas including significant Site features and identification of backfill areas.
- Tabular comparison of imported cover soil characterization analytical results to Part 375 SCOs.
- Copies of daily inspection reports and, if applicable, problem identification and corrective measure reports.
- Photographic documentation of work activities.

## 11.0 OPERATIONS AND MAINTENANCE PLAN

After the completion of the remedial construction, the Operations and Maintenance Plan will be implemented to maintain the soil cap at the Site. The Operations and Maintenance Plan describes the procedures required to ensure the integrity of the soil cap. At a minimum, two inspections of the soil cap at the Site will be conducted in every March and September, and any time after a significant rainstorm (when the rainstorm intensity exceeds 2.5 inches in 8 hours) that could have impacted the integrity of the cap. Inspection will be conducted by the NYCDPR personnel and records will be kept to document observations and findings of the inspection. The inspection of the Site would be performed to check for the following conditions:

- Improper or missing signage.
- Property fence not in good condition and secured.
- Soil erosion evident at the Site or in adjacent areas.
- Excessive vegetation growing.
- Noticeable depressions or ponded water.
- Areas of bare vegetation.
- Areas of stressed or missing vegetation.
- Areas of continual poor growth despite regrowth efforts.
- Invasive or deep-rooting species on the cap.
- Impacts from burrowing animals on the cap.
- Maturity of plants to allow for mowing.

Corrective actions will be taken immediately if the above listed condition is identified.

## **FIGURES**

LiRo-Engineers, Inc.  
Parcel  
***RAP***

Mariners Marsh Park 4.75-Acre  
*3418 Richmond Terr., Staten Island, NY*

---

**APPENDIX 1 -  
TECHNICAL SPECIFICATIONS  
FOR REMEDIAL ACTION**

LiRo-Engineers, Inc.  
Parcel  
**RAP**

Mariners Marsh Park 4.75-Acre  
*3418 Richmond Terr., Staten Island, NY*

---

## **APPENDIX 2 - CONSTRUCTION HEALTH AND SAFETY PLAN**