REMEDIAL INVESTIGATION WORK PLAN

Willets Point Development
126th Street/Willets Point Blvd.
Queens, NY 11368
NYSDEC BCP No. C241146

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
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FINAL
September 2014

CONTENTS

LIST OF APPENDICIES

LIST OF TABLES

LIST OF FIGURES

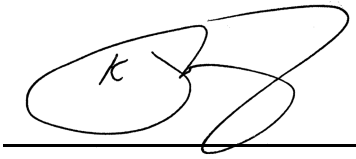
ACRONYMS AND ABBREVIATIONS

AOCs	areas of concern
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
CPP	Citizen Participation Plan
DRO	Diesel Range Organics
DUSR	Data Usability Summary Report
ECD	Electron Capture Detector
EIMS	Environmental Information Management System
ELAP	Environment Laboratory Approved Program
ESA	Environmental Site Assessment
FSP	Field Sampling Plan
GPR	ground penetrating radar
GRO	Gasoline Range Organics
HASP	Health & Safety Plan
IRM	Interim Remedial Measures
LNAPL	light Non Aqueous Phase Liquid
MIP	membrane interface probe
MTA	Metropolitan Transit Authority
NAPL	non aqueous phase liquid
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OER	Office of Environmental Remediation
PCB	Polychlorinated biphenyl
PID	Photoionization Detector
RECs	Recognized Environmental Conditions
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan

RSCOs	Recommended Soil Cleanup Objectives
SVOCs	Semi Volatile Organic Compounds
TAL	Target Analyte List
TPH	total petroleum hydrocarbons
UST	Underground Storage Tanks
USGS	United States Geological Survey
Integral	Integral Consulting Inc.
QAPP	Quality Assurance Project Plan
QDG	Queens Development Group
VOC	Volatile Organic Compound

CERTIFICATION

I Kevin McCarty, P.G. certify that I am currently a Qualified Environmental Professional as defined in 6 NYCRR Part 375and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



Signature

9/9/2014

Date

1 INTRODUCTION

Integral Engineering P. C. (Integral) has prepared this Remedial Investigation Work Plan (RIWP) on behalf of Queens Development Group, LLC, QDG URA Corporation, QDG Hotel Partners, LLC, QDG 126th Street Partners, LLC, QDG Parking Partners, LLC, and QDG Retail Partners, LLC (Volunteers), for the Willets Point Development property (Site). The Site is located in the borough of Queens, NY and comprises approximately 23.5 acres inclusive of 56 individual tax lots within 8 City blocks as well as specific roadway areas adjacent to many of the lots. Figures 1 and 2 show the Site, its location within the area of Queens, and the layout of the blocks, individual lots and roadways that are included. Also included within the Site are former City street areas shown within Willets Point Boulevard, 36th Avenue, 37th Avenue, 38th Avenue and 39th Avenue.

The Site is currently enrolled in the New York State Brownfield Cleanup Program (BCP) and listed as Site No. C241146. This document comprises a remedial investigation (RI) to be implemented at the Site and is being submitted to the New York State Department of Environmental Conservation (NYSDEC) along with a completed Supplement (under separate cover) to the previously approved BCP Application dated August 2013. The Supplement includes the remaining lots and street areas that comprise the Site and requests for their inclusion in the BCP Site.

This Draft RIWP includes a summary of Site history, a summary of previous environmental assessments and investigations, a description of the Site geologic and hydrogeologic setting, a summary of subsurface features, and a plan of action for further delineation of areas of concern identified previously by Integral and others.

The information and data collected during two previous investigations demonstrates that impacts can be expected to be identified in areas where long term historic commercial and industrial usage has taken place. In addition to the surficial impacts that are expected to exist, the entire Site is built upon a several hundred acre zone of historic fill. This zone also includes a large surrounding area that comprises the remainder of Willets Point, Citi Field and United States Tennis Authority sports complexes, the New York City Department of Parks and Recreation Olmstead Center and as the entire Flushing Corona Park.

Historic access to the area for formal inspection and testing has been restricted to allow only limited gathering of data. Many of the facilities and businesses within the Willets Point Development only recently ceased operations. No business operations have taken place during the period of ownership by the Volunteers. A full characterization of the Site will be performed as part of the Remedial Investigation.

The RIWP incorporates testing of all potentially impacted media including soil/historic fill, groundwater and soil vapor. The testing incorporates qualitative field analysis combined with quantitative certified laboratory analysis. Various methods of sample collection will also be employed to include direct push technology, hollow stem augers and test pitting in order to collect samples, install temporary and permanent monitoring points and access all areas necessary to characterize the entire Site.

The goal in using the multiple methods of sample collection will be to provide data in the most flexible and efficient manner. This will facilitate a rapid decision making process for identifying areas requiring further assessment, those where remedial action will be necessary and where proper use of presumptive engineering controls may be employed.

1.1 SITE DESCRIPTION

The Site is located in a commercial and industrial section of Queens, NY. The larger area of Willets Point covers approximately 62 acres with adjacent roadways, lots and lands adjacent to the Flushing Creek, Van Wyck Expressway and Northern Boulevard. The Site is also bordered on the immediate western boundary by New York City park land that contains Citi Field. Large residential and commercial areas are located immediately east of Flushing Creek and west of the Grand Central Parkway. Figure 1 and 2 show the Site limits, areas included within and adjacent to the Site. The Site is comprised of an approximately 23.5 acre parcel in northern Queens, New York. It consists of 56 tax lots and street areas that cover portions or all of eight (8) City blocks and sections of the mapped City streets adjacent to those lots. The overall Site boundaries can be described as 126th Street on the western edge, Northern Boulevard along the northernmost extremity, 127th Street along the eastern side and Roosevelt Avenue and a large Metropolitan Transit Authority (MTA) parcel along the southern perimeter.

Many of the roadways within the Site and surrounding Willets Point area are littered with debris. Although storm sewers exist throughout the project area, pooling of water on and around the roadways is common, indicating they may be partially clogged, collapsed or not functioning properly. Much of the roadway in Willets Point and the Site is heavily deteriorated and degraded. The majority of the pavement in the degraded area is no longer visible or can be seen to have been patch with a variety of surface materials, including asphalt and concrete.

In the adjacent and surrounding properties, land use includes a number of small and medium-sized commercial and industrial businesses similar to the operations that were within the Site. These include various automotive repair, waste management, warehouse and manufacturing facilities. The southern area is bordered by large material management operations, including construction and demolition debris processing. A large rail line and station with storage and repair operations is located immediately south of the Site along with large auxiliary parking lots. Two prominent sporting arenas are also located immediately adjacent to and in close proximity to the Site. Citi Field and the USTA Facility are both located within the larger area of

NY City-owned land that is Flushing Corona Park. The area beyond is a densely populated port of Queens with residential, commercial and industrial land use, including one of the region's largest airport facilities.

The Site is identified on New York City tax maps to include the following blocks and lots:

Block 1820 – Lots 9, 18

Block 1822 – Lot 17

Block 1823 – Lots 19, 20, 21, 23, 26, 28, 33, 40, 44, 47, 52 & 55

Block 1824 – Lots 1, 12, 19, 21, 26, 28, 33, 38, 40, 45, & 53 (entire block)

Block 1825 – Lots 1, 19, 21, 25, 28, 30, 37, 46, 48, 53, 55 & 58 (entire block)

Block 1826 – Lots 1, 5, 14, 18, 20, 31 & 35 (entire block)

Block 1827 – Lot 1 (entire block)

Block 1833 – Lots 103, 111, 117, 120, 141, 143, 151, 155, 158 & 172

A Site location map is provided as Figure 1. A map showing the Site property boundaries and tax lots is included as Figure 2, and a topographic map showing the entire Site is included as Figure 3.

Several investigations have taken place covering the overall Willets Point area and one within Block 1822 Lot 17, these investigation reports are appended to this RIWP and summarized in Section 2.1. The information presented in the reports is useful because it presents a description of the overall conditions and the Site combined with its surrounding environs.

According to previous investigations and reports conducted and prepared by HDR/LMS in 2005 and 2007, there were numerous underground storage tanks (USTs), gasoline filling stations and open reported petroleum spills within the Site. Sampling was performed and historic fill and limited site conditions were evaluated.

1.2 REGULATORY INTERACTION

1.2.1 Regulatory Jurisdiction

The Site is listed as having different combinations of Hazardous Materials, Noise and Air Quality E-Designations. The E-Designation program is designed to ensure that the provisions set forth during rezoning actions are implemented in order to avoid significant adverse impacts to human health or the environment through exposure to potential hazardous materials, unwanted sound on sensitive noise receptors, and mobile or stationary pollutants in ambient air quality. The E-Designation program is administered by the Mayor's Office of Environmental Remediation (OER).

NYS DEC will be the lead agency with jurisdiction over the investigation and remediation of Willets Point. Information generated from the activities under the Brownfield Cleanup Program will be provided to NYC OER to simultaneously satisfy Hazardous Materials E-Designation requirements.

1.2.2 Remedial Investigation Decision and Approval Process

The investigation and remediation employed at the Site will ultimately satisfy the NYSDEC Brownfield Cleanup Program requirements and E-Designation Program for New York City. Regulatory interaction will incorporate a continual and detailed communication with NYSDEC throughout the entire performance of the RIWP.

During the performance of the RI the need for additional investigation and interim remediation is anticipated. Supplemental RI activities and Interim Remedial Measures (IRM) will be proposed to NYS DEC through Addenda to this RIWP and IRM Work Plans. The process of interim reporting will begin when sampling locations and data collection efforts identified in the RIWP have been partially or fully completed and the need for decision-making becomes apparent.

Memoranda and work plans will include investigation results assembled and presented to DEC on an area by area basis, which may include one or more lots, as appropriate. The data will be presented along with recommendations for additional investigative measures (additional MIP, Geoprobe, test pit exploration), Interim Remedial Measures (UST removal, hot spot removal, LNAPL recovery) or no further action. A Work Plan will be submitted for NYSDEC approval for any proposed Interim Remedial Measures (IRM). Existing figure format that shows detailed information of lots/blocks over aerial photographs will be used to generate site figures. The interim memoranda and work plans may also include recommended sampling locations and type of sample collection method (MIP, Geoprobe, etc.), recommended interim remedial measures, a recommendation for no further action and the specific deliverable form of data (MIP graph, lab analysis or boring log with screening, etc.). Delineation end points will be established based on site background (see discussion of previous sampling in Section 2) in consultation with DEC prior to implementation of this RIWP.

The areas that have been investigated will be identified on Figures with a color coded area on the figure. Areas requiring additional investigation (step out sampling, delineation, vertical delineation sampling, test pit exploration, further groundwater monitoring, etc.) or remediation (UST removal, LNAPL remediation, etc.) will show the initial sampling location, contaminants of concern in a data/text box on that location and recommended additional investigation points with general measurements for reference. Any text accompaniment will be provided in a concise memo format. Text will specify the recommended investigative or remedial measure or no further action recommendation for which NYSDEC approval is sought. The memos/figures will be presented electronically to NYSDEC and a phone review of data or review in the field will occur, if NYSDEC is present. An electronic approval (with contingencies, as necessary) will

be provided by NYSDEC for the proposed additional sampling, remedial measure or no further action recommendation. The verbal component of the communication process is proposed to allow NYSDEC to provide for dynamic and collaborative discussion of findings, recommended additional activities and approval while field efforts are ongoing.

The intention is to complete the RI in a single continuous or nearly continuous phase of work. This process of testing, rapid presentation of data, review, discussion and email approval will provide flexibility to move the investigation forward as rapidly as reasonably. Throughout the performance of the RI, if supplemental investigation is necessary, Addenda to the RIWP will be prepared and submitted for review and approval. Additionally, if more immediate Interim Remedial Measures (IRM) are proposed during the RI, IRM Workplans will be submitted for review and approval. Upon DEC approval, the RI Report will be submitted to OER to satisfy E-Designation hazardous materials requirements. The RAWP will encompass IRM activities.

1.3 SITE HISTORY

Based on the existing information and reports prepared for the larger Willets Point area, historic usage of the Site is described as having been occupied under the current usage (various automotive repair and scrap operations, junk yards, small industrial operations, waste management operations and other similar businesses) since the mid 1900s.

Prior to development and the current street grid, the overall Willets Point area was a tidally influenced saltwater meadow. Sanborn maps prior to 1902 show a small number of rural homesteads occupying the mostly vacant area. During the early 1900s, Fishooks McCarthy purchased approximately 1,200 acres of the swampland, stretching from Kew Gardens and Forest Hills to the south, Flushing Bay on the north, Corona to the west and Flushing to the east, for use as the dumping ground for his Brooklyn Ash Removal Company. The 1914 and 1931 Sanborn maps of the area show the homes identified on the earlier map no longer existing with garages and filling stations taking their place. The ash dump is not identifiable on the Sanborn maps.

In 1906, the Brooklyn Ash Company began dumping incinerator ash, along with other refuse that was collected throughout New York City, into the marshland. The material was transported to the site by overland rail and by barges that traveled via Flushing Creek. Due to the extensive filling, the larger area deteriorated rapidly. The refuse and ash was dumped throughout the area, including the Site, for approximately 26 years. Accounts from 1934 report that the entire area north of Horace Harding Boulevard (Long Island Expressway) as being buried in ash and garbage. Mountains of refuse existed in the area, with piles reaching 90 feet high and homes up to a mile away were reportedly affected by rats, mosquitoes, smoke, and unpleasant odors.

Dumping was halted in 1932 after the contract between the Brooklyn Ash Removal Company and the City of New York expired. By this time, more than 50 million cubic yards of ash and refuse had been disposed of in the marshland. The city intended to use the 1939 Worlds Fair as a mechanism to transform the desolate wasteland commonly known as the Corona Dumps into what would eventually be a New York City park. Robert Moses was instrumental in transforming the fill area into the site for the World's Fair. Work commenced in January, 1936. Refuse was spread over any of the remaining marsh areas as fill, and a tidal dam was constructed on the Flushing River. Test borings advanced at the time of the park construction penetrated up to 30 feet of refuse before reaching the meadow mat that was originally present at the surface. Topsoil was supplied from worked sediment that was recovered during the creation of two lakes (Meadow Lake and Willow Lake) within the Flushing Corona Park. The area currently known as Willets Point, including the Site, was not included in the 1939 fair ground plans. It was also unaffected during the second World's Fair in the 1960s.

1.4 PURPOSE

The RIWP has been developed to achieve the following BCP objectives:

- To define the nature and extent of contamination on the Site.
- To present data in a manner that will facilitate rapid interim decision making moving the investigation forward.
- To identify if residual contaminant source areas are present on the Site.
- To determine whether remedial action is needed to protect human health and the environment.
- To produce data of sufficient quantity and quality to support the remediation of the Site, if warranted.

This Draft RIWP was developed in general accordance with the NYSDEC's Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10), dated May 2010.

Specifically, this Draft RIWP provides a summary of environmental conditions, including the following:

- Relevant information from existing environmental reports and previously conducted Site investigations
- Technical overview and findings from previous reports
- Planned investigation activities as outlined in Section 3 for the Draft RIWP (including soil, soil vapor, and groundwater investigations)
- Site base mapping, supporting figures presenting sampling results/data, and locations of planned investigational activities.

- Quality Assurance Project Plan (QAPP) (Appendix A)
- Site Specific Health & Safety Plan (HASP) (Appendix B)
- Community Air Monitoring Plan (CAMP) (Appendix B)
- Field Sampling Plan (FSP) (Appendix C)
- Citizen Participation Plan (CPP) (Appendix D)

References used in assessment of this Site and for development of this Work Plan are identified in the References section at the end of this document.

2 BACKGROUND

2.1 SUMMARY OF PREVIOUS INVESTIGATIONS AND ASSESSMENTS

In accordance with the DER-10, this Draft RIWP incorporates a summary of the previous Environmental Site Assessments and Site Investigations, which provide the basis for identifying the areas of concern (AOCs).

2.1.1 Phase I/II Environmental Site Assessments

A Phase I ESA was conducted in February 2005 on the entire Willets Point area (Appendix E). The Phase I assessed the potential for hazardous materials based on a reconnaissance from public rights-of-way (but generally no access to private property); a review of historical maps; federal and state regulatory records; and topographic and geologic/hydrogeologic data. Overall, based on the general conditions noted during the public right-of-way evaluation, the majority of the properties operating in the District were believed to contain potential concerns over waste discharge and other issues related to individual site conditions. Historical uses included metal wholesaling, recycling, various automotive body and mechanical repair operations and scrap parts sale and distribution. During the reconnaissance, metal construction debris and other recyclable metal was observed, in addition to all types of car parts (e.g., radiators, gas tanks and batteries). Contamination typical for this land use includes automotive wastes (e.g., waste oil, gasoline and radiator fluids), PCB-contaminated wastes and oils, solvents, heavy metals and lead acid batteries. Since there are no municipal sewer systems servicing the area, wastewater discharge to leach fields, septic tanks and underground tanks represent a potential direct pathway for contaminants to reach the subsurface and shallow groundwater.

The regulatory databases searched as a part of the Phase I ESA identified numerous registered petroleum storage tanks (and based upon the time period that the Site has been occupied by these types of businesses, it was determined that other unregistered tanks were also present), as well as a limited number of open-status petroleum spills (though other spills may have occurred and were not reported to the State).

A more recent Phase I Environmental Site Assessment was performed for the Site by Integral in August 2013. This assessment incorporated review of available historical maps and databases, but did not include the full Agency database search. This Phase I is included as Appendix F. The Phase I review includes the documentation of several recognized environmental conditions (RECs) identified throughout the Site. These are represented on the individual block and lot Figures included in this RIWP to inform proposed sample locations.

2.1.2 Subsurface Investigations

Two subsurface investigations were available for review. Both were conducted in the overall area covering portions of the Site. The Phase II Environmental Site Investigations were conducted specifically to evaluate conditions for potential redevelopment. A geotechnical assessment was included and summarized within the first Phase II Report. The reports are titled Phase II Environmental Site Assessment Willets Point, Queens, NY November 2005, (Appendix G); and Willets Point Development District, Block 1822, Lot 17 126-36 34th Avenue, Limited Phase II Site Investigation Report, February 2009 (Appendix H).

2.1.2.1 Phase II Environmental Site Assessment, Nov. 2005

Scope of Work

The Environmental Site Assessment (ESA) was conducted by HDR/LMS in order to gather information used to evaluate redevelopment plans and contribute to logistical planning for the Willets Point project. The Phase II ESA was a diverse evaluation that included the following types of assessments:

- Preliminary limited Phase II Environmental Investigation
- Metes and bounds topographic site feature survey
- Geotechnical review
- Infrastructure layout
- Noise comparative evaluation
- Traffic pattern assessment

The components of this overall ESA that pertain to the RIWP include the historic information gathered as part of the background, review of geotechnical information as it provides additional understanding of subsurface conditions, and the actual performance of the environmental portion of the ESA. The main component of the ESA was focused on the installation of 47 probes and 7 temporary piezometers. The information gathered and reviewed provides a general overview of the entire Willets Point District. This area covers a larger footprint than the BCP Site, but the evaluation is very important in looking at known conditions.

The geotechnical review was limited to existing information from other nearby projects in order to understand if construction within this specific area could be performed using typical methodology or if the area would require significant additional effort. The projects that were evaluated included several completed specifically for the City of New York and one where very specific geotechnical design was required for the construction. They included the 28 million gallon underground Combined Sewer Overflow Tank located at Fowler Avenue and College Point Boulevard, Flushing Meadows Corona Park pool and rink just west of the Van Wyck Expressway in Corona Park and the Shea Stadium Redevelopment EIS just west of and adjacent to the Willets Point project area.

The Phase II ESA was devised to cover as much of the overall Willets Point District as possible under the scope that would allow a general subsurface condition evaluation to be performed. The Report indicated that data collection was limited only to sidewalks along the streets because access to individual properties was not available.

Investigation Findings

A total of 47 probes were completed throughout the Willets Point area. Figures 4-6 and 4-7 within Appendix G show the distribution of sampling locations over the entire Willets Point District. Samples were collected continuously from the surface to the bottom depth in order to provide lithologic descriptions. The bottom depth for the majority of borings was the limit of the historic fill material which was underlain by an organic peat or clay layer. Borings installed during both environmental and geotechnical efforts were used to identify the overall fill thickness across Willets Point. A number of the shallow environmental borings were terminated at the base of what was reported as the fill zone. This was historically identified as the former tidal wetlands surface containing clay or more organic deposits. A total of 22 of the collected samples were submitted to the laboratory for a variety of analyses including volatile organic and semi-volatile organic compounds, total metals, pesticides, PCBs, and ethylene glycol.

Groundwater sampling was conducted from 7 piezometers installed in specific probe locations. Screen intervals were located within the shallow saturated zone and wells were typically installed to a depth of 10 ft. Groundwater was analyzed for volatile and semi-volatile compounds.

During the investigation, site conditions that were noted included flooded streets with significant rutting and stained pools of water. Numerous vent pipes and fill ports were recorded in the Report.

Sampling identified four different types of material within the upper 5 to 10 feet across the larger Willets Point District. Commingled fill that included ash, slag, coal and mixed waste fill was encountered across a majority of the area. Some locations included sands that were not thought to be native but fill material. Clay was encountered in some locations; in other borings, the fill material covered the entire length of the boring. The Phase II included several cross-sections which look at selected areas along the perimeter of the BCP Site. While fill material was identified in most of the sampled intervals throughout the area, the investigation did not identify areas within the BCP Site containing odors or discoloration due to something other than the fill material itself or instrument readings indicative of other impacts. Soil sampling provided information with respect to the overall presence or lack of presence for VOC and SVOCs. VOCs were present in a majority of the samples that were analyzed but in concentrations that were usually below comparative cleanup levels at the time (TAGM 4046). A further review of the data showed that the majority of samples containing reported VOCs were at trace levels. The most common reported volatile organics included those typically noted as

potential laboratory contaminants and included methylene chloride, acetone and carbon disulfide. In the case of auto-body repair and painting facilities, methylene chloride and acetone were more commonly present but the consistently trace levels did not point to potential sources or plume areas. SVOC concentrations were reported in virtually all of the samples as well. In the case of SVOCs, they were reported with a greater number of identified compounds and over a wider range of concentrations. Total additive SVOC concentrations ranged from nearly non-detect to just over 30 mg/kg. These represent a reasonable cross section for non-impacted historic fill that is known to contain previously incinerated material as well as coal.

The HDR/LMS Phase II ESA Report is included as Appendix G.

2.1.2.2 Limited Phase II Investigation Report-Willets Point, Block 1822, Lot 17, Feb. 2009

Scope of Work

The primary purpose of the investigation was to collect samples throughout the parcel in areas that could be accessed in order to allow for a general assessment of the overall site conditions in relation to the existing land use at the time and for proposed future development scenarios. The data was used to make recommendations for presumptive remedial measures. No Phase I assessment was performed on the property prior to performing the investigation. Therefore, specific testing locations were not specifically intended to cover all RECs that existed.

The Phase II included an initial geophysical investigation that was limited by site conditions. Stacked vehicles and buildings filled with parts and cars prevented large areas from being assessed.

A total of six (6) borings/probes were installed throughout the site. Sampling was conducted to a depth of 15 feet below grade (ftbg). Samples were collected from each boring and evaluated for obvious signs of impact as well as to identify, where possible, the thickness of the fill material and depth to native sediments. Laboratory analysis was conducted from specific samples for VOCs, SVOCs, TAL metals, Pesticide/PCBs and total petroleum hydrocarbons by DRO/GRP.

Groundwater was also sampled from shallow temporary wells installed at five (5) of the boring locations. Samples were analyzed for VOCs, SVOCs, PCBs, metals and pesticides/herbicides. The investigation was performed without leaving wells in place and, therefore, no groundwater elevation map was able to be prepared. Conditions noted in the Report indicated a sheen was present at two (2) wells. The Site Investigation Report is included as Appendix H.

The investigation did not include vapor monitoring.

Investigation Findings

Data from the investigation was compared to the current NYCRR Part 375-6 Soil Cleanup Objectives. A variety of VOCs, SVOCs and metals were reported above unrestricted and

restricted residential SCOs. There were also results from individual samples that identified pesticides and PCBs above restricted residential RSCOs. Impacts noted in the report were representative of the use and operations as a scrap yard. Surficial contamination included organics and metals that are consistent with that type of use.

Shallow groundwater results contained petroleum compounds indicative of underground storage tank overflow or leaking above or underground storage. An existing open petroleum spill was noted at the time of the investigation, and contamination was attributed to that known spill.

Remedial recommendations were presented in the report covering continued use under the scenario that was current at the time of the investigation and for redevelopment of the site. The redevelopment scenario discussed complete removal of all items associated with the use as a scrap yard; removal of impacted areas, including underground and aboveground tanks; closing open petroleum spills and the impacts associated with them; and removal of material from impacted areas, including PCB-impacted soil, septic systems, etc. The recommendations discussed the issue of handling this property as one site and preventing impacts to adjoining areas.

2.1.2.3 Summary of Previous Investigations

The following conclusions are based on the results of the investigations conducted to date:

- VOC analyses showed similar lab-related contaminants were present. While these compounds may be present on the scrap yard site, several other VOCs were noted in the 2009 investigation and not included in the 2005 data. These were specifically noted as petroleum-based compounds.
- SVOCs were reported at relatively low concentrations in the 2005 Investigation. These samples were collected from within the confines of the general roadways and appear to present the general conditions present in historic fill. Samples collected in the 2009 Investigation were collected from just below the surface and were found to contain concentrations of SVOCs that that in at least one case contained a wider range of detected SVOC compounds.
- Heavy metals present in fill material within the roadways contained many of the same metals identified in the 2009 Site Investigation. Concentrations in the 2009 Investigation samples were noted to be consistently higher, even compared to the composite of the upper several feet in the 2005 samples. Based on a comparison, it might be reasonable to assume that the surficial material would have a greater signature of those specific metals. As would be expected from the heavy surface use and storage of many different types of scrap metal, lead, zinc and mercury were noted to be consistently higher in the 2009 data.

- PCBs were not identified in the 2005 data but were noted in half of the 2009 samples. One was above the residential RSCO and nearly at the subsurface limit. The presence of PCBs is likely a Site-related impact and not specific to historical fill.
- Diesel Range Organics (DROs) were not looked at or analyzed for in 2005. They were noted in the 2009 Report at concentrations exceeding detection limits in all samples and ranging several orders of magnitude. No Gasoline Range Organics (GROs) were reported.
- The results of both the physical description of the site and the limited and preliminary data indicate a difference in quality and chemical concentrations between the subsurface material and material nearer the surface where land use is heavy and known. Several parameters may be able to provide assistance in evaluating the historic fill present throughout the entire area and material impacted by the many small auto-related businesses.
- A similar comparison to groundwater can also be made. The groundwater quality within the entire Site area and surrounding historic fill is clearly not potable. The shallow groundwater within localized areas of sites with intense use, leaking USTs or having been impacted by underground discharges, contains a different suite of organic contaminants will be identified and evaluated for remedy.

2.2 PHYSICAL SETTING

The Site incorporates approximately 23.5 acres of fairly level land situated in the City of New York, Queens County, New York. The Site is mapped on the Flushing, NY Quadrant 7.5 Minute Topographic Map, published by the United States Geological Survey (USGS). Review of the topographic map indicates that the Site is located approximately 10 feet above sea level (NAVD 88).

2.2.1 Geologic/ Hydrogeologic Setting

The site is in the Willets Point area of Flushing, Queens County, New York. It is situated near the westernmost end of Long Island. The regional stratigraphy of Long Island, including the aquifers and confining layers, was formed from glacial tills and outwash sands of the Pleistocene Epoch. These layers lie unconformably over older deposits of the Cretaceous Period. The Cretaceous deposits lie over an impermeable bedrock surface dipping to the southeast. The bedrock consists of crystalline metamorphic rock of the lower Paleozoic Era. Local aquifers that supply or have the potential to supply groundwater for consumption or industrial uses consist primarily of the late Cretaceous and Pleistocene sands and gravels. The formations overlying bedrock form a southward-dipping wedge that attains a maximum thickness of 1050 feet in the southeast corner of Queens County. Three principal aquifers are present under Long Island, along with specific over and underlying clays. The Upper Glacial aquifer is the nearest to the surface. In the site vicinity, the Magothy aquifer directly underlies

the Upper Glacial. The Raritan clay member of the Raritan Formation is found below the Magothy and acts in a confining capacity over the underlying Lloyd aquifer. Bedrock is situated beneath the Lloyd aquifer and the generally southeasterly dip of its surface is transferred to the overlying sedimentary formations.

The surface of the site and surrounding local area represents a lowlying drainage zone that was a large tidally influenced salt marsh. The marsh was directly connected to Flushing Bay via a series of tidal water courses that lead to Flushing Creek. At one time it was a continuous meandering water body connecting the upland to the bay for natural drainage. This lowlying area was initially filled causing a surcharge, compaction and settling of the original surface. It was then graded to have a similar elevation to the immediate surrounding land. The current shallow geologic zone is completely man-made with what is currently defined under NYCRR Part 375-1.2 (x) as 'historic fill'. Much of the fill is below the current water table, while a significant percentage does remain above the saturated zone. Overall drainage patterns have been completely manipulated to include two lakes within the fill zone and a tidal gate preventing influence beyond the man-made terminus of Flushing Creek. Flushing Creek has both sift and hard shoreline structures with the majority of the soft shoreline along the southern edges. The Site is primarily paved but the larger inland area covered by Flushing Meadows/Corona Park is grass covered and does allow infiltration to the shallow water table above the original meadow mat and marsh base.

The Upper Glacial aquifer consists primarily of sand and gravel, the result of glacial deposition. Topography varies because of the Harbor Hill terminal moraine, in the central portion of Queens County. The resulting southwesterly trending ridgeline marks the southernmost limits of the Wisconsin Age glaciation in this area. South of the moraine outwash, deposits resulting from the transport of sediment in glacial melt waters are present. The site is north of the terminal moraine in a relatively low-lying area. Shallow groundwater in this area is under unconfined water table conditions and is encountered at relatively shallow depths below grade.

The Magothy aquifer varies in thickness. It is nonexistent in the extreme western end of Long Island and northern Queens, and up to 450 feet thick at the southern end of the Queens County. In areas where the aquifer has eroded, Gardiners clay and Jameco gravel are present. The Magothy is composed of mostly deltaic very fine to coarse sand and silty sand with lesser amounts of interbedded clay and silt. Although the Magothy is predominately discontinuous, there is a prominently consistent basal sand and gravel zone with interstitial clay and silt. This unit is reportedly 50 to 100 feet thick under most of Queens County. This unit increases in thickness along the eastern end of Long Island. Water within Magothy's Pleistocene deposits exists under relatively unconfined conditions. Water at lower elevations in the aquifer may exist under confining conditions, dictated by clay beds within the aquifer.

2.2.2 Setting

Shallow groundwater depth in the Willets Point area is expected to vary depending on deposits of less permeable organic deposits from the original swamp/wetlands. Regardless, it would be consistent to expect groundwater to be encountered between 3 and 7 feet across the Site. The amount of water available in shallow intervals will depend entirely on the deposits in which it is encountered.

2.2.3 Subsurface Features

Subsurface conflicts at the Site include the local utility corridors that exist throughout the area. Willets Point Boulevard contains the bulk of underground infrastructure, including a 60-inch diameter water main and numerous underground electrical conduits along its entire length. Other infrastructure includes the existing storm sewers in the street grid and various connections to the building lots.

Additional subsurface features may include drainage and cesspool-type septic systems that have been historically installed throughout the Site. There are no drawings or design information available to locate or describe such items, but the lack of sanitary sewers and the many businesses with running water present the very real potential for the presence of such systems.

Shallow groundwater has been reported to be present and generally separated from deeper aquifers by the former surface of the tidal wetlands.

3 REMEDIAL INVESTIGATION

The work described in this RIWP will be conducted in accordance with 6 NYCRR Part 375 Brownfield Cleanup Regulations, and in general conformance with the NYSDEC DER-10. The Remedial Investigation (RI) work will also comply with the QAPP and FSP appended to this RIWP. The investigation process will involve sampling of soil/fill, soil vapor and groundwater. This Section describes the types of media to be sampled, evaluated and assessed. It also describes the different methods of sampling that will be employed.

Prior investigation work performed within the historic fill in the Willets Point District and referenced in this RIWP, as well as construction projects in the area have shown that this area is applicable to all of the testing methods presented in this RIWP. While conditions within the historic fill are believed to provide modest challenges that are not unlike sampling within other urban NYC areas, the developed portions of the Site will provide challenges with respect to horizontal and vertical access to sampling locations. Areas contain low ceilings, vacant buildings, open lots, concrete slabs, asphalt parking and other impediments. The RIWP is presented as an organized plan to use specific sampling methodologies and tools in certain areas. The scope also intends and is specifically designed to be flexible in order to use the technology best suited for rapid collection of quality data that will inform the overall Site remedy.

Where conditions are identified that require modification of sampling methods, the recommendation will be made to NYSDEC by providing the following information: Block and Lot identification of the specific location, sampling location identified on existing figures with the initially proposed method for sampling, reason for the sampling change and the new sampling method along with any change in the data collection and reporting.

The goal will be to complete the RIWP investigation work as rapidly in each specific area in order to inform all additional recommendations. Specific areas may be defined as entire Blocks or smaller more discrete Lots. Recommendations may include Interim Remedial Measures including suspected tank assessments and removals, potential discharge or treatment locations and subsequent end-point sampling or delineation of impacted areas where definition has not been completed. Additional recommendations will be provided using the same sampling Figures included with this RIWP. Each will be submitted to NYSDEC for review, comment and approval.

As discussed in the Introduction of this Work Plan, the information and data collected during the two previous investigations demonstrates that historic fill conditions exist throughout the Site and that shallow surficial impacts are also expected to exist as a result of the long history of Site usage. A full characterization of the Site will be performed as part of the Remedial Investigation. One main component of the Remedial Investigation will be to extend all borings that incorporate soil/fill sample collection for laboratory analysis to a depth that confirms the

bottom of the fill. This was identified in some previous samples as a clay or organic layer representative of the former tidal wetlands surface. The RI will include sampling depths that encounter and confirm this depth or specifically indicate its absence.

3.1 PURPOSE AND OBJECTIVES

The purpose of this RIWP is to define the nature and extent of contamination on the Site; to determine whether contamination is present that warrants remedial action; and where engineering and institutional controls can be employed to mitigate exposure. The RIWP incorporates the process for making additional sampling recommendations in order to fully delineate areas noted to be impacted by Site use and present an approvable remedy. The RIWP has also been developed to provide data of sufficient quantity and quality to support development of a Remedial Action Alternatives Analysis, if remedial action is warranted for the Site. This RIWP was developed to meet the following Site-specific objectives:

- Evaluate the historic fill that exists throughout the Site and identify areas that have been impacted through Site operations;
- Provide interim data during the RI to NYSDEC in order to facilitate a rapid decision process for additional testing and evaluation;
- Delineate the areal and vertical extent of contaminants in onsite fill/soil;
- Determine if groundwater and soil vapor beneath the Site has been impacted and determine the extent of contamination, if found;
- Evaluate potential sources of contamination, the migration pathways, and actual or potential receptors of contaminants on or through soil, groundwater and soil vapor;
- Evaluate potential offsite impacts to groundwater from onsite contamination, if present;
- Evaluate methods for remediating and preventing onsite impacted groundwater from migrating and affecting adjacent or surrounding properties;
- Assess potential onsite migration of offsite groundwater contaminates and evaluate mitigation methods;
- Evaluate the potential for soil vapor to migrate into future onsite developments; and
- Evaluate the potential for onsite soil vapor to migrate offsite via preferred pathways, if present.

3.2 SCOPE OF REMEDIAL INVESTIGATIONS

The RI will begin after the 30 day public comment period and after NYSDEC and New York State Department of Health (NYSDOH) approval of this RIWP. The RI will include a number of different efforts divided into phases. The purpose and need for these phases are discussed in this Section in order to present this RIWP in the most definitive manner possible while allowing

NYSDEC to further review and approve additional and more refined testing as the project moves forward. The purpose of this method of collecting data, performing review, and making recommendations for additional testing under this RI is to build flexibility into the overall program from the beginning. The process built into the approved RIWP allows added phases of investigation to use data and information from recently completed work without the preparation and submission of full data reports. This process will also allow multiple phases to be performed simultaneously or as needed in order to complete the RI and gather sufficient data to inform interim remedial efforts and make final remedial recommendations.

This RIWP is presented to allow individual description of Tasks that use different data collection methodologies. The Process by which the overall work will be completed is initially anticipated to incorporate one task at a time. This is expected to be modified when data collection produces information on specific areas that will require additional delineation or testing and when specific sampling methods are found to be inadequate or unable to produce data of the proper quality to inform decisions.

The Site as it currently exists is a densely developed assemblage of small to medium sized lots. The redevelopment project involves the complete demolition and removal of all existing structures, foundations and infrastructure that can be identified. The RI will begin prior to the demolition of all onsite building. It is anticipated that some access limitations will be encountered. Exploration and testing locations as well as methods are expected to be modified during the field program based on observations made in the field, access or subsurface obstruction. The RI anticipates collecting data and sampling from within structures remaining onsite.

3.3 SCOPE OF REMEDIAL INVESTIGATIONS

The scoping process, for the purpose of identifying and defining the RI tasks described below, included the following:

- Visits to the Site
- Evaluation of DER-10 requirements and relevant State and Federal guidance documents
- Evaluation of existing on and offsite data (see Section 2.1)

The RI will include a comprehensive membrane interface probe (MIP) investigation, a ground penetrating radar (GPR) survey, Site-wide advancement of soil borings, installation of temporary and permanent monitoring wells, and Site-wide installation of soil vapor points (Table 1).

The RI is partially divided by media in order to allow for the resulting information and data to be evaluated for further delineation or assessment. As an overall process, it is being proposed that investigation and presentation of data, information and recommendations be made on a

block-by-block basis in order to allow a uniform and consistent approach to the Site. Roadway areas will be included with blocks to provide historical fixed reference points and connections to each individual block. Data may be provided in smaller areas based on the type of information gathered, timing and recommendations for interim remedial efforts or additional investigation.

The nature, general location, methodology and rationale for each task are detailed in the sections below. Installation of MIPs, soil borings, test pits, groundwater monitoring points/wells, and soil gas sampling points will be completed in accordance with Sections 3.5, 3.6, 3.7 and 3.8 below, and the standard procedures included in the FSP, included as Appendix C.

Depending on the finding of this RIWP, an RIWP Addendum may be submitted to NYSDEC during and/or following the implementation of the RI activities described below to document procedures and determinations made during the RI. Such an Addendum, if submitted, would make recommendations for Interim Remedial Measures, if necessary, based upon the finding of this RI. IRM Workplan(s) may also be submitted during or after the RI to present measures for addressing isolated zones that require remedy separate from the overall site-wide efforts and engineering controls. Data from initial collection efforts will be presented to NYSDEC throughout the RIWP implementation to make decisions for additional delineation sampling in order to complete the entire RI in a single effort. While there are additional; testing efforts that would be associated with post-RI recommendations including IRM efforts, the object of submitting data during the RI will be to fully investigate the Site without fully separate phases and submittals of individual stand-alone reports.

3.4 GROUND PENETRATING RADAR

GPR is proposed to be conducted over the entire Site but there are limitations that will limit the ability for full initial coverage. It is expected that more than one effort will be necessary in order to cover the overall Site. Some areas may require that GPR be performed following demolition and clearing of existing structures. The Site is covered with a variety of surfaces including roadways with asphalt, concrete and unimproved surfaces. A significant portion of the Site is covered with structures and associated foundation slabs. All parcels will be cleared or will have all loose material and debris contained in a small confined space prior to initiating the RI on those Lots. The RI may begin on areas that have been cleared while other Lots are in the process of being cleared. Prior to the advancement of MIP points (Section 3.5), all accessible areas will be cleared for utilities and subsurface infrastructure using GPR and contacting utility owners using the established markout procedures. If the proposed MIP location is not accessible for GPR clearance, then the location may be cleared utilizing soft digging techniques (e.g., an air knife or hand auger/probe) or re-located/eliminated if soft digging is not feasible.

GPR will focus initially on potential utilities, piping and larger buried structure identification within open and accessible areas across the Site. The GPR survey will allow open areas and individual boring locations to be assessed before, during, and after the MIP Phase and will provide additional information that can guide appropriate testing in specific areas.

GPR utilizes an electromagnetic pulse to determine the reflective values of objects in the subsurface. It functions using a send/receive technology; the radar sends an electromagnetic pulse from the surface and the reflections are received, again, at the surface. The typical process for a GPR survey involves traversing an area with a portable digital pulse GPR system in order to obtain detailed horizontal profiles. This system allows the operator to obtain digital recordings of time series traces for radar amplitude at discrete locations within the survey area. Spacing of the traverse lines will be dependent upon the interference and resolution. Typical depth range for GPR equipment is primarily governed by site specific lithology. The majority of buried utilities and structures are expected to be positioned above the groundwater table (less than 10 feet below the grade).

The relatively consistent type of fill material that exists above the historic tidal marsh deposits may offer an opportunity to identify large and possibly smaller anomalies including abandoned underground tanks and drainage or leaching systems. Based upon the relatively long and intense period of land use and the division of the lots into even smaller spaces, it is anticipated that numerous buried structures may be identified beneath existing floor slabs.

The specific areas of the Site that are accessible will be identified, and survey information will be collected for presentation on what is expected to be a block-by-block process. Individual lots may also be presented depending upon scale and mapping ability. The goal will be to identify anomalies with sufficient accuracy to allow placement of viable sampling locations.

The GPR survey report identifying recognizable subsurface obstructions, questionable zones and/or subsurface anomalies will be composited on the block figure layouts and presented to DEC along with recommendations for modifications to any sampling locations or for additional locations. Areas identified as containing potential underground storage tanks may provide opportunity to alter sampling methodology as will be described in Section 3.5.

3.5 MEMBRANE INTERFACE PROBE (MIP) SAMPLING

The MIP is a percussion-tolerant VOC sensor that can continuously log volatile organics that diffuse through a semi-permeable membrane. The MIP fits onto conventional direct push technology (DPT) equipment and is inserted into the target investigation zone in a manner similar to a standard DPT sampling device. The tool tip has a membrane that is permeable to VOCs and a built-in heating element that causes VOCs near the MIP to volatilize from soil or groundwater. The volatilized VOCs pass through the membrane, where a carrier gas transports

the VOCs through sealed tubing to a laboratory grade Photoionization Detector (PID), Flame Ionization Detector (FID), and Electron Capture Detector (ECD).

MIP sampling is proposed to appropriately cover the entire Site. The location of preliminary MIP samples will be determined via a gridded layout of the Site which has been adjusted to include a minimum of one MIP location per tax lot. The MIP will be advanced using a Geoprobe direct push unit in conjunction with a data acquisition vehicle. Generally, the MIP is advanced at a rate of one foot per minute. When necessary, point advancement is halted every foot to allow the heater plate to achieve the optimal temperature range (100 to 120°C). Detector response and electrical conductivity data are recorded continuously and are viewable in real time.

MIP points will be advanced from the surface to the top of the peat confining layer (approximately 10 to 15 feet below the soil/water interface), or until probe detector readings have returned to background. Typically, the peat and shallow surface of the former tidal marsh will be encountered between depths of 10 to 20 ft below grade. The majority of this surface has been previously identified from investigation borings to be above 15 ft. MIP sampling will be coupled with probing in different areas across the site. This will combine MIP sensing and standard core collection in order to correlate and allow comparison with conditions. Conductivity probes are commonly used to allow identification of differing layers. The fill layer is specifically different from the silty clay and underlying clay deposits and can be identified using conductivity. Probes will be installed in any locations where confirmation of the fill base is not able to be reasonably determined.

Continuous vertical analysis of the vadose and saturated zones will be conducted, and additional delineation points will be performed contemporaneously based on real time data interpretation. Use of real-time field-screening techniques/investigations (e.g., Triad) will be applied and incorporate delineation MIP points in areas where impacts are documented via the mobile MIP laboratory. Delineation borings will be advanced radiating out from any preliminary MIP location that shows signs of impact and will be advanced in order to delineate potential source areas or localized hot spots until no obvious signs of impacts are observed or access limitations prevent any further investigation[1]. Figure 4 shows the spatial layout of preliminary MIP samples.

The step-out delineation approach focuses the subsequent subsurface soil investigation on probable source areas and hot spots, while obtaining a more complete data set and eliminating multiple mobilizations and superfluous sample collection. The analysis of impacted soil and potential source area delineation will assist in evaluation of the remedy.

In order to perform a preliminary characterization of the subsurface at the Site, MIP points will be targeted in the following areas:

[1] There are access limitations onsite. Delineation borings will be advanced if access is practicable.

- Advancement of approximately 123 MIP samples.
- The initial coverage proposed is using a grid of approximately 100 by 150 ft. The orientation uses Willets Point Boulevard as a benchmark and is adjusted to be uniform and parallel with that roadway.
- A minimum of one preliminary MIP sampling point will be located on each tax lot.
- Additional preliminary MIP sampling locations are biased towards previously identified AOCs and RECs (Figure 4a and Figure 4b).
- Delineation MIP sampling locations will be determined in the field by a Qualified Environmental Professional (QEP) via real-time data analysis and will support the evaluation of source or hot spot areas.

The MIP investigation will be implemented in order to provide a baseline of existing and past conditions that may not be visible from current surface conditions. Results will provide information primarily related to volatile organic impacts in unsaturated and saturated soil/fill material, as well as in shallow groundwater. Results of the MIP investigation will inform the subsequent phases of the RI (i.e., the quantity, location and depth of soil borings, soil vapor points, test pits, and temporary and permanent groundwater wells).

The results of the MIP investigation will be presented to NYSDEC on areas that are portions of the overall Site. This could be on a block-by-block basis or in smaller Lot-specific areas. The results will be presented to NYSDEC using the existing Figure format that is included in this RIWP. The aerial based photo layout in the figures that have Lot boundaries overlain, provide easily discernible site details. This format will be replicated to make recommendations for delineation work, moving specific sample locations, elimination of sample locations or replacement with different sampling method. The process for presenting data and initial results to assist in the justification will include these same figures for consistency. The process is proposed to allow for a clear and easily presentable format for rapid approval. All of the information will then be able to be presented in the Final RI Report to assist with additional recommendations. Data may also be provided to NYSDEC on a larger footprint depending on the results of the initial assessment to cover assessment information including groundwater sample collection, flow direction, and impacts from off-site. Location rationales for quantitative sample collection will be biased towards the results of the MIP investigation and previously identified RECs and/or AOCs. The block-by-block or smaller area assessment and submission process is intended to allow maximum flexibility with regard to the sampling schedule.

Quantitative analysis of samples will be conducted during the aforementioned successive phases, the results of which will inform the remedial action.

3.6 SOIL SAMPLING

In order to characterize the soil at the Site, soil sampling will be conducted in three phases: 1) Historic Fill Evaluation, 2) Hot Spot and Source Area Assessment, and 3) Previously Identified REC and AOC Investigation.

3.6.1 Shallow Historic Fill Evaluation

Sampling of the Historic fill will be performed throughout the Site. The Historic fill will be evaluated both within the roadways and parcels over the Site. Sampling within roadways provides a reasonable opportunity to evaluate historic fill that has minimal impacts from the surrounding automotive/industrial land uses, and may therefore; provide an expectation of chemical concentrations within the subsurface, exclusive of impacts associated with current and former Site operations. While this material may also have been impacted due to runoff from individual lots, spills, or purposeful pumping out of buildings, roadway impacts are expected to be lesser, relative to developed portions of the Site. Sampling within other Lots across the Site offers a provision for consistent sampling over the entire area that covers at a minimum, each Lot. Combining the MIP and Fill samples, there is coverage throughout the entire site including roadways and individual Lots that have been recently identified as having been subdivided for separate businesses.

The shallow historic fill evaluation task is presented as an individual effort from MIP and other tasks for two reasons. The first is to provide a description of the methodology, rationale and procedures and the second is due to the fact that the method for sampling, sample collection and analysis provides a different degree of quantified results. Samples collected will be submitted for laboratory analysis described below.

The following scope of work is proposed for the evaluation of historic fill around the perimeter and within the Site boundaries:

- Advance an estimated 11 soil borings within the current roadways in and along the Site boundaries. The borings are intended to evaluate the horizontal and vertical extent of historic fill, assess potential impacts, and assist in the presentation of Alternative Analysis and remedy recommendations;
- Install additional borings as shown on Figures (identified as "Historic Fill Evaluation Soil/Groundwater Monitoring Well Locations") to assess fill condition and thickness throughout the Site;
- Evaluate physical characteristics of the entire fill column in each boring and identify appropriate intervals from which samples will be collected;
- Collect soil samples: (0-2 ftbg) for evaluating conditions as a result of road use, runoff, property discharge, flooding, etc., and the interval at or above the water (approximately 3-7 ftbg) for comparison of the surficial fill with the material at depth; and

- Analyze soil samples from the roadway and Site borings for:

    - VOCs via EPA Method 8260C (if warranted based on field observations as described below)
    - TCL SVOCs via EPA Method 8270D
    - Target Analyte List (TAL) Metals via EPA Method 6010C/7471B
    - Polychlorinated Biphenyls (PCBs) via EPA Method 8082A
    - TCLP RCRA Metals (analysis from sample collected from the water table interface at each of the historic fill soil borings (50% of the total samples)Figure 4-12b show the overall recommended locations for soil probes for this effort. Final locations may be modified based upon clearance, underground and overhead utilities, and any remaining traffic or use of the roads. Probes will extend through the surface to the base of the historic fill layer and will terminate in either the organic tidal marsh layer or in native sediments if there is no peat identified. The probes will extend an additional sample tube (approximately 2-4ft) length below the first indication of the bottom of the fill zone into native material. Continuous logging of the fill and sediment will be conducted and samples will be collected from a minimum of two specific intervals to evaluate and allow comparison of the surface fill with the material at depth.

    - Each location will be converted into a permanent groundwater monitoring well to allow groundwater elevations to be measured and provide sampling of shallow groundwater around the perimeter of the Site.

In order to evaluate the conditions within the historic fill, it is planned that two samples will be collected from each boring. Where no other impacts beyond historic fill are present and identified within a boring, the two samples will be collected and analyzed from the unsaturated zone. If other more obvious impacts are noted, the sample intervals can be adjusted.

Soil borings will be installed using a track mounted Geoprobe® utilizing direct push technology. Continuous soil samples will be collected using four (4) or five (5) foot macrocore samplers fitted with dedicated acetate liners. The soil/fill retrieved from each sampler will be field screened with a PID for VOCs and described by Integral field personnel on boring logs. Evidence of contamination (e.g., Light Non Aqueous Phase Liquid [LNAPL], sheens, odors, staining, elevated PID readings) will be documented by Integral field personnel. Product samples, if encountered, will be submitted for gas chromatography-mass spectrometer fingerprint analysis. Locations where LNAPL is identified or suspected to be present may be recommended to be converted to a temporary monitoring well or depending on the status of demolition and proximity to areas requiring demolition, a more permanent well may be recommended. Additional sampling in the vicinity may also be proposed in order to delineate the shallow groundwater impacts. The procedure for recommending additional sampling

locations will incorporate the procedure previously outlined and will include method for assessment, type of data to be collected, and reporting process.

Samples collected for laboratory analysis are expected to include surface (0-2 ftbg) and the interval above the water table (3-5 ftbg), but may be adjusted to include additional material in the saturated zone if found at a greater depth.

Previous sampling data from the November 2005 Phase II indicated that fill material contained varying concentrations of SVOCs and metals at levels consistent with historic fill containing ash. In addition, results of physical inspection of the properties and review of agency spill database information have also been used to guide and more specifically locate sample areas within smaller Lots. These locations are shown on the specific sampling figures presented in this RIWP. These represent locations where potential hot spot assessment can be performed.

Samples will be analyzed for SVOCs and TAL metals. The surface (0-2 ftbg) interval will also be analyzed for PCBs, if the 0-2 interval contains PCB isomers above the NYCRR Part 375 - 6.8 table (b) Residential Limit of 1 ppm, the second sample interval will also be analyzed for PCBs. VOC impacts will be monitored in the field by a qualified environmental professional via soil screening using a PID and visual/olfactory indication. In the event PID readings are noted to be > 25% above background or if visual or olfactory impacts are observed, then VOC analysis via EPA Method 8260 will also be run on a sample-by-sample basis. Sampling from prior investigations within Willets Point as well as the overall ash landfill area, have shown that VOCs are not generally present throughout the fill

In order to assess the consistency of the fill material with respect to its placement within the area of saturated material, fill samples will be collected from near or just into the water table and analyzed for TCLP metals. This effort and associated analyses will allow an overall assessment and more specifically to assess the condition of the historic fill rather than the surface land use or waste characterization for removal.

3.6.2 Hot Spot and Source Area Assessment

Subsurface impact sample locations will be determined based upon the results of the MIP, probe/boring and GPR investigations. Soil boring advancement and sampling will be similar to the historic fill evaluation process, with an emphasis on subsurface intervals that exhibited potential VOC impacts during the MIP investigation and may be revised based upon the locations of RECs and/or AOCs which are identified during the RI.

The results of the MIP sampling and GPR survey will be presented along with proposed locations and sampling depths for confirmatory soil and groundwater sampling. It is expected to be presented to NYSDEC on a block-by-block basis but depending on the information that is available and need for more localized rapid information, recommendations can be provided on

a Lot-by-Lot basis. Additional information will include proposed depths for sample collection dependent upon the type of identified impact, and the proposed laboratory analyses.

Sampling locations are provided on the individual Lot area figures (4-12b) based on currently identified RECs and historical information that was reviewed. Additional sampling locations may be added or existing locations may be adjusted within Lots to focus on areas identified by MIP sampling, GPR anomalies or other new information. Location and sample interval rationale for quantitative sample collection will be biased based on the results of the MIP investigation and/or previously identified RECs and AOCs. Based upon the results of the MIP investigation, some sample locations may be combined with soil boring locations proposed in areas previously identified as AOCs or RECs, the rationale, sample interval, and analysis of which are discussed below in Section 3.6.3.

The block-by-block assessment and submission process is intended to allow maximum flexibility with regard maintaining continual progress with the sampling schedule.

In order to evaluate potential impacts in onsite soil/fill not previously sampled, identified as AOCs, or as containing RECs, the following scope of work is proposed:

- Advancement of soil borings based upon the results of the MIP and GPR investigations. These borings will be installed to evaluate the horizontal and vertical extent of onsite impacts; document subsurface conditions throughout the Site; assess or confirm the presence of potential plumes and/or hotspots; evaluate potential contaminant sources; assist in the presentation of Alternative Analysis and remedy recommendations; and characterization for soil disposal;
- Evaluation of the physical characteristics of the entire soil/fill column in each boring;
- Assistance in the development of a geologic cross-section of the Site;
- Analysis of soil samples:
    - VOCs via EPA Method 8260C
    - Additional Analyses based on REC/AOC (SVOC/PCB/Total Metals)

Soil borings/probes will be installed using a track-mounted Geoprobe® utilizing direct push technology. Continuous soil samples will be collected using a four (4) or five (5) foot macrocore samplers fitted with dedicated acetate liners. The soil/fill retrieved from each sampler will be field screened with a PID for VOCs and described by Integral field personnel on boring logs. Evidence of contamination (e.g., Non Aqueous Phase Liquid [NAPL], sheens, odors, staining, elevated PID readings, and fill vs. native material) will be documented by Integral field personnel. Product samples, if encountered, may be submitted for gas chromatography-mass spectrometer fingerprint analysis if a source is able to be located in an effort to tie sources with specific plumes.

It is anticipated that at a minimum, one (1) soil sample will be collected per boring, with the interval determined via the area-specific results of the MIP investigation. Based on MIP results, water table conditions and the overall boring recoveries, additional sample collection may be warranted. Based upon the shallow depth to groundwater and the potential for subsurface discharge to be directly in groundwater at some locations, sampling from MIP will be conducted over the entire interval. Delineation borings may encounter concentrated contaminants below the water table and these depths will also be targeted for groundwater sample collection (in addition to soil) when encountered. Borings installed as part of this assessment will be directly correlative to a MIP boring location which exhibited VOC impacts, additional locations identified as a result of GPR, demolition or other information gathered during the RI. Confirmatory soil and groundwater samples will be collected from intervals that exhibit an elevated response during the MIP investigation, in consultation with DEC. The purpose of this soil investigation phase is to evaluate the horizontal and vertical extent of onsite impacts and assess or confirm the presence of plumes and/or hotspots. Therefore, soil samples selected for laboratory analysis will analyzed for VOCs via EPA Method 8260 only. However, if boring locations are combined among investigation phases (i.e., subsurface impact assessment and AOC/REC investigation) then the sample will be analyzed for full scan parameters as detailed below in Section 3.6.3. Intervals may also be split and analyzed for parameters separately depending upon physical conditions.

Soil samples selected for laboratory analysis will be placed in laboratory-supplied containers, sealed and labeled, and placed in a cooler and chilled to 4^{o}C for transport under chain-of-custody procedures. Soil samples will be submitted to a NYSDOH ELAP-certified laboratory via courier service under standard chain-of-custody protocol and analyzed for all of the compounds included in NYCRR Part 375 SCOs and Final CP-51 SCLs. Laboratory analytical parameters and methods are outlined above.

Based upon the finding of the Hot Spot and Source Area Assessment, recommendation for the installation of test pits and/or interim remedial measures (IRMs) such as UST excavations, may be presented to NYSDEC in the Addendum to the RIWP and/or IRM Work Plan.

3.6.3 Previously Identified REC and AOC Investigation

Previous Phase I ESAs conducted on the Site identified several AOCs and RECs associated with historic and current land use. In order to evaluate potential impacts in onsite soils associated with previously documented environmental concerns, surficial and subsurface soil samples are proposed to be collected within these areas. The principal targeted analyses for this investigation phase will be VOCs, SVOCs, metals, and PCBs; constituents that are not able to be evaluated using MIPs. Additionally, VOCs will be analyzed in these locations with samples collected for analysis. This will assist in providing greater detail, flexibility as well as quantitative data on top of MIP sampling. Locations may be adjusted or added based on the results or findings of GPR and following removal and demolition of existing structures.

In order to further characterize the onsite soil/fill, the following scope of work is proposed:

- Advancement of soil borings within or in the vicinity of previously identified AOCs and RECs. Borings are shown on Figures 4-12b. These borings will be installed to evaluate the horizontal and vertical extent of onsite impacts; document subsurface conditions throughout the Site; assess the presence of potential plumes and/or hotspots; evaluate potential contaminant sources; assist in the presentation of Alternative Analysis, IRM, remedy recommendations, and initial characterization for fill disposal;
- Evaluation of physical characteristics of the entire soil/fill column in each boring and identify appropriate intervals from which samples will be collected;
- Assistance in the development of a geologic cross-section of the Site;
- Analysis of soil samples:
  - VOC via EPA Method 8260;
  - SVOCs via EPA Method 8270D;
  - TPH as DRO/GRO via EPA Method 8015B;
  - Target Analyte List (TAL) Metals via EPA Method 6010C/7471B;Plus Cyanide via EPA Method 9013;
  - Polychlorinated Biphenyls (PCBs) via EPA Method 8082A;
  - Pesticides via EPA Method 8081B; and

Soil borings/probes will be installed using a track-mounted Geoprobe® utilizing direct push technology. Continuous soil samples will be collected using a four (4) or five (5) foot macrocore samplers fitted with dedicated liners. Each boring is expected to be installed to the bottom of the fill layer and into the underlying organic peat or silty clay. In the event there are obvious impacts beneath the fill layer, sampling will continue in order to evaluate the vertical extent. In order to prevent downward migration through the fill and below, continuation of sampling may require additional precautions and this will be determined in the field following discussion with NYSDEC. The soil/fill retrieved from each sampler will be field screened with a PID for VOCs and described by Integral field personnel on boring logs. Evidence of contamination (e.g., Non Aqueous Phase Liquid [NAPL], sheens, odors, staining, elevated PID readings, and fill vs. native material) will be documented by Integral field personnel. Product samples, if encountered, may be submitted for gas chromatography-mass spectrometer fingerprint analysis if a source is able to be located in an effort to tie sources with specific plumes.

It is anticipated that two (2) soil samples will be collected per boring. As a default, one (1) shallow fill sample will be collected from the interval directly below the surface (0-2 ftbg) in order to evaluate surficial impacts, and one (1) sample will be collected from the interval of highest suspected impact based upon PID readings and visual/olfactory observations. If impacts are not observed, then a sample will be collected from the remaining material at the water table. Soil boring locations associated with this phase of subsurface investigation are shown on Figures 5 through 12B. Based upon the results of the MIP investigation, these locations may be

combined with Hot Spot and Source Area Assessment sample locations described above in Section 3.6.2.

Each shallow sample (0-2 ftbg) will be analyzed for SVOCs, pesticide/PCBs, TAL metals, TPH by DRO and GRO. Deeper sample intervals (water table interface) will include VOCs and the full list of analyses above except PCBs, the analysis of which will be held pending the results of the shallow sample from the equivalent boring. The specific boring location and depths will be presented to NYSDEC for any subsequent borings along with the specific information leading to the decision. Information and reasoning for sample collection and analysis will also be presented for rapid review.

In addition to the collection of soil samples, locations where impacts are noted within the water table during the installation of the borings or in borings adjacent to MIP sampling where results indicate significantly elevated readings were reported, will have groundwater samples collected. Groundwater samples will be analyzed for VOCs and can also be analyzed for SVOCs if soil conditions indicate impacts from non-VOC contaminants. In locations where there is an impact beneath the water table and a water sample is being collected, this may eliminate some or all of the analyses of fill from the same zone. This would refer to the second fill sample to be collected from a boring.

All soil samples selected for laboratory analysis will be placed in laboratory-supplied containers, sealed and labeled, and placed in a cooler and chilled to 4°C for transport under chain-of-custody procedures. Soil samples will be submitted to a NYSDOH ELAP-certified laboratory via courier service under standard chain-of-custody protocol and analyzed for all of the compounds included in NYCRR Part 375 SCOs and Final CP-51 SCLs. Laboratory analytical parameters and methods are outlined above. QA/QC procedures to be followed are described in the Quality Assurance Project Plan (QAPP) provided as Appendix A.

3.7 GROUNDWATER SAMPLING

As discussed in Section 3.5, MIP points will be advanced from the surface to the top of the peat confining layer (approximately 10 to 15 feet below the soil/water interface), and continuous vertical analysis of the vadose and saturated zones will be conducted. Results will provide information primarily related to volatile organic impacts in unsaturated soil/fill material, as well as in shallow groundwater. Analysis of MIP data collected within the saturated zone will largely inform the locations of temporary groundwater wells and will aid in the determination of permanent well placement.

Section 3.6.3 also indicates that during the installation of borings for investigation of Previously Identified RECs/AOCs and Hot Spot Assessment, a groundwater sample may be collected from the boring via a temporary well point where an initial impact was noted from MIP sampling or during the installation of that boring. These samples will be analyzed for VOCs and potentially

SVOCs. The specific analyses to be performed at each sampling point will be determined in consultation with NYSDEC following review of the MIP results. Sample collection for metals or other analyses will be performed on approximately 20% of temporary groundwater monitoring wells. Collection of samples from temporary wells will be evaluated for filtered and unfiltered analyses based upon recovery and sample availability.

Groundwater monitoring wells will be installed as both temporary and permanent monitoring points to allow intermediate testing and evaluation and monitoring over the project life. Both will allow relatively rapid collection of samples and confirmation of conditions identified during the MIP sampling and AOC/REC boring installation. The well installation will cover geographic areas of the Site from both the historic fill evaluation and the Site interior. While they are not exclusive of each other, historic fill sampling may also be located in areas that may be able to monitor off-site impacts or flow coming into the site. It is anticipated that the results of the MIP investigation, historic fill sampling and hot spot evaluation will be presented to NYSDEC on a block-by-block basis as they are each advanced. Information from this investigative work will be used to present proposed locations, depths, and screened intervals for temporary and permanent groundwater monitoring wells.

Based on the progress and amount of data/information collected in an area and the determination for added delineation sampling or identified impacts, results may also be presented to NYSDEC on a more localized basis and may include Lot by Lot information and results. It is anticipated that data will be available from individual sampling efforts in localized areas such as MIP, GPR, historic fill sampling and AOC/REC sampling. The process will incorporate the presentation of data that is available identifying contaminants of concern, additional information and recommended location for placement of sample locations.

3.7.1 Temporary Groundwater Sampling Points

Groundwater data within the Site will be evaluated primarily through temporary groundwater monitoring points. Location rationales for temporary groundwater wells will be biased towards the results of the MIP and other components of the investigation. The number and location of temporary wells will be determined during the performance of investigation tasks that will include GPR evaluation of potential buried tanks, installation of borings into the water table within the Site as well as along the perimeter and during the MIP investigation task. There is currently not sufficient information to propose the specific number of temporary groundwater points that will be installed within interior lots. Information collected during MIP sampling or from other sampling efforts described in Sections 3.6.1, 3.6.2, and 3.6.3 will provide a substantial amount of additional data and will be used to determine the number and location of temporary groundwater sampling points. Initial small diameter temporary wells are expected to be incorporated into the evaluation to establish flow characteristics and properly locate permanent wells.

Temporary wells may follow similar construction as the permanent wells (as described below) but may use smaller diameter drilling equipment and similarly smaller diameter PVC and may not have full steel covers with concrete collars. Temporary wells will typically be installed where opportunity allows during smaller diameter probe sampling and where questionable impacts are identified. Installation will be facilitated using direct push equipment or small diameter augers that are installed using the same equipment. Auger diameter will vary based on drilling conditions and while they will not facilitate the installation of a standard sandpack, there is typically some filtering media installed in the formation around the screen. Rapid installation can be performed and sampling conducted almost immediately in order to evaluate impacts. These impacts are typically associated with tanks or structures identified during sampling, test pitting or the investigation of anomalies identified from GPR surveys. Temporary wells can often be converted to permanent wells by reinstalling a larger well with hollow stem augers. Sampling of temporary wells will include purging of at least 3-5 calculated well volumes in order to allow formation groundwater to enter the well. Sampling for VOCs will follow low flow procedures in order to produce comparable results with permanent wells and allow data comparison for decision making. All temporary well installations will be identified to NYSDEC. Following sampling, recommendations will be made regarding later conversion to permanent wells.

3.7.2 Permanent Groundwater Monitoring Wells

Permanent monitoring wells are proposed to cover the Site as a whole rather than on the more localized scale (block basis). In addition, the amount of anticipated demolition over the entire Site area makes the installation of more permanent wells in the early stages if the RIWP inefficient. If the need for long term monitoring of smaller zones is identified, permanent wells will be appropriately placed in order to provide this information. All permanent wells will be proposed using the same procedure as investigation sampling. In addition to providing locations and rationale/data for longer term monitoring, the anticipated window for monitoring well installation will also be indicated. This will take into account anticipated demolition of adjacent buildings and structures to prevent damaging wells.

The initial installation of permanent wells will include perimeter wells installed within the roadways of the Site. The 11 soil boring locations identified as "Historic Fill Evaluation Soil Sampling Location" on Figure 4 will be converted to permanent groundwater monitoring wells, in order to allow a larger groundwater contour map to be created that captures the entire Site. Additional permanent monitoring wells may and are anticipated to be installed within the Lots to provide additional points where groundwater elevation can be measured and the contours further refined. Wells within Willets Point Boulevard will be evaluated for placement due to the location of large subsurface utilities in this area. A large NYCDEP water main exists beneath the roadway and this may intersect groundwater, creating a barrier to shallow

groundwater flow. Final locations and number will be evaluated in the field and discussed with NYSDEC prior to finalization.

Based on the lack of current information and sampling data regarding the majority of the on-site areas, the specific number of permanent wells cannot be as yet determined or recommended. Factors determining the number will include areas that are identified to require remedial or closure efforts, long-term treatment and/or monitoring, impacts identified to originate beyond the site that will require monitoring to prevent impacting on-site remediation areas, and the potential need to monitor off-site impacts, if any. Additionally, areas that are remediated through IRM activities may not require further monitoring or evaluation. Although groundwater quality data will be evaluated from permanent monitoring wells, the primary function of the permanent monitoring wells is to evaluate and allow monitoring of perimeter quality and flow direction conditions as well as to determine the effectiveness of any required remedy. Perimeter wells will inform the final remedy with regard to potential migration of contamination onto the Site from offsite sources as well as potential offsite migration of identified onsite contamination (if present).

In order to characterize the groundwater at the Site as an iterative process, the following scope of work is proposed. This scope presents the minimum efforts that will be performed and based on conditions that are encountered, additional monitoring may be recommended:

- Collect and assess groundwater data from Site-wide MIP and geoprobe sampling;
- Install temporary monitoring wells in areas of impact to provide groundwater quality information; submit samples for laboratory analysis; and conduct overall survey to provide general groundwater flow characteristics;
- Based on all initial data from MIP, soil sampling and groundwater sampling from temporary wells, and demolition schedule, recommendations for permanent groundwater monitoring wells screened across the groundwater interface will be made;
- Survey permanent and remaining temporary wells;
- Evaluate groundwater elevations and present groundwater contours;
- Purge all permanent wells in accordance with USEPA low-flow purging and sampling procedures and collect samples for lab analysis. All purging and sampling of permanent wells will be performed in accordance with proper program protocols described later in this Section;
- Temporary wells will be sampled for VOCs and SVOCs. The full suite of analyses (described below) run on approximately 20% of the samples. This will be dependent upon sample collection (volume) ability, turbidity, etc. If sufficient volume for the full suite can be collected, both filtered and unfiltered metals will be analyzed. If a filtered metals sample is not collected, the data will be usable for comparing to disturbed

conditions (construction dewatering). This data will be useful in evaluating dewatering operations for later development.

- Analyze groundwater samples from permanent monitoring wells for:
  - VOCs via EPA Method 8260C;
  - SVOCs via EPA Method 8270D;
  - TAL Metals via EPA Method 6010B/7471B (filtered and unfiltered);
  - PCBs via EPA Method 8082A; and
  - Pesticides via EPA Method 8081A.

Monitoring well construction will generally follow the protocol described below.

Permanent monitoring wells will be installed using a track mounted Geoprobe, outfitted with 4¼ inch hollow-stem auger attachments. Currently it is anticipated that wells will be installed approximately 5-6 feet below the groundwater table (expected to be approximately 5-10 ftbg) in order to collect samples in the shallow saturated zone. The final depths and screened intervals will be proposed and determined in consultation with NYSDEC and based on the results of preliminary investigation activities via MIP, soil sampling and analysis groundwater samples from temporary monitoring wells. It is anticipated that the depth to groundwater will have been identified throughout the site during the MIP and REC/AOC boring installation. The wells will be constructed of 2 inch inside diameter schedule 40 PVC riser with 10' of .020 inch slotted PVC screen. It is expected that the screen interval will straddle the groundwater interface; specific screen intervals will be determined in consultation with NYSDEC depending on the nature and extent of contamination identified via preliminary sampling. The annular space around the well will be filled with No. 2 Morie quartz sand to a depth of 2 feet above the top of the well screen, followed by 2 feet of bentonite, then backfilled with screened (un-impacted) soil cuttings to approximately 6 inches below grade. The wells will be finished with 6 inches of bentonite pellets placed below a locking flush-mounted road box, set in a cement apron. In the event a well is located in an area that is prone to severe flooding and it cannot be moved based on Site factors and conditions, it may be necessary to install it as a casing protected stick-up to allow future identification. The finished thickness of the backfill materials may need to be adjusted with the expected shallow depth to groundwater. In the event this adjustment is necessary, the cuttings will be the first type of material eliminated. Any further adjustments will be made to allow a minimum of 1 foot of sand above the well screen and then to maintain an additional foot of bentonite above this level to prevent downward infiltration from the surface.

Monitoring wells will be developed within a week of installation. Development will be performed to settle the sandpack and allow the disturbance from installation to be cleared from the borehole. Typical development in native material often reduces turbidity and increases yield by clearing the "smearing" caused from drilling. Development is not expected to have the same impact in historic fill because the nature of the material is different from native sediment. Prior to sampling, all wells will be purged.

Sampling of the monitoring wells may be performed on some wells prior to completed installation of others due to the nature and size of the area, access and timing of these efforts. A schedule will be provided to NYSDEC that will include well locations (temporary or permanent), numbering, details of wells (depth, diameter, construction) and sampling schedule. Purging will be performed using either small volume pumps or bailers. Purge water will be discharged in a similar manner to development water, and the same notifications and precautions will be employed. Following purging, one (1) representative groundwater sample will be collected from each well, using dedicated polyethylene tubing attached to a bladder pump capable of low flow control. Water quality indicators (pH, temperature, specific conductivity, and turbidity) will be monitored while purging. Groundwater samples will be collected according to EPA's *Low Flow Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells* (Low Flow Procedures, January 2010). Wells in areas identified to contain NAPL will be monitored on a weekly basis and, depending on conditions, will have product removed from them.

Groundwater samples will be pumped directly into laboratory-supplied sample bottles. Samples will be collected, cooled, properly packaged to prevent breakage, and submitted to a NYSDOH ELAP-certified laboratory via courier service under standard chain-of-custody protocol. Laboratory analytical parameters and methods are outlined above. QA/QC procedures to be followed are described in the QAPP included as Appendix A.

3.8 SOIL VAPOR SAMPLING

Soil vapor testing will be performed during various stages of the project to evaluate existing conditions as they relate to onsite impacts, to identify potential impacts from offsite or adjacent sources and to monitor and document the efficacy of the final remedy. Results of soil vapor will be compared to data collected from all other investigation efforts (GPR, MIP, AOC/REC borings, historic fill assessment and groundwater sampling) in order to assess sources of vapor contamination, the effectiveness of IRM efforts for mitigation or removal as well as to compare data with final remedy, end-use and engineering controls in order to present a long term effective remedy. Monitoring will also provide information to assist in the final remedial recommendations for the development of the Site, as setting the procedural decision making for future development. The redevelopment plan is intended to take place in stages, with portions of the Site having full coverage building footprints, while other areas will be capped with grade level parking. Land use for parking will be evaluated for the final scenario of commercial/residential in order to incorporate the proper remedial components into the project. Vapor monitoring will include important information to allow proper design of all interim and final mitigation and engineered systems. One important component is the understanding of conditions along the perimeter of the Site in order to properly manage any residual vapor that is not addressed by Site remediation.

Soil vapor testing can be described as being performed over two different phases. The first phase will be governed by the results of the MIP investigation. As discussed in the preceding Sections, it is anticipated that the results of the MIP investigation will be presented to NYSDEC on a block-by-block basis along with proposed soil vapor, soil, and groundwater sample locations. Location rationale for temporary soil vapor points will be biased towards the results of the MIP investigation and previously identified RECs and/or AOCs. It is proposed that the first phase of soil vapor testing will be performed on each tax lot with subsequent delineated sampling performed as the second phase to characterize areas identified to be impacted.

The number and location of permanent monitoring points and delineation samples collected from additional points will be determined based upon the results of the preliminary sampling results and will be proposed to NYSDEC in an Addendum to the RIWP. The results of perimeter groundwater monitoring and the historic fill evaluation will principally contribute to the determination of specific locations for permanent soil vapor monitoring points. During the onsite investigation, an effort will be made to identify both potential onsite and offsite sources. It is expected that in many cases, there will be commingled areas of groundwater contamination from the intersection of multiple small source areas. These areas will be managed and, following removals of Site sources, further determinations will be able to be made regarding offsite residual impacts.

Soil vapor probes will be installed using dedicated 1/8" Teflon tubing. The tubing will be implanted into the hole and the annular space sealed with bentonite to prevent ambient air from entering the area around the probe. Once the seal is secure, a "T" fitting and valve will be connected on the above-surface end of the tubing. A syringe will be used to purge the vapors in the probe and tubing of three volumes. As required by the NYSDOH, a helium (He) tracer will be used as part of the sampling process and all testing will follow the NYSDOH Soil Vapor Guidance[2]. Prior to sample collection, the He vapor will be screened using a field meter and the measurement recorded at each soil vapor sampling location. Prior to sample collection, a multi-gas meter will be used to measure the concentration of O_2, CO_2, and CH_4 in each probe, to assess the subsurface chemistry (e.g., redox state). Following this procedure, the soil vapor samples will be collected in clean, batch certified, two (2) liter Summa™ canisters at flow rates no greater than 200 ml/min.

Soil vapor samples will be collected over a period of two (2) hours. Soil vapor samples will be analyzed for VOCs via USEPA Method TO-15 at a NYSDOH ELAP-certified analytical laboratory.

[2] *Guidance for Evaluating Soil Vapor Intrusion in the State of New York, Final*. October 2006.

Ambient Air Sample

Background (ambient) air commonly contains VOCs at measurable but low concentrations and can contribute a positive bias to soil vapor samples. To characterize such "background" concentrations, an ambient working conditions air sample will be collected along with the soil vapor samples. The ambient air sample will be collected using a clean, batch certified Summa™ canister over an 8-hour period. The Summa™ canister will be placed at a height of 4-6 feet above grade to simulate breathing zone elevation.

3.9 INVESTIGATION DERIVED WASTE

It is anticipated that soil cuttings and groundwater will be generated during Site characterization activities. The cuttings from drilling operations will be managed in accordance with DER-10 Section 3.3(e)(1)(ii) and (3)(ii) provided no NAPL or significant obvious impact is present. Material placed back in the borehole will be backfilled to the surface or to a level of where the original surface of fill material and then backfilled with inert material (sand). Cutting volumes are not anticipated to be significant with the type and method of sampling proposed. Volumes less than what constitutes a 5 gallon container will be placed at the borehole of unpaved areas. In the event NAPL is identified, it will be containerized in a central location within a drum labelled for mixed cuttings. Upon completion of the effort remaining material will be sampled, classified and disposed. Prior to sampling, the material will not be considered solid waste under storage regulations.

Groundwater collected during sampling will be handled according to DER-10 Section 3.3 (e)(5)(ii) or as agreed to in the field with DEC. Following the completion of the RI, any containers of groundwater will be evaluated based upon laboratory data for appropriate disposal. In addition, wastes, such as used personal protective equipment (PPE), will be generated during sampling and drilling activities. Used PPE and other non-hazardous materials will be disposed of in municipal trash dumpsters onsite or will be containerized for disposal.

3.10 QUALITY ASSURANCE / QUALITY CONTROL (QA/QC)

Samples will be collected in accordance with the QAPP included as Appendix A.

Sample analysis will be performed by a NYSDOH ELAP certified laboratory. The laboratory will report sample results on a 5-day turnaround time. An independent sub-consultant will validate sample results and a Data Usability Summary Report (DUSR) will be prepared.

3.11 SUMMARY TABLE OF PROPOSED SAMPLING

As required by Section 3.3(b) 3 of DER-10, a sampling and analysis table with all proposed sampling methods and media in addition to QA/QC samples is included in Table 2.

3.12 QUALITATIVE EXPOSURE ASSESSMENT

Following receipt of the sample results, a qualitative exposure assessment (EA) will be completed. The assessment will be performed in accordance with Section 3.3(c) 4 of DER-10 and the NYSDOH guidance for performing a qualitative EA (NYSDEC DER-10; Technical Guidance for Site Investigation and Remediation; Appendix 3 B). The results will be included in the RI report.

3.13 HEALTH AND SAFETY PLAN (HASP)

All work at the Site will be completed in accordance with the Health and Safety Plan (HASP) included in Appendix B.

3.14 AIR MONITORING

The NYSDOH Generic Community Air Monitoring Plan (CAMP), included as Appendix 1A of DER-10, will be implemented during all ground-intrusive sampling activities. Details of the CAMP are included in the HASP (Appendix B).

3.15 REPORTING

3.15.1 Addendum to the RIWP

If appropriate, additional investigation work will be presented in an Addendum (or several Addenda) to the RIWP. Interim Remedial Measures (IRM) may also be proposed before the full completion of the RI and will be described in IRM Work Plans. All of the modifications and addenda that were presented during the period of the RI and approved by NYSDEC will be summarized in the Remedial Investigation Report. These would include changes in sampling protocol, analytical parameters, additional delineation samples and areas that require additional effort including demolition. The Addendum will incorporate the summary of information showing areas that will be focused on for Interim Remedial Measures as well in order to present focused opportunities for the most efficient and timely completion of more common focused remediation. Addenda will be presented at various stages throughout the RI in order to allow review and continuation of the work described in Sections 3.6, 3.7, and 3.8. and will be summarized in the RI Report.

It is anticipated that a complete Addendum to this RIWP will be submitted to NYSDEC following the implementation of the RI activities described in this RIWP proposing any modifications or additional sampling.

3.15.2 Remedial Investigation Report

The RI Report will be prepared and will include all of the data collection methods, analytical results and assessment to document Site conditions and will meet the requirements of DER-10. The report will include details of the sampling, tabulated sample results and an assessment of the data and conclusions. Recommendations for additional actions including potential IRM activities will be included. An RI Addendum may also be prepared and submitted in advance of the RI Report to document additions and modifications to the RI that were made based on field information. IRM actions may also be presented in the Addendum.

Soil sample results will be compared to the Soil Cleanup Objectives (SCOs) included in Part 375-6.8(a), (b) and CP-51. Groundwater sample results will be compared to the Class GA Standards. Soil vapor sample results will be compared to the NYSDOH AGVs and matrices.

The report will also include the qualitative exposure assessment, CAMP results, laboratory data packages, DUSR, geologic logs, well construction diagrams and well purging/sampling logs. All data will also be submitted electronically to NYSDEC via the Environmental Information Management System (EIMS) in EqUIS format.

4 SCHEDULE

Based upon current knowledge of the Site, the following Remedial Investigation schedule, subject to change, is proposed. A minimum of 5-day notice will be provided to NYSDEC in advance of field sampling. The schedule shows the RI as a single effort and more than one sampling task may be performed at a time during the RI.

Task	**Begin Date**	**Task Duration**	**End Date**	**Total Project Duration**
NYSDEC/NYSDOH Approval of RIWP		0	Sept. 15, 2014	0
Prepare RI RFP	Sept. 15, 2014	2 weeks	Sept. 30, 2014	2
Bid RIWP (Req. under city contract)	Oct.1, 2014	3 weeks	Oct. 21, 2014	5
Descope/Make Consultant Selection/City Approval	Oct. 28, 2014	3 weeks	Nov. 16, 2014	8
Contract/Insurance/Subcontract Team Accounting	Nov. 23, 2014	1 week	Nov. 29, 2014	9
RIWP Kick-off* w/DEC for Schedule/Staffing	Dec.6, 2014	1 week	Dec. 9, 2014	10
Mobilization/Utility Clearance	Dec. 13, 2014	1 week	Dec. 17, 2014	11
Implement RI	Dec. 20, 2014	13 weeks	March 19, 2015	24
Prepare Addendum to RIWP	March 26, 2015	4 weeks	April 23, 2015	28
Implement RI (Addendum Phases)	May 16, 2015	15 weeks	Aug. 29, 2015	43
Prepare Draft RI Report	Aug. 6, 2015	8 weeks	Oct. 31, 2015	51

(Time between tasks in partial weeks, for review/approval 4 weeks)

*The above schedule is subject to modification based on the occurrence of a Force Majeure event. Force Majeure events potentially affecting this Site include, but are not limited to, (a) the pendency of lawsuits challenging the City of New York's approval of this project, and (b) the procedural and funding steps required by New York City law and regulations by virtue of the City's past ownership of the site and its funding of certain aspects of the project.

Should a Force Majeure event occur, we will advise the Department within five days and comply with the other applicable requirements of 6 NYCRR §375-1.5(b)(4).

5 REFERENCES

NYSDEC 2010. New York State Department of Environmental Conservation, Division of Environmental Remediation. DER Technical Guidance for Site Investigation and Remediation (DER-10). 2010.

NYSDEC 2010. New York State Department of Environmental Conservation DEC Policy. Commissioner's Policy 51 – Soil Cleanup Guidance. October 21, 2010.

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Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Effluent Limitations.

New York State Department of Environmental Conservation, (2007). Guidance for the Development of Quality Assurance Plans and Data Usability Summary Reports (DUSR), September 2007.

New York State Department of Environmental Conservation (undated), DER-23 Citizen Participation Handbook for Remedial Programs, Division of Environmental Remediation.

TABLES

Table 1. Willets Point Development RIWP Sample Designations

Block/Street	Lot	Sample Type	Sample ID
1820	9	Preliminary MIP Sampling	MIP-B20L9-1
36th	NA	Historic Fill Soil Sampling	HF-R36-1
1820	9	Hotspot/Source Soil Sampling	HS-B20L9-1
1820	9	REC/AOC Soil Sampling	SB-B20L9-1
1820	9	Delineation Soil Sampling	SB-B20L9-1A
1820	9	Temporary Monitoring Well	TW-B20L9-1
1820	9	Permanent Monitoring Well	MW-B20L9-1
1820	9	Perimeter Monitoring Well	PMW-B20L9-1
1820	9	Temp Soil Vapor Point	TSV-B20L9-1
1820	9	Permanent Soil Vapor Point	PSV-B20L9-1

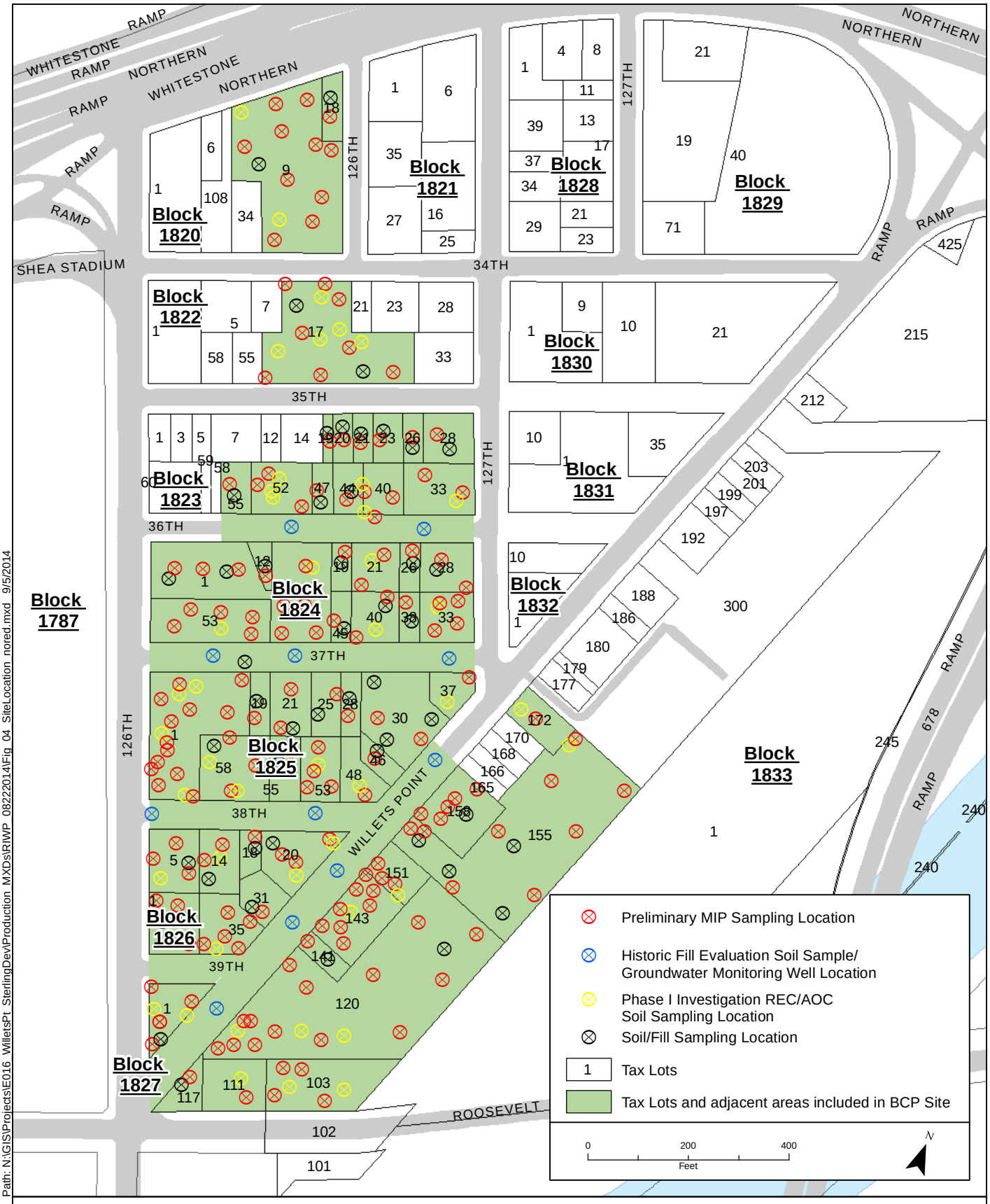
Table 2. Proposed Sampling and Analysis Table

Sample ID	Matrix	Sample Depth	Drilling Method	Sampling Method	Analytical Method	Rationale
MIP Block/Lot Sample #	Soil	Terminates at the peat layer which varies across the Site	Track Mounted Geoprobe with VOC Sensor	Qualitative VOC screening	PID, FID, ECD	Provide interim data during the RI to NYSDEC in order to facilitate a rapid decision process for additional testing and evaluation
Soil Boring (Historic Fill) Roadway Sample #		0-2 and 3-5 feet below grade	Track Mounted or Limited Access Geoprobe	PID Screening / Grab	SVOCs by 8270D TAL Metals by 6010C/7471B PCBs by 8082A 20% for TCLP RCRA Metals	Evaluate the historic fill that exists throughout the Site and identify areas that have been impacted through Site operations
Soil Boring (Hotspot/Source) Block/Lot Sample #		TBD per field			VOCs by EPA Method 8260C	Advanced to delineate the areal and vertical extent of contaminants in onsite fill/soil based on MIP results
Soil Boring REC/AOC Block/Lot Sample #		Terminates at the peat layer which varies across the Site			VOCs by 8260C SVOCs 8270D TPH by 8015B TAL Metals by 6010C/7471B Cyanide by 9013 PCBs by 8082A Pesticides by 8081B 20% for TCLP RCRA Metals	Determine if soil has been impacted via historic and current Site operations

Soil Boring Delineation Block/Lot Sample # - A	Soil	TBD per field screening	Track Mounted or Limited Access Geoprobe	PID Screening / Grab	VOCs by 8260C SVOCs 8270D PCBs by 8082A	Contingent soil borings. Advanced to delineate the areal and vertical extent of contaminants in onsite fill/soil
Temporary Well Point Block/Lot TW-Sample #	Groundwater	TBD	Track Mounted Geoprobe (1" well)	Low Flow Peristaltic Pump	VOCs by 8260C SVOCs by 8270D	Evaluate potential impacts to onsite groundwater based on MIP Results
Permanent onsite Monitoring Well Block/Lot MW-Sample #			Geoprobe with Hollow Stem Auger (2" well)		VOCs by 8260C SVOCs by 8270D 20% for TAL Metals by 6010C/7472B (filtered and unfiltered) PCBs by 8082A Pesticides by 8081B	Evaluate groundwater flow direction and potential onsite impacts to groundwater based on Temp wells and AOCs
Permanent Perimeter Monitoring Well Block/Lot PMW-Sample #						Evaluate groundwater flow direction and onsite migration of potential offsite (upgradient) impacts

Temporary Soil Vapor Point Block/Lot TSV-Sample #	Soil Vapor	2 feet above the groundwater table	Hammer Drill or Geoprobe if concurrent with a soil boring	2 Hour Summa Canister	VOCs by EPA TO-15	Evaluate potential soil vapor impacts based on MIP results
Permanent Soil Vapor Point Block/Lot PSV-Sample #						Assess soil vapor impacts identified by temporary samples

FIGURES



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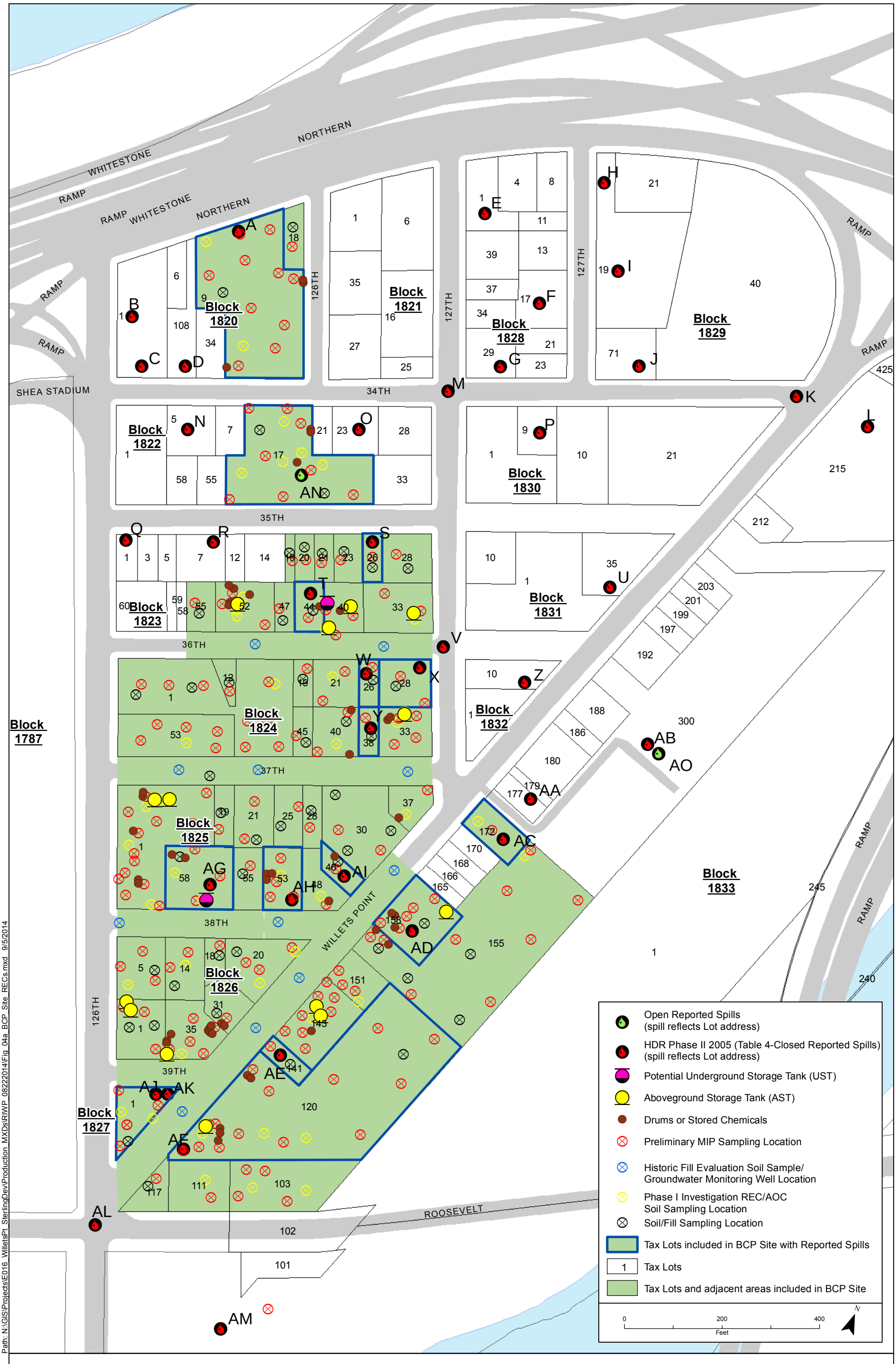
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 4.
BCP Site Overview
Willets Point
Queens, New York



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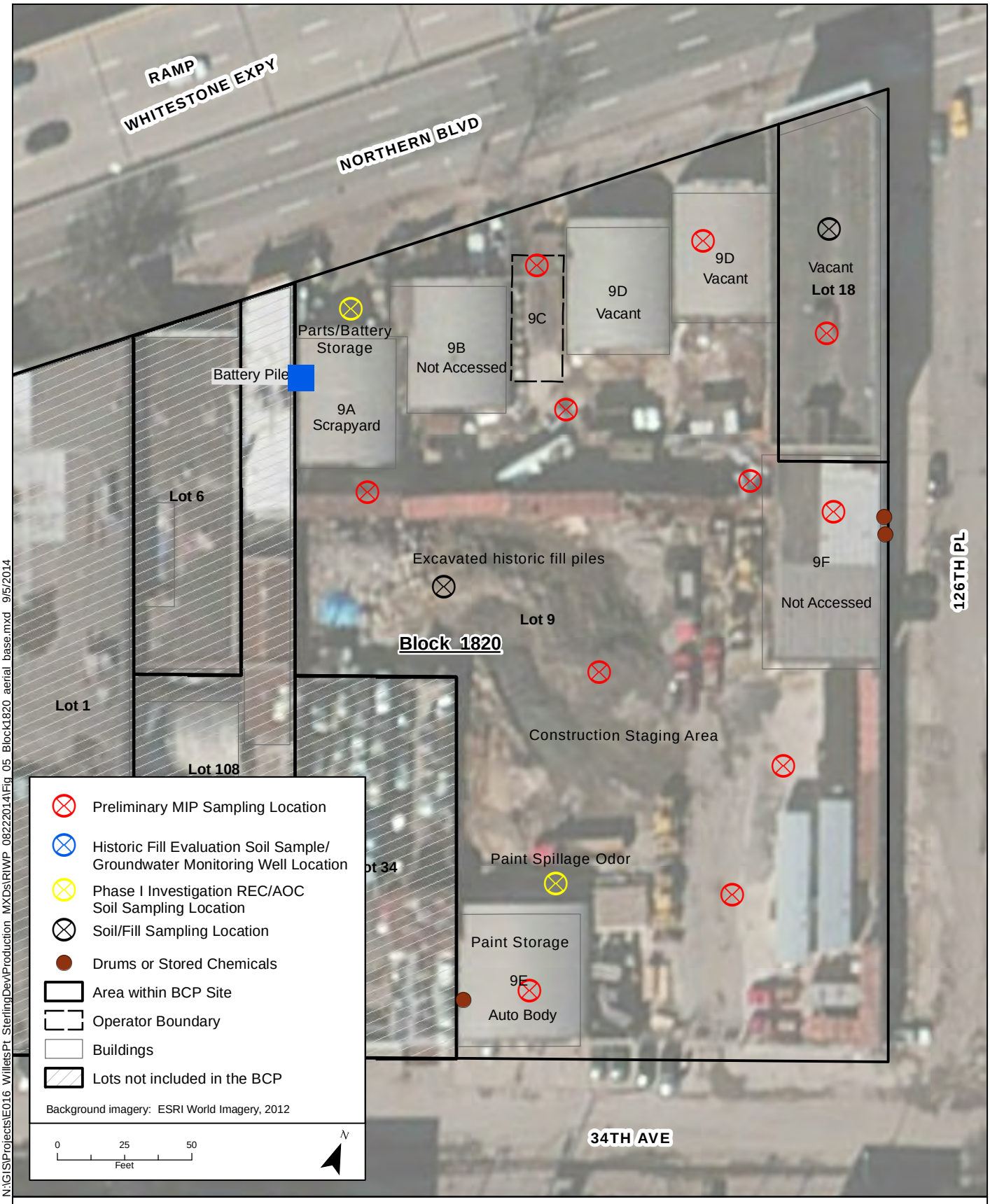
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 4a.
BCP Site RECs/AOCs Overview
Willets Point
Queens, New York

Figure 4a. BCP Site RECs/AOC Overview Spill Index

Index Number	Spill Number	Open or Closed Spill
A	0007567	Closed
B	9903532	Closed
C	9415616	Closed
D	0007567	Closed
D	0007565	Closed
E	9209850	Closed
F	9905010	Closed
G	9404088	Closed
H	9907507	Closed
H	9514275	Closed
I	9905865	Closed
J	9600865	Closed
J	9812291	Closed
J	9600832	Closed
K	9600865	Closed
K	0102763	Closed
K	0400112	Closed
L	9906470	Closed
M	0300559	Closed
N	9606370	Closed
O	8708984	Closed
O	8801419	Closed
O	0203121	Closed
O	09501956	Closed
P	0007552	Closed
P	0007606	Closed
Q	0007530	Closed
R	0007541	Closed
S	0007548	Closed
T	9500746	Closed
U	0230007	Closed
V	0111612	Closed
W	0007568	Closed
X	0007569	Closed
Y	9101625	Closed
Z	0007568	Closed
Z	9106802	Closed
AA	9106800	Closed
AA	0007569	Closed
AB	0007542	Closed
AC	9107763	Closed
AD	0330028	Closed
AE	1310009	Closed
AE	0104327	Closed
AE	9106801	Closed

AE	0110982	Closed
AF	0007539	Closed
AG	9106201	Closed
AH	0230008	Closed
AI	0007535	Closed
AI	9914105	Closed
AJ	9103593	Closed
AK	0230008	Closed
AL	9103593	Closed
AM	0009018	Closed
AN	701012	Open
AO	7542	Open



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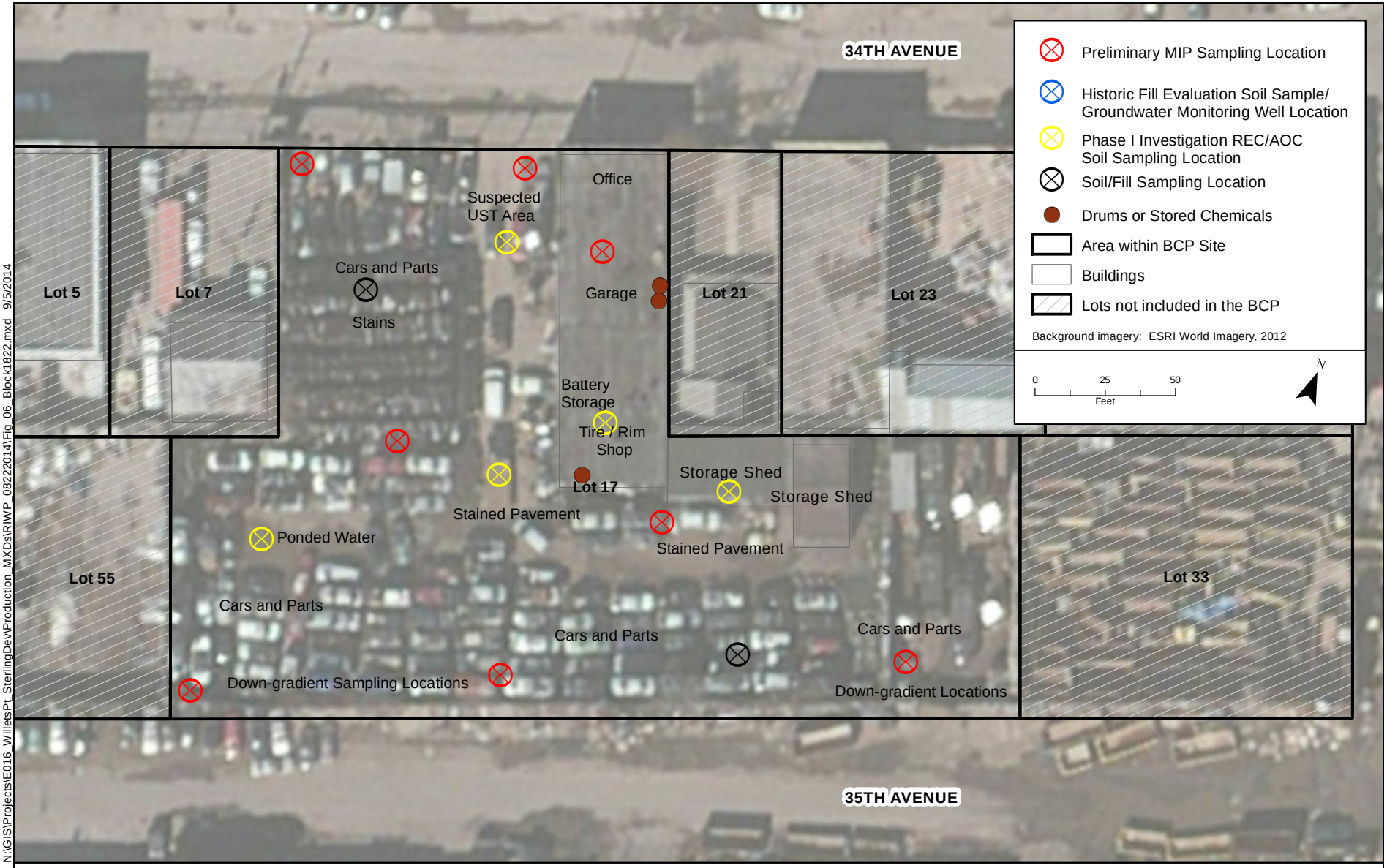
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 5.
Block 1820 BCP Site
Willets Point
Queens, New York



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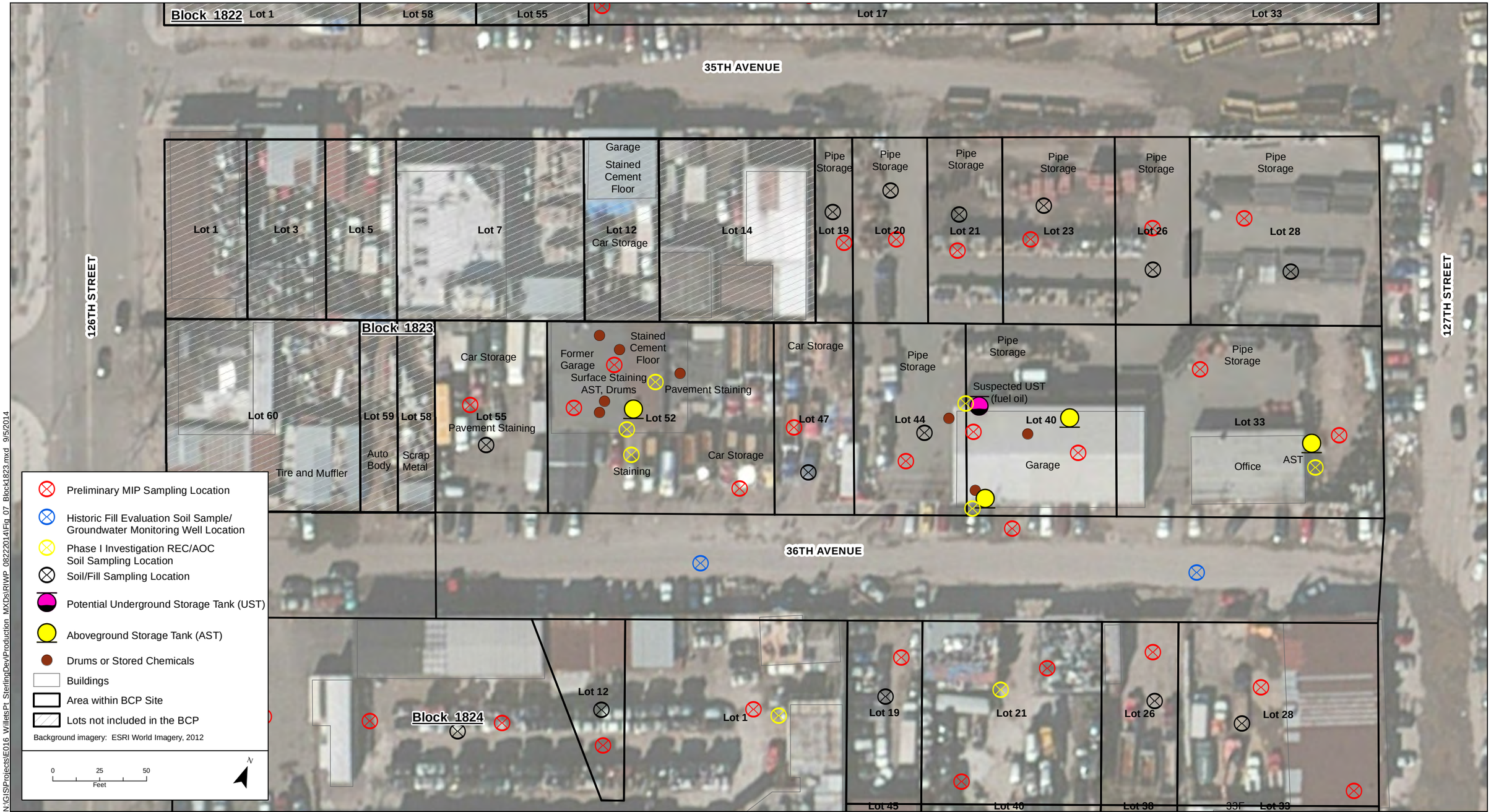
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 6.
Block 1822 BCP Site
Willets Point
Queens, New York



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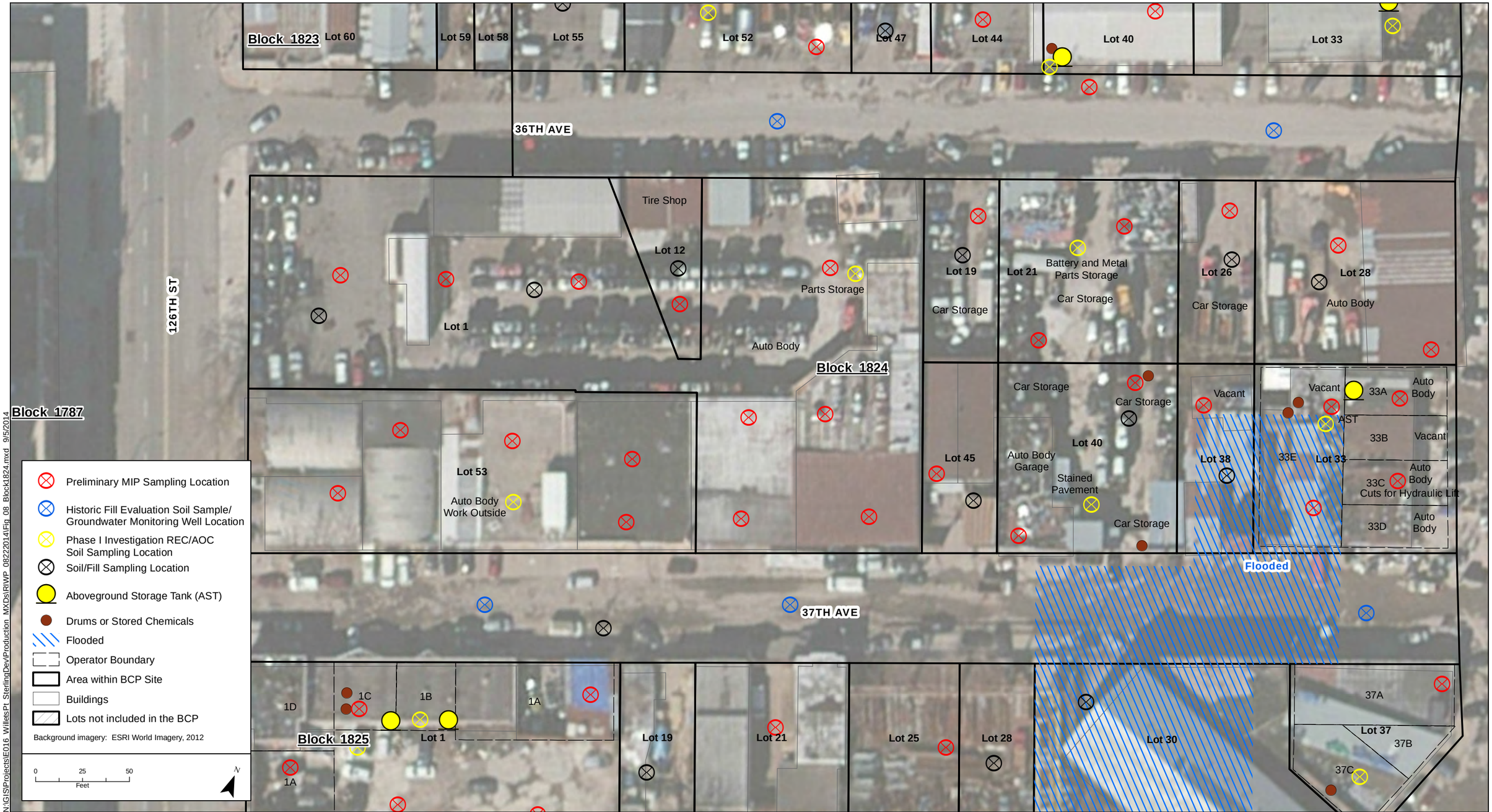
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 7.
Block 1823 BCP Site
Willets Point
Queens, New York



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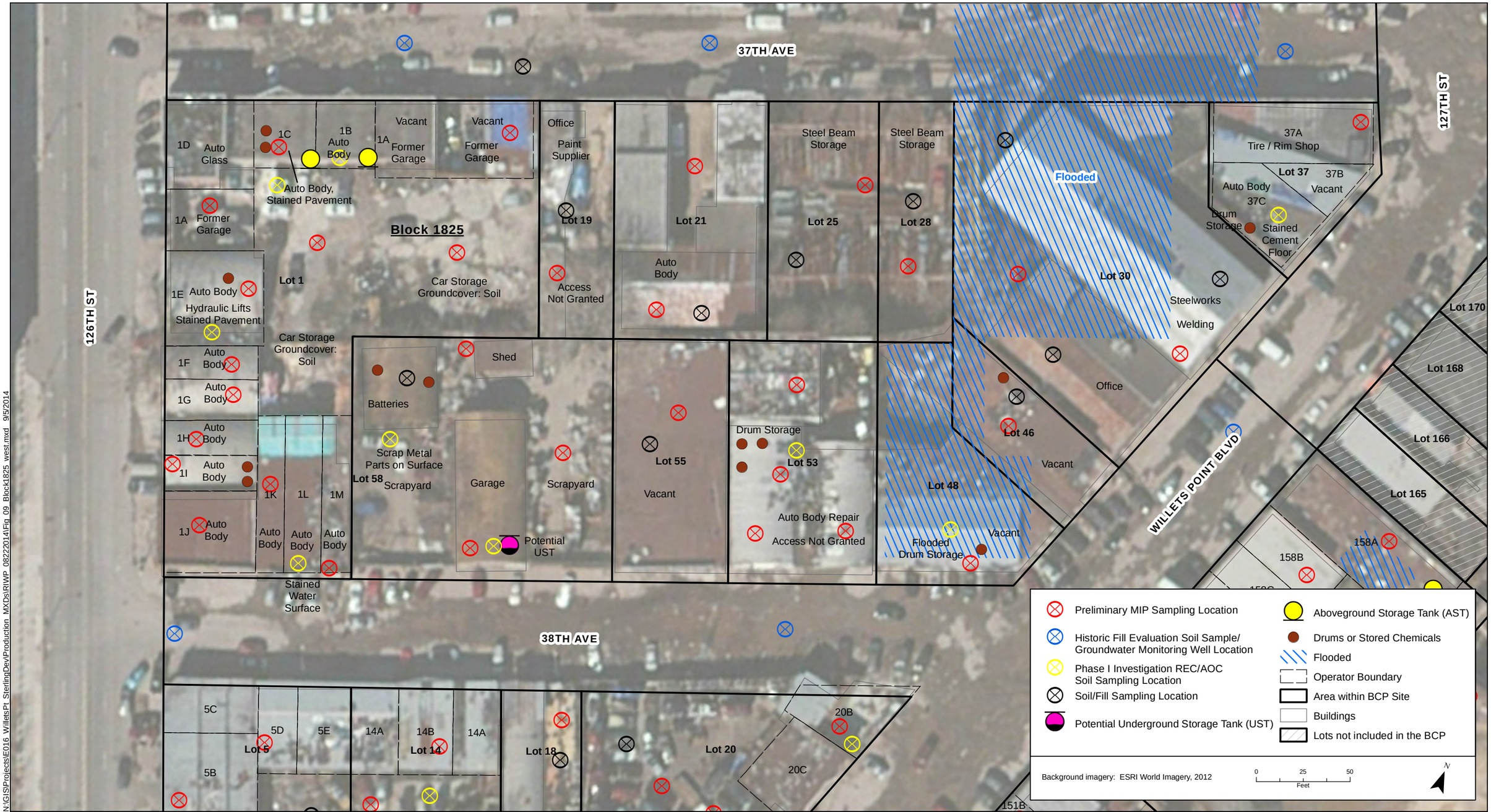
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 8.
Block 1824 BCP Site
Willets Point
Queens, New York



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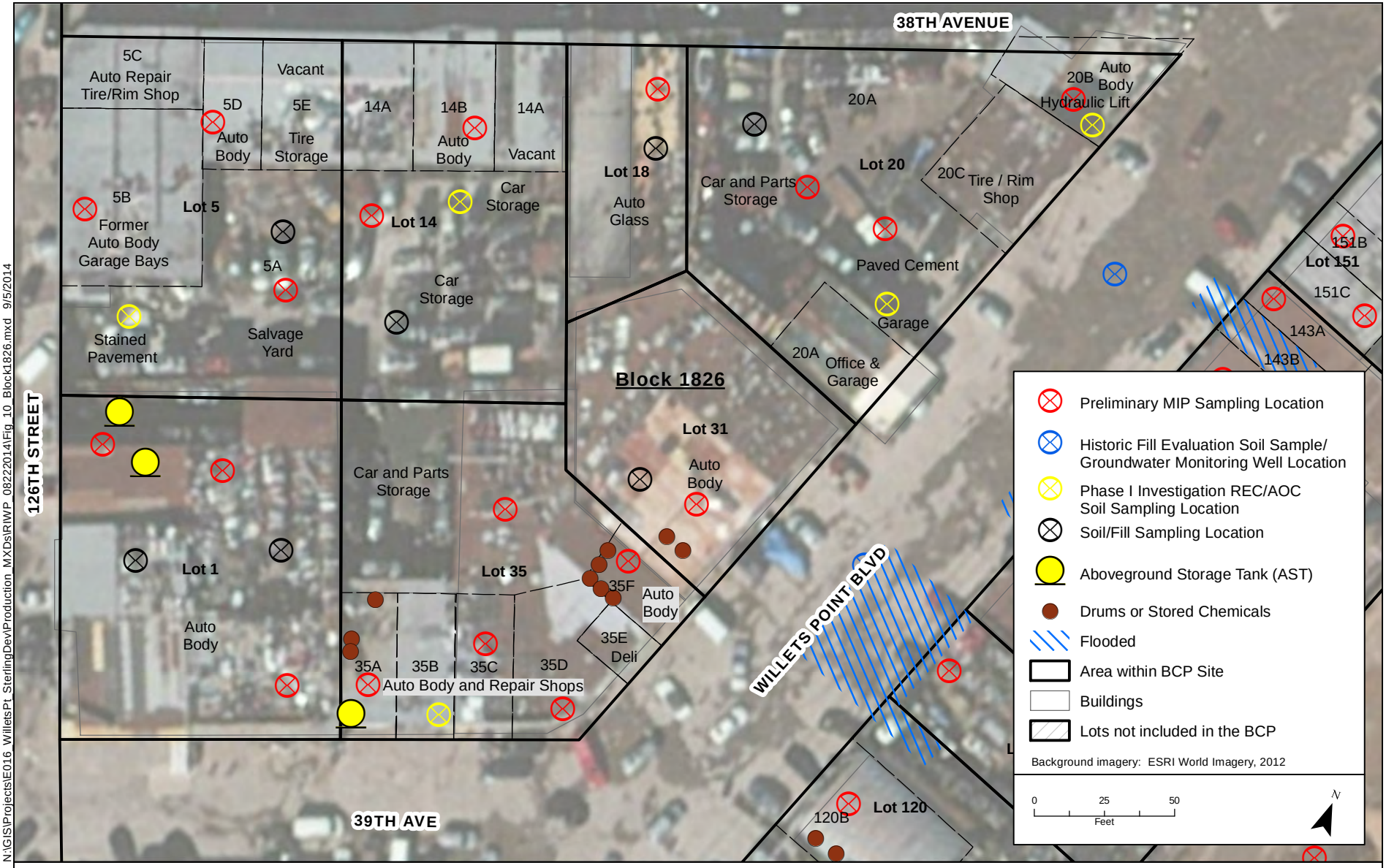
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA
4. Roadway included in BCP site (38th Ave, 37th Ave)

Figure 9.
Block 1825 BCP Site
Willets Point
Queens, New York



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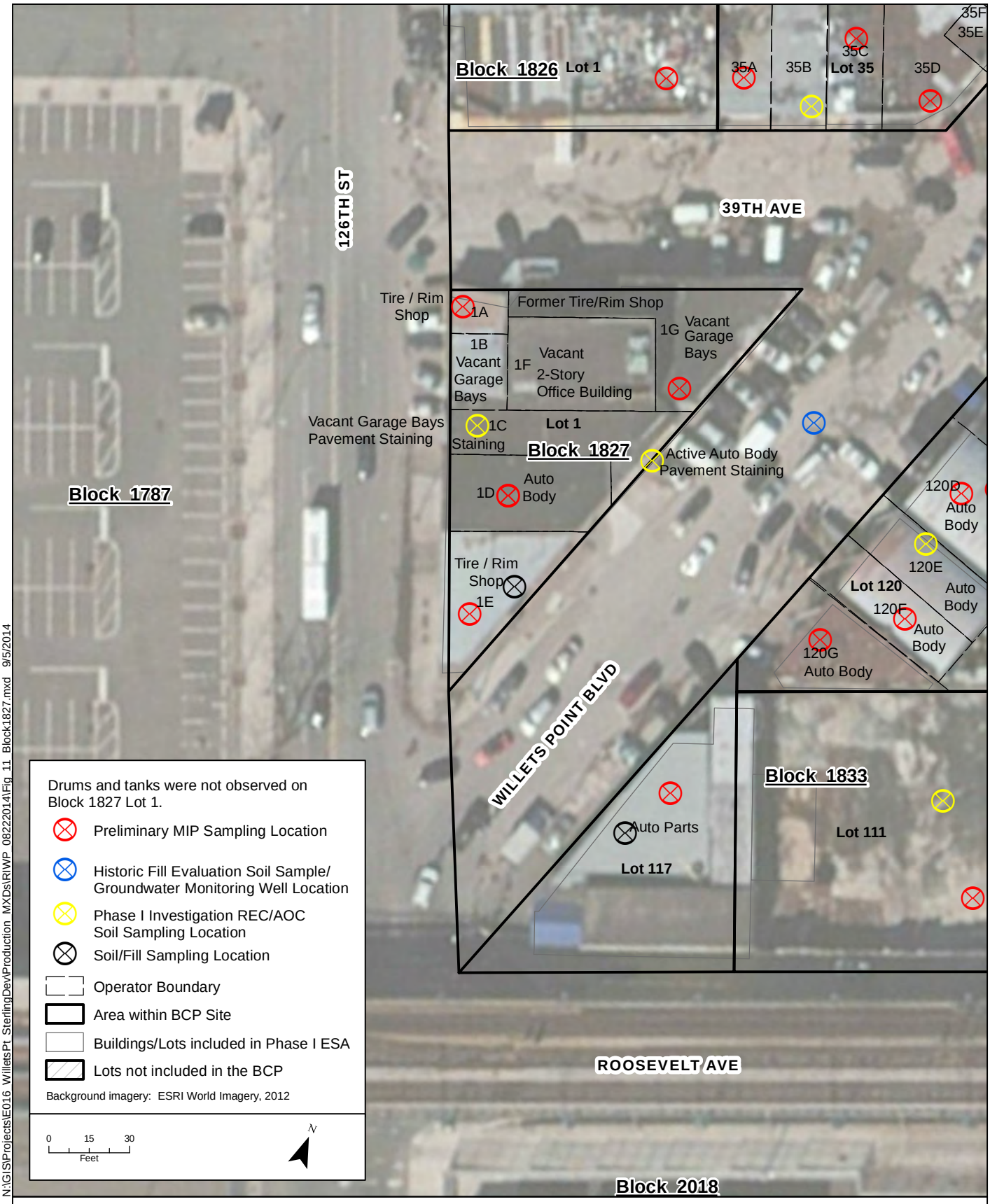
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA
4. Roadway included in BCP site (39th Ave, 38th Ave., Willets Point Blvd.)

Figure 10.
Block 1826 BCP Site
Willets Point
Queens, New York



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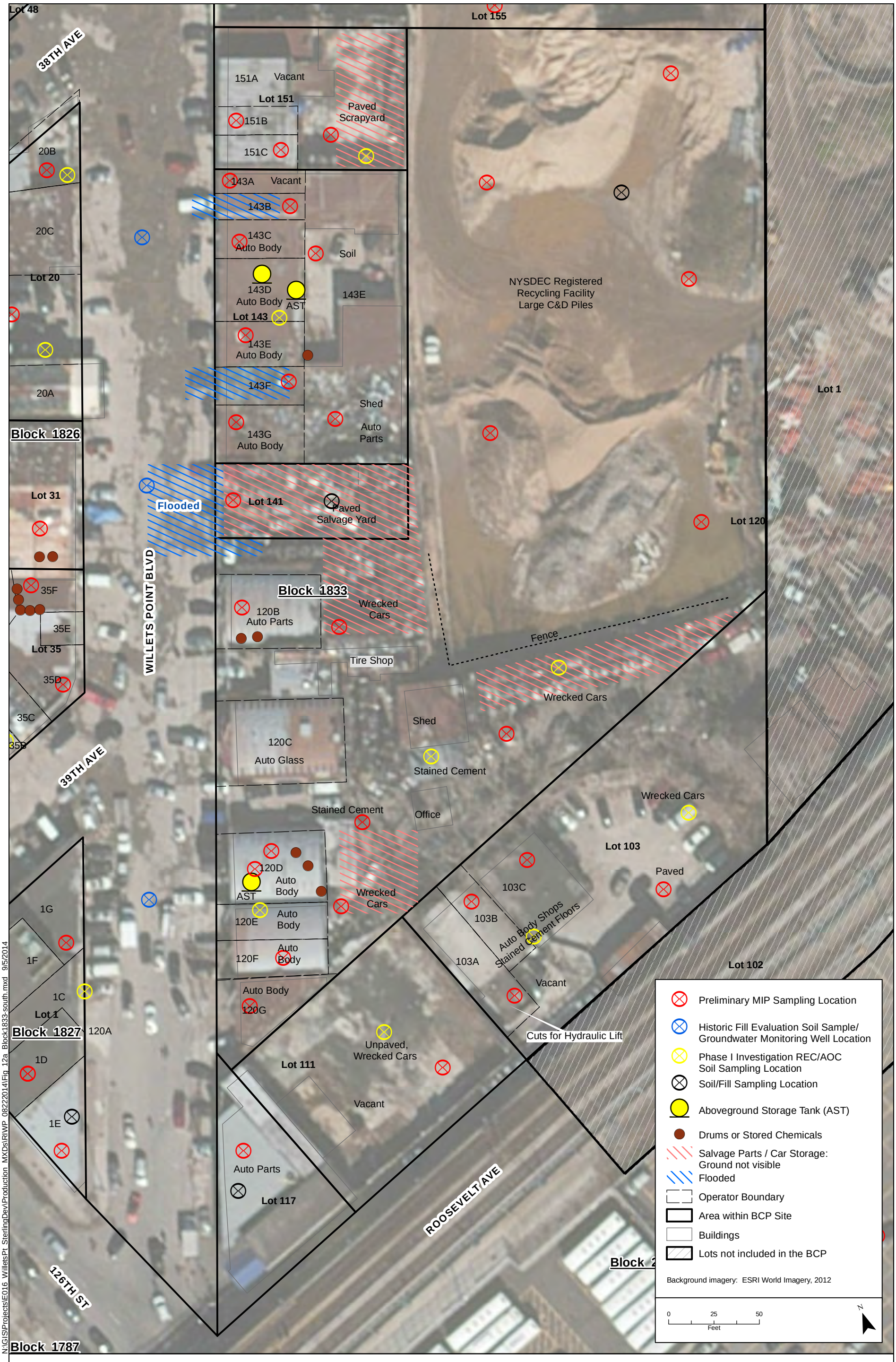
Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 11.
Block 1827 BCP Site
Willets Point
Queens, New York



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Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 12a.
Block 1833 BCP Site
Willets Point
Queens, New York

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Notes:
1. REC = Recognized Environmental Condition
2. AOC = Area of Concern
3. REC/AOC soil sample locations based upon the findings of preliminary conducted Phase I and Phase II ESA

Figure 12b.
Block 1833 BCP Site
Willets Point
Queens, New York