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STATEN ISLAND MARINE DEVELOPMENT LLC

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May 31, 2019

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NYSDEC Region 2
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625 Broadway
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Dear Mr. Iglesias, Mr. Everett, Mr. Conetta, Mr. Arakhan, Mr. Burke and Mr. Grathwol;

Staten Island Marine Development (SIMD) is pleased to submit two attached conceptual plans for remediation of the former Port Mobil Terminal Major Oil Storage Facility (MOSF; the "Facility"). These Plans include a Corrective Measures Implementation (CMI) Workplan Addendum and a MOSF Closure Plan (the "Plans").

As discussed below, these Plans provide a Facility-wide program for Corrective Measures, MOSF closure and site preparation for protective development of the property. With these Plans, SIMD proposes to complete all required obligations of the USEPA Administrative Consent Order and updated Corrective Measures Implementation Workplan (Louis Berger, 2017) for the Facility, close the MOSF and relinquish the Facility license, and achieve a high-quality remediation that renders the property protective of public health and the environment for its proposed industrial warehousing use. We recognize that there is significant overlap between the regulatory duties and requirements of USEPA and NYSDEC in this matter and we therefore provide both documents to each agency in a single submittal. The remedial obligations of each Plan have been separated according to logical lines and in a manner that does not duplicate efforts across Plans. We have been diligent in our efforts to work with staff at both agencies to determine the most satisfactory division of work between these Plans.

The implementation of these Plans will greatly accelerate the rate of Corrective Measures completion at the Facility compared to past remedial activity and site-wide remediation is expected to be complete within two years. Corrective Measures will be implemented across the entire Facility in a continuous remediation event that will achieve site-wide subsurface petroleum source removal and will also result in permanent elimination of liquid petroleum storage at the site.

Background

The Facility is a petroleum bulk storage terminal used for the distribution of gasoline and distillate fuels and has been in operation since 1934. It encompasses approximately 200 acres with 120 acres utilized

for Facility operations. The Facility is located on Arthur Kill Road in southwestern Staten Island immediately adjacent to the Arthur Kill. Significant industrial features of this Facility consist of 62 solid waste management units including 38 large aboveground storage tanks, two storm water impoundments, oil/water separators and other ancillary operational and site support infrastructure.

Development Plan

The proposed development plan will reclaim, redevelop and revitalize the property for new industrial warehousing use. The project will include construction of three new buildings to establish a total of approximately 2.5 million square feet of new building space and create more than 2,500 new jobs. The project would be one of the largest active redevelopment projects in New York City. After development, the property will have highly-secure perimeter access restrictions and additional secured entry to buildings and will not be accessible to consumers or the general public. These site access controls will greatly reduce potential exposure risks associated with comparable residential and commercial properties.

Facility-Wide Remedial Plan

SIMD's Facility-wide plan for Corrective Measures, MOSF closure and site preparation for project development consists of three parts:

- Completion of Corrective Measures identified in the USEPA-approved CMI Workplan, including all remaining Corrective Measures in seven Remedial Areas and continued performance of USEPA-approved ICM and MNA monitoring programs;
- Facility-wide Corrective Measures to be implemented under the authority of USEPA according to the proposed CMI Workplan Addendum included in this submittal. This Workplan includes remediation of:
    - Tank areas and associated piping systems;
    - Surface impoundment systems;
    - All remaining solid waste management units requiring Corrective Measures that have not received a sign-off from USEPA.
- Facility-wide remedial measures to be implemented under the authority of NYSDEC according to the proposed MOSF Closure Plan included in this submittal. This Plan includes:
    - Decommissioning and removal of tanks and associated piping and relinquishment of the Facility license;
    - Performance of remedial actions required for development of industrial warehousing on the property to eliminate potential exposure pathways and protect future users of the property, including engineering controls consisting of a composite cover system and soil vapor intrusion control system.
    - Establishment of a Site Management Plan to provide for long-term site monitoring and maintenance, and site inspection and certification of engineering and institutional controls. The Site Management Plan will be administered by NYSDEC under a Site Management Consent Order.
    - Establishment of an environmental easement granted to NYSDEC to prevent groundwater withdrawal for potable supply, to prohibit future land uses other than industrial use and to require compliance with the Site Management Plan.

Taken together, the remedial actions proposed under these Plans will support environmental remediation and land development goals by enabling integration of approved storage tank and other solid waste management unit decommissioning, demolition, remedial investigation, and Corrective Measures

activities with site preparation activities for building construction to support development goals and schedules.

Pre-Remedial Investigation

The remedial investigation program established in the proposed CMI Workplan Addendum recognizes that historical MOSF operations have resulted in limited access to many areas of the Facility for environmental data collection. A strategy has been established that couples decommissioning and removal of storage tanks and other solid waste management units with environmental data collection and field screening for delineation of potential petroleum areas of concern. Highlights of the Pre-Remedial Investigation to be performed under the proposed CMI Workplan Addendum include:

- Pre-Remedial Investigation will be performed to evaluate the storage tanks and tank impoundment areas, surface impoundments, other solid waste management units that have not yet received a signoff from USEPA, and areas with soil to be relocated and beneficially reused within the property to: (1) delineate the areal extent of LNAPL and grossly contaminated soil that will require removal for offsite disposal; (2) delineate the areas of residual petroleum-impacts to be treated with ISCO and bioremediation; and (3) demonstrate compliance with New York State storage tank closure regulations.
- Pre-Remedial Investigation will be performed in compliance with DER-10 and will be conducted to evaluate the nature and extent of petroleum occurrence, including areas of the Facility where site operations prevented prior remedial investigation.
- Pre-Remedial Investigation data and information will be used to define the Corrective Measures to be employed and the areal and vertical extent of Corrective Measures activities. They are designed to support direct field implementation of Corrective Measures by a qualified environmental professional according to the approved procedures established in the Plan.

Corrective Measures

Corrective Measures selected for use in the proposed CMI Workplan Addendum will utilize only remedial technologies that have already been approved by USEPA in the prior CMI and CMI Addenda and that have been subjected to Corrective Measures alternative analysis and determined by USEPA to be appropriate for use at the Facility. Highlights of the Corrective Measures to be performed under the proposed CMI Workplan Addendum include:

- **Soil Excavation and Disposal:** Removal of grossly contaminated soil from ground surface through the water table smear zone will be conducted to achieve expedited petroleum source mass removal.
- **LNAPL Removal and Disposal:** Removal of LNAPL will be conducted directly from remediation excavations via a combination of a mobile on-site oil/water separator, vacuum operations and absorbent booms/pads.
- **In-Situ Chemical Oxidation:** After LNAPL removal, sodium persulfate ISCO will be applied in the stabilized excavation to chemically treat residual source-zone impacts.
- **Bioremediation**: An engineered oxygen releasing compound will be applied after NAPL removal to promote in-situ bioremediation. Bioremediation will be in conjunction with the application of sodium persulfate ISCO described above. ISCO and bioremediation will accelerate the degradation rate of petroleum hydrocarbons and fuel oxygenates through a combination of chemical and natural biological processes.
- **Monitored Natural Attenuation:** Continued implementation of the approved MNA Program is proposed to monitor degradation of the residual dissolved-phase impacts over time and to monitor

and evaluate the effectiveness of natural attenuation to achieve the remediation goals for the existing contaminants of concern.

In summary, multiple Corrective Measures technologies will be used in conjunction under the proposed CMI Workplan Addendum to address LNAPL and grossly contaminated soil impact areas in a consistent manner to achieve the goals established in the ACO and the CMI Workplan (Louis Berger, 2017). It is anticipated that after the completion of site-wide remediation, all MNA and other long-term environmental monitoring programs will be incorporated into a single Site Management Plan that would be implemented under a Site Management Consent Order with NYSDEC.

Project Benefits

Environmental benefits of the project include:

- Permanent petroleum source removal within two years to achieve goals established in the USEPA ACO
- Elimination of commercial mass-storage of petroleum and liquid wastes and associated risk to human health and the environment
- Permanent protection of human health and the environment from past contaminant releases and elimination of potential releases in the future
- Permanent cover of the original terminal footprint with a composite cover system and placement of a soil vapor intrusion control system under the building slabs to eliminate potential exposure pathways for direct contact with residual subsurface materials at the site
- Minimize infiltration and groundwater recharge within the property
- Raise land elevation of industrial property above FEMA flood elevations to prevent potential for future flooding from storm events and sea level rise
- Provide an opportunity for public access to the waterfront
- Provide an opportunity to include solar renewable energy on 2.5 MSF of building rooftop space
- Provide an opportunity to establish ferry access to provide maritime commuting options to lower fuel consumption and associated greenhouse gas emissions

Economic benefits of the project include:

- Create over 2,500 permanent new jobs for Staten Island and surrounding residents
- Generate new tax revenue for local, state and federal government

We greatly appreciate your guidance and counsel as we work to develop these Plans for your approval and look forward to discussing them with you in our meeting at USEPA on June 13.

Sincerely,

Tom DelMastro
Chief Executive Officer
SIMD, LLC

Conceptual MOSF Closure Plan
Kinder Morgan, Staten Island, NY Facility

MAY 30, 2019
PROJECT 208-190418

PRESENTED TO

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REPORT CERTIFICATION

CONCEPTUAL MOSF CLOSURE PLAN
KINDER MORGAN, STATEN ISLAND, NY FACILITY

The material and data in this report were prepared under the supervision and direction of the undersigned.

Cornerstone Engineering, Geology and Land Surveying, PLLC

Gary J. DiPippo, P.E. Date
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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
- 1.1 Purpose 1-1
- 1.2 Site History and Facilities 1-1

2.0 SITE DEVELOPMENT PLAN 2-1
- 2.1 overview and land development plan 2-1
- 2.2 Site preparation for land development 2-2
- 2.3 Project Benefits 2-2

3.0 MOSF CLOSURE PLAN 3-1
- 3.1 Preparation for MOSF Closure 3-1
- 3.2 Tank Cleaning and Decommissioning 3-2
- 3.3 Impoundment Closure and Decommissioning 3-3
- 3.4 Building Demolition 3-3
- 3.5 Closure Documentation and Registration 3-4

4.0 RELEASE RESPONSE AND CORRECTIVE ACTION 4-1
- 4.1 Corrective Action Investigation 4-1
- 4.2 Corrective Measures 4-2

5.0 DEVELOPMENT ENGINEERING CONTROLS 5-1
- 5.1 surface cover 5-1
- 5.2 Vapor Intrusion Control System 5-1

6.0 SITE MANAGEMENT PLAN 6-1

7.0 SCHEDULE 7-1

8.0 LIMITATIONS 8-1

APPENDIX SECTIONS

FIGURES

Figure 1 Site Location Map (excerpted from Corrective Measures Implementation Workplan Addendum, Conceptual Plan, Weston 2019)

Figure 2 Site Plan (excerpted from Corrective Measures Implementation Workplan Addendum, Conceptual Plan, Weston 2019)

ATTACHMENT

Example Site Wide Inspection Form

1.0 INTRODUCTION

1.1 PURPOSE

Kinder Morgan is the current owner/operator of the Major Oil Storage Facility (MOSF) at 4104 Arthur Kill Road, Staten Island, New York (see Figure 1 for site location).

The MOSF license was issued by the New York State Department of Environmental Conservation (NYS DEC); License No. 2-2120.

SIMD, LLC plans to reclaim, redevelop and revitalize the 200-acre property for new industrial warehousing use. The project would be one of the largest redevelopment projects in New York City. To accomplish the redevelopment of the property requires closure of the MOSF in accordance with 6 CRR-NY 613.

This Conceptual MOSF Closure Plan presents the various elements of closure that would be implemented for final site closure, license relinquishment, and to permit implementation of the redevelopment project.

1.2 SITE HISTORY AND FACILITIES

Petroleum storage and transfer operations were started at the site by Mobil Oil Corporation in 1934. The site is formerly known as the Port Mobil Terminal. Kinder Morgan purchased the site in 2005 and assumed the MOSF license. Kinder Morgan assumed responsibility for RCRA Corrective action in 2014.

The Facility is a petroleum bulk storage terminal designed for the distribution of gasoline and distillate fuels. The nominal storage capacity at the Facility is 125 million gallons with an annual throughput of approximately 1.4 billion gallons. Operations at the Facility have included above ground tank storage, storm water management and treatment, and material transfer activities.

The MOSF consists of (see Figure 2 for an overall site plan):

- Approximately 200 acres of property of which 120 acres have been used for petroleum storage and transfer. The 200-acre property has elevations that vary from approximately 60 feet amsl to the east, to less than 10 feet to the west.
- 38 above-ground storage tanks (ASTs) within bermed secondary containment with low-permeability geosynthetic clay liner. The tanks range from approximately 40 to 75 feet tall and vary in diameter from approximately 35 to 140 feet.
- Above-grade petroleum product transfer piping.
- Two geomembrane lined, stormwater management, upper and lower surface impoundments.
- Lift station and oil water separators for discharge of stormwater from the surface impoundments under a SPDES permit.
- Support buildings including: an office, warehouse, boiler house, and foam house.

For additional site description, see *Site Management Plan* discussion.

2.0 SITE DEVELOPMENT PLAN

2.1 OVERVIEW AND LAND DEVELOPMENT PLAN

The proposed development plan will reclaim, redevelop, and revitalize the 200-acre property for new industrial warehousing use. Land development under the proposed plan will include construction of three new buildings to establish a total of approximately 2.5 MSF of new building space.

Land development under the proposed plan will include:

- Construction of three new buildings to establish a total of approximately 2.5 MSF of new building space.
- The site development footprint and general arrangement of the three (3) building(s), roads, and trailer and car parking lots are designed to be at an approximate elevation of 40 feet (NAVD 88).
- As part of the green remediation plan and to achieve green remediation and sustainability goals, the beneficial reuse of onsite soil material for site final grading is planned. All materials proposed for beneficial reuse on site will be managed in compliance with an Onsite Soil Beneficial Reuse Plan to be submitted for approval as a part of the CMI Workplan Addendum.
- Site development will include a composite cover system as further described in Section 5.1, and will be implemented under the authority of NYS DEC. The composite cover system will include the following low-permeability surfaces:
    - Buildings and building slabs;
    - Concrete truck aprons;
    - Asphalt parking areas for truck trailers and cars; and,
    - Water quality basins constructed with impermeable liner systems.
- The typical building design consists of the following elements, from bottom up:
    - A building pad constructed of general fill to designed elevations;
    - Soil vapor intrusion control system as described further in Section 5.2, and which will be implemented under the authority of NYS DEC;
    - Approximately 12" of engineered sub grade fill material; and,
    - Approximately 8" of reinforced concrete floor.

Proposed use of the development will be industrial warehousing. There will be no general public or consumer access to the property. The property will have a highly secured perimeter controlled access and additional secured entry to buildings. These controls will prevent site access to the general public and will eliminate potential exposure risks associated with residential and commercial property.

2.2 SITE PREPARATION FOR LAND DEVELOPMENT

Site preparation for project development will include:

- Continuation and completion of existing approved remedial measures identified in the USEPA-approved Corrective Measures Implementation (CMI) Workplan (see CMI Workplan Addendum, Weston 2019, for further details), including:
    - Completion of all remaining Corrective Measures in seven Remedial Areas;
    - Continued performance of existing approved Interim Corrective Measures (ICM) and MNA monitoring programs;
- Completion of Pre-Remedial Investigation and Corrective Measures for the entire property under the CMI Workplan Addendum (Weston, 2019) under the authority of USEPA including remediation of:
    - Tank areas and associated piping systems;
    - Surface impoundment systems;
    - All remaining solid waste management units requiring Corrective Measures (those that have not received a sign-off from USEPA).
- Completion of Facility closure and remedial activities established in this MOSF Closure Plan under the authority of NYSDEC including:
    - Decommissioning and removal of tanks and associated piping (see Section 3 for additional details).
    - Performance of remedial actions associated with development of the industrial warehousing usage of the property, including Engineering Controls consisting of a composite cover system and soil vapor intrusion controls to eliminate potential exposure pathways and protect future users of the property (see Section 5 for further details).
    - Establishment of a Site Management Plan to allow for long term site monitoring and maintenance, and site inspection and certification of Engineering and Institutional Controls (see Section 6 for further details). The Site Management Plan would be administered by NYS DEC under a Site Management Order on Consent.
    - Establishment of an Environmental Easement with NYSDEC to prevent groundwater withdrawal for potable supply, to prohibit future land uses other than industrial use and to require compliance with the Site Management Plan (see Section 6 for further details).

2.3 PROJECT BENEFITS

Environmental benefits include:

- Permanent petroleum source removal within two years to achieve goals established in the USEPA Administrative Order on Consent;
- Permanent elimination of commercial mass-storage of petroleum and liquid wastes and associated risk to human health and the environment;
- Permanent protection of human health and the environment from past contaminant releases and elimination of potential releases in the future;

- Permanent cover of the original terminal footprint with a composite cover system and placement of a soil vapor intrusion controls system under the building slabs to eliminate potential exposure pathways for direct contact with residual subsurface materials at the site;
- Minimize infiltration and groundwater recharge within the property;
- Raise land elevation of industrial property above FEMA flood elevations to prevent potential for future flooding from storm events and sea level rise;
- Provide an opportunity to provide public access to the waterfront;
- Provide an opportunity to improve and permanently preserve wetland areas on the north and south sides of the site and possible establishment of environmental education and other benefits and amenities, such as bird watching and habitat improvement;
- Provide an opportunity to include solar renewable energy on 2.5 MSF of building space; and
- Provide an opportunity to establish ferry access to provide maritime commuting options to lower fuel consumption and associated greenhouse gas emissions.

Economic benefits Include:

- Create over 2,500 permanent new jobs for Staten Island and surrounding residents; and
- Generate new tax revenue for local, state and federal governments.

3.0 MOSF CLOSURE PLAN

Closure of the MOSF will be in accordance with 6 CRR-NY 613. In addition, the closure will follow relevant provisions of NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, most recent edition.

30 days prior to commencing closure the NYS DEC will be notified of the intent to permanently close the MOSF and provide a schedule for closure implementation.

3.1 PREPARATION FOR MOSF CLOSURE

Preparation for tank closure will be comprised of the following:

- Lockout and tagout any electrical systems or other energy source supplying power to pumps or other equipment connected to a tank, except as may be necessary for tank emptying and cleaning operations.
- Maintain tank vent lines in functioning, open condition until tanks are empty and clean.
    - If tank vent is part of a manifold, isolate the vent from the manifold and provide a separate temporary vent for the tank being emptied and cleaned.
- Maintain corrosion protection systems until tanks are empty and clean.
- Verify that sufficient on-site fire-firefighting equipment and supplies are available and properly functioning.
    - Coordinate with local FDNY representatives and provide notification of tank decommissioning activities.
- Empty tank contents to the lowest draw off point.
    - All marketable product remaining in tanks will be properly handled, in accordance with the site's MOSF license, and transported to another Kinder Morgan facility.
- Remove all remaining pumpable liquids from tanks.
    - Product not suitable for market will be used on site (e.g., for use in the on-site boiler), or disposed/recycled at a properly permitted facility in accordance with applicable local, state, and federal regulations.
- Drain piping of any remaining product, flushing with water, as appropriate. Separate, blank, plug, or double block and bleed piping, as appropriate.
- Remove tank residue, to the extent practical and segregate this material for disposal/recycle at a properly permitted facility, in accordance with applicable local, state, and federal regulations.
- Isolate empty tanks:
    - Inspect tank for manifold vent, vapor recovery system, fill/conveyance lines, siphon assembly, or any other connections.
    - Isolate all connections to a tank by disconnecting, plugging, blanking, and/or double-blocking all piping and connections, taking precautions to bleed system as needed.
    - If plugs are used, verify that they are suitable to withstand any pressure that may be encountered in pipelines.

3.2 TANK CLEANING AND DECOMMISSIONING

Tank cleaning and decommissioning will follow the preparation activities and will generally be in accordance with the following procedures:

- Inert tank:
    - Displacement with inert gas (carbon dioxide or nitrogen). Provide full distribution of inert gas throughout the tank.
    - Vapor displacement with ventilation if tank openings are sufficient to accommodate blowers or eductors. Blowers or eductors shall not provide an ignition source. Ventilation equipment shall be grounded to control potential static electricity. Because of potential for explosive atmospheres with this option, extreme care will be taken if used, for venting locations and equipment.
    - Vapor release from ventilation or inerting shall be in accordance with applicable provisions of the air permit and vapor recovery requirements for the MOSF.
- Test for oxygen, combustible gas, and toxic vapors/gas levels using oxygen, combustible gas, and photoionization or flame ionization detectors, as applicable.
- Tanks may be entered for cleaning without restrictions only if:
    - Oxygen level is between 19.5 and 23.5 percent.
    - Combustible gas is less than 10% of the lower explosive limit.
    - Toxic vapors/gases are within permissible OSHA or ACGIH levels, as appropriate.
    - Residues are not anticipated to produce gases or vapors above combustible or permissible limits.
- Conditions for tank entry for cleaning, other than those meeting the 'without restrictions' conditions, shall require use of proper personal protective equipment, ventilation, and/or other safety and protection measures, as applicable.
- Tank entry will be in accordance with a Health and Safety Plan, consistent with OSHA requirements, and shall include requirements for confined space entry.
- Tank cleaning options based on materials and contents:
    - Physical removal of residues using scraping, wiping, shoveling, vacuuming, or adsorbents, as applicable based on remaining contents.
    - Low or high pressure water wash.
    - High pressure steam cleaning.
    - Cleaning agents (e.g., surfactants, degreasers), if necessary, based on tank contents and in accordance with all local, state, and federal rules, regulations, and guidelines.
    - All residues and cleaning materials shall be properly disposed of at a properly permitted disposal facility in accordance with all applicable local, state, and federal regulations.
- Following tank cleaning, tanks may be dismantled and disposed/recycled off site at a facility permitted to accept such material for disposal or recycle, along with drained and flushed piping and ancillary fittings and appurtenances.

3.3 IMPOUNDMENT CLOSURE AND DECOMMISSIONING

The upper and lower impoundments were closed in 2001, but have since continued to be used for stormwater management at the MOSF. Upon full closure of the MOSF, the impoundments will be closed out and not used for stormwater management. Impoundment closure will be scheduled to occur when the impoundments are no longer needed for stormwater control, and will generally be in accordance with the following procedures:

- The closure will include: the impoundments, two hydrocarbon monitoring catch basins, a lift station, and the oil-water separators.
- Remaining water in the impoundments will be removed via pumping through the oil/water separators, if necessary to meet discharge standards. Supplemental treatment, if necessary, such as sediment or granular activated carbon filters, may be employed for treatment for discharge in compliance with the existing SPDES permit, modified as necessary to manage this water.
- Any residues/sediments remaining in the impoundments will be shoveled, vacuumed, and/or wet slurried for separate collection and disposal. The collected materials may be mixed with a drying agent (e.g., cement or agricultural products) to control free liquids prior to off-site disposal at a properly permitted disposal facility in accordance with all local, state, and federal regulations.
- The impoundment liners will be pressure washed. The wash fluids will be containerized for characterization and discharged under the existing/modified SPDES permit (see previous discussion of treatment options) or sent for off-site disposal at a properly permitted disposal facility in accordance with all local, state, and federal regulations.
- The impoundment liners will be removed for disposal, subject to coordination with the RCRA Corrective Measures work (See Section 4).
- Decommissioning of the hydrocarbon monitor catch basins, lift station, and oil-water separators will involve the same general steps as those performed for the impoundment removal:
    - Remove standing water or remaining liquids, if any, and discharge under the SPDES permit or to a properly permitted disposal facility in accordance with all local, state, and federal regulations.
    - Remove any residues or sediment remaining in the catch basins, the base of the lift station, and the oil-water separators by physical means and containerize for characterization and off-site disposal at a properly permitted disposal facility in accordance with all local, state, and federal regulations.
    - Pressure wash the oil-water separators, catch basins, and lift station interiors. Collect wash water for characterization and discharge under the SPDES permit or to a properly permitted disposal facility in accordance with all local, state, and federal regulations.
    - The oil-water separators will be sent for scrap/recycling or to a permitted landfill, dependent upon the condition of the units at the time of closure.

3.4 BUILDING DEMOLITION

Building demolition will comply with all relevant provisions of the following:

- 40 CFR 61, Subpart M, *National Emission Standards for Hazardous Air Pollutants, Standard for Demolition and Renovation*.
- 10 CRR-NY 73, *Asbestos Safety Program Requirements*
- 12 CRR-NY 56 Asbestos regulations of the New York State Department of Health

- 6 CRR-NY 360 Solid Waste Regulations
- 6 CRR-NY 364 Transporter regulations
- Occupational Safety and Health Administration (OSHA), 29 CFR 1910, *General Industry* and 29 CFR 1926 *Construction Standards*, as applicable.

Asbestos has been documented at the site in floor and ceiling tiles, building insulation, pipe insulation, gasket material and roofing felt and shingles. All asbestos containing material (ACM) will be properly identified, managed, abated, and disposed of in accordance with all applicable local, state, and federal regulations. All asbestos work will be performed by properly trained and certified individuals, as applicable and in accordance with applicable regulations. Asbestos removal will precede general building demolition.

Electrical service and other utilities will be cut off and terminated and capped as applicable, prior to the start of building demolition. Utility work will be coordinated with the utility authorities.

Before beginning building demolition any residual waste materials, fire suppression foam, or any hazardous or contaminated materials will be segregated for proper characterization and disposal at an appropriately permitted off-site disposal facility.

Use of explosives for any and all aspects of building demolition will be prohibited. Similarly, the use of cutting torches or other hot work is not permitted until the work area is cleared of flammable materials. If hot work is performed, hot work permit procedures will be followed and appropriate fire-suppression will be maintained at all times during such work.

During demolition, precautions will be taken to prevent catastrophic or uncontrolled collapse of the buildings. Demolition methods causing unacceptable ground impact or dust generation is not permitted. Water mist will be used to limit the spread of dust and dirt.

All debris resulting from the building demolition, along with any non-demolition wastes, will be removed from the site and transported by licensed transporters to a permitted waste disposal or recycling facility in accordance with all applicable local, state, or federal regulations. Alternatively, debris may be characterized and, if suitable for re-use consistent with the provisions of DER-10 and Part 360-12 for soil reuse and specifically meeting site-specific cleanup goals for placement below the covered areas subject to an Environmental Easement and a Site Management Order on Consent, then the demolition materials may be used as fill as appropriate to the overall site development plan.

3.5 CLOSURE DOCUMENTATION AND REGISTRATION

Records of tank closures, other facility closures, materials and waste management, and remedial actions will be compiled that demonstrate compliance with closure requirements. 30 days after completion of permanent closure, a registration application will be submitted to the NYSDEC indicating that the MOSF has been permanently closed.

4.0 RELEASE RESPONSE AND CORRECTIVE ACTION

4.1 CORRECTIVE ACTION INVESTIGATION

In accordance with 6 CRR-NY 613-4.5(a)(1)(i), the MOSF closure must also address 6 CRR-NY 613-6 for any confirmed releases. There have been seven confirmed petroleum discharges at the site as follows:

- NYSDEC Spill No. 11953, February 6, 2001, Underground Siphon Line Leak (ongoing under RCRA);
- NYSDEC Spill No. 0210883, January 3, 2003, LNAPL in monitoring well ICM-1 (ongoing under RCRA);
- NYSDEC Spill No. 0700619, April 17, 2007, No. 2 Fuel Oil Norther Bulkhead area (closed August 3, 2007);
- NYSDEC Spill No. 907511, October 4, 2009, No. 6 Fuel Oil, northwest of boiler house (closed November 10, 2009);
- NYSDEC Spill No. 1010851, January 24, 2011, No. 2 Fuel Oil, northwest of Tank No. 18 (ongoing monitoring);
- NYSDEC Spill No. 1107362, September 12, 2011, heating oil within the berm of Tank No. 11 (closed August 3, 2012); and,
- NYSDEC Spill No. 1202199, June 4, 2012, No. 2 Fuel Oil, transfer pipe northwest of tank No. 18 (closed June 5, 2012).

The MOSF is the subject of a RCRA Corrective Measures Implementation Workplan and Addenda which address confirmed releases as well as other regulated sources of contamination at the site. Ongoing petroleum release investigation and clean-ups, identified as a part of MOSF operations, have been incorporated into the RCRA Corrective Measures Implementation Workplan and Addenda.

In accordance with the USEPA Administrative Consent Order (ACO) for the site, *Section VI Performance Goals, Required Activity and Work to be Performed*, the 38 tanks and tank impoundments, two surface impoundments and other SMU's and soil to be relocated and beneficially reused within the property (collectively, Target CM Areas) will be investigated for the presence of petroleum-related impacts that require Corrective Measures. These investigations will be performed in accordance with NYS DEC Program Policy DER-10 Technical Guidance for Site Investigation and Remediation and the NYSDEC Part 375-6.8(b) Restricted Use Soil Cleanup Objectives, Protection of Public Health, Industrial (SCOs).

Each Target CM Area will be investigated using conventional soil boring and test pit technology to evaluate the nature and extent of petroleum occurrence. Where feasible, test pits will be used to provide a broader field of inspection to evaluate the presence/absence of petroleum. All soil borings and test pits will be located using a global positioning system (GPS) survey device to record the coordinates of all investigation locations.

Where tanks or other MOSF structures are present in Target CM Areas, investigations will be performed after implementation of the MOSF Closure Plan for removal of tanks or other MOSF structures to enable unimpeded access, optimal opportunity for sample collection, and environmental evaluation.

Target CM Areas include:

- Tanks and tank impoundment areas (RCRA Solid Waste Management Unit (SWMU) designations 23-62);
- Surface impoundments (SWMUs 13 and 14);
- Road Trench (SWMU 1);

- Former API Separator Site (SWMU 4);
- Primary API Separator (SWMU 5);
- Utility API Separator (SWMU 6);
- Vacuum Tank 1, High Flash Tank (SWMU 7);
- Vacuum Tank 2, Low Flash Tank (SWMU 8);
- Hydrocarbon Monitor Catch Basins (SWMU 9);
- Excavated Soils Area (SWMU 17);
- North Beach Recovery Well Holding Tank (SWMU 19); and
- Site-wide groundwater.

The Target CM Areas cover each of the NYSDEC identified spills that have not been closed, plus the MOSF facilities.

Reference the *Corrective Measures Implementation Workplan Addendum, Conceptual Plan* (Weston, 2019) for the details of the investigations and Corrective Measures to be performed in each area.

4.2 CORRECTIVE MEASURES

Corrective Measures in each Target CM Area will be based on the results of the investigations as described in the CMI Addendum.

Corrective Measures include:

- Excavation of vadose zone soils and associated smear zone soils to expose and remove LNAPL and grossly contaminated soil;
- LNAPL recovery from the surface of the groundwater table via a combination of mobile on-site oil/water separator, vacuum operations, and absorbent booms/pads;
- Addition of chemical oxidant to open excavation areas to oxidize residual petroleum in vadose zone and upper saturated zone soils;
- Application of oxygen release compound (ORC) to enhance biodegradation of dissolved phase contamination; and
- Monitored Natural Attenuation (MNA) for dissolved phase contamination.

In addition to the Target CM Areas identified in Section 4.1 for investigation, Corrective Measures to be implemented at the Facility will include completion of Corrective Measures already approved under the *Updated Corrective Measures Implementation Work Plan* and associated Addenda (Louis Berger, July 7, 2017) including each of the following areas:

- CMI Area 2 (Tank 50), Area 3 (North Beach), Area 5 (Boiler House) and Area 7 (Siphon Building/Oil water Separator);
- Passive LNAPL Monitoring Areas including CMI Area 4, the ICM-1 Area, the MW-1 Area and the RFI-9 Area; and
- Facility-wide MNA program.

Reference the *Corrective Measures Implementation Workplan Addendum, Conceptual Plan* (Weston, 2019) for the details of the Corrective Measures to be employed.

5.0 DEVELOPMENT ENGINEERING CONTROLS

5.1 SURFACE COVER

Surface cover Engineering Controls to be implemented under this Plan will supplement the MOSF closure and RCRA Corrective Action activities to support the site development plan. The surface cover will eliminate the potential for direct contact with residual soils.

Composite surface cover will include:

- Building slab under all building areas (from surface down):
  - Reinforced concrete with thickness based on building use and loadings (generally a minimum of 4 inches thick to function as a surface cover);
  - Vapor barrier (see Section 5.2);
  - Granular base course for slab, minimum of 6 inches thick for the purpose of a surface cover; and
  - Foundation design based on geotechnical evaluation as part of building design.
- Bituminous Concrete Pavement on all site access roads and parking areas (from surface down):
  - 2-inch-thick fine-aggregate bituminous concrete surface wearing course;
  - 4-6-inch-thick coarse-aggregate bituminous concrete base course;
  - 8-9-inch-thick aggregate sub-base course; and,
  - Geotextile separation/demarcation layer below sub-base course.

Actual bituminous concrete pavement design may vary based on geotechnical and site development considerations (e.g., pavement loading).

- Soil cover in areas not covered by reinforced concrete slabs or bituminous concrete pavement:
  - 6-inch surface layer for erosion protection either topsoil stabilized with vegetation or coarse stone cover;
  - Minimum 6-inch sub-soil layer; and
  - Geotextile separation/demarcation layer below subsoil.

Soils used in cover systems would meet the site SCOs approved by USEPA in the CMI (6 CRR-NY 375-6.8(b) Restricted Use Soil Cleanup Objectives, Protection of Public Health – Industrial) and will be specified in the Environmental Easement.

5.2 VAPOR INTRUSION CONTROL SYSTEM

A vapor intrusion control system will be employed for occupied buildings proposed for development of the site to eliminate any soil vapor intrusion exposure pathway.

Vapor intrusion control systems will include:

- Vapor barrier options, selection based on building design considerations:
  - Sheet membrane;
  - Spray applied membrane; and/or

  - Aerated floor design as component of structural concrete slab.
- Geotextile protection layer above membrane prior to concrete pour; and
- Underlying gravel layer below vapor barrier, typical minimum 6-inch thickness.

6.0 SITE MANAGEMENT PLAN

Purpose of the Site Management Plan (SMP) is to ensure continued effective performance of the remedial actions and engineering and Institutional Controls to protect public health and the environment. The SMP will be implemented under a Site Management Consent Order with NYS DEC. The SMP will include the following:

- General
  - Notifications:
    - 60-day notice of proposed changes in site use;
    - 7-day notice of field activity associated with the remedial program;
    - 15-day notice of proposed ground-intrusive activity pursuant to the Excavation Workplan;
    - Notice within 48-hours of potential reduction of the effectiveness of remedial actions or Engineering Controls; and
    - Verbal notice by noon of the following day of any emergency.
  - Contacts to be included in Site Management Plan, as appropriate:
    - Property/project manager;
    - Property owner;
    - NYSDEC regulator; and
    - USEPA regulator.

The Site Management Plan will include a summary of information regarding the site (briefly summarized below) and will include pertinent site documents by reference

- Summary of Previous Investigations and Remedial Actions.
- Site Location and Description:
  - Located at 4104 Arthur Kill Road, Staten Island, NY;
  - Approximately 200 acres of property of which 120 acres have been used for petroleum bulk storage and transfer operations;
  - Site elevations vary from approximately 60 feet above MSL to the east, to less than 10 feet above MSL to the west;
  - Site bounded to the north and west by the Arthur Kill, to the south by the Charleston section of Staten Island, and to the east by the Clay Pit Pond State Park preserve;
  - Facilities include 38 tanks, transfer piping, an office building, warehouse, boiler plant, and surface impoundments with associated equipment (e.g., OWS);
  - Facility is zoned manufacturing (industrial);
  - The Arthur Kill is an SD designated surface water body adjoining the site;
  - Nine ship/barge berths are located on the property at the eastern bank of the Arthur Kill. These berths are used for mooring, loading, and unloading vessels;
  - Geology is a heterogeneous mix of fill and natural deposits of sand, silt, and clay with some gravel. Fill deposits underlain by discontinuous marine tidal marsh deposits and clay at depth.

Natural surface soils are typically Upper Pleistocene ground moraine deposits (glacial deposits). The deposits are primarily reddish-brown clayey till derived mostly from Upper Triassic and Lower Jurassic shale and sandstone. The ground moraine contains localized areas of stratified sand and gravel;

- Hydrogeology – water table aquifer in the fill/geologic deposits, tidally influenced, and varying from approximately one to 29 feet below grade. Groundwater flows to the northwest, toward the Arthur Kill, and generally reflects site topography; and
- No documented potable water supply wells on Staten Island, and underlying aquifer is tidally influenced and saline.

- Investigation and Remedial History
  - Remedial Action Objectives:
    - USEPA-approved SCOs included in the *Updated Corrective Measures Implementation Work Plan* (Louis Berger, July 7, 2017, Sections 3.3 and 3.4).
    - USEPA-approved Facility Perimeter SCOs:
      - Perimeter soils are the 6 CRR-NY 375-6.8(b) Restricted Use SCOs – Industrial;
      - Undeveloped northern perimeter soils to 2 feet below ground surface adjacent to the Arthur Kill tidal flats are the 6 CRR-NY 375-6.8(b) Restricted Use SCOs – Protection of Ecological Resources; and
      - Soils SOCs for Protection of Groundwater were determined by USEPA to be not necessary because there is no current or future use of groundwater anticipated at or down gradient of the site.
    - Facility Non-Perimeter Soils SCOs from the *Updated Corrective Measures Implementation Work Plan* (Louis Berger, July 7, 2017, Section 3.4, which adopted the 6 CRR-NY 375-6.8(b) Restricted Use SCOs – Industrial.
  - Seven documented MOSF releases.
  - NYS DEC Consent Order with Mobil Oil Corporation.
  - USEPA Administrative Order on Consent with Kinder Morgan Liquids Terminals, LLC.
  - Corrective Measures Program under RCRA:
    - 62 SWMUs and 1 AOC;
    - Soil excavations;
    - LNAPL recovery;
    - MNA monitoring; and,
    - Routine groundwater monitoring.
  - Contaminants of Concern
    - Petroleum hydrocarbons;
    - BTEX;
    - MTBE;
    - PAHs; and,

        - Lead.
- Institutional and Engineering Control Plan
    - NYS DEC Order on Consent for Site Management
    - Environmental Easement for industrial use:
        - Purpose is to:
            - Ensure continued industrial use and prevent other uses that could increase human exposure risks.
            - Prohibit withdrawal of groundwater for potable supply.
        - Will be granted on the site pursuant to Article 71, Title 36 of the New York State Environmental Conservation Law
        - Will provide for:
            - Allowable site use (i.e., industrial);
            - Engineering Controls operation, maintenance, and inspection in accordance with the SMP;
            - Prohibition on groundwater use for potable supply;
            - Continuation of environmental monitoring in accordance with the SMP;
            - Monitoring and reporting on the performance and effectiveness of the Corrective Measures and Engineering Controls per the SMP; and
            - Access for the regulatory agencies for inspection and assessment of the effectiveness of the Environmental Easement and compliance with the SMP.
        - Approved by NYS DEC
        - To be filed with Richmond County Clerk
        - Proof of filing of Environmental Easement to be submitted to NYS DEC and EPA
    - Engineering Controls (see Section 5):
        - Composite Surface Cover System;
        - Vapor Intrusion Control System;
        - Soil Management Plan:
            - Purpose: to govern future invasive activity that may penetrate the cover materials and residual soils, that may be necessary to support industrial use (e.g., utility repairs);
            - Notification to NYSDEC of proposed disturbance including nature, extent, schedule, controls, and disposal facilities;
            - Under the supervision of a qualified professional;
            - Site Preparation:
                - Dig Safely New York notification;
                - Private utility mark-out for on-site areas;

  - Soil erosion and sediment controls;
  - Stormwater management;
  - Health and Safety and Community Air Monitoring Plan; and
  - Odor and Dust Control Plans.
- Soil disturbance:
  - Segregate cover materials for reuse, when applicable;
  - Recycle pavement disturbed for soil disturbance, when applicable;
  - Soil screening – visual and with screening instruments (e.g., PID);
  - Define when disturbed soil may be reused as backfill (e.g., no excess soil, soil meets reuse criteria);
  - Excess soil or soil not meeting reuse criteria characterized in accordance with DER-10, Section 5.4(e) frequency and analytical requirements, transported off-site by licensed haulers to properly permitted disposal facilities in accordance with all applicable local, state, and federal regulations; and,
  - Temporary stockpiling per soil erosion and sediment control plans and based on soil screening. Typically stockpiling of excavation spoils on plastic sheeting, within temporary containment area, and covered with plastic sheeting when stockpile not in active use.
- Potential Additional Corrective Measures:
  - If LNAPL or petroleum residuals meeting corrective action criteria are encountered, a spill will be registered with the NYS Spills Hotline.
- With DEC approval, typical spill response action would include:
  - excavation of vadose zone soils and associated smear zone soils to expose and remove LNAPL and impacted soils;
  - Potential modification of any ongoing LNAPL recovery operations;
  - Potential use of chemical oxidant to treat residual petroleum in vadose zone and upper saturated zone soils in open excavations; and
  - Potential application in open excavations of oxygen release compound (ORC) to enhance biodegradation of dissolved phase contamination.
- Liquids management, if any, during soil disturbance via containerization and off-site disposal or discharge under a SPDES permit.
- Imported fill:
  - Compliance with approved Soil Import Plan in the Soil Management Plan
  - Source identification, location, and history;
  - Meets 6 CRR-NY 375-6.8(b) Restricted Use SCOs - Industrial; and,
  - Backup documentation including laboratory reports of analytical characterization per DER-10 Table 5.4(e)10 and 5.4(e)3/ii(3);

- Imported gravel, rock, stone from virgin source or recycled concrete and brick from a registered processing facility and per the requirements of Section 304 of the NY State Department of Transportation Standard Specifications.

- Restoration of surface cover per original designs.

- Inspections and Monitoring
  - Site-wide annual inspections:
    - Check for compliance with Institutional Controls including site usage and groundwater use prohibitions;
    - Check the condition of and continued effectiveness of Engineering Controls for:
      - Surface Cover; and
      - Vapor Intrusion Controls.
    - Check that site records documenting performance and any site activities are up to date.
    - Complete and sign inspection checklist (example attached).
  - Monitoring
    - Groundwater sampling and analyses and MNA evaluations,
    - MNA Groundwater Monitoring Well Maintenance Plan, and
    - Other sampling or monitoring required by NYS DEC.
- Operation and Maintenance Plan
  - Surface cover maintenance:
    - Soil cover erosion repair, if any;
    - Vegetation maintenance (e.g., bare spot repair, fertilizer);
    - Sealing of cracks in pavement;
    - Pavement sealcoating as necessary to maintain surface cover function; and
    - Building slab crack repair.
- Periodic Assessment
  - Climate change vulnerability assessment:
    - Shoreline erosion potential; and
    - Wind damage potential.
- Reporting
  - Routine inspection reports on file.
  - Periodic Review Report:
    - Annual submittal, per DER-10 Section 6.3 requirements;
    - Identification, assessment, and certification of engineering and Institutional Controls;
    - Results of monitoring and trends;

- Results of inspections, and actions taken;
- Operation and maintenance summary;
- Need for Corrective Measures, if any;
- Engineering Controls performance effectiveness evaluation;
- Conclusions and recommendations for changes, if any; and
- Certification of institutional and Engineering Controls by a qualified environmental professional or professional engineer.

7.0 SCHEDULE

Milestone	Approximate Date
Submit Conceptual MOSF Closure Plan	May 2019
NYSDEC Review of Conceptual MOSF Closure Plan	June 2019
Submit MOSF Closure Plan	June 2019
NYSDEC Approval of MOSF Closure Plan	August 2019
Property Closing	September 2019
MOSF Closure Notification to NYSDEC	September 2019
Begin MOSF Closure	October 2019

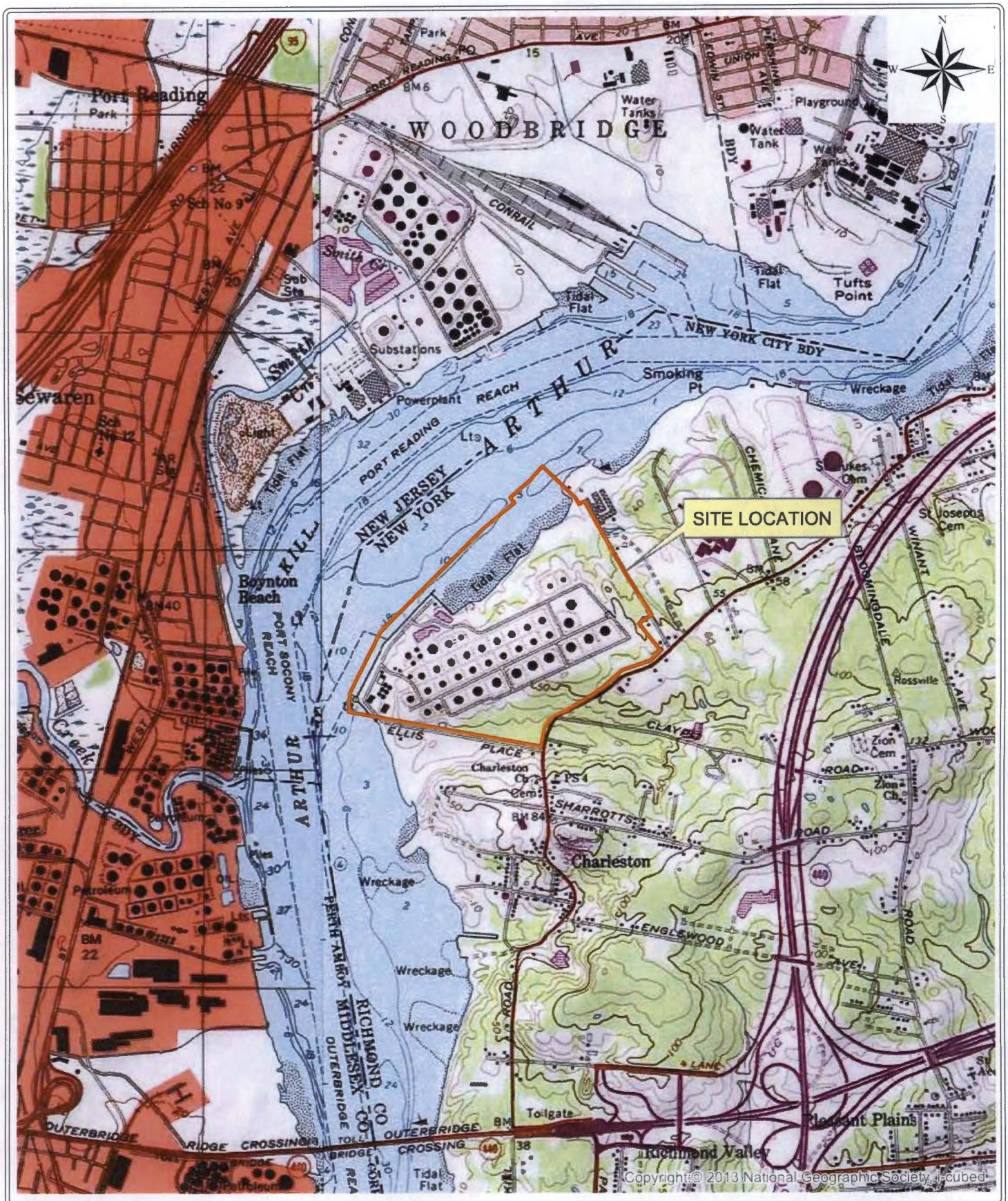
8.0 LIMITATIONS

The work product included in the attached was undertaken in full conformity with generally accepted professional consulting principles and practices and to the fullest extent as allowed by law we expressly disclaim all warranties, express or implied, including warranties of merchantability or fitness for a particular purpose. The work product was completed in full conformity with the contract with our client and this document is solely for the use and reliance of our client (unless previously agreed upon that a third party could rely on the work product) and any reliance on this work product by an unapproved outside party is at such party's risk.

The work product herein (including opinions, conclusions, suggestions, etc.) was prepared based on the situations and circumstances as found at the time, location, scope and goal of our performance and thus should be relied upon and used by our client recognizing these considerations and limitations. Cornerstone Environmental Group, LLC shall not be liable for the consequences of any change in environmental standards, practices, or regulations following the completion of our work and there is no warrant to the veracity of information provided by third parties, or the partial utilization of this work product.

FIGURES

Figure 1	Site Location Map (excerpted from Corrective Measures Implementation Workplan Addendum, Conceptual Plan, Weston 2019)
Figure 2	Site Plan (excerpted from Corrective Measures Implementation Workplan Addendum, Conceptual Plan, Weston 2019)



SCALE: 2,000 1,000 0 2,000 Graphic Scale in Feet	TITLE: SITE LOCATION MAP STATEN ISLAND, NEW YORK
PROJECT: Conceptual CMI Addendum	
CLIENT NAME: Staten Island Marine Development	WESTON SOLUTIONS
DATE: May 2019	FIGURE #: 1

ARTHUR KILL

BULKHEAD AREA

STEEL SHEATING

SURFACE IMPOUNDMENT / NORTH BEACH AREA

ARTHUR KILL

MEAN HIGH WATER OCTOBER 10, 1980

MARINE WAREHOUSE AND OFFICE

BOILER HOUSE

FOAM HOUSE

OFFICE

SURFACE IMPOUNDMENT

SURFACE IMPOUNDMENT

OFFICE AND GARAGE

20 41 43 60

53 54

2 4 6 8 10 12 14 16 18

40 1 3 5 7 9 11 13 15 17

58 59

61 62 44 45 49 50 51 52 55 56 57

ELLIS ROAD (LANE)

TANK FARM AREA

Legend

- (2) Existing Aboveground Tank with Identification Number
- Containment Berm
- Surface Impoundment
- Buildings

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan
Kinder Morgan Luquids Terminals, Staten Island, New York

LEGEND:
350 175 0 350
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

TITLE:
FACILITY WIDE SITE PLAN
STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE # 2

P:\Staten_Island_Marine\mxd\CMI_Addendum\23880_SIMD_Facility_Wide_Site_Plan.mxd.mxd

ATTACHMENT

EXAMPLE SITE WIDE INSPECTION FORM

EXAMPLE SITE-WIDE INSPECTION FORM

Date:_____ Site Conditions:_____

Name and title of person filling out this inspection log:

_____

Inspection Checklist

Site Component	Check	Adequate?
Security	Signs Intact and not Missing	☐ Yes ☐ No
	Fence Integrity	☐ Yes ☐ No
	Gates Functioning, Lockable	☐ Yes ☐ No
Access Roads	Stable	☐ Yes ☐ No
	Functioning as Surface Cover EC	☐ Yes ☐ No
Stormwater Management	Well Vegetated Surface	☐ Yes ☐ No
	Standing Water	☐ Yes ☐ No
	Signs of Erosion	☐ Yes ☐ No
	Signs of Overflow	☐ Yes ☐ No
Monitoring Wells	Locked	☐ Yes ☐ No
	Casing, Collar, Finish – Good Condition	☐ Yes ☐ No
Pavement Surface Cover	Stable	☐ Yes ☐ No
	Functioning as Direct Contact Control	☐ Yes ☐ No
Soil Surface Cover	Stable, no Signs of Erosion	☐ Yes ☐ No
	Functioning for Direct Contact Control	☐ Yes ☐ No
Vapor Intrusion	Monitoring Records	☐ Yes ☐ No
	Systems Intact and Functioning	☐ Yes ☐ No
	Building Slabs Intact and Functional	☐ Yes ☐ No
LNAPL Recovery	Systems Maintained and Functional	☐ Yes ☐ No
	Complete Records	☐ Yes ☐ No
Institutional Controls	Only Industrial Use	☐ Yes ☐ No

COMMENTS (List need for any corrective action):

_____

_____

_____

_____

_____

_____

_____

_____

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA)
CORRECTIVE MEASURES IMPLEMENTATION
WORKPLAN ADDENDUM
CONCEPTUAL PLAN

FORMER PORT MOBIL TERMINAL FACILITY
4101 ARTHUR KILL ROAD, STATEN ISLAND, NEW YORK

MAY 2019

PREPARED FOR:
SIMD, LLC

PREPARED BY
WESTON SOLUTIONS, INC.

REPORT CERTIFICATIONCORRECTIVE MEASURES IMPLEMENTATION WORKPLAN ADDENDUM CONCEPTUAL PLAN

KINDER MORGAN, STATEN ISLAND, NY FACILITY

The material and data in this report were prepared under the supervision and direction of the undersigned.

Randy Abbuhl, Date
N.Y. P.E. License # 070844

It is a violation of Article 145 of the New York State Education Law; unless acting under the direction of a licensed Professional Engineer who affixes signature, date, seal and the words "altered by"; for any person to alter this document in any way.

TABLE OF CONTENTS

1 INTRODUCTION 1-1
1.1 LOCATION AND PHYSICAL SETTING 1-1
1.2 GEOLOGIC SETTING 1-1
1.3 SITE HISTORY AND USAGE 1-2
1.4 SUMMARY OF SWMUS AND REMEDIATION AREAS 1-3
2 LAND DEVELOPMENT PLAN 2-1
2.1 OVERVIEW OF LAND DEVELOPMENT PLAN 2-1
2.2 SITE PREPARATION 2-2
2.3 PROJECT BENEFITS 2-2
3 REMEDIAL GOALS OF CMI WORKPLAN ADDENDUM 3-1
4 CORRECTIVE MEASURES SELECTION 4-1
4.1 APPLICABILITY 4-1
4.2 CORRECTIVE MEASURES SELECTION 4-1
4.3 SUMMARY OF SELECTED CORRECTIVE MEASURES TECHNOLOGIES 4-2
5 CORRECTIVE MEASURES IMPLEMENTATION PLAN 5-1
5.1 PRE-REMEDIAL INVESTIGATION 5-1
5.1.1 Purpose 5-1
5.1.2 Methods 5-1
5.1.3 Soil Field Investigation Activities 5-3
5.1.3.1 Tanks and Tank Impoundment Areas (SWMUs 23-62) 5-4
5.1.3.2 Surface Impoundment (SWMU 13 -14) 5-5
5.1.3.3 Road Trench (SWMU 1) 5-5
5.1.3.4 Former API Separator Site (SWMU 4) 5-6
5.1.3.5 Primary API Separator (SWMU 5) 5-6
5.1.3.6 Utility API Separator (SWMU 6) 5-6
5.1.3.7 Vacuum Tank 1 (High Flash Tank) SWMU 7 5-6
5.1.3.8 Vacuum Tank 2 (Low Flash Tank) SWMU 8 5-6
5.1.3.9 Hydrocarbon Monitor Catch Basins (HMCB) SWMU 9 5-7
5.1.3.10 Excavated Soils Area SWMU 17 5-7
5.1.3.11 North Beach Recovery Well Holding Tank (SWMU 19) 5-8
5.1.4 Groundwater Field Investigation Activities 5-8
5.2 CORRECTIVE MEASURES 5-9
5.2.1 Applicable Cleanup Objectives 5-9
5.2.1.1 Corrective Measures Implementation 5-9
5.2.1.2 Corrective Measures to Address Petroleum Impact 5-10
6 CORRECTIVE MEASURES SUPPLEMENTAL PLANS 6-1
6.1 PERMITTING 6-1
6.2 STORMWATER POLLUTION PREVENTION PLAN 6-1

TABLE OF CONTENTS CONTINUED

6.3 SOIL MANAGEMENT PLAN 6-2
6.4 QUALITY ASSURANCE PROJECT PLAN 6-3
6.5 COMMUNITY AIR MONITORING PLAN 6-4
6.6 HEALTHY AND SAFETY PLAN 6-4

7 SUPPLEMENTAL REMEDIAL MEASURE UNDER NYSDEC MOSF 7-1

7.1 MOSF CLOSURE PLAN 7-1
7.2 ENGINEERING CONTROLS 7-1
7.3 INSTITUTIONAL CONTROLS 7-2
7.4 SITE MANAGEMENT PLAN 7-2

8 CORRECTIVE MEASURES DEVELOPMENT SCHEDULE 8-1

9 REFERENCES 9-1

LIST OF TABLES

Table 1 SWMU List
Table 2 SWMU Status Summary
Table 3 Soil Cleanup Objectives

LIST OF FIGURES

Figure 1 Site Location Map
Figure 2 Site Plan
Figure 3 SWMU/Areas of Remediation Location Map
Figure 4 Completed and Current ICM Locations and Hot Spot Areas
Figure 5 Proposed Soil Sample Location Map – Tanks and Tank Impoundment Areas (SWMUs 23-62)
Figure 6 Proposed Sample Location Map – Surface Impoundments (SWMUs 13 & 14)
Figure 7 Proposed Sample Location Map – Road Trench (SWMU 1)
Figure 8 Vacuum Tank 2 (SWMU 8)
Figure 9 Excavated Soil Area (SWMU 17)
Figure 10 Existing Monitoring Well Location Map

LIST OF APPENDICES

Appendix 1A Generic CAMP template established by the NYS Department of Health, DER-10

LIST OF ACRONYMS

ACO	Administrative Order on Consent
amsl	above mean sea level
AOC	Area of Concern
API	American Petroleum Institute
ASTs	Aboveground storage tanks
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, xylene
CAMP	Community Air Monitoring Plan
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COCs	Contaminants of Concern
CY	cubic yards
ELAP	Environmental Laboratory Approval Program
Facility	Port Mobil Terminal
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HDPE	High Density Polyethylene
HMCB	Hydrocarbon Monitor Catch Basins
ICM	Interim Corrective Measures
ISCO	in-situ chemical oxidation
LNAPL	Light Non-aqueous Phase Liquid
MNA	Monitored Natural Attenuation
MOSF	Major Oil Storage Facility
MSF	thousand square feet
MTBE	Methyl tert-butyl ether
NAPL	non-aqueous phase liquid
NOI	Notice of Intent
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
ORC	oxygen releasing compound
OWSs	oil/water separators
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyl
PDI	Pre-Design Investigation
PID	photo-ionization detector
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
SCOs	Soil Cleanup Objectives

LIST OF ACRONYMS CONTINUED

SIMD	Staten Marine Development
SMP	Site Management Plan
SOP	Standard Operating Procedures
SPDES	State Pollutant Discharge Elimination System
SVOCs	Semi-volatile organic compounds
SWMU	Solid Waste Management Units
SWPPP	Stormwater Pollution Prevention Plan
TWP	temporary well point
USEPA	U.S. Environmental Protection Agency
WTS	Water Treatment System
WW	Wastewater

1 INTRODUCTION

SIMD LLC proposes to complete all required obligations of the USEAP Administrative Consent Order (ACO) and updated *Corrective Measures Implementation (CMI) Workplan* (Louis Berger, July 7, 2017) for the former Port Mobil Terminal Facility (Facility) located at 4101 Arthur Kill Road, Staten Island, New York (see **Figure 1**). A Site Plan is provided as **Figure 2.** This Resource Conservation and Recovery Act (RCRA) CMI Workplan Addendum has been prepared to provide the framework to achieve the design, construction, operation, maintenance, and long-term monitoring required by the U.S. Environmental Protection Agency (USEPA)-approved CMI for the Facility. This CMI Workplan Addendum will be implemented across the entire Facility in a continuous remediation event that will achieve site-wide subsurface petroleum source removal and will result in permanent elimination of liquid petroleum storage at the site. This will result in a completed RCRA Corrective Measures program, elimination of potential human exposure pathways and attainment of cleanup objectives and will render the property protective of human health and the environment for the planned future industrial warehousing use.

1.1 LOCATION AND PHYSICAL SETTING

- The Facility is located at 4104 Arthur Kill Road in Staten Island, NY (**Figure 1**). The 200-acre property has elevations that vary from approximately 60 feet above mean sea level (amsl) to the east, to less than 10 feet to the west.
- The northwestern property boundary is bounded by the Arthur Kill (see **Figure 1**). Waters within the Arthur Kill near the Facility have been designated SD class surface waters as defined in New York Codes, Rules and Regulations (NYCRR), Title 6, Chapter X, subpart 701.14. This designation refers to saline surface water conditions with a restricted use. As subpart 701.14 states " "water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for fish propagation."

1.2 GEOLOGIC SETTING

- The Facility is underlain by heterogeneous fill and natural deposits of sand, silt, and clay, with some gravel, as reported in the RCRA Facility Assessment (RFA, July 1993). These deposits contain a water table aquifer that is recharged directly by precipitation.
- The natural surface soils in this area are typically Upper Pleistocene ground moraine deposits (glacial deposits). The deposits are primarily reddish-brown clayey till derived mostly from Upper Triassic and Lower Jurassic shale and sandstone. The ground moraine contains localized areas of stratified sand and gravel.
- Depth to groundwater beneath the developed portion of the property varies from one to 29 feet below grade and groundwater generally flows to the northwest, toward the Arthur Kill, generally mimicking the surface topography.
- The RFA Report determined that there are no known potable water wells on Staten Island. The nearest potable source is reportedly a surface water body located approximately ten

miles northwest of the Facility. The RFA also reported that the aquifer under the Facility is influenced by tidal fluctuations, which could result in saline groundwater quality not fit for human consumption. Previous sampling of selected wells at the facility indicated that salinity levels are above the New York State Drinking Water Standards. These site hydrogeologic conditions indicate that human exposure via contact with potable water is not likely. Therefore, potential environmental receptors from potential on-site releases would include the Arthur Kill.

1.3 SITE HISTORY AND USAGE

- The Facility has been a waterfront petroleum terminal since 1934 and is in a predominantly industrial and commercial port area.
- The Facility is a petroleum bulk storage terminal designed for the distribution of gasoline and distillate fuels. The nominal storage capacity at the Facility is 125 million gallons with an annual throughput of approximately 1.4 billion gallons. The Facility encompasses approximately 200 acres with 120 acres utilized for Facility operations. The surrounding land use is characterized as industrial. The property was sold to Kinder Morgan on July 9, 2005.
- Operations at the Facility have included above ground tank petroleum storage, storm water management and treatment, and petroleum transfer activities. Additionally, the Facility has an above ground piping network to transfer petroleum products throughout its operational areas.
- Facility industrial features relevant to the USEPA ACO include 38 aboveground storage tanks, two large storm water impoundments, oil/water separators and other ancillary operational and site support infrastructure of interest as listed below (62 Solid Waste Management Units [SWMU] and 1 Area of Concern [AOC]):

  SWMUs:

  1 Road Trench
  2 Wastewater (WW) Transfer Lines
  3 Tank Farm Catch Basins
  4 Former American Petroleum Institute (API) Separator Site
  5 Primary API Separator
  6 Utility API Separator
  7 Vacuum Tank 1 (High Flash Tank)
  8 Vacuum Tank 2 (Low Flash Tank)
  9 Hydrocarbon Monitor Catch Basins (HMCB)
  10 Waste Storage T41
  11 Waste Storage T48
  12 Petroleum Tank 60 (T60)
  13 Upper Holding Pond (aka Upper Surface Impoundment)
  14 Lower Holding Pond (aka Lower Surface Impoundment)
  15 Dravo Water Treatment System (WTS)
  16 Container Storage Pad
  17 Excavated Soils Area

18 North Beach Recovery Wells
19 North Beach Recovery Well Holding Tank
20 Southern Groundwater Plume Recovery Well
21 Boiler House Recovery Well
22 Tank 41 (T41) Dike
23-62 Tank Farm Dikes

AOC A Polychlorinated biphenyl (PCB) Transformer Sites

1.4 SUMMARY OF SWMUS AND REMEDIATION AREAS

A description of the SWMUs identified historically on the site are summarized below. The locations of the SWMUs and Remediation Areas are depicted on **Figure 3.** A list of the SWMUs is included in **Table 1** and a status summary is provided as **Table 2.** The SWMUs which require further investigation are discussed in Section 5.

SWMU 1 – Road Trench

- The Road Trench runs along the west side of the main facility road in the western portion of the facility. It consists of reinforced concrete trench and associated conduit (unknown construction) between the tank farm and Arthur Kill. It is approximately 4 feet wide by 5 feet deep by 2,300 feet long, split into 2 sections. It consists of 6 sump/pumping stations. The Road Trench historically received separated WW from the oil/water separators (OWSs) (SWMUs 5 & 6) and pumpable sludge from the Dravo WTS (SWMU 15) via WW transfer lines (SWMU 2). The Road Trench also historically received leachate from tank dikes before installation of the claymax liners at the dikes in 1990/1991.
- Formerly, the road trench received both stormwater runoff and water which had been discharged from the OWS. As of 1993, all piping from the OWS is connected directly to the WTS. Since this change, the only material collected in the Road Trench is precipitation which falls on the bulkhead and tank farm areas.

SWMU 2 - Wastewater Transfer Lines

- The WW transfer lines are located primarily aboveground in the dock area and throughout the WW treatment areas. The WW transfer lines consist of wrapped concrete piping with flanges and steel transfer piping. The lines transfer barge cleaning water to T48 and T60 (SWMU 11 & 12) as well as OWSs (SWMUs 5 & 6), water from vacuum truck unloading pad to T48, and WW from T48 and T60 to holding ponds (SWMUs 13 & 14).
- The RFA recommended no further action.

SWMU 3 – Tank Farm Catch Basins

- In-ground concrete basins approx. 6 feet x 10 feet x 10 feet deep installed prior to installation of impermeable liners in 1990/1991. Receive tank bottom water which is pumped to vacuum truck and then discharged to T48 (SWMU 11). Prior to installation of the catch basins, discharge of tank bottom water was to the inside earthen dike area.
- RFA recommended no further action.

SWMU 4 – Former API Separator Site

- The former API Separator was located adjacent to and partially covered by the container storage pad (SWMU 16) on the western portion of facility. The API Separator was located aboveground, constructed of concrete, and contained no lining. It was estimated to be 12 feet x 80 feet and was demolished in the late 1970s.

SWMU 5 – Primary API Separator

- The Primary API Separator was installed in 1975 and an impervious lining was installed in 1990. It is located west of the lower holding pond (SWMU 13) and south of Dravo WTS (SWMU 15). The Primary API Separator is aboveground and constructed of reinforced concrete with an impervious lining. It is 10 feet by 65 feet by 4.5 feet deep located on a concrete pad with 6-inch curbs. The pad drains to the Road Trench (SWMU 1). It used to separate hot water rinse collected through Vacuum Tank 1 (SWMU 7) from barge cleaning, and WW discharged from T48 (SWMU 11). It separated WW discharged to the Road Trench to the lower holding pond (SWMUs 13). It separated oil discharged via WW transfer lines (SWMU 2) to Waste Storage T41 (SWMU10) and T48 (SWMU11). It was emptied and cleaned every 2 years. The sludge from the separator is contained in 55-gallon drums and stored at SWMU16. It is non-hazardous. In 1993, all piping from the separator was connected directly to the WTS instead of the Road Trench (SWMU 1).

SWMU 6 – Utility API Separator

- The Utility API Separator was installed in 1975 and an impervious lining was installed in 1990. The API Separator is located west of the lower holding pond (SWMU 13) and south of Dravo WTS (SWMU 15). It is aboveground, constructed of reinforced concrete with an impervious lining. It is 12 feet by 70 feet by 4.5 feet deep located on a concrete pad with 6 inch curbs. The pad drains to the Road Trench (SWMU 1). It used to separate hot water rinse collected through Vacuum Tank 1 (SWMU 7) from barge cleaning, and WW discharged from T48 (SWMU 11). It separated WW discharged to Road Trench to holding ponds (SWMUs 13 &14). It also separated oil discharged via WW transfer lines (SWMU 2) to Waste Storage T41 (SWMU10) and T48 (SWMU11). It was emptied and cleaned every 2 years. The sludge from cleaning is contained in 55-gallon drums and stored at SWMU16. The sludge from the cleanout is non-hazardous.
- In 1993, all piping from this separator connected directly to the WTS instead of the Road Trench (SWMU 1).

SWMU 7 – Vacuum Tank 1 (High Flash Tank)

- The vacuum tank 1 was installed in 1986, replacing a steel riveted box tank. It is located south of the Dravo WTS (SWMU 15) in the western portion of facility. It is a cylindrical steel tank, 8 ft 6 in diameter, 12 ft high and mounted on a 4 ft tall steel base within a concrete containment dike with 4 ft tall walls and a sump. It receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling. Steam is pumped through the tank with condensation released to the sump below. The water in the containment is pumped back into the tank.

SWMU 8 – Vacuum Tank 2 (Low Flash Tank)

- Vacuum Tank 2 was installed in 1976. It is located south of Vacuum Tank 1 (SWMU 7) and the Dravo WTS (SWMU15) in the western portion of the facility. It is a cylindrical steel tank, 7 ft diameter, 15 ft long, and cradle-mounted horizontally on 4 ft concrete pilings within a concrete containment dike with 2 ft tall walls and a sump. It receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling.

SWMU 9 – Hydrocarbon Monitor Catch Basins (HMCB)

- The Hydrocarbon Monitor Catch Basins were installed in 1981. They are located adjacent to the holding pond inlets. They consist of 2 in ground concrete tanks 20 ft by 20 ft by 10 ft deep. They receive WW from the Tank Farm Dikes (SWMUs 23 through 62) via the Tank Farm Drainage System. If hydrocarbons are detected, the feed to the pond is stopped. WW from the basins is then pumped to the waste storage tank for off-site disposal.

SWMU 10 – Waste Storage T41

- Waste Storage T41 was installed in 1937. It was a steel aboveground storage tank (AST), 45 ft diameter by 25 ft with a capacity of 4,212,600 gallons. This tank is used for storage and separation (by gravity) of waste petroleum product and water. Water from bottom was sent to the lower holding pond (SWMU 13). Oil on top was shipped off-site. The unit was taken out of service in 1989. The unit was planned to be used in lieu of the holding ponds for storage of characteristic wastes and was fitted with a double bottom. It contains an earthen dike.

SWMU 11 – Waste Storage T48

- Waste Storage T48 was installed in 1943. It was a steel AST, 100 ft diameter by 35 ft with a capacity of 2,058,000 gallons. The sidewalls (to 6 ft) and bottom of the tank were covered with an epoxy. It was used for collection and storage of WW contaminated with petroleum product. It received the following:
    - Drippage from Drip Pans and tank bottom water from the catch basins (SWMU 3) collected by vacuum truck, transported to T48, and unloaded at the vacuum truck unloading pad.
    - Petroleum product and petroleum product /water mixtures from barge cleaning pumped through the WW transfer lines (SWMU 2).
    - Oil layer from separators (SWMUs 5 & 6).
    - The water from the bottom was released through the WW transfer lines (SWMU 2) to separators (SWMUs 5 & 6). The oil on top was shipped off-site twice a year. The unit was planned to be used in lieu of the holding ponds for storage of characteristic wastes prior to treatment.
- The RFA recommended no further action.

SWMU 12 – T60

- T60 was installed in 1950. It is a steel AST, 60 ft diameter by 48 ft with a capacity of 1,012,200 gallons. The sidewalls (to 6 ft) and bottom of the tank were covered with epoxy. The unit was originally used for the collection and storage of WW and waste oil. The unit received WW and slop oil from the barge cleaning and deballast lines. Water from the bottom was released directly to the lower holding pond (SWMU 13) and to T48 (SWMU 11) through WW transfer lines (SWMU 2). The oil on top was shipped off-site two times per year. The unit planned to be used in lieu of the holding ponds for storage of characteristic wastes prior to treatment (based on draft State Pollutant Discharge Elimination System [SPDES] permit).
- The RFA recommended no further action.

SWMU 13 – Lower Holding Pond (aka Lower Surface Impoundment)

- The Lower Holding Pond is located northwest of the tanks and southeast of Dravo WTS (SWMU15). It is a RCRA-regulated lined surface impoundment for the collection of storm water and WW prior to treatment in the Dravo WTS (SWMU 15). It has a capacity of 1,305,000 gal and is 13,125 sf. The Lower Holding Pond originally had a soil base, a High Density Polyethylene (HDPE) liner was installed in 1981. At that time, 1 to 5 ft of soil was removed to add capacity to pond. In 1981, the Hydrocarbon Monitor Catch Basins (SWMU 9), settling basin (as part of the unit and made of concrete, 15 ft x 15 ft x 11 ft deep with sloped bottom), and energy dissipation chamber were installed. The WW from the Road Trench (SWMU 1) first goes through the settling basin. The energy dissipation chamber is at the effluent of the pond to keep flow even to the Dravo WTS (SWMU 15). The energy dissipation is concrete 15 ft by 18 ft by 11.5 ft deep with a removable baffle. The WW is pumped to the WTS on an as needed basis. If near capacity, WW can be diverted to the upper holding pond (SWMU 14) via WW transfer lines (SWMU 2). This holding pond received contaminated water from North Beach Recovery wells (SWMU 18), WW from barge cleaning, stormwater from the Tank Farm Drainage System (SWMU 12) and Road Trench (SWMU 1), T60 bottom water (SWMU 12), and effluent from the upper holding pond (SWMU 14). Emergency bypass to Outfall 002 was previously permitted under a NYSDEC SPDES permit.

SWMU 14 – Upper Holding Pond (aka Surface Impoundment)

- The Upper Holding Pond is located northwest of the tank farm. It is a RCRA-regulated lined surface impoundment for the collection of stormwater and WW prior to release to the lower holding pond (SWMU 13) and treatment in the Dravo WTS (SWMU 15). It has a capacity of 1,750,000 gallons and 10,000 sf. Its location was formerly part of T41 Dike (SWMU 22). The Upper Holding Pond was installed in 1981, the original soil bottom was excavated and replaced with clean, compacted soil and HDPE liner. The Upper Holding Pond receives WW from T41 & T48 (SWMU 10 & 11), stormwater from Tank Farm Drainage System (SWMU 12), the Road Trench (SWMU 1) and effluent discharged to the lower pond (SWMU 13) on an as needed basis.

SWMU 15 – Dravo Water Treatment Systems (WTS)

- The Dravo WTS is made up of 2 Dravo resin bed filters and a sludge reclamation tank located in a concrete block building with concrete floor. Four inch concrete curbing is located at all entrances to the building. Floor drains are located in the WTS that lead to the Road Trench (SWMU 1). WW from the lower holding pond (SWMU 13) goes through the 2 filters (2 cylindrical tanks 15 ft tall and 13 ft diameter) then discharge to a permitted outfall. The filters are backwashed periodically, and the backwash waste is discharged to a sludge reclamation tank (cylindrical tank 10-12 ft diameter and 21 ft high with a capacity of 23,000 gallons). Supernatant is discharged to an outfall and sludge was historically pumped to the Road Trench (SWMU 1) and lower holding pond (SWMU 13) via WW Transfer Lines (SWMU 2). Non-pumpables were removed by vacuum truck for off-site disposal. Discharge to the Arthur Kill is monitored for oil and grease. The treatment plant has received water and tank bottoms from other sites.
- It should be noted, the road trench (SWMU 1) formerly received both stormwater runoff and water which had been discharged from the OWS. As of 1993, all piping from the OWS is connected directly to the WTS. Since this change, the only material collected in the Road Trench is precipitation which falls on the bulkhead and tank farm areas.
- RFA recommended no further action.

SWMU 16 – Container Storage Pad

- The Container Storage Pad is a 6-inch thick concrete pad. The pad is uncovered and measures 25 ft by 25 ft. It slopes to a concrete secondary containment surrounding the separators (SWMU 5 and 6).

SWMU 17 – Excavated Soils Area

- The excavated soils area is located on the southeast side of the facility across the road from T52 and T55. It consists of an area of about 200 ft by 300 ft. The Excavated Soils Area is an area of storage and disposal of fill removed from excavations across the facility (e.g. dirt piles located along the hill on east side of facility from tank dike upgrade in 1990 and 1991), sand from sandblasting, broken-up asphalt and general construction debris.

SWMU 18 – North Beach Recovery Wells

- The North Beach Recovery Wells are two groundwater recovery wells (LRW-1 and LRW-2) installed to remediate the North Beach groundwater plume in 1980. LRW-1 was only used for short time. LRW-2 was active until 1991 when it collapsed.
- As of March 4, 1991, approximately 991,357 gallons of product were recovered.
- RFA recommended no further action.

SWMU 19 – North Beach Recovery Well Holding Tank

- The North Beach Recovery Well Holding Tank was installed in 1980. It is a steel horizontal storage tank with no secondary containment and a capacity of 550 gallons. The product was transported to T48 (SWMU 11) by vacuum truck. The North Beach Recovery Well Holding Tank has been inactive since 1991.

SWMU 20 – Southern Groundwater Plume

- The Southern Groundwater Plume is located at the southwest end of the facility near the terminal office and warehouse. The plume was found in 1981. Speculation that the source was the tank farm area drainage conduit associated with the Road Trench (SWMU 1), which is believed to have been partially submerged.
- In August 1999, a soil and groundwater investigation was conducted in the Former Southern Recovery Area.
- No significant concentrations were detected and no further remediation was warranted.

SWMU 21 – Boiler House Recovery Well

- The Boiler House Recovery Well, NRW-2, was installed in 1982 on east side of Boiler House. Gasoline had been observed in some of the borings in the area in late 1981. The source of the gasoline is undetermined.
- RFA recommended no further action.

SWMU 22 – T41 Dike

- The T41 Dike was operational in 1937. It is located on the northwest portion of the facility. It was originally constructed as secondary containment for T41. In 1981, this Dike area was modified and expanded to accommodate the construction of the upper surface impoundment (SWMU 14). This is now a combined containment area that also serves as overflow for the Impoundments. Liquid collected in this dike is storm water and it's discharged to the Road Trench (SWMU 1). At the time of the RFA, upgrade was planned.

SWMUs 23–62 – Tank Farm Dikes

- The Tank Farm Dikes are earthen berms surrounding product storage tanks. Since the 1990/1991 upgrade, the Tank Farm Drainage System, Tank Farm Catch Basins (SWMU 3) and impermeable liners have been operational. Soil excavated from the units during installation of the liners was placed in the Excavated Soils Area (SWMU 17).

In addition to the SWMUs described above, seven Remediation Areas have also been identified for the Facility. Remediation Areas are area-specific and are established for the purposes of investigation and remediation. A description of the Remediation Areas identified at the Facility is provided below:

Remediation Area 1 (Tank 41 Berm Area)

- Remediation in this area was completed in 1999-2000 to risk-based standards. However, as a result of the change in Soil Cleanup Objectives (SCOs), former excavation endpoint samples exceed the SCOs for B(a)P.
- Additionally, during Pre-Design Investigation (PDI) conducted by Louis Berger in 2016 to delineate Polycyclic aromatic hydrocarbons (PAH) soil impacts, Light Non-aqueous Phase Liquid (LNAPL) was observed.
- An area encompassing approximately 9,300 square feet was identified to contain product in either the liner, soils beneath the liner, or both.

Remediation Area 2 (Tank 50)

- In 2016, PDI was completed with the goal of identifying the source of dissolved-phase Benzene, Toluene, Ethylbenzene, Xylene (BTEX) concentrations being detected at monitoring well KM-GP-13, located adjacent to Tank 50's berm wall.
- Two areas of previously unknown LNAPL were identified within and extending beneath the confines of Tank 50 northern berm.
- Petroleum fingerprinting identified LNAPL to be a mixture of weathered gasoline and #2/diesel fuel oil.
- Total volume of approximately 350 gallons of LNAPL was calculated to be present.

Remediation Area 3 (North Beach/MW-100 Area)

- Between 2016 and 2017, PDI was completed with the goal of delineating and quantifying MW-100 LNAPL area.
- Four separate LNAPL areas were identified ranging in location from monitoring well MW-100 (upgradient) to Tank 10 diked areas.
- Petroleum fingerprinting identified LNAPL to be a mixture of weathered gasoline and #2/diesel fuel oil.
- Total volume of approximately 950 gallons of LNAPL was calculated to be present in the four areas.

Remediation Area 4 (LNAPL in Bulkhead Recovery Area)

- The remediation driver for Area 4 is the occasional presence of residual LNAPL within monitoring wells TMP-1, LC-1 and LC-2. The Corrective Measures Study (CMS) selected continued manual LNAPL removal activities (i.e., absorbent socks, bailer, etc.), as needed, until LNAPL is no longer recoverable.
- Inspection of all monitoring wells in Area 4, including TMP-1 through TMP-3, LC-1, LC-2, and RW-1 through RW-3 occurs on a monthly basis. During each visit, depth-to-product (DTP, if present) and depth-to-water (DTW) readings are collected. If LNAPL is present, absorbent socks are installed and replaced on an as-needed basis. Upon replacement of the absorbent socks, a percent saturation will be estimated to track LNAPL recovery efforts.

Remediation Area 5 (Boiler House Area)

- Between 2015 and 2016, PDI was completed to delineate the LNAPL identified during the in-situ chemical oxidation (ISCO) pilot study activities and source of dissolved-phase BTEX in monitoring well MW-113.
- Two areas of LNAPL were identified:
    - Northwest of the Boiler House – 11 gallons calculated; identified as #4 fuel oil
    - Northeast of the Boiler House– 65 gallons calculated; identified as #2 fuel oil

Remediation Area 6 (Former Lube Tanks Area)

- Between 2015 and 2016, PDI was completed to delineate the LNAPL identified during the ISCO pilot study activities and source of dissolved-phase BTEX in monitoring well KM-GP05.

- A LNAPL area of approximately 6,205 sf was identified upgradient (east) of the former Lube Tanks.
- Petroleum fingerprinting identified LNAPL to be a mixture of kerosene and gasoline.

Remediation Area 7 (Siphon Building/OWS Area)

- In 2016, PDI was completed to delineate PAH impacts identified at boring location GPAP-2 and LNAPL identified at monitoring well RFI-9 and soil endpoint sampling of a former oil/water separator located adjacent to the siphon building.
- PAH impacts were identified to be surficial and localized around former boring GPAP-2.
- Petroleum fingerprinting identified LNAPL to be a weathered #2 fuel oil.
- A LNAPL area of approximately 3,550 sf was identified.

Northern Bulkhead / ICM-1 Area

- Currently, any minor thickness of product detected from ICM-1 is manually removed using absorbent socks during ICM O&M visits.
- In 2007, Kinder Morgan Terminals reported a release of approximately 372 barrels of #2 heating oil in the northern bulkhead area in the vicinity of ICM-1. The spill originated from an open underground vacuum line. The release was reported to encompass an area of approximately 800 square feet. Emergency response activities by Kinder Morgan included product recovery from the trench, holding pond, and the removal of impacted soil and gravel.
- Approximately 367 barrels of product were recovered; nearly 2 feet of product was reported in ICM-1 shortly after the release.
- 12 temporary wells were installed around the area of ICM-1 and the other areas of associated release. No measurable product (other than an occasional sheen) was reported in any of the wells. Follow-up gauging on May 29, 2007 confirmed no measurable product in these wells. All temporary wells were removed on May 29, 2007.
- Persistent product thickness in excess of 2 feet was measured in ICM-1 in July and August 2007. On August 29, 2007, a product removal and recovery test was performed at ICM-1 for Exxon Mobil to evaluate the persistence of the increased product levels in this well and the potential need for an automated recovery system. Subsequent site visits in September and October 2007 to gauge and manually recover product from ICM-1 resulted in the removal of approximately 5 gallons of product and the reduction of product thickness to 0.03 feet or less.
- On November 1, 2007, the Spill Buster system previously located at RFI-7 and MW-1 02 was installed at ICM-1. The system was later removed in April 2008 for explosion proof modifications but has not been redeployed due to the presence of only sheens to recoverable thicknesses of product (<0. 1-feet thick) subsequently observed in MW-1 02, RFI-7, and ICM-1.

Interim Corrective Measures (ICM)

- ICM were implemented with the installation of monitoring wells in locations where LNAPL was detected, mostly in the 1990's.

- LNAPL recovery systems were installed at the Facility to address persistent detections of LNAPL in wells identified during ICMI and SV/RFI investigations and/or during on-site monitoring for the Major Oil Storage Facility (MOSF) permit or Monitored Natural Attenuation (MNA) programs.
- Regularly scheduled monthly ICM system O&M activities for the existing LNAPL recovery systems have continued at the Facility since submittal of the revised CMS Workplan in June 2010. The ICM O&M activities conducted during this time have been reported on a quarterly basis as required by the Order. A summary of the ICM O&M activities for existing LNAPL recovery systems conducted since submittal of the revised CMS Workplan is presented in the following sections.
- The location of each ICM system is shown on **Figure 4,** however these systems have all been removed and only the occasional presence of a very thin layer of product is found in only ICM-1 out of all the ICM wells.

AOC A PCB Transformer Sites

The PCB transformer sites were located along the main facility road, north of the north beach area. Six former PCB transformer locations existed. The transformers were removed and shipped off-site for disposal in 1982. The RFA recommended confirmatory soil sampling for semi-volatile organic compounds (SVOCs) and PCBs.

2 LAND DEVELOPMENT PLAN

The proposed development plan will reclaim, redevelop and revitalize the property for new industrial warehousing use. The property will not be accessible to consumers or the general public. There will be a highly secured access to the property and additional secured entry to buildings. These controls will prevent site access to the general public and will eliminate potential exposure risks associated with comparable residential and commercial properties. The project would be one of the largest active redevelopment projects in New York City.

2.1 OVERVIEW OF LAND DEVELOPMENT PLAN

- Land development under the proposed plan will include:
  - Construction of 3 new buildings to establish a total of approximately 2.5 thousand square feet (MSF) of new building space.
    - The site development footprint and general arrangement of the 3 buildings, roads, and trailer and car parking lots are designed to be at an approximate elevation of 40 feet (NAVD 88).
    - As part of the green remediation plan and to achieve sustainability goals, the beneficial reuse of onsite soil material for site final grading is planned. All materials proposed for beneficial reuse on site will be managed in compliance with a Soil Beneficial Reuse Plan to be prepared for implementation as part of this CMI Workplan Addendum. (Section 6.3).
    - Site development will include a composite cover system that is included in the MOSF Closure Plan and will be implemented under the authority of New York State Department of Environmental Conservation (NYSDEC). The composite cover system will include the following low-permeability engineered surfaces:
      - Buildings and building slabs;
      - Concrete truck aprons;
      - Asphalt parking areas for truck trailers and cars; and,
      - Water quality basins constructed with impermeable liner systems.
    - The typical building design consists of the following elements, from bottom up:
      - A building pad constructed of suitable fill obtained from the site layered and compacted to designed elevations;
      - Soil vapor intrusion control system. The soil vapor intrusion control system is included in the MOSF Closure Plan and will be implemented under the authority of NYSDEC;
      - Approximately 12" of engineered sub grade fill material; and,
      - Approximately 8" of Portland cement concrete floor.

2.2 SITE PREPARATION

The Facility-wide plan for Corrective Measures and site preparation for project development consists of three parts:

- Completion of existing approved Corrective Measures identified in the USEPA-approved CMI Workplan, including all remaining Corrective Measures in seven Remedial Areas and continued performance of USEPA-approved ICM and MNA monitoring programs;
- Facility-wide Corrective Measures to be implemented under the authority of USEPA according to this CMI Workplan Addendum. This Workplan includes remediation of:
    - Tank areas and associated piping systems;
    - Surface impoundment systems;
    - All remaining solid waste management units requiring Corrective Measures that have not received a sign-off from USEPA.
- Facility-wide remedial measures to be implemented under the authority of NYSDEC according to a MOSF Closure Plan. This Plan includes:
    - Decommissioning and removal of tanks and associated piping and relinquishment of the Facility license;
    - Performance of necessary remedial actions associated with the development of industrial warehousing on the property to eliminate potential exposure pathways and protect future users of the property, including engineering controls consisting of a composite cover system and soil vapor intrusion control system.
    - Establishment of a Site Management Plan to allow for long-term site monitoring and maintenance, and site inspection and certification of engineering and institutional controls. The Site Management Plan will be administered by NYSDEC under a Site Management Consent Order.
    - Establishment of an Environmental Easement granted to NYSDEC to prevent groundwater withdrawal for potable supply, to prohibit future land uses other than industrial use and to require compliance with the Site Management Plan.

2.3 PROJECT BENEFITS

- Environmental benefits of the project include:
    - Permanent petroleum source removal and protection of human health and the environment from past contaminant releases to achieve goals established in the USEPA ACO and elimination of potential releases in the future
    - Complete Corrective Measures within two years
    - Permanent elimination of commercial mass-storage of petroleum and liquid wastes and associated risk to human health and the environment.
    - Permanent cover of the original terminal footprint with a composite cover system and placement of a soil vapor intrusion control system under the building slabs to eliminate potential exposure pathways for direct contact with residual subsurface materials at the site
    - Minimize infiltration and groundwater recharge within the property

  - Raise land elevation of industrial property above FEMA flood elevations to prevent potential for future flooding from storm events and sea level rise
  - Provide an opportunity for public access to the waterfront
  - Provide an opportunity to include solar renewable energy on 2.5 MSF of building rooftop space
  - Provide an opportunity to establish ferry access to provide maritime commuting options to lower fuel consumption and associated greenhouse gas emissions
- Economic benefits of the project include:
  - Create over 2,500 permanent new jobs for Staten Island and surrounding residents
  - Generate new tax revenue for local, state and federal government

3 REMEDIAL GOALS OF CMI WORKPLAN ADDENDUM

- This CMI Workplan Addendum will be implemented in parallel with other ongoing Corrective Measures and proposed closure and remedial activities at the Facility to render the property protective of human health and the environment for the proposed industrial warehousing use.
- Ongoing Corrective Measures include:
  - Continuation and completion of ongoing Corrective Measures at seven Remediation Areas established in the USEPA-approved CMI and CMI Addenda;
  - Continuation and completion of ongoing USEPA approved MNA and ICM.
- Proposed closure and remedial activities include:
  - Implementation of a proposed MOSF Closure Plan to be administered under the authority of NYSDEC.
- The goals of this proposed CMI Workplan Addendum are:
  - Fulfill the Corrective Measures requirements established in the USEPA ACO and the CMI;
  - Implement this CMI Workplan Addendum, in parallel with other ongoing Corrective Measures and proposed closure and remedial activities listed above, to achieve a high-quality remediation that renders the property protective of public health and the environment for its proposed industrial warehousing use;
  - Utilize only remedial technologies that have been subjected to Corrective Measure alternative analysis and Corrective Measure selection in the USEPA-approved CMI and CMI Addenda and that have been determined by USEPA to be appropriate for use at the Facility;
  - Utilize and address all existing environmental data and obtain additional environmental data required to define the scope and extent of Corrective Measures;
  - Recognize that historical industrial operations at SWMU's have resulted in limited access to many areas of the Facility for environmental data collection and develop a Corrective Measure strategy that couples decommissioning and removal of these SMU's with (1) environmental data collection and field screening for delineation of potential petroleum Areas of Concern; and (2) prompt application of field-determined Corrective Measure responses that are field-actuated using pre-defined Corrective Measure technologies, methods and approaches established in this CMI Workplan Addendum;
  - Document the performance of Corrective Measures construction activities to demonstrate that the work has been completed as designed and achieves the Corrective Measure remedial goals of the CMI. To supplement the quality control and documentation function provided for all remedial activities under this CMI Workplan Addendum, qualified environmental professionals will direct all field activities;

  - Report the findings of Corrective Measures construction activities to USEPA to demonstrate that the property is protective of human health and the environment for the proposed industrial warehousing use; and,
  - Greatly accelerate the rate of Corrective Measures implementation at the Facility compared to past remedial activity and complete site wide remedial construction within 2 years.
- In addition to this CMI Workplan Addendum, a MOSF Closure Plan will be administered under the authority of NYSDEC Division of Environmental Remediation. The goals of that plan are:
  - Achieve compliance with New York State MOSF closure laws and regulations;
  - Decommission and remove tanks and associated piping;
  - Relinquish the MOSF license for the Facility;
  - Provide for certain engineering controls that render the property protective during future industrial warehousing usage, including construction of a composite surface cover system to prevent direct exposure pathways to residual soils beneath the site and construction of a soil vapor intrusion control system to prevent direct exposure pathways to soil vapor originating beneath the site;
  - Establish a Site Management Plan to allow for long term site monitoring and maintenance, and site inspection and certification of engineering and institutional controls. The Site Management Plan will be administered under a Site Management Consent Order established with NYSDEC; and,
  - Establish an Environmental Easement with NYSDEC to prevent groundwater withdrawal for potable supply, to prohibit future land uses other than industrial use and to require compliance with the Site Management Plan.
- This proposed CMI Workplan Addendum, implemented in conjunction with other ongoing Corrective Measures and proposed closure and remedial activities, will support land development goals by:
  - Enabling real-time integration of approved SWMU decommissioning, demolition, investigation, field screening, petroleum delineation and Corrective Measures activities with development site preparation construction activities to support development goals and schedules.

4 CORRECTIVE MEASURES SELECTION

4.1 APPLICABILITY

- Corrective Measures selected in this CMI Workplan Addendum will apply to:
  - Remediation of tanks and piping;
  - Remediation of surface impoundments;
  - Remediation of all remaining SWMUs listed in the ACO unless otherwise approved by USEPA; and,
  - Remediation of utility lines and associated features
- Corrective Measures selected under this CMI Workplan Addendum will be performed on LNAPL and grossly contaminated media that are observed onsite during Pre-Remedial Investigations, Corrective Measures work and invasive construction activity.
- Grossly contaminated media is defined in NYSDEC Program Policy DER-10 Technical Guidance for Site Investigation and Remediation, May 2010 (DER-10) as "soil, sediment, surface water, or groundwater which contains sources or substantial quantities of mobile contamination in the form of non-aqueous phase liquid (NAPL) that is identified either visually, through strong odor, by elevated contaminant vapor levels or is otherwise readily detectable without laboratory analysis".
- Ongoing Corrective Measures required under the existing USEPA-approved CMI and CMI Addenda will be executed in their entirety and implemented conjunctively under the authority of those plans.
- Corrective Measures under this CMI Workplan Addendum will include all remaining remediation required by the ACO that is not already addressed under the existing approved CMI and CMI Addenda.
- Tank and associated piping decommissioning, closure and demolition and certain remedial elements associated with development, including engineering controls (composite cover system, soil vapor intrusion control system) and institutional controls (Environmental Easement with land and groundwater use restrictions and Site Management Plan including long-term environmental monitoring) will be completed as part of the MOSF Closure Plan under the authority of NYSDEC. That work will be performed on a parallel track to the CMI Corrective Measures activities detailed herein.

4.2 CORRECTIVE MEASURES SELECTION

- Corrective Measures technology and methods selected under this CMI Workplan Addendum will include only remedial technologies and methods that have already been approved by USEPA in the existing CMI and CMI Addenda for the Facility. These approved Corrective Measure technologies have been subjected to rigorous analysis to assure they are appropriate for use at this Facility and were also subjected to full public review and comment.

- Corrective Measures evaluations and alternatives analyses have been completed and approved by USEPA for the selected Corrective Measures technologies and have determined that these technologies are appropriate for site conditions.
    - The approved Corrective Measures technologies have been subjected to detailed site-specific analyses, including pilot studies.
    - The approved Corrective Measures technologies are commonly used in the land remediation industry and have demonstrated a successful track record on similar sites.
    - The approved Corrective Measures technologies have a demonstrated track record at this Facility.
- Document sources for approved Corrective Measures for this Facility include:
    - CMS, Woodard & Curran, June 2013
    - Corrective Measures Implementation Workplan (Updated), Louis Berger, July 2017
    - CMI Addenda for the six approved addenda included as appendices in the July 2017 CMI Workplan, as follows:
        - CMI Workplan Addendum – Area 1 (Tank 41 Berm Area), May 6, 2016
        - CMI Workplan Addendum – Area 2 (Tank 50), January 20, 2017
        - CMI Workplan Addendum – Area 3 (North Beach/MW-100 Area), April 28, 2017
        - CMI Workplan Addendum – Area 5 (Boiler House Area), June 29, 2016
        - CMI Workplan Addendum – Area 6 (Former Lube Tanks Area), March 31, 2016
        - CMI Workplan Addendum – Area 7 (Siphon Building/OWS Area), December 30, 2016
        - It should be noted that a CMI Workplan Addendum was not required for Area 4 because remediation utilizing a thermal enhanced product recovery system was largely completed and approved by USEPA.
        - The CMI Workplan (Updated) and addenda were approved by USPEA on October 16, 2017.

4.3 SUMMARY OF SELECTED CORRECTIVE MEASURES TECHNOLOGIES

- Several Corrective Measures technologies have been approved for use on the property under the USEPA-approved CMI and CMI Addenda. A summary of approved Corrective Measures technologies for this property from the approved CMI and CMI Addenda that are applicable to achieve the goals of this Plan include:
    - **Vadose Zone Soils**
        - Excavation and off-site disposal of grossly contaminated soil is an approved Corrective Measures remedial alternative for the Facility and is a selected Corrective Measures technology in this Plan due to its ability to achieve comprehensive and expedited petroleum source mass removal. Soil

excavation is traditionally an effective method for the treatment of petroleum impacted soils especially in the vadose zone.

- Soil excavation, transport and disposal and/or recycling offsite was selected to eliminate hot spot areas in the existing CMI and CMI Addenda.
- Soil excavation, transport and disposal and/or recycling under this CMI Workplan Addendum will be implemented using the same protocol established in the USEPA-approved CMI and CMI Addenda and will comply with all local, state and federal laws and regulations.

- **Groundwater and Saturated Soils**
  - Excavation and off-site disposal of grossly contaminated soil containing observable sorbed-phase product at the water table smear zone is an approved Corrective Measures remedial alternative for the Facility and is a selected Corrective Measures technology in this Plan due its ability to achieve comprehensive and expedited petroleum source mass removal Excavation and removal is commonly used in the remedial industry and is an effective method for addressing petroleum impacted soils.
  - LNAPL extraction and off-site disposal is an approved Corrective Measures remedial alternative for the Facility and is a selected Corrective Measures technology in this Plan due its ability to remove additional petroleum mass that may remain after excavation activities are complete.
  - ISCO is an approved Corrective Measures remedial alternative for the Facility and is a selected Corrective Measures technology in this Plan. Its application will augment soil excavation and LNAPL removal to enhance ongoing remediation after remedial construction activities are complete. ISCO has the ability to remediate sites in a faster timeframe compared to other in-situ remediation approaches. Application of ISCO is discussed in Section 5.
  - Bioremediation enhancement is an approved Corrective Measures remedial alternative for the Facility and is a selected Corrective Measures technology in this Plan. It will be implemented to augment soil excavation and removal, LNAPL removal and ISCO application in order to provide a longer-term remediation and attenuation of dissolved-phase groundwater impacts via biological degradation of petroleum contaminants.
  - MNA is an approved Corrective Measures remedial alternative for site groundwater and is a selected Corrective Measures technology in this Plan. MNA will be utilized in conjunction with the selected Corrective Measures technologies discussed above.

- Implementation of selected Corrective Measures technologies will be as follows:
  - **Soil Excavation and Disposal:** Removal of grossly contaminated soil from the vadose zone through the water table smear zone (a minimum of one-foot below encountered water table) will be conducted to achieve expedited petroleum source mass removal.
  - **LNAPL Removal and Disposal:** Removal of LNAPL will be conducted directly from remediation excavations via a combination of a mobile on-site oil/water

separator, vacuum operations and absorbent booms/pads. All encountered LNAPL with a continuous thickness greater than 0.1-inches in any excavation (including during investigation, remediation or construction), will be recovered, containerized and disposed in accordance with this Plan and will be in compliance with all applicable local, state and federal regulations.

- **In-Situ Chemical Oxidation:** After LNAPL removal, sodium persulfate ISCO will be applied to address residual source-zone impacts. The method for ISCO application is discussed in Section 5. Sodium persulfate was previously approved for use at the Facility by USEPA.
- **Bioremediation**: An engineered oxygen releasing compound (ORC, calcium or magnesium peroxide) will be used to promote in-situ bioremediation and will be applied after NAPL removal in conjunction with the application of sodium persulfate ISCO described above. The method for engineered oxygen releasing compound application is discussed in Section 5. Aerobic Bioremediation technologies are used to accelerate the degradation rate of petroleum hydrocarbons and some fuel oxygenates through natural biological processes.

- **Monitored Natural Attenuation:** Continued implementation of the approved MNA Program is proposed to monitor degradation of the residual dissolved-phase impacts over time and to monitor and evaluate the effectiveness of natural attenuation to achieve the remediation goals for the existing Contaminants of Concern (COCs). In conjunction with this CMI Workplan Addendum, all existing USEPA-approved MNA remedies will continue to be implemented.

In summary, multiple Corrective Measures technologies will be used in conjunction under this Plan to address LNAPL and grossly contaminated soil impact areas in a consistent manner to achieve the goals established in the ACO and the *CMI Workplan* (Louis Berger, July 7, 2017).

It is anticipated that after the completion of site-wide remediation, all MNA and other long-term environmental monitoring programs will be incorporated into a single Site Management Plan that would be implemented under a Site Management Consent Order with NYSDEC.

5 CORRECTIVE MEASURES IMPLEMENTATION PLAN

This CMI Workplan Addendum for the Facility has been developed pursuant to Section 3008(h), 42 U.S.C. 6928 (h) of the RCRA ACO issued by the USEPA to Kinder Morgan, the current owner, and ExxonMobil Corporation, the former owner, on September 10, 2009.

This section of the proposed CMI Workplan Addendum describes the method for management of LNAPL and grossly contaminated soil at the Facility. This section is divided into three subsections: Pre-Remedial Investigation, Corrective Measures, and Environmental Monitoring.

5.1 PRE-REMEDIAL INVESTIGATION

5.1.1 Purpose

- Pre-Remedial Investigation will be performed to evaluate the tanks and tank impoundment areas, surface impoundments, other SWMUs that have not yet received a signoff from EPA, and areas with soil to be relocated and reused within the property.
- Pre-Remedial Investigation will be performed in compliance with DER-10 and will be conducted to evaluate the nature and extent of petroleum occurrence, including areas of the Facility where site operations prevented prior remedial investigation.
- Pre-Remedial Investigation data and information will be used to define the Corrective Measures to be employed and the areal and vertical extent of Corrective Measures activities.
- Corrective Measures technologies to be employed include direct excavation and off-site disposal of solid phase (soil) and LNAPL petroleum impacted areas, in-situ treatment of petroleum residuals in soil and groundwater with ISCO and ORC, and monitored natural attenuation of groundwater. The Pre-Remedial Investigation will be performed in tank and tank impoundment areas, surface impoundments, other SWMUs as defined by the ACO, and in areas with soil to be relocated and reused within the property to: (1) delineate the areal extent of LNAPL and grossly contaminated soil that may require removal for offsite disposal; (2) delineate the areas of residual petroleum-impacts to be treated with ISCO and bioremediation; (3) to demonstrate compliance with New York State storage tank closure regulations.
- Pre-Remedial Investigations are designed to support direct field implementation of Corrective Measures by a qualified environmental professional according to the approved procedures established in this Plan.

5.1.2 Methods

- 38 tanks and tank impoundments, two surface impoundments and other SWMUs in accordance with the ACO, *Section VI Performance Goals, Required Activity and Work to be Performed*, and soil to be relocated and reused within the property (collectively, Target CM Areas) will be investigated. These investigations will be performed in accordance with

NYSDEC Program Policy DER-10 Technical Guidance for Site Investigation and Remediation (DER-10; May 2010).

- Pre-Remedial Investigation will include performance of soil borings/test pits and collection of soil samples for chemical analysis, and installation of temporary groundwater monitor wells and collection of groundwater samples for chemical analysis.
- The proposed locations for soil borings/test pits, soil samples and groundwater monitor wells are shown in **Figures 5** through **9.**
- Chemical analyses for soil samples and groundwater samples will be compared to USEPA-approved SCOs and groundwater quality standards for the Facility as described in this Plan.
- Each Target CM Area will be investigated using conventional soil boring and test pit technology to evaluate the nature and extent of petroleum occurrence. Where feasible, test pits will be utilized to enable visual evaluation of conditions over a larger area compared to soil borings and to expose the entire soil profile for observation. Soil borings will used in areas where test pits are not feasible or preferred.
- All soil borings/test pits, soil samples and groundwater monitor wells will be located using a handheld global positioning survey (GPS) device to record the coordinates of all investigation locations.
- Where tanks or other Facility structures are present in Target CM Areas, Pre-Remedial Investigation will be performed after removal of tanks or other Facility structures to enable unimpeded equipment access and optimize sample collection and environmental evaluation. Areas without structural impedance may be sampled earlier in the Pre-Remedial Investigation field program pending other constraints to site access.
- Soil and groundwater samples will be collected for chemical analysis as discussed later in this Section and are intended to enable comparison to applicable SCOs and groundwater standards established in the EPA-approved CMI.
- A modification to the USEPA-approved Quality Assurance Project Plan (QAPP) for this Facility will be prepared for approval under this CMI Workplan Addendum. The QAPP is discussed in Section 6.4.
- The location of soil borings/test pits, soil samples and groundwater monitor wells may be modified based on field observations to improve identification of subsurface petroleum impacts. Additional soil borings/test pits may be performed as determined in the field.
- In addition to the initial soil boring/test pit program, additional delineation soil borings/test pits will be performed if LNAPL or grossly contaminated soil is observed during site characterization. The delineation soil borings/test pits will be performed to establish the areal and vertical extent of petroleum impact and will use step-out soil boring/test pit exploration when grossly contaminated media are encountered. An objective of this part of the Pre-Remedial Investigation program is to characterize the approximate limits of LNAPL and grossly contaminated soil that will require Corrective Measures removal action for offsite disposal.
- Groundwater will be investigated in accordance with the ACO for the tank and tank impoundment areas, the two surface impoundments and the other SWMUs. The groundwater investigation objectives include evaluation for the presence of LNAPL.

Additionally, long term monitoring of the groundwater will be conducted in accordance with the MNA groundwater monitoring program established in the USEPA-approved CMI Workplan. The proposed groundwater investigation is detailed below in Section 5.1.5.

5.1.3 Soil Field Investigation Activities

- Soil quality will be evaluated in all Target CM Areas as follows:
  - Utility clearance: Prior to initiating any intrusive field activities (test pits, soil borings, etc.), a geophysical-type survey will be performed to evaluate for the potential presence of utilities.
    - Publicly available One Call service will be utilized to identify known and mapped utilities
  - Soil Investigation Methodology
    - Test pits will be performed utilizing appropriate equipment to achieve data collection goals and may include an extended reach excavator
    - Soil borings will be performed utilizing direct push methods (e.g. Geoprobe®).
    - Soil samples will be collected via acetate sleeves or split spoons, to evaluate current conditions and to identify the potential for petroleum impacts.
    - Each test pit and soil boring will be evaluated using field screening methods, including:
      - Soil will be screened for visual/olfactory evidence of petroleum
      - Soil will be screened for LNAPL pass/fail identification via oil/water agitation tests
      - Soil will be screened with a five gas meter including a photo-ionization detector (PID).
    - Continuous two-foot soil sampling will be performed to four feet below the water table, or deeper if evidence of grossly contaminated soil is encountered in borings.
    - If no PID readings are detected and no other evidence of grossly contaminated soil is observed in a soil boring, samples will be collected from the 6-inch interval above the identified groundwater table. If PID readings are detected or evidence of grossly contaminated soil is observed, the boring will be moved in the downgradient direction and reinstalled.
    - Test pits will be used for exploratory subsurface investigation to evaluate the occurrence of LNAPL in the soil column and water table at each tank location using multiple locations completed inside and outside the containment area. Samples for chemical analysis will not be collected from the exploratory test pits.

The following subsections describe the historic investigations conducted at each CM Target Area, and the proposed sampling approach for each area under this CMI Workplan Addendum.

5.1.3.1 Tanks and Tank Impoundment Areas (SWMUs 23-62)

In accordance with the ACO, subsurface soil and groundwater are required to be investigated below the liners of the tanks and tank impoundments.

- A limited investigation of the tanks/tank impoundments areas was conducted in 1996 (*Revised RCRA Facility Assessment Sampling Visit/RCRA Facility Investigation Final Report*, Woodard & Curran, December 2004). A total of 56 borings were installed and one sample was collected from each boring. Soil samples were analyzed for various compounds in most borings including volatile organic compounds (VOCs), SVOCs, and metals. The results of the BTEX analysis is depicted on **Figure 5**.
- In accordance with DER-10 Subdivision 3.5.1(b), one surface soil sample will be collected for every 100 feet of tank perimeter. Based on the perimeter length of these tanks, approximately 5 surface soil samples will be collected per tank and approximately 190 soil samples in total. Proposed soil sample locations are depicted on **Figure 5**.
    - In addition, 2 additional surface soil samples will be collected in accordance with DER-10 Subdivision 3.5.1(b). A minimum of 76 surface soil samples, will be collected for all tanks to meet this requirement and evaluate petroleum occurrence around the base of each tank.
    - All surface soil samples will be collected using hand auger method or by shallow hand or mechanical excavation.
    - Surface soil samples will be collected from a depth of 0 to 0.5 feet below the liner for SVOCs and metals and 0.5 to 1.0 feet below the liner for VOCs.
    - Test pits and/or soil boring locations will be biased to areas of petroleum impact, based on soil discoloration/odors, history of repairs/replacement, soil beneath valves or low areas where spills or leaks from valves may have accumulated.
    - Soil samples will be submitted to a New York State Department of Health (NYS) Environmental Laboratory Approval Program (ELAP) certified laboratory for analysis of BTEX, Poly-aromatic Hydrocarbons (PAHs), Methyl tert-butyl ether (MTBE), and lead in accordance with the sample methodology defined in the ACO and the *Updated Corrective Measures Implementation Workplan* (Louis Berger, July 7, 2017)
    - In accordance with DER-10, one boring will located adjacent to or within two feet of the most down gradient edge of each tank at the Facility. Continuous 2-foot soil sampling will be performed to four feet below the water table, or deeper if evidence of grossly contaminated soil is encountered. The boring will be converted to a temporary well point (TWP) to evaluate the presence of LNAPL as described in Section 5.1.5.
        - If field screening methods as described above in 5.1.3 indicate grossly contaminated media to be present, the test pit or soil boring will be terminated and step-out test pits or soil borings will be performed to delineate the extent of petroleum impact for excavation.
        - Test pits/soil borings will be completed in 10- to 20-foot step-back intervals in four directions to delineate extent of petroleum impact until the field screening criteria are satisfied.

- Exploratory subsurface investigation will be conducted to evaluate the occurrence of LNAPL in the soil column and water table at each tank location using multiple soil borings/test pits completed inside and outside the containment area, as described above.

5.1.3.2 Surface Impoundment (SWMU 13 -14)

- In accordance with the ACO and the 2001 Surface Impoundment Closure Report, subsurface soil and groundwater are required to be investigated below the impoundment liners.
- A limited investigation of the surface impoundments was conducted in 2012 (*Surface Impoundment Investigation Report*, Louis Berger, November, 2012). Exceedances of benzo(a)pyrene and dibenzo(a,h) anthracene were detected (**Figure 6**).
- A total of 12 surface soil samples will be collected below the liner from the surface impoundments (six from each impoundment) to evaluate the potential impacts from the surface impoundments.
- All surface soil samples will be collected using hand auger method or shallow hand or machine excavation.
- Surface soil samples will be collected from a depth of 0 to 0.5 feet below the liner for SVOCs and metals and 0.5 to 1.0 feet below the liner for volatiles.
- If field screening methods as described in Section 5.1.3 indicate LNAPL or grossly contaminated soil to be present, the test pit or soil boring will be terminated and step-out test pits or soil borings will be performed to delineate the extent of petroleum impact for excavation.
- Test pits/soil borings will be completed in 10- to 20-foot step-back intervals in four directions to delineate the approximate extent of petroleum impact until the above field screening criteria are satisfied.
- Soil samples will be submitted to a NYS ELAP certified laboratory for analysis of VOCs, SVOCs, and metals in accordance with the sample methodology defined in the ACO and the *Updated Corrective Measures Implementation Workplan* (Louis Berger, July 7, 2017)

5.1.3.3 Road Trench (SWMU 1)

- The RFA recommended the Road Trench be cleaned out and integrity visually inspected. As part of the Pre-Remedial Investigation, an inspection after decommissioning will be performed.
- Up to six surface soil samples will be collected directly below the concrete trench biased towards areas of cracks, etc. for direct exploration of grossly contaminated media. Proposed sample locations are depicted on **Figure 7.**
- All surface soil samples will be collected using hand auger method or shallow hand or machine excavation. If the road trench is not decommissioned at the time of the sampling, concrete coring or other suitable concrete removal will be used for access to underlying

soils, and if the trench remains in service for stormwater the concrete will be patched after sample collection.

- Surface soil samples will be collected from a depth of 0 to 0.5 feet below the concrete for SVOCs and metals and 0.5 to 1.0 feet below the concrete for VOCs.
- If field screening methods as described above in 5.1.3 indicate LNAPL or grossly contaminated soil to be present, step-out test pits or soil borings will be performed to delineate the extent of petroleum impact.
- Test pits/soil borings will be completed in 10- to 20-foot step-back intervals in four directions to delineate extent of petroleum impact until the above field screening criteria are satisfied.
- Soil samples will be submitted to a NYS ELAP certified laboratory for VOCs, SVOCs, and metals analysis.

5.1.3.4 Former API Separator Site (SWMU 4)

- This SWMU is being addressed under Remediation Area 7 and no further Pre-Remedial Investigation is proposed. The Corrective Measures for this SWMU will be performed as detailed in CMI Workplan Addendum for Area 7 (Louis Berger, December 2016).

5.1.3.5 Primary API Separator (SWMU 5)

- This SWMU is being addressed under Remediation Area 7 and no further Pre-Remedial Investigation is proposed. The Corrective Measure for this SWMU will be completed as detailed in CMI Workplan Addendum for Area 7 (Louis Berger, December 2016).

5.1.3.6 Utility API Separator (SWMU 6)

- This SWMU is being addressed under Remediation Area 7 and no further Pre-Remedial Investigation is proposed. The Corrective Measure for this SWMU will be completed as detailed in CMI Workplan Addendum for Area 7 (Louis Berger, December 2016).

5.1.3.7 Vacuum Tank 1 (High Flash Tank) SWMU 7

- This SWMU is being addressed under Remediation Area 7 and no further Pre-Remedial Investigation is proposed. The Corrective Measure for this SWMU will be completed as detailed in CMI Workplan Addendum for Area 7 (Louis Berger, December 2016).

5.1.3.8 Vacuum Tank 2 (Low Flash Tank) SWMU 8

- The RFA recommended cleaning the dike and integrity testing of the tank. If it fails, confirmatory soil sampling under and around unit is required. Three soil borings were

installed (GPAP-1, GPAP-2, & GPAP-3) adjacent to the former primary and secondary separators (SWMUs 4 through 6) and vacuum tanks No.1 & 2 (SWMUs 7 & 8).

- One soil sample was collected by hand auger immediately outside the tank dike where a crack was observed.
- A limited soil removal was completed in 1998 in this SWMU which included the excavation of 100 cubic yards (cy) of visually petroleum impacted soil in 2 areas around Vacuum Tank VT-2. The extent of the excavation was limited by structures and subsurface utilities. LNAPL detected at the base of the west corner of VT-2 and recovery well RW-4 was installed.
- As part of the Pre-Remedial Investigation, an inspection after decommissioning will be performed. If there is any evidence of integrity issues, a soil investigation will be conducted and up to three surface soil samples will be collected.
- If field screening methods as described above in 5.1.3 indicate grossly contaminated media to be present, step-out test pits or soil borings will be performed to delineate the extent of petroleum impact.
- Test pits/soil borings will be completed in 10- to 20-foot step-back intervals in four directions to delineate extent of petroleum impact until the above field screening criteria are satisfied.
- Surface soil samples will be collected from a depth of 0 to 0.5 feet below ground surface (bgs) for SVOCs and metals and 0.5 to 1.0 feet bgs for VOCs.
- Soil samples will be submitted to a NYS ELAP certified laboratory for VOCs, SVOCs, and metals analysis.

5.1.3.9 Hydrocarbon Monitor Catch Basins (HMCB) SWMU 9

- The RFA recommended cleaning out the unit and performance of a visual integrity inspection. If it fails visual inspection, confirmatory soil sampling under and around the affected areas is required for VOCs and SVOCs.
- Two soil samples were collected from soil borings GPAP-6 & GPAP-7 downgradient of the HMCB. Groundwater samples were also collected. BTEX were detected in the soil and groundwater samples.
- This SWMU is being addressed under SWMUs 13 and 14 because it is located within the surface impoundment (SWMU 13) and Pre-Remedial Investigation will be performed under that SWMU.

5.1.3.10 Excavated Soils Area SWMU 17

- The RFA recommended confirmatory soil sample collection for VOCs, SVOCs, and metals. The soil piles are no longer present and a solar panel farm has been installed in the approximate area of the former soil piles.
- Up to six surface soil samples will be collected where feasible within the location of the former soil piles to evaluate if there are any petroleum impacts to the ground surface from the soil piles.

- Proposed soil sample locations are depicted on **Figure 9**.
- Surface soil samples will be collected from a depth of 0 to 0.5 feet bgs for SVOCs and metals and 0.5 to 1.0 feet bgs for VOCs.
- Soil samples will be submitted to a NYS ELAP certified laboratory for VOCs, SVOCs, and metals analysis.

5.1.3.11 North Beach Recovery Well Holding Tank (SWMU 19)

- The RFA recommended confirmatory soil sample collection for VOCs, SVOCs, and metals.
- Two soil samples (HA-1 & HA-2) were collected by hand auger near the recovery system.
- This SWMU is being addressed under Remediation Area 3 and no further Pre-Remedial Investigation is proposed. The Corrective Measure for this SWMU will be completed as detailed in CMI Workplan Addendum for Remediation Area 3.

5.1.4 Groundwater Field Investigation Activities

Groundwater will be investigated in accordance with the ACO for the Target CM Areas including tank and tank impoundment areas, the two surface impoundments and the other SWMUs. The groundwater investigation objectives include evaluation for the presence of LNAPL.

- A TWP will be installed for each tank/tank impoundment and SMUs to evaluate for the presence of LNAPL.
- The TWP will be installed using direct push drilling methodology. TWPs will be constructed of 1-inch diameter polyvinyl chloride (PVC) with 10 feet of 0.010-slot PVC screen. The TWP screen will be installed to bracket the water table to evaluate the presence of LNAPL and enable collection of groundwater samples.
- Proposed TWP locations are outlined on **Figure 5**.
- An interface probe will be used to measure any potential LNAPL and determine the depth to groundwater. If no evidence of LNAPL is observed, one groundwater sample will be collected.
- One to three well volumes will be purged with a check-valve system prior to sampling. After purging and equilibration, a bailer will be lowered to the top of the water column for sample collection. VOC samples will be filled directly from the bailer with as little agitation as possible.
- Groundwater samples will be submitted to a NYS ELAP certified laboratory for analysis of BTEX and MTBE.
- The temporary well point will be decommissioned after sample collection. If any exceedances of the applicable groundwater quality standards are detected, further groundwater evaluation will be performed as part of the USEPA-approved MNA remedy.
- In conjunction with this CMI Workplan Addendum, all existing USEPA-approved MNA Corrective measures will continue to be implemented. Continued implementation of the MNA Program is proposed to evaluate continued attenuation and mineralization of the

residual dissolved-phase impacts over time and to monitor the continued effectiveness of natural attenuation to achieve the remediation goals for COCs.

- Remediation and development will involve significant earth moving activities and development-related construction activities. This will necessitate decommissioning and repositioning of some existing MNA monitoring wells. This will be addressed in a MNA Well Maintenance Plan to be established under this CMI Workplan Addendum. The MNA Well Maintenance Plan is discussed in Section 7.4.
    - It is proposed under the MOSF Closure Plan that after the completion of site-wide Corrective Measures, all MNA and other long-term environmental monitoring programs will be incorporated into a single site-wide Site Management Plan that would be implemented under a Site Management Consent Order administered by NYSDEC.

5.2 CORRECTIVE MEASURES

5.2.1 Applicable Cleanup Objectives

- Applicable Cleanup Objectives are the USEPA-approved SCOs included in the *Updated Corrective Measures Implementation Workplan* (Louis Berger, July 7, 2017) (Section 3.3 and 3.4). SCOs are reported in **Table 3** and discussed below.
- USEPA-approved Facility Perimeter SCOs
    - The SCOs applicable to all soils around the perimeter of the Facility are 6 NYCRR Part 375-6.8 Restricted Use SCOs - Industrial.
    - 6 NYCRR Part 375-6.8 Restricted Use SCOs – Protection of Ecological Resources were approved by USEPA for soils to a depth of 2 ft bgs along the undeveloped northern portion of the Facility perimeter adjacent to the Arthur Kill River tidal flats.
    - Soil SCOs protective of groundwater were determined by USEPA not to be necessary since there is no current or future use of groundwater anticipated at or downgradient of the Facility.
- Facility Non-Perimeter SCOs
    - The ACO requires that the soil cleanup levels for non-perimeter areas of the Facility be developed. Section 3.4 of the *Updated Corrective Measures Implementation Workplan* (Louis Berger, July 7, 2017) adopted 6 NYCRR Part 375-6.8 Restricted Use SCOs - Industrial for non-perimeter soils.

5.2.1.1 Corrective Measures Implementation

- Corrective Measures at the Facility under this CMI Workplan Addendum will be completed under a single construction mobilization that will include tank decommissioning and removal, Pre-Remedial Investigation and Corrective Measures to address petroleum impact in Target CM Areas.
- This CMI Workplan Addendum presents specific Corrective Measures to be implemented

at all Target CM areas and any new areas found to contain LNAPL or grossly contaminated soil including:

- All tanks and tank impoundment areas;
- All surface impoundment areas;
- All other solid waste management units that have not been investigated, remediated and/or closed per the ACO; and,
- All remaining ICM Wells currently containing LNAPL
- Areas where soil will be relocated and reused onsite.

- In addition, Corrective Measures to be implemented at the Facility will include completion of Corrective Measures already approved under the *Updated Corrective Measures Implementation Workplan* and associated Addenda (Louis Berger, July 7, 2017) including all of the following areas:
  - CMI Area 2 (Tank 50), Area 3 (North Beach), Area 5 (Boiler House) and Area 7 (Siphon Building/Oil Water Separator);
  - Passive LNAPL Monitoring Areas including CMI Area 4, the ICM-1 Area, the MW-1 Area and the RFI-9 Area;
  - Facility-wide MNA program.

The *Updated Corrective Measures Implementation Workplan* (Louis Berger, July 7, 2017) recommended the following Corrective Measures for use across the Facility:

- LNAPL: Recovery and off-site disposal of LNAPL through excavation of LNAPL and grossly contaminated soil that exhibits a petroleum residue as described below as well as recovery from open excavation areas that contain LNAPL on groundwater;
- Groundwater and Saturated Soils: MNA, to be augmented with hot-spot remediation via LNAPL recovery, ISCO and bioremediation; and
- Vadose Zone Soils: MNA with excavation as an enhancement to eliminate hot spot areas.

5.2.1.2 Corrective Measures to Address Petroleum Impact

The following Corrective Measures methods will be implemented to address LNAPL and grossly contaminated soil in Target CM Areas:

- To address all locations containing LNAPL identified during the Pre-Remedial Investigation, a multi-stage Corrective Measures approach will be used.
  - Stage 1 will involve the excavation of the vadose zone soils to expose LNAPL impacted horizons and allow excavation and offsite disposal of LNAPL and associated smear zone soils throughout the limits of LNAPL impact.
  - Stage 2 will involve LNAPL recovery by extraction of floating product from the surface of the (pooled) water table.
  - Stage 3 will involve the stabilization of the bottom of the open excavation with an aggregate stabilization layer.
  - Stage 4 will involve in-situ application of a chemical oxidant to the excavation pit/aggregate stabilization layer to chemically destroy residual petroleum in an

around the excavation and in the upper region of the saturated zone.

- Stage 5 will involve bioremediation, the application of an engineered oxygen releasing compound to the excavation pit to increase the oxygen content within groundwater and stimulate biological activity to address the dissolved-phase contaminants in and around the excavation area.
- Stage 6 will involve, following application of the ISCO and bioremediation compounds noted above, filling the rest of the excavation with backfill in accordance with the Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum.

The multi-stage Corrective Measures approach will use the following approved Corrective Measures elements:

Stage 1: Soil Excavation and Off-Site Disposal

- Soil excavation and offsite disposal is a highly effective method for management of petroleum impacted soils to achieve petroleum source removal and mass reduction. Excavation and soil handling activities will be performed in accordance with an approved Soil Management Plan and Stormwater Pollution Prevention Plan to be prepared for implementation of this CMI Workplan Addendum. Soil will be disposed in accordance with a Soil Disposal Plan that will be part of the Soil Management Plan to be prepared under this CMI Workplan Addendum. The Stormwater Pollution Prevention Plan is discussed in Section 6.2. The Soil Management Plan is discussed in Section 6.3.
- Multiple underground utilities are known to pass through and near the Facility. Prior to commencement of excavation activities, the excavation contractor will contact Dig-Safe NY, and any other utilities in the area that are not addressed by Dig-Safe NY, will be checked using a geophysical-type survey. Excavation near underground utilities, noted either through Dig-Safe NY's mark-outs or the geophysical survey, will be required to be cleared utilizing a guzzler or hand tools at two locations along the utility line for verification. Due to the potential for unmarked underground utilities, the bucket of the excavator/backhoe will not be permitted to have teeth. Instead a plate welded to the bucket will be used during excavating. During excavation operations, a lookout will be designated to observe ground contact with the excavator/backhoe blade.
- Approximate extent of the soil removal will be defined as part of the Pre-Remedial Investigation described above. Additional excavation may be required based on field observations of grossly contaminated media and to enable for proper excavation sloping.
- Vadose zone soils exhibiting gross contamination will be excavated for off-site disposal to a depth of approximately one foot above the water table. The excavation will continue to a minimum of one foot below the water table to remove the smear zone.
- On-site handling (stockpiling, etc.), transportation and disposal of soils will be conducted in accordance with a Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum.
- Backfill of excavations will be performed in accordance with the Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum.
- Confirmation Sampling:

- End-point confirmation sampling will be conducted after removal of all NAPL and grossly contaminated soil is completed.
- End-point confirmation samples will be collected from each completed excavation as required by DER-10 Section 5.4.
- One end-point confirmation soil sample will be collected from every 30 linear feet of excavation sidewall and for every 900 square feet of excavation bottom area.
- End-point confirmation soil samples will be collected as discrete samples and submitted to a NYS ELAP certified laboratory for chemical analysis for BTEX, PAHs, MTBE, and lead.
- End-point confirmation soil samples will be compared to the Facility SCOs as discussed above.

Stage 2: LNAPL Recovery and Off-Site Disposal

Direct LNAPL recovery and off-site disposal is a highly effective method for management of LNAPL petroleum impacted areas to achieve petroleum source removal and mass reduction.

- Direct LNAPL recovery activities will commence after completion of the excavation activities and removal of the smear zone. Separate-phase LNAPL that was not captured during the excavation phase will float to the surface of the water. Recovery of the LNAPL will be conducted via a combination of vacuum operations, absorbent booms/pads and direct pumping and skimming. Recovered fluids will be transferred to an on-site temporary Oil/Water Separator equipped with a properly sized Granular Activated Carbon Unit and bag filter as detailed further below.
  - A pre-packaged, trailer-mounted temporary Oil/Water Separator unit will be designed and assembled off site for delivery to the Facility remediation area. The design of this system will be submitted under a LNAPL recovery plan to be included in a SPDES Permit/Permit Modification to be submitted to NYSDEC and included in this CMI Workplan Addendum.
  - The existing SPDES permit for the Facility currently permits the discharge of Facility stormwater that collects in the active stormwater impoundments. Existing permit conditions also include Oil/Water Separator treatment, routine sampling for compliance and effluent discharge limits. A SPDES Permit/Permit Modification application will be submitted to NYSDEC to address all activities associated with remediation and construction and will include discharges from Oil/Water Separator effluent from the direct LNAPL recovery activities. Full compliance with SPDES permit conditions regarding effluent sampling and analysis and effluent discharge limits will be achieved under the CMI Workplan Addendum.
  - Absorbent booms/pads will be containerized in 55-gallon drums and/or 30cy containers pending proper waste classification for offsite disposal.

Stage 3: In-Situ Chemical Oxidation

ISCO will be performed in accordance with an ISCO Plan to be prepared for implementation of this CMI Workplan Addendum. The ISCO Delivery Plan will provide a calculation basis for dosing and describe application procedures to be applied in the field. ISCO application will

augment LNAPL removal to enhance ongoing remediation following backfilling activities. ISCO has the ability to remediate sites in a faster timeframe than other in-situ remediation approaches. The selected ISCO compound is sodium persulfate in accordance with the Updated Corrective Measures Implementation Workplan and associated Addenda (Louis Berger, July 7, 2017).

Each excavation area that contained LNAPL will receive an application of the sodium persulfate ISCO. Following grossly contaminated soil and LNAPL excavation and removal (Stage 1) and LNAPL recovery (Stage 2), the bottom of the open excavation will be stabilized with an aggregate layer to stabilize the open excavation and sodium persulfate ISCO will be applied (Stage 3) as follows:

- Where LNAPL removal and/or product-saturated soil removal is performed, ISCO will be applied to the base of the excavation which will be stabilized with an aggregate stabilization layer. This aggregate stabilization layer will be placed at the water table interface with approximately a one-foot thickness of media below, and a one-foot thickness above the measured water table. This will ensure adequate distribution of the oxidant is achieved throughout the surface of the water table. The aggregate stabilization layer will later be covered with a geotextile fabric prior to backfilling.
- The amount of oxidant added will be calculated based on chemical stoichiometry using estimates of the mass of petroleum to be treated. The quantity of sodium persulfate (and activator) will be calculated in an ongoing design-consultation with an ISCO remediation specialist. The mass of petroleum to be treated in soil and groundwater (e.g. impacted soils/groundwater, residual LNAPL etc.) will be estimated and will consider natural soil demand, and the equivalent mass of persulfate to meet that demand will be calculated and applied.
- ISCO application will be implemented with in-place mixing of equal volumes of clean water and oxidant when applied as a solid or as a solution.
    - The quantity of oxidant (and activator) will be calculated in continuous and ongoing real time design-consultation with a pre-retained ISCO remediation specialist for each excavation. Based on field conditions such as real-time measured LNAPL and ISCO demand screening, combined with safety considerations such as real-time weather readings and construction site locality, the ISCO application will be completed in either a solid or liquid application. The solid application entails placing the oxidant in the solid form to the groundwater surface within the aggregate stabilization layer. If conditions preclude a solid in-excavation application, a liquid spray application of equal volume will be applied to the aggregate stabilization layer. The liquid mixture will be a spray-application of clean water and oxidant mixed beside the excavation area per the ongoing design consultation.

Stage 4: Bioremediation with Engineered Oxygen Releasing Compounds

Bioremediation with an engineered oxygen releasing compound will occur in accordance with a Bioremediation Plan to be prepared for implementation of this CMI Workplan Addendum. The Bioremediation Plan will provide a calculation basis for ORC dosing and describe application procedures to be applied in the field. An oxygen-releasing in-situ bioremediation compound

(calcium or magnesium-based) will be applied to the excavation along with the application of sodium persulfate ISCO described above. Aerobic bioremediation technologies are used to accelerate the degradation rate of petroleum hydrocarbons and some fuel oxygenates through natural biological processes. The process helps to facilitate the mineralization of biodegradable compounds to CO_2 and H_2O. This engineered oxygen releasing compound will facilitate two major mechanisms:

- Provide elevated pH (around 11) for alkaline activation of persulfate to promote degradation of dissolved phase contaminants. ISCO chemistry typically sustains up to 4 months.
- Provide a long-term source (up to a year) of dissolved oxygen to enhance aerobic biodegradation of residual groundwater contaminants following other forms of remediation. One of the key components of this aerobic bioremediation reagent is its high active oxygen content that will help sustain biological mechanisms for an extended period. The engineered oxygen releasing compound will increase the dissolved oxygen (DO) in the groundwater for a period of approximately 12 to 18 months to stimulate aerobic bioremediation of the residual dissolved-phase impacts in and around the excavation area
- The application of an oxygen releasing compound to the groundwater table will achieve an alkaline pH of at least 10.5 and dissolved oxygen of least 8 to 10 mg/L. Adding oxygen releasing compounds with ISCO treatment with sodium persulfate provides the ability to continue treatment of residual organics in groundwater with biodegradation once the remediation by ISCO with sodium persulfate is exhausted.
    - The quantity of engineered oxygen releasing compound will be calculated in an ongoing design-consultation with a bioremediation specialist for each excavation. The quantity will be based on treating the measured COD in groundwater. The oxygen releasing compound will be evenly applied throughout the aggregate stabilization layer as well as added evenly on top of the aggregate or water table surface
- The aggregate stabilization layer will be covered with a permeable geotextile fabric and backfilled with reused onsite soils or imported fill in accordance with an approved Soil Management Plan to be prepared under this CMI Workplan Addendum.

Stage 5: Backfilling

Backfilling of the excavation will occur in accordance with an approved Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum. The Soil Management Plan is discussed in Section 6.3. Backfilling will include:

- Backfill materials used to fill excavations will be laid down in compacted 24" lifts;
    - Backfill materials will consist of soil beneficially reused from the site and, if required, soil imported from off-site;
    - Soil will be beneficially reused in accordance with a Onsite Soil Beneficial Reuse Plan contained in a Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum.
    - Soil will be imported in accordance with a Soil Import Plan contained in a Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum. Imported soils will meet the backfill import criteria established in

6NYCRR 375-6.7(d);

- Solid waste will not be imported onto the Facility; and,
- Soil handling and management within the Facility will be performed in accordance with a Soil Management Plan to be prepared for implementation of this CMI Workplan Addendum.

6 CORRECTIVE MEASURES SUPPLEMENTAL PLANS

6.1 PERMITTING

The environmental permits required to implement this CMI Workplan Addendum are expected to be as follows:

- A modification of the existing Individual Industrial SPDES Permit for discharge of treated effluent from LNAPL recovery Corrective Measures;
- Coverage under the SPDES General Permit (GP-0-15-002) for Stormwater Discharges from Construction Activity for soil disturbance; and
- Compliance with the provisions of the Underground Injection Control Program regulations for placement of chemical oxidant/ORC, which under the RCRA program would be managed through permit by rule.

In addition to the above permits, removal action Corrective Measures that require off-site disposal will require acceptance of wastes (including soil and water) by government authorized and permitted disposal facilities (see Section 6.3 for additional discussion). A thorough review of any additional permit requirements will be conducted, including a SPDES pre-application conference with the NYSDEC. All required permits and authorizations will be obtained prior to implementation of field activities.

6.2 STORMWATER POLLUTION PREVENTION PLAN

Pursuant to the requirements of coverage under the SPDES General Permit for Stormwater Discharges from Construction Activity, Permit GP-0-15-002, Part III, a Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to submitting the Notice of Intent (NOI) to obtain coverage under this SPDES General Permit. The SWPPP will meet the criteria set forth by NYSDEC in Part III of the General Permit and will be prepared for implementation of this CMI Workplan Addendum. The SWPPP will include practices consistent with the New York State Standards and Specifications for Erosion and Sediment Control. The contents of the SWPPP will generally be as follows:

- An erosion and sediment control component including:
  - Background information on the project scope;
  - Site maps/construction drawings illustrating the types and areas of disturbance;
  - A description of site soils and the hydrologic soil group;
  - A construction phasing plan;
  - A description of the soil erosion and sediment control practices including maps/construction drawings, specifications, and details for each erosion and sediment control;
  - A map showing the locations of stormwater discharges;
  - Temporary and permanent soil stabilization plans;
  - A maintenance inspection schedule; and
  - A description of pollution prevention measures (e.g., for litter, construction chemicals).

- Identification prior to the start of construction of contractors and subcontractors that will be performing the work, and a signed copy of the certification from each contractor or subcontractor, per Section III.A.6 of the General Permit.

The CMI will not involve development or creation of impervious surfaces, and therefore, a post-construction stormwater management component of the SWPPP is not anticipated for the CMI. However, post-construction stormwater management and additional SWPPP components will be separately prepared for the Land Development Plan.

6.3 SOIL MANAGEMENT PLAN

A Soil Management Plan will be prepared for implementation of this CMI Workplan Addendum. All soil management activities will comply with the Soil Management Plan. The Soil Management Plan will include a Soil Handling and Transport Plan, a Soil Disposal Plan, an Onsite Soil Beneficial Reuse Plan and a Soil Import Plan, the major components of which are described below

- Soil Handling and Transport Plan
    - Site preparation and soil erosion and sediment controls,
    - Soil trenching and excavation,
    - Dust and odor controls,
    - Soil screening in accordance with Section 5.2.2.1 for identification of grossly contaminated soil,
    - Excavation oversight and inspection,
    - Health and safety and OSHA requirements,
    - Backfill requirements:
        - Sequencing with ISCO/ORC,
        - Placement of aggregate stabilization layer,
        - Placement and compaction of backfill soil (reused or imported),
    - On-site soil transport plan:
        - Vehicle decontamination plan,
        - Dust control,
        - No free liquids management (e.g., bed liners, admixture, etc.)
    - Soil stockpile management plan:
        - Erosion and sediment control measures,
        - Management of stockpiles pending off-site disposal (if not direct loaded),
        - Management of stockpiles pending soil reuse,
        - Dust and odor controls.
- Soil Disposal Plan
    - Identification of off-site disposal facilities,
    - Documentation from disposal facilities (permits, acceptance requirements, if any violations),
    - Generator and manifest records and records retention,
    - Transporter identification and licenses,

  - Transport vehicle requirements (e.g., decontamination, bed liners),
  - Limitations on truck routes, if any.
- Onsite Soil Beneficial Reuse Plan
  - Compliance with 6 NYCRR 375-6.7(d),
  - Compliance with DER-10, Section 5.4(e)4,
  - Identification and segregation of soils potentially to be beneficially reused,
  - Screening/testing for compliance with SCOs,
  - Segregation of materials by type (e.g., general fill, suitable under foundations, etc.),
  - Assessment of background/historic fill concentrations and placement location/depth per 6 NYCRR 375-6.7(d)(3).
- Soil Import Plan
  - Compliance with DER-10, Section 5.4(e),
  - Imported material other than soil:
    - Gravel, rock, stone from virgin material quarry or mine;
    - Recycled material (concrete, brick) from a registered construction and demolition debris processing facility and per the requirements of Section 304 of the NY State Department of Transportation Standard Specifications;
  - Soil Materials:
    - Source identification, location, and history of source site use or verification of prior fill source approval;
    - Testing requirements and compliance with DER-10, Table 5.4(e)10;
    - Testing requirements based on volume of fill per DER-10 Section 5.4(e)3.ii(3);
    - Documentation of imported fill (e.g., bills of lading);
    - Assessment of background/historic fill concentrations and placement location/depth per DER-10, Section 5.4(e)8;
  - Definition of physical and placement requirements for site development

6.4 QUALITY ASSURANCE PROJECT PLAN

A modification to the current approved QAPP prepared by Louis Berger (January 2016) will be prepared for implementation of this CMI Workplan Addendum. Specific worksheets to be updated include:

- Worksheet 12- Measurement Performance Criteria
- Worksheet 13- Secondary Data Criteria and Limitation Table
- Worksheet 15 - Reference Limits and Evaluation Table
- Worksheet 16 - Project Schedule Timeline Table
- Worksheet 18- Sampling Locations and Methods/Standard Operating Procedures (SOP) Requirements
- Worksheet 19- Analytical SOP Requirements
- Worksheet 20- Field Quality Control Sample Summary Table

- Worksheet 21 -Analytical SOP Reference Table
- Worksheet 23- Analytical SOP References Table
- Worksheet 24- Analytical Instrument Calibration Table
- Worksheet 28- QC Sample Table
- Worksheet 30 - Analytical Services Table
- Worksheet 36- Validation Summary Table

CMI Program Field SOPs will be included as an attachments to the QAPP modification.

6.5 COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) will be prepared for implementation of this CMI Workplan Addendum. The CAMP will be prepared using the Generic CAMP template established by the NYS Department of Health, DER-10, **Appendix 1A**. The purpose of the CAMP is to provide protection for the downwind community, through real-time monitoring for VOCs and particulates at the downwind perimeter of work areas, more specifically off-site receptors including residents and workers, from potential airborne contaminant releases as a result of investigative or remedial work activities performed at the site. The CAMP will specify:

- Requirements for continuous or periodic monitoring;
- VOC monitoring, response levels, and actions;
- Particulate monitoring, response levels, and actions;
- Monitoring equipment requirements;
- Site-specific requirements for monitoring based on the site-related compounds of BTEX, PAHs, and lead.

6.6 HEALTHY AND SAFETY PLAN

A site-specific Health and Safety Plan (HASP) will be prepared for implementation of this CMI Workplan Addendum. The HASP will be developed in accordance with 29 CFR 1910.120 (HAZWOPER) that includes each CMI-related activity. The site-specific HASP will address the chemical and physical hazards associated with the constituents of concern and the site location. The HASP will include the site description, responsibilities of key personnel, on-site hazards (chemical and physical), air monitoring, personal protective equipment (PPE), site control, decontamination, and emergency response.

7 SUPPLEMENTAL REMEDIAL MEASURE UNDER NYSDEC MOSF

7.1 MOSF CLOSURE PLAN

A MOSF Closure Plan established and approved under the authority of NYSDEC and will be implemented on a parallel track with this CMI Workplan Addendum. In general, the MOSF Closure Plan will address the following:

- Closure of the MOSF in accordance with 6 NYCRR 613;
- Conformance with the relevant provisions of NFPA 326, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*, most recent edition;
- Notification to the NYSDEC of the intent to permanently close the MOSF and a schedule for closure implementation;
- Preparations for Tank Closure such as lockout/tagout, venting, emptying tanks, management of residual product;
- Tank Cleaning and Decommissioning including inerting of tanks, tank entry and cleaning, and tank dismantling and disposal/recycle;
- Impoundment closure including the hydrocarbon monitoring catch basins, lift station, and oil-water separators, handling of impoundment water/residues, impoundment liner removal and disposal, and equipment decommissioning;
- Building demolition per appropriate regulatory requirements (e.g., asbestos, solid waste, transportation, OSHA); and,
- Closure Documentation and Registration including records of facility closure and a completed registration application documenting permanent closure.

In addition to the above items specific to MOSF closure, engineering and institutional controls along with a Site Management Plan will be implemented to support the site development plan, as summarized in the sections that follow.

7.2 ENGINEERING CONTROLS

The Engineering Controls will consist of a composite surface cover and soil vapor intrusion controls. The composite surface cover will eliminate the potential for direct contact with residual soils, and the soil vapor intrusion controls will be employed for occupied buildings proposed for development of the site to eliminate any soil vapor intrusion exposure pathway.

Composite surface cover will include three general types of covers, as follows:

- Reinforced concrete building slabs under all building areas underlain by vapor intrusion controls and a granular base course;
- Bituminous concrete pavement on all site access roads and parking areas consisting of bituminous concrete surface and base course layers, underlain by aggregate sub-base course and a geotextile separation/demarcation layer; and,
- Soil covers in areas not covered by reinforced concrete slabs or bituminous concrete pavement consisting of an erosion control surface layer (vegetation or stone), subsoil, and a geotextile separation/demarcation layer.

The soil vapor intrusion control system will consist of the following:

- A soil vapor barrier with options of sheet or spray applied membrane or an aerated floor design integral with the concrete slab;
- A geotextile protection layer above the vapor barrier prior to concrete pour; and
- An underlying gravel layer below the vapor barrier.

For additional details regarding the engineering controls, reference should be made to the MOSF Closure Plan.

7.3 INSTITUTIONAL CONTROLS

An Environmental Easement will be granted on the site pursuant to Article 71, Title 36 of the New York State Environmental Conservation Law. The environmental easement will place restrictions on future property uses that are inconsistent with the development plan and the engineering controls. The Environmental Easement will limit the site to industrial use and prohibit groundwater use. The Environmental Easement will provide for:

- Allowable site use (i.e., industrial);
- Engineering controls operation, maintenance, and inspection in accordance with a Site Management Plan (SMP, see Section 7.4);
- Prohibition on groundwater use without proper treatment;
- Continuation of environmental monitoring and MNA in accordance with the SMP;
- Monitoring and reporting on the performance and effectiveness of the Corrective Measures and engineering controls per the SMP;
- Access for the regulatory agencies for inspection and assessment of the effectiveness of the Environmental Easement and compliance with the SMP.

The Environmental Easement will be initially developed in draft form for review by USEPA and NYSDEC followed by filing of an approved Environmental Easement with the Richmond County Clerk.

7.4 SITE MANAGEMENT PLAN

A SMP will be prepared for approval under the MOSF Closure Plan. The SMP will be prepared in accordance with the provisions of DER-10, Section 6.2, and based on templates available from the NYSDEC. The SMP will ensure continued performance of the remedy after remedial construction and site development is complete to assure continued protection of public health and the environment. The SMP will be implemented under a Site Management Consent Order to be established with NYSDEC.

The key elements of the SMP are as follows:

- General section that provides for notifications and contacts for implementation of the SMP;
- A summary of information regarding the site such as site location and description, geology, investigation and remedial history;
- Remedial Action Objectives;

- The institutional and engineering control plans that describe the Environmental Easement and requirements and the engineering controls;
- A Soil Management Plan that describes controls on future subsurface disturbance (e.g., utility maintenance) and procedures for protection of the environment and public health and site restoration;
- Inspections including site-wide inspections for compliance with the institutional controls and maintenance of the effectiveness of engineering controls;
- Continuation of the monitoring programs for the site to be implemented under the SMP and governed by the Site Management Consent Order, including an MNA Monitoring Well Maintenance Plan;
- An Operation and Maintenance Plan to address maintenance of surface covers and vapor intrusion controls;
- Periodic assessment such as climate change vulnerability in the shoreline area of the site; and,
- Reporting including routine inspection reports, groundwater monitoring reports, and periodic review reports per DER-10, Section 6.3, along with certifications of the continued effectiveness of the institutional and engineering controls by an environmental professional or professional engineer.

For additional details regarding the SMP, reference should be made to the Conceptual MOSF Closure Plan.

8 CORRECTIVE MEASURES DEVELOPMENT SCHEDULE

- Submit conceptual CMI Workplan Addendum (May 2019)
- USEPA comment on conceptual CMI Workplan Addendum (June 2019)
- Submit CMI Workplan Addendum (June 2019)
- Approval of CMI Workplan Addendum (August 2019)
- Closing on Property (August 2019)
- Begin remedial action for tank removal, Pre-Remedial Investigation, Corrective Measures; (September 2019)
- Schedule Milestones – Durations Only
    - Notice to Proceed
    - Tank Decommissioning – 4 months
    - Tank Demolition – 5 to 6 months
    - CMI Remedial Effort – 12 to 18 months
    - Site Development Earth Work – 18 to 24 months.
    - Infrastructure – 6 to 12 months
    - Horizontal Pad(s) - Site Development – 24 to 30 months
    - Vertical Building Development – 24 to 30 months
    - Total Project Duration – approximately 4 Years.

9 REFERENCES

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Louis Berger, "Quarterly Progress Report – January to March 2017", 2017, May 12

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TABLES

Table 1
SWMU and AOC List

Kinder Morgan Facility Staten Island, NY

SWMU No./ AOC	Identification	Description
1	Road Trench	The unit runs along the west side of the main facility road in the western portion of the facility. It consists of reinforced concrete trench and associated conduit (unknown construction) between the tank farm and Arthur Kill and is approx. 4 ft wide x 5 ft deep x 2,300 ft long, split into 2 sections. It has 6 sump/pumping stations. The unit receives separated wastewater (WW) from the oil/water separators (OWSs) (SWMUs 5 & 6) & pumpable sludges from the Dravo Water Treatment System (WTS or WWTS) (SWMU 15) via WW transfer lines (SWMU 2). The unit received leachate from tank dikes before installation of the claymax liners at the dikes in 1990/1991. Active since facility startup.
2	Wastewater (WW) Transfer Lines	Located primarily aboveground in the dock area & throughout the WW treatment areas. Consists of wrapped concrete piping with with flanges and steel transfer piping. Transfers barge cleaning water to T48 and T60 (SWMUs 11 & 12) as well as OWSs (SWMUs 5 & 6), water from vacuum truck unloading pad to T48, WW from T48 and T60 to holding ponds (SWMUs 13 & 14).
3	Tank Farm Catch Basins	In-ground concrete basins located for each tank, approximately 6 ft x 10 ft x 10 ft deep installed prior to installation of impermeable liners in 1990/1991. The basins receive tank bottom water which is pumped to vac truck and then discharged to T48 (SWMU11). Prior to installation of the catch basins,discharge of tank bottom water was to the inside earthen dike area.
4	Former API Separator Site	Located adjacent to and partially covered by container storage pad (SWMU 16) on western portion of facility. Aboveground, constructed of concrete, no lining. Estimated to be 12 ft x 80 ft, demolished in the late 70s.
5	Primary API Separator	Installed in 1975 with an impervious lining in 1990. It is located west of the lower holding pond (SWMU 13) and south of Dravo WWTS (SWMU 15). It is aboveground, constructed of reinforced concrete with impervious lining, 10 ft x 65 ft x 4.5 ft deep, on concrete pad with 6 in curbs.
6	Utility API Separator	Installed in 1975 with an impervious lining in 1990. It is located west of the lower holding pond (SWMU 13) and south of Dravo WWTS (SWMU 15). It is bboveground, constructed of reinforced concrete with impervious lining, 12 ft x 70 ft x 4.5 ft deep, on concrete pad with 6 in curbs.
7	Vacuum Tank 1 (High Flash Tank)	Installed in 1986, replacing a steel riveted box tank. It is located south of Dravo WWTS (SWMU 15) in western portion of facility. It is a cyclindrical steel tank, 8 ft 6 in diameter by 12 ft high, mounted on a 4 ft tall steel base, within concrete containment dike with 4 ft tall walls and sump. It receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling. Steam pumped through tank with condensation released to sump below. Water in the containment is pumped back into the tank.
8	Vacuum Tank 2 (Low Flash Tank)	Installed in 1976. It is located south of Vac Tank 1(SWMU 7) and Dravo WTS (SWMU 15) in western portion of facility. It is a cyclindrical steel tank, 7 ft diameter by 15 ft long, cradle-mounted horizontally on 4 ft concrete pilings, within concrete containment dike with 2 ft tall walls and sump. Receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling.

Table 1
SWMU and AOC List

Kinder Morgan Facility Staten Island, NY

SWMU No./ AOC	Identification	Description
9	Hydrocarbon Monitor Catch Basins (HMCB)	Installed in 1981. It is located adjacent to holding pond inlets. It contains two inground concrete tanks 20 ft x 20 ft x 10 ft deep. It receives WW from Tank Farm Dikes (SWMUs 23 through 62) via Tank Farm Drainage System.
10	Waste Storage T41	Installed in 1937. It is a steel AST, 45 ft diameter by 25 ft (4,212,600 gal cap) with an earthen dike. Storage and separation (by gravity) of waste petroleum product and water. Water from bottom was sent to lower holding pond (SWMU 13). Oil on top was shipped to off-site refinery. Unit was taken out of service in 1989.
11	Waste Storage T48	Installed in 1943. It is a steel AST, 100 ft diameter by 35 ft (2,058,000 gal cap). Sidewalls (to 6 ft) and bottom of tank covered with epoxy. It is used for the collection and storage of WW contaminated with petroleum product. It receives the following: 1. Drippage from Drip Pans and tank bottom water from the catch basins (SWMU 3) collected by vac truck, transported to T48, and unloaded at the vac truck unloading pad. 2.Petroleum product & petroleum product /water mixtures from barge cleaning pumped through the WW transfer lines (SWMU 2). 3. Oil layer from separators (SWMUs 5 & 6). Water from bottom released through WW transfer line (SWMU 2) to separators (SWMUs 5 & 6). The oil on top was shipped to off-site refinery 2 times/yr.
12	T60	Tank T60 was installed in 1950. It is a steel AST, 80 ft diameter by 48 ft (1,012,200 gal cap). Sidewalls (to 6 ft) and bottom of tank covered with epoxy. It is used for the collection and storage of wastewater and waste oil. Received ww and slop oil from barge cleaning and deballast lines. Water from bottom released directly to the lower holding pond (SWMU 13) and to T48 (SWMU 11) through WW transfer lines (SWMU 2). Oil on top was shipped to off-site refinery 2 times/yr.
13	Lower Holding Pond	RCRA-Interim Status at time of RFA. Northwest of tanks and southeast of Dravo WWTS (SWMU15). RCRA-regulated lined surface impoundment for the collection of stormwater and ww prior to treatment in the Dravo WTS (SWMU 15). 1,305,000 gal cap and 13,125 sf. Originally had soil base, then HDPE liner was installed in 1981. At that time, 1 to 5 ft soil removed to add capacity to pond. In 1981, Hydrocarbon Monitor Catch Basins (SWMU 9), settling basin (as part of the unit and made of concrete, 15 ft x 15 ft x 11 ft deep with sloped bottom), energy dissipation chamber were installed. WW from the Road Trench (SWMU 1) first goes through the settling basin. Energy dissipation chamber is at the effluent of the pond to keep flow even to Dravo WWTS (SWMU 15). It is concrete 15 ft x 18 ft x 11.5 ft deep with removable baffle.
14	Upper Holding Pond	RCRA-Interim Status at time of RFA. Northwest of tank farm. RCRA-regulated lined surface impoundment for the collection of stormwater and ww prior to release to the lower holding pond (SWMU 13) and treatment in the Dravo WTS (SWMU 15). 1,750,000 gal cap and 10,000 sf. Location was formerly part of T41 Dike (SWMU 22). Installed in 1981, old soil excavated and replaced with clean, compacted soil and HDPE liner. Received WW from T41 & T48 (SWMUs 10 & 11), stormwater from Tank Farm Drainage System (SWMU 12) and Road Trench (SWMU 1). Effluent discharged to lower pond (SWMU 13) on as needed basis.

Table 1
SWMU and AOC List

Kinder Morgan Facility Staten Island, NY

SWMU No./ AOC	Identification	Description
15	Dravo Water Treatment System (WTS)	2 Dravo resin bed filters and a sludge reclamation tank located in a concrete block bldg with concrete floor. Part of SPDES system (not RCRA). Concrete curbing exists at all entrances to bldg. Floor drains to Road Trench (SWMU 1). WW from lower holding pond (SWMU 13) goes through the 2 filters (2 cyclindrical tanks 15 ft tall and 13 ft diam) then discharged to permitted outfall. Filters backwashed periodically and backwash waste discharged to sludge reclamation tank (cyclindrical tank 10-12 ft diam and 21 ft high with 23,000 gal cap). Non-pumpables removed by vac truck for off-site disposal.
16	Container Storage Pad	6" thick concrete pad, uncovered, 25 ft x 25 ft, slopes to concrete secondary containment surrounding the separators (SWMUS 5 &6). Barge scale, water treatment sludges, and separator sludges in 55-gal drums for less than 90 days. Rebuilt in 1990, when the pad was installed.
17	Excavated Soils Area	Located on southeast side of facility across road from T52 and T55. Area of about 200 ft x 300 ft. Storage and disposal of fill removed from excavations across the facility (e.g. dirt piles located along hill on east side of facility from tank dike upgrade in 1990 and 1991), sand from sandblasting, broken-up asphalt and general construction debris. Currenlty the location of a solar panel farm.
18	North Beach Recovery Wells	Installed in 1980. 2 gw recovery wells (LRW-1 and LRW-2) installed to remediate the North Beach GW Plume. Water pumped to lower holding pond (SWMU 13), oil to North Beach Recovery Well Holding Tank (SWMU 19). LRW-1 was only used for short time. LRW-2 was active until 1991 when it collapsed.
19	North Beach Recovery Well Holding Tank	Installed in 1980. It is a steel horizontal storage tank, 550 gallon, product was transported to T48 (SWMU 11) by vac truck. Inactive since 1991. No secondary containment.
20	Southern Groundwater Plume Recovery Well	Located at southwest end of site near terminal office and warehouse. Plume found in 1981. Speculation that source was tank farn area drainage conduit associated with the Road Trench (SWMU 1), which is believed to have been partially submerged.
21	Boiler House Recovery Well	Installed in 1982. Well NRW-2 on east side of Boiler House. Gasoline had been observed in some of the borings in the area in late 1981. Source undetermined.
22	T41 Dike	Operational in 1957. Located on the northwest portion of the facility. Originally constructed as secondary containment for T41. In 1981, part of area modified to build upper holding pond (SWMU 14) which decreased the cap of containment. T41 was used for product storage. Containment also servesw as overflow for ponds.
23-62	Tank Farm Dikes	Earthen berms surrounding product storage tanks. Since 1990/1991 upgrade, the Tank Farm Drainage System, Tank Farm Catch Basins (SWMU 3) and impermeable liners have been operational. Soil excavated from the units during installation of the liners was placed in the Excavated Soils Area (SWMU 17). Managed rainwater and any product accidentally released with the bottom water. Prior to lining, some releases were directly to soils.
A	PCB Tranformer Sites	Along main facility road, north of the north beach area. 6 former PCB transformer locations. Transformers removed and shipped off-site for disposal in 1982.

Table 2
SWMU and AOC Status Summary

Kinder Morgan Facility Staten Island, NY

SWMU No./ AOC	Identification	Description	Status
1	Road Trench	The unit runs along the west side of the main facility road in the western portion of the facility. It consists of reinforced concrete trench and associated conduit (unknown construction) between the tank farm and Arthur Kill and is approx. 4 ft wide x 5 ft deep x 2,300 ft long, split into 2 sections. It has 6 sump/pumping stations. The unit receives separated wastewater (WW) from the oil/water separators (OWSs) (SWMUs 5 & 6) & pumpable sludges from the Dravo Water Treatment System (WTS or WWTS) (SWMU 15) via WW transfer lines (SWMU 2). The unit received leachate from tank dikes before installation of the claymax liners at the dikes in 1990/1991. Active since facility startup.	Road trench is required to be cleaned out and visually inspected for integrity. Investigation and remediation, if necessary is proposed.
2	Wastewater (WW) Transfer Lines	Located primarily aboveground in the dock area & throughout the WW treatment areas. Consists of wrapped concrete piping with flanges and steel transfer piping. Transfers barge cleaning water to T48 and T60 (SWMUs 11 & 12) as well as OWSs (SWMUs 5 & 6), water from vacuum truck unloading pad to T48, WW from T48 and T60 to holding ponds (SWMUs 13 & 14).	RFA recommended no further action.
3	Tank Farm Catch Basins	In-ground concrete basins located for each tank, approximately 6 ft x 10 ft x 10 ft deep installed prior to installation of impermeable liners in 1990/1991. The basins receive tank bottom water which is pumped to vac truck and then discharged to T48 (SWMU11). Prior to installation of the catch basins,discharge of tank bottom water was to the inside earthen dike area.	RFA recommended no further action.
4	Former API Separator Site	Located adjacent to and partially covered by container storage pad (SWMU 16) on western portion of facility. Aboveground, constructed of concrete, no lining. Estimated to be 12 ft x 80 ft, demolished in the late 70s.	Investigation and remediation, if necessary will be conducted as part of Area 7 remediation.
5	Primary API Separator	Installed in 1975 with an impervious lining in 1990. It is located west of the lower holding pond (SWMU 13) and south of Dravo WWTS (SWMU 15). It is aboveground, constructed of reinforced concrete with impervious lining, 10 ft x 65 ft x 4.5 ft deep, on concrete pad with 6 in curbs.	Investigation and remediation, if necessary will be conducted as part of Area 7 remediation.
6	Utility API Separator	Installed in 1975 with an impervious lining in 1990. It is located west of the lower holding pond (SWMU 13) and south of Dravo WWTS (SWMU 15). It is aboveground, constructed of reinforced concrete with impervious lining, 12 ft x 70 ft x 4.5 ft deep, on concrete pad with 6 in curbs.	Investigation and remediation, if necessary will be conducted as part of Area 7 remediation.
7	Vacuum Tank 1 (High Flash Tank)	Installed in 1986, replacing a steel riveted box tank. It is located south of Dravo WWTS (SWMU 15) in western portion of facility. It is a cylindrical steel tank, 8 ft 6 in diameter by 12 ft high, mounted on a 4 ft tall steel base, within concrete containment dike with 4 ft tall walls and sump. It receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling. Steam pumped through tank with condensation released to sump below. Water in the containment is pumped back into the tank.	Investigation and remediation, if necessary will be conducted as part of Area 7 remediation.
8	Vacuum Tank 2 (Low Flash Tank)	Installed in 1976. It is located south of Vac Tank 1(SWMU 7) and Dravo WTS (SWMU 15) in western portion of facility. It is a cylindrical steel tank, 7 ft diameter by 15 ft long, cradle-mounted horizontally on 4 ft concrete pilings, within concrete containment dike with 2 ft tall walls and sump. Receives petroleum product residue from barge cleaning operations via product piping. The petroleum product is transferred to T48 (SWMU 11) for separation and settling.	Tank is required to be cleaned out and visually inspected for integrity. Investigation and remediation, if grossly contaminated media is encountered.
9	Hydrocarbon Monitor Catch Basins (HMCB)	Installed in 1981. It is located adjacent to holding pond inlets. It contains two in ground concrete tanks 20 ft x 20 ft x 10 ft deep. It receives WW from Tank Farm Dikes (SWMUs 23 through 62) via Tank Farm Drainage System.	Investigation and remediation, if necessary, will be conducted as part of SWMUS 13 and 14.
10	Waste Storage T41	Installed in 1937. It is a steel AST, 45 ft diameter by 25 ft (4,212,600 gal cap) with an earthen dike. Storage and separation (by gravity) of waste petroleum product and water. Water from bottom was sent to lower holding pond (SWMU 13). Oil on top was shipped to off-site refinery. Unit was taken out of service in 1989.	Investigation and remediation, if necessary, will be conducted as part of SWMUS 23-62.
11	Waste Storage T48	Installed in 1943. It is a steel AST, 100 ft diameter by 35 ft (2,058,000 gal cap). Sidewalls (to 6 ft) and bottom of tank covered with epoxy. It is used for the collection and storage of WW contaminated with petroleum product. It receives the following: 1. Drippage from Drip Pans and tank bottom water from the catch basins (SWMU 3) collected by vac truck, transported to T48, and unloaded at the vac truck unloading pad. 2.Petroleum product & petroleum product /water mixtures from barge cleaning pumped through the WW transfer lines (SWMU 2). 3. Oil layer from separators (SWMUs 5 & 6). Water from bottom released through WW transfer line (SWMU 2) to separators (SWMUs 5 & 6). The oil on top was shipped to off-site refinery 2 times/yr.	RFA recommended no further action.

Table 2
SWMU and AOC Status Summary

Kinder Morgan Facility Staten Island, NY

SWMU No./ AOC	Identification	Description	Status
12	T60	Tank T60 was installed in 1950. It is a steel AST, 60 ft diameter by 48 ft (1,012,200 gal cap). Sidewalls (to 6 ft) and bottom of tank covered with epoxy. It is used for the collection and storage of wastewater and waste oil. Received ww and slop oil from barge cleaning and deballast lines. Water from bottom released directly to the lower holding pond (SWMU 13) and to T48 (SWMU 11) through WW transfer lines (SWMU 2). Oil on top was shipped to off-site refinery 2 times/yr.	RFA recommended no further action.
13	Lower Holding Pond	RCRA-Interim Status at time of RFA. Northwest of tanks and southeast of Dravo WWTS (SWMU15). RCRA-regulated lined surface impoundment for the collection of stormwater and ww prior to treatment in the Dravo WTS (SWMU 15). 1,305,000 gal cap and 13,125 sf. Originally had soil base, then HDPE liner was installed in 1981. At that time, 1 to 5 ft soil removed to add capacity to pond. In 1981, Hydrocarbon Monitor Catch Basins (SWMU 9), settling basin (as part of the unit and made of concrete, 15 ft x 15 ft x 11 ft deep with sloped bottom), energy dissipation chamber were installed. WW from the Road Trench (SWMU 1) first goes through the settling basin. Energy dissipation chamber is at the effluent of the pond to keep flow even to Dravo WWTS (SWMU 15). It is concrete 15 ft x 18 ft x 11.5 ft deep with removable baffle.	Pre-remedial Investigation recommended and remediation if grossly contaminated media is encountered.
14	Upper Holding Pond	RCRA-Interim Status at time of RFA. Northwest of tank farm. RCRA-regulated lined surface impoundment for the collection of stormwater and ww prior to release to the lower holding pond (SWMU 13) and treatment in the Dravo WTS (SWMU 15). 1,750,000 gal cap and 10,000 sf. Location was formerly part of T41 Dike (SWMU 22). Installed in 1981, old soil excavated and replaced with clean, compacted soil and HDPE liner. Received WW from T41 & T48 (SWMUs 10 & 11), stormwater from Tank Farm Drainage System (SWMU 12) and Road Trench (SWMU 1). Effluent discharged to lower pond (SWMU 13) on as needed basis.	Pre-remedial Investigation recommended and remediation if grossly contaminated media is encountered.
15	Dravo Water Treatment System (WTS)	2 Dravo resin bed filters and a sludge reclamation tank located in a concrete block bldg with concrete floor. Part of SPDES system (not RCRA). Concrete curbing exists at all entrances to bldg. Floor drains to Road Trench (SWMU 1). WW from lower holding pond (SWMU 13) goes through the 2 filters (2 cylindrical tanks 15 ft tall and 13 ft dam) then discharged to permitted outfall. Filters backwashed periodically and backwash waste discharged to sludge reclamation tank (cylindrical tank 10-12 ft dam and 21 ft high with 23,000 gal cap). Non-pumpables removed by vac truck for off-site disposal.	RFA recommended no further action.
16	Container Storage Pad	6" thick concrete pad, uncovered, 25 ft x 25 ft, slopes to concrete secondary containment surrounding the separators (SWMUS 5 &6). Barge scale, water treatment sludges, and separator sludges in 55-gal drums for less than 90 days. Rebuilt in 1990, when the pad was installed.	• RFA recommended no further action.
17	Excavated Soils Area	Located on southeast side of facility across road from T52 and T55. Area of about 200 ft x 300 ft. Storage and disposal of fill removed from excavations across the facility (e.g. dirt piles located along hill on east side of facility from tank dike upgrade in 1990 and 1991), sand from sandblasting, broken-up asphalt and general construction debris. Currently the location of a solar panel farm.	Pre-remedial Investigation recommended and remediation if grossly contaminated media is encountered.
18	North Beach Recovery Wells	Installed in 1980. 2 gw recovery wells (LRW-1 and LRW-2) installed to remediate the North Beach GW Plume. Water pumped to lower holding pond (SWMU 13), oil to North Beach Recovery Well Holding Tank (SWMU 19). LRW-1 was only used for short time. LRW-2 was active until 1991 when it collapsed.	RFA recommended no further action.
19	North Beach Recovery Well Holding Tank	Installed in 1980. It is a steel horizontal storage tank, 550 gallon, product was transported to T48 (SWMU 11) by vac truck. Inactive since 1991. No secondary containment.	RFA recommended no further action.
20	Southern Groundwater Plume Recovery Well	Located at southwest end of site near terminal office and warehouse. Plume found in 1981. Speculation that source was tank farm area drainage conduit associated with the Road Trench (SWMU 1), which is believed to have been partially	RFA recommended no further action.
21	Boiler House Recovery Well	Installed in 1982. Well NRW-2 on east side of Boiler House. Gasoline had been observed in some of the borings in the area in late 1981. Source undetermined.	RFA recommended no further action.
22	T41 Dike	Operational in 1937. Located on the northwest portion of the facility. Originally constructed as secondary containment for T41. In 1981, part of area modified to build upper holding pond (SWMU 14) which decreased the cap of containment. T41 was used for product storage. Containment also serves as overflow for ponds.	Investigation and remediation, if necessary, will be conducted as part of SWMUS 23-62.
23-62	Tank Farm Dikes	Earthen berms surrounding product storage tanks. Since 1990/1991 upgrade, the Tank Farm Drainage System, Tank Farm Catch Basins (SWMU 3) and impermeable liners have been operational. Soil excavated from the units during installation of the liners was placed in the Excavated Soils Area (SWMU 17). Managed rainwater and any product accidentally released with the bottom water. Prior to lining, some releases were directly to soils.	Pre-remedial Investigation recommended and remediation if grossly contaminated media is encountered.
A	PCB Transformer Sites	Along main facility road, north of the north beach area. 6 former PCB transformer locations. Transformers removed and shipped off-site for disposal in 1982.	No further action.

Table 3
Soil Cleanup Objectives

Kinder Morgan Facility Staten Island, NY

Constituent	Facility Perimeter Bulkhead and Non-Perimeter Areas SCO
BTEX and MTBE (ug/mg)	
Benzene	89,000
Toluene	1,000,000
Ethylbenzene	780,000
Total Xylenes	1,000,000
MTBE	1,000,000
PAHs (ug/kg)	
Acenaphthene	1,000,000
Acenaphthylene	1,000,000
Anthracene	1,000,000
Benzo(a)anthracene	11,000
Benzo(a) pyrene	1,100
Benzo(b)fluoranthene	11,000
Benzo(g,h,i)perylene	1,000,000
Benzo(k)fluoanthene	110,000
Chrysene	110,000
Dibenzo(a,h) anthracene	1,100
Fluoranthene	1,000,000
Fluorene	1,000,000
Indeno(1,2,3-cd)pyrene	11,000
1-Methylnapthalene	--
2-Methylnapthalene	--
Naphthalene	1,000,000
Phenanthrene	1,000,000
Pyrene	1,000,000
Lead (mg/kg)	
Lead	3,900

Notes:

Based on Part 375-6/CP-51 Restricted Use Industrial SCOs
BTEX Benzene, Toluene, ethylbenzene, and xylenes
MTBE Methyl Tertiary Butyl Ether
PAHs Polyaromatic Hydrocarbons
ug/kg micrograms per kilogram
mg/kg milligrams per kilogram
SCO Soil Cleanup Objective
-- not available

Table 3
Soil Cleanup Objectives

Kinder Morgan Facility Staten Island, NY

Constituent	Part 375-6/CP-51 Restricted Use Industrial SCO	Part 375-6/CP-51 Restricted Use Ecological SCO	Calculated Ecological SCO	Facility Perimeter Tidal Flat Area SCO
BTEX and MTBE (ug/kg)				
Benzene	89,000	70,000	--	70,000
Toluene	1,000,000	36,000	--	36,000
Ethylbenzene	780,000	--	325,000	325,000
Total Xylenes	1,000,000	260	--	260
MTBE	1,000,000	--	198,000	198,000
LMW PAHs (ug/kg)				
Acenaphthene	1,000,000	20,000	--	20,000
Acenaphthylene	1,000,000	--	--	177,000(1)
Anthracene	1,000,000	--	--	177,000(1)
Fluoranthene	1,000,000	--	--	177,000(1)
Fluorene	1,000,000	30,000	--	30,000
1-Methylnapthalene	--	--	--	177,000(1)
2-Methylnapthalene	--	--	--	177,000(1)
Naphthalene	1,000,000	--	--	177,000(1)
Phenanthrene	1,000,000	--	--	177,000(1)
Total LMW PAHs	--	--	177,000	177,000
HMW PAHs (ug/kg)				
Benzo(a)anthracene	11,000.00	--	--	5,700(2)
Benzo(a)pyrene	1,100	2,600	--	1,100
Benzo(b)fluoranthene	11,000	--	--	5,700(2)
Benzo(g,h,l)perylene	1,000,000	--	--	5,700(2)
Benzo(k)fluoranthene	110,000	--	--	5,700(2)
Chrysene	110,000	--	--	5,700(2)
Dibenzo(a,h)anthracene	1,100	--	--	1,100
Ideno(1,2,3-cd)pyrene	11,000	--	--	5,700(2)
Pyrene	1,000,000	--	--	5,700(2)
Total HMW PAHs	--	--	5,700	5,700
Lead (mg/kg)				
Lead	3,900	63	--	63

Notes:

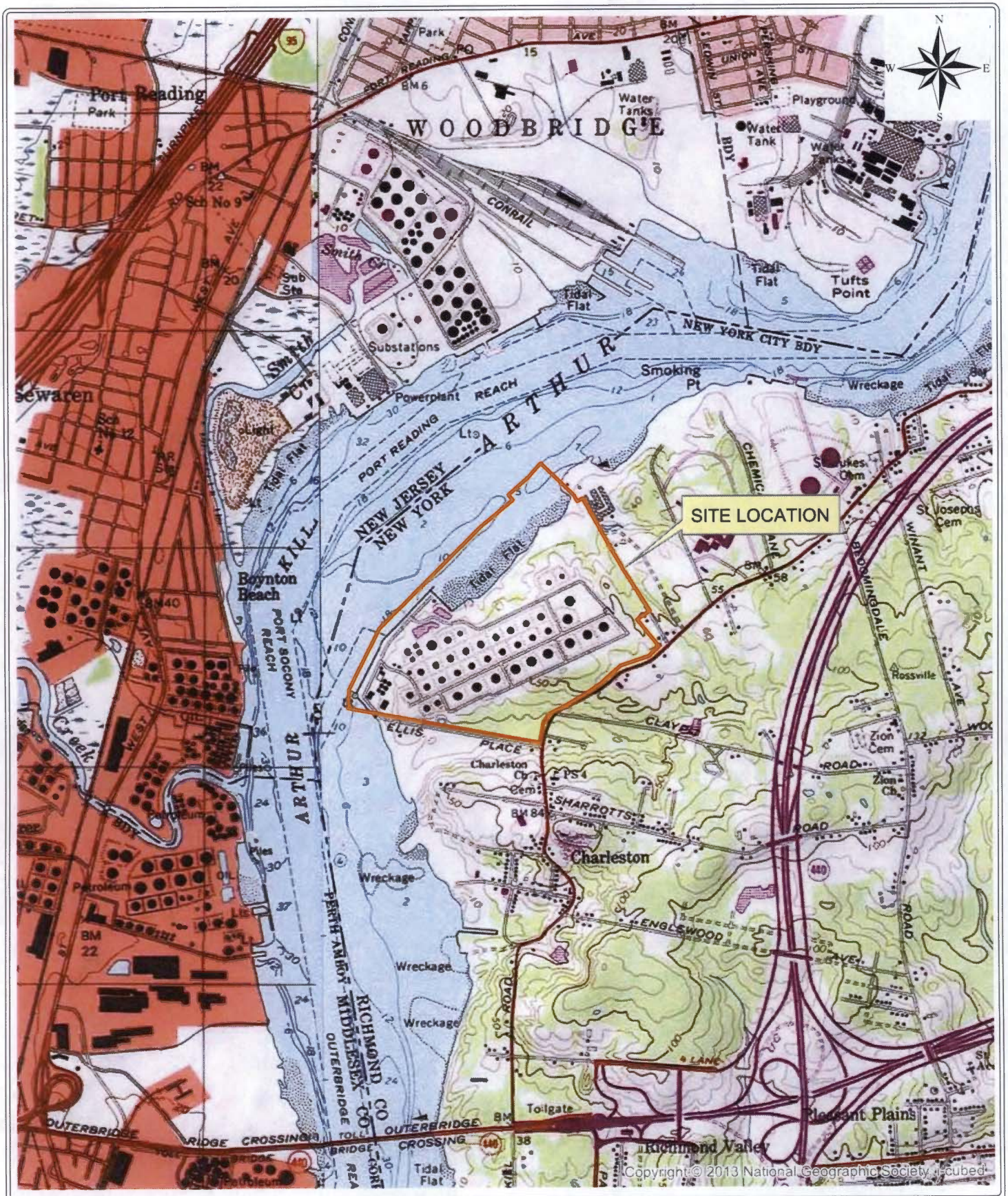
BTEX = benzene, toluene, ethylbenzene and xylenes
MTBE = Methyl Tertiary Butyl Ether
LMW PAHs = Low Molecular Weight Polyaromatic Hydrocarbons
HMW PAHS = High Molecular Weight Plyaromatic Hydrocarbons

ug/kg = Micrograms per kilogram
mg/kg = Milligrams per kilogram
SCO = Soil Cleanup Objective
"--" = Not available/not calculated

(1) The SCO for this constituent has been set to the lower SCO calculated for total LMW PAHs. Note that the sum of all LMW PAHs cannot exceed 177,000 ug/kg.

(2) The SCO for this constituent has been set to the lower SCO calculated for total HMW PAHs. Note that the sum of all HMW PAHs cannot exceed 5,700 ug/kg.

FIGURES



SCALE:

2,000 1,000 0 2,000

Graphic Scale in Feet

TITLE:

SITE LOCATION MAP
STATEN ISLAND, NEW YORK

PROJECT:

Conceptual CMI Addendum

CLIENT NAME:

Staten Island Marine Development

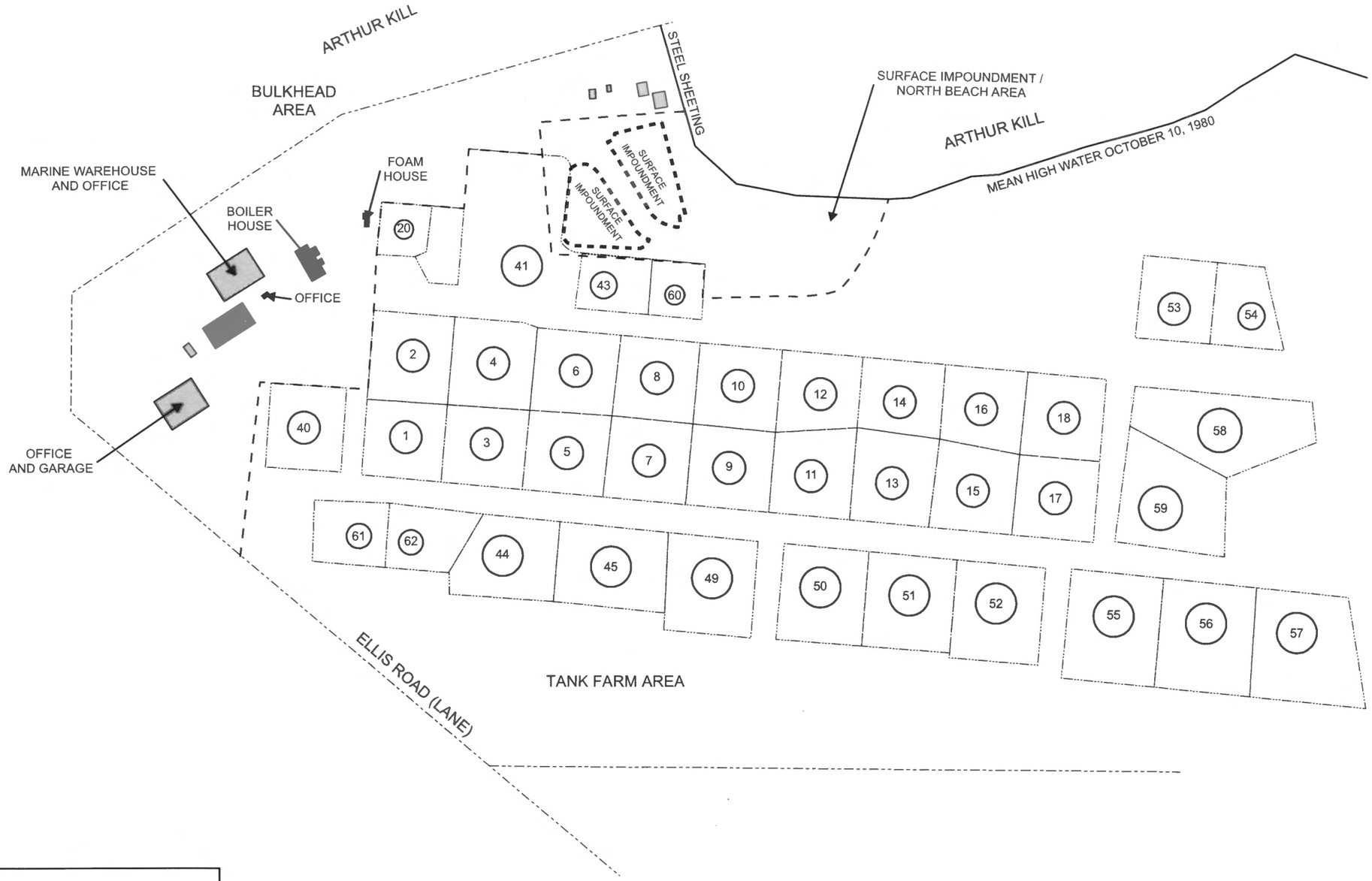
WESTON SOLUTIONS

DATE:

May 2019

FIGURE #:

1



Legend

- (2) Existing Aboveground Tank with Identification Number
- Containment Berm
- Surface Impoundment
- Buildings

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan
Kinder Morgan Luquids Terminals, Staten Island, New York

LEGEND:
350 175 0 350
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

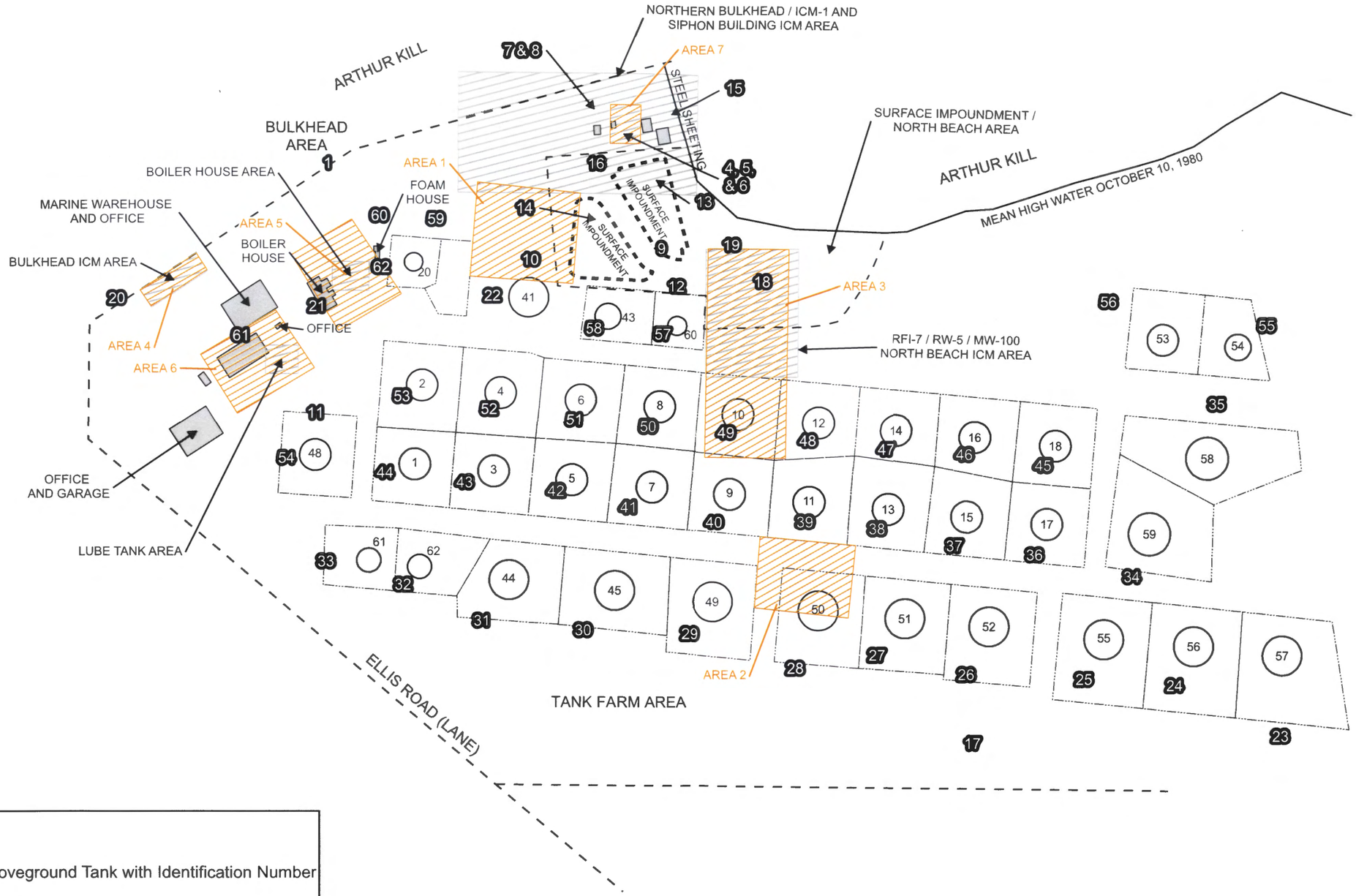
TITLE:
FACILITY WIDE SITE PLAN
STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 2

P:\Staten_Island_Marine\mxd\CMI_Addendum\23880_SIMD_Facility_Wide_Site_Plan.mxd



Legend

- (2) Existing Aboveground Tank with Identification Number
- 9 SWMU Location
- Areas of Remediation
- Containment Berm
- ICM Area
- Surface Impoundment
- Buildings

Notes:
1. SWMU – Solid Waste Management Unit
2. SWMU 2 and 3 locations are not shown. The transfer lines (SWMU 2) are located throughout the facility primarily in the dock area and throughout the wastewater treatment areas. The tank farm catch basins (SWMU 3) include all facility tanks and part of SWMUs 23-62.

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan
Kinder Morgan Liquids Terminals, Staten Island, New York

LEGEND
350 175 0 350
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

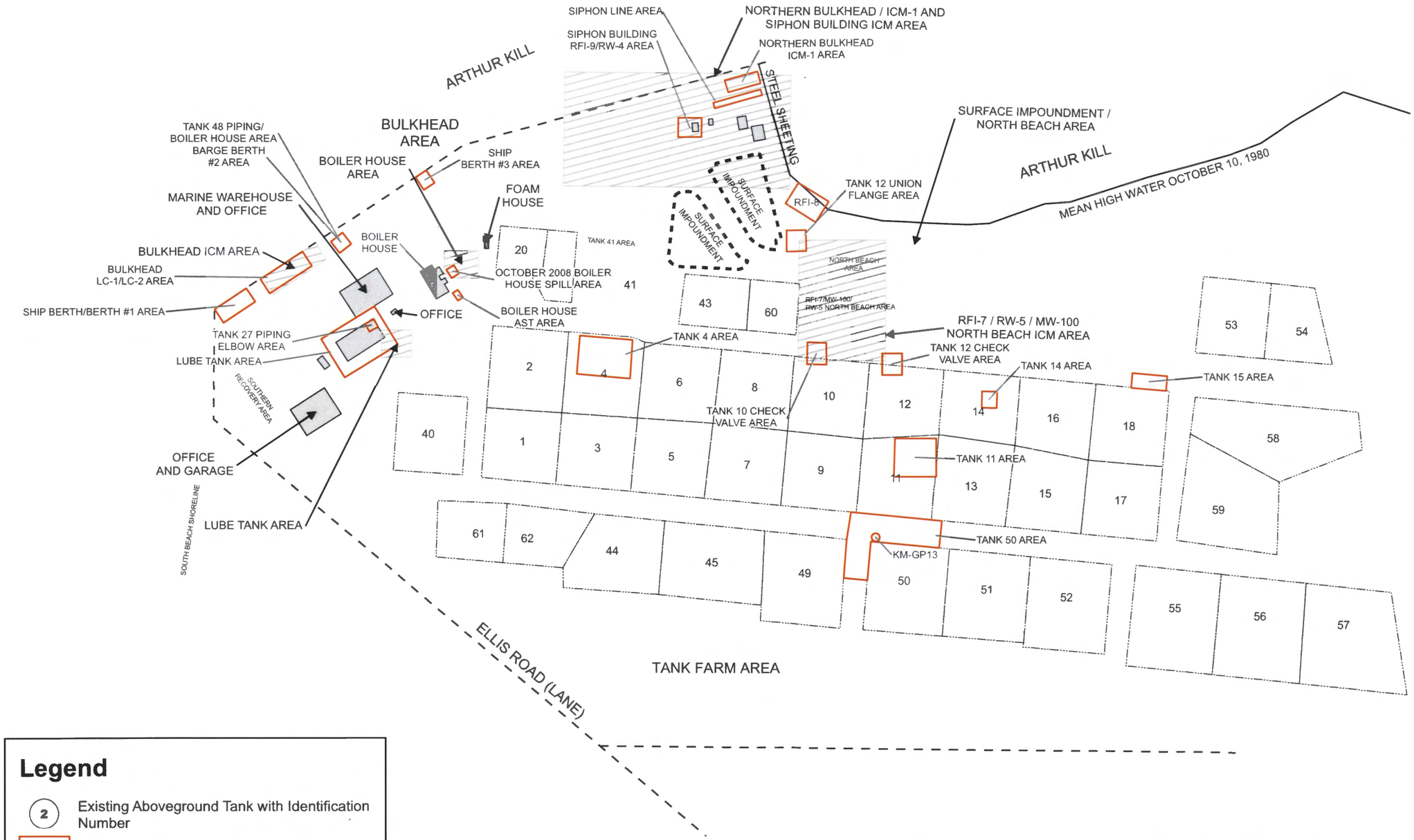
TITLE:
SWMU/AREAS OF REMEDIATION LOCATION MAP STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 3

P:\Staten_Island_Marine\mxd\CMI_Addendum\23964_SIMD_CMI_SWMU_Map.mxd.mxd



Legend

- (2) Existing Aboveground Tank with Identification Number
- ICM Area
- Containment Berm
- ICM Area
- Surface Impoundment
- Buildings

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan
Kinder Morgan Luquids Terminals, Staten Island, New York

LEGEND
350 175 0 350
Graphic Scale in Feet

PROJECT: Kinder Morgan Terminal

CLIENT NAME: Staten Island Marine Development

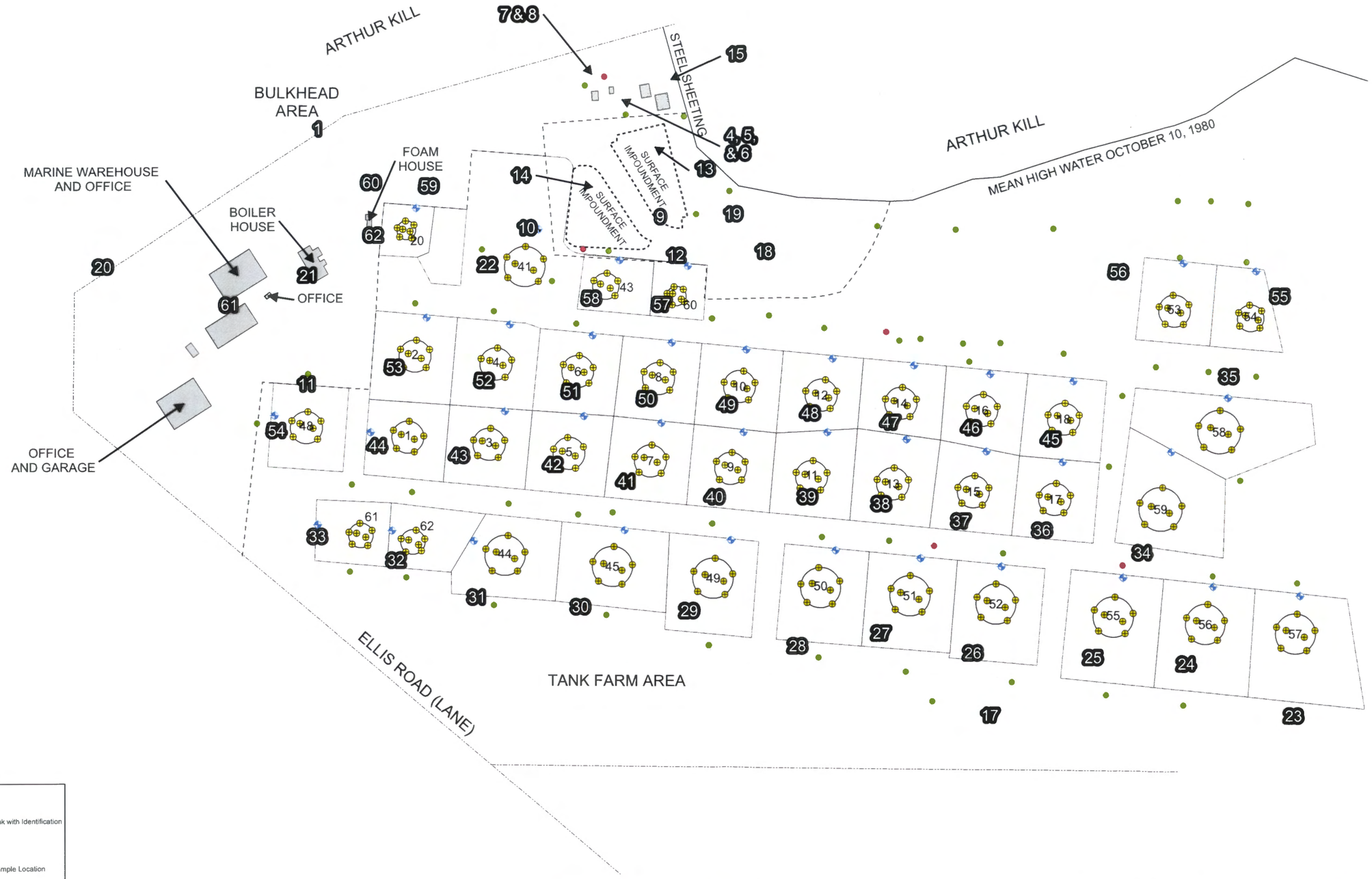
TITLE:
COMPLETED AND CURRENT ICM LOCATIONS AND HOT SPOT AREAS STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 4

P:\Staten_Island_Marine\mxd\CMI_Addendum\24035_SIMD_ICM_Loc_Hot_Spot_Areas.mxd.mxd



Legend

- Existing Aboveground Tank with Identification Number
- SWMU Location
- Proposed Surface Soil Sample Location
- Proposed Temporary Well Point
- Historical Soil BTEX Below Industrial Restricted Use Cleanup Objectives
- Historical Soil BTEX Above Industrial Restricted Use Soil Cleanup Objectives
- Containment Berm
- Surface Impoundment
- Buildings

160 80 0 160
Graphic Scale in Feet

Note:
1. SWMU – Solid Waste Management Unit
2. Surface soil locations are representative of average tank size. Actual number of samples to be field verified based on one sample per 100' of actual tank perimeter.

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan, Kinder Morgan Liquids Terminals, Staten Island, New York

WESTON SOLUTIONS SM
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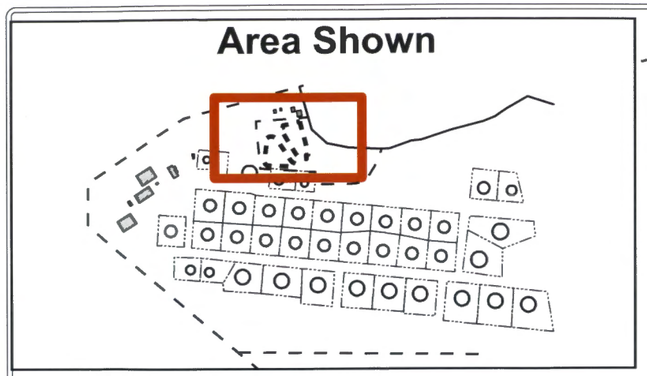
http://www.westonsolutions.com

REPORT DATE: May 2019	PROJECT MANAGER: M. Affiitto	CLIENT NAME: Conceptual CMI Addendum	DRAWING TITLE: PROPOSED SOIL SAMPLE LOCATION MAP – TANKS AND TANK IMPOUNDMENT AREAS (SWMU 23-62) STATEN ISLAND, NEW YORK
DRAWING (MXD, DWG, Cad, Proposed_Tank_and_Impoundment_Samples.mxd PATH= P:\Staten_Island_Marine\mxd\CMI_Addendum\	CHECKED BY: M. Affiitto		
REVISION No:	CONTRACT No: DELIVERY ORDER NO:	PROJECT NAME: Staten Island Marine Development	
WORK ORDER No: 15588.002.001.0005	DRAWN/MODIFIED BY: K. Heulitt DATE CREATED: 5/9/2019		FIGURE: 5 SCALE: 1 " = 160 ' DATE: 5/9/2019



STEEL SHEETING

SURFACE IMPOUNDMENT

SURFACE IMPOUNDMENT

Legend

- (2) Existing Aboveground Tank with Identification Number
- ⊕ Proposed Surface Sample Location
- Historical Soil Boring, No Exceedance
- Historical Soil Boring, Exceedance/Product Observed
- Historical Test Pit, No Exceedance
- Historical Test Pit, Exceedance/Product Observed

Source:
1. Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan Kinder Morgan Liquids Terminals, Staten Island, New York.
2. Louis Berger Area 7 Extent of Excavations Kinder Morgan Liquids Terminals, Staten Island, New York.
3. PhotoMaps by Nearmap, March 2019.

LEGEND:
80 40 0 80
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

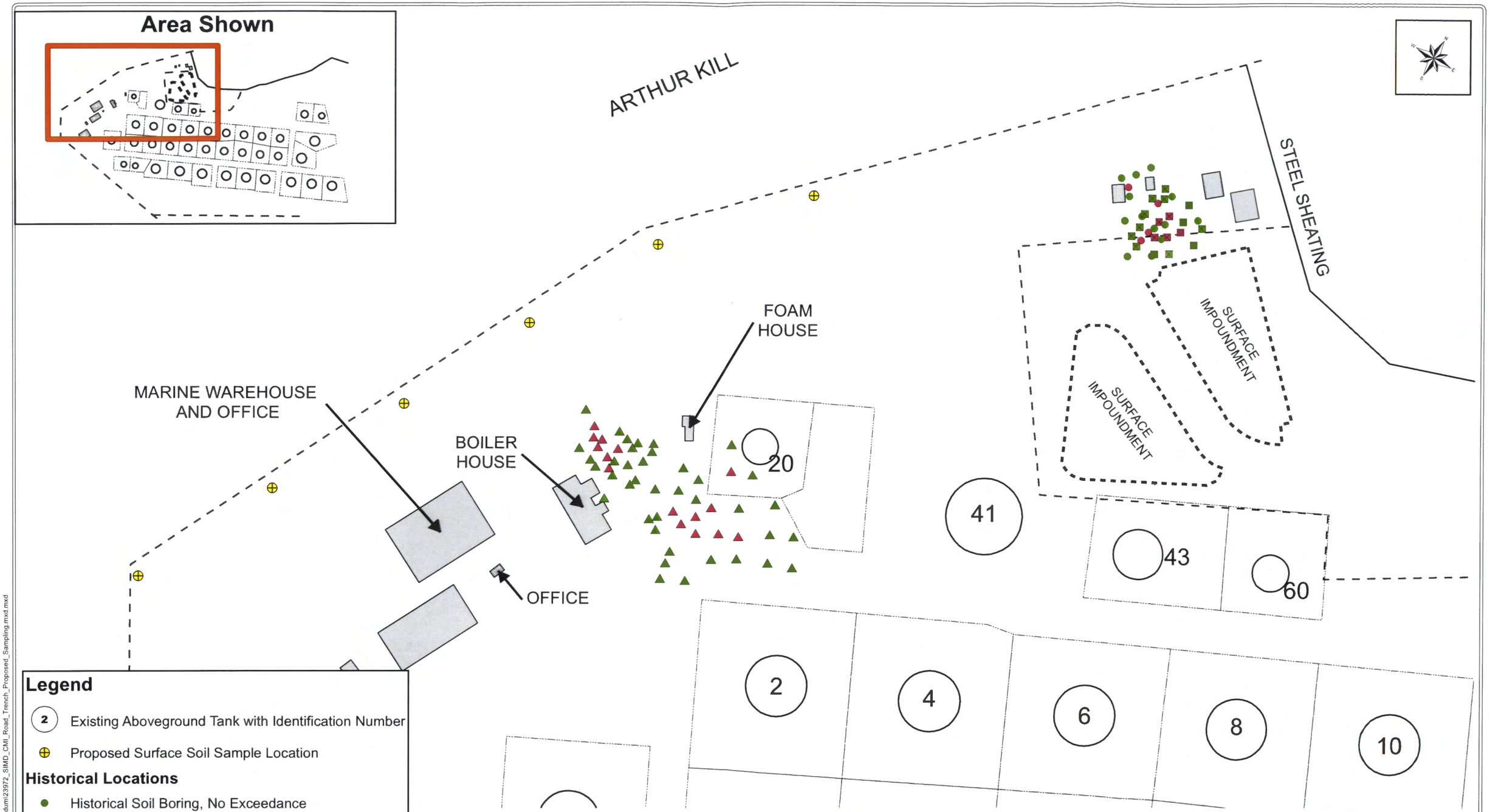
TITLE:
PROPOSED SAMPLE LOCATION MAP SURFACE IMPOUNDMENTS (SWMU 13 AND 14) STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 6

P:\Staten_Island_Marine\mxd\CMI_Addendum\23970_SIMD_CMI_Holding_Ponds_Proposed_Sampling.mxd



Legend

- (2) Existing Aboveground Tank with Identification Number
- ⊕ Proposed Surface Soil Sample Location

Historical Locations

- ● Historical Soil Boring, No Exceedance
- ● Historical Soil Boring, Exceedance/Product Observed
- ▲ Temporary Well, No Exceedance
- ▲ Temporary Well, Product Observed
- ■ Historical Test Pit, No Exceedance
- ■ Historical Test Pit, Exceedance/Product Observed

Note:
1. Typical sample location to be field adjusted biased toward cracks in concrete trench lining or other evidence of potential contamination.

Source:
1. Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan Kinder Morgan Liquids Terminals, Staten Island, New York.
2. Louis Berger Area 7 Extent of Excavations Kinder Morgan Liquids Terminals, Staten Island, New York.
3. PhotoMaps by Nearmap, March 2019.

LEGEND: 150 75 0 150 Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

TITLE: PROPOSED SAMPLE LOCATION MAP ROAD TRENCH (SWMU 1) STATEN ISLAND, NEW YORK

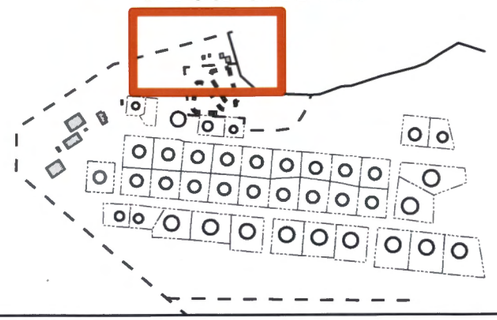
WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 7

P:\Staten_Island_Marine\mxd\CMI_Addendum\23972_SIMD_CMI_Road_Trench_Proposed_Sampling.mxd.mxd

Area Shown



STEEL SHEETING

SURFACE IMPOUNDMENT

Legend

- (2) Existing Aboveground Tank with Identification Number
- ⊕ Proposed Surface Soil Sample Location
- ● Historical Soil Boring, No Exceedance
- ● Historical Soil Boring, Exceedance/Product Observed
- ■ Historical Test Pit, No Exceedance
- ■ Historical Test Pit, Exceedance/Product Observed

Source:
1. Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan Kinder Morgan Liquids Terminals, Staten Island, New York.
2. Louis Berger Area 7 Extent of Excavations Kinder Morgan Liquids Terminals, Staten Island, New York.
3. PhotoMaps by Nearmap, March 2019.

LEGEND:
80 40 0 80
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

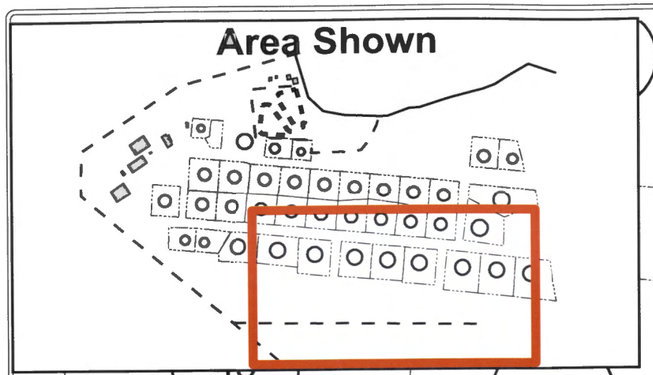
TITLE:
PROPOSED SAMPLE LOCATION MAP
VACUUM TANK 2 (SWMU 8)
STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 8

P:\Staten_Island_Marine\mxd\CMI_Addendum\24080_SIMD_Vacuum_Tank_2_Proposed_Sampling.mxd



11
13
15
17
59
49
50
51
52
55
56
57

TANK FARM AREA

Legend

(2) Existing Aboveground Tank with Identification Number

⊕ Proposed Surface Soil Sample Location

Source:
1. Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan Kinder Morgan Liquids Terminals, Staten Island, New York.
2. Louis Berger Area 7 Extent of Excavations Kinder Morgan Liquids Terminals, Staten Island, New York.
3. PhotoMaps by Nearmap, March 2019.

LEGEND:
150 75 0 150
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

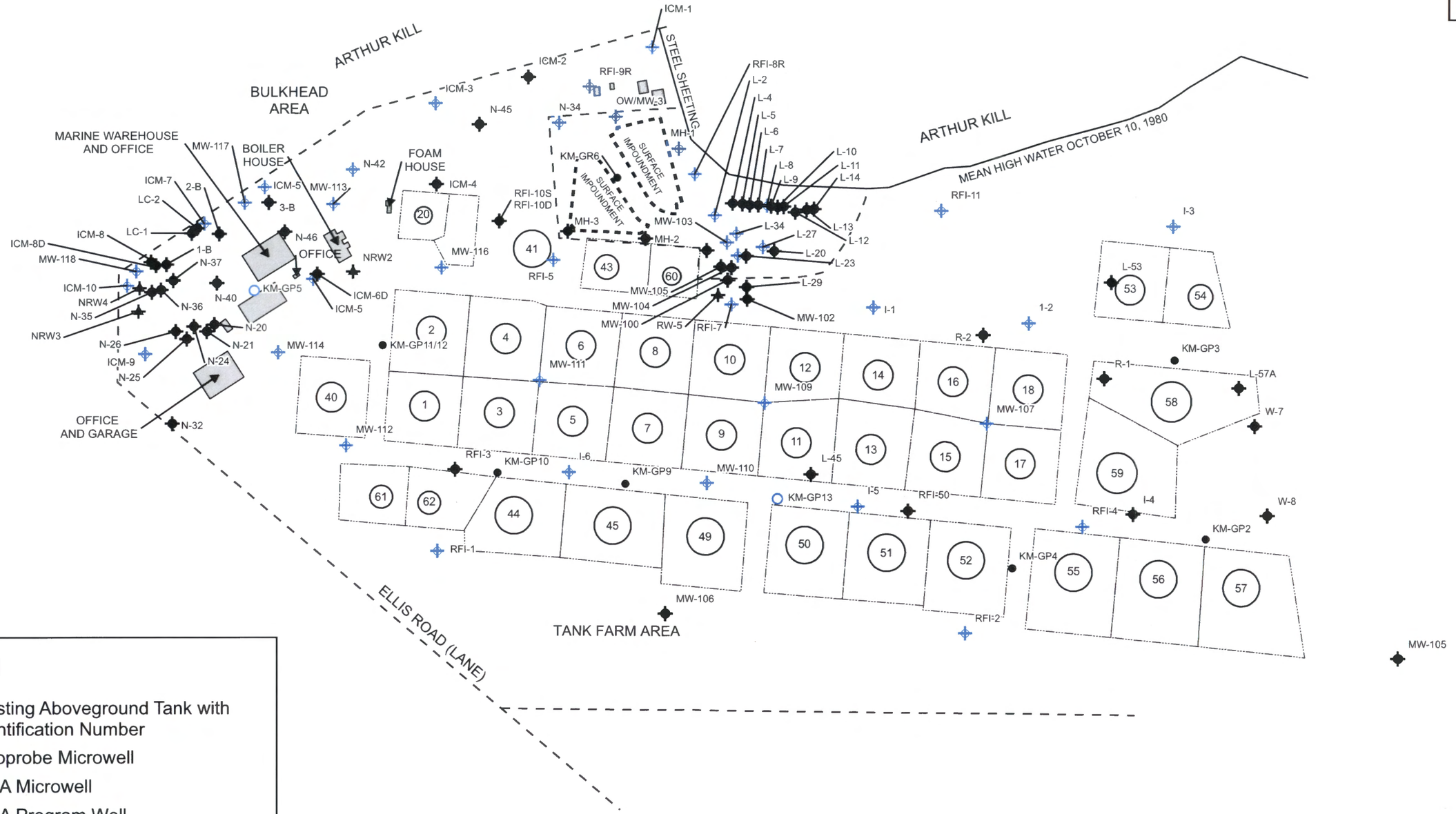
TITLE:
PROPOSED SAMPLE LOCATION MAP EXCAVATED SOIL AREA (SWMU 17) STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 9

P:\Staten_Island_Marine\mxd\CMI_Addendum\24081_SIMD_Excavated_Soil_Area_Proposed_Sampling.mxd.mxd



Legend

- (2) Existing Aboveground Tank with Identification Number
- Geoprobe Microwell
- MNA Microwell
- MNA Program Well
- Monitoring Well
- Recovery Well
- Containment Berm
- Surface Impoundment
- Buildings

Source:
Louis Berger Area 6 (Former Lube Tanks) Facility Wide Site Plan
Kinder Morgan Luquids Terminals, Staten Island, New York

LEGEND:
350 175 0 350
Graphic Scale in Feet

PROJECT: Conceptual CMI Addendum

CLIENT NAME: Staten Island Marine Development

TITLE: EXISTING MONITORING WELL LOCATION MAP
STATEN ISLAND, NEW YORK

WESTON SOLUTIONS SM

DATE: May 2019

FIGURE #: 10

P:\Staten_Island_Marine\mxd\CMI_Addendum\23965_SIMD_CMI_Monitoring_Wells.mxd.mxd