Remedial Alternatives Analysis

ECL Article 27/Title 14

NYSDEC Site #C828162

Former Vacuum Oil Refinery

5, 15 Flint Street
City of Rochester, New York 14608

Prepared for:
One Flint Street, LLC
120 East Avenue
Rochester, New York 14604

Prepared by:
Ravi Engineering and Land Surveying, P.C.
2110 S. Clinton Ave, Suite 1
Rochester, New York 14618

October 2016 P.N. 45-14-003/0L

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 8
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May 10, 2017

Mr. Thomas Masaschi
One Flint St., LLC
120 East Avenue, 3rd Floor
Rochester, NY 14604

Dear Mr. Masaschi;

Re: 5 & 15 Flint Street, Site #C828162
Remedial Alternatives Analysis
October 7, 2016
City of Rochester, Monroe County

The New York State Departments of Environmental Conservation (NYSDEC) and Health (NYSDOH; collectively referred to as the Departments) have completed their review of the Remedial Alternatives Analysis (the Report) dated October 7, 2016 and prepared by Ravi Engineering & Land Surveying. P.C. for the 5 & 15 Flint Street site located in the City of Rochester, Monroe County.

The proposed remedy is a Track 1: Unrestricted Use remedy with a Track 4: Restricted Use contingency and is referred to as the Excavation to Pre-Release Conditions remedy. The Elements of the Proposed Remedy are provided in Attachment 1.

Additionally, NYSDEC offers the following corrections and clarifications to the Report:

- Figure 3 in the Report is replaced by the Figure 3 provided in Attachment 2.

Please attach this letter and all attachments to the front of the Report and place copies in the document repositories established for the site.

Please distribute copies of the Report as follows:

- Frank Sowers (NYSDEC) – 1 paper copy and 1 complete electronic copy on CD;
- Bridget Boyd (NYSDOH) – 1 paper copy and 1 complete electronic copy on CD;
- Wade Silkworth (MCHD) – 1 complete electronic copy on CD;
- John Frazer (MCHD) - 1 complete electronic copy on CD;
- Phillis Wheatley Community Library (document repository)- 1 paper copy and 1 complete electronic copy on CD; and
- The Plymouth-Exchange Neighborhood Association (document repository) - 1 paper copy and 1 complete electronic copy on CD.

Thank you for your cooperation in this matter and please contact me at 585-226-5357 or frank.sowers@dec.ny.gov if you have any questions.

Sincerely,

Frank Sowers, P.E.
Professional Engineer 1

Enclosure:
Attachment 1 – Elements of the Proposed Remedy
Attachment 2 – Figure 3

ec:w/Encl.
B. Conlon
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ATTACHMENT 1

5 & 15 Flint Street
Brownfield Cleanup Program
Rochester, Monroe County
Site No. C828162
May 2017

ELEMENTS OF THE PROPOSED REMEDY

The alternatives developed for the site and the evaluation of the remedial criteria are presented in the Alternative Analysis. The remedy is proposed pursuant to the remedy selection criteria set forth in DER-10, Technical Guidance for Site Investigation and Remediation and 6 NYCRR Part 375.

The proposed remedy is a Track 1 remedy.

The proposed remedy is referred to as the Excavation to Pre-Release Conditions remedy.

The elements of the proposed remedy are as follows:

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

The existing on-site buildings will be demolished and materials which can't be beneficially reused on site will be taken off-site for proper disposal in order to implement the remedy.

Excavation and off-site disposal of contaminant source areas, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u);
- non-aqueous phase liquids;
- soil with visual waste material or non-aqueous phase liquid; and
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G.

Excavation and off-site disposal of all on-site soils which exceed unrestricted SCOs, as defined by 6 NYCRR Part 375-6.8. If a Track 1 cleanup is achieved, a Cover System will not be a required element of the remedy. Approximately 100,000 cubic yards of contaminated soil will be removed from the site.

Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site.

3. Enhanced Bioremediation

In-situ enhanced biodegradation will be employed to treat contaminant**s** in groundwater within the excavation areas. The biological breakdown of contaminants through aerobic respiration will be enhanced by the placement of an oxygen release compound (ORC), or similar material into the subsurface. The material will be placed within the excavations described in remedy element 2 prior to backfilling.

Contingent Remedy:

The intent of the remedy is to achieve Track 1 unrestricted use; therefore no environmental easement or site management plan is anticipated. In the event that Track 1 unrestricted use is not achieved, the following contingent remedial elements will be required and the remedy will achieve a Track 4 restricted-residential cleanup.

1. Remedial Design

A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. Excavation

The existing on-site buildings will be demolished and materials which can't be beneficially reused on site will be taken off-site for proper disposal in order to implement the remedy.

Excavation and off-site disposal of contaminant source areas, including:

- grossly contaminated soil, as defined in 6 NYCRR Part 375-1.2(u); and
- non-aqueous phase liquids;
- soils that create a nuisance condition, as defined in Commissioner Policy CP-51 Section G; and

- soil containing total polychlorinated biphenyls (PCBs) exceeding 1 ppm in the top two feet of soil and 10 ppm in soils below two feet.

Approximately 22,000 cubic yards of contaminated soil will be removed from the site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to replace the excavated soil or complete the backfilling of the excavation and establish the designed grades at the site.

3. Cover System:

A site cover will be required to allow for restricted residential use of the site in areas where the upper two feet of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). The site cover may consist of paved surface parking areas, sidewalks, or a soil cover. Where a soil cover is to be used it will be a minimum of two feet of soil placed over a demarcation layer, with the upper six inches of soil of sufficient quality to maintain a vegetative layer. Soil cover material, including any fill material brought to the site, will meet the SCOs for cover material as set forth in 6 NYCRR Part 375-6.7(d). In areas where building foundations or building slabs preclude contact with the soil, the requirements for a site cover will be deferred until such time that they are removed.

4. Engineering and Institutional Controls

Imposition of an institutional control in the form of an environmental easement and a Site Management Plan, as described below, will be required. The remedy will achieve a Track 4 restricted residential cleanup at a minimum and will include imposition of a site cover (as a contingency if soil greater than 2 feet but less than 15 feet deep does not meet the restricted residential SCOs), an environmental easement, and site management plan as described below.

5. Institutional Control

Imposition of an institutional control in the form of an environmental easement for the controlled property which will:

- require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- allow the use and development of the controlled property for restricted residential use, commercial use or industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- require compliance with the Department approved Site Management Plan.

6. Site Management Plan

A Site Management Plan is required, which includes the following:

a. an Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in Paragraph 5 above.

Engineering Controls: The soil cover discussed in Paragraph 3 above.

This plan includes, but may not be limited to:

- an Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- a provision should redevelopment occur to ensure no soil exceeding protection of groundwater concentrations will remain below storm water retention basin or infiltration structures.

- descriptions of the provisions of the environmental easement including any land use, and groundwater use restrictions;
- a provision for evaluation of the potential for soil vapor intrusion for any occupied buildings on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- a provision that should a building foundation or building slab be removed in the future, a cover system consistent with that described in Paragraph 3 above will be placed in any areas where the upper two feet of exposed surface soil exceed the applicable soil cleanup objectives (SCOs)
- provisions for the management and inspection of the identified engineering controls;
- maintaining site access controls and Department notification; and
- the steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. a Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- monitoring of groundwater to assess the performance and effectiveness of the remedy;
- a schedule of monitoring and frequency of submittals to the Department; and
- monitoring for vapor intrusion for any occupied existing or future buildings on the site, as may be required by the Institutional and Engineering Control Plan discussed above.

ATTACHMENT 2

RAVI ENGINEERING & LAND SURVEYING, P.C.
2110 S. Clinton Ave., Suite 1
Rochester, New York 14618
585-223-3660 p
585-697-1764 f
An MBE/DBE Firm
www.ravieng.com

PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

PROJECT NAME: 5, 15 FLINT STREET ROCHESTER, NEW YORK BROWNFIELD CLEANUP PROGRAM NYSDEC SITE #C828162

TITLE: TRACK 1 PROPOSED REMEDIAL EXCAVATION

PROJECT NO: 45-14-003-0L

DATE: APRIL 2016

DRAWING NO: FIGURE 3

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DRAWINGS

CERTIFICATIONS

I, Nancy S. Van Dussen, certify that I am currently a NYS registered professional engineer and that this plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that the site description presented in this Remedial Alternatives Analysis (RAA) is identical to the site descriptions presented in the Brownfield Cleanup Agreement for 5, 15 Flint Street in the City of Rochester and related amendments.

I certify that this RAA includes proposed use restrictions, Institutional Controls, Engineering Controls, and plans for all operation and maintenance requirements applicable to the Site and provision for development of an Environmental Easement to be created and recorded pursuant to ECL 71-3605 [if Track 1 is not achieved]. This RAA requires that all affected local governments, as defined in ECL 71-3603, will be notified that such Easement has been recorded. This RAWP requires that a Site Management Plan must be submitted by the Applicant for the continual and proper operation, maintenance, and monitoring of all Engineering Controls employed at the Site, including the proper maintenance of all remaining monitoring wells, for approval by the Department [if Track 1 is not achieved].

I certify that this RAA has a plan for import of all soils and other material from off-Site and that all activities of this type will be in accordance with all local, State and Federal laws and requirements.

I certify that that this RAA has a plan for nuisance control during the remediation and all invasive development work, including a dust, odor and vector suppression plan and that such plan is sufficient to control dust, odors and vectors and will prevent nuisances from occurring.

I certify that all information and statements in this certification are true. I understand that a false statement made herein is punishable as Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

061266	10-7-16	Nancy S. Van Dussen
NYS Professional Engineer #	Date	Signature

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

1.0 INTRODUCTION

One Flint Street, LLC has elected to pursue cleanup and redevelopment of the 5, 15 Flint Street property under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP) as NYSDEC Site #C828162 (the "Site"). The Site consists of two (2) non-contiguous parcels on the south side of Flint Street, totaling approximately 7.2 acres on the western bank of the Genesee River in Rochester, New York. This Remedial Alternatives Analysis (RAA) and provides a summary of remedial alternatives evaluated and selects remedial actions to be implemented for the remediation at the 5, 15 Flint Street site in the City of Rochester, New York.

2.0 BACKGROUND

The Site is a grass-, brush-, and tree-covered undeveloped parcel. The majority of the Site ground surface and sub-surface is influenced by historical fill materials deposited on the Site. The Site slopes downward to the west bank of the Genesee River. A narrow City of Rochester property separates the 5 Flint Street and 15 Flint Street properties; it is the filled bed of the historic Genesee Valley Canal that was subsequently used as a Pennsylvania Railroad corridor.

The parcels are generally located south and west of the intersection of Flint Street and Exchange Street, and are part of the former Vacuum Oil Site. The Vacuum Oil Company was a predecessor of ExxonMobil Oil Corporation. The petroleum processing that was conducted at the Vacuum Oil refinery included crude oil distillation to produce lighter end kerosene products and heavier lubricating oil products, polishing of the lubricating oils, and grease manufacturing. The Vacuum Oil refinery included other related operations, including tin can manufacturing. Below is a description of each of the two (2) parcels:

5 Flint Street Parcel – Former Barrel Prep and Storage Area

This parcel is a 1.6-acre parcel that is zoned "R-1" for low density residential use; the land is currently vacant. An existing three-story block and brick building is located in the northeast end of 5 Flint Street. It was reportedly built between 1918 and 1930, and has been vacant without utilities for an unknown amount of time. The currently undeveloped portion of the 5 Flint Street parcel was vacant land until approximately 1875.

After that time, the parcel was developed with various buildings associated with the Vacuum Oil refinery. Records indicate that 5 Flint Street originally served as shipping and receiving yard between two railroad corridors, along which raw materials for the refinery were received and refinery products were shipped. Barrel manufacturing and/or storage were reportedly conducted at the northeastern end of the parcel and several oil storage tanks were located in the southwestern part of the parcel in the 1890s. The refinery continued operations until closing in approximately 1935, at which point the facility was a lube blending facility until about1933 when operations ceased. By that time nearly 95% of the 5 Flint Street parcel had been improved with various buildings including a cooperage (barrel factory), drum washing and storage buildings, a paint shop, barrel stave storage buildings and sheds, a storage building for barrel headings and iron, and other unidentified support buildings.

15 Flint Street Parcel – Former Storage and Operations Area

This parcel is a 5.6-acre parcel that is zoned "R-1" for low density residential. There are three (3) buildings present on the parcel, including an approximately 1,600-square-foot (sq. ft.) brick building, a metal storage building, and a concrete block building.

The 15 Flint Street parcel was vacant land until approximately 1875, when the Vacuum Oil refinery expanded on to the site from its original operations on the north side of Flint Street. The property was used as a petroleum storage and processing facility until approximately 1892, and then for lube oil blending until approximately 1933, when the facility closed. Refinery structures occupied nearly the entire 15 Flint Street parcel except for the southernmost extension of the parcel south of the southeast end of Riverview Place. Grade level foundation and retaining walls from the original refinery structures still remain on the parcel.

The Vacuum Oil Company owned the 15 Flint Street parcel until 1940. Since that time, the site has operated as a scrap metal salvage yard, an automobile wrecking and salvage yard, an automotive junkyard, and a car crushing facility.

The Site is currently in the "R-1"- zoning district, which allows for low density residential uses. Commercial or multi-family use would require rezoning. As indicated by the City of Rochester Brownfield Opportunity Areas (BOA) Application, the City is in support of the redevelopment of this area.

3.0 SUMMARY OF PREVIOUS INVESTIGATIONS

Site Investigation Report, NYSDEC, March 2001

In 1999-2000, the NYSDEC conducted an investigation that consisted of a passive soil gas survey, surface soil samples, subsurface soil samples, and groundwater samples from three monitoring wells on the 5 Flint Street parcel, the bicycle path to the east, the former canal, and the undeveloped area to the south of the Site.

The results of this investigation indicated widespread petroleum-related contamination (SVOCs) and benzene/toluene/ethylbenzene/xylenes (BTEX) in the surface soil, subsurface soil, and groundwater. The most significant petroleum contamination was detected at the 5 Flint Street parcel. To a lesser extent, chlorinated VOCs, metals, and pesticides were detected in concentrations that exceeded NYS standards.

The results of this investigation indicated that Site contamination was not the result of disposal of a consequential amount of hazardous waste. As a result of these findings, NYSDEC did not include the Refinery Site in the NYS Listing of Inactive Hazardous Waste Disposal Sites.

Roux Associates, Inc.

The Roux Associates, Inc. (Roux) January 12, 2009 *Subsurface Investigation Summary Report* documented the activities associated with the subsurface investigation that Roux conducted from June 16 through July 2, 2008 during which 117 soil borings were advanced at the Site and on adjacent parcels that were at one time a part of the Vacuum Oil refinery property.

2008 Roux - Soil

Soil borings were collected in the Former Storage and Operations Area (15 Flint Street), Former Canal and Rail Area (offsite), the former barrel prep and storage area (5 Flint Street), the bicycle path area (offsite), and in the undeveloped area. Fill materials consisting of automobile parts, construction and demolition (C/D) debris, concrete, ash, slag, bricks, wood, cinders, and pipe were encountered throughout the Site. Soil staining was noted in the soil borings; free product was noted in 15 Flint Street soil borings. Volatile organic compound (VOC) vapors were monitored with a photoionization detector (PID); headspace PID readings ranged from non-detect to 2,498 parts per million (ppm) in on-site borings. PID readings as high as 4,378 ppm were observed in the off-site bicycle path area.

A total of 181 soil samples were submitted for laboratory analysis. Analytical results are summarized below:

- 23 VOCs were detected at concentrations at or above the laboratory reporting limits and 14 VOCs exceeded the applicable NYS Soil Cleanup Objectives (SCO);
- 155 VOC tentatively identified compounds (TICs) were detected at concentrations at or above the laboratory reporting limits;
- 29 semivolatile organic compounds (SVOCs) detected at concentrations at or above the laboratory reporting limits and 15 SVOCs exceeded the applicable NYS SCO;
- 247 SVOC TICs were detected at concentrations at or above the laboratory reporting limits;
- 13 pesticides and three polychlorinated biphenyls (PCBs) were detected at concentrations at or above the laboratory reporting limits and three pesticides exceeded the applicable NYS SCO;
- 12 Priority Pollutant (PP)-13 total metals were detected at concentrations at or above the laboratory reporting limits and 9 PP-13 total metals exceeded the applicable NYS SCO;
- 23 soil samples collected and analyzed for total petroleum hydrocarbon (TPH) fingerprinting exhibited a match for “diesel fuel, gasoline and/or motor oil.”

2008 Roux - Groundwater

Roux collected a total of 26 groundwater samples; analytical results are summarized below:

- 31 VOCs were detected at concentrations at or above the laboratory reporting limits, and 24 VOCs exceed the applicable NYS Ambient Water Quality Standard (AWQS);
- 71 VOC TICs were detected at concentrations at or above the laboratory reporting limits;
- 21 SVOCs were detected at concentrations at or above the laboratory reporting limits, and 11 SVOCs exceed the applicable NYS AWQS;
- 109 SVOC TICs were detected at concentrations at or above the laboratory reporting limits;
- Four pesticides and one PCB were detected at concentrations at or above the laboratory reporting limits, and one pesticide and one PCB exceed the applicable NYS AWQS;
- 13 Priority Pollutants-13 (PP-13) dissolved metals were detected at concentrations at or above the laboratory reporting limits and four PP-13 dissolved metals exceed the applicable NYS AWQS;
- 11 ground water samples collected and analyzed for total petroleum hydrocarbons (TPH) Fingerprinting exhibited a match for Diesel Fuel, Gasoline, and Motor Oil.

2008 Labella - Soil

Labella Associates, P.C. (Labella) was retained by the City of Rochester in October 2008 to conduct a Phase II Environmental Site Assessment (ESA) to supplement the Roux data. Labella collected a total of 27 soil samples for laboratory analysis. Results are summarized below:

- 20 VOCs were detected at concentrations at or above the laboratory reporting limits and 5 VOCs exceeded the applicable NYS SCO;
- Total VOC TICs ranged from 4.0 to 1,379 ppm and five samples exceeded the SCO;
- 15 SVOCs were detected at concentrations at or above the laboratory reporting limits and 4 SVOCs exceeded the applicable NYS SCO;
- SVOC TICs (total) ranged from 0.022 to 11.55 ppm;
- Ten metals were detected at concentrations at or above the laboratory reporting limits and two exceeded the applicable NYS SCO;
- Based on visual evidence of impairment, soil samples collected from soil borings B-18 (4 to 8 ft. deep) and B-27 (6.2 to 8 ft. deep) were submitted to the laboratory for a Hydrocarbon Fuel Scan. Results indicated that the sample collected from soil boring B-18 was

representative of crude oil, fuel oil, or similar material. The sample collected from soil boring B-27 was representative of naphtha, gasoline, crude oil, fuel oil, or similar material.

2008 Labella - Groundwater

Labella collected eighteen groundwater samples for laboratory analysis. Results are summarized below:

- 25 VOCs were detected at concentrations at or above the laboratory reporting limits and 9 VOCs exceed the applicable NYS AWQS;
- 15 SVOCs were detected at concentrations at or above the laboratory reporting limits and 4 SVOCs exceed the applicable NYS AWQS;
- One PCB was detected at a concentration at or above the laboratory reporting limit: it did not exceed the applicable NYS AWQS.

2011 Labella – Test Pits

In accordance with its Remedial Investigation Work Plan (RIWP), Labella conducted field work in March 2011; they excavated five test pits and collected five soil samples that were submitted for laboratory analysis:

- VOCs were detected in four samples; two samples had at least one VOC that exceeded Part 375 Unrestricted Soil Cleanup Objectives (SCOs).
- SVOCs were detected in three samples; two samples had SVOC concentrations that exceeded Unrestricted SCOs.
- Two samples analyzed for metals had detections; both samples had mercury concentrations that exceeded Unrestricted SCO, and one sample had arsenic and lead concentrations that exceeded Unrestricted SCOs.
- Two samples were analyzed for pesticides; one sample had a 4,4-DDT concentration that exceeded Unrestricted SCOs.

Other Media

The media of concern are identified as soil and groundwater; the historic data and the RE&LS Remedial Investigation (RI) did not identify any other media of concern.

Risk Assessment

If no remedial measures are conducted, an exposure pathway exists for pedestrians to come into direct contact with contaminated surface soils. Construction workers on the Site will also be at risk of exposure if remedial measures are not implemented.

People are not coming into contact with the contaminated groundwater, because the area is served by a public water supply that is not affected by this contamination. The future proposed use of the Site would either remove contaminated subsurface soils or restrict access and prevent exposure to contaminated subsurface soils through the use of institutional controls.

4.0 REMEDIAL ACTION OBJECTIVES (RAOs)

The objective of this RAA is to evaluate remedial alternatives to address the contaminants of concern at the Site as presented above, and to select the most appropriate remedy that is protective of human health and the environment and ensures short- and long-term effectiveness, in light of cost and future use of the Site. As defined in NYSDEC DER-10 (Section 4.2), remedial alternatives shall be evaluated based on the following criteria:

1.) *Overall Protection of Public Health and the Environment* - This criterion evaluates exposure and residual risks to human health and the environment during or subsequent to implementation of the alternative.

2.) *Compliance with Standards, Criteria and Guidance (SCG)* - This criterion evaluates whether the remedial alternative will ultimately result in compliance with SCG, to the extent practicable.

3.) *Long-Term Effectiveness and Permanence* - This criterion evaluates if the remedy is effective in the long-term after implementation (e.g., potential rebound). In the event that residual impacts will remain as part of the alternative, then the risks and adequacy/reliability of the controls are also evaluated.

4.) *Reduction of Toxicity, Mobility, or Volume with Treatment* - This criterion evaluates the reduction of contaminant toxicity, mobility or volume as a result of the remedial alternative. In addition, the reversibility of the contaminant destruction or treatment is evaluated.

5.) *Short-Term Effectiveness* - This criterion evaluates if the remedial alternative protects the community, workers and the environment during implementation.

6.) *Implementability* - This criterion evaluates the remedial alternative based on its suitability, implementability at the specific site, and availability of services and materials that will be required.

7.) *Cost* - This criterion evaluates the capital, operation, maintenance, and monitoring costs for the remedial alternative. The estimated costs are presented on a present worth basis.

8.) *Community Acceptance*-This criterion evaluates if the remedial action is likely to be viewed favorably by the community at large.

9.) *Land Use*- This criterion evaluates the consistency of the remedial action with the reasonably anticipated future land uses of the site and its surroundings.

4.1 Soils

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

4.2 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground water contamination.

4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

5.0 OBJECTIVES

To be consistent with the City of Rochester R-1 Low-Density Residential District zoning, a Track 1 remedy for Unrestricted Use is proposed, since pursuant to 6 NYCRR 375-1.8(g)(2)(i), institutional or engineering controls are not allowed for single-family housing. Completion of the Track 1 cleanup will avoid possible exposure to neighboring and future residents.

The Site is divided from the north side of the historic *Vacuum Oil* property. The City of Rochester is working with New York State in their Brownfield Opportunity Area (BOA) program to address contamination on the property. As part of the BOA process, the City is considering rezoning the property to either a PD Planned Development District or R-3 High-Density Residential District, which would allow multifamily dwellings and possibly commercial uses. However, no formal rezoning process has begun, and the State Environmental Quality Review Act (SEQRA) review process, which must precede any decision making on rezoning is not complete, so it cannot be determined at this juncture whether there will be rezoning.

In accordance with DER-10 Section 4.4(d)2, the AAR will develop, at a minimum "one alternative, if the alternative proposed will achieve unrestricted use relative to soil contamination, without the use of institutional/engineering controls" for a Track 1 cleanup.

- Track 1, 6 New York Codes, Rules and Regulations (NYCRR) Part 375-3.8(e)(1) requires site media to meet 6 NYCRR Part 375 SCOs that will allow the Site to be used for any purpose without restrictions on the Use of the Site (i.e., unrestricted use). The soil cleanup must achieve the unrestricted use criteria at any depth above bedrock. Exceedances of the unrestricted SCOs were observed from grade to the top of bedrock on the entire 5 Flint Street parcel, and the northern portion of the 15 Flint Street parcel. Therefore this alterative assumes approximately 100,000 cubic yards (cy) or 160,000 tons of soil/fill will be removed.

Since groundwater contamination is present and there is the potential for off-site migration, DER-10 requires remedy selection to:

1. Identify a remedy for the site that includes removal, containment, or treatment of the on-site sources contributing to the groundwater contamination, as set forth in DER-10 Section 4.1(d)2.

If the City rezones the Site in a timely fashion to allow for development, then a Track 2 or 4 cleanup can be considered.

Remedial Action Objectives

The development of an appropriate remedial approach begins with definition of site-specific Remedial Action Objectives (RAOs) to address substantial public health and ecological risk or other significant environmental issues identified during remedial investigations. In developing the RAOs, considerations is given to the reasonably anticipated future use of the Property (i.e., residential reuse) and the applicable SCGs. Accordingly, appropriate RAOs for the BCP Site has been defined as:

Soil/Fill RAOs

- Remove or treat soil/fill in exceedance of unrestricted SCOs and prevent degradation of on-site and off-site groundwater quality.
- Remove or treat metals-impacted soil/fill areas to the degree necessary to prevent further degradation of groundwater quality and remove soil/fill that exceeds unrestricted SCOs.
- Prevent ingestion/direct contact with soil/fill where contaminant levels exceed SCOs.
- Prevent off-site migration of soil/fill contaminants in surface water in excess of SCOs.

Groundwater RAOs

- Prevent ingestion of contact with groundwater containing contaminant levels exceeding TOGS 1.1.1 Groundwater Standards or with evidence of or contact with light non-aqueous phase liquid (LNAPL).
- Remove, capture, or otherwise mitigate LNAPL as potential source of groundwater contamination.
- Remove soil/fill in exceedance of SCOs to achieve on-site groundwater plume stabilization and prevent off-site migration of contaminated groundwater, to the extent feasible.

Soil Vapor RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

General Response Actions

General Response Actions (GRAs) are broad classes of actions that are developed to achieve the RAOs and form the foundation for the identification and screening of remedial technologies and alternatives.

Soil/Fill

In a Track 1 cleanup, the GRAs available to address the RAOs for soil/fill include:

- Treatment (e.g., in-situ or ex-situ)
- Excavation and off-site disposal

Groundwater
The GRAs available to address the RAOs for groundwater include:

- Monitored natural attenuation
- Treatment (e.g., in-situ or ex-situ)

Soil Vapor
The GRAs available to address the RAOs for Soil Vapor include:

- Source Removal
- Treatment (e.g., vapor extraction)
- Mitigation (e.g. active sub-slab depressurization)

Standards, Criteria, and Guidance

According to DER-10 Section 1.3(b)71, SCGs mean "standards and criteria that are generally applicable, consistently applied, and officially promulgated, that are either directly applicable or not directly applicable but are relevant and appropriate, unless good cause exists why conformity should be dispensed with, and with consideration being given to guidance determined, after the exercise of scientific and engineering judgement, to be applicable.

Additional discussions concerning the specific SCOs that may be applicable, relevant, or appropriate to remedy selection for the Property are presented below:

Chemical Specifics SCGs

Chemical-specific SCGs are usually health- or risk-based concentrations in environmental media (e.g., air, soil, water), or methodologies that when applied to site-specific conditions, result in the establishment of concentrations of a chemical that may be found in, or discharged to, the ambient environment. The determination of potential chemical-specific SCGs for a site is based on the: nature and extent of contamination; potential migration pathways and release mechanisms for site contaminants; reasonably anticipated future site use; and likelihood that exposure to site contaminants will occur.

Based on the proposed Track 1 cleanup, site-specific action levels are proposed for the Site (SSALs). The following SSALs were developed for the Site based on its proposed residential use and will be used to designate soil/fill requiring remediation. The contaminants of concern (COCs) and applicable SCOs for Unrestricted Use are:

VOCs	**Unrestricted Use SCO (ppm)**	**Restricted Restricted Residential SCO (ppm)**
Acetone	0.05	100
1,2,4-Trimethylbenzene	3.6	52
Xylenes (total)	0.26	100
2-Butanone	0.12	100
1,1-Dichloroethane	0.27	26

SVOCs	**Unrestricted Use SCO (ppm)**	**Restricted-Restricted Residential SCO (ppm)**
Acenaphythene	20	100
Anthracene	100	100
Benzo (a) anthracene	1	1
Benzo (a) pyrene	1	1
Benzo (b) fluoranthene	1	1
Benzo (g,h,i) Perylene	100	100
Benzo (k) Fluoranthene	0.8	3.9
Chrysene	1	3.9
Dibenz (a,h) anthracene	0.33	0.33
Dibenzofuran	7	59
Flouranthene	100	100
Flourene	30	100
Indeno (1,2,3-cd) pyrene	0.5	0.5
Naphthalene	12	100
Phenantherene	100	100
Pyrene	100	100

Metals	**Unrestricted Use SCO (ppm)**	**Restricted-Restricted Residential SCO (ppm)**
Antimony	12	NS
Arsenic	13	16
Barium	350	400
Cadmium	2.5	4.3
Chromium	30	180
Copper	50	270
Lead	63	400
Nickel	30	310
Selenium	3.9	180
Silver	2	180
Zinc	109	10,000
Mercury	0.18	0.81

PCB	**Unrestricted Use SCO (ppm)**	**Restricted-Restricted Residential SCO (ppm)**
Total PCBs	0.1	1

Pesticides	Unrestricted Use SCO (ppm)	Restricted-Restricted Residential SCO (ppm)
4,4-DDD	0.0033	13
4,4-DDE	0.0033	8.9
4,4-DDT	0.0033	7.9
Aldrin	0.005	0.097
alpha-BHC	0.02	0.48
beta-BHC	0.036	0.36
Dieldrin	0.005	0.2
Endrin	0.014	11

Nuisance Conditions

Soils that are in compliance with the SCOs can exhibit an odor or other type of nuisance (e.g. product, staining). If soil removal is completed and nuisance factors persist, NYSDEC may require that additional remedial actions be carried out to address the nuisance condition.

Soil/Fill Remedial Technologies

Enhanced Biotreatment

Landfarming is an aboveground remediation technology for soils that reduces concentrations of petroleum constituents through volatilization and biodegradation. This technology typically involves spreading excavated contaminated soils in a 12- to 36-inch layer on the ground surface and stimulating aerobic indigenous microbial activity within the soils through aeration and/or the addition of minerals, nutrients, moisture, and sometimes pH adjustment. The enhanced microbial activity results in degradation of adsorbed petroleum constituents through microbial respiration.

Biopiles are used to reduce concentrations of petroleum constituents in excavated soils through the use of biodegradation. This technology involves heaping contaminated soils into piles (or "cells") and stimulating aerobic microbial activity within the soils through the aerations and/or addition of minerals, nutrients, and moisture. The enhanced microbial activity results in degradation of adsorbed petroleum constituents through microbial respiration.

For the COCs at the Site, chemicals or biological parameters would require mixing with the landfarmed soils to chelate the metals and breakdown the PCBs and SVOCs, as aeration is not affective with these compounds.

Excavation and Disposal

Using this technology, soil/fill in exceedance of Unrestricted Use SCOs would be removed and disposed of off-site at a permitted landfill. Post-excavation bottom and sidewall sampling and waste characterization sampling for disposal would be conducted in conformance with DER-10.

Dewatering would be required to excavate contaminated soil to any depth below the water table. The excavated area would be backfilled with approved material. Backfilled areas would be compacted in lifts as recommended to make the geotechnical properties suitable for development.

Groundwater/LNAPL Remedial Technologies

As the excavation will require dewatering as described above, pumping the water for proper disposal will be required as the soils are removed.

Pump-and-Dispose Off-Site

During excavation, groundwater that collects in the pit can be pumped to on-site holding tanks (10,000-gallon "Frac tanks"); when full, the water in the tanks can be sampled for laboratory testing for VOC content. If the total VOCs are <2.13 ppm, the water is permissible for discharge to the City of Rochester combined sewer system. If the total VOCs are >2.13 ppm, then disposal at an off-site waste water treatment plant (WWTP) will be required.

The frac tanks will be equipped with oil/water separators; LNAPL that is pumped from the ground will be segregated and properly collected and disposed of off-site.

If residual groundwater contamination is identified after the remediation and backfilling is completed, the following methodologies will be considered:

Monitored Natural Attenuation

Monitored natural attenuation (MNA) refers to the reliance on natural biological and physiochemical processes (within the context of a carefully controlled and monitored site cleanup approach). Natural attenuation processes include a variety of physical, chemical, and biological processes that, under favorable conditions, reduce the mass, toxicity, mobility, volume, and/or concentration of contaminants in groundwater. Long-term performance monitoring is a fundamental component of a MNA remedy.

In-Situ Bioremediation

Bioremediation is an engineered technology that modifies environmental conditions (physical, chemical, biochemical, or microbiological) to encourage microorganisms to destroy or detoxify organic and inorganic contaminants. In situ bioremediation of groundwater has become one of the most widely used technologies for contaminated site treatment because of its relatively low cost, adaptability to site-specific conditions.

Remedial Alternatives Assessment

This section provides an analysis of the selected remedial approach by media using the Remedy Selection Evaluation Criteria identified in Section 4.2 of Guidance Document DER-10: Technical Guidance for Site Investigation and Remediation.

1. ***Impacted Soils Left In-Place*** **- No Action:**

   The no-action alternative is included as a procedural requirement and as a baseline to evaluate other alternatives. Under this alternative, no further remedial or monitoring activities would occur. No environmental easement would be recorded to run with the land, including institutional or engineering controls to further manage residual contamination. The Site would remain virtually unchanged, and change in use would not be limited except by existing land use controls such as zoning.

2. ***All Soils in exceedance of SCOs excavated for off-site disposal:***

   Present R-1 zoning, which allows single-family dwellings, will require a Track 1 cleanup:

   1. Track 1 - Unrestricted use. The following provisions apply to a site being addressed pursuant to Track 1:
      a. The remedial program shall achieve a cleanup level that will allow the site to be used for any purpose without any restrictions on the use of the site as described in subparagraph 375-1.8(g)(a)(i);
      b. The soil component of the remedial program shall achieve the unrestricted soil cleanup objectives as set forth in Table 375-6.8(a) for all soils above bedrock;
      c. The remedial program shall not include the use of long-term intuitional or engineering controls; provided, however, that a restriction on groundwater use may be included as a component of the remedial program if the applicant a) is a volunteer, and b) has demonstrated that there has been a reduction in groundwater contamination to asymptotic levels.

   As indicated on Figure 2, all soils contaminated above SCOs for Unrestricted Use set forth at 6 NYCRR Part 375-6.8(a) would be excavated for off-site disposal at a permitted landfill as a non-hazardous waste. Prior to landfill approval, the contaminated soils will require sampling and analysis for the suite of parameters required by Waste Management of New York for approval. Based on the RI data, and using the assumption that the contaminated soils do not contain any parameters (lead, mercury, PCBs) at hazardous concentrations, a remedial approach of excavation and off-site disposal has been analyzed. Based on Figure 2 and the calculation that approximately 100,000 cubic yards of soil/fill will require removal, and a conversion factor of 1.6 tons per cubic yard (cy) of soil, approximately 160,000 tons of soils would require excavation for off-site disposal. Under this scenario, excavation and off-site disposal would require approximately three months to complete.

The export of soils to and from the BCP Site is subject to sampling requirements and restrictions detailed in Section 5.4 of DER-10.

3. ***All Soils in exceedance of SCOs treated on site:***

   In this option, instead of excavating the contaminated soils for off-site disposal, several in situ options are considered to treat the spoils on the Site.

Zoning

The Site is presently zoned R-1 Low-Density Residential District. The City is currently considering rezoning to R-3 High-Density Residential District, which would allow multi-family use, or a PD Planned Development District, which could also allow commercial uses.

If following completion of the BOA and SEQRA processes, and a public hearing in front of the Rochester City Council, the Site is re-zoned to allow multi-family uses, a Track 2 Restricted Residential Use and a Track 4 Restricted Use cleanup could be considered. However, under the current Rochester Zoning Code, only single-family dwellings are allowed, so only a Track 1 cleanup can be utilized. The following options could be considered if the Site is re-zoned:

4. ***Track 2 Option***

   While Track 2 requires that soils up to 15 feet below grade meet the applicable standards, the Site bedrock is shallower than 15 feet deep. Further, restricted-residential SCOs are exceeded for many COCs throughout the Site, so the extent of remediation would be basically the same for Track 2 as for Track 1. For example the unrestricted SCO for Benzo(a)anthracene, which has been detected throughout the Site as high as 760 ppm, is 1 ppm, which is the same as the restricted-residential SCO. The unrestricted SCO for Mercury which has been detected at 17.7 ppm is 0.18 ppm, while the restricted-residential SCO is 0.81 ppm. Based on the requisite source removal, and the depth to bedrock being shallower than 15 feet across the Site, the Track 2 option will be no different than the Track 1 option.

5. ***Track 4 Option***

   ***Soil capping, partial soil excavation with off-site disposal and Site Management Plan with Institutional Controls*:**

   Under this Track 4 cleanup alternative, the Site would be designated for restricted residential use.

   ECL 27-1415(5) requires “source removal” as part of a Track 4 cleanup. The soils above bedrock on the 5 Flint Street parcel exhibit staining and odors, and free product (LNAPL) is floating on top of groundwater, so all or a significant portion of these soils would be classified as source material. In a like manner, portions of the soils above bedrock on the north side of the 15 Flint Street parcel would require removal as source material.

All remaining disturbed soils would be capped with asphalt, a concrete building slab, or a minimum of two feet of clean soil cover. Institutional controls (e.g., deed restrictions, NYSDEC Environmental Easement, etc.) and development of a Site Management Plan (SMP) would be implemented to protect against exposure and also would control Site use. The clean soils used for the cap would be imported from a location off site, i.e. a different construction site.

Cleanup Objectives:

1. *Overall Protection of Public Health and the Environment*
2. *Compliance with Standards, Criteria and Guidance (SCG)*
3. *Long-Term Effectiveness and Permanence*
4. *Reduction of Toxicity, Mobility, or Volume with Treatment*
5. *Short-Term Effectiveness*
6. *Implementability*
7. *Community Acceptance*
8. *Land Use*

6.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

Alternative 1: Impacted Soils Left In-Place - No Action

Under this alternative the soils would remain as is, and future Site use and development would not be limited. In addition, remedial and monitoring activities as well as placement of institutional controls at the Site would not be implemented.

Assessment

This alternative would not result in the protection of human health or the environment, since contaminated soil and fill material would be left in place. Soil samples collected from the Site were found to exceed NYSDEC Part 375-6 SCOs and, in the event that the impacted area is disturbed during future Site activity and no remedial actions have been undertaken, there is a potential for human exposure to the impacts.

This alternative would not result in the reduction of contaminant toxicity, mobility, or volume and would not be in compliance with chemical-specific remedial action objectives. Therefore, this alternative is not protective of the environment.

There would be no increased short-term risks associated with the no action alternative, since remedial activities would not be implemented. There does not appear to be a current exposure pathway with these impacts; however, this alternative will not be effective in the long-term, and is not a permanent remedy.

Based on the findings of the studies performed to date, it is anticipated that this alternative would not be acceptable to the community.

Of the alternatives being considered, the no action alternative for this Site is not effective for the long-term, and does not reduce toxicity, mobility, or contamination at the Site. . The estimated cost for this alternative is summarized below:

Estimated Cost of No Action **$ 0**

Alternative 2: Track 1

Excavation of contaminated soils from site for off-site disposal:

Under this alternative, all Site soils with contamination in exceedance of Unrestricted Use SCOs will be excavated for off-site disposal at a permitted landfill. As indicated on Figure 2:

- All of the soils above bedrock on the 5 Flint Street parcel will be removed.
- All of the soils above bedrock on the northern end (approximately 25% of total area) on the 15 Flint Street parcel will be removed.
- All of the soils down to a depth of 8 feet beneath ground surface (BGS) will be removed on the east-central portion of the 15 Flint Street parcel.
- All of the soils down to a depth of two (2) feet BGS will be removed from the remainder of the 15 Flint Street parcel.

Assessment

This alternative will be protective of human health and the environment because, once implemented, all contaminated soil and fill material will be removed and there will be no potential for human exposure to the impacted soils and no impact to the environment.

Because all contaminated soil and fill material will be removed, this alternative will result in compliance with chemical-specific RAOs.

During implementation of this approach, there would be potential for exposure of workers to contaminated soil and fill material; however, this potential would be controlled through proper implementation of the Health and Safety Plan (HASP). Because the remedy would result in the removal of all contaminated soil and fill from the Site, this alternative would result in permanence and long-term effectiveness.

It is anticipated that this alternative would be acceptable to the community since it would result in the removal of all contaminants from the Site. However, the truck traffic and possible resulting dust would result in negative impacts on the community while the remediation is in progress only.

Of the alternatives being considered, excavation and off-site disposal of contaminated soil and fill will be effective for the long-term and mitigates future concerns relative potential future exposures to impacted soils in these areas.

To excavate the contaminated soils, the following tasks will be required:

- To prepare the Site for excavation, it will have to be cleared of debris and grubbed, and the buildings will require demolition.

- The debris in the buildings, primarily the large dilapidated structure on the 5 Flint Street parcel, will have to be removed and properly disposed of off site.

- A pre-demolition asbestos survey will be required in conformance with NYS Department of Labor (DOL) Industrial Code Rule 56 (CR 56), Subpart 56-5.1.

- Asbestos abatement will be required in conformance with CR 56, Subpart 56-8, including third party air sampling in conformance with Subpart 56-4.

- Once the buildings have been cleared of debris and asbestos abatement has been completed, the buildings must be demolished in conformance with applicable City of Rochester and New York State regulations.

Cost

The cost of the Design Phase of the project, including Remedial Action Work Plan (RAWP) preparation and bid solicitation is estimated to be **$10,000.**

The cost to clear and grub the Site, and remove the debris from the buildings and the Site in general is estimated to be **$100,000**.

The cost to perform the asbestos survey, conduct the asbestos abatement, and conduct the third party air monitoring is estimated to be **$100,000**.

The cost to demolish the buildings and dispose of the construction demolition debris is estimated to be **$400,000**.

Based on the RI data, and using the assumption that the contaminated soils are <u>not</u> classified "hazardous," a remediation approach of excavation and off-site disposal has been analyzed. It is estimated that approximately 100,000 cubic yards of contaminated soil/fill are present, and using a conversion factor of 1.6 tons per cy of soil, approximately 160,000 tons of soils would require excavation for off-site disposal. Excavation, transportation, and landfill tipping fees costs are estimated at $75.00 per ton. The cost for soil removal is estimated to be **$12,000,000.**

To return the Site to grade allowing for future development, the excavations will require backfilling. The price to backfill the Site in compacted lifts with run-of-bank (ROB) gravel is estimated at $25.00 per ton. Based on an estimated 160,000 tons, the cost for backfill is estimated to be **$4,000,000.**

Assuming the remedial project takes approximately two months to complete, an additional cost for on-site project monitoring, documentation, Community Air Monitoring Plan (CAMP) monitoring, confirmatory soil and groundwater sampling, and laboratory analyses is estimated to be **$200,000**.

During excavation, groundwater that collects in the pit will be pumped into frac tanks for off-site disposal. An estimated fee for water handling is **$150,000**.

Upon completion of the remedial project, a Final Engineering Report (FER) and a Site Management Plan (SMP) deliverable reports are required. An estimated fee for these reports is **$20,000**.

Based on these prices, the total cost for the excavation of contaminated soils is estimated to be in the range of $17,000,000.

If the City re-zones the Site in a timely fashion to allow for development, then a Track 4 cleanup could be considered.

Alternative 3: Track 4

Soil capping, partial soil excavation with off-site disposal and Site Management Plan with Institutional Controls:

The same components will be required for a Track 4 cleanup as discussed above for the Track 1 effort. As the buildings are too dilapidated to be rehabilitated, they will require removal in the Track 4 option. The difference Track 1 and Track 4 will be that, after "source removal" is conducted, residual contamination will be left in place.

Under this Track 4 cleanup alternative, the Site would be designated for restricted residential use. Source area soils and LNAPL product would be removed and disposed of in a permitted solid waste landfill.

- Based on the nature of contaminants present at the Site, all alternatives proposing a remedial action include the excavation of contaminated soils based on the presence of LNAPL. The data indicate that two LNAPL source areas would require removal. An estimated 24,000 tons of LNAPL-contaminated soils would be removed from the north end of the 15 Flint Street parcel, and approximately 4,800 tons of LNAPL-contaminated soil would be removed from beneath the slab of the dilapidated structure at the north end of 5 Flint Street.

- PCBs are identified as a contaminant of concern. Paragraph V(I)(2) of NYSDEC Commissioner's Policy CP-51 requires removal of PCB contamination above 10 ppm. PCBs have not been detected at concentrations greater than 10 ppm in any of the historic data. As such, no PCB hotspot removal is proposed.

- CP-51 also has a requirement that total polyaromatic hydrocarbons (PAHs) exceeding 500 ppm at any depth also need to be removed to the extent feasible. Based on these criteria, PAH "hotspot" removal would be required from each parcel; approximately 4,400 tons of PAH-contaminated soil would be removed from the 5 Flint Street parcel, and approximately 1,800 tons of PAH-contaminated soil would be removed from 15 Flint Street.

After LNAPL hotspot removal, all remaining soils would be capped with either asphalt, a concrete building slab, or a minimum of two feet of clean soil cover. Institutional controls (e.g., deed restrictions, NYSDEC Environmental Easement, etc.) and a Site Management Plan (SMP) including a Health & Safety Plan (HASP) would be implemented to protect against exposure and also would control Site use.

The cost of the Design Phase of the project, including Remedial Action Work Plan (RAWP) preparation and bid solicitation is estimated to be **$10,000.**

The cost to clear and grub the Site, and remove the debris from the buildings and the Site in general is estimated to be **$100,000**.

The cost to perform the asbestos survey, conduct the asbestos abatement, and conduct the third party air monitoring is estimated to be **$100,000**.

The cost to demolish the buildings and dispose of the construction demolition debris is estimated to be **$400,000**.

Based on the RI data, and using the assumption that the LNAPL-contaminated soils are not classified "hazardous," It is estimated that approximately 18,000 cubic yards of LNAPL-contaminated soil/fill are present, and using a conversion factor of 1.6 tons, approximately 28,800 tons of soils would require excavation for off-site disposal. An additional 6,200 tons of PAH-contaminated soil is estimated for removal. Excavation, transportation, and landfill tipping fees costs are estimated at $75.00 per ton. The cost for soil removal is estimated to be **$2,625,000.**

To return the Site to grade allowing for future development, the excavations will require backfilling. The price to backfill the Site in compacted lifts with run-of-bank (ROB) gravel is estimated at $25.00 per ton. Based on an estimated 35,000 tons, the cost for backfill is estimated to be **$875,000.**

Assuming the remedial project takes approximately one month to complete, an additional cost for on-site project monitoring, documentation, confirmatory sampling, and laboratory analyses is estimated to be **$75,000**.

During excavation, groundwater that collects in the pit will be pumped into frac tanks for off-site disposal. An estimated fee for water handling is **$150,000**.

Upon completion of the remedial project, a Final Engineering Report (FER) a Site Management Plan (SMP) deliverable reports are required. An estimated fee for these reports is **$20,000**.

Based on these prices, the total cost for source removal and covering residual contamination during construction is estimated to be in the range of $4,400,000.

Alternative 4: Ex-situ treatment of contaminated soil in a landfarm:

This technology typically involves creating an on-site "biocell" by spreading excavated contaminated soils in a 12- to 36-inch layer on the ground surface and stimulating aerobic indigenous microbial activity within the soils through aeration and/or the addition of minerals, nutrients, moisture, and sometimes pH adjustment.

If the estimated 100,000 cubic yard (cy) of soil requiring treatment were excavated and spread into a 36-inch layer for treatment, an approximate footprint of 900-feet by 900-feet would be required to accommodate the volume, which cannot be contained within the Site boundaries. The soil volume requiring treatment will not be possible to landfarm on the Site.

In-situ treatment of contaminated soil:

Two different methodologies were investigated as options for in-situ treatment; both will require that all of the contaminated soils be excavated so that they can be inoculated before they are returned to the ground. These two technologies are:

- Bioremediation, in which a bacterial mixture will remediate the COCs using living organisms. The bacteria are designed that utilize the COCs as a food source. **An estimate to treat the soils with bacteria is $7,500,000, which includes approximately $500,000 for labor and equipment to inoculate the soils.**

- Mycoremediation is a form of bioremediation, the process of using fungi to degrade or sequester contaminants in the environment. Stimulating microbial and enzyme activity, mycelium reduces toxins in-situ. Some fungi are hyperaccumulators, capable of absorbing and concentrating heavy metals in the mushroom fruit bodies. **An estimate to treat the soils with bacteria is $29,500,000, which includes approximately $500,000 for labor and equipment to inoculate the soils.**

Limitations

There are several inherent limitations using the above technologies. Many factors including, but not limited to, the existence of an indigenous microbial population, soil types, temperature, pH, and the availability of oxygen and nutrients can influence the efficacy of in-situ treatment. In addition:

These technologies can be anticipated to take > 3 years to achieve results; the Site cannot be developed until closure conditions are obtained.

Based on the limitations discussed above, the in situ remediation may not succeed in reaching the SCOs permitting the Site for residential use.

Further, a large in situ treatment project may not be favorably received by the surrounding residential neighborhood.

7.0 COMPARATIVE EVALUATION OF ALTERNATIVES AND RECOMMENDED ACTIONS

Alternative 1: The no action alternative will not be protective of human health and the environment. It will not be acceptable to the community as the contaminated surficial soils can result in exposure to impacted soil and fill material through direct contact. Further, the no-action alternative does not result in the mitigation of contaminants in the environment.

Alternative 2: The excavation and removal of all contaminated soils for off-site disposal will be a long-term and permanent remedy. As the Site will be cleaned up and acceptable for re-development, it will be acceptable to the community. As all of the contamination will be removed, this option will result in the mitigation of contaminants in the environment.

Alternative 3: Under the present zoning, capping residual contaminants left in place is not an option. If the Site is rezoned, then a Track 4 cleanup will be considered.

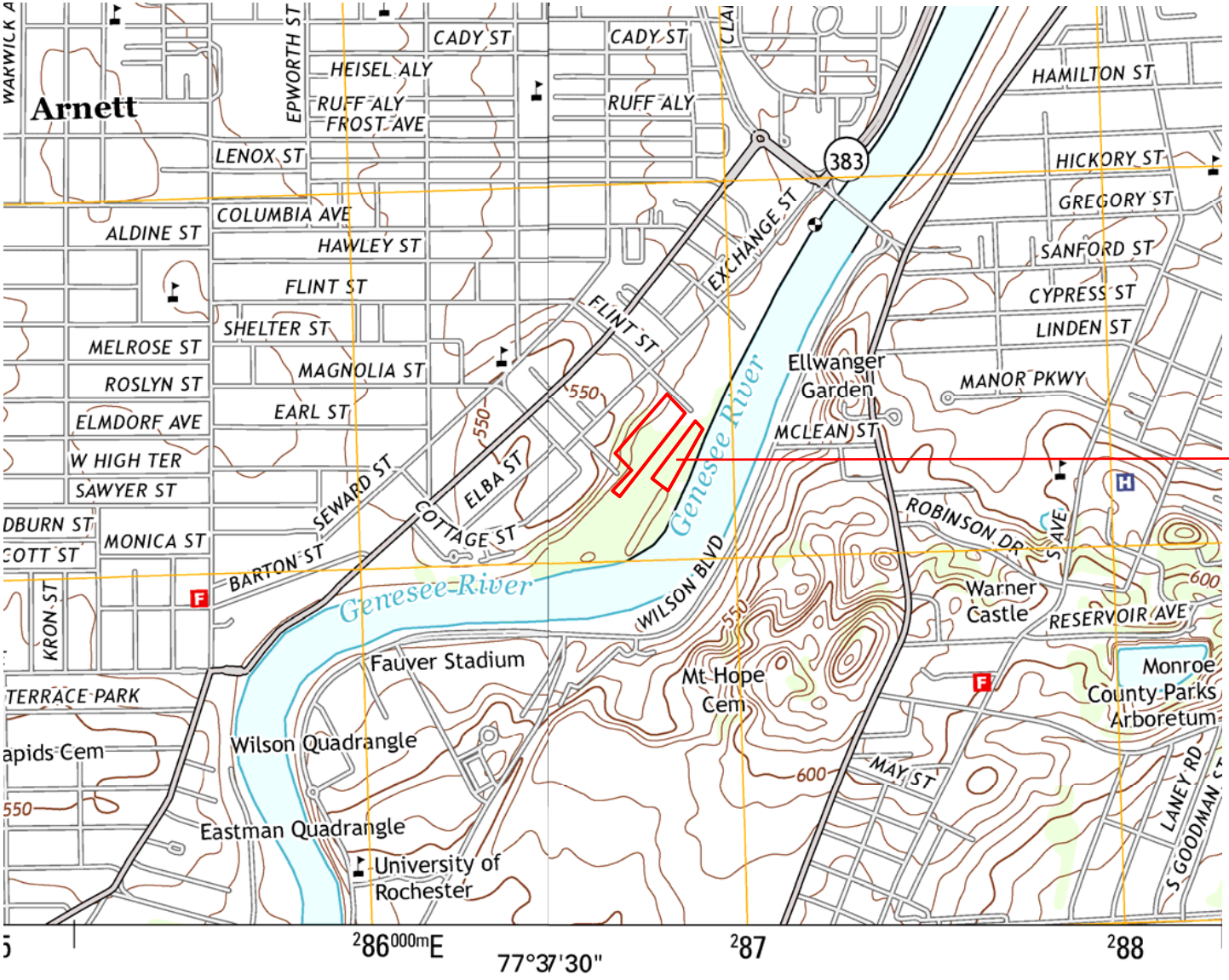
Alternative 4: The treatment of contaminated soils on Site with bioremedial agents.

- The residential neighborhood may not favorably receive a large in situ treatment project.

- Because of the limiting factors discussed above, this option may not result in the mitigation of contaminants in the environment.

The recommended remedial action is Alternative 2, involving the removal of all soils in exceedance of SCOs for Unrestricted Use. In addition, contaminated groundwater will be removed along with the contaminated soils.

FIGURES



MAP SOURCE: USGS

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ROCHESTER, NEW YORK 14618
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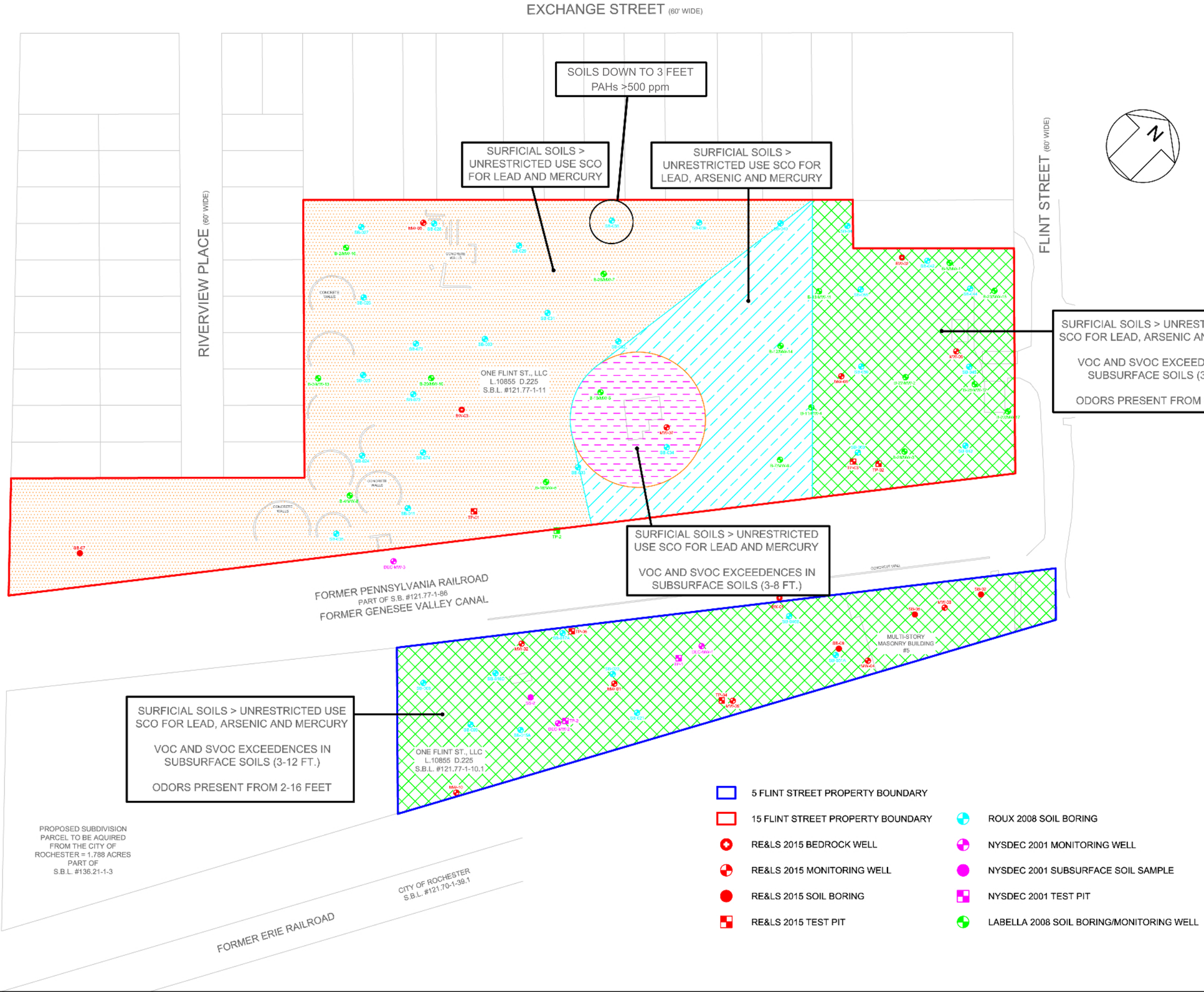
5 & 15 Flint Street		PROJECT NO. 45-14-003-0L	April 2016
Site Location Map		SCALE NTS	Figure 1



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An MBE/DBE Firm
www.raviveng.com

PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
ESTIMATED NATURE AND EXTENT OF SOIL CONTAMINATION

PROJECT NO:
45-14-003-0L

DATE:
APRIL 2016

DRAWING NO:
FIGURE 2

EXCHANGE STREET (60' WIDE)

RIVERVIEW PLACE (60' WIDE)

FLINT STREET (60' WIDE)

EXCAVATION - 4 FT

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-11

FORMER PENNSYLVANIA RAILROAD
PART OF S.B. #121.77-1-86
FORMER GENESEE VALLEY CANAL

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-10.1

MULTI-STORY MASONRY BUILDING #5

PROPOSED SUBDIVISION
PARCEL TO BE AQUIRED
FROM THE CITY OF
ROCHESTER = 1.788 ACRES
PART OF
S.B.L. #136.21-1-3

FORMER ERIE RAILROAD

CITY OF ROCHESTER
S.B.L. #121.70-1-38.1

N

LEGEND

- EXCAVATION - 2 FT
- EXCAVATION - 4 FT
- EXCAVATION - 8 FT
- EXCAVATION - BEDROCK
- EXCAVATION GRADING FROM BEDROCK TO 8 FT

- 5 FLINT STREET PROPERTY BOUNDARY
- 15 FLINT STREET PROPERTY BOUNDARY
- RE&LS 2015 BEDROCK WELL
- RE&LS 2015 MONITORING WELL
- RE&LS 2015 SOIL BORING
- RE&LS 2015 TEST PIT
- ROUX 2008 SOIL BORING
- NYSDEC 2001 MONITORING WELL
- NYSDEC 2001 SUBSURFACE SOIL SAMPLE
- NYSDEC 2001 TEST PIT
- LABELLA 2008 SOIL BORING/MONITORING WELL

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PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

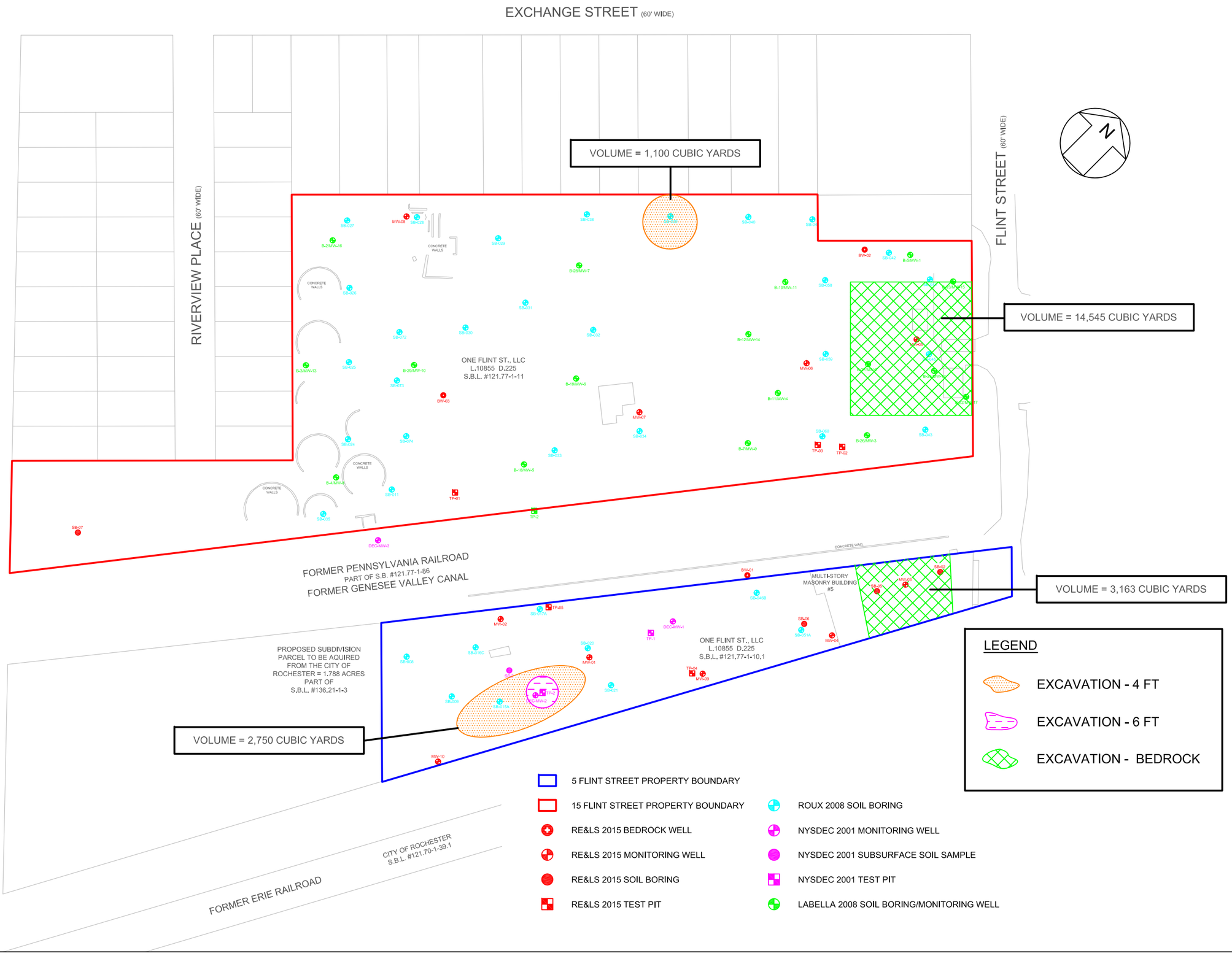
PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
TRACK 1 PROPOSED REMEDIAL EXCAVATION PLAN

PROJECT NO:
45-14-003-0L

DATE:
APRIL 2016

DRAWING NO:
FIGURE 3



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An MBE/DBE Firm
www.ravieng.com

PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

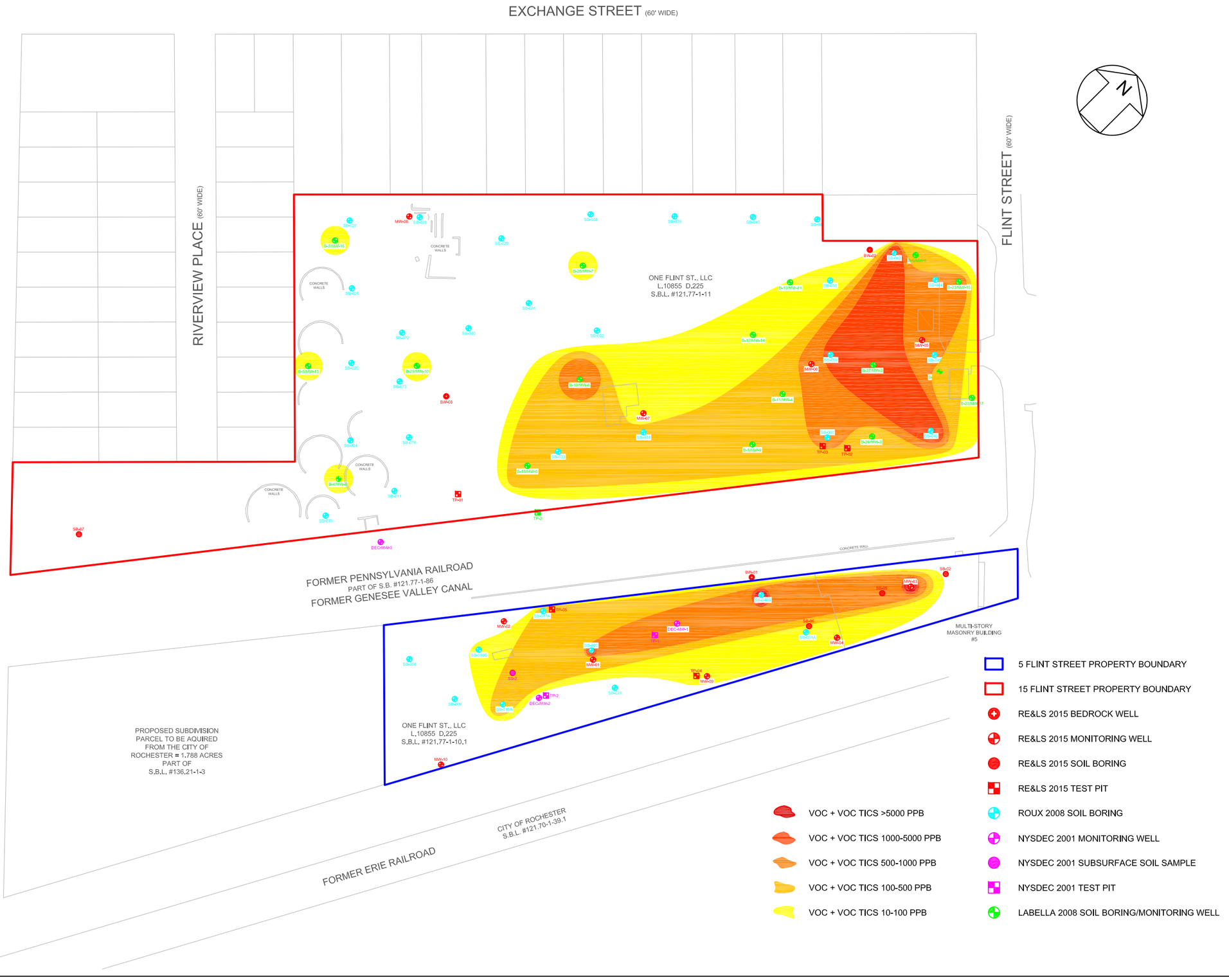
PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
TRACK 4 SOIL REMOVAL VOLUMES & LOCATIONS

PROJECT NO: 45-14-003-0L

DATE: OCTOBER 2016

DRAWING NO: FIGURE 4



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PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
GROUNDWATER ISOPLETH - VOCS + VOC TICS

PROJECT NO: 45-14-003-0L

DATE: APRIL 2016

DRAWING NO: FIGURE 5

EXCHANGE STREET (60' WIDE)

RIVERVIEW PLACE (60' WIDE)

FLINT STREET (60' WIDE)

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-11

FORMER PENNSYLVANIA RAILROAD
PART OF S.B. #121.77-1-86
FORMER GENESEE VALLEY CANAL

MULTI-STORY MASONRY BUILDING #5

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-10.1

PROPOSED SUBDIVISION
PARCEL TO BE AQUIRED
FROM THE CITY OF
ROCHESTER = 1.788 ACRES
PART OF
S.B.L. #136.21-1-3

FORMER ERIE RAILROAD

CITY OF ROCHESTER
S.B.L. #121.70-1-39.1

- SVOC + SVOC TICS >5000 PPB
- SVOC + SVOC TICS 1000-5000 PPB
- SVOC + SVOC TICS 500-1000 PPB
- SVOC + SVOC TICS 100-500 PPB
- SVOC + SVOC TICS 10-100 PPB

- 5 FLINT STREET PROPERTY BOUNDARY
- 15 FLINT STREET PROPERTY BOUNDARY
- RE&LS 2015 BEDROCK WELL
- RE&LS 2015 MONITORING WELL
- RE&LS 2015 SOIL BORING
- RE&LS 2015 TEST PIT
- ROUX 2008 SOIL BORING
- NYSDEC 2001 MONITORING WELL
- NYSDEC 2001 SUBSURFACE SOIL SAMPLE
- NYSDEC 2001 TEST PIT
- LABELLA 2008 SOIL BORING/MONITORING WELL

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www.raviveng.com

PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
GROUNDWATER ISOPLETH - SVOCS + SVOC TICS

PROJECT NO: 45-14-003-0L

DATE: APRIL 2016

DRAWING NO: FIGURE 6

EXCHANGE STREET (60' WIDE)

RIVERVIEW PLACE (60' WIDE)

FLINT STREET (60' WIDE)

N

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-11

CONCRETE WALLS

MW-06

BW-02

MW-05

LNAPL - 0.15

MW-08

SHEEN

BW-03

MW-07

DEC-4MW-3

FORMER PENNSYLVANIA RAILROAD
PART OF S.B. #121.77-1-86
FORMER GENESEE VALLEY CANAL

CONCRETE WALL

BW-01

LNAPL - 0.025

MW-04

MULTI-STORY MASONRY BUILDING #5

SHEEN

MW-02

SHEEN

DEC-4MW-1

SHEEN

MW-01

SHEEN

MW-03

SHEEN

ONE FLINT ST., LLC
L.10855 D.225
S.B.L. #121.77-1-10.1

DEC-4MW-2

MW-09

PROPOSED SUBDIVISION
PARCEL TO BE AQUIRED
FROM THE CITY OF
ROCHESTER = 1.788 ACRES
PART OF
S.B.L. #136.21-1-3

FORMER ERIE RAILROAD

CITY OF ROCHESTER
S.B.L. #121.70-1-39.1

APPROXIMATE AREA OF LNAPL IN WELLS

LNAPL - 0.33 LNAPL MEASUREMENT IN FEET (APRIL 2016)

5 FLINT STREET PROPERTY BOUNDARY

15 FLINT STREET PROPERTY BOUNDARY

RE&LS 2015 BEDROCK WELL

RE&LS 2015 MONITORING WELL

NYSDEC 2001 MONITORING WELL

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An MBE/DBE Firm
www.ravieng.com

PROJECT MANAGER: P.M.

MAPPING BY: A.A.

MAP SCALE: 1" = 100'

PROJECT NAME:
5, 15 FLINT STREET
ROCHESTER, NEW YORK
BROWNFIELD CLEANUP PROGRAM
NYSDEC SITE #C828162

TITLE:
LNAPL IN GROUNDWATER

PROJECT NO:
45-14-003-0L

DATE:
FEBRUARY 2016

DRAWING NO:
FIGURE 7