2.0 RI Study Area Description and History

This section presents a description of the RI Study Area, information regarding Historic MGP Site ownership and operational history, and the results of previous investigations and remedial work performed. A summarized review of historical photographs, historical topographic maps, historical drawings, Sanborn maps, and aerial photographs for these and other local properties is provided in Table 2-1.

2.1 Historic MGP Site Description

The Metropolitan Works former MGP Site was historically located at 124 – 136 2nd Avenue, Brooklyn, Kings County, New York 11215, east of the Gowanus Canal, between the Gowanus Expressway (Interstate 278) and the New York City Transit Train Bridge and associated subway rail line. Current zoning and land use at the Historic MGP Site is commercial with parking and vacant lots. Current zoning and land use in areas adjacent to the Historic MGP Site include a mixture of commercial, parking, industrial, and transportation/utilities. The Historic MGP Site is bounded by the former 11th Street right of way and the 11th Street basin to the north, 2nd Avenue to the east, 13th Street to the south, and the Gowanus Canal to the west. The location of the Historic MGP Site and the surrounding area is shown on Figure 2-1. The locations of historic and current features are shown on Figure 2-2.

A portion of the Historic MGP Site was the subject of previous remedial/redevelopment activities undertaken by FC Gowanus, an independent third party developer, with NYSDEC oversight. This RI Report details investigation activities for those portions of the Historic MGP Site that were not addressed by the previous remedial/redevelopment activities, i.e., the "Current Site." The Current Site occupies all or portions of five properties as shown below and summarized on Figure 2-3 and in Section 2. 2.

Block/Lot Number	Owner's Name and Address	Operator's Name and Property Address	Current Status
Block 1007 Lot 172	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Pathmark 1 – 27 12th Street Extension or 2 11th St. Brooklyn, NY 11215	A retail shopping plaza (strip mall) including a large grocery store (Pathmark) and smaller retail shops.
Block 1025 Lot 16	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Pathmark 22 – 42 12th St. or 21–41 13th St. Brooklyn, NY 11215	A parking lot, part of the retail shopping plaza occupying lot 172.
Block 1025 Lot 20	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Pathmark Hamilton Place Brooklyn, NY 11215	A parking lot, part of the retail shopping plaza occupying lot 172.
Block 1025 Lot 100	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Not Available 50 12th Street Brooklyn, NY 11215	Used as a retail parking lot selling used automobiles during the majority of the RI work. Currently a vacant, asphalt-paved lot.
Block 1025 Lot 26	Milea Associates II LLC 12-60 12th Street Brooklyn, NY 11215	Multiple vendors including NY Hardwoods and Lumber Liquidators 60-64 12th Street Brooklyn, NY 11215	Currently a one to two-story garage converted to retail stores.

2.2 Adjacent/Off-site Properties

The Current Site is bounded by the Gowanus Canal, commercial properties, former 11th Street right-of-way, and 13th Street. To the west is the Gowanus Canal, beyond which are transportation/utility use (Block 483, Lot 1) and industrial use (Block 483, Lot 11) properties. To the east are a Lowe's Supply Store (Lowe's) and 2nd Avenue, beyond which are commercial and residential properties. To the south are 13th Street, commercial properties, and the Gowanus Expressway (Interstate 278). To the north is a portion of the Lowe's parking lot, including the former 11th Street right-of-way. The properties occupied by Lowe's (Block 1007, Lots 118 and 220) and associated parking lots (Block 1007, Lots 1 and 219) were the subject of a previous remediation, by FC Gowanus, under NYSDEC prior to their current configuration. To the south and west of the Current Site lie two properties (Block 1025, Lots 1 and 52) that were previously part of the Brooklyn Alcatraz Asphalt Company (BAAC). Across the Gowanus Canal to the west is a property occupied by Greco Brothers Redi Mix Concrete located at 381/539 Smith Street (Block 483, Lot 1). A summary of the adjacent/off-site properties is presented below and provided on Figure 2-3.

Block/Lot Number	Owner's Name and Address	Operator's Name and Property Address	Current Status
Block 1007 Lots 10 and 269	NYC Department of Business Services 110 Williams Street New York, NY 10038	Not Available – Vacant Lot 12th St. Brooklyn, NY 11215	Part of the retail shopping plaza. Parcel contains a permanent sewer easement.
Block 1025 Lot 18	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Pathmark Hamilton Place Brooklyn, NY 11215	Part of the retail shopping plaza as part of the parking lot. Parcel contains an easement.
Block 1007 Lot 118	RRG Gowanus Canal, Inc. and Forest City Master Associates III, LLC	Lowes 118 2nd Avenue Brooklyn, NY 11215	One-story retail store for Lowe's
Block 1007 Lot 220	RRG Gowanus Canal, Inc. and Forest City Master Associates III, LLC	Lowes 118 2nd Avenue Brooklyn, NY 11215	One-story retail store for Lowe's
Block 1007 Lot 1	RRG Gowanus Canal, Inc. and Forest City Master Associates III, LLC	Lowes 118 2nd Avenue Brooklyn, NY 11215	Vacant lot used for parking
Block 1007 Lot 219	RRG Gowanus Canal, Inc. and Forest City Master Associates III, LLC	Lowes 118 2nd Avenue Brooklyn, NY 11215	Vacant lot used for parking
Block 1025 Lot 1	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Pathmark Hamilton Place Brooklyn, NY 11215	Part of the retail shopping plaza as part of the parking lot. Parcel contains an easement.
Block 1025 Lot 52	Gloria Farran and Iron Commercial Realty, LLC	Not Available – Vacant Lot 65 13th Street Brooklyn, NY 11215	Vacant lot
Block 480 Lot 1	Smith Street Properties, LLC.	Bayside Fuel Oil Depot 527 Smith Street Brooklyn, NY 11231	Buildings (4) on property, fuel oil terminal
Block 483 Lot 1	381 Hamilton Avenue Corp. 87-13 Rockaway Blvd.	Greco Brothers Redi Mix Concrete 381/539 Hamilton Avenue Brooklyn, NY 11215	Concrete plant
Block 483	539 Smith Street Realty	Greco Brothers Redi Mix	Concrete plant

Block/Lot Number	Owner's Name and Address	Operator's Name and Property Address	Current Status
Lot 11		Concrete 551 Smith Street Brooklyn, NY 11231	
Block 483 Lot 20	539 Smith Street Realty	Benson Scrap Iron and Metal 543 Smith Street Brooklyn, NY 11231	Metal scrap yard
Block 1020 Lot 1	City of New York 127 2nd Avenue Brooklyn, NY 11231	City of New York Department of Sanitation 127 2nd Avenue Brooklyn, NY 11231	New York City Department of Sanitation (NYCDOS)
Block 486 Lot 18	New York City Fire Department	252 Lorraine Street Brooklyn, NY 11231	New York City Fire Department

2.3 Current Site Topography and Drainage

The topography of the Current Site is relatively flat with an elevation of approximately 10 ft North American Vertical Datum 1988 (NAVD88) and gently sloping from east to west, from 2nd Avenue to the Gowanus Canal.

Nearly all the Current Site is covered by buildings or pavement. Therefore, little to no precipitation is captured through infiltration, but instead flows across the Current Site from east to west towards the Gowanus Canal via sheet flow, and is captured by an onsite storm water drainage system. The discharge point for the storm water management system at the Current Site, composed of catch basins connected by buried pipe, is the Gowanus Canal, a NYSDEC Class D (SD) water body (the most degraded saline water body classification; [GEI, 2007]), designated for fishing and fish survival.

The Gowanus Canal is a tidally influenced channel that opens to Gowanus Bay and Upper New York Bay (USEPA, 2012). The canal experiences a semidiurnal tidal cycle with a vertical tidal range from 4. 7 to 5.7 feet (USEPA, 2012). The only fresh surface water inflow to the canal are wet-weather combined sewer outfall (CSO) and stormwater discharges (USEPA, 2012) making up 90% of the freshwater flow. Because of its narrow width, limited freshwater input and enclosed upper end, the canal has low current speeds and limited tidal exchange with Gowanus Bay (USEPA, 2012). Circulation is enhanced by the addition of water from the Flushing Tunnel located at the head of the canal, when it is operating (USEPA, 2012). The estimated annual discharge of CSOs to the Gowanus Canal in 2008 was approximately 122. 6 million gallons annually to the north of the Union Street Bridge (GEI, 2012).

2.4 Regional Geology

According to P. E. Misut and Jack Monti Jr.'s, 1999 article, "Simulation of ground-water flow and pumpage in Kings and Queens Counties, Long Island, New York," in the U. S. Geological Survey Water-Resources Investigations Report 98-4071, the bedrock throughout the region consists of undifferentiated gneiss, schist, and pegmatite. The crystalline bedrock exhibits a soft, clayey, weathered zone up to 100 ft thick. Based on local control points, bedrock at the Current Site is estimated to be at depths greater than 160 feet below ground surface (ft bgs). The bedrock is relatively impermeable, with water transmitted along faults and fractures.

According to Herbert Buxton and Peter K. Shernoff's 1999 article, "Ground-Water Resources of Kings and Queens Counties, Long Island, New York," United States Geological Survey, Water Supply Paper 2498, unconsolidated deposits overlying crystalline bedrock include the Lloyd Sand Member of the Raritan Formation, which acts as an aquifer and consists mainly of deltaic deposits of fine to coarse quartzose sand interbedded with gravel, clay and silt. The unit ranges from 0-300 feet thick and from 90-825 feet below sea level. The Lloyd Sand Member yields up to 2000 gallons per minute (gpm) in some wells. Specific capacities are as high as 44 gpm per foot of drawdown. Water within the aquifer is often under artesian pressure and the horizontal hydraulic conductivity is reported to be in the range of 33-75 feet per day (ft/d) (Misut and Monti, 1999). According to (Misut and Monti, 1999), the Lloyd Sand Member is locally absent in King's County near New York Bay in the area of the Current Site.

The Clay Member of the Raritan Formation, which acts as a confining unit to the underlying Lloyd Sand aquifer, consists of gray, white, red or purple deltaic clay and silty clay and some interbedded layers of sand and gravel. The unit ranges from 0-200 feet thick and from 30-650 feet below sea level (Buxton and Shernoff, 1999). The Clay Member is an impermeable confining unit. Local lenses and layers of sand and gravel with moderate to high permeability are encountered in some areas. The vertical hydraulic conductivity is 0.001 ft/d (Misut and Monti, 1999). According to (Misut and Monti, 1999), the Clay Member of the Raritan Formation is either very thin or locally absent in King's County near New York Bay in the area of the Current Site.

The Jameco Gravel, which acts as an aquifer, overlies the Clay Member of the Raritan Formation and consists of coarse sand and gravel with some cobbles and boulders consisting of dark brown and dark gray igneous, metamorphic, and sedimentary rocks. The unit ranges from 0-200 feet thick and from 90-240 feet below sea level (Buxton and Shernoff, 1999). The Jameco Gravel is highly permeable and may yield as much as 1,500 gpm. Specific capacities are as high as 135 gpm per foot of drawdown. Water is often under artesian pressure and the horizontal hydraulic conductivity is reported to be in the range of 200-300 ft/d (Misut and Monti, 1999). According to (Misut and Monti, 1999), the Jameco Gravel is believed to be present immediately above crystalline bedrock at the Current Site.

The Gardiners Clay, which acts as a confining unit to the underlying Jameco Gravel, is a greenish-gray clay and silt with some interbedded sand and gravel. The unit ranges from 0-150 feet thick and from 40-200 feet below sea level (Buxton and Shernoff, 1999). The Gardiners Clay is the principal confining unit in the region. Locally, the Gardiners Clay may contain moderate to highly permeable sand and gravel lenses. The vertical hydraulic conductivity ranges from 0.001-0.0029 ft/d (Misut and Monti, 1999).

The Upper Pleistocene glacial deposits, which act as an aquifer overlying the Gardiners Clay, include terminal moraine deposits, ground moraine deposits, and glacial outwash deposits consisting of clay, sand, gravel and boulders. The unit ranges from 0-300 feet thick (Buxton and Shernoff, 1999). The hydrogeologic properties of the Upper Pleistocene glacial deposits (upper glacial aquifer) are highly variable. The till has low permeability, the sand and gravel part of the outwash is highly permeable. Yields of individual wells are as much as 1,700 gpm. Specific capacities of wells are as much as 109 gpm per foot of drawdown and the horizontal hydraulic conductivity ranges from 20-80 ft/d in the moraines to 200-300 ft/d in the outwash (Misut and Monti, 1999).

The recent Holocene deposits are grouped with the Upper Pleistocene glacial deposits and consist of tan to white beach sand and gravel, dune sand and gray bay bottom silt and clay deposits. The beach and dune deposits are well stratified and well sorted. The recent deposits also contain fill made up of earth, rocks, concrete fragments, ash, rubbish and hydraulic fill (Misut and Monti, 1999). The sandy beds of the Holocene deposits have moderate to high permeability beneath barrier beaches (Misut and Monti, 1999).

2.5 Pre-MGP History

The following sections summarize the Historic MGP Site history and usage based on a review of Sanborn maps covering the 110 year period of 1886 through 1996, aerial photographs, historical survey maps, historical BUG drawings, and historical photographs, some of which were not available during preparation of the RIWP (AECOM, 2009). A summary of the historical information is provided in Table 2-1 and provided on Figure 2-2.

The 1776 survey of the Gowanus Creek shows that the area surrounding the creek was a tidal marshland that extended to the east of the current location of 2nd Avenue prior to development of the RI Study Area. A figure showing the area of the former MGP prior to development is shown on Figure 2-4. Before the mid-1840s, the creek and its tributaries were dammed and used primarily to power tide mills (USEPA 2012). By the mid-1840s, Brooklyn was rapidly growing and the Gowanus marshes were considered to be a detriment to local development (USEPA 2012). In 1847 and 1848, plans to construct basins along the creek to drain the marshlands for development were drafted. The Gowanus Canal served as an open sewer when it was initially constructed in the late 1860s (USEPA 2012). By the late 1870s, sewers entering the canal carried a combination of household waste, industrial effluent, and stormwater runoff (USEPA 2012). By the 1880s the canal was constructed to its current configuration. In 1911, New York City began operating the Gowanus Canal Flushing Tunnel to address the canal's serious water quality issues (USEPA 2012). The Flushing Tunnel connects the head of the canal with Buttermilk Channel in Upper New York Bay (USEPA 2012). It was designed to improve circulation and flush pollutants from the canal by pumping water in either direction (USEPA 2012). The Flushing Tunnel operated until the mid-1960s, when it fell into disrepair (USEPA 2012). The Flushing Tunnel was rehabilitated and reactivated in 1999 by the New York City Department of Environmental Protection (NYCDEP) but was determined to be inadequate. In July 2010, the Flushing Tunnel was shut down by NYCDEP to perform facility improvements in an effort to improve operation of the Tunnel. The Flushing Tunnel resumed operation in May of 2014.

2.6 MGP Site History

The Historic MGP Site was operated by the Metropolitan Gas and Light Company as early as 1872. Historic MGP Site buildings noted on the 1886 Sanborn map include a coal shed, several one-story buildings, and retorts, indicating that the original gas manufacturing process was coal carbonization, though a note on the map states, "Used for Storage Only", indicating that at this time gas was not being produced and the Historic MGP Site may have been used to store gas produced at another MGP. By 1888, gas production appears to have resumed, based on the date of construction for Holder No. 2. In 1895, the Metropolitan Works became part of The Brooklyn Union Gas Company (BUG), which was incorporated in that year.

Several gas holders were constructed at the Historic MGP Site over its history. Gas holders typically stored gas that was produced at an MGP. In general, there were two classifications of holders: relief holders, where gas was held and cooled prior to purification, and distribution holders, where purified gas was held. Holder No. 1 (320,000 cubic feet (ft^3) capacity, 2-lifts) was constructed with a subsurface brick tank and a concrete foundation in 1872, based on internal BUG documentation (BUG Drawing 1-G-120 and Gas Holder Inventory Sheet dated December 31, 1915). Holder No. 2 (370,000 ft^3 capacity and 2-lifts) was built in 1888 and had a below ground brick tank and a concrete foundation. Holder No. 3 (575,000 ft^3 capacity and 3-lifts) was constructed in 1891 with a concrete foundation and above ground steel tank. In 1903, a 105,000 ft^3, 2-section relief holder (Holder No. 4), with an above ground steel tank and concrete foundation was constructed. Holder No. 5, 5-lifts with 5 million ft^3 capacity, was built in 1904 with an above-ground, steel tank and concrete foundation. Holder No. 5 remained in use after decommissioning of the Metropolitan works MGP and would have held gas produced off-site at another MGP.

Historical records suggest that the Historic MGP Site operated a coal carbonization process until sometime prior to 1915, by when the plant appears to have been converted to a carbureted water gas process, and included oil storage tanks located east of Holder No. 2. A BUG photograph (No. 1285) dated August 17, 1910 (Appendix A) shows the roof removed from the generator house (which was apparently under construction/renovation), suggesting that the conversion of the plant to the water gas process was ongoing in 1910.

Holder No. 4 was used as a relief holder from its construction (1903) until approximately 1915, after which the Sanborn Map labeled it a hydrogen holder. A 1928 survey of the Historic MGP Site indicates that Holder No. 4 was no longer in use by this time, and Holder No. 1 was serving as the relief holder. After demolition of the MGP, Holder No. 4 was used as a coal bunker until approximately 1957, as this was the year the property was sold. The re-use of former Holder No. 4 as a coal bunker suggests that any MGP residuals present in the above-ground Holder No. 4 tank were significantly removed. Based on available historical records, the MGP appears to have operated until sometime during the time period of 1928 to 1935 based on information contained in a 1928 Metropolitan Works BUG survey and BUG drawing 1G120 (corrected to 1935).

Military By-Products Processing Plant

Due to shortages in the base products used in the manufacture of explosives during World War I, the US Government identified existing gas works operations as a significant source of those materials that were not actively utilized. The primary base products produced during distillation of coal and gasification of petroleum distillates used for enriching the gas (water gas) included:

- Light Oil
- Benzol
- Toluol
- Xylol

To better capture these base products (primarily crude toluol), the US Government initiated a by-products recovery program to install standardized scrubbing units at several existing metro New York area MGP works plants including the Metropolitan Works, without disruption to the existing gas manufacture and distribution systems (McGurty, 1919). The construction of the by-products recovery facilities at the existing MGPs, including Metropolitan Works, was completed by contractors working for the US Government and directed by the Ordinance Department (USORD) of the US Government under a unit developed in 1917 known as the “Toluol Unit,” for benefit of the US Government.

The government provided material such as wash oil for use in the plants, paid direct materials and labor costs, as well as overhead and administrative and general expenses associated with the operation of the by-products process plants (USORD, July 2, 1918). The government also made decisions regarding the disposal of wastes, such as crude still residue, and various by-products (USORD, June 5, 1918). The United States provided indemnities to BUG affording “full and complete protection in the carrying out of the terms of this contract and of the directions of the Contracting Officer.” The United States “hereby agrees, for and during the term of this agreement, to indemnify and hold the Contractor harmless from any and all costs, charges and expenses including liability for damages imposed upon the Contractor by the municipal authorities in any permit for or consent to the construction, existence, use, maintenance, operation, or removal of any mains, pipes, conduits, poles, or any other sub or super structures.”

The United States equipped the Metropolitan Works by-products recovery plant with a gas scrubbing system, wash oil stripping system, light oil fractionating equipment, storage facilities, and additional equipment (USORD, January 4, 1918). The Metropolitan Works by-products recovery plant was rated to scrub 12,000 million cubic feet of water gas per day. The estimated annual pure toluol production was 295,000 gallons. Between August and November 1918, the Ordnance Department produced 467,687 gallons of light oil, 137,789 gallons of crude benzol, 119,728 gallons of crude toluol, and 90,295 gallons of solvent naphtha at the Metropolitan Plant (USORD, n. d.).

The government-owned light oil recovery plant at Metropolitan Works was constructed between December 1917 and August 1918 and BUG operated the facility under contract with the US Government from October 8, 1918 (Porter, 1919) to November 22, 1918. The government owned the facility until May of 1920. The by-products recovery facility was primarily located along 2nd Avenue as outlined on Figure 2-2. Based on a 1921 BUG drawing (2-G-126), a still house was present at the intersection of 12th Street and 2nd Avenue, associated storage tanks were noted at the corner of 11th Street and 2nd Avenue, and tower scrubbers (listed as not used) were noted adjacent to and north of the No. 2 Gas Holder (Figure 2-2). One sewer connection at the Metropolitan By-Products Recovery Plant is depicted on Brooklyn sewer maps.

The Ordnance Department decided to attempt to sell the government-owned toluol plants as salvage in or about December 1919. On May 28, 1920, the United States entered into an agreement with McLoughlin for the sale of the government-owned equipment at the Metropolitan Plant.

2.7 Post-Historic MGP Site History

A hand-written note on BUG drawing 1G120, dated 1909 and revised in 1935, states that in 1935, the Metropolitan Works between 12th and 13th Streets was demolished, and some buildings south of 12th Street, including Holder No. 5 continued to operate as "BUG 12th Street Holder Station." The 12th Street Holder Station is identified on all aerial Historic MGP Site figures. The Holders No. 1, No. 2, No. 3, and No. 4 were purged and disconnected as noted on the BUG drawing #1G120, dated 1909, corrected in 1935. In the 1928 BUG survey of the Metropolitan Works, Holders 2, 3, and 4 are noted "not used" although they are shown as being present. It is unknown whether the Holders No. 1, 2, 3, and 4 were disconnected in or prior to 1935. BUG drawing 1G-120, dated 1937 and corrected to 1956, and a 1938 Sanborn Map confirm the 12th Street Holder Station designation. The 1938 Sanborn Map also labels Holder No. 4 as "to be coal bunker" and shows Holder No. 5 as being present. Holders 1 through 3 are no longer present on the 1938 Sanborn Map indicating that they were likely demolished sometime between 1935 and 1938.

BUG drawing 1G-120 for the 12th Street Holder Station, dated 1937 and corrected to 1956, includes handwritten notes indicating that:

- Block 1007, Lot 172 was sold on August 22, 1957
- Block 1007, Lot 118 was sold on May 18, 1948
- Block 1007, Lot 219 was sold November 15, 1949
- Block 1025 Lot 16 (coal storage, Holder No. 5, 12th Street Holder Station) was sold on January 31, 1958
- The parcel between the 12th Street Holder Station and 2nd Avenue, constituting a portion of current Block 1025, Lot 26, was sold on August 30, 1948 and January 31, 1958

By 1950, the northeastern portion (Block 1007, Lot 118) of the Historic MGP Site was listed as housing the US Post Office Garage and Repair shop, with some former MGP structures (e. g., Holder No. 4 and a boiler

house) located closer to the Gowanus Canal on the western portion of the Historic MGP Site. The southern portion of the Historic MGP Site, also identified as the 12th Street Holder Station, still housed Holder No. 5 and the exhaust house, with the parcel listed as a storage area for old electric cables.

The 1969 Sanborn map indicates BUG as the owner of parcels on Block 1025 (the 12th Street Holder Station), where Holder No. 5 was still shown to be present. All other above ground structures related to the former MGP operations are no longer present. The 1969 Sanborn map also shows a food products warehouse present adjacent to the Gowanus Canal, on current Block 1007, Lot 172. By 1977, the Sanborn map indicated that all structures from the former MGP had been removed from the surface of the Historic MGP Site. Sanborn maps from 1982 through 1996 show no major changes in the Historic MGP Site usage, with the US Postal Service (now demolished) and formerly present in the current Lowes property (Block 1007, Lots 1, 118, 219, and 220), the food products warehouse (currently a Pathmark Supermarket), and parking covering the footprint of the former MGP on Block 1007, Lots 16, 18, 172, and 269. The portion of the MGP south of 12th Street, also identified as the 12th Street Holder Station, on Block 1025, Lot 26 was developed into a two story building which remains present. The building housed a former maintenance garage and is currently used for mixed retail and office space.

2.8 Historic Land Use along the Gowanus Canal

The Gowanus Canal supported the transport of bulk materials such as coal, petroleum, asphalt, and lumber, as well as the rapid growth of industry in Brooklyn and surrounding areas, and the land use adjacent to Gowanus Canal reflected this industrialization. Figure A-1 in Appendix A under the subsection “Third Party Sites with Historical Usage of PAHs and Tar” provides a summary of historic and/or current businesses using tar and PAHs along the Gowanus Canal in proximity to the Metropolitan former MGP. Operations identified as potential sources of PAHs and tar in the Historic MGP Site area can be divided into the following general categories:

- Asphalt plants
- Petroleum use/storage
- Coal yards
- Creosote plant

The closest former or current business operations to the Metropolitan Historic MGP Site outlined on Figure A-1 include:

- The BAAC bordering the Historic MGP Site to the west and east
- The Cranford Asphalt Company bordering the Historic MGP Site to the northeast
- The New York City Transit Authority property to the west and across the canal from the Historic MGP Site
- The US Postal Service (USPS) and US General Service Administration (USGSA) to the east of the Historic MGP Site
- Cibro Petroleum Products and Bayside Coal and Fuel Oil Company (Bayside) to the northwest and across the canal from the Historic MGP Site

A summary of key properties in proximity to the Historic MGP Site is provided in the following paragraphs.

Brooklyn Alcatraz Asphalt Company: The BAAC property began operations on the Gowanus Canal in or around 1903 on Block 1025, Lot 1 (Figure 2-3). A fire occurred at Brooklyn Alcatraz's facility in 1911, when hot asphalt streamed out of a supply trough and set fire to a three-story building at the site. In 1913, the company had a substantial contract with New York City (NYC) for street paving. The earliest map of the facility located is a 1915 Sanborn map (Appendix A), which depicts a structure for storage, a garage, a blacksmith and repair shop on the northerly side of the property. The main processing building was located on the southerly portion of the site, and contained asphalt tanks (located over boilers), dryers, and an engine room. The process area had an earth floor. A large iron tar tank was located near Gowanus Canal at the northeasterly side of the process building. A coal bin was located adjacent to the process building on the northwesterly side, and a 20,000 gallon asphalt tank a located on the southerly side of the process building. Brooklyn Alcatraz also had some office space across 13th Street and an additional area located further inland which contained additional garage space, cooperage area, and a feed store room.

In 1926 the US Army Corps of Engineers (USACE) reported that Brooklyn Alcatraz used the wharf for receiving cement, asphalt, sand, and broken stone. The site reportedly had a timber bulkhead with earth fill, and the company had a derrick with a 55-foot boom and a 1-ton bucket.

The 1938 Sanborn map indicates that Brooklyn Alcatraz's facility was not in operation at the time the insurance inspector visited the site. However, BAAC reportedly was caught up in a City paving fraud in 1940, so it appears operations may have continued past 1938; however, in the 1942 survey the USACE indicated that the asphalt plant structures had been removed during the construction of the Hamilton Avenue Bridge. Brooklyn Alcatraz's property was sold by court order in 1944.

Cranford Asphalt Company: Cranford Company began acquiring property on Gowanus Canal in 1903 and built a small asphalt plant in 1904 (Appendix A, 1904 Sanborn, expanded view north subsection) on Block 1007, Lot 1 (Figure 2-3). Historical records indicate the plant faced Ninth Street and extended along the east side of the Gowanus Canal to Tenth Street. A New York Times article reporting on a fire at the Cranford plant in May 1910 indicated that there was formerly a two-story wood framed plant building on the north side of the property containing gasoline and petroleum powered generators. Behind this building there was a three-story building used as a mill. Adjacent to the mill was a swinging crane reported to be approximately 100 feet tall. In the eastern portion of the property it was reported that the site contained approximately 500 barrels of crude oil and tar and adjacent to this area were three tanks, two 1,000 gallon capacity crude oil tanks and one 500 gallon gasoline tank. This area was reportedly saved from catching fire during the May 1910 fire that significantly damaged the plant. The company continued to acquire small pieces of property through 1911 and rebuilt their plant following the fire (Appendix A, 1915 Sanborn, expanded view north subsection). A Sanborn map from 1915 show the plant used the 11th Street basin area to off-load sand through a conveyor system. Subsequent Sanborn maps from 1922, 1928, 1938, and 1950 (Appendix A, expanded view north subsection) document the plant layout and modifications over time. Records indicate the business continued to operate through 1950. Operations ceased around 1953. The company continued to exist and leased the property to the USPS through at least 1965. Ultimately the company sold the site in 1973.

USPS and USGSA Properties: The USPS property is located at 124 and 136-138 Second Avenue and included a Vehicle Maintenance Facility (VMF), a Detached Mail Unit (DMU) facility, and support facilities. USEPA issued the General Services Administration (GSA), the agency responsible for federally owned property, a general notice letter (GNL) for the Gowanus Canal site. The initial leases for the DMU and VMF were with the United States of America. In addition, Motorola Holdings Company assigned its rights to the property to the Reconstruction Finance Corporation. GSA is the successor to the Reconstruction Finance

Corporation. However, when the government acquired title to the property between 1980 and 1983, title was placed in the USPS.

The USPS operated the DMU from 1952 to 1998. The DMU was a two-story concrete block structure, with a footprint of approximately 50,000 square feet, built on a concrete slab foundation. The slab foundation was elevated such that the first floor was raised to provide loading dock areas on the north and south sides of the building. Both floors of the building were comprised of large open areas for mail handling and distribution. A utility area was constructed on the north central side of the building. Four 10,000-gallon heating oil underground storage tanks (USTs) were located beneath the loading platform near the utility area. Additional structures on the DMU site included a two-story brick building with overhead garage doors that provided access for vehicles. A covered storage area without sides projected from the north wall of the building. Another structure on-site was a warehouse building located adjacent to the Gowanus Canal. Sanborn maps (Appendix A) indicate that historically this warehouse was used for used machinery and chemical storage. A loading dock in the building opened onto the canal. Catch basins were located in the partially paved parking area between the buildings. Consultants working for the USPS indicated that the catch basins drained into the Gowanus Canal.

The USPS operated at the VMF from 1950 to June 1992 and sold the property in 2002. The VMF was a one-story building of about 85,000 square feet, which contained the vehicle service facilities for the USPS in the area. The building was a large open drive-through structure that included service bays for vehicle maintenance. It was a concrete block structure, built on a concrete slab foundation, and had a partial basement. The building included a vehicle wash apparatus, spray painting booth, USTs, aboveground storage tanks, and vehicle fuel pumps and storage tanks. A boiler room was located on the south side of the building, which had a floor drain for boiler blow-down. The facility contained numerous floor drains in the vehicle service area and a sub-grade vault, containing an oil-water separator, which consultants working for the USPS believed were connected to the city's combined sewer system. In the spring of 1990, USPS personnel discovered a blockage in the sewer lines on site. The drain lines were "snaked out" and a "stoppage" discovered which "indicated the likelihood of a break in the line somewhere under the building." Moreover, when City personnel were cleaning out the street sewer lines in October 1990, oil was found flowing into the City's sewers from the VMF sewer connection. USPS personnel informed USPS' consultant (Rizzo) that the drain lines were snaked and the oil/water separator was cleaned on December 1, 1990.

Bayside Coal and Fuel Oil Company: Bayside operates at two sites on the Gowanus Canal: the Bond Street Terminal and the Smith Street Terminal. The Smith Street Terminal is located on the easterly side of the Gowanus Canal north of Hamilton Avenue and closest to the former MGP. The address is 503-527 Smith Street (Block 480, Lots 1 and 8). Bayside operates a bulk petroleum storage and distribution facility at this site. Bayside's operations at this site began in 1994 and continue to the present.

Bayside receives petroleum products at the Smith Street Terminal by barge via two 8-inch and four 6-inch pipelines that extended from the wharf to three steel storage tanks with a total capacity of 48,400 barrels. An aboveground diesel tank was installed in 2001. The storage tanks identified at the site are:

- Tank 001, 500,000 gallons, underground, #6 fuel oil, installed in 1946
- Tank 002, 390,012 gallons, underground, #6 fuel oil, installed in 1946
- Tank 003, 200,004 gallons, underground, #4 fuel oil, installed in 1946
- Tank 004, 448,182 gallons, aboveground, #2 fuel oil, installed in 1972
- Tank 005, 448,182 gallons, aboveground, #2 fuel oil, installed in 1972

- Tank OBF1, 3,000 gallons, aboveground, #2 fuel oil, installed in 1992
- Tank GDF1, 275 gallons, aboveground, diesel, installed in 2001
- The treatment system at the site consists of an oil/water separator with a 6,000-gallon UST pre-separator holding tank and 5,000-gallon UST spill containment tank

Since operations at the Smith Street Terminal began, Bayside Depot has moved approximately 30 to 40 million gallons of petroleum products per year.

In September of 1994, Bayside Depot entered into an agreement to operate the terminal while 527 Smith Street, Inc. retained ownership of the terminal and continued the remediation (see following sentences). In July 1996, Bayside Depot acquired the terminal and entered into a Consent Order with NYSDEC to continue the remediation work. At the time Bayside Depot entered into the Consent Order, ongoing remediation efforts at this time included pumping floating product from 10 monitoring wells.

In December 1996, Bayside's consultant, Resource Control Corporation (RCC), submitted a Remedial Action Plan to the NYSDEC for construction and installation of a product recovery system at the terminal. RCC identified a hydrocarbon plume that covered the central, northwestern, and southeastern portions of the property. The consultant estimated that there was 10,200 gallons of liquid phase petroleum (i.e., "product") in the plume. Pumping continued and by July 2003, RCC's review of the product in the monitoring wells indicated the existence of a single isolated plume in the northern portion of the site. The plume's highest product thickness was 0. 95 feet in well GT-07. In October 2003, RCC informed the NYSDEC that the product recovery system had recovered a significant amount of oil from the ground and oil only sporadically appeared in the wells. As a result, RCC operated the recovery system only a few times a week to remove product from the wells.

In September 2004, Bayside's new consultant, Fenley & Nicol Environmental (F & N), examined all existing monitoring wells for the presence of liquid phase hydrocarbons and found two areas of product on the site. Results of later sampling events characterized # 2 fuel oil type hydrocarbons in the plume in the easterly area of the site, near the Gowanus Canal. The second area of product was located in the plume on the westerly side of the site, near Smith Street, which contained relatively high viscous # 6 fuel oil type carbons. By December 2004, F & N stated that the overall product thickness beneath the site had begun to decrease.

Remediation activities continued but in May 2009, the NYSDEC noted that the thickness of the product in MW-5 had risen from 0. 2 feet to 6.8 feet in just two months and informed Bayside Depot that this increase may indicate a new discharge. The last quarter of testing in 2009 showed only one well with product and MW-5 with trace levels of floating product. Based on these results, F & N stated that separate phase hydrocarbons beneath the site had been sporadic and did not follow a pattern. The consultants concluded that the tidal action of the Gowanus Canal might be influencing the behavior of the residual product level in the wells.

Operations and Maintenance activities related to the ongoing remedial actions continued at the Bayside property until at least 2010.

Two additional properties in proximity to the Historic MGP Site with known hydrocarbon releases include:

- A NYSDEC spill number (07-00373) was identified for the former maintenance garage (address of 60 12th Street) to address a release from USTs including (1) 3,000 gallon diesel tank and (1) 3,000

gallon gasoline tank. Documented soil and groundwater impacts include volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and MTBE.

- One adjacent property identified during a records search is the NYC Department of Sanitation (DOS) UST NYSDEC Spill site (spill number 9310764/0007546), known as the "Brooklyn West 06 Site", with an address of 127 2nd Avenue. This property is east of 2nd Avenue adjacent to the eastern edge of the Lowes building and is upgradient from the Historic MGP Site. Available data indicates a multi-phase extraction system is operating at the NYCDOS property. The system is recovering VOC impacted groundwater with evidence of free-phase petroleum at a minimum of one well location.

Other properties with known or suspected historical uses of PAHs and/or tar in proximity to the Historic MGP Site include:

- The former Barrett Manufacturing plant at Halleck and Smith Streets southwest and down-canal from the Site, who was a major purchaser, storer, processor, manufacturer, and shipper of coal tar products.
- The former Warren Chemical & Manufacturing Company located south of the Site adjacent to Hamilton Avenue that operated as an asphalt plant and distiller of coal tar used to manufacture tarred felt and asphalt materials.
- The former Coal Tar Product Company located at 2nd and Hamilton Avenue and later at Creamer and Smith Streets that operated as a coal tar roofing manufacturer and were a major purchaser, storer, and user of coal tar products.
- The City of New York's former asphalt plant at the 7th Street basin that used coal tar for its road repair activities.
- The City of New York's former waterfront dump and incinerator property located at the intersection of Hamilton Avenue and the Gowanus Canal.
- The former Ernest Zobel Co. and Ernest Zobel Chemical Corporation at 92-112 9th Street and 521 3rd Avenue that manufactured dyes, printing ink, and paints. Dyes were manufactured almost exclusively from coal tar products.
- The former Iridescent Dyestuff & Color Company at 247-251 Bush Street who manufactured dyestuffs made almost exclusively from coal tar products.
- The former Thompson & Company and Nelsons Brothers coal yard located at 9th and Smith Streets.

A summary of the Gowanus Canal industries with documented PAH and tar sources are provided in Appendix A.

2.9 Potential Source Areas for MGP-Related Residuals

Aside from the non-MGP sources identified in the previous section, historical research identified various former Historic MGP Site features and two adjacent off-site facilities which could have been potential source areas for MGP residuals. These potential source areas are shown on Figure 2-2 and are summarized as follows:

- Areas adjacent to former Gas Holders No. 1, No. 2, and No. 3, which were previously investigated and remediated.

- Areas adjacent to and surrounding former Gas Holders No. 4 and No. 5.
- The Former Generator House and Tar Tank No. 2 area (along the western edge of the Current Site).
- The former BAAC footprint (adjacent to the southwestern boundary of the Current Site) and the former Cranford Company asphalt manufacturer's footprint (adjacent to the northeastern boundary of the Current Site) as both properties may have received byproducts from the former MGP.

2.10 Previous and Concurrent Investigations and Remedial Work

A review of the historical information available for the Historic MGP Site was performed by Nelson, Pope & Voorhis, LLC (NP&V) with the results summarized in a report entitled "*Phase I Environmental Site Assessment*", dated May 15, 1997 (NP&V, 1997). The report included a review of the historic Sanborn Fire Insurance maps for the Historic MGP Site as well as other available information (including tax records, zoning records, and United States Geologic Society (USGS) Topographic Maps). A copy of the Sanborn maps is included in Appendix A, and a summary of the historical information obtained from these sources is presented in Table 2-1.

Previous investigation and remediation activities have occurred at the Historic MGP Site between 1997 and 2007 prior to development of the property to its current state. A list of previous reports reviewed is summarized on Table 2-2. Copies of previous reports reviewed are provided in Appendix A of the RIWP (AECOM, 2009). Figure 2-5 illustrates the pre-RI sampling and remediation locations, including recovery well locations and a summary of areas previously remediated and closed by NYSDEC.

The majority of these locations are near the southern portion of the main former MGP parcel (Block 1007, Lot 220), where three former gas holders (Holders No. 1, No. 2, and No. 3) and historic above ground oil storage tanks (ASTs) and USTs part of the former US Postal Service building Block 1007, Lot 118, were located. The eastern portion of the Historic MGP Site north of 12th Street, currently occupied by Lowe's (Block 1007, Lots 219 and 220) and two adjacent parcels (Block 1007, Lots 1 and 118), were investigated and remediated through excavation of the former oil tanks and Holders No. 1, No. 2, and No. 3. In addition, approximately 44 recovery wells were installed to allow recovery of free phase non-aqueous phase liquid (NAPL) along the downgradient boundaries of the Previously Remediated Area. This work, completed in 2003 by FC Gowanus, allowed the eastern portion of the former MGP and the two adjacent parcels (Block 1007, Lots 1 and 118) to be closed by NYSDEC in September 2003. This portion of the Historic MGP Site presently houses a Lowes home improvement center and associated parking lot.

Information provided in these previous reports was used to develop the initial scope of work for this RI. Note that prior to initiation of the RI, many of the pre-RI investigation locations, including monitoring wells, were removed due to excavation activities associated with the FC Gowanus work. The only monitoring points present when the RI was initiated included the perimeter recovery wells (RW) RW-1 through RW-44 (located along the western edge (Block 1007, Lot 119) of the Lowe's parcel and three 4-inch monitoring wells (possibly including AMW-1 and AMW-2) located along 2nd Avenue near the intersection with 12th Street.

Information on other environmental reports is limited to a Tank Closure Report and a Phase II Environmental Assessment, both dated 2007, for the maintenance garage facility (Block 1025, Lot 26 [60 12th Street]). A list of available information related to the spill is provided in Appendix A of the RIWP (AECOM, 2009).