



Site Characterization Report

Former Pratt Refinery - 224055A
26 North 12th Street
Brooklyn, New York
Lot 1 of Tax Block 2277

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Acronyms List

AST	Aboveground Storage Tanks
AWQSGVs	Ambient Water Quality Standards and Guidance Values
Bbls	Barrels
BCP	Brownfields Cleanup Program
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BUG	Brooklyn Union Gas
CAMP	Community Air Monitoring Plan
COPC	Contaminants of Potential Concern
CSCO	Commercial Soil Cleanup Objectives
CVOC	Chlorinated Volatile Organic Compound
DNAPL	Dense Non-Aqueous Phase Liquid
DUSR	Data Usability Summary Reports
DVS	Data Validation Services
EFR	Enhanced Fluid Recovery
ELAP	Environmental Laboratory Accreditation Program
ESA	Environmental Site Assessment
GEI	GEI Consultants, Inc.
GPR	Ground-Penetrating Radar
HASP	Health and Safety Plan
LNAPL	Light Non-Aqueous Phase Liquid
M&E	Metcalf and Eddy of New York, Inc.
MGP	Manufactured Gas Plant
MOSF	Major Oil Storage Facility
MPFL	Major Petroleum Facility License
MTBE	Methyl Tert-Butyl Ether
NFA	No Further Action
NYC	New York City
NYCDPR	New York City Department of Parks and Recreation
NYCEDC	New York City Economic Development Corporation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
PAH	Polycyclic Aromatic Hydrocarbons
PCE	Perchloroethylene
PFAS	Per- and Polyfluoroalkyl Substances
PGWSCO	Protection of Groundwater Soil Cleanup Objectives
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride

Acronyms List (Continued)

QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Information System
RI	Remedial Investigation
RRSCO	Restricted Residential Soil Cleanup Objectives
SC	Site Characterization
SCO	Soil Cleanup Objectives
SCR	Site Characterization Report
SCWP	Site Characterization Work Plan
SI	Site Investigation
SOCONY	Standard Oil Company of New York
SOW	Scope of Work
SPDES	State Pollutant Discharge Elimination System
SVOC	Semivolatile Organic Compound
TAGM	Technical and Administrative Guidance Memorandum
TAL	Target Analyte List
TCE	Trichloroethylene
TOGS	Technical and Operational Guidance Series
T&P Shop	Terminals & Pipelines Shop
USCS	Unified Soils Classification System
UST	Underground Storage Tank
UUSCO	Unrestricted Use Soil Cleanup Objectives
VOC	Volatile Organic Compound

1. Introduction

This Site Characterization Report (SCR) summarizes the findings of the Site Characterization (SC) performed at the Former Pratt Refinery (224055A - Williamsburg), located at 26 North 12th Street, Brooklyn, New York and referred to on New York City (NYC) tax maps as NYC Tax Lot 1 of Tax Block 2277, shown on Figure 1 (Block 2277 Site). This SC work was performed pursuant to an Order on Consent (Order), which was entered into voluntarily by the City of New York and ExxonMobil Oil Corporation (collectively, “Parties” or “Respondents”) on December 28, 2018. The Respondents are represented by Roux Environmental Engineering and Geology, D.P.C. (Roux) and TRC Engineers, Inc. (TRC) (collectively, the “Consultants”), who are responsible for the implementation of the SC work.

The SC was completed in accordance with the Site Characterization Work Plan (SCWP) dated November 19, 2018 and approved by New York State Department of Environmental Conservation (NYSDEC) as it was incorporated into the Order. The Order preserves the Respondents’ rights to seek reimbursement and any other forms of recovery from any responsible parties. The Block 2277 Site was most recently used for petroleum storage and distribution, and previously used for petroleum refining, storage, and distribution operations. The Block 2277 Site is one of five blocks that may be redeveloped by the New York City Department of Parks and Recreation (NYCDPR).

In conjunction with its assumption of the Major Petroleum Facility License (MPFL) from Bayside Fuel Oil Depot Corporation (Bayside), the City of New York is solely responsible for any obligations associated with the permanent closure of the MPFL License. As indicated in the SCWP, implementation of this SC is intended to satisfy the requirements for implementation of a “Site Assessment Proposal” required for the closure of the MPFL. Upon acceptance of this report by the NYSDEC, the City of New York will seek the closure of the MPFL as the tanks, piping and appurtenances have all been removed from the Site.

This SCR was developed in accordance with the NYSDEC Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and Major Oil Storage Facility (MOSF) closure requirements outlined in the NYSDEC DER-11 / Procedures for Licensing Onshore Major Oil Storage Facilities.

1.1 SCR Document Organization

This SCR is separated into the following sections:

- Section 2 Provides background information regarding the Block 2277 Site history
- Section 3 Provides a summary of previous Block 2277 Site investigations and remedial activities
- Section 4 Describes the Block 2277 Site characterization scope of work
- Section 5 Describes the Block 2277 Site geology and hydrogeology
- Section 6 Describes the Block 2277 Site characterization results
- Section 7 Provides a conceptual site model
- Section 8 Provides a qualitative exposure assessment
- Section 9 Provides a summary and conclusions
- Section 10 Includes all references

2. Block 2277 Site Ownership/Operational History

This section provides a summary of the ownership and operational history of the Block 2277 Site and a brief summary of surrounding parcels. A summary of previous remedial investigations and related actions is presented in Section 3.

2.1 Block 2277 Site History

Block 2277 in Williamsburg, New York, is bounded by Kent Avenue, North 12th Street, the East River, and Bushwick Inlet (Figure 1). Following the filling of land under water, the industrial history of the block dates to 1868 when Charles Pratt acquired the property (New York City Board of Standards and Appeals, 1919) and operated a refinery. During the nineteenth century, the refinery chiefly produced Astral Oil, which was an illuminating oil similar to kerosene. By the mid-1870s, the Pratt Works had a weekly crude oil throughput capacity of 15,000 barrels (630,000 gallons), from which the following products were manufactured (Cornwall, May 1876):

Table 1 Refinery Products (1870s)

Product	Percent Yield
Illuminating Oil (e.g., Astral Oil)	75%
Naphtha	10%
Coke and loss	5%
Residuum	4%
Gasoline	3%
Benzine	3%

In the early 1880s, Pratt expanded its refinery by acquiring the western portion of Block 2282 (across Kent Avenue, immediately east of Block 2277) and Block 2294 (located west of Kent Avenue, between North 10th Street and North 11th Street), see Figure 1 and Plate 1. In 1892, Pratt conveyed its property on Block 2282 and Block 2294 to Standard Oil Company of New York (SOCONY) (Indenture, June 1, 1892). In 1943, SOCONY conveyed its portion of Block 2282 to Kent Avenue Realty Corp. (Indenture, September 1, 1943). Subsequently, following numerous property transfers, Block 2282 was redeveloped under the NYSDEC Brownfields Cleanup Program (BCP) by a third party and all contamination was addressed (NYSDEC BCP Site Code No. C224207). In 1934, SOCONY ceased operations on Block 2294. In 1937, SOCONY conveyed Block 2294 to Havemeyers and Elder, Inc. Since that time, Block 2294 has been transferred through a number of other owners and is currently owned by the City of New York.

Pratt and his companies (Charles Pratt Manufacturing Company, Charles Pratt and Company, and Pratt Manufacturing Company [collectively, "Pratt"]) owned and operated a refinery on Block 2277 until 1892. On June 1, 1892, Pratt conveyed Block 2277 to SOCONY (Indenture, June 1, 1892).

SOCONY conducted refining operations at the Block 2277 Site from 1892 to 1936. The refinery manufactured refined petroleum products such as illuminating kerosene (i.e., Astral Oil), naphtha, gasoline, and benzine. In addition to the refinery operational units, there were numerous storage tanks and processing units throughout the Block 2277 Site during the periods of SOCONY's ownership. Storage tanks at the Block 2277 Site stored crude oil and refined products, including petroleum tar (also known as petroleum still bottoms or residuum). Petroleum tar is distinctly different than tar that is generated as a waste of the manufactured gas process (i.e., MGP tar), which was generated from manufactured gas plant (MGP) operations at adjacent third-party facilities, as discussed in Section 2.2. At the turn of the twentieth century, and with the "*advent of automotive transportation and electric lights*," SOCONY "*began to concentrate more on gasoline and naphthas... while [the production of] 'Astral Oil' for illumination began to decline from which it never recovered*" (Linton, January 24, 1950).

Based on historical documentation, by the mid-1910s there was likely a pipeline that conveyed gas oil from the Block 2277 Site to the Williamsburg MGP on the adjacent Block 2287 (Agreement, June 30, 1914). While this pipeline provided gas oil to the Williamsburg MGP at no time were MGP-related operations conducted on the Block 2277 Site. Similarly, coal tar (a byproduct of MGP operations) was neither produced nor stored at the Block 2277 Site. SOCONY discontinued refinery operations on Block 2277 in 1936. From 1936 through 1949, SOCONY used the block for a "*small packaging operation*" (Linton, January 24, 1950). As documented in local newspapers at the time, fires were reported to have occurred on the Block 2277 Site during the operations of both Pratt and SOCONY.

Prior to selling Block 2277 in 1951, and likely following the cessation of refining operations in 1936, SOCONY removed refinery structures located on the southeastern corner of the block. In 1951, SOCONY conveyed almost all of the property on Block 2277 to Maspeth Rail and Terminal Corp. (Maspeth Rail), a predecessor entity to Chevron Corporation, except for a small area in the northeast corner of Block 2277. In 1953, SOCONY conveyed this small area to Maspeth Rail. As of 1958, the Block 2277 Site was owned by Paragon Oil Company, Inc. (Paragon), which was also a predecessor entity to Chevron Corporation. At some point between February 1952 and April 1961, Maspeth Rail or Paragon removed refinery-era storage tanks along Bushwick Inlet and razed the entire block. In 1965, Paragon paved the lot and erected a bulk oil terminal that had ten aboveground storage tanks (ASTs), associated piping, a truck loading rack, and a total capacity of approximately 5.5 million gallons of petroleum products.

In 1978, the bulk oil terminal was owned and operated by Texaco, Inc. (a predecessor entity to Chevron Corporation) and had an average daily throughput of 475,986 gallons, most of which was for gasoline (372,806 gallons), followed by middle distillates (70,602 gallons), and residual fuels (32,508 gallons) (Texaco Inc, May 5, 1978). In 1988, Star Enterprise (a joint enterprise between Texaco, Inc. and Saudi Refining, Inc.) acquired the terminal, which at the time had a daily throughput of 665,574 gallons (Star Enterprise, December 19, 1988). In 1992, Sun Company, Inc. (R&M), a predecessor entity to Sunoco, Inc., acquired a 45% interest in Block 2277 and the bulk oil terminal through a Master Operating Co-Tenancy and Cost Sharing Agreement with Star Enterprise (Special Warranty Deed, July 9, 1992).

Bayside Fuel Oil Depot Corp. (Bayside) acquired the Block 2277 Site from Star Enterprise in 1997, though Star Enterprise continued to own a narrow strip of land along the Bushwick Inlet shoreline and the foot of Block 2277. Bayside operated the bulk oil terminal until 2011. In 2001, North 12th Street Properties, LLC, a corporate entity related to Bayside, acquired ownership of the Block 2277 Site.

In 1998, Motiva Enterprises, LLC was formed as a “successor-in-interest” to Star Enterprise. In 2003, Motiva granted Bayside three easements for its property on Block 2277, which Bayside used for:

- Constructing, maintaining, and using a dock for loading/offloading of barges and boats at the far western end of the Block 2277 Site;
- Maintaining and using a boat launching ramp; and
- Maintaining the existing 12” diameter steel pipe for discharging treated wastewater under a SPDES permit (Easement Agreements, August 20, 2003).

In 2011, bulk oil terminal operations ceased at the Block 2277 Site and, by December 2013, the tanks were “empty and vapor free, and all connecting lines [were] securely capped” (NYSDEC, December 31, 2013). In 2014, the City of New York (NYC) acquired Motiva’s property on Block 2277 (Quit Claim Deed, December 31, 2014; LiRo Engineers, June 11, 2015) and in 2016, NYC acquired the remainder of the Block 2277 Site. Demolition of the bulk terminal infrastructure began in 2019 under NYC ownership. The truck loading rack structure was demolished by winter 2019 and by the end of summer 2019, the rest of the tanks and all other infrastructure were demolished and removed from the Block 2277 Site.

A full summary of post-SOCONY Block 2277 Site ownership is included below:

Table 2 Block 2277 Site Ownership History

Entity	Years
<ul style="list-style-type: none"> • Successor Entity 	
Charles Pratt	1868-1871
Charles Pratt Manufacturing Co., Charles Pratt and Co., Pratt Manufacturing Co.	1871-1892
SOCONY <ul style="list-style-type: none"> • ExxonMobil Oil Corporation 	1892-1951
Maspeth Rail and Terminal Corp. <ul style="list-style-type: none"> • Texaco, Inc. (subsidiary of Chevron Corporation) 	1951-1958*
Paragon Oil Company, Inc./Texaco Refining & Marketing, Inc. <ul style="list-style-type: none"> • Texaco, Inc. (subsidiary of Chevron Corporation) 	1958-1988
Star Enterprise (joint enterprise between Texaco Inc. and Saudi Refining Inc.) <ul style="list-style-type: none"> • Texaco, Inc. (subsidiary of Chevron Corporation), Saudi Refining, Inc. (subsidiary of Saudi Arabian Oil Company [Saudi Aramco]) 	1988-1992
Star Enterprise and Sun Company, Inc. (R&M) <ul style="list-style-type: none"> • Texaco, Inc. (subsidiary of Chevron Corporation), Saudi Refining, Inc. (subsidiary of Saudi Aramco), and Sunoco, Inc. 	1992-1997

Entity	Years
<ul style="list-style-type: none"> • Successor Entity 	
Bayside Fuel Oil Corp./Bayside Fuel Oil Depot Corp. (Bayside) <ul style="list-style-type: none"> • Bayside Fuel Oil Depot Corp. 	1997-2001
Motiva Enterprises, LLC <ul style="list-style-type: none"> • Motiva Enterprises, LLC (subsidiary of Saudi Aramco) 	1998-2014**
North 12 th Street Properties, LLC (Bayside leased the block from 2001-2011) <ul style="list-style-type: none"> • North 12th Street Properties, LLC (a corporate entity related to Bayside) 	2001-2016
Motiva Enterprises, LLC (easements) <ul style="list-style-type: none"> • Motiva Enterprises, LLC 	ca. 2003-2014
City of New York <ul style="list-style-type: none"> • City of New York 	2016-present

* In 1951, SOCONY conveyed all of its property on Block 2277 to Maspeth Rail and Terminal Corp., except for a 0.7-acre area in the northeast corner of the block adjacent to Kent Avenue, which SOCONY conveyed to Maspeth Rail and Terminal Corp. in 1953.

** Motiva owned a narrow strip of land along the Bushwick Inlet shoreline and the foot of Block 2277 from 1998 to 2014, when the City of New York acquired the area from Motiva.

A summary of the contents of tanks at the terminal, including capacity, contents, and operational entity over a selection of various years is provided below.

Table 3 Block 2277 Site Petroleum Storage Capacity (1965-2007)

Tank	Approximate Capacity (gal.)	1965 (Paragon)	1981 (Paragon)	1990 (Star)	1991-1993 (Star)	1997, 2001-2002 (Bayside)	2007 (Bayside)
1	500,000	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
2	500,000	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Kerosene
3	500,000	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
4	500,000	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
5	212,000	Kerosene	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
6	1,050,000	#2 Fuel Oil	#2 Fuel Oil	Kerosene	Kerosene	Fuel Oil (#1, 2, or 4)	#2 Fuel Oil
7	840,000	#4 Fuel Oil	#4 Fuel Oil	Fuel Oil (#1, 2, or 4)	Fuel Oil (#1, 2, or 4)	Diesel	Diesel
8	212,000	Diesel	Diesel	Kerosene	Kerosene	Diesel	#2 Fuel Oil

Tank	Approximate Capacity (gal.)	1965 (Paragon)	1981 (Paragon)	1990 (Star)	1991-1993 (Star)	1997, 2001-2002 (Bayside)	2007 (Bayside)
9	212,000	Diesel	Diesel	Gasoline	Gasoline	Gasoline	Gasoline
10	1,260,000	#6 Fuel Oil	#6 Fuel Oil	Diesel	Kerosene	Diesel	#2 Fuel Oil

2.2 Block 2287 Site History

As Block 2287 is partially hydraulically upgradient of the Block 2277 Site, it is important to understand the former operational/ownership history of this area. In addition, it has been shown (summarized later in this report) that contamination from Block 2287 has migrated beneath the Block 2277 Site and is a source of impacts to the Block 2277 Site.

In July 1850, the Williamsburgh Gas Light Company (WGLC) was incorporated and originally operated an MGP on North 6th Street in Brooklyn (Brooklyn Daily Eagle, March 21, 1864). In 1860, WGLC acquired property on Block 2287 (located west of Kent Avenue, between North 11th Street and North 12th Street) and erected an MGP that began operations in 1864 (New York City Board of Standards and Appeals, 1921). In 1895, WGLC and six other Brooklyn gas companies merged into the Brooklyn Union Gas Company (BUG) (Murphy, 1995).

In 1901, the *New York Press* characterized the Williamsburg MGP's gas holders as "*among the largest used for storing gas in the city*" (New York Press, August 1, 1901). From 1907 through 1927, the Williamsburg MGP produced approximately 100 billion cubic feet of gas, more than any of BUG's other MGPs (The Brooklyn Union Gas Company, 1907-1927). From 1930 to 1934, BUG operated the Williamsburg MGP in standby mode during peak heating season, and in 1938, the company withdrew the MGP from service (The Brooklyn Union Gas Company, 1938).

The Williamsburg MGP produced manufactured gas from 1864 to 1934, initially via the coal gas process and, after ca. 1891, via the water gas process (Brown's Directory of American Gas Companies, 1891). As part of their manufacturing process, coal gas MGPs used petroleum naphtha to enrich their gas (Williamson and Daum, 1959). Water gas MGPs used cheaper gas oil, rather than naphtha, to enrich manufactured gas (Evans, 1916; Williamson and Daum, 1959).

The water gas process produced byproduct tar-water emulsions that, due to their water content, were unsuitable for sale. As a result, these "*valueless tar-water emulsions would frequently be discharged to the environment*" (Hatheway, 2012). Between 1911 and 1923, the Williamsburg MGP manufactured approximately 67 billion gallons of gas, which yielded approximately 42 million gallons of tar (The Brooklyn Union Gas Company, 1907-1927). By 1921, the MGP had several structures on Block 2287 dedicated to handling tar, including tanks, tar separating tanks, tar pumps, and tar extractors. The MGP also had a sump and separators located proximate to the East River (New York City Board of Standards and Appeals, 1921). In 1924, BUG reported that the Williamsburg MGP had 12 tar tanks, with a total capacity of 388,800 gallons (The Brooklyn Union Gas Company, 1924).

Post-BUG occupants of Block 2287 included Ferro-Co. Corp (sheet metal products manufacturer), Commercial Corrugated Container Corp. (manufacturer of corrugated boxes), and the New York City Department of Sanitation (operated a motor vehicle repair and garage facility on the block). The City of New York currently owns Block 2287.

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