WORK PLAN

Brownfield Cleanup Program
Remedial Investigation
Portion of Former Vacuum Oil Refinery
Site No. C828190

City of Rochester
Portion of Former Vacuum Oil Refinery
1, 13, 31, 69, and 75 Cottage Street; 100 Riverview Place;
102 Violetta Street; and 1320 S. Plymouth Avenue
Rochester, New York

October 2015

O'BRIEN & GERE

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I Douglas M. Crawford certify that I am currently a NYS registered professional engineer and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

DOUGLAS M. CRAWFORD, P.E., VICE PRESIDENT
O'Brien & Gere Engineers, Inc.

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1. INTRODUCTION

O'Brien & Gere (OBG) has developed this Remedial Investigation (RI) Work Plan (referred to herein as RI Work Plan) on behalf of the City of Rochester (City) for an approximate 15.4 acre portion of the former Vacuum Oil Refinery consisting of the following City-owned parcels: 1, 13, 31, 69, and 75 Cottage Street; 100 Riverview Place; 102 Violetta Street; and 1320 S. Plymouth Avenue (Site). A Site Location map is presented as **Figure 1**. The Site was accepted into the New York State Department of Environmental Conservation (NYSDEC) BCP on April 6, 2015 as Site Number C828190.

The Site, with the BCP Site boundary depicted on **Figure 2**, is approximately 15.4 acres in size and consists of eight City-owned parcels as identified above. The Site was historically operated as a petroleum refinery, blending, and bulk oil storage facility from approximately 1866 to 1930. Crude oil, kerosene, naphtha, finished lubricants, and containers for these products (*e.g.*, wooden barrels, tin cans, and drums) were manufactured and stored on-Site. Operations and facilities that formerly occupied the Site include bulk storage tanks, former canal beds, rail yard, barrel manufacturing plant, numerous storage areas, and underground facilities that previously serviced Site operations (*e.g.*, utilities, sewers, and piping).

This RI Work Plan provides background information regarding Site conditions, describes the project objectives, and outlines the strategies and methodologies that will be implemented during the investigation. Four companion documents have been developed that document the procedures and protocols outlined in this RI Work Plan:

- The Field Sampling and Analysis Plan (FSAP) provides information regarding field sampling methods and procedures that will be used during the investigation;
- The Quality Control Plan (QCP) specifies the quality assurance/quality control (QA/QC) procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the RI;
- A site-specific Health and Safety Plan (HASP) has been prepared to outline procedures that will be undertaken to protect OBG personnel from potential hazards that may exist as a result of the fieldwork performed at the property; and
- A Community Air Monitoring Plan (CAMP) is included as part of the HASP that provides measures for monitoring and responding to volatile organic or dust generation during the implementation program that could potentially migrate to off-Site receptors.

1.1 PROJECT OBJECTIVE

Subsurface environmental investigations were conducted at the Site by the NYSDEC and ExxonMobil (EM) to evaluate soil and groundwater conditions. These investigations were conducted on approximately 27 acres of the former Vacuum Oil Site of which the City owns approximately 15.4 acres. The investigations identified the presence of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), and pesticides in soil and/or groundwater.

Data gaps remain for the purpose of further evaluating the horizontal and vertical extent of contamination and characterizing surface and subsurface impacts on the Site.

The objective of this RI Work Plan includes, but is not limited to the following;

- Delineation of the horizontal and vertical extent of contamination at the Site;
- Characterization of the surface and subsurface impacts to the Site;
- Identification of the source(s) of contamination, migration pathways, and actual or potential receptors of contaminants;
- Evaluation of the actual or potential threats to public health and environment;

- Production of data of sufficient quantity and quality to support the evaluation of proposed remedial alternatives.

The City has entered the BCP as a Volunteer, and as such, the delineation and extent of off-Site contamination is not required; however, the contaminants migrating off-Site, the location(s), and environmental media will be evaluated.

Additional RI Work Plan Addenda will be prepared and implemented, as needed, to achieve the objectives of the RI.

The information will be used to identify if remedial measures are necessary and to allow for future redevelopment of the Site to occur.

1.2 WORK PLAN ORGANIZATION

The remainder of this Work Plan describes the planned RI activities and is organized as follows:

Section 2 – provides a description of the Site, summary of Site operational history, and the results of the previous investigation and remedial work performed at the Site;

Section 3 – presents the specific objectives for the investigation followed by a description of the tasks that will be undertaken to gather information to meet the project objectives;

Section 4 – describes the companion documents that are included as appendices to the RI Work Plan: Field Sampling Plan (FSAP), Quality Control Plan (QCP), and the Health and Safety Plan (HASP) (with an included Community Air Monitoring Plan (CAMP));

Section 5 – provides the anticipated project personnel;

Section 6 – provides details regarding the content of the RI Report;

Section 7 – provides the anticipated project schedule; and

Section 8 – provides a list of references used in preparation of this RI Work Plan.

2. BACKGROUND

2.1 SITE DESCRIPTION

The Site is located at 1, 13, 31, 69, and 75 Cottage Street; 100 Riverview Place; 102 Violetta Street; and 1320 S. Plymouth Avenue in Rochester, Monroe County, New York and encompasses approximately 15.4 acres. A Site Location map is presented as **Figure 1**. A Brownfield Boundary map is presented as **Figure 2**.

The Site is bordered by the Genesee River to the east/southeast/south beyond a narrow strip of New York State-owned land, residential property to the west, vacant land (formerly a junkyard addressed as 15 Flint Street) to the northwest, and Flint Street with commercial land to the north across Flint Street. Vacant land addressed as 5 Flint Street and containing a single, three-story building is also located near the north end of the Site. Although 5 Flint Street is located on the northern side of the Site, the Site also wraps around 5 Flint Street in a "U" shape (see **Figure 2**).

2.2 SITE HISTORY

The Site was historically operated as a petroleum refinery, blending, and bulk oil storage facility from approximately 1866 to 1930. Crude oil, kerosene, naphtha, finished lubricants, and containers for these products (*e.g.*, wooden barrels, tin cans, and drums) were manufactured and stored on-Site. Operations and facilities that formerly occupied the Site include bulk storage tanks, former canal beds, rail yard, barrel manufacturing plant, numerous storage areas, and underground facilities that previously serviced Site operations (*e.g.*, utilities, sewers, and piping). Subsequent to demolition of structures as outlined below in Section 2.3, the Site has remained vacant.

2.3 CURRENT SITE CONDITIONS AND USE

While most of the above grade structures have been demolished and removed, some remnants of former structures remain. It is unknown as to what subsurface structures remain. Based on historic aerial photographs, the structures were removed sometime between 1926 and 1958. An asphalt-paved bicycle/walking path runs through the entire eastern side of the Site from the north end of the property to the south of the property and beyond in both directions. An approximate 1.2 acre grass-covered area is located on the eastern boundary of the Site along the Genesee River. The rest of the Site is undeveloped (with the exception of the historic items mentioned above) and consists of wooded and vegetative areas.

Groundwater is not utilized as a drinking water source in the vicinity of the Site. Groundwater has been observed on the adjoining 5 Flint Street property at approximately 3 feet (ft.) to 7.5 ft. below ground surface (bgs), as indicated in Stantec, Inc.'s (Stantec's) document titled *Phase I Environmental Site Assessment, 5 Flint Street, Rochester, New York*, dated August 2008 (referenced in Section 8). Groundwater flow direction is generally to the southeast toward the Genesee River.

The Site is currently zoned as R-1 Low Density Residential and does not support the intended future use. The intended future use of the Site based on an approved City Brownfield Opportunity Area (BOA) Master Plan includes mixed use development, waterfront and open space improvements, flex space and incubator/workforce training, and commercial and housing redevelopment. The BOA Master Plan includes proposed zoning modifications for the preferred development alternatives. State Environmental Quality Review (SEQR) zoning changes are anticipated to occur in late 2016.

2.4 SURROUNDING LAND USE

Residential, commercial, and light industrial manufacturing properties generally surround the Site within a one-half mile radius. The Genesee River borders the eastern Site boundary beyond a narrow strip of New York State-owned land.

2.5 PREVIOUS SITE INVESTIGATIONS

Historical investigations performed by EM, the NYSDEC, and the City on the Site and/or the adjoining 5 Flint Street and 15 Flint Street parcels (as referenced in Section 8) indicate the presence of contamination in surface

soil, subsurface soil, and groundwater consisting of one or more of the following; VOCs, SVOCs, metals, PCBs, and/or pesticides.

Further details regarding the previous Site investigations are presented within the references identified in Section 8 and are summarized in OBG's report titled *Phase I Environmental Site Assessment Report, 1, 13, 31, 69, and 75 Cottage Street, 100 Riverview Place, 102 Violetta Street, and 1315 S. Plymouth Avenue, Rochester, New York*, dated December 2012.

2.5.1 Data Usability Summary Report

During the 2008 EM investigation Roux Associates, Inc. (Roux) collected 35 unvalidated samples on-Site. As part of third-party oversight on behalf of the City, Labella Associates, P.C. (LaBella) collected six split soil samples from the same interval as Roux; two soil samples from two soil borings, but at different intervals than Roux; and three split groundwater samples. These seven soil samples and three groundwater samples were validated by a third-party validator and are depicted on **Figure 3**. A comparison of the LaBella soil samples versus (vs.) the Roux soil samples are presented on **Table 1** and a comparison of the LaBella groundwater samples vs. the Roux groundwater samples are presented on **Table 2**. LaBella Data Usability Summary Report (DUSR) documentation is presented at **Exhibit A**. Upon qualitative review of the validated vs. unvalidated analytical results for the split samples collected by both LaBella and Roux at the same intervals, there is not substantial difference in the results. However, due to the specific intervals only being available at only six locations for direct comparison, the recollection and reanalysis of a portion of EM investigation locations is recommended to further reevaluate the reproducibility of the EM results. It is proposed that five soil samples be collected from existing soil boring locations to confirm the validity of historic data. This resampling effort is described below in Section 3.

2.6 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) has been developed based on the data provided in the prior Site investigations referenced in Section 8.

An automotive junkyard (and also a former scrap bailing company among other uses) was formerly located on the northwestern adjoining 15 Flint Street parcel. The Genesee River bounds the east side of the Site beyond a narrow strip of land owned by New York State. A mix of residential, commercial, and light industrial properties is situated to the north and west of the Site. Portions of adjacent properties are vacant. The Flint Street Right-of-Way is also present along the northern boundary of the Site.

According to the AMEC Earth and Environmental, Inc. (AMEC) report titled *Historic and Current Site Conditions Report, Former Vacuum Oil Refinery Site*, dated June 13, 2005 (referenced in Section 8), both native and fill materials are present at the Site. Native soils are described as consisting of sands, silts, and clays. Fill is described as consisting of bricks, slag, cinders, gravels, wood, and miscellaneous debris. Groundwater has historically been encountered ranging from approximately 3 ft. to 7.5 ft. bgs and generally flows in a southeastern direction toward the Genesee River. Depth to bedrock is approximately 10 ft. to 15 ft. bgs.

The topography of the Site is predominately flat at approximately 515 ft. to 520 ft. above mean sea level (AMSL); however, the western/northwestern side of the Site slopes steeply upward in the vicinity of the southern/southwestern side of the Site to approximately 540 ft. AMSL. The Site is vacant and portions are wooded and/or overgrown with vegetation. Wetlands are present in the Genesee River and a 100 year floodplain is present on-Site and in the surrounding vicinity of the Site as depicted on **Figure 4**.

Twenty-six recognized environmental conditions (depicted on **Figure 5**) were noted in OBG's report titled *Phase I Environmental Site Assessment Report, 1, 13, 31, 69, and 75 Cottage Street, 100 Riverview Place, 102 Violetta Street, and 1315 S. Plymouth Avenue, Rochester, New York*, dated December 2012. These recognized environmental conditions constitute several data gaps with respect to surface and subsurface conditions at the Site. A brief summary of recognized environmental conditions depicted on **Figure 5** include the following:

Table 3

Summary of Recognized Environmental Conditions

Parcel or Location Description	Location Relative to Site	Recognized Environmental Condition(s)
1 Cottage Street	Site	REC #'s 1, 2, 3, 5, 7, 8, 9, 14, 15, 16, 17, 18, 19, 20, and 21
13 Cottage Street	Site	REC #'s 1, 2, 3, 5, 6, 7, 8, 9, 13, 14, 15, 16, 17, 18, 19, 20, and 21
31 Cottage Street	Site	REC #'s 1, 2, 3, 5, 7, 8, 9, 15, 16, 17, 19, 20, and 21
69 Cottage Street	Site	REC #'s 1, 2, 3, 5, 7, 8, 9, 15, 16, 17, 19, 20, and 21
75 Cottage Street	Site	REC #'s 1, 2, 3, 5, 7, 8, 9, 15, 16, 17, 19, 20, and 21
100 Riverview Place	Site	REC #'s 1, 2, 3, 5, 7, 8, 9, 13, 15, 16, 17, 19, 20, and 21
102 Violetta Street	Site	REC #'s 1, 2, 3, 4, 5, 6, 7, 8, 9, 14, 15, 16, 17, 18, 19, 20, 21, and 26
1320 S. Plymouth Avenue	Site	REC #'s 1, 2, 3, 5, 6, 7, 8, 9, 12, 13, 14, 15, 16, 17, 19, 20, 21, and 26
5 Flint Street	Off-Site Upgradient	REC #'s 1, 2, 3, 5, 6, 7, 8, 11, 13, 14, 15, 17, 18, 19, 21, 23, and 26
15 Flint Street	Off-Site Upgradient	REC #'s 1, 2, 3, 5, 6, 7, 8, 12, 13, 14, 15, 16, 17, 19, 21, 23, and 26
South of 13 Cottage Street	Off-Site Downgradient	REC #'s 2, 3, 14, 15, 17, 19, and 21
Cottage Street (Exact Location Unknown)	Off-Site Upgradient	REC # 22
22 Flint Street	Off-Site Crossgradient	REC # 24
950-984 Exchange Street	Off-Site Upgradient	REC # 25

REC #1. Building, use, and cleaning (with naphtha) of railroad tank cars for transportation of refinery products.

REC #2. Former refinery structures, rail sidings, rail spurs, railroads, tank cars, disturbed areas, and potential sludge pits, which were part of various former refinery operations. A former metal scrap yard and automotive junkyard on northwestern adjoining 15 Flint Street.

REC #3. Historic information indicates widespread, multiple releases including discharge of naphtha and waste oil to the Genesee River, public sewer system, disposal in excavations on-Site, burning in pits on-Site, and broken pipelines.

REC #4. Permits for the demolition of the service station and removal of storage tanks. City Building Information System (BIS) is most likely incorrect and not attributed to the Site.

REC #5. The detection of one or more of the following: volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], metals, and/or polychlorinated biphenyls [PCBs]) in both soil and groundwater on several on-Site and off-Site parcels.

REC #6. One or more SVOCs; benzene, toluene, ethylbenzene, and xylenes (BTEX); and/or metals were present in surface soil both on-Site and off-Site; subsurface soil both on-Site and off-Site; and groundwater both on-Site and off-Site.

REC #7. High concentrations of soil gas and TPH in many locations on both on-Site and off-Site parcels; the presence of SVOCs and BTEX in surface soil, subsurface soil, groundwater on both on-Site and off-Site parcels; and a pit formerly associated with industrial processes off-Site.

REC #8. Several existing and potential sources of contamination on-Site and off-Site.

REC #9. "Widespread" petroleum contamination in surface soil, subsurface soil, and groundwater.

REC #10. Nearby historic drycleaning operations.

REC #11. Several existing and potential sources of contamination on-Site and off-Site.

REC #12. Forensic analysis results indicating the presence of kerosene which was historically conducted as part of refinery operations, the presence of PCBs in subsurface soil; VOCs and SVOCs in subsurface soil and groundwater; and metals in subsurface soil off-Site.

REC #13. Presence of subsurface soil one or more metals, VOCs, and/or SVOCs on-Site and off-Site; and groundwater contamination (one or more pesticides, PCBs, VOCs, and/or SVOCs) on-Site and off-Site. Presence of degraded kerosene off-Site.

REC #14. VOCs, SVOCs, pesticides, PCBs, and/or metals in soil and/or groundwater on-Site and off-Site

REC #15. Container mismanagement.

REC #16. Encountered asbestos-containing materials (ACMs) and the potential for fill and buried demolition debris to contain ACM.

REC #17. Disposal of "waste oil" and a "burn pit;" former disturbed areas on-Site; Monroe County Department of Health (MCDOH) documentation indicating the presence of a petroleum sludge pit located on the southern adjacent parcel south of 13 Cottage Street, the identification of the Site as a confirmed waste site, and the potential for several additional sludge pit locations on the southern portion of the Site.

REC #18. Solid waste and/or observation of ash/black foundry sand.

REC #19. Lack of documentation regarding the appropriate removal and disposal of hazardous materials.

REC #20. High concentrations of soil gas, with TPH in many locations throughout the Site and chlorinated VOCs in a small area of the Site.

REC #21. SVOCs and BTEX were detected in surface soil, subsurface soil, and groundwater above NYSDEC standards.

REC #22. Disposal of metals, VOCs, and SVOCs at an unaddressed location on Cottage Street.

REC #23. 5 Flint Street and 15 Flint Street listed in Environmental Data Resources, Inc. (EDR) databases indicating the presence of subsurface contamination.

REC #24. #2 Fuel Oil Spill at 22 Flint Street.

REC #25. 950-984 Exchange Street listed in the NY SPILLS database as having an area of soil contamination in exceedance of TAGM #4046 SCOs where former Vacuum Oil Refinery petroleum storage tanks were situated.

REC #26. Storage and manufacture of kerosene, naphtha, finished lubricants, and crude oil; the transportation of these products; the associated disposal excavations and burn pit which have the potential to be located near the structures identified herein; and constituent detections in both soil and groundwater in the vicinity of former oil refinery structures.

While not a recognized environmental condition, it was also noted in the Phase I ESA Report that a "coat of oil" was present on the Genesee River from the "works and extending out, across, and down to the Court St. dam" in an August 1901 article.

Based on previous investigations and information presented in this section, the primary contaminants of concern (COCs) include products and by-products associated with crude oil, kerosene, naphtha, and finished lubricants. Soil and groundwater sampling and laboratory analyses have confirmed the presence of contamination in surface soil, subsurface soil, and groundwater consisting of one or more of the following: VOCs, SVOCs, metals, PCBs, and/or pesticides. The lateral and vertical extent of these contaminants have not been delineated and constitutes a data gap which requires further evaluation.

During prior remedial efforts on adjoining parcels, approximately 100 pounds of asbestos material were encountered and subsequently disposed of during test pit activities on the northwestern 15 Flint Street parcel. Tar sludge pits have also been encountered on an adjacent parcel south of the Site, believed to be a result of Vacuum Oil operations, some of which have been remediated by the NYSDEC.

3. REMEDIAL INVESTIGATION ACTIVITIES

3.1 INVESTIGATION OBJECTIVES

Data gaps remain as outlined in the CSM as detailed in Section 2.6. The overall objectives for the RI (as stated in Section 1 and below) are to further evaluate the horizontal and vertical extent of contamination and characterizing surface and subsurface impacts on the Site.

The objective of this RI Work Plan includes, but is not limited to the following;

- Evaluation of the horizontal and vertical extent of contamination at the Site;
- Characterization of the surface and subsurface impacts to the Site;
- Assessment of the source(s) of contamination, migration pathways, and actual or potential receptors of contaminants;
- Evaluation of the actual or potential threats to public health and environment;
- Production of data of sufficient quantity and quality to support the evaluation of proposed remedial alternatives.

The City has entered the BCP as a Volunteer, and as such, the delineation of the extent of off-Site contamination is not required; however, the contaminants migrating off-Site, the location(s), and environmental media will be evaluated.

The information will be used to identify if remedial measures are necessary and to allow for future redevelopment of the Site to occur.

The discussion that follows describes the investigative activities for the Site. Additional details pertaining to procedures and protocols for sample collection are included in the FSAP provided in **Appendix A**, and sample analysis information is detailed in the QCP provided in **Appendix B**.

In addition to the sampling and analysis activities the RI will include completion of a Qualitative Human Health Exposure Assessment (QHHEA) and Fish and Wildlife Resource Impact Analysis (FWRIA) as described below.

3.2 INVESTIGATIVE APPROACH

3.2.1 Partial Site Clearing

As part of the Site investigation activities, approximately 20% of the 15.4 acres (*i.e.*, approximately 3 acres) of the Site will be cleared for the purpose of gaining access to proposed investigation locations. In general, trees less than 12 inches in diameter will be cut down only to the extent necessary to clear pathways for access to the proposed investigation locations. The cleared trees and brush will be either chipped or pushed to the side and left on-Site. The proposed lanes to be cleared are depicted on **Figure 6**. It is proposed to access the Site from Flint Street and create a network of cleared lanes/paths to access the proposed sample locations. The northern end of 1320 S. Plymouth Avenue has ponded water during the wetter months of the year so it is proposed to perform clearing and subsequent field activities during the drier season.

Site clearing will be conducted in one or two stages. The first stage will be to clear two main paths from Flint Street southward on either side of the adjoining 5 Flint Street building followed by location survey of proposed sample locations. Subsequent to that, a second stage of clearing will be performed to the remainder of proposed sample locations, as necessary.

3.2.2 Geophysical Survey

The purpose of the geophysical survey will be to evaluate historical subsurface features and potential unknown conditions for the placement of subsequent test pits, soil borings, and/or groundwater monitoring wells. A limited Site geophysical survey will be conducted to the extent possible (*e.g.*, cleared portions of the Site) with an electromagnetic survey unit to locate magnetic anomalies associated with ferrous objects such as steel tanks. The survey will be focused on portions of the Site (to the extent cleared as detailed in Section 3.2.1) where

former Vacuum Oil buildings and operations were concentrated and in areas where present day utilities may be located. The electromagnetic survey is anticipated to cover approximately 3-4 acres of the Site, but may be expanded if necessary depending on the results of the initial survey.

A letter report will be generated that will include a map depicting the identified anomalies and will be imported into the geographic information system (GIS) database. Potential subsurface anomalies, such as possible subsurface utilities, tanks, and foundations, will be marked for subsequent investigation. The data from the geophysical survey will be used to focus subsequent subsurface investigations.

Following the completion of the GPR survey, the surveyed areas and anomaly locations will be labeled, staked and flagged, and the horizontal locations will be recorded utilizing a Trimble Geo-XH® GPS (or equivalent) unit for horizontal control using the World Geodetic System of 1984 datum (WGS 1984 datum).

3.2.3 Sample Locations

Surface Soil

The objective of investigating surface soil is to evaluate the horizontal extent of COCs and fill in spatial data gaps identified from previous investigations as described in Sections 2.5 and 2.6. The data will be used in conjunction with the QHHEA and FWIA to assess potential exposure. The exact locations will be selected in the field and adjusted as needed to avoid surface or subsurface structures or utilities. As stated above, a portion of the northern end of 1320 S. Plymouth Avenue occasionally has ponded water during the wetter months. Sampling in that area will be conducted during the drier season. A total of 34 proposed surface soil samples will be collected from the 0-2 inch (in.) depth interval, excluding vegetative cover, and a total of 20 proposed surface soil samples will be collected from the 0-2 ft. depth interval, using methods in accordance with the FSAP included as **Appendix A**. The 0-2 ft. bgs interval will also be evaluated for several purposes including the following:

- Human health exposure assessment
- Site cover evaluation
- Off-Site migration evaluation
- Ecological resources evaluation; and
- Historic fill material (HFM) evaluation (if historic fill is present).

The proposed surface soil samples are situated across the Site to evaluate data gaps and to evaluate off-Site migration of contamination and contact exposures (to the extent feasible on Cottage Street sloped topography). Information pertaining to the sample analyses (and the locations to be sampled for the 0-2 in. vs. 0-2 ft. interval) is presented on **Table 4** presented on the next page, the attached **Table 5**, and also provided in the QCP. Proposed surface soil sample locations are depicted on **Figures 6** and **7**.

Subsurface Soil (Borings and Test Pits)

The objective of investigating subsurface soil is to evaluate potential subsurface anomalies, the horizontal and vertical extent of COCs, fill in spatial data gaps identified from previous investigations as described in Sections 2.6, evaluate off-Site migration of contamination, verify previous analytical results that did not include NYSASP Category B deliverables, and to investigate and evaluate the location and extent of HFM (per Section 3.11 of DER-10). Per an August 12, 2015 meeting with the NYSDEC neither total organic carbon (TOC) or total petroleum hydrocarbon (TPH) analysis will be required for HFM evaluation. Further objectives for the excavation of test pits include the documentation of the depth and condition of former canal walls, evaluate potential contaminant migration across/under the canal walls, and identify pipelines (if observed) within the footprint of the former canal that may continue off-Site to the north or south. A total of 52 test pits and 76 soil borings are proposed to be completed as shown on **Figures 6** and **7**. Based on the Site geology, the test pit excavation depth and soil boring depth will be approximately 8 ft. bgs, equipment refusal, or bedrock, whichever is encountered first. A shallow groundwater table may also limit the depth of test pit excavations. The exact locations will be selected in the field and adjusted as needed to avoid surface or subsurface structures, large

trees, or utilities. Sample depths will vary and more than one sample may be collected from select locations to assist in defining the three dimensional extent of contamination. As stated above, a portion of the northern end of 1320 S. Plymouth Avenue occasionally has ponded water during the wetter months. Sampling in that area will be conducted during the drier season. Previous Site drilling conditions indicated the presence of shallow bedrock and the potential for subsurface structures. As such, test pits will be excavated using an excavator and/or backhoe and soil borings will be advanced using conventional hollow stem auger (HSA) methods to enable a deeper penetration than direct-push methods. The subsurface samples (consisting of both test pits and soil borings) will be advanced using methods in accordance with the FSAP and will be collected at select intervals as detailed in the FSAP included as **Appendix A**. Information pertaining to the sample analyses is presented on **Table 4** presented on the next page and provided in the QCP. Proposed test pit and subsurface soil boring and locations are depicted on **Figures 6** and **7**.

Soil Vapor

The objective of investigating soil vapor is to evaluate the potential for off-Site soil vapor intrusion (SVI), specifically at the perimeter of the Site adjacent to residential areas. A total of eight soil vapor samples will be collected from approximately 4 ft. bgs as shown on **Figure 6**. The actual sample depth will be established by site conditions at the time samples are collected. The objective will be to collect the sampled from at least 3 ft. below the ground surface and 1 ft. above the groundwater table The exact locations will be selected in the field and adjusted as needed to avoid surface or subsurface structures, large trees, or utilities.

One round of soil vapor sampling will be performed in accordance with the FSAP included as **Appendix A**. Information pertaining to the sample analysis is presented on **Table 4** presented on the next page and provided in the QCP.

The investigation of SVI within the footprint of proposed future structures is not included in the scope of work presented within this RI Work Plan; however, it is understood that additional SVI evaluation may need to be conducted in the future.

Groundwater

The objective of investigating groundwater is to evaluate the horizontal and vertical extent of COCs in both the overburden and bedrock, fill in spatial data gaps identified from previous investigations as described in Sections 2.6, and evaluate the potential for off-Site migration of contamination. A total of 25 shallow overburden wells will be installed to an approximate depth of 15 ft. bgs for the purpose of evaluating shallow groundwater conditions as shown on **Figures 6** and **8**. Five nested well pairs will also be installed as shown on **Figures 6** and **8**. These well nests will consist of one monitoring well installed in the overburden and a second within the bedrock (expected to be encountered at approximately 10 ft. to 15 ft. below grade, and the screens will be installed 10 ft. into competent bedrock). Examples of well construction are depicted on **Figure 9.** The exact locations will be selected in the field and adjusted as needed to avoid surface or subsurface structures, large trees, or utilities. As stated above, a portion of the northern end of 1320 S. Plymouth Avenue occasionally has ponded water during the wetter months. Sampling in that area will be conducted during the drier season.

These well nests will consist of one monitoring well installed in the overburden and a second within the bedrock (expected to be encountered at approximately 10 ft. to 15 ft. below grade. The bedrock well will be set to approximately 10 ft below the bedrock surface and constructed with a 5 ft well screen. Examples of well construction are depicted on **Figure 9.**

Monitoring wells will be installed, developed, and sampled in accordance with the FSAP included as **Appendix A**. Two rounds of groundwater sampling will be conducted, separated by several months to evaluate seasonal fluctuations. Information pertaining to the sample analyses is presented on **Table 4** presented on the next page and provided in the QCP. Locations of proposed overburden and bedrock groundwater monitoring wells are depicted on **Figures 6** and **8**. Hydraulic conductivity testing will also be conducted at select groundwater monitoring wells as detailed in the FSAP.

The existing on-Site overburden groundwater monitoring well, MW-3, will be evaluated for use by OBG's drilling subcontractor. If the existing monitoring well can be redeveloped, it will be used for groundwater sampling. If it cannot be reused, the existing monitoring well will be properly decommissioned in accordance with CP-43: Groundwater Monitoring Well Decommissioning Policy.

Additionally, nine grab groundwater samples will be collected in the vicinity of the western perimeter of the Site, as depicted on **Figure 6**, if groundwater is observed within 15 ft. bgs, refusal, or bedrock, whichever occurs first, at these nine locations. These grab groundwater samples will be collected from temporary 1 in. inner diameter (ID) PVC monitoring wells installed with a 5 ft. well screen intersecting the groundwater table. One well volume will be removed prior to collecting a sample using a thimble bailer. Other development and sampling procedures will follow the FSAP included as **Appendix A**. These temporary monitoring wells will be backfilled with sand and a bentonite seal prior to the collection of soil vapor samples.

3.3 SURVEY OF SAMPLE LOCATIONS

Each of the 35 newly-installed monitoring well locations and one existing monitoring well location will be surveyed by a New York State licensed surveyor for horizontal and vertical control using the WGS 1984 datum. Horizontal coordinates will be expressed in longitude (negative decimal degrees) and latitude (degrees); and vertical coordinates will be provided using the North American Vertical Datum of 1988 (NAVD88). Monitoring wells will be surveyed to the nearest 0.01 ft. (relative to mean sea level [MSL]) at the top of the well's riser pipe (measuring point), top of protective steel casing and ground surface at each location. A notch will be placed in the interior casings to provide the point to collect future groundwater level and elevation measurements.

The soil boring locations, surface soil sample locations, soil vapor locations, grab groundwater locations, and test pit locations will be labeled, staked, and flagged following completion. The horizontal locations will be recorded utilizing a Trimble Geo-XH® GPS (or equivalent) unit for horizontal control using the WGS 1984 datum. Test Pit locations will be specified in three dimensions.

The groundwater elevation data, laboratory analytical data, elevation survey, and GPS data will be used to prepare a Site basemap.

Table 4. Summary of Analytical Samples

Samples	Matrix	Laboratory Analysis	USEPA Method	No. of Samples	Trip Blank	Field Duplicate	Field Blank	MS	MSD	Total
Surface Soil	Soil	Target Compound List (TCL) VOCs + 10 Tentatively Identified Compounds (TICs)	8260 + 10 TICs	39	2	3	3	3	3	53
		TCL SVOCs + 20 TICs	8270 + 20 TICs	46		3	3	3	3	58
		Target Analyte List (TAL) Metals and cyanide	6010, 7470, 7471, 9012	45		3	3	3	3	57
		PCBs	8082	16		1	1	1	1	20
		TCL Pesticides	8081	20		1	1	1	1	24
Subsurface Soil	Soil	TCL VOCs + 10 TICs	8260 + 10 TICs	72	18	4	4	4	4	106
		TCL SVOCs + 20 TICs	8270 + 20 TICs	73		4	4	4	4	89
		TAL Metals and cyanide	6010, 7470, 7471, 9012	69		4	4	4	4	85
		PCBs	8082	63		4	4	4	4	79
		TCL Pesticides	8081	27		2	2	2	2	35
Test Pits	Soil	TCL VOCs + 10 TICs	8260 + 10 TICs	36	6	2	2	2	2	50
		TCL SVOCs + 20 TICs	8270 + 20 TICs	42		3	3	3	3	54
		TAL Metals and cyanide	6010, 7470, 7471, 9012	39		2	2	2	2	47

Samples	Matrix	Laboratory Analysis	USEPA Method	No. of Samples	Trip Blank	Field Duplicate	Field Blank	MS	MSD	Total
Test Pits	Soil	PCBs	8082	33		2	2	2	2	41
		TCL Pesticides	8081	19		1	1	1	1	23
Groundwater (two rounds shown)	Water	TCL VOCs + 10 TICs	8260 + 10 TICs	72	14	4	4	4	4	102
		TCL SVOCs + 20 TICs	8270 + 20 TICs	72		4	4	4	4	88
		TAL Metals and cyanide	6010, 7470, 7471, 9012	72		4	4	4	4	88
		PCBs	8082	72		4	4	4	4	88
		TCL Pesticides	8081	72		4	4	4	4	88
Grab Groundwater	Water	TCL VOCs + 10 TICs	8260 + 10 TICs	9	1	1	1	1	1	14
		TCL SVOCs + 20 TICs	8270 + 20 TICs	0		0	0	0	0	0
		TAL Metals and cyanide	6010, 7470, 7471, 9012	0		0	0	0	0	0
		PCBs	8082	0		0	0	0	0	0
		TCL Pesticides	8081	0		0	0	0	0	0
Soil Vapor	Soil Vapor	VOCs	TO-15	8	0	1	1	0	0	10

Notes:

1. Note the parameters to be analyzed at each proposed sample location varies. This variation is based on OBG's review of historic analytical data, cumulative historic reports, and OBG's Phase I ESA recognized environmental conditions. Therefore, the quantity of analyses depicted differs from the quantity of proposed sample locations.

3.4 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

The QHHEA will be completed for the Site. The QHHEA will be developed in accordance with NYSDEC's DER-10 and Draft Brownfield Cleanup Program Guide. The overall objective of the QHHEA is to evaluate the linkages between the contaminant source(s) and potentially exposed human receptor populations. To satisfy this objective, the QHHEA will document and describe the contaminant source(s) and COCs, the current and reasonably anticipated future land use at the Site and at potentially affected off Site areas, potential exposure pathways, and potentially exposed receptor populations.

The assessment will include the following components:

- A description of the contaminant source(s) including the location of the contaminant release to the environment (waste disposal area or point of discharge) or, if the original source is unknown, the contaminated environmental medium (soil, indoor or outdoor air, biota, water) at the point of exposure;
- An explanation of the contaminant release and transport mechanisms to the exposed population;
- Identification of potential exposure point(s) where actual or potential human contact with a contaminated medium may occur;
- Description(s) of the route(s) of exposure (*i.e.*, ingestion, inhalation, dermal absorption); and
- Characterization of the receptor populations who may be exposed to contaminants at a point of exposure.

The evaluation of current and reasonably anticipated future land use will guide the identification of potentially exposed human receptors and the identification of complete or incomplete exposure pathways for the Site.

The assessment will also evaluate laboratory analytical results for the potential for off-Site migration and associated off-Site exposures that may be evaluated in a supplemental RI, if necessary.

3.5 FISH AND WILDLIFE RESOURCE IMPACT ANALYSIS

A FWRIA Part 1– Resource Characterization will be performed as part of the RI. The FWRIA will be performed in accordance with NYSDEC DER-10 and P IIB of the NYSDEC *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (FWIA) guidance document (NYSDEC 1994). In accordance with the FWIA guidance, a qualitative evaluation of actual or potential impacts to fish and wildlife resources from Site-related constituents will be performed. The evaluation will include a description of the ecological resources located on and within 0.5-miles of the Site. The FWRIA will also evaluate if contamination is potentially migrating off-Site and/or toward the Genesee River.

Available information and the resource descriptions developed from the evaluation will be used to characterize the exposure setting, identify migration pathways, and evaluate contaminant fate and transport and potential effects to fish and wildlife resources. This information will also be used to identify contaminants of potential ecological concern (COPECs) via comparison of the existing Site media data to ecologically-based screening values and/or criteria. The results of the Part 1 FWRIA will be used to identify the need to advance the ecological evaluation process to Part 2 – Ecological Impact Assessment.

3.6 HANDLING OF INVESTIGATION-DERIVED WASTES

The RI activities will produce IDW, which will require appropriate management in accordance with state and federal regulations (Title 40 of the Code of Federal Regulations (CFR) Parts 239 through 279 and Title 6 of New York Codes, Rules and Regulations (6 NYCRR) Chapter IV, Subchapter B Parts 360 through 376). The anticipated IDW includes the following:

- Drill cuttings;
- Groundwater resulting from the development and sampling of monitoring wells;

- Decontamination fluids resulting from decontamination of the equipment brought onto the Site and personnel boot wash; and
- Dedicated sampling equipment, personnel protective equipment (PPE), and general refuse resulting from the execution of field activities.

The management of these materials will be in accordance with the requirements outlined in Section 3.3(e) of DER-10. Specific IDW handling is discussed in the FSAP (presented in **Appendix A**). The proposed IDW staging area is to be located on City-owned land immediately north of Flint Street (a continuation of the 1320 S. Plymouth Avenue tax parcel) as depicted on **Figure 6**.

3.7 DATA MANAGEMENT AND VALIDATION

Analytical data from the laboratory will be received in hardcopy and electronic format as Electronic Data Deliverables (EDDs) compatible with EQuIS™.

The data package will be reviewed by a data validator. A DUSR will subsequently be prepared to document the usability of the data. Additional information pertaining to data validation and DUSR preparation is provided in the QCP (**Appendix B**).

Data qualifiers provided in the DUSR will be manually input into the database once received from the validator. The City and NYSDEC will be notified via email upon completion of data entry for each sample delivery group.

4. ASSOCIATED WORK PLAN PRODUCTS

4.1 FIELD SAMPLING AND ANALYSIS PLAN

The FSAP for the Site is provided in **Appendix A** of this RI Work Plan. The FSAP presents the procedures for execution of field activities to be conducted as part of the RI as identified in Section 3. The FSAP also provides rationale and detailed procedures for collecting environmental samples including equipment and personnel requirements, drilling and well installation techniques, sampling techniques, and equipment decontamination procedures.

4.2 QUALITY CONTROL PLAN

The QCP for the Site is provided in **Appendix B** of this RI Work Plan. The QCP provides QA/QC criteria for work efforts associated with the sampling of environmental media as part of the RI.

This QCP provides the framework for generating data of a known and acceptable level of precision and accuracy. The QCP provides information regarding the project description and personnel responsibilities, and sets forth specific procedures to be used during sampling of relevant environmental matrices, other field activities, and the analyses of data. The procedures in this QCP will be followed by personnel participating in the field investigation and in the laboratory analyses of environmental samples.

4.3 HEALTH AND SAFETY PLAN

The HASP for the Site is provided in **Appendix C** of this RI Work Plan. The HASP has been developed to provide both general procedures and specific requirements to be followed by field personnel while performing RI activities at the Site.

The HASP describes the responsibilities, training requirements, protective equipment, and standard operating procedures to be used by personnel to address potential health and safety hazards while in investigation areas. The plan specifies procedures and equipment to be used by personnel during work activities and emergency response to minimize exposures of personnel to hazardous materials.

A CAMP that outlines the monitoring and response activities associated with monitoring VOCs and particulates at the property boundaries near the activities is included in the HASP. The CAMP was prepared in accordance with Appendix 1A of DER-10. CAMP monitoring will only be required for intrusive investigations.

4.4 CITIZEN PARTICIPATION PLAN

Citizen involvement during the investigation of the Site is an important aspect of this program. The Citizen Participation Plan (CPP) (presented in **Appendix D**) provides interested citizens with an overview of public involvement opportunities during the investigation and future remediation (if required) of the Site. The CPP also provides:

- Information about the Site's history, planned Site investigations and/or cleanup activities;
- A description of planned CPP activities and a tentative schedule of when they will occur;
- A glossary of terms and acronyms that may be encountered while learning about the Site; and
- A list of project contacts knowledgeable about the project.

The objective of this CPP is to encourage communication among all parties involved or affected by contaminant investigation and cleanup activities at the Site.

5. PROJECT PERSONNEL

The personnel for this project are anticipated as follows:

Name and Title	*Telephone*
City of Rochester Key Personnel	
Joseph Biondolillo Senior Environmental Specialist, Department of Environmental Quality Rochester, New York	(585) 428-6649 (585) 314-1617 (cell)
Dennis Peck Field Technician, Department of Environmental Quality Rochester, New York	(585) 428-6884 (585) 469-6372 (cell)
NYSDEC Key Personnel	
Frank Sowers Project Manager Avon, New York	(585) 226-2466
New York State Department of Health Key Personnel	
Bridgette K. Boyd, Public Health Specialist III New York State Department of Health Albany, NY	(518) 402-7860
OBG Key Personnel	
Doug Crawford Project Officer Syracuse, New York	(315) 956-6442 (315) 200-5204 (cell)
Deborah Wright Project Manager Rochester, New York	(315) 956-6377 (315) 546-4541 (cell)
Jeff Parsons Corporate Health and Safety Manager Syracuse, New York	(315) 956-6070 (315) 391-0638 (cell)
Anthony DiNardo Site Safety & Health Coordinator and Field Team Leader Rochester, New York	(585) 295-7707 (716) 982-9838 (cell)

Subcontractors:

Underground Services, Inc. (SoftDig)	Geophysical Survey
Nothnagle Drilling, Inc.	Soil Borings and Monitoring Wells (and select Site Clearing as necessary)
TREC Environmental, Inc.	Site Clearing

Nature's Way Environmental (WBE)	Test Pits (and Site Clearing as necessary)
ALS Environmental Group	Analytical Laboratory
City Survey and/or Fisher Associates (WBE)	Surveying

Data Validation will be performed by Ms. Linda Yates of SGD Environmental, Ms. Jodi Zimmerman of Valu-data of Western New York, or Ms. Karen Storne of OBG depending on availability.

6. RI REPORT

Following completion of the RI field activities, a RI Report as outlined in NYSDEC's DER-10 will be prepared. The RI Report will include a summary of the work completed and conclusions related to the nature and extent of contamination as documented by the investigations.

Specific information to be contained in the RI Report is as follows:

- Introduction including purpose/objectives of the RI, Site history, Site location and description, and regional setting including topography, drainage, and geology;
- A description of the adjacent land uses, zoning types, and potential end users;
- A summary of field investigation procedures, sampling, and analysis activities;
- Presentation of data, including geological interpretations of the data, and conclusions appropriate for the Site including:
  - Comparison of data to one or more applicable Standards, Criteria, and Guidance (SCGs) or Standards and Guidance Values (SGVs) including, but not limited to the following:
    - Unrestricted Use Soil Cleanup Objectives (SCOs) referenced in the NYSDEC General Remedial Program Requirements, presented in the New York State Codes, Rules and Regulations; Title 6, Chapter IV, Subpart 375 (Part 375), Table 375-6.8(a), dated December 14, 2006;
    - Residential Use SCOs referenced in Part 375, Table 375-6.8(b);
    - Restricted Residential Use SCOs referenced in Part 375, Table 375-6.8(b);
    - Protection of Groundwater SCOs referenced in Part 375, Table 375-6.8(b);
    - Protection of Ecological Resources SCOs referenced in Part 375, Table 375-6.8(b);
    - Residential Use Supplemental SCOs (SSCOs) referenced in the NYSDEC Commissioners Policy/51 (CP-51) Soil Cleanup Guidance Document, Table 1, issued October 21, 2010;
    - Restricted Residential Use SSCOs referenced in CP-51 Table 1;
    - Protection of Groundwater SSCOs referenced in CP-51 Table 1;
    - Protection of Ecological Resources SSCOs referenced in CP-51 Table 1; and
    - New York State Ambient Water Quality Standards and Guidance values, referenced in Table 1 of the NYSDEC Division of Water Technical and Operational Guidance Series 1.1.1 document titled Ambient Water Quality Standard and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1) dated June 1998 (as amended by addendum dated April 2000 and June 2004). Overburden and bedrock groundwater will be compared to the class "GA."
  - Data Usability
  - Contaminant fate and transport;
- A summary of the findings as they relate to nature and extent of contamination, including identification of COCs, and a general CSM that outlines the potential source areas and migration pathways. The pathway analysis will take into consideration potential future uses of the property, including potential tenants and Site development components to the extent possible, as well as soil cleanup levels developed for the BCP;
- A revised CSM describing the Site geology, hydrogeology, sources and types of contamination and migration pathways;
- A qualitative human health exposure assessment that identifies and characterizes potential exposure pathways at the Site and off-Site (upon evaluation of laboratory analytical results), and estimates the potential magnitude, frequency, duration, and routes of exposure of human receptors that may be exposed;

- The FWRIA;
- A recommendation if a supplemental RI is required; and
- A recommendation as to whether or not remediation may be warranted.

The analytical data will be received electronically from the laboratory and uploaded into a database. Once the DUSR has been received, qualifiers will be added to the database. The database will be used to develop tables and assist with analysis.

Relevant supporting data including laboratory analytical data, well logs, and sampling logs will be included in the RI Report. Additional tables, maps, and figures will be developed to support the discussion of the findings. These may include groundwater flow contours, and analytical data presentation tables or figures.

7. SCHEDULE

A project schedule including the anticipated duration of field work and reporting is included in **Appendix E**.

8. REFERENCES

AMEC Earth and Environmental, Inc., 2005. *Historic and Current Site Conditions Report, Former Vacuum Oil Refinery Site*, June 13, 2005.

LaBella Associates, P.C. (LaBella), 2008. *Data Summary Package, Phase II ESA Subsurface Investigation, Former Vacuum Oil Refinery Site, 15 Flint Street, Rochester, New York*, October 2008.

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NYSDEC, 2001. *Site Investigation Report Former Vacuum Oil Company Site #828089P, Rochester, Monroe County*, March 2001.

NYSDEC. 2010. *DER-10 Technical Guidance for Site Investigation and Remediation*. Division of Environmental Remediation.

OBG, 2008. *Project Oversight Management Plan Services Report, Former Vacuum oil Refinery Site Rochester, New York NYSDEC Spill No. 0370583, DEQ PSA Agreement No. 031534*, October 10, 2008.

OBG, 2012. *Phase I Environmental Site Assessment Report, 1, 13, 31, 69, and 75 Cottage Street, 100 Riverview Place, 102 Violetta Street, and 1315 S. Plymouth Avenue, Rochester, New York*, December 2012.

Roux Associates, Inc., 2009. *Subsurface Investigation Summary Report, Former Vacuum Oil Company Refinery Area*, January 12, 2009.

Stantec, Inc. (Stantec), 2008. *Phase I Environmental Site Assessment, 15 Flint Street, Rochester, New York*, April 2008.

Stantec, 2008. *Phase I Environmental Site Assessment, 5 Flint Street, Rochester, New York*, August 2008.