November 2020

Site Characterization Results

Former Bayside Fuel Depot – Williamsburg, Brooklyn (Block 2277)

Presenters:
ExxonMobil Environmental & Property Solutions
NYC Department of Parks and Recreation

Agenda

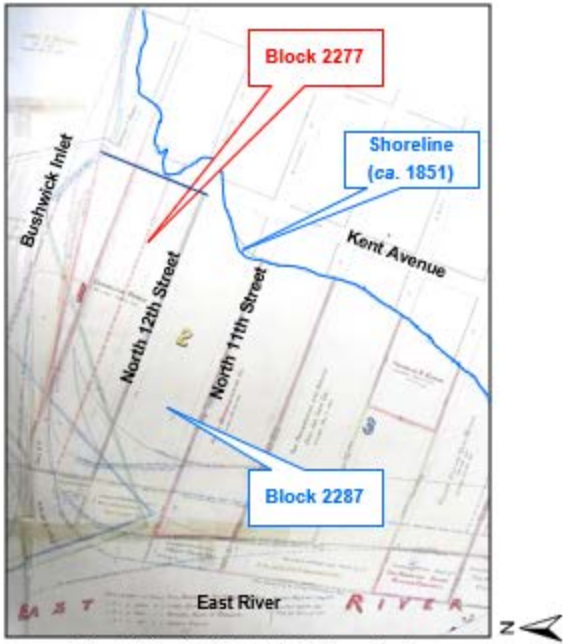
- Background
- Block 2277 – Petroleum Facility Overview
- Block 2287 – Manufactured Gas Plant (MGP) Overview
- Site Characterization Results, Summary, and Conclusions

Area Map

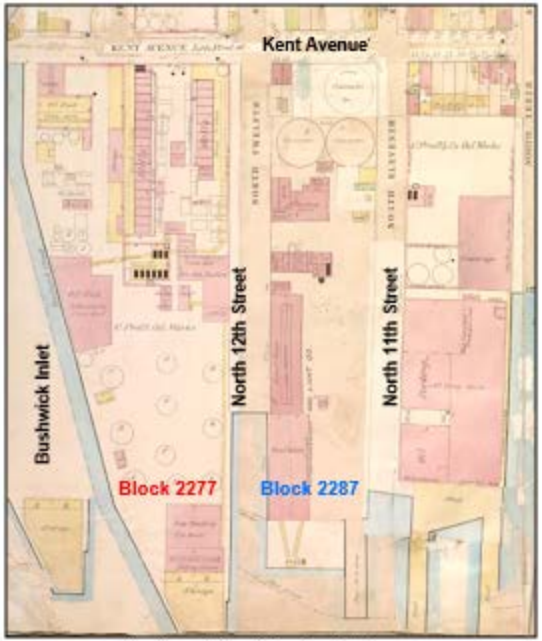
Aerial photograph circa April 2018

Filled Land

The refinery (Block 2277) and the MGP (Block 2287) were both constructed on fill that extended into East River after *ca.* 1851



Grants of Lands Under Water in Kings County



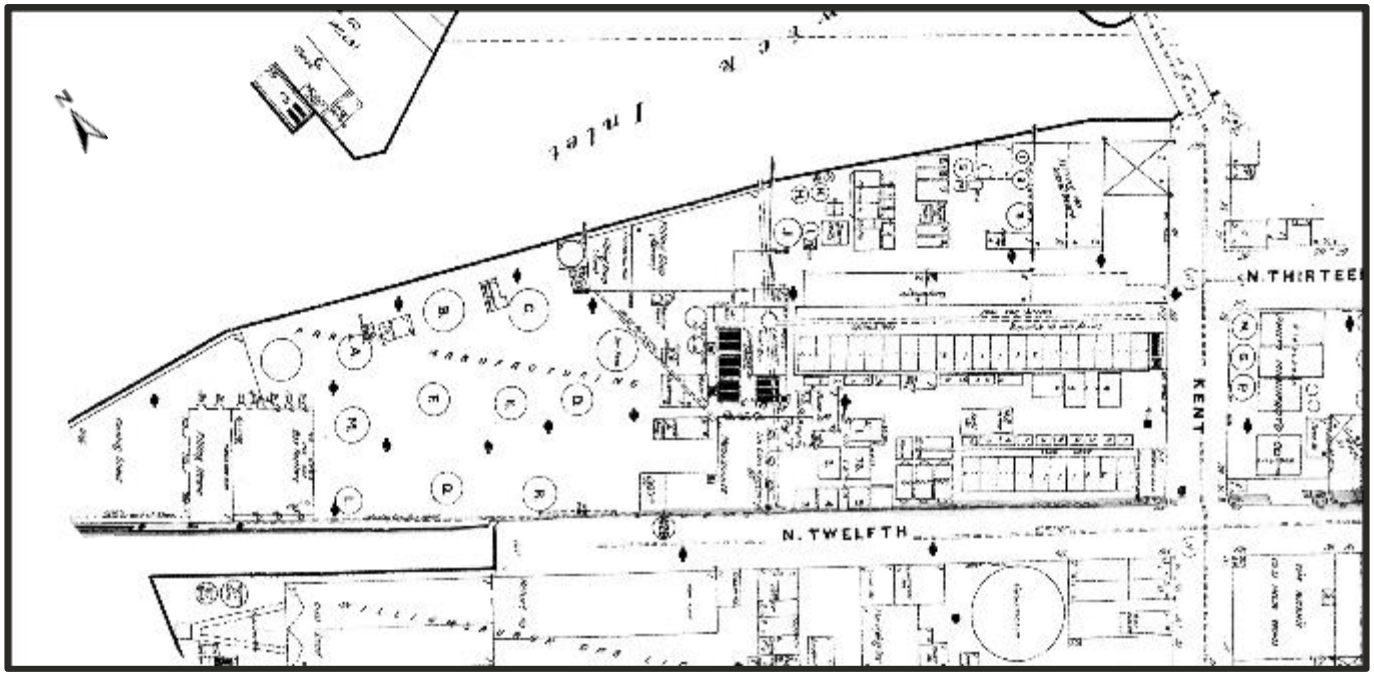
Higginson Atlas of Brooklyn, 1868

Block 2277 Historical Site Overview

- 100+ years of industrial operations at Block 2277 by many entities
- History of multiple owners/operators, including 60+ years post SOCONY
  - Including Chevron, Saudi Aramco, Sunoco, Bayside, Motiva and NYC
- Block 2277 impacted by MGP operations from adjacent parcel (Block 2287)
- Despite multiple impacts and owners/operators, NYC and EM voluntarily agreed to perform a site characterization

Pre-SOCONY Operations (1868-1892)

- **1868 - 1892** – Property owned and operated by Charles Pratt
  - Operations conducted under various names associated with Charles Pratt; Charles Pratt Manufacturing Co., Charles Pratt and Co., Pratt Manufacturing Co.



Sanborn Insurance Map circa 1877

Block 2277

SOCONY Refinery Operations
(1892-1936)

SOCONY Operations (1892-1936)

- **1892** – SOCONY commences refinery operations at Block 2277
  - Refined petroleum products include Astral oil (kerosene), naphtha, gasoline, lubricating oil, paraffins (wax), road oil, and asphalt

- **1936** – SOCONY refining operations at Block 2277 ceased
  - Small packaging operation was still present through 1949

- **1951** – SOCONY sells Block 2277 to Maspeth Rail and Terminal Corp. (Chevron predecessor)
  - Small area of the parcel in the northeast was retained by SOCONY until 1953

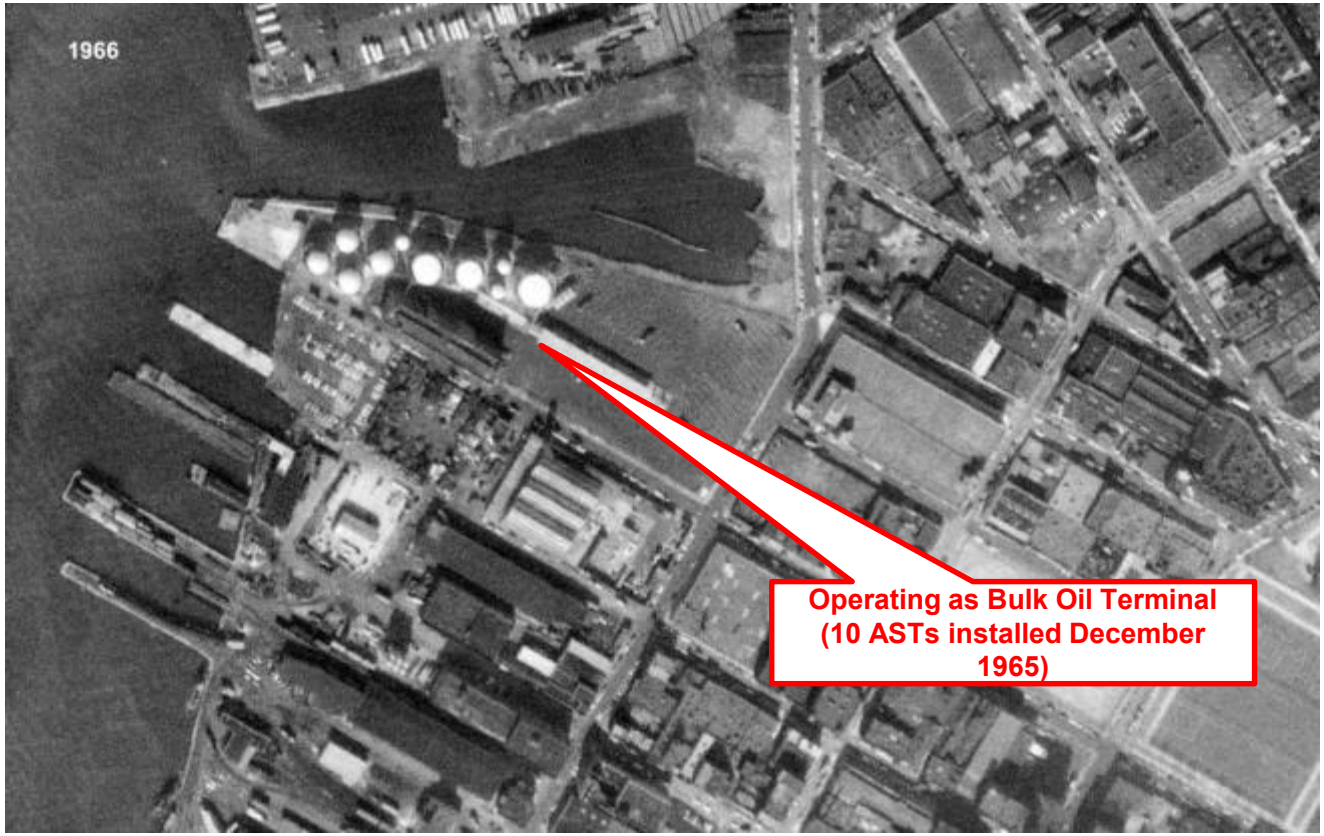
Block 2277

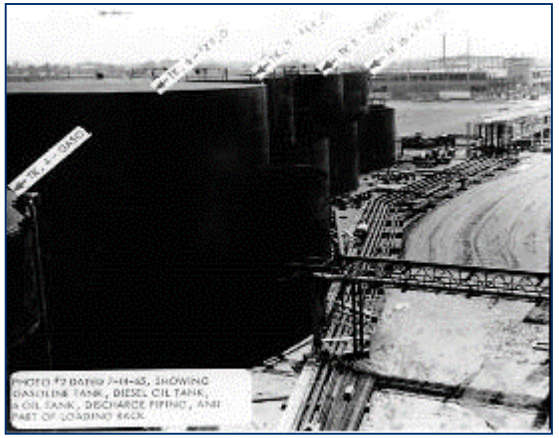
Post-SOCONY Ownership (1951-present)

Chevron Operations (1951-1997)

- **1951** – Maspeth Rail and Terminal Corp. (a Chevron predecessor entity) acquires Block 2277 from SOCONY
- **1952 – 1961 –** SOCONY refinery infrastructure removed and site is cleared
- **1965** – Chevron predecessor installs 10 ASTs along Bushwick Inlet
- **1965-1997** – Chevron predecessors operate bulk oil terminal
  - Terminal total storage capacity is ~5.5 million gallons (gasoline, diesel, kerosene, fuel oil #2, #4, and #6)
  - In 1980s, the terminal's average daily throughput is ~8,200 barrels
  - Documented petroleum releases during Chevron's operations

1966 – Chevron Predecessor





Chevron Petroleum Releases and Related Work

- NAPL observed in monitoring wells near loading rack (1992) and ASTs (1996)

- **1996 -** NYSDEC spill report #9804544 documents an on-going spill beginning Feb 1996
  - Detection of MTBE indicates petroleum impacts from Chevron's operations
- **2004** – Chevron's Human Health Exposure Assessment concludes BTEX and MTBE (a post-1979 gasoline additive) present in groundwater at concentrations exceeding NYSDEC criteria

- **2007** – Chevron's groundwater sampling detects MTBE exceeding NYSDEC criteria in multiple wells
- **2008** - January 2008: Following completion of remedial actions, Chevron received a No Further Action (NFA) notice for the spill
    - NFA notes that "the spill site has been contaminated by MGP source material, tar migrated from the Williamsburg Works MGP Site"
    - NFA contains a reopener for: off-site migration, previously unknown environmental conditions, and receipt of information that Site is insufficiently protective of human health

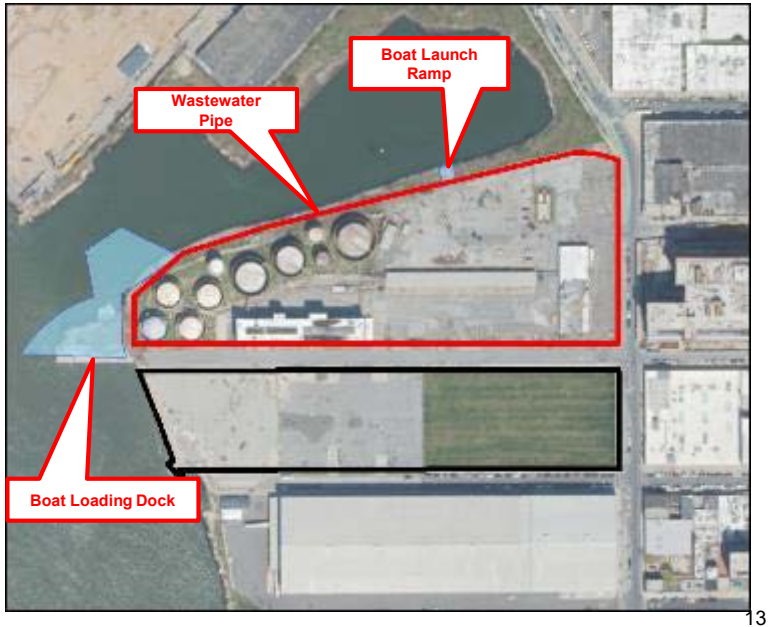
Bayside Operations (1997-2011) / Motiva Ownership (1998-2014)

Bayside Fuel Oil Corp./Bayside Fuel Oil Depot Corp. (“Bayside”)

- Bayside owned the Site from 1997 to 2001
- Continued operations at the site until 2011 under a lease from North 12th Street Properties
  - North 12th Street Properties is a Bayside-related entity that owned Block 2277 from 2001-2016
  - During its tenure, Bayside stored gasoline, fuel oil #2, #4, and #6, kerosene, and diesel at the terminal

Motiva (successor to Star Enterprise)

- Motiva owned portions of the Site from 1998-2014.
- 2003-2014: Motiva grants three easements to Bayside for the portions of the Site it owns to:
  - Construct, maintain, and use a dock for loading/off-loading of barges and boats
  - Maintain and use a boat launch ramp to access Bushwick Inlet for emergency response purposes
  - Maintain existing 12” diameter steel pipe to discharge treated wastewater under SPDES permit



City of New York (2014-present)

- **March 2016** – City of New York (“NYC”) purchases Block 2277 from North 12th Street Properties, LLC; which was a Bayside related entity
  - NYC assumes the Site’s Major Oil Storage Facility (“MOSF”) License and its obligations from Bayside
  - In 2014, City of New York acquired a narrow strip of land from Motiva
- **December 2018** – NYC/ExxonMobil Consent Order – voluntary investigation of Block 2277; NYC seeks permanent closure of the MOSF License
- **January 2019 – January 2020 –** Perform Site Characterization activities across Block 2277
  - **July 2019 – September 2019 –** AST and building demolition activities performed

Circa April 2018

Circa June 2020

Entity • Successor Entity	Years
Charles Pratt	1868-1871
Charles Pratt Manufacturing Co., Charles Pratt and Co., Pratt Manufacturing Co.	1871-1892
SOCONY • **ExxonMobil Oil Corporation**	1892-1951
Maspeth Rail and Terminal Corp. • **Texaco, Inc. (subsidiary of Chevron Corporation)**	1951-1958*
Paragon Oil Company, Inc./Texaco Refining & Marketing, Inc. • **Texaco, Inc. (subsidiary of Chevron Corporation)**	1958-1988
Star Enterprise (joint enterprise between Texaco Inc. and Saudi Refining Inc.) • **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) • **Texaco, Inc. (subsidiary of Chevron Corporation), Saudi Refining, Inc. (subsidiary of Saudi Aramco), and Sunoco, Inc.**	1992-1997
Bayside Fuel Oil Corp./Bayside Fuel Oil Depot Corp. (Bayside) • **Bayside Fuel Oil Depot Corp.**	1997-2001
Motiva Enterprises, LLC • **Motiva Enterprises, LLC (subsidiary of Saudi Aramco)**	1998-2014**
North 12th Street Properties, LLC (Bayside leased the block from 2001-2011) • **North 12th Street Properties, LLC (a corporate entity related to Bayside)**	2001-2016
Motiva Enterprises, LLC (easements) • **Motiva Enterprises, LLC**	*ca*. 2003-2014
City of New York • **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.

Block 2287

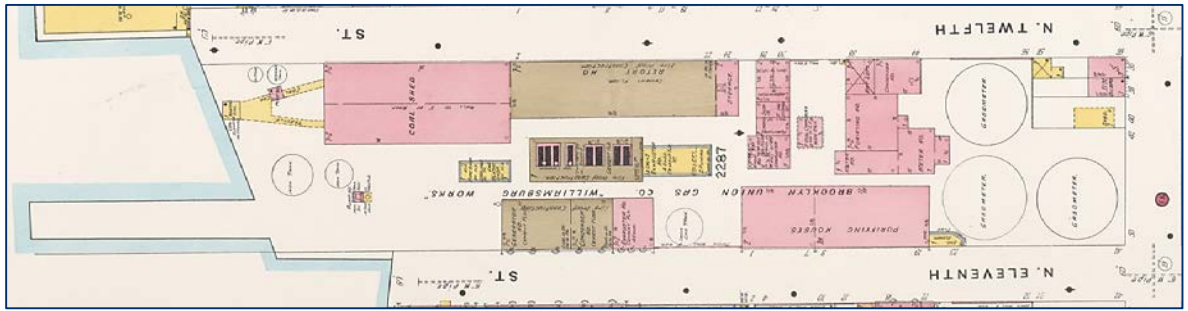
National Grid MGP Operations
(*ca*. 1860-1934)

Block 2287 Timeline Overview

- **1850** –Williamsburg Gas Light Company (“WGLC”) formed franchise to supply gas in Williamsburg
- **1860** – WGLC acquires Block 2287 and erects a manufactured gas plant (“MGP”)
- **1860s-1934** – MGP produces manufactured gas via several processes
- **1895** – Brooklyn Union Gas Company (“BUG”) created from merger of seven Brooklyn manufactured gas companies, including WGLC
- **1901** – Retorts / gas tanks at MGP are among “largest used for storing gas in the city”
- **1930-1934** – BUG operates Williamsburg MGP in standby mode during peak heating season
- **1938** – BUG withdraws Williamsburg MGP from service

Sanborn Map (1905)
Manufactured Gas Plant

- MGP infrastructure, processes, products, and wastes different than those of a petroleum refinery or bulk petroleum fuel terminal.
- MGP tar waste is a potent source of PAH that is compositionally distinct from petroleum.
- MGP tar waste has a significantly higher PAH concentration than petroleum.



Williamsburg Works MGP (BUG) – MGP Tar Residuals

- **MGP Tar Yield -** BUG reports to the New York Public Service Commission indicate that from 1911-1923 the Williamsburg Works generated a total of 42 million gallons of MGP tar

- **MGP Tar is "not a petroleum refinery product" -** In 1921, BUG notes the distinction of tar from petroleum refinery products in an appeal to a NYC Fire Commissioner order regarding its storage tanks at the Williamsburg MGP. The company states:
  - "tar, a by-product of the manufacture of gas, is not a petroleum refinery product, but is obtained…in the process of gas manufacture"

- National Grid RI Investigation documented MGP tar residuals in subsurface beneath Block 2287 which is also migrating onto Block 2277 beneath 12th Street

- The MGP operations were dismantled between 1935 and 1941

Block 2287

Post-National Grid Operations (1943-present)

Post-MGP Ownership

- **1943** – **U.S. Navy** (firefighting school)
- **1950** – **Ferro-Co. Corp** (sheet metal products manufacturing)
- **1960** – **Commercial Corrugated Container Corp.** (mfgr of corrugated boxes)
- **1976-2007** – **NYC Department of Sanitation ("DSNY")** (motor vehicle repair and garage facility)
  - **1996** – 0.84 feet of free petroleum product (identified as diesel) found in DSNY monitoring well adjacent to motor fuel tank system
- **2007** – Acquired through condemnation by NYC

Site Characterization Findings

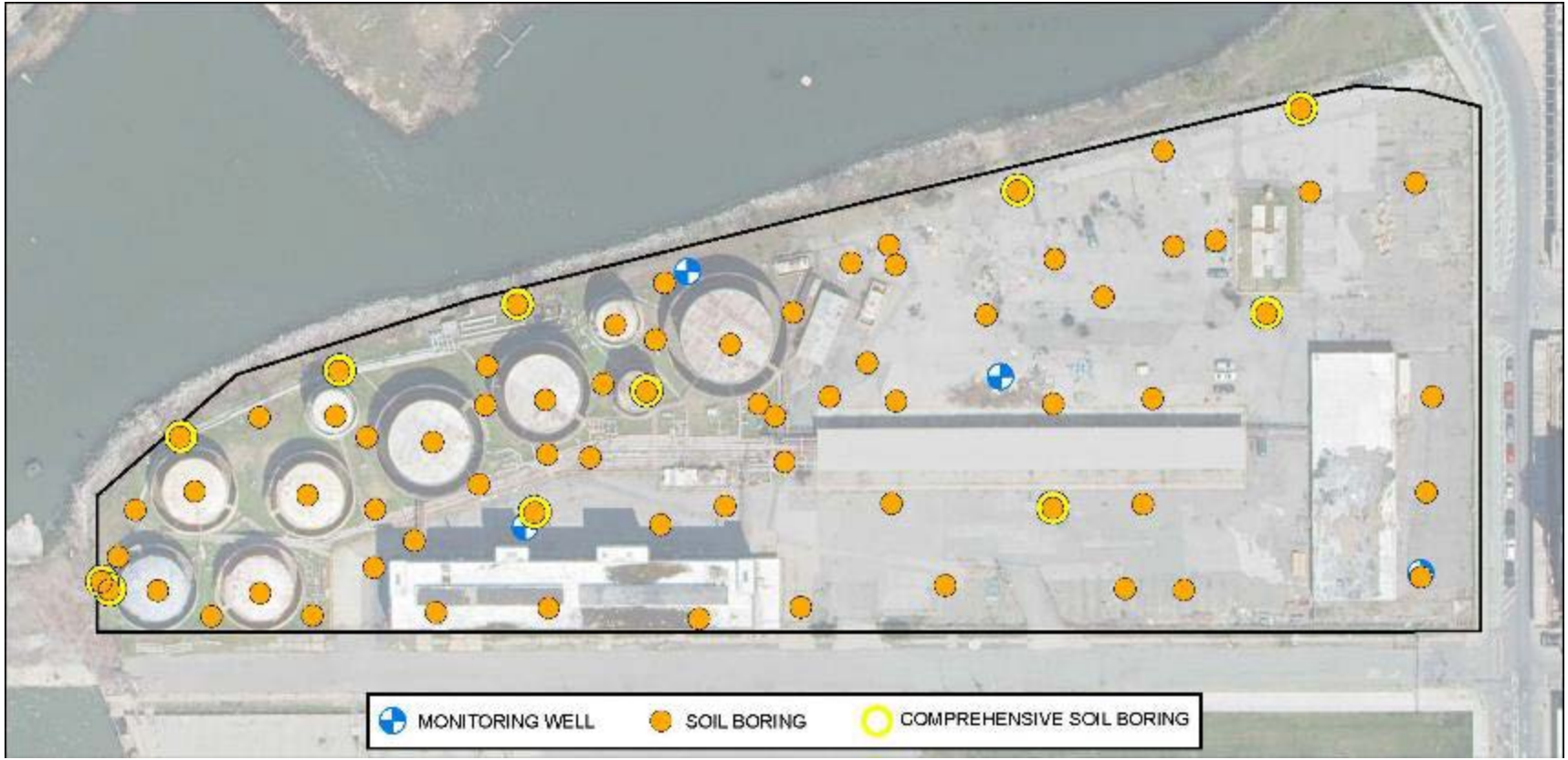
Overview

- Recap of Site Characterization Field Work and Analytical Data

- Site Characterization Findings/Conclusions

Circa 1929

Site Characterization Sampling Locations



Note: Comprehensive soil borings include additional analytical parameters and temporary monitoring wells.

Recap of Site Characterization Work

Pre-Demolition

- 39 Soil borings completed
- 164 Soil samples (+ QA/QC) collected
- 12 Groundwater wells (temporary and permanent) sampled (+ QA/QC)

Post-Demolition

- 33 Soil borings completed
- 124 Soil samples (+ QA/QC) collected
- 2 Groundwater wells (temporary) sampled (+ QA/QC)

Site Characterization Conclusions

- Site characterization is complete and satisfies the December 2018 Workplan and Consent Order

- Soil - historical filling and operations has led to impacts (mostly SVOCs/metals) that are typical of NYC historical fill

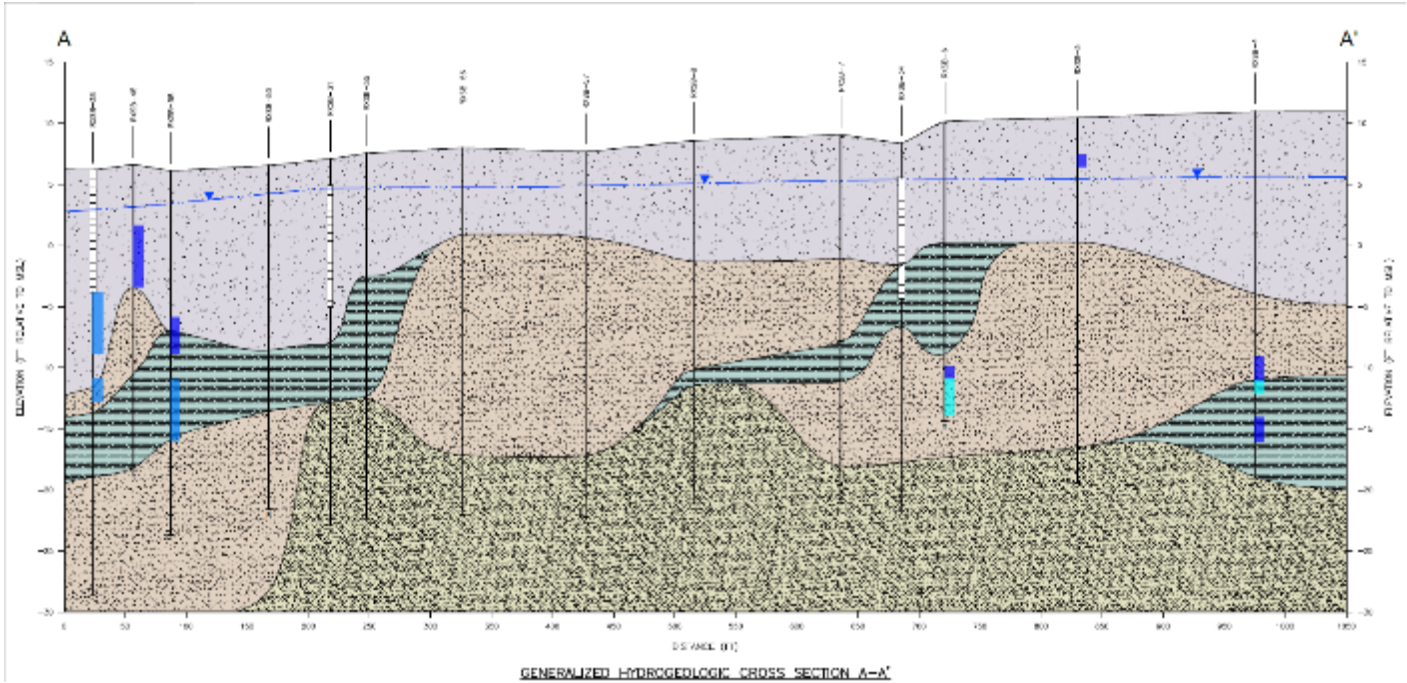
- Groundwater - groundwater impacts include low concentrations of VOCs, with the highest concentrations of benzene and MTBE being in upgradient areas and in the vicinity of previous remedial actions by Chevron; PFOA/PFOS present at concentrations above AWQGS

- LNAPL - petroleum staining present throughout the subsurface, with occasional observations of sheens and blebs; residual saturation was observed in isolated locations

- DNAPL - identified at depth, primarily along North 12th Street (RXBSB-4, RXSB-6) and is representative of leading edge of MGP-related contamination that originated from upgradient parcel (Block 2287) currently being remediated by National Grid

Geologic Cross Sections

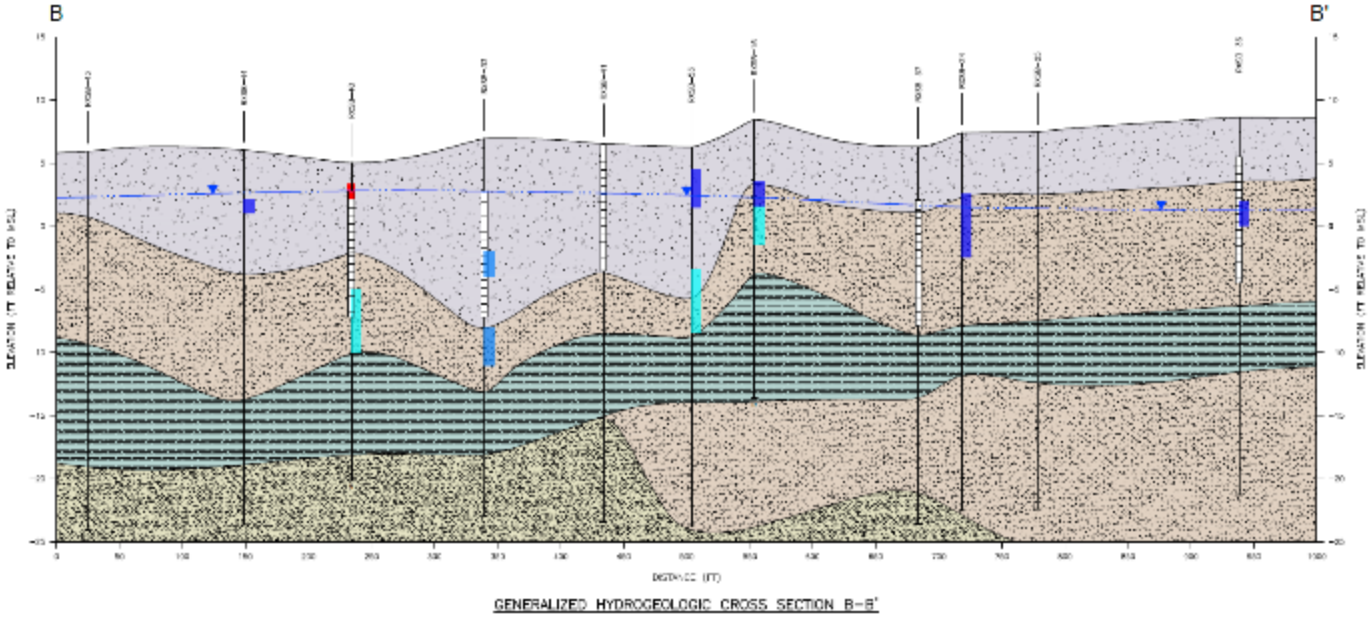
CROSS SECTION
A – A’



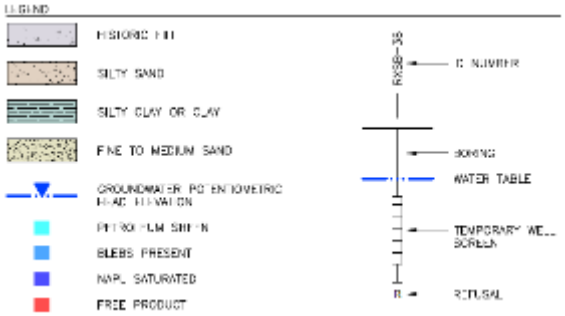
Findings

- Fill present from land surface down to 10-15’ bls
- Heterogeneric geology with layers of low permeability deposits beneath the fill
- Deeper DNAPL occurrences detected at depth (~25’ bls)

CROSS SECTION B – B’

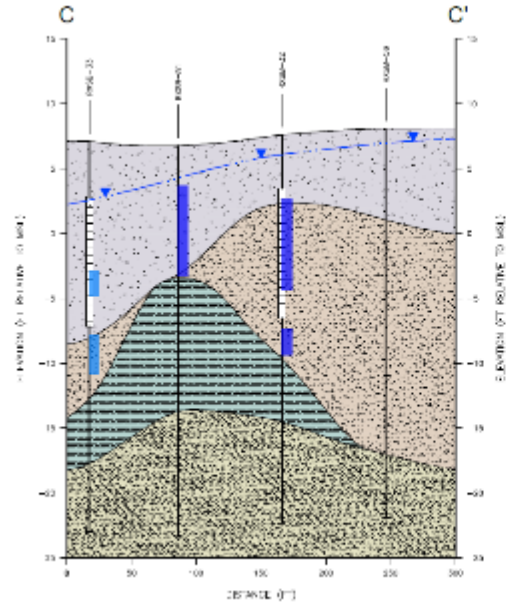


GENERALIZED HYDROGEOLOGIC CROSS SECTION B–B'

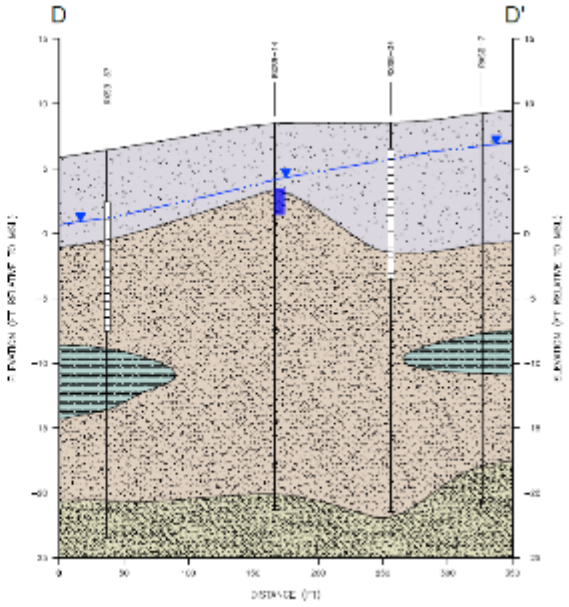


Findings

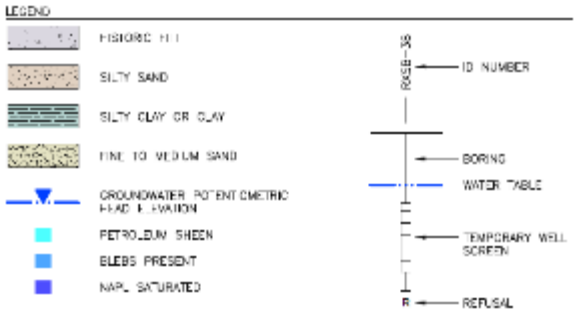
- Historic fluvial, low permeability deposits form a continuous layer across northern boundary of the Site
- LNAPL occurrences predominantly present at the water- table above fluvial deposits.
- No DNAPL identified at depth



GENERALIZED HYDROGEOLOGIC CROSS SECTION C–C'



GENERALIZED HYDROGEOLOGIC CROSS SECTION D–D'

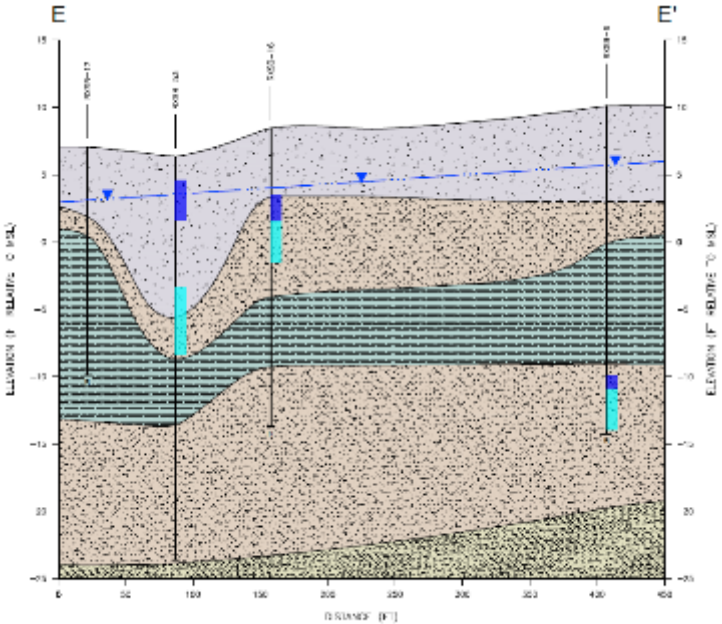


CROSS SECTIONS
C – C'
D – D'

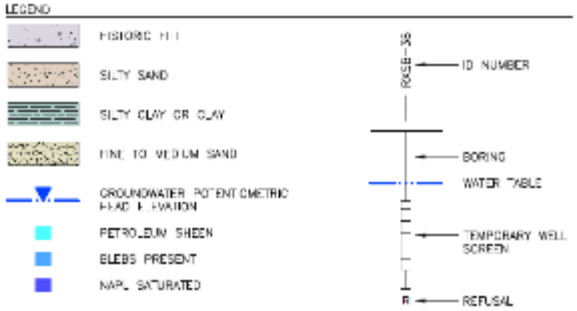
Findings

- LNAPL occurrences more often identified along western half of the Site
- Fluvial deposits do not form a continuous layer across the Site

CROSS SECTION E – E’



GENERALIZED HYDROGEOLOGIC CROSS SECTION E–E'

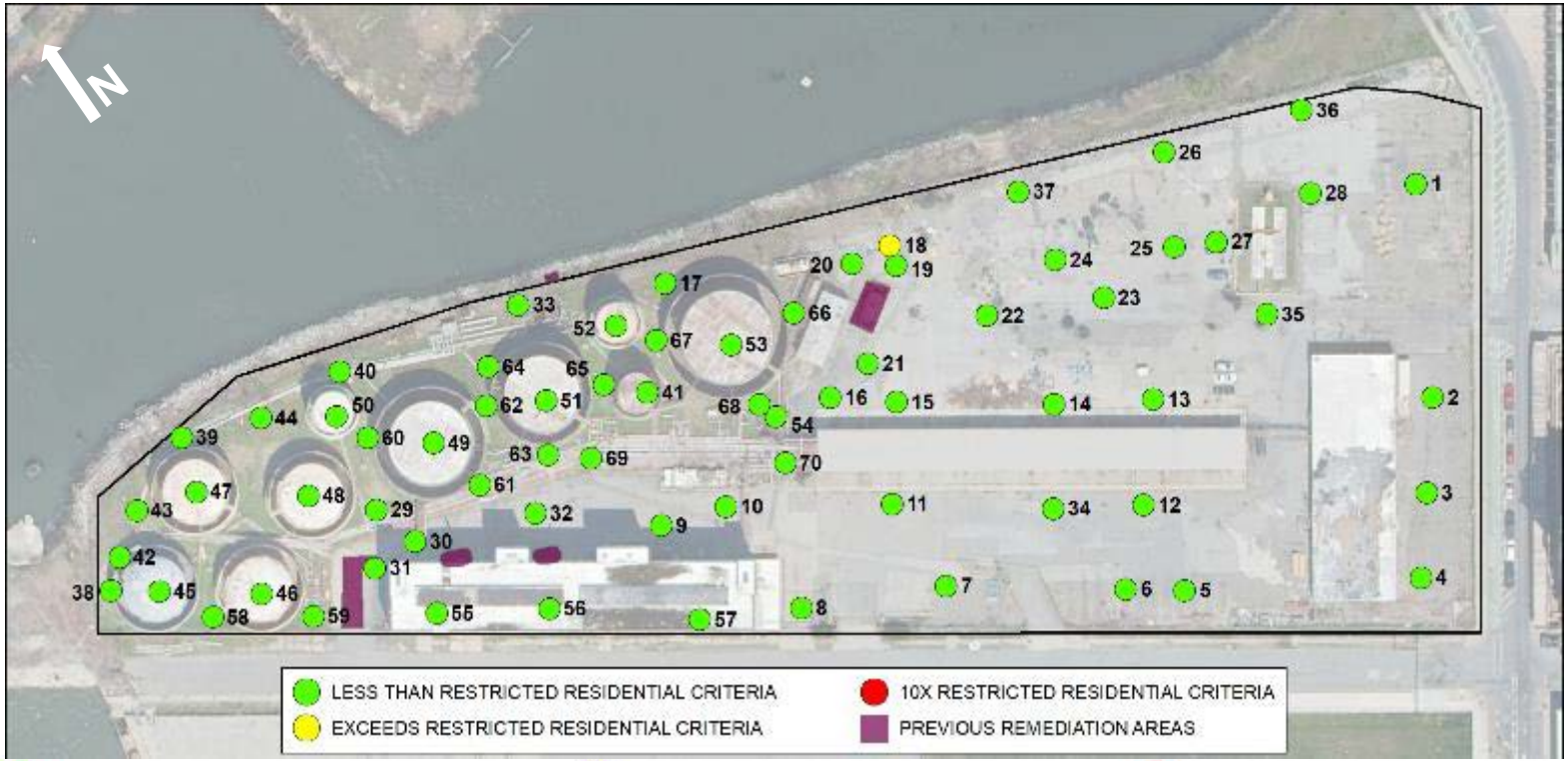


Findings

- LNAPL occurrences more often identified along western half of the Site
- DNAPL occurrences identified at depth along 12th Street do not appear to extend across the Site

Sample Data & Observations

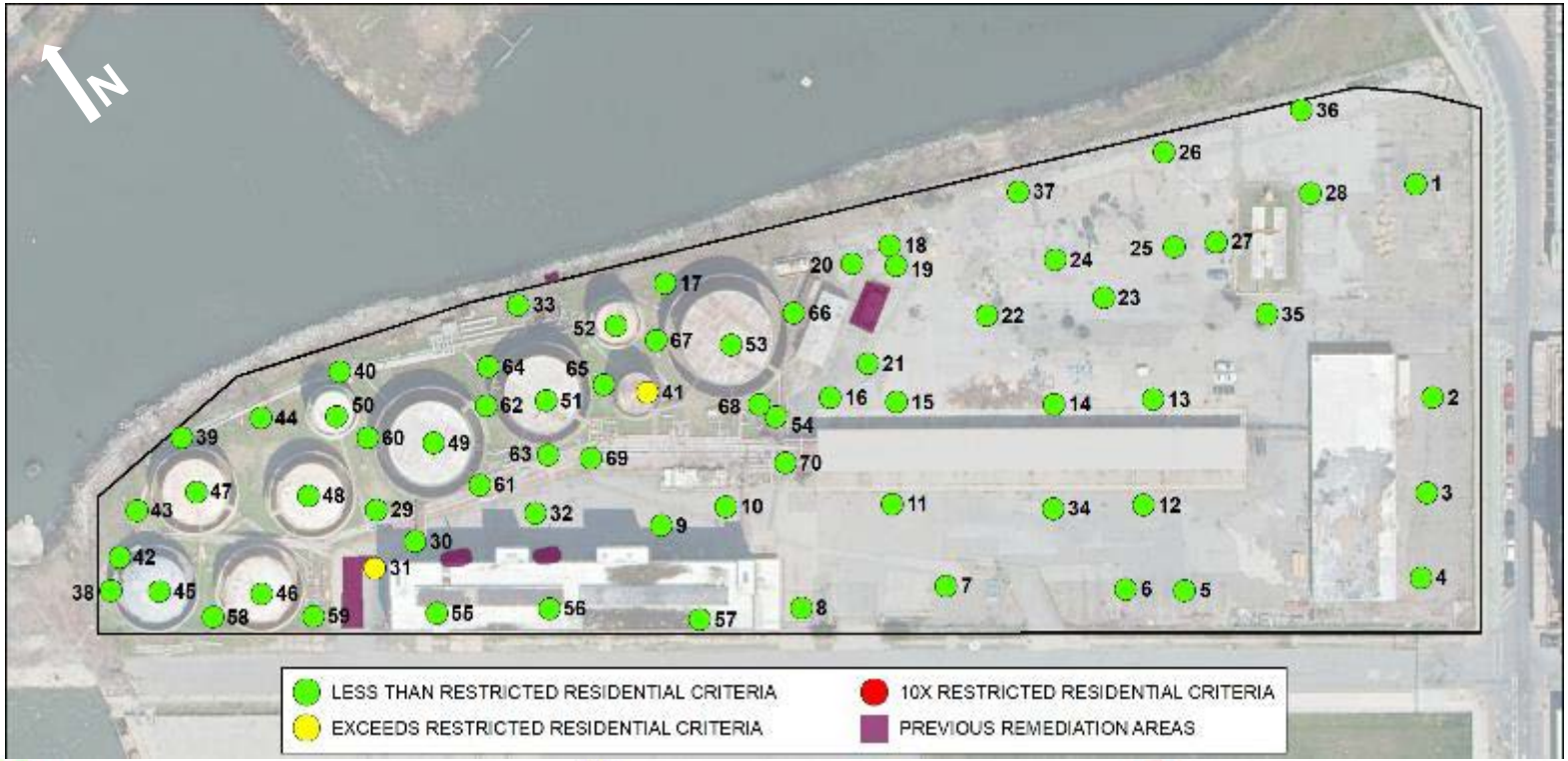
VOCs in Surface Soil (0-2 feet below land surface)



LESS THAN RESTRICTED RESIDENTIAL CRITERIA
EXCEEDS RESTRICTED RESIDENTIAL CRITERIA
10X RESTRICTED RESIDENTIAL CRITERIA
PREVIOUS REMEDIATION AREAS

Note: Boring numbers are indicated but do not include RXSB prefix

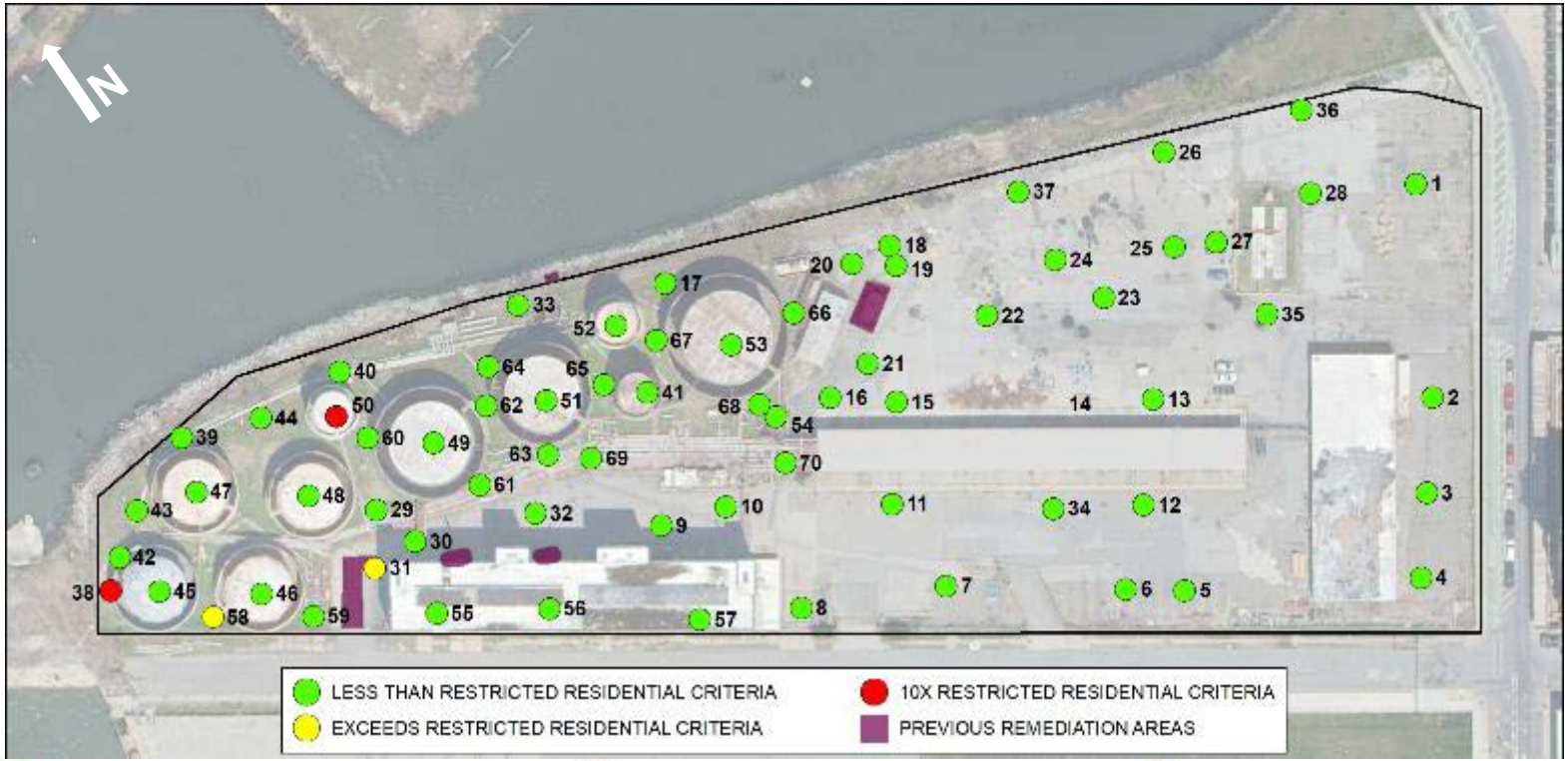
VOCs in Vadose Zone Soil (2-5 feet below land surface)



LESS THAN RESTRICTED RESIDENTIAL CRITERIA
EXCEEDS RESTRICTED RESIDENTIAL CRITERIA
10X RESTRICTED RESIDENTIAL CRITERIA
PREVIOUS REMEDIATION AREAS

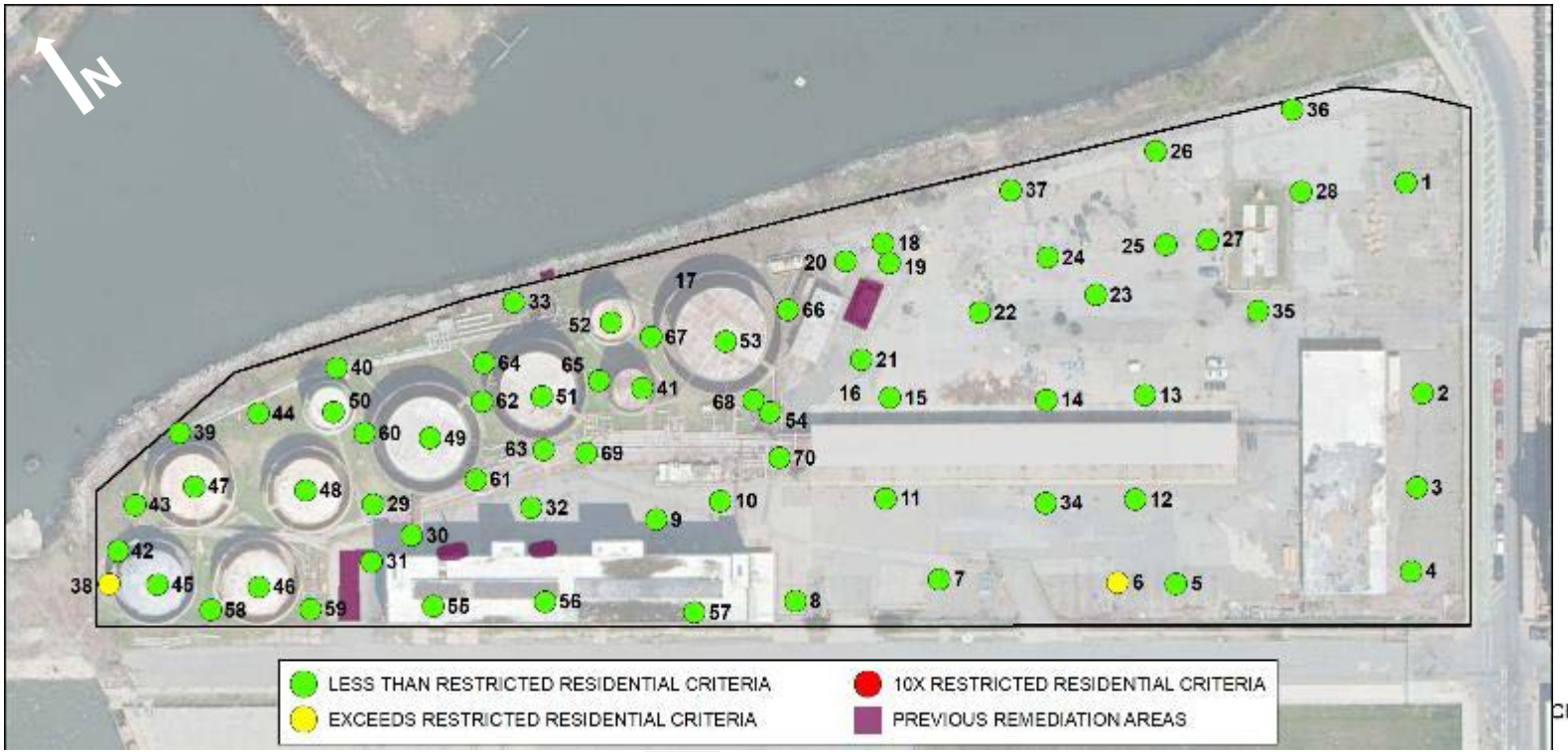
Note: Boring numbers are indicated but do not include RXSB prefix

VOCs in Saturated Soil (5-18 feet below land surface)



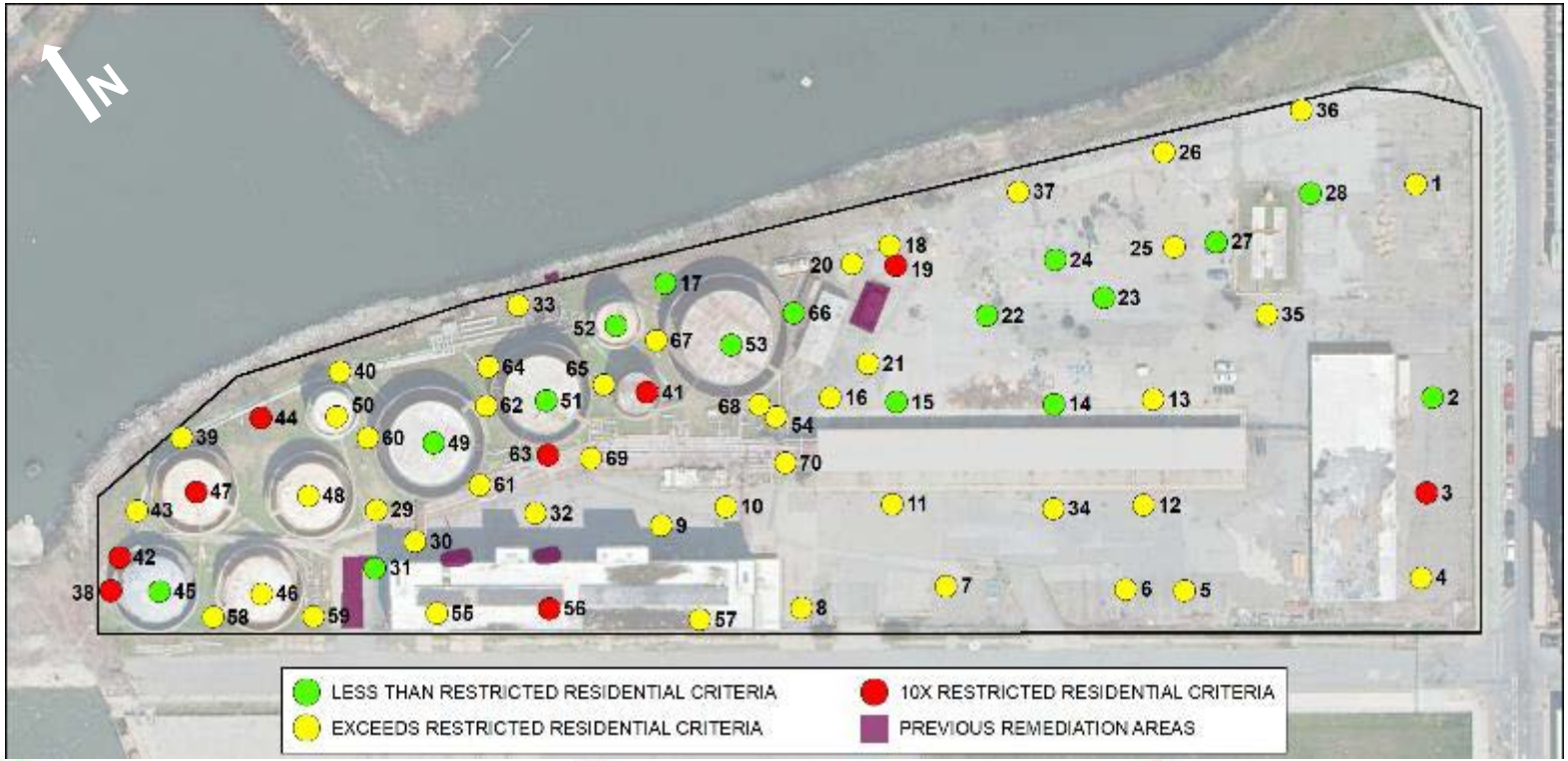
Note: Boring numbers are indicated but do not include RXSB prefix

VOCs in Soil at Soil Boring Bottom (18-35 feet below land surface)



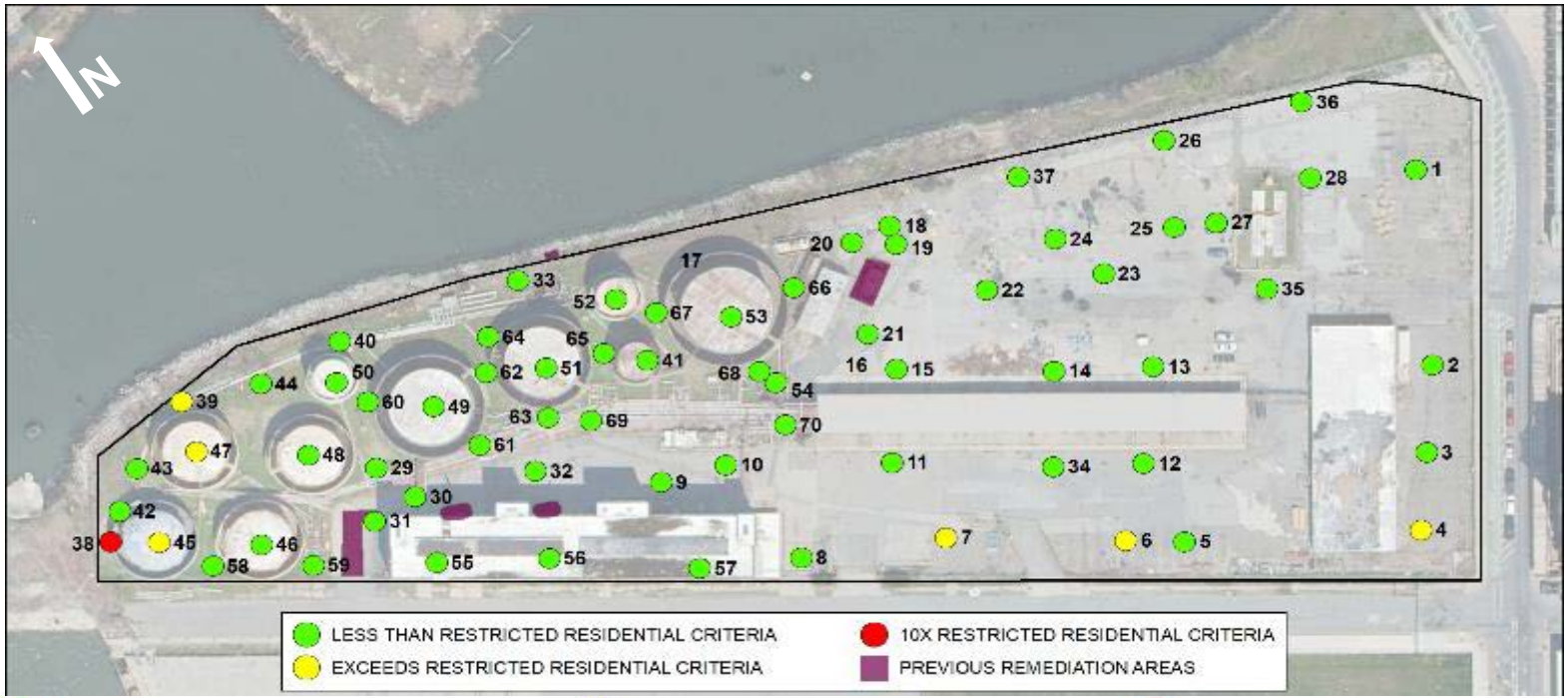
Note: Boring numbers are indicated but do not include RXSB prefix

SVOCs in Surface Soil (0-2 feet below land surface)



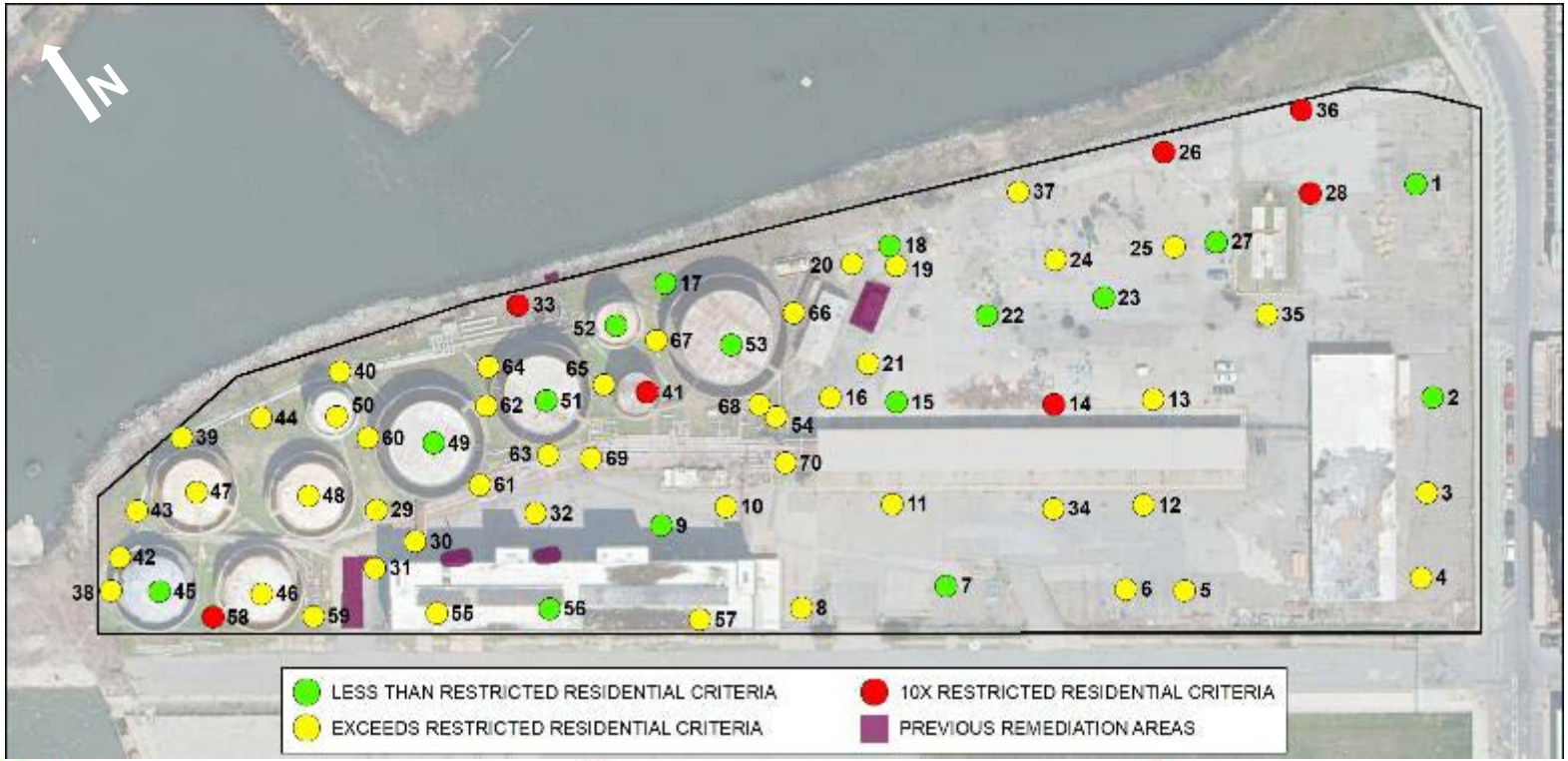
Note: Boring numbers are indicated but do not include RXSB prefix

SVOCs in Soil at Soil Boring Bottom (18-35 feet below land surface)



Note: Boring numbers are indicated but do not include RXSB prefix

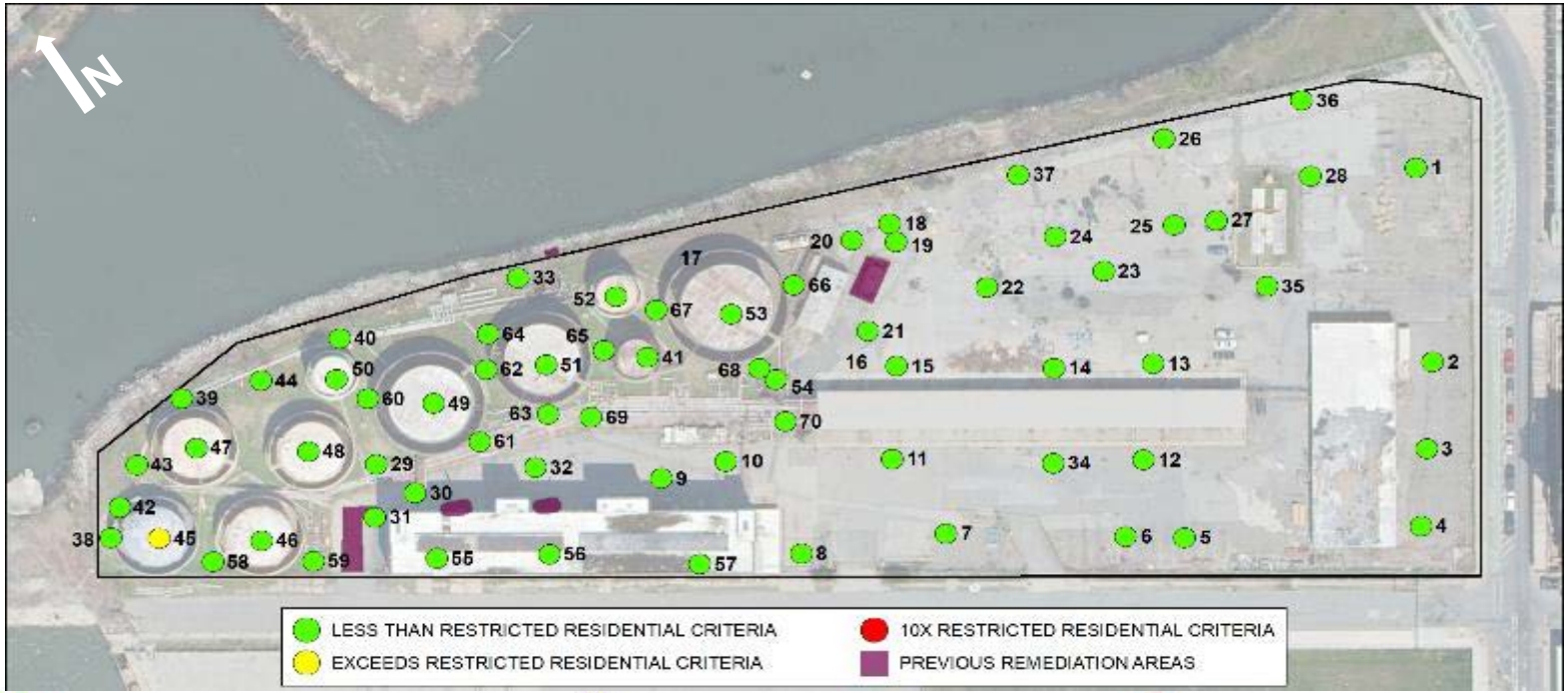
Metals in Surface Soil (0-2 feet below land surface)



LESS THAN RESTRICTED RESIDENTIAL CRITERIA
EXCEEDS RESTRICTED RESIDENTIAL CRITERIA
10X RESTRICTED RESIDENTIAL CRITERIA
PREVIOUS REMEDIATION AREAS

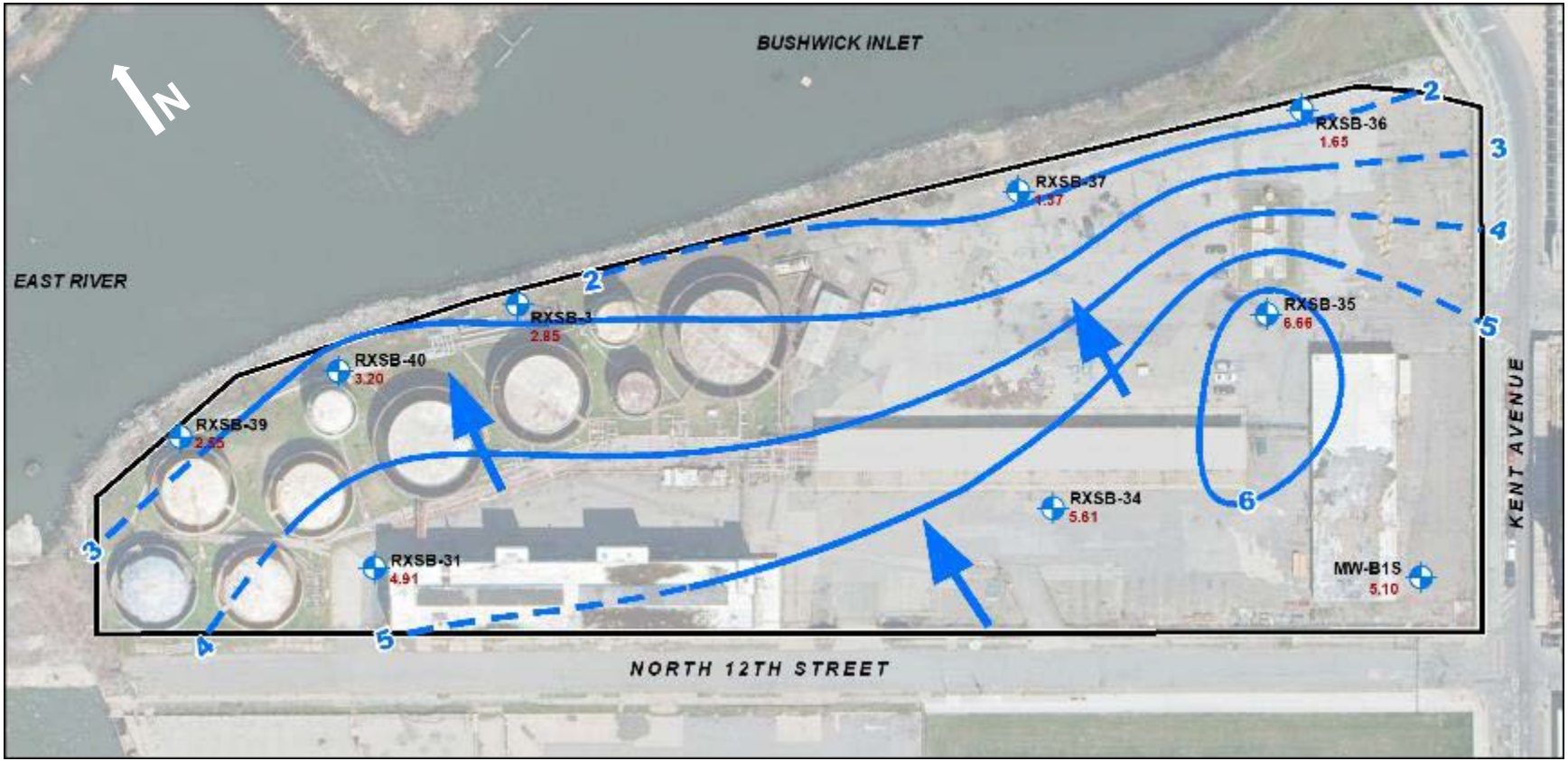
Note: Boring numbers are indicated but do not include RXSB prefix

Metals in Soil at Soil Boring Bottom (18-35 feet below land surface)



Note: Boring numbers are indicated but do not include RXSB prefix

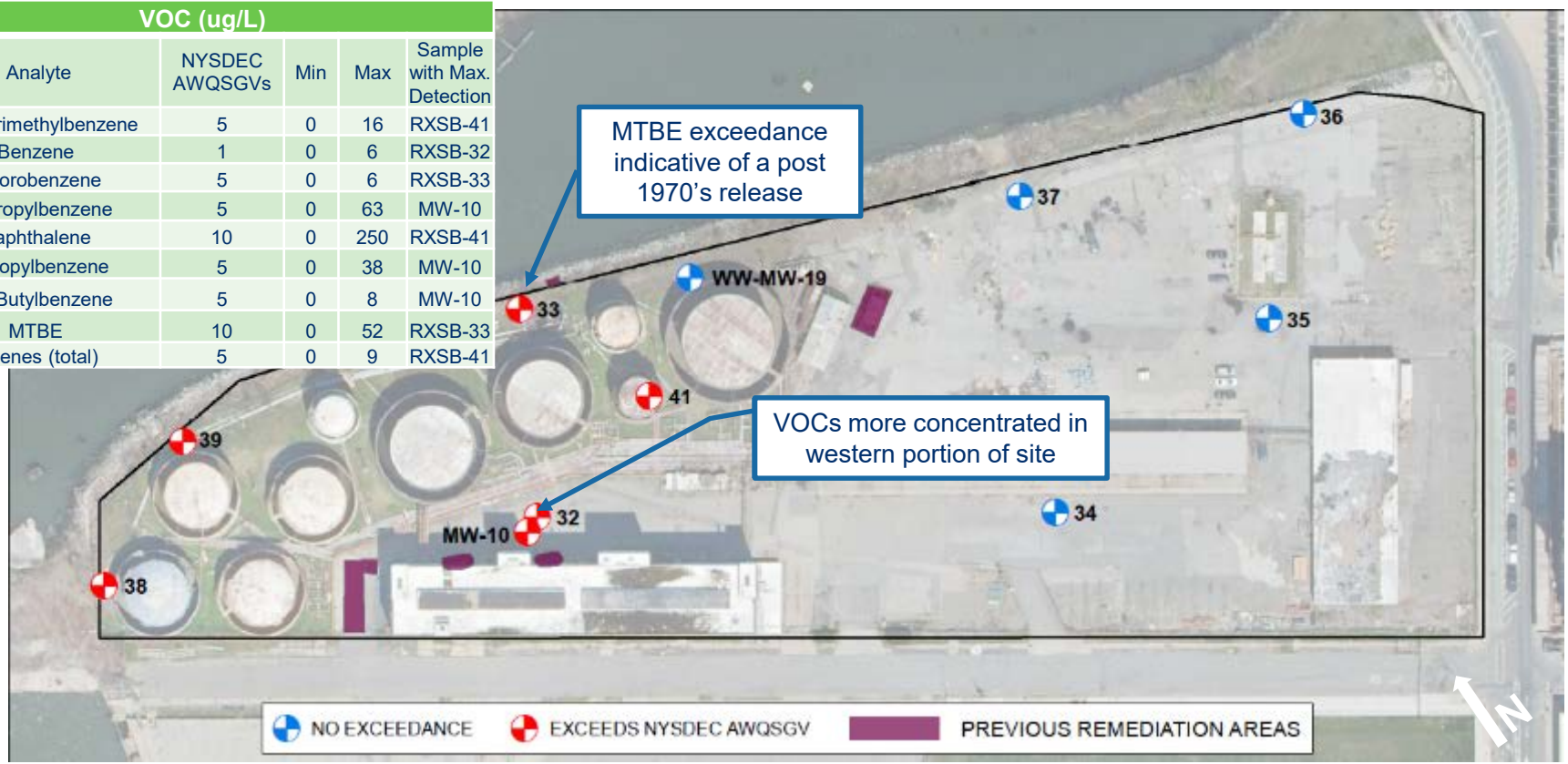
Groundwater Flow



Note: Groundwater elevations at monitoring wells shown in red

VOCs in Groundwater

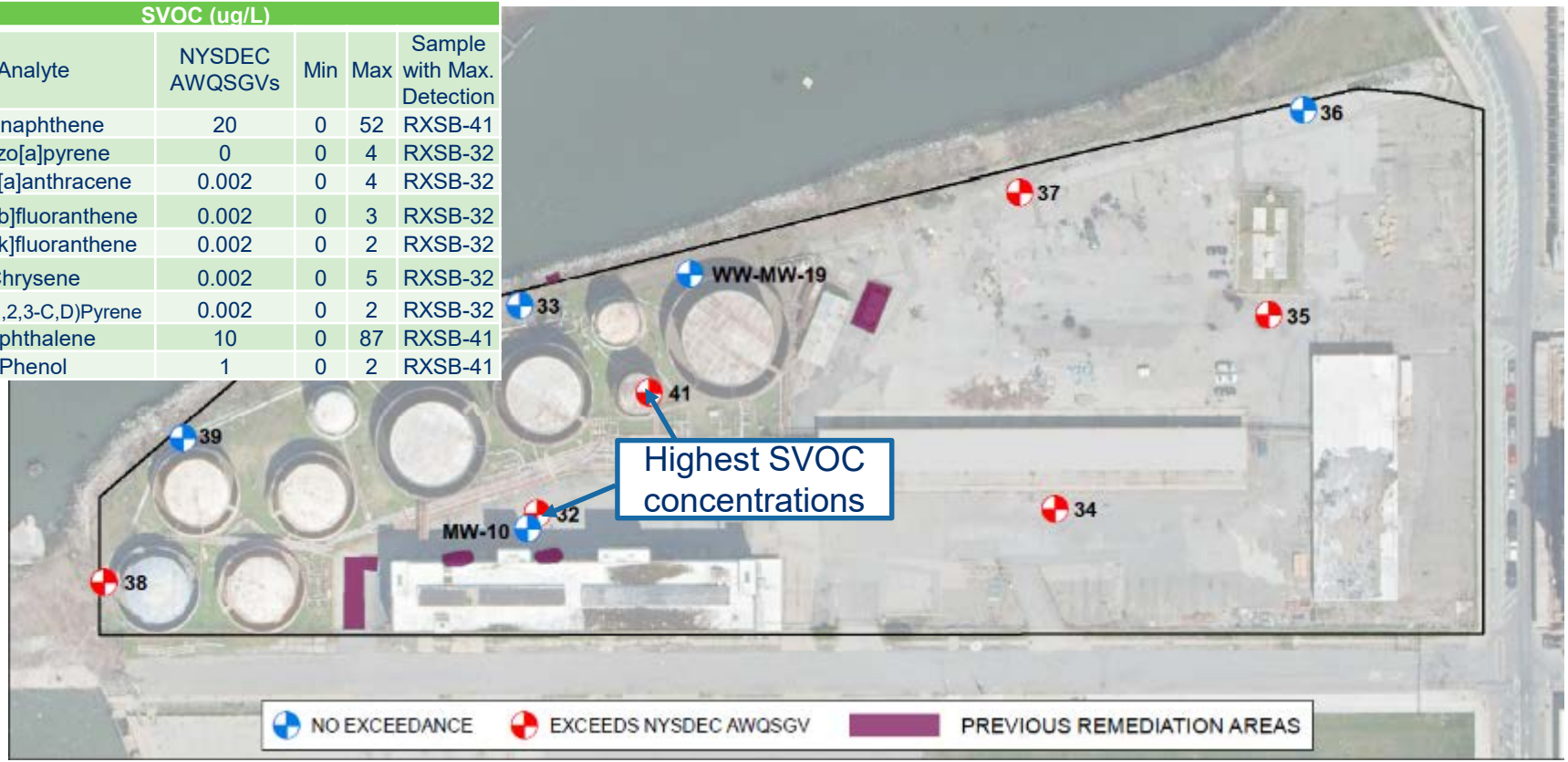
VOC (ug/L)				
Analyte	NYSDEC AWQSGVs	Min	Max	Sample with Max. Detection
1,2,4-Trimethylbenzene	5	0	16	RXSB-41
Benzene	1	0	6	RXSB-32
Chlorobenzene	5	0	6	RXSB-33
Isopropylbenzene	5	0	63	MW-10
Naphthalene	10	0	250	RXSB-41
n-Propylbenzene	5	0	38	MW-10
sec-Butylbenzene	5	0	8	MW-10
MTBE	10	0	52	RXSB-33
Xylenes (total)	5	0	9	RXSB-41



Note: Boring numbers are indicated but do not include RXSB prefix

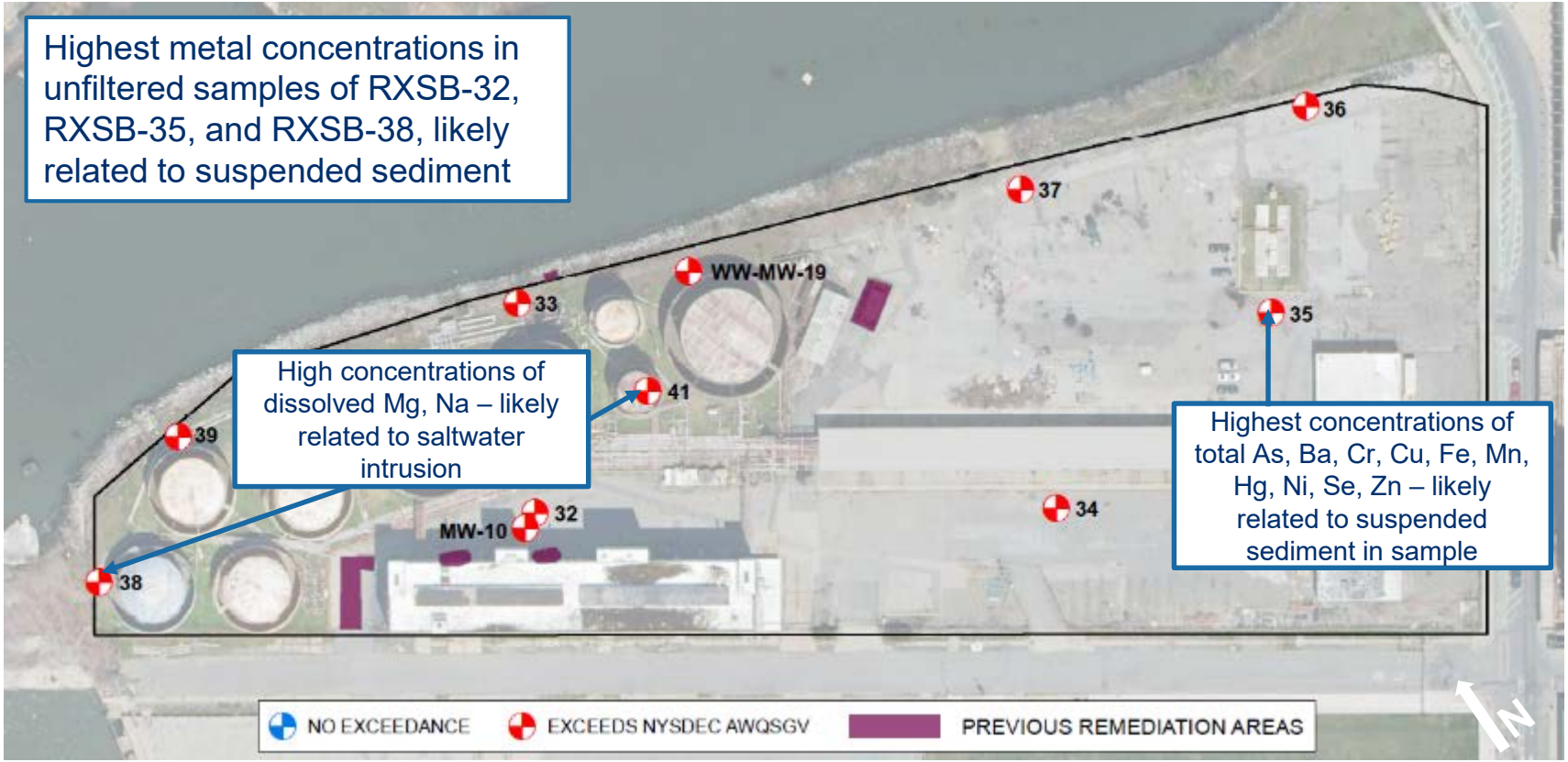
SVOCs in Groundwater

SVOC (ug/L)				
Analyte	NYSDEC AWQSGVs	Min	Max	Sample with Max. Detection
Acenaphthene	20	0	52	RXSB-41
Benzo[a]pyrene	0	0	4	RXSB-32
Benzo[a]anthracene	0.002	0	4	RXSB-32
Benzo[b]fluoranthene	0.002	0	3	RXSB-32
Benzo[k]fluoranthene	0.002	0	2	RXSB-32
Chrysene	0.002	0	5	RXSB-32
Indeno(1,2,3-C,D)Pyrene	0.002	0	2	RXSB-32
Naphthalene	10	0	87	RXSB-41
Phenol	1	0	2	RXSB-41



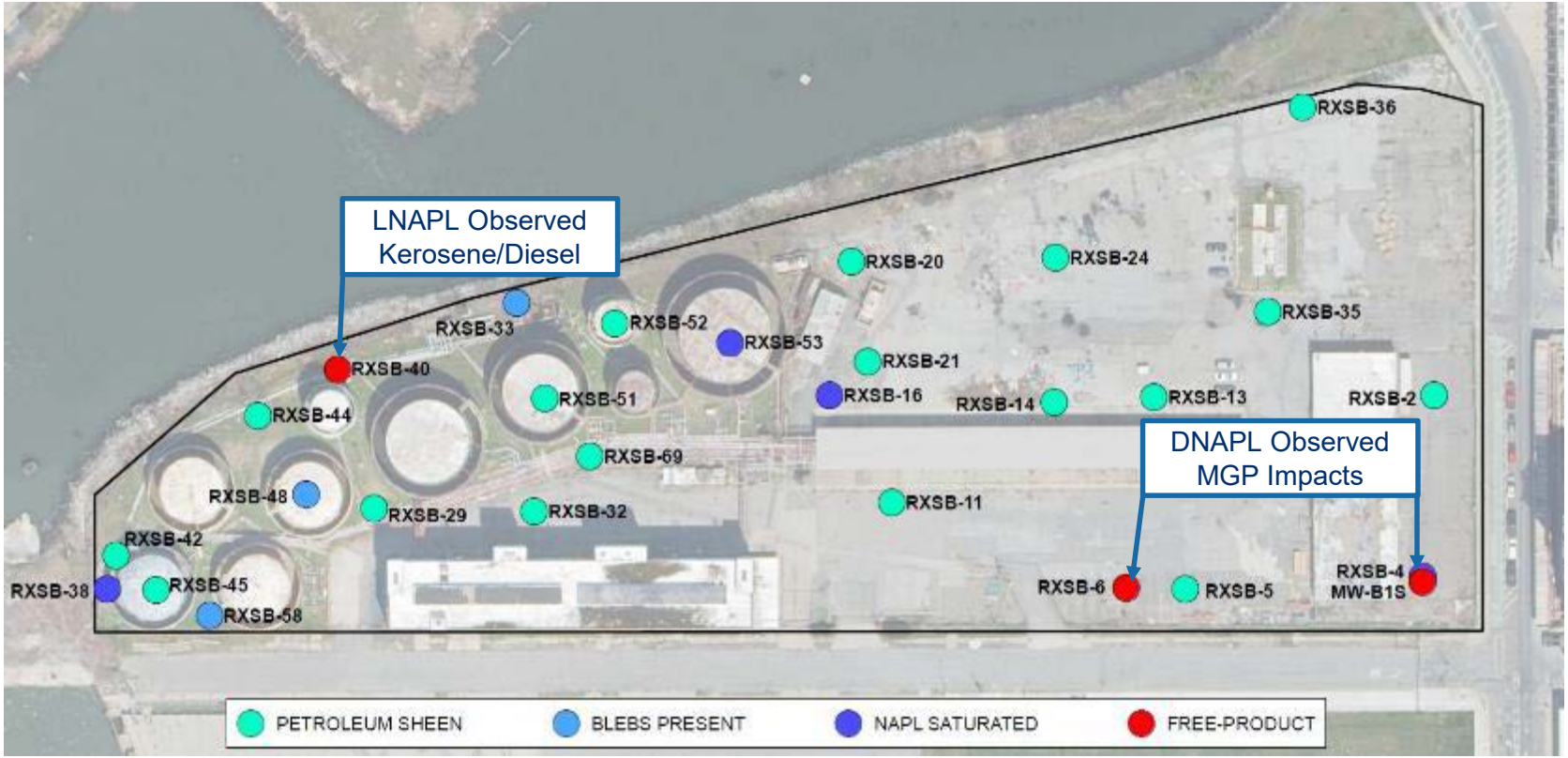
Note: Boring numbers are indicated but do not include RXSB prefix

Metals in Groundwater



Note: Boring numbers are indicated but do not include RXSB prefix

Observed Product



PFAS Data

PFAS Data		
Location	PFOA (ng/L)	PFOS (ng/L)
NYSDEC AWQSGVs	**10**	**10**
RSB-29	**160**	ND
RSB-30	0.85J	0.85 J
RSB-30 DUP	**15**	ND
RSB-31	**82**	ND

Summary and Conclusions

- Site characterization is complete
  - ExxonMobil and the City of New York have satisfied the requirements of the December 2018 Order on Consent and Site Characterization Work Plan
  - The requirements for implementation of a “Site Assessment Proposal” in accordance with the MPFL have been satisfied. The City of New York will seek formal closure of the MPFL following NYSDEC acceptance of the SC Report

- NYC plans to eventually redevelop the Site into a municipal park
  - Based on current environmental conditions and existing engineering controls (i.e., fencing, pavement, etc.) there is not a need for interim remedial measures
  - Future redevelopment of the Site as a Park will include construction of a Site-wide cover and an anticipated need to raise the Site grade in flood zone/flood plain areas

Summary and Conclusions

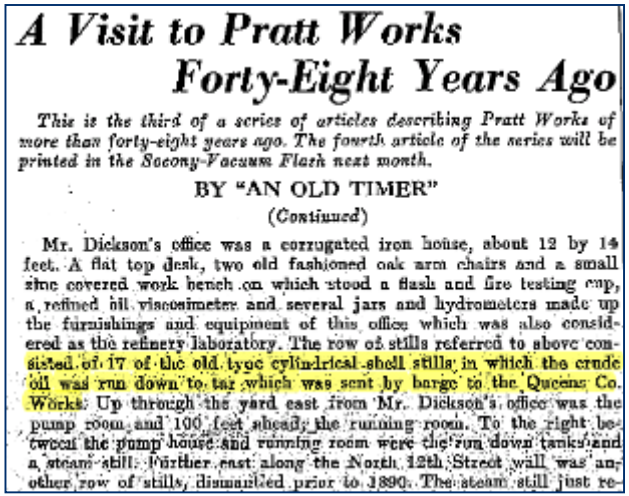
- Future Remediation responsibility must be shared by multiple parties
  - 60 years of multiple petroleum operators after SOCONY operations ceased in 1949
  - Evidence of modern fuel components (e.g., diesel, kerosene, and MTBE)
  - Evidence of MGP impacts along 12th Street migrating into Block 2277
  - Evidence of fire suppression chemicals PFAS

Discussion

BACKUP

Presence of Petroleum Tar, Not MGP Tar, at pre-SOCONY Refinery

- Petroleum “tar tanks” depicted on 1887 Sanborn map (pre-SOCONY) stored still "bottoms" from crude oil distillation process; Still “bottoms” are not a byproduct of MGP processing



A Visit to Pratt Works Forty-Eight Years Ago

This is the third of a series of articles describing Pratt Works of more than forty-eight years ago. The fourth article of the series will be printed in the Socony-Vacuum Flash next month.

BY "AN OLD TIMER"

(Continued)

Mr. Dickson's office was a corrugated iron house, about 12 by 14 feet. A flat top desk, two old fashioned oak arm chairs and a small zinc covered work bench on which stood a flash and fire testing cup, a refined bil viscosimeter and several jars and hydrometers made up the furnishings and equipment of this office which was also considered as the refinery laboratory. The row of stills referred to above consisted of 17 of the old type cylindrical shell stills in which the crude oil was run down to tar which was sent by barge to the Queens Co. Works. Up through the yard east from Mr. Dickson's office was the pump room and 100 feet ahead, the running room. To the right between the pump house and running room were the run down tanks and a steam still. Further east along the North 12th Street wall was another row of stills, dismantled prior to 1890. The steam still just re-

Socony-Vacuum Flash, June 20, 1934

MGP Site Map (*ca.* 1921)

- Per a *ca.* 1921 site map, the Williamsburg MGP had
  - 13 buildings
  - 5 tar tanks (total capacity of 278,000 gallons)
  - 4 gas oil tanks (total capacity of 1.453 million gallons)
  - Multiple separators

WHEREAS, the premises consist of a plot of ground, upon which is located the Williamsburgh Works of the Brooklyn Union Gas Co., lying on the east and west sides of Kent avenue between North 11th and North 12th streets, upon which there are 13 buildings and 4 gas oil tanks, the tanks having a total capacity of approximately 1,453,000 gals. and 5 tar tanks having a total capacity of approximately 278,000 gals.; and