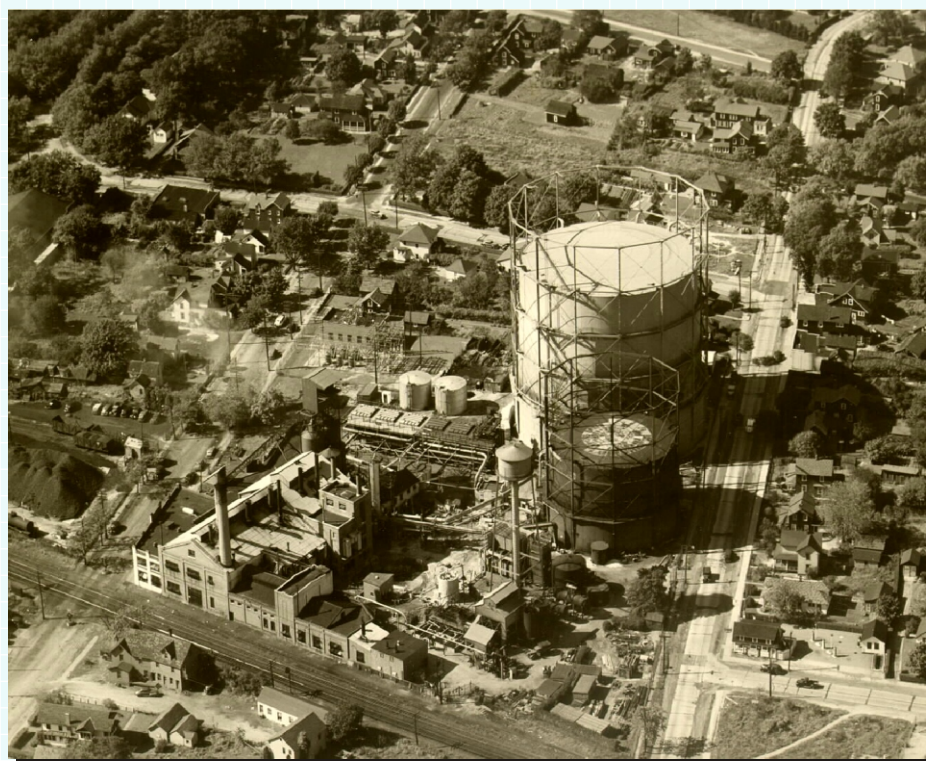
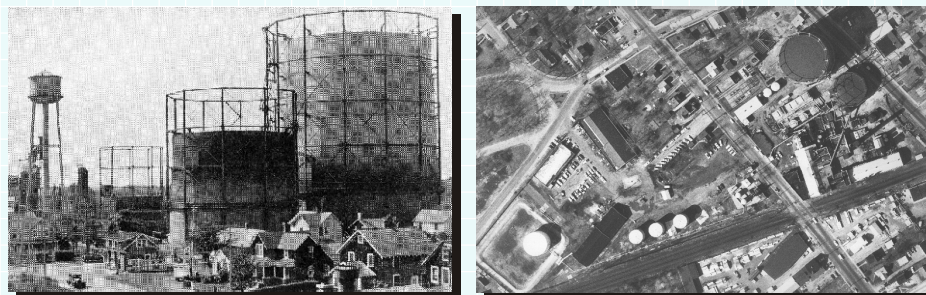


KEYSPAN



Bay Shore/Brightwaters Former Manufactured Gas Plant Site

FINAL REMEDIAL INVESTIGATION REPORT

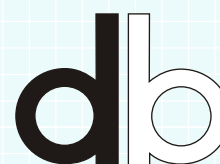
VOLUME 1

JANUARY 2003

Prepared for:

KEYSPAN
One MetroTech Center
Brooklyn, New York

Prepared by:



DVIRKA
AND
BARTILUCCI
CONSULTING ENGINEERS

A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.



KeySpan Corporation
Environmental Asset Management
175 East Old County Road
Hicksville, NY 11801

January 9, 2003

Amen M. Omorogbe, P.E., Project Manager
New York State Department of Environmental Conservation
Bureau of Western Remedial Action
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7017

Re: Bay Shore/Brightwaters Former MGP Site
Final Remedial Investigation Report

Dear Mr. Omorogbe:

Enclosed please find two (2) copies of Volumes 1 and 2 of the following final report:

*“Bay Shore/Brightwaters Former Manufactured Gas Plant Site
Final Remedial Investigation Report
January 2003”*

In addition, enclosed is one (1) electronic copy of the report on compact disc (CD).

By copy of this letter, the above-referenced document has also been forwarded to the parties named below.

If you should have any questions, please do not hesitate to contact me at (516) 545-2563.

Very truly yours,

Theodore O. Leissing, Jr.
Director, MGP Program - Long Island
KeySpan Corporation

TOL/ESK/ld

Enclosures

cc: W. Parish, NYSDEC Region 1 (1 copy)
W. Kuehner, NYSDOH (2 copies, 1 CD)
S. Robbins, SCDHS (1 copy)
L. Liebs, KSE (1 CD)

**BAY SHORE / BRIGHTWATERS
FORMER MANUFACTURED GAS PLANT SITE**

FINAL REMEDIAL INVESTIGATION REPORT

VOLUME 1

Prepared for:

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JANUARY 2003

**BAY SHORE/BRIGHTWATERS FORMER
MANUFACTURED GAS PLANT SITE
FINAL REMEDIAL INVESTIGATION REPORT**

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EXECUTIVE SUMMARY

Introduction

KeySpan Corporation (KeySpan) entered into an Order on Consent (Index No. D1-0002-98-11) with the New York State Department of Environmental Conservation (NYSDEC) to conduct a remedial investigation of a former manufactured gas plant (MGP) site located in Bay Shore and the Incorporated Village of Brightwaters, Suffolk County, New York. As required by the Order on Consent, a field investigation was completed in the Fall of 2000 as documented in the report entitled, "Bay Shore/Brightwaters Former Manufactured Gas Plant Site Remedial Investigation Report," dated April 2002. Based on the findings of the completed field program, additional sampling activities were recommended. As a result, a supplemental field investigation was subsequently completed in accordance with the scope of work presented in the Supplemental Field Investigation Work Plan for the Bay Shore/Brightwaters Former Manufactured Gas Plant Site, dated February 8, 2002. Additionally, a Qualitative Human Exposure Assessment and an evaluation of environmental risks were performed.

In addition to the remedial investigation, a number of other related investigation and remedial activities were completed or are currently in progress as Interim Remedial Measures (IRMs). IRMs are undertaken on an accelerated schedule to investigate, evaluate and remediate chemical constituents present in the environment that are attributable to a site. The implemented IRMs associated with the site include: the Cut and Plug IRM; the Brightwaters Yard Underground Storage Tank (UST) Removal/Closure IRM/Investigation; the Watchogue Creek/Crum's Brook IRM/Investigation; and the Brightwaters Yard Groundwater Plume IRM/Investigation.

This final remedial investigation report presents: introductory and background information related to the site; an overview of historic and current site operations; a discussion of the completed investigation programs; a discussion of the geology and hydrogeology of the investigation area; discussions of the nature and extent of chemical constituents in the environment related to the site; and a summary of the findings of the two field programs and associated IRMs. In addition, the data and results of the field programs were used to prepare a final Qualitative Human Exposure Assessment and to perform a Fish and Wildlife Resources Impact Analysis (FWRIA) for the site and surrounding area.

KeySpan and the NYSDEC are developing a Remedial Action Plan (RAP) to address the environmental implications associated with the Bay Shore/Brightwaters former MGP site. That Plan will include a number of remedial measures, both within the site boundaries and in the community, to eliminate, reduce or contain sources of the MGP-related contaminants that are found in the defined groundwater plumes in the community and to eliminate or limit the pathways through which residents, workers and other members of the public could be exposed to the contaminants associated with the former MGP operations. The Plan will include a number of remedial measures designed to protect public health and the environment.

Summary of Findings

The site exhibits the characteristics expected of a former MGP site. These characteristics have had impacts both on the actual former site and on groundwater to the south or downgradient of the site. However, it is important to note:

1. The presence of chemical constituents in soil and groundwater is reasonably consistent with that expected of a former MGP site that had operated for the time period, length of time and in the way the Bay Shore/Brightwaters site operated.

2. The presence of trace amounts of some observed chemical constituents are attributable to sources other than the site, including chemicals produced by car and truck traffic, other commercial and industrial operations and the operation of internal combustion engines for lawn maintenance equipment, boats and other typical activities in the community.
3. There are no findings indicating that chemical constituents from the site have impacted currently used drinking water supplies in the community.
4. Groundwater containing chemical constituents attributable to the site migrates in a southerly direction from the site and enters Lawrence Creek.
5. The remedial investigation and Qualitative Human Exposure Assessment have indicated that there are pathways through which people on the site and in the community may possibly be exposed to potentially hazardous materials related to former MGP activities; however, no imminent hazards were identified. The potential for this exposure should be evaluated for possible reduction through remedial actions. Therefore, KeySpan has initiated, with NYSDEC approval and under NYSDEC supervision, some IRMs, and will develop long-term remedial actions in the next phase of this program, the development of a Remedial Action Plan. These IRMs and subsequent remedial actions will address properties that are currently or potentially impacted by the site (including the site itself) to ensure future valuable use of these properties.
6. The remedial investigation and FWRIA have indicated that there are pathways through which fish and wildlife could be exposed to potentially hazardous materials related to former MGP activities. However, because of the level of urbanization in the community and the transient nature of wildlife present, remedial activities specifically directed at fish and wildlife exposure are not required.

Site Location and Description

The Bay Shore/Brightwaters former MGP site is located in Bay Shore and the Incorporated Village of Brightwaters, located in the Town of Islip, Suffolk County, New York. The site is approximately 10 acres in area and is bisected by Clinton Avenue. The Long Island Rail Road (LIRR) - Montauk Branch borders the site to the south with Fifth Avenue to the east, and Orinoco Drive to the north.

The site consists of several parcels, including the Bay Shore Site, Bay Shore West Parcel, Bay Shore West Storage Lot Parcel, Brightwaters East Parcel and the Brightwaters Yard Site. For the purpose of this report, the parcels have been grouped into two general areas. The first area comprises the Bay Shore Site and Bay Shore West Parcel. The second area includes the Brightwaters Yard Site, Brightwaters East Parcel and the Bay Shore West Storage Lot Parcel. Additionally, the Watchogue Creek/Crum's Brook area is located approximately 400 feet east of the site.

The Bay Shore Site includes an active KeySpan gas regulator station, a decommissioned Long Island Power Authority (LIPA) electric substation and a small storage building, all of which are located in the northern part of the site. The southern portion of the Bay Shore Site is vacant and generally covered with grass, small trees and other low vegetation. The Bay Shore West Parcel is currently vacant and was previously covered with relatively dense vegetation. The parcel was cleared of vegetation in February 2002 and most of the parcel is covered with dolostone/crushed stone. The parcel is used for storage of equipment and materials in support of utility operations. The Bay Shore West Storage Lot Parcel is utilized for the storage of equipment and materials used to support gas construction activities based at the

Brightwaters Yard Site. The Brightwaters Yard Site and Brightwaters East Parcel extend into the Incorporated Village of Brightwaters and support an active KeySpan gas construction facility.

The area surrounding the Bay Shore/Brightwaters former MGP site is typically suburban, with a variety of land uses including residential, commercial and light industrial. The site is bounded on the east, north, and west by residences and small commercial businesses, and to the south by the LIRR. Immediately south of the LIRR are a number of residences, as well as the adjacent KeySpan-owned parcel that was formerly used as a commercial lumber property. Properties further south are principally single-family residential homes; however, some commercial properties exist along Union Boulevard.

Topography at the site is relatively flat, with the land surface sloping less than one percent southward toward the Great South Bay. Site elevation ranges from roughly 20 to 24 feet above mean sea level (msl). Storm water within the site infiltrates to subsurface soil. In general, the storm water drainage systems in the Bay Shore/Brightwaters area in the vicinity of the site are designed to convey flows to local surface water bodies and, ultimately, the Great South Bay. There are no naturally occurring or manmade surface water bodies within the boundaries of the site. Two natural streams, and several artificially impounded lakes and ponds are located within a half mile of the site between the site and the Great South Bay. The surface water bodies nearest to the site include Watchogue Creek/Crum's Brook (north of Montauk Highway), Watchogue Creek (south of Montauk Highway), Lawrence Creek, Lawrence Lake and O-Co-Nee Pond.

The site is directly underlain by a fill unit, which ranges in thickness across the site from 2 to 7 feet and consists mostly of sand and gravel with minor occurrences of silt and clay, and varying amounts of brick, concrete, cinders, clinker, wood and ash. In addition, a number of concrete slabs and other subsurface structures associated with the former MGP facility are located throughout the property. Underlying the fill unit within the southwestern portion of the Brightwaters Yard Site exists a recent-aged (post-glacial) clay-silt unit varying in thickness from 2 to 6 feet. The clay-silt unit appears to be relatively thin and discontinuous beneath the Bay Shore Site. Underlying the fill unit and clay/silt unit, where present, are native glacial outwash sands and to a lesser extent, gravels characteristic of the Upper Glacial aquifer, which is approximately 70 feet in thickness beneath the site. Beneath this exists a low permeable formation consisting of a fine sand with varying amounts of clay and silt, which forms the upper surface of the Magothy formation. This formation includes the Magothy aquifer, which is the primary source of public water supply in Nassau and Suffolk Counties.

Groundwater beneath the site ranges in depth from approximately 4 to 8 feet below ground surface (bgs) and generally flows in a southerly direction throughout the site. Horizontal groundwater velocities within the Upper Glacial aquifer at and downgradient of the site have been estimated to range from between 2.1 and 2.5 feet per day. On-site and downgradient monitoring well clusters indicate horizontal groundwater flow within the Upper Glacial aquifer. The only substantial vertical flow was observed at a well cluster located in close proximity to Lawrence Creek where a significant upward vertical gradient was observed, indicating an area of groundwater discharge.

A total of two active public water supply wells are located within a 1/2-mile radius of the site. The wells extract water from the Magothy aquifer at depths of 595 feet and 803 feet bgs. There is no evidence to indicate that the public supply wells have been impacted by the site. Based on the results of a private well survey completed by KeySpan in areas located downgradient (south) of the Bay Shore/Brightwaters former MGP site, only four private wells were reported and confirmed in this area. Only one of the wells was determined to be active with use limited to irrigation purposes. Additional details concerning the completed private well survey are provided later in this section.

Site History

Operations

The site opened as a gas plant in 1889 under the ownership of the Mutual Gas and Light Company. The Suffolk Gas and Electric Light Company owned and operated the site from 1889 to 1917. In 1918, the Long Island Lighting Company (LILCO) became the legal owner. Gas manufacturing reportedly occurred between 1889 and approximately 1973, when the plant was demolished. In 1918, LILCO began operating a carbureted water gas plant. Later in the life of the plant, it was converted to an oil-gas process. Manufacturing operations were conducted on the Bay Shore property, while the Brightwaters Yard property was used to support gas manufacturing and distribution operations. Since approximately the 1920s to the early 1970s, it is believed that the former Bay Shore MGP discharged storm water and treated process wastewater to an industrial Cesspool in the Watchogue Creek/Crum's Brook area.

Previous Site Investigations

Between 1979 and 2000, there were several environmental investigations completed at and in the vicinity of the site, including:

- 1979 Groundwater Investigation, Geraghty and Miller, Inc.
- 1989 Preliminary Assessment, NUS Corporation
- 1992 Field Investigation of Bay Shore Site, Brightwaters Yard and Adjacent Properties, Malcolm Pirnie, Inc.
- 1997 Lanier Lane Investigation, Fenley and Nicol Environmental
- 1997 Subsurface Investigation of Brightwaters/Bay Shore Site, GEI Consultants, Inc.
- 1999-2000 Investigation of Bay Shore Site Groundwater Plume Discharge to Lawrence Creek, Suffolk County Department of Health Services

The investigations determined that chemical constituents were present in soil and groundwater on-site and that there were two separate groundwater plumes emanating from the site, one originating from the Bay Shore Site and one from the Brightwaters Yard Site. The investigations indicated that the sources of the plumes were associated with former MGP operations on the Bay Shore Site and Brightwaters Yard Site. The investigations determined that the chemical constituents detected in on-site soil and groundwater, as well as in off-site groundwater, were primarily benzene, toluene, ethylbenzene and xylene (BTEX) and polycyclic aromatic hydrocarbons (PAHs). In addition, the data from the initial field program completed in the Fall of 2000 indicated that the Bay Shore Site groundwater plume is discharging to Lawrence Creek through the bottom sediments of the creek.

Bay Shore/Brightwaters Former MGP Site Remedial Investigation

As discussed above, an initial field program was completed by KeySpan in the Fall of 2000, the results of which are documented in the report entitled, "Bay Shore/Brightwaters Former MGP Site Remedial Investigation Report." dated April 2002. Based on KeySpan's assessment of data presented in this report and discussions with the NYSDEC and Suffolk County Department of Health Services (SCDHS), it was determined that additional data was needed to further refine understanding of the nature

and extent of MGP-related chemical compounds and residuals present in the subsurface environment and to develop a remedial strategy for the site and off-site areas. Therefore, a supplemental field investigation scope of work was developed.

The objectives of the remedial investigation, Qualitative Human Exposure Assessment and FWRIA were to:

- Sufficiently characterize the site to achieve an understanding of the nature and extent and migration of chemical constituents in the environment;
- Identify the potential human exposure pathways and environmental risks associated with chemical constituents found in the environment in order to determine the need for remedial action; and
- Provide sufficient environmental information to determine the need for remedial action and evaluate remedial alternatives leading towards the design and implementation of selected remedies.

The remedial investigation field programs included the following activities:

- Soil vapor sampling;
- Surface soil sampling;
- Subsurface soil sampling;
- Monitoring point inventory, assessment and initial groundwater sampling;
- Groundwater probe installation and sampling;
- Groundwater monitoring well installation and sampling;
- Pore water sampling;
- Surface water and surface water sediment sampling;
- Storm water runoff and sediment sampling;
- Ambient air and indoor air sampling;
- Private groundwater well sampling;
- Test pits;
- Perimeter and location-specific air monitoring; and
- Surveying and mapping.

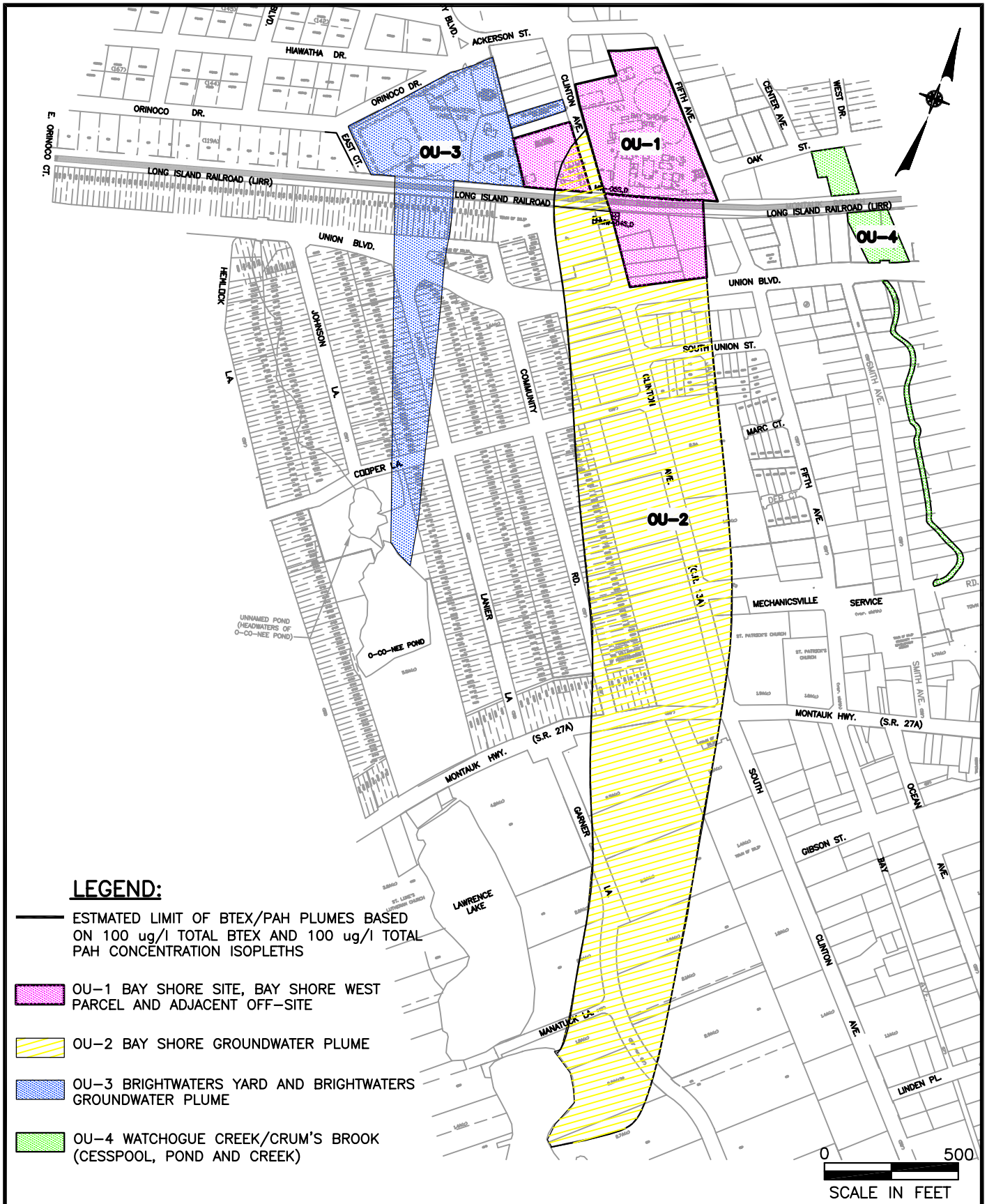
Operable Unit Designations

In an effort to manage the remediation of the Bay Shore/Brightwaters former MGP site, the site has been divided into four operable units (OUs), including:

- *Operable Unit 1* - Bay Shore Site, Adjacent Off-site Areas north of Union Boulevard and Bay Shore West Parcel.
- *Operable Unit 2* - Bay Shore Site Groundwater Plume.
- *Operable Unit 3* - Brightwaters Yard and Groundwater Plume.
- *Operable Unit 4* - Watchogue Creek/Crum's Brook.

The geographic boundaries of each operable unit are provided on **Figure ES-1**. Note that Operable Unit 4, Watchogue Creek/Crum's Brook, is located approximately 400 feet east of the Bay Shore Site. A

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BAY SHORE/BRIGHTWATERS FORMER MGP SITE FINAL REMEDIAL INVESTIGATION
BAY SHORE, NEW YORK

db
Dvirka and Bartilucci
CONSULTING ENGINEERS
A DIVISION OF WILLIAM F. COSULICH ASSOCIATES, P.C.

OPERABLE UNIT DESIGNATIONS

FIGURE ES-1

former Cesspool located at the headwaters of Watchogue Creek was the historical discharge point for treated wastewater generated at the Bay Shore MGP Site.

Remedial Investigation Findings

Bay Shore Site and Adjacent Off-site Locations (Operable Unit 1)

With the exception of the former industrial cesspool area located immediately southwest of the former Gas Holder, the northern third of the Bay Shore Site does not contain elevated levels of BTEX, PAHs or nonaqueous phase liquid (NAPL)/tar at saturated levels. In addition, the southeastern portion of the Bay Shore Site is free of these MGP-related constituents. The highest concentrations of BTEX and PAHs within the Bay Shore Site are found in shallow subsurface soil (not exceeding 12 feet in depth), located southwest of the former Relief Holder and within the general vicinity of a former Naphthalene Scrubber. This area extends south to the former locations of the Effluent Water Treatment Facilities, Tar Separators and Tar Settling and Tar Holding Tanks. A second area of elevated BTEX and PAHs in subsurface soil is located in the vicinity of the former Tar and Drip Oil Collecting Pits and the former Tar Well located within the southwest corner of the site.

NAPL/tar observed in subsurface soil in the central third of the site is generally limited to approximately 20 to 30 feet below ground surface (bgs). The sources of this relatively shallow NAPL/tar are former MGP structures. The occurrence of NAPL/tar in deeper soils (greater than 30 feet bgs) is generally limited to the southern third of the site and adjacent downgradient areas. The observed distribution of NAPL/tar in subsurface soil indicates a southerly migration of this material from on-site source areas primarily located in the southernmost third of the site to downgradient areas. NAPL/tar migration appears to be predominantly horizontal in nature at and below the water table; however, in the vicinity of the southern property boundary, a significant downward vertical migration component appears to have been present. As a result, there appears to be a deep NAPL/tar zone located above the Glacial/Magothy formation interface from the property boundary to approximately 250 feet south of the site.

Analytical results of samples collected during the initial field program indicated metal concentrations in subsurface soil within the Bay Shore Site to be at or below typical background concentrations. Of the samples analyzed, the only anomaly was lead, detected in the general area of the former industrial Cesspool located southwest of the Main Holder at a concentration of 1,210 mg/kg. The vast majority of subsurface soil samples collected within the Bay Shore Site were found to be either free of detectable levels of total cyanide or exhibited total cyanide concentrations below 1.0 mg/kg with a maximum total cyanide concentration of 9.3 mg/kg.

Shallow groundwater (i.e., from the water table to 26 feet bgs) present in the southern half of the Bay Shore site contains BTEX and PAHs with the highest concentrations observed southwest of the former Relief Holder, downgradient of the former Tar Separators/Effluent Treatment House, the 54,000 Cubic Foot Gas Holder/Heavy Oil Tank and the former Tar and Drip Oil Collection Pit. In addition, BTEX and PAH compounds are present downgradient of the former Tar Well located in the southwestern portion of the site. While the former industrial Cesspool located southwest of the former Gas Holder contains levels of BTEX and PAHs in subsurface soil, groundwater data from downgradient of this former structure indicates relatively low concentrations of BTEX and PAHs. On-site deep groundwater (from a depth of 50 to 80 feet bgs) exhibited nondetectable to trace levels of BTEX and PAHs, with total BTEX concentrations not exceeding 5.0 ug/l and total PAH concentrations not exceeding 50.0 ug/l. However, samples collected along the southern property boundary contained higher levels of BTEX and PAHs.

Bay Shore West Parcel (Operable Unit 1)

Sampling conducted within the Bay Shore West Parcel identified an area of subsurface soil that exhibited BTEX with total BTEX concentrations observed up to 495.0 mg/kg. Based on available data, this area is approximately 400 square feet and appears to be centered around the locations of two former Oil Storage Tanks. The BTEX in this area appears to be relatively shallow with concentrations of total BTEX not exceeding 0.1 mg/kg below a depth of 12 feet.

Analytical results of samples collected during the initial field program indicated metal concentrations in subsurface soil within the Bay Shore West Parcel to be at or below typical background concentrations. The vast majority of subsurface soil samples collected within the Bay Shore West Parcel were found to be either free of detectable levels of total cyanide or exhibited total cyanide concentrations below 1.0 mg/kg.

BTEX compounds were detected in shallow groundwater along the southern property boundary with total BTEX concentrations of up to 21,500.0 ug/l. Groundwater sample locations collected off-site and immediately downgradient of the Bay Shore West Parcel exhibited total BTEX concentrations in shallow groundwater of between 353.0 ug/l and 4,500.0 ug/l. BTEX compounds were not detected above 81.0 ug/l within groundwater deeper than 26 feet below grade. Based on the southerly flow of groundwater and the location of sample points, the likely source of the BTEX present in shallow groundwater is subsurface soil located in the vicinity of the former oil tanks described above.

Bay Shore Site Groundwater Plume (Operable Unit 2)

The sources of BTEX and PAH compounds in off-site groundwater downgradient of the Bay Shore Site appear to be primarily located within the central and southern portions of the site and are associated with the former MGP operations conducted at the site. The Bay Shore West Parcel appears to be a minor contributor of these compounds to off-site groundwater.

The BTEX/PAH plume associated with the Bay Shore Site appears to be migrating in the direction of the natural flow of groundwater, south to southeast, extending from the Bay Shore Site to the southeast corner of the Bay Shore West Parcel: a width of approximately 500 feet. The total length of the plume is estimated to be approximately 3,400 feet with the plume discharging to Lawrence Creek, a tidally influenced surface water body located south of Montauk Highway. Although the plume discharges to Lawrence Creek, analysis of surface water samples collected from the suspected discharge area indicated BTEX and PAHs to be at relatively low concentrations.

While the plume appears to extend throughout the vertical extent of the Upper Glacial aquifer immediately downgradient of the Bay Shore Site, the low permeable fine sands, silt and clay underlying this aquifer restrict the vertical migration of the plume. Therefore, impact to the underlying Magothy aquifer should not occur. Also limiting the downward migration is the transition from a predominantly horizontal flow regime to an “upward” or discharging flow regime in the Upper Glacial aquifer downgradient of the site. This is supported by the fact that BTEX and PAHs were found to be nondetectable in groundwater samples collected from below the low permeable clay of the Magothy formation.

The elevated concentrations of carbon dioxide and the almost complete absence of dissolved oxygen within the defined plume strongly support the conclusion that microbial respiration is occurring within the plume. Based on this data, it is apparent that BTEX and PAHs are being used as organic substrates by the microbes and are being metabolized. It is expected that these natural processes will continue and will reduce BTEX/PAH concentrations in the future.

While the Bay Shore Site groundwater plume appears to be well defined, groundwater data and NYSDEC records documenting petroleum releases downgradient of the site suggests that there are other sources contributing BTEX and PAHs to groundwater in the vicinity of the former MGP site.

Metals analysis of groundwater samples collected during the initial field program from monitoring wells located downgradient of the Bay Shore Site indicated that the majority of RCRA listed metals were generally within concentration ranges that would be considered typical of ambient groundwater quality for the Upper Glacial aquifer given the commercial and industrial land use within the area.

Total cyanide concentrations in the majority of groundwater samples collected during the initial field program from wells located downgradient of the Bay Shore Site were found to be below instrument detection limits or the Contract Required Detection Limit (CRDL) of 20 ug/l. The maximum observed concentrations did not exceed 70 ug/l. Free cyanide analysis was generally consistent with the total cyanide results with the majority of samples exhibiting free cyanide concentrations below the instrument detection limit or the CRDL of 20 ug/l. The maximum observed concentrations did not exceed 60 ug/l.

Brightwaters Yard and Groundwater Plume (Operable Unit 3)

Surface and subsurface soil in the Brightwaters Yard Site does not appear to exhibit elevated levels of chemical constituents, with the exception of subsurface soil in two areas. Subsurface soil in the vicinity of the former underground storage tanks (USTs) located on the Brightwaters East Parcel adjacent to the Gas Construction and Maintenance Facility (GCMF) building, as well as in the vicinity of the former H-Fuel tank in the southwestern portion of the Brightwaters Yard Site, exhibited elevated levels of BTEX and PAHs. However, as part of an IRM conducted in the Spring of 2002, KeySpan has remediated impacted subsurface soil associated with the UST area through soil excavation and follow-up treatment with in-situ chemical oxidation. Furthermore, as part of a second IRM, KeySpan has treated the source area associated with the former H-Fuel Tank through the removal of NAPL, as well as the use of in-situ chemical oxidation. The effectiveness of this IRM is currently being evaluated.

Groundwater beneath the Brightwaters Yard Site, Brightwaters East Parcel and Bay Shore West Storage Lot Parcel does not appear to exhibit elevated levels of BTEX and PAHs with the exception of groundwater in the vicinity and downgradient of the former H-fuel tank on the Brightwaters Yard Site and the former USTs on the Brightwaters East Parcel, discussed above.

Air samples collected at locations within the GCMF building exhibited detectable concentrations of BTEX. The GCMF is an active operation and equipment and supplies are stored within the garage area of this building. Typical items stored within the garage area may include equipment with gasoline engines. Therefore, detecting trace concentrations of benzene, xylene and toluene in interior air would be expected.

The Brightwaters Yard plume consists of dissolved-phase BTEX and PAH compounds originating from the H-Fuel area located in the southwest corner of the site as described above. The plume has been determined to be approximately 200 feet wide at the site boundary and approximately 1,400 feet long. Starting in September 2000, KeySpan began actively treating the plume with an oxygen injection technology. As part of this IRM, a line of oxygen injection points were installed perpendicular to the plume along the southern shoulder of Union Boulevard. The review of quarterly BTEX and PAH groundwater data collected from monitoring wells located along the plume centerline indicates reductions in BTEX/PAH concentrations downgradient of the oxygen injection points. It is expected that these reductions will continue in the future and will propagate downgradient along with the natural flow of groundwater effectively treating the entire dissolved-phase plume.

Investigations conducted to date indicate the plume discharges to the lower portion of O-Co-Nee Pond. However, BTEX and PAHs were only detected sporadically and at trace concentrations in surface water samples collected from this area. This is attributable to:

- mixing through dispersive forces and reduction of chemical mass through natural biodegradation processes.
- groundwater containing BTEX and PAHs that may discharge to the pond is further diluted as the result of mixing with the surface water and other water sources discharging to the pond.
- BTEX dissolved in surface water would have a propensity to volatilize from the water and undergo additional biological decay, resulting in further reduction of concentrations.

Watchogue Creek/Crum's Brook (Operable Unit 4)

The investigation activities associated with Operable Unit 4 were primarily conducted in two general areas, one being the former cesspool area and the other being the former pond area and headwaters of Watchogue Creek/Crum's Brook.

Former Cesspool Area

Surface soil samples collected in the vicinity of the former Cesspool did not exhibit chemical constituents at elevated levels. Subsurface soil samples collected from this area exhibited elevated levels of BTEX and PAHs within and immediately downgradient (south) of the cesspool area. For samples collected during the initial field program, RCRA metals analysis of subsurface soil samples indicated all targeted metals to be generally at or below typical background concentrations for soil in the eastern United States. Total cyanide analysis indicated the majority of soil samples to be free of detectable levels of total cyanide or exhibit cyanide at concentrations less than the CRDL of 1.0 mg/kg. Groundwater in the vicinity and downgradient of the former Cesspool exhibits detectable levels of BTEX and PAHs. However, concentrations are relatively low and there is no measurable plume beyond the immediate vicinity of the former Cesspool.

Former Pond Area and Watchogue Creek/Crum's Brook Headwaters

Surface soil samples collected in the former pond area and headwaters of Watchogue Creek/Crum's Brook did not exhibit chemical constituents at elevated levels. Subsurface soil samples collected from this area exhibited elevated levels of BTEX and PAHs. Both BTEX and PAH concentrations rapidly decrease with increasing depth. The highest BTEX and PAH concentrations in subsurface soil appear to be present in stream and pond sediments associated with the former pond area. These sediments are currently overlain by several feet of sand that were apparently used to fill in the pond. The sand used to backfill this area was found to contain little to no BTEX and PAHs.

For subsurface soil samples collected during the initial field program, RCRA metals analysis indicated that the majority of targeted metals were within or below typical background concentrations for soil in the eastern United States. Total cyanide analysis indicated that the majority of soil samples did not exhibit detectable levels of total cyanide or exhibited total cyanide at concentrations below the CRDL.

BTEX compounds and PAHs were detected at low concentrations in groundwater samples collected in the vicinity of the former pond area and headwaters of Watchogue Creek/Crum's Brook. Based on the results of the investigation, subsurface soil within the former pond area appears to be a minor contributor of BTEX and PAHs to groundwater.

Surface water samples collected from the former pond area and headwaters of Watchogue Creek/Crum's Brook between the LIRR and Union Boulevard and samples collected from within the main body of the creek between Union Boulevard and Mechanicsville Service Road did not exhibit detectable levels of BTEX compounds. Several PAHs were detected at trace levels in the main body of the creek. Surface water sediment samples collected from the main body of the creek exhibited detectable concentrations of BTEX, PAHs and metals. However, in general, the concentrations of the chemicals detected in surface water and sediment would be considered typical of surface water and sediment that receives storm water from suburban roadways and surrounding commercial and light industrial properties.

Private Property Air Sampling Program

Air sampling was conducted at 16 off-site locations during the remedial investigation. At one location, two rounds of sampling were conducted and at another location, three rounds of sampling were conducted. A total of 67 samples were collected and each sample was analyzed for 61 volatile organic compounds. The majority of the volatile organic compounds for which analysis was performed were not detected. The majority of those compounds that were detected were detected at concentrations within the range of background levels as reported by the New York State Department of Health (NYSDOH) and those compounds detected above NYSDOH background levels are generally those not typically associated with MGP impacts. Additionally, naphthalene, the compound most commonly associated with potential MGP impacts, was not detected in any of the samples. The analytical results obtained were reviewed by the NYSDOH and the detected compounds were found to be at acceptable levels.

Private Well and Basement Survey

A Well and Basement Survey was performed of properties within, between and in the immediate vicinity of the two groundwater plumes, as defined in the remedial investigation. Results of 145 questionnaires completed thus far have identified a very small number of properties at which the potential for indoor air exposure exists. The owners of these properties have been contacted. This survey information, coupled with results of the indoor air sampling performed to date, indicates that potential exposures to site-related chemicals via inhalation of indoor air in the vicinity of the site are minimal.

Seventeen of the 145 survey respondents reported the presence of a groundwater well on their property. The presence of a well was confirmed at four properties: one of these wells is in active use for irrigation purposes and three wells were confirmed to be inactive (i.e., not in use) for a period of several years. KeySpan attempted to sample all four wells. Two wells could not be sampled due to access issues (i.e., piping setup). Sampling of the other two wells, the active irrigation well and one inactive well, was performed. With the exception of methyl tert-butyl ether (MTBE), a common gasoline additive, no VOCs or SVOCs were detected in the sample collected from the active irrigation well. Several VOCs and SVOCs, including naphthalene, were detected in the inactive well. This well is not currently used as a source of water for any purpose and the pump is currently inoperable. Additionally, 144 of the 145 survey respondents indicated that they do not use groundwater wells for domestic purposes (i.e., cooking, bathing). Consequently, exposure to potentially site-related constituents that may be present in groundwater does not occur for these individuals (i.e., domestic use of groundwater is an incomplete exposure pathway).

Additional details regarding the completed well and basement survey are provided in **Appendix F (the Qualitative Human Exposure Assessment)**.

Qualitative Human Exposure Assessment Findings

Under current and future site use conditions, the potentially exposed populations (i.e., potential receptors) are those that might come into contact with site-related chemicals of potential concern (COPCs). These receptor populations and the potential exposure pathways associated with each population are

summarized in Tables 2-2A through 2-2K of **Appendix F (the Qualitative Human Exposure Assessment)**. Additional information concerning the potential for these exposures to occur is provided in Tables 2-3A through 2-3E (**Appendix F**).

For this Executive Summary, potential on-site exposures refer to those occurring on the Bay Shore Site, Bay Shore West Parcel, the Brightwaters Yard and the Bay Shore West Storage Lot Parcel. Potential off-site exposure scenarios include those associated with Watchogue Creek/Crum's Brook and the Bay Shore and Brightwaters groundwater plumes.

Under current site use conditions and based upon the best available information, the on-site trespasser population may receive exposure to surface soil via the ingestion (oral) and dermal routes. On-site KeySpan workers are assumed to spend time both outdoors and indoors and, consequently, may be exposed to chemicals in surface soil (during outdoor activities) and also to COPCs in indoor air (during indoor activities). Adult nearby off-site utility workers may be exposed to site-related COPCs in surface and subsurface soil via ingestion and dermal contact and groundwater via dermal contact. Potential exposure for nearby off-site utility workers is possible because of the presence of subsurface sewer, telephone, gas, water and railroad lines/facilities in the areas immediately adjacent to the site.

Under future site use conditions and based upon the best available information, potentially exposed human populations include on-site and off-site construction workers and on-site adult commercial workers, adult and child visitors, and on-site adult and child residents. Exposure for the construction worker is possible because virtually any site re-development would involve some kind of construction activity. Potential on-site exposure media for the construction worker includes surface soil (via ingestion and dermal contact), subsurface soil (via ingestion and dermal contact), and groundwater (via dermal contact). Off-site construction worker exposure to the former cesspool area and former pond area of Watchogue Creek/Crum's Brook also may be possible. Potential exposure media and pathways for the off-site construction worker are identical to those of the future on-site construction worker.

Off-site residents living downgradient of the site may be exposed to chemicals volatilizing from groundwater and into indoor air. Based on indoor air sampling performed to date and the results of the Well and Basement Survey, see details in **Appendix F**, a very small number of properties, at which the potential for indoor air exposure exists, have been identified. The owners of these properties have been contacted. Additionally, these residents may be exposed to site-related chemicals in groundwater if they are using groundwater for domestic purposes. The results of the survey identified only one private well in active use. This well is used for irrigation purposes and is located to the south of the Brightwaters Site. As discussed previously, with the exception of MTBE, a common gasoline additive, no VOCs or SVOCs were detected in the sample collected from this well.

Potentially complete exposure pathways associated with O-Co-Nee Pond and Lawrence Creek for off-site residents include ingestion and dermal contact with sediment and surface water. Additionally, the consumption of fish and crabs from O-Co-Nee Pond and Lawrence Creek may occur. Potential exposure to site-related chemicals due to the consumption of fish and crabs from these surface water bodies is expected to be minimal because:

- BTEX and PAH compounds generally were not detected or were detected at relatively low concentrations in surface water; and
- The chemicals present in the surface water, pore water and sediment do not tend to bioconcentrate or bioaccumulate.

Potential exposures along Watchogue Creek/Crum's Brook include the following populations: adult and child residents living along the creek in the former Pond area and trespassers in the creek south of Union

Boulevard. Potential exposure media for these off-site residents and trespassers includes surface soil (via ingestion and dermal contact); and potential exposure to surface water and sediment via ingestion and dermal contact. As part of an IRM, the creek south of Union Boulevard has undergone restoration efforts, including the removal of shallow sediments and channel realignment.

Fish and Wildlife Resources Impact Analysis Findings

Following the Appendix 1C Decision Key in the NYSDEC's Fish and Wildlife Resources Impact Analysis (FWRIA) Document, a FWRIA was deemed required. The analysis focuses on risks associated with site-related chemicals detected in soil, surface water, sediment, and groundwater. The complete FWRIA can be found in **Appendix F**.

The site reconnaissance conducted as part of this analysis indicates that the site and surrounding area are poor quality environmental resources, due to the limited presence of vegetation. The site is partially covered with buildings, blue stone and asphalt. Wildlife species, typically present are adapted to an urban setting. Due to the size of the vegetated areas, only a few individual animals will be present.

However, remediation is suggested to at least abate entry of the Bay Shore plume into Lawrence Creek and to prevent entry of the Brightwaters plume into O-Co-Nee Pond. IRMs that address the Brightwaters plume already are underway and remedial actions currently are being developed to address the Bay Shore plume.