Corrective Action Plan
Petroleum Impacted Media

719 River Street
Woonsocket, Rhode Island

City of Woonsocket

Woonsocket, Rhode Island

September 2022

FUSS & O'NEILL

317 Iron Horse Way
Suite 204
Providence, RI 02908

Project No. 20181545.B10

FUSS & O'NEILL

September 30, 2022

Mr. Michael Cote
Principal Environmental Scientist
Office of Land Revitalization & Sustainable Materials Management
Rhode Island Department of Environmental Management
235 Promenade Street
Providence, RI 02908

RE: Corrective Action Plan
Plat 8 Lots 5, 35, 37 and 58
719 River Street, Woonsocket, Rhode Island

Dear Mr. Cote:

The purpose of this letter is to provide you with the attached *Corrective Action Plan* (CAP) for the above-referenced site in accordance with the requirements of Section 1.14 of the Rhode Island Department of Environmental Management (RIDEM) *Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials* (250-RICR-140-25-1). Fuss & O'Neill, Inc. (Fuss & O'Neill) prepared this report on behalf of the City of Woonsocket (City) under the City's Brownfields Assessment Program funded by the United States Environmental Protection Agency (USEPA). Please contact the undersigned if you have any questions or require additional information regarding this report, or the project in general.

Sincerely,

Allen P. Tevyaw II
Geologist

Patrick J. Dowling, CPG
Associate | Department Manager

/rlz

Attachments: Corrective Action Plan

C: Mr. Michael Debroisse, City of Woonsocket
Ms. Rachel Simpson, Office of Land Revitalization & Sustainable Materials Management

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1 Introduction

1.1 Objectives

The purpose of this document is to provide a Corrective Action Plan (CAP) in accordance with Section 1.14 of the Rhode Island Department of Environmental Management (RIDEM) *Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials* (250-RICR-140-25-1). This CAP, prepared by Fuss & O'Neill, Inc. (Fuss & O'Neill) on behalf of the City of Woonsocket (City), describes activities proposed to address the management of out of service underground storage tanks and associated petroleum impacted media at the property identified as the 719 River Street in the City of Woonsocket, Rhode Island (the City) Assessor's Plat (A.P.) 8, Lots 5, 35, 37 and 58.

The development of this CAP, as well as site investigation activities discussed herein, were conducted under the City's Community Wide Brownfields Assessment Program, which is a grant-funded program by the United States Environmental Protection Agency (USEPA).

2 Background

2.1 Site Description, History, and Foreseeable Future Use

The "Site" or "subject site," defined herein as 719 River Street, consists of a 5.021-acre assemblage of parcels located at Assessor's Plat 8, Lots 5, 35, 37 and 58, Woonsocket, Rhode Island. Lot 37 was formerly improved with a two-story, approximately 88,059 square-foot mill building (Building 1). During 2022, a majority of the Building 1 was razed, with the exception of a brick-style section of the building located at the southeastern most portion of the Site. Lot 5 was formerly improved with a one-story, approximately 3,025 square-foot industrial building (Building 2). Building 2 was also razed during 2022. Lots 58 and 35 are undeveloped and consist of vegetation and paved areas. Copies of the property description cards available at the City Tax Assessor's office are attached as *Appendix A*. A map consisting of a portion of a United States Geological Survey (USGS) topographic map showing the Site location is provided as *Figure 1*, and a Site plan is provided as *Figure 2*.

The property was abandoned by the last owner of record, which according to City records, was Dorado Properties LLC since 1995. However, in 2017, the City of Woonsocket, as the primary creditor of the property, petitioned the RI Superior Court to appoint a Special Master for the site. Since 2017, the Special Master working in conjunction with the City have legally taken control of the property and have been proceeding with the resolution of outstanding legal and physical issues at the site, with a goal of clean up and beneficial reuse.

Historically, the Site has been occupied by several textile mills, an auto repair facility, and a trucking company. Lot 58 was developed with residential buildings until approximately 1981. Sanborn maps, reviewed as part of an October 2019 *Phase I Environmental Site Assessment* (ESA) prepared by BETA, indicated an auto repair facility with a 150-gallon buried tank was located in the southeast portion of the Site and several additional USTs were formerly on the Site. Based on historical aerial

photographs, several buildings at the Site have been razed, the Blackstone River was re-routed, and Lot 35 was filled in between 1919 and 1943 and between 1954 and 1964.

According to the October 2019 *Phase I ESA*, the former Building 2 was heated by coal or wood and the former Building 1 was heated by natural gas.

2.1.1 Foreseeable Future Use

We understand that the City intends to initiate remediation activities so that the Site can be redeveloped and returned to productive use. The City plans to use the development of the Site as a catalyst to help modernize and increase the aesthetic value of the River Street corridor, which is a linear strip of industrial factories, mills, and auto repairs facilities along the Blackstone River. The redevelopment plan for the Site may consist of converting the remaining portion of Building 1 and surrounding grounds into a mix of potential uses, potentially including residential, commercial, and/or industrial uses.

2.2 Geographic and Physiographic Setting

The topography of the Site is generally flat with a slight slope to the east towards the Blackstone River. The regional topography gradually slopes down to the north and east towards the Blackstone River (USGS, 2018).

Surficial material at the Site was mapped as Udorthents-Urban Land Complex, which is described as human transported material (USDA, 2010).

Bedrock beneath the Site is mapped as Esmond-Dedham sub terrane formation which consists of conglomerate, sandstone, and shale. (Hermes, et al, 1994). Bedrock outcrops were not observed at the Site during soil boring investigations conducted at the Site in June 2021 by Fuss & O'Neill.

2.3 Groundwater

The groundwater beneath the Site was classified by RIDEM as GB (RIDEM, 2019). GB groundwater is designated to not be suitable for public or private drinking water use. GB groundwater areas are typically located beneath highly urbanized areas, permanent waste disposal areas and the area immediately surrounding the permanent waste disposal areas (RIDEM, 2018). According to RIDEM environmental resource mapping, the nearest GA groundwater is located approximately 0.20 miles west (upgradient) of the Site.

Based on USGS mapping, field observations, and groundwater gauging, the groundwater flow direction was calculated to flow to the east towards the Blackstone River. Groundwater depths in five monitoring wells gauged by Fuss & O'Neill during the July and September 2021 Site Investigation ranged from approximately 8 to 16 feet below grade (fbg). Groundwater equipotential contours generated from field data collected during July 2021, are depicted on *Figure 3*

The Groundwater Classification & Wellhead Protection Area Map of the Woonsocket, RI quadrangle, available from RIDEM, showed no wellhead protection areas (WHPAs) within a one-half mile radius of the subject site.

2.4 Surface Water

The nearest surface water body, the Blackstone River, is located adjacent to the western boundary of the Site (USGS, 2018). The Blackstone River was classified by RIDEM as Class B1 (RIDEM, 2010c). Class B1 waters are designated for primary and secondary contact recreational activities and fish and wildlife habitat. They should be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters should have good aesthetic value. Primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. However, all Class B criteria must be met.

Additionally, the Blackstone River was identified in the State of Rhode Island 2018-2020 303(d) List of Impaired Waters (RIDEM, 2021) as having been impacted due to cadmium, iron, lead, non-native aquatic plants, dissolved oxygen, total phosphorous, mercury and polychlorinated biphenyls (PCB) in fish tissue, enterococcus and fecal coliform.

Based on the RIDEM Environmental Resource Map, a marsh/wet meadow emergent wetland is located within Lots 5 and 35. Note that Fuss & O'Neill did not independently determine wetland boundaries or the presence of wetlands as part of this assessment.

Based on the Federal Emergency Management Agency (FEMA) Flood Map 44007C0069G, the eastern portion of the Site is located within a Special Flood Hazard Area defined as being within the 100-year flood plain. The western, eastern, and southern portions of the Site are located within the 500-year flood plain.

2.5 Potential Receptors

The activities conducted by individuals working at, visiting, or trespassing at the Site should be evaluated under current and foreseeable Site uses to determine whether compounds present in environmental media at the Site pose a risk to those individuals. Additionally, construction workers associated with redevelopment and future Site users should be considered potential receptors. Furthermore, the adjacent Blackstone River as further described in *Section 2.4*, should also be considered potential receptor.

2.6 Previous Environmental Investigations

2.6.1 October 2019 Phase I ESA

A *Phase I ESA* was conducted for the Site in October 2019 by BETA as part of a Target Brownfield Assessment funded by RIDEM. The *Phase I ESA* identified the following Recognized Environmental Conditions (RECs) associated with the Site:

- **REC #1: Historic Use:** The Site was historically used by textile mills, an auto repair facility, and a trucking operation. The database search listed one of the former textile mills as a generator of hazardous waste.

- **REC #2: Vehicles and Trucks:** BETA observed oil and/or hazardous materials (OHM) staining near and under many of the vehicles and trucks in the northern, western, and central portions of the Site. The vehicles and trucks were located on paved and unpaved areas.

- **REC #3: Underground Storage Tanks (USTs):** Historic records reviewed as part of the Phase I ESA identified at least two USTs and potentially an additional five USTs that exist at the Site.

- **REC #4: Solid Waste/Debris/Fill:** Solid waste and debris was observed at the Site during the Phase I ESA, along with evidence of fill.

Based on the RECs identified in the Phase I ESA, Fuss & O'Neill, on behalf of the City, conducted a Phase II Environmental Site Assessment/Site Investigation at the site as part of the City's Community Wide Brownfield Assessment Grant from USEPA. The results of this assessment were documented in a *Site Investigation Report* (SIR) in November 2021.

The *Phase II ESA/Site Investigation* included the advancement of seventeen soil borings and installation of six monitoring wells. Sixteen soil samples were collected and analyzed for volatile organic compounds (VOC), polycyclic aromatic hydrocarbons (PAH), priority pollutant 13 metals, total petroleum hydrocarbons (TPH) and polychlorinated biphenyls (PCBs). Six groundwater samples were collected and analyzed for VOC. In August 2021, Fuss & O'Neill conducted ten additional soil boring advancement due to the identification of a petroleum release in the area north of the mill building. Sampling locations are depicted on *Figure 2*.

2.7 Site Assessment Findings

Fuss & O'Neill identified arsenic, lead, PAH and TPH in soil at the Site, which were attributable to the presence of urban fill materials consisting of soil containing traces of brick, concrete, asphalt, coal, and ash that was historically deposited throughout the Site at depths of approximately 10 to 20 feet below grade.

In addition to the Site-wide fill conditions, a release of petroleum was identified in the area north of the Building 1. Soil containing TPH above the GB-LC was identified in samples collected from above the groundwater table in the area adjacent to Building 1, as depicted in *Figure 2*. During drilling activities, petroleum contaminated soil and groundwater was observed from approximately 5 to 20 fbg in soil borings SB-5, SB-7, MW-8, SB-17, SB-18, SB- 20, SB-23, SB-25, and SB-27. Additionally, 4.5 feet of non-aqueous phase liquid (NAPL) was observed in MW-8. The investigation indicated that two large USTs were identified directly north of the mill building within the observed plume of petroleum in the subsurface.

An approximation of the delineation of the observed subsurface petroleum, which was consistent in appearance and texture to No. 6 fuel oil is shown on *Figure 4*. The extent to which the petroleum extends beneath Building 1 has not been confirmed at this time and will be further assessed as part of a Limited Design Investigation, as discussed in *Section 3.1*.

No VOC were detected in groundwater samples collected from the Site at concentrations exceeding the RIDEM Method 1 GB-GO. Free-phase petroleum was only identified in MW-8, which is located downgradient of the two suspected UST's and within the delineation plume.

The investigation included a ground-penetrating radar (GPR) survey of the Site to identify buried structure, primarily targeted at identifying the presence of underground storage tanks (USTs). The GPR survey indicated five potential USTs exist at the Site. For the most part, the actual volume of the USTs is unknown. However, approximate volumes of the USTs were estimated based on the approximate dimensions of the subsurface anomalies identified at each location by the GPR survey, which therefore may be overestimated. The results of the GPR survey are summarized below:

- **Two potential USTs located north of Former Building 1**: Evidence of an approximately 20,000-to-30,000-gallon UST and an approximately 10,000 to 12,000-gallon UST was observed north of the former footprint of Building 1. In addition, fill ports, vent pipes, and an access hatch were observed at the ground surface within the boundary of the anomalies.

- **Potential UST located south of Former Building 1:** Evidence of an approximately 150-to-300-gallon UST was observed south of the former footprint of Building 1 in the vicinity of a former auto repair facility. According to the 1950 to 1970 Sanborn mapping, a 150-gallon tank was identified at this location.

- **Potential UST located north of Former Building 2:** Evidence of an approximately 1,000 to 1,500-gallon UST was observed north of the former footprint of Building 2. According to the 1950 to 1970 Sanborn mapping, a gasoline tank was identified north of Building 2.

- **Potential UST located on Lot 5**: Evidence of an approximately 4,000-to-5,000-gallon UST was located in the southern portion of Lot 5 within a concrete foundation. Based on historic aerials and Sanborn mapping, the UST was located within a former auto garage.

2.8 Proposed Site-Wide Remediation Strategy

In addition to the petroleum remediation activities described herein, site-wide activities are proposed to be conducted to address additional releases of hazardous materials. The site-wide remedial approach is documented in the November 2021 *Site Investigation Report*. The overall remediation approach consists of the following activities:

- Conduct UST closures, as described in the CAP documented herein.
- Conduct petroleum remediation, as described in the CAP documented herein.

- Construct a soil cap in accordance with a forthcoming *Remedial Action Work Plan* to be prepared in accordance with the OLRSMM Remediation Regulations.
- Implement institutional controls (Environmental Land Usage Restriction) in accordance with a forthcoming Remedial Action Work Plan to be prepared in accordance with the OLRSMM Remediation Regulations.

Remediation activities not related to petroleum releases will be developed and documented in a *Remedial Action Work Plan* (RAWP) for the site that will be prepared for RIDEM submission and approval. Soil cap construction and ELUR implementation will not occur during petroleum remediation phase of the cleanup. Soil construction will be performed concurrently with site redevelopment and a schedule for has not been determined.

The RAWP will be submitted to the RIDEM Office of Land Revitalization and Sustainable Materials Management, and a copy will also be forwarded to the RIDEM UST Program. A *Soil Management Plan* (SMP) will also be developed in conjunction with the RAWP that will establish guidelines for soil management throughout the site during redevelopment.

2.9 Public Notice Activities

Prior to conducting field activities at the Site, public notice activities were conducted in accordance with Section 1.8.7(A)(1) of the RIDEM *Remediation Regulations*. A notification letter was prepared using the RIDEM standard pre-Site Investigation template letter. This letter notified abutting property owners that a Site Investigation was set to commence. No public comments were received by RIDEM, the City, or Fuss & O'Neill during the completion of the Site Investigation.

Upon completion of site investigation activities, a post-investigation notification letter was prepared using the RIDEM standard post-Site Investigation template letter. This letter notified abutting property owners that site investigation activities were complete and provided a summary of the findings.

3 Corrective Action Plan

This CAP includes remediation objectives for the identified releases of petroleum at the site. These activities will be coordinated through the RIDEM UST Program. Aspects of the CAP are included in the following subsections.

3.1 Limited Design Investigation

A Limited Design Investigation (LDI) will be implemented prior to the start of remedial activities to further assess the presence of petroleum in soil and in a separate phase if present within the footprint of the recently demolished portions of Building 1 on Lot 37. The purpose of the LDI activities is to gather additional information to assist in confirming the extent of proposed excavation and soil management activities upgradient from the approximately 20,000-to-30,000-gallon UST and approximately 10,000 to 12,000-gallon UST where subsurface investigation had been historically blocked by the now-demolished building.

The LDI will consist of the advancement of approximately four (4) direct-push (i.e., Geoprobe®) soil borings to be identified as LDI-1, LDI-2, LDI-3, and LDI-4 at areas within the footprint of Building 1, upgradient from the suspected USTs. The soil borings will be advanced to a maximum depth of approximately 25 feet below grade surface. The recovered soil at each boring will be characterized for texture, color, grain type, and moisture and was field screened for VOC using a Phocheck Tiger ® photoionization detector (PID). One soil sample per soil boring will be collected for laboratory analysis of VOC and TPH. Sample collection will be based upon suspected or observed evidence of releases, or at the groundwater table.

The findings of the LDI will be used to further refine our understanding of the southern extent of the release and the volume of petroleum impacted soil requiring remedial action.

3.2 UST Closures

Site Investigation activities identified five USTs at the Site that require proper closure in accordance with the *UST Regulations*. At the initiation of remediation activities at the site, USTs identified at the site will be closed in accordance with the RIDEM *UST Regulations* by excavation and removal. Prior to closure, the tanks will be registered, and permanent closure applications will be submitted, and the closures will be coordinated and scheduled with the RIDEM UST Program.

3.3 Remediation Activities

3.3.1 Excavation

During site investigation activities, petroleum contaminated soil was observed from approximately 5 to 20 fbg in several soil borings, as depicted in *Figure 5*. Based on these site investigation findings, approximately 12,000-14,000 cubic yards of petroleum impacted soil has been identified within the release area. However, the vertical extent of petroleum impacted soil may be exaggerated due to downward smearing of free product during geoprobe advancement through petroleum impacted zone. The volume of free product is considered to be concentrated within the vadose zone and the smear zone near the water table.

At the identified release area, soil containing petroleum at levels greater than the RIDEM GB Leachability Criteria (GB-LC) and free product from within the vadose zone and the smear zone near the water table will be excavated and stockpiled on site. As the vertical extent of petroleum impacted soil is assumed to have been exaggerated, excavation depth will only be extended up to two feet below the water table. The goal of the remediation strategy documented herein is to remove free product to the maximum practicable extent and limit the potential for petroleum-related compounds to migrate and degrade groundwater or other environmental receptors. Targeted removal of free product and soil containing petroleum at levels greater than the RIDEM GB-LC will minimize the spread of petroleum contamination into uncontaminated zones.

Removal of free product will be accomplished via active removal during the remedial excavation process. Free product will be removed either via excavation and/or during dewatering processes. Removal of separate-phase petroleum via dewatering is discussed in *Section 3.6*.

Excavated soil will be placed on top of and covered with 6-mil polyethylene sheeting and/or staged in roll off containers and covered. Soil containing petroleum at levels greater than the GB-LC that is stockpiled on-site will be designated for remediation by one of two options. These options are discussed below. Soil containing petroleum at concentrations less than the GB-LC but above the Residential Direct Exposure Criteria (R-DEC) may remain on-site, as a RIDEM-approved soil cap will be emplaced over all areas of the site. Site-wide soil capping and remediation of mixed waste stream releases will be permitted via a forthcoming RAWP for the site to be submitted to the RIDEM Office of Land Revitalization and Sustainable Materials Management.

3.3.2 Soil Recycling and On-Site Re-Use

Soil containing petroleum at concentrations greater than the GB-LC not designated for off-site disposal will be designated for on-site recycling by Portland cement and asphalt emulsion stabilization and solidification. The process will transform the material into a compactable high-strength soil-cement matrix. Based on the regulatory criteria, cost effectiveness, limited available funds the City has for cleanup, technological feasibility, and the volume of soil to be remediated, on-site soil stabilization was included as part of the preferred remedial strategy documented in the November 2021 *SIR*. Stabilization using asphalt emulsion and/or concrete additives has been demonstrated to be an effective method for eliminating direct contract and leachability exposure risks from petroleum impacted soil. This remedial process has been utilized at other Rhode Island cleanup sites with great success, including at Woonsocket's municipal middle school campus, where 26,000 tons of petroleum contaminated soil was stabilized and reused on-site as stable fill and the Kettle Point remediation project in East Providence, RI. RIDEM's Office of Land Revitalization & Sustainable Materials Management approved the remedial strategy in a January 2022 *Remedial Decision Letter*.

The soil remediation objective of the on-site recycling will be to produce recycled material that no longer poses a direct-exposure risk, contaminant migration risk, or volatilization risk. Compliance evaluations will be conducted to confirm compliance with the remediation objectives. These evaluations will include analytical testing of recycled material to confirm that the material meets a proposed site-specific criterion for Synthetic Precipitation Leaching Procedure (SPLP) total petroleum hydrocarbons (TPH). The actual criterion will be determined during a bench scale test of the actual soil containing petroleum from the site. However, the proposed criterion is expected to be approximately 10 milligrams per liter (mg/L) for SPLP TPH analyzed by United States Environmental Protection Agency (USEPA) Method 8100. Results of the bench scale test and the proposed final criterion will be forwarded to RIDEM for approval.

During the stabilization /solidification processing, soil will be screened to eliminate larger materials (stones greater than three inches in diameter, miscellaneous debris, etc.). Oversize materials screened from the soil will be reused on-site as general fill unless they are grossly contaminated with petroleum. Grossly contaminated oversize materials will be crushed and incorporated with soil containing petroleum for on-site treatment. Solid waste items will be collected, managed as in accordance with RIDEM Solid Waste Regulations, and disposed of properly.

A mixture of Portland Cement and asphalt emulsions will then be added to the soil so that petroleum is prevented from leaching from the soil. Prior to acceptance as a recycled material but after processing, the stabilized/solidified soil will be analyzed for SPLP TPH at a frequency of one sample per approximately 500 tons of processed soil. Only stabilized/solidified soil that meets the site-specific RIDEM-approved SPLP TPH criterion will be accepted as a recycled material for on-site use. With the exception of the screened larger materials, no additional solid or liquid effluent waste will be generated during the stabilization/solidification process. Excess unused virgin asphalt emulsion will be removed from the site by the contractor.

Subsequent to stabilization/solidification of the soil containing petroleum, the resulting recycled material will be stockpiled on site for future on-site use. The ultimate use of the recycled material would be used as backfill for the excavation and tank graves or to be emplaced elsewhere at the site beneath a forthcoming site-wide soil cap or as on-site sub-grade base material for paved soil-cap areas of the site. Processed stockpiles will be placed on a low permeability surface (e.g., polyethylene sheeting, existing building foundation, pavement) to prevent mixing of the stockpiles with on-site soil.

The soil stabilization/solidification process is anticipated to be completed concurrent with site remediation activities relating to petroleum releases from USTs. We anticipate up to 1,000 tons of soil can be processed per day. However, the schedule will be weather dependent as rain or high winds could delay the schedule. Documentation of the stabilization/solidification activities will be included in a Closure Report.

3.3.3 Off-Site Disposal

Excavated soil may be designated for off-site disposal to an asphalt batching facility or other licensed disposal facility. This remediation method will reduce the risk of contaminant migration and direct exposure by physically removing the source from the site. The soil will be disposed of at an appropriate off-site receiving facility under appropriate non-hazardous material shipment documentation, depending on the ultimate disposal location. Prior to the disposal of soil from on-site, the soil will be characterized to confirm that soil quality is in conformance with the requirements of the receiving facility. The transport and disposal of contaminated soil from the site will be subject to the review and approval of a Qualified Environmental Professional to certify compliance with this document and RIDEM's anti-degradation guidance. Disposal will be conducted in accordance with local, state, and federal regulations as well as the receiving facility's acceptance criteria. Documentation of off-site soil disposal will be included in a *Closure Report.*

3.4 Bench-Scale Test

To evaluate the chemical stabilization properties of the petroleum-impacted material to be excavated at the Site, an Environmental Professional and selected Remediation Contractor will conduct a bench-scale test of contaminated on-site soils. Soil will be collected from various locations exhibiting the highest TPH concentrations measured to date at the Site. This "worst-case" soil sample will be treated via the stabilization /solidification process and be allowed to stand undisturbed for 24-48 hours. The sample

will then be submitted to a RI-certified laboratory for SPLP TPH. Bench-scale test results will be forwarded to RIDEM prior to initiating remedial activities.

3.5 Post-Excavation Confirmatory Sampling

The following criteria will be used to guide remedial excavations and verify compliance:

1. Visual and olfactory observations
2. Field screening of soils using a PID and/or TPH analyzer
3. Confirmatory soil sampling and laboratory analyses of remedial excavation limits.

Post-excavation soil samples will be collected from the margins of the initial excavation extents in accordance with the following sampling frequency:

- One sample per every 50 feet of each sidewall will be collected for field screening. A minimum of one sample per sidewall will be collected from excavations smaller than 50 feet in length or width.
- One sample per every 100 feet of each sidewall will be collected and analyzed for TPH via Method 8100. A minimum of one sample per sidewall will be collected from excavations smaller than 100 feet in length or width.
- Bottom samples will not be collected for due to the excavation extending up to two feet below the water table.

Grab samples shall be collected at these regular intervals. The actual number of sidewall and bottom samples will be dependent on the exact limits of the excavation.

The confirmatory samples will be collected by Environmental Professional overseeing the remediation. The environmental professional will then review the analytical results to evaluate compliance with the numeric remedial objectives, prior to restoring or capping the excavation area. Based on the initial confirmatory sampling analytical results, if sidewall samples collected from the horizontal limits of the initial excavation do not comply with the remedial objectives, then additional excavation will be conducted in accordance with the procedures described herein. Horizontal excavation and sidewall confirmatory sampling will continue until either confirmatory sample results are compliant with the remedial objectives, or if further excavation is precluded by site conditions.

3.6 Dewatering

Dewatering may be necessary to obtain hydraulic control of the groundwater at select areas given the identified free product within the smear zone in the release area. Groundwater, and where identified free product, will be extracted directly through sumps or from open excavations via submersible pump and aboveground hoses. The dewatered groundwater/ NAPL mixture shall be discharged into several fractional tanks (frac tanks) stored in the vicinity of the respective work area. Once the frac tank is filled, the contents shall either be pumped through hoses to a treatment system, or transported by vacuum tanker, whichever is appropriate.

We currently assume the dewatering treatment system will consist of two (2) to four (4) frac tanks, which will be plumbed in-series so that the water level equalizes within the tanks. Coarse sediment and potential NAPL will be allowed to settle in the initial frac tanks. Water will then be pumped from the frac tanks into the treatment system using an electric pump near the base of the frac tanks. Water will be pumped through two (2) bag filters in series to remove any suspended solids above 5-microns. Following pre-filtration, water will be directed through four 2,000-pound granular activated carbon units to remove any potential VOC. Residual NAPL captured in the frac tanks will be skim-pumped and disposed of at a licensed facility.

It is anticipated that treated groundwater will then be pumped via hosing to a nearby catch basin or directly to the Blackstone River using a RIPDES Remediation General Permit (RGP). This anticipated dewatering and treatment system has not yet been fully designed or permitted under the RIPDES RGP. The forthcoming RGP application will include detailed information about hydraulic control and dewatering system design flows and components.

3.7 Remediation Contractor

Fuss & O'Neill is coordinating the remedial design and permitting requirements for the remediation. The contractor(s) that will be retained by the City of Woonsocket to perform the remediation activities have not been selected to date. RIDEM will be notified of the selected remediation contractor(s) upon selection.

3.8 Remediation Schedule

The anticipated remedial design and implementation schedule is as follows:

- Remedial planning and permitting complete by Spring 2023.
- Remediation contractor selected and awarded by Summer 2023
- Remediation activities complete by Fall 2023
- Post-remediation groundwater monitoring to commence by Fall 2023

3.9 Set-up Plan

Construction access will be established prior to initiation of remedial activity. Clearing and grubbing within the access area, remedial excavation areas, and equipment and materials staging areas will be conducted. Cleared vegetation, with the exception of selected mature trees, will be either disposed off-Site or mulched/chipped and used to support on-Site landscaping. Soil intermingled among the root ball of existing vegetation will be removed to the extent feasible and returned to the ground surface prior to re-grading.

Prior to remedy implementation, appropriate measures will be taken to manage and minimize the potential for migration of hazardous materials through surface run-off or air-borne dust. This will be achieved by the installation of erosion controls, wetting soil, or other appropriate measures, as necessary. Material staging areas, including the locations of stockpiled or containerized contaminated media, will be designated at the Site. These areas will be secured and protected from runoff with appropriate best

management practices including use of polyethylene sheeting and perimeter erosion controls, as appropriate.

3.10 Soil Stockpiling and Material Curing

Soil stockpiling for all excavated or stabilized soil, cured or uncured will occur at Lot 5 and 37, due to the release area extending on to both lots. All excavated or stabilized soil, cured or uncured, shall be stockpiled on and under minimum 6 mil polyethylene sheeting and surrounded by hay bayes and/or straw wattle. Stockpiles shall be covered whenever soil is not actively being added to, or removed from, the stockpile. Stockpile covering shall be adequately secured against wind. Stockpiles shall be inspected daily, and any breach of cover or sediment/erosion control shall be repaired as soon as possible, but prior to the end of the day.

Unstabilized petroleum-impacted soil will be stockpiled proximal to the excavation extent. Stabilized soil will be stockpiled at a designated area outside of the release area and separate from the unstabilized stockpile. Stockpile areas will be depicted on construction documents prepared for the Remediation Contractor.

Each processed soil stockpile will include up to 500 cubic yards of processed material. The processed soils will cure for 48-96 hours before testing and laboratory analysis. A composite soil sample will be collected from each 500 cubic yard stockpile of processed material. Limited available space on Lots 5 and 37 outside of the release area may impact the volume of excavated petroleum-impacted soil that can be recycled and allowed to cure any a given time.

After laboratory results have been evaluated, it will be determined if the performance criteria for the stabilized soils have been met. If they have not, stabilized will remain segregated, stockpiled on and under minimum 6-mil polyethylene sheeting, allowed to cure for an additional four days and the re-sampled and re-analyzed. Stabilized soils that fail to meet the soil stabilization performance standard upon reanalysis shall either be reprocessed, or appropriately disposed off-site.

3.11 Operating Logs

Documentation of Site activities related to construction and remedial activities shall be submitted to RIDEM in a Closure Report consistent with the requirements of the Remediation Regulations. Documentation shall include, but not limited to, a log of excavation measurements and volumes of excavated petroleum impacted soil generated, volumes of petroleum impacted soil stabilized and volumes of stabilized soil generated, analytical results from confirmatory sampling, stabilized soil sampling, benchmark testing, observations of NAPL and other visual or olfactory indications of contamination, bills of lading, weigh slops, and facility receipts, and any other documentation the Environmental Professional deems relevant to investigation and remediation of the Site.

4 Post-Remediation Groundwater Monitoring Program

The objective of this section is to provide the specifications for a post-remediation environmental monitoring program at the Site to evaluate groundwater conditions. The following program was developed in accordance with the RIDEM *Remediation Regulations*.

4.1 Groundwater Remedial Objectives

Groundwater remedial objectives will be three consecutive groundwater monitoring events in which NAPL is not detected and VOC concentrations are below their respective GB-GO standards in groundwater samples collected from three monitoring wells to be installed post-remediation activities.

4.2 Monitoring Location

During each monitoring event, groundwater samples will be collected from three newly install groundwater monitoring wells at the Site, designated as MW-7S and MW-107D. The anticipated locations of these wells are depicted on *Figure 3*.

4.3 Monitoring Frequency

The monitoring frequency will be quarterly, commencing within three months from the acceptance of closure activities by RIDEM. Requests for reduced sampling frequency may be submitted to RIDEM for approval. If results indicate that detected VOC are below respective GB-GO standards for three consecutive groundwater monitoring events, the Owner will submit a request to terminate the proposed sampling program based on the remedial objectives being met.

4.4 Monitoring Procedures

Groundwater samples will be collected, stored, transported, and analyzed in accordance with applicable RIDEM and United States Environmental Protection Agency (USEPA) sampling methods and generally accepted industry practices. Groundwater samples and field parameters will be collected using "low-flow" sampling procedures.

Prior to sampling, monitoring wells will be gauged with an interface probe to check for the presence and thickness of NAPL within the water column.

Laboratory analysis will be conducted by a Rhode Island State Certified Environmental Testing Laboratory.

4.5 Monitoring Parameters

During each monitoring event, each of the groundwater samples collected from the on-Site monitoring wells will be analyzed for VOC by USEPA Method 8260. Additionally, field parameters will be recorded in the field at the time of sample collection, including temperature, pH, dissolved oxygen, specific conductivity, and oxidation-reduction potential.

4.6 Well Maintenance

Throughout the post-remediation monitoring period, the monitoring wells will be properly maintained by the Owner. In the event that a monitoring well is damaged or destroyed prior to remedial objectives being met, the Owner will make the proper repairs.

4.7 Reporting and Data Evaluation

On an annual basis, the results of the prior year's groundwater monitoring events will be summarized in a report and submitted to RIDEM. The report will include the following:

- Site plan.
- Summary tables of analytical data.
- Laboratory analytical reports.
- Evaluation of the quality and usability of laboratory analytical data.
- Evaluation of the analytical data for compliance with the RIDEM Method 1 GB-GO.
- Evaluation of the analytical data for compliance with the Groundwater Remedial Objectives for the Site.
- Recommendations for either continued groundwater monitoring or termination of the sampling program based on achievement of the remedial objectives.

Certifications

I hereby certify the completeness and accuracy of the information contained in the above-referenced documents to the best of my knowledge

	Associate	09/30/2022
Signature of Fuss & O'Neill, Inc. Patrick J. Dowling, CPG	Title	Date

I hereby certify that the above-referenced documents are a complete and accurate representation of the contaminated site and the release and contain all available facts surrounding the release to the best of my knowledge.

Signature of Performing Party City of Woonsocket	Title	Date

Printed Name

FUSS & O'NEILL

Certifications

I hereby certify the completeness and accuracy of the information contained in the above-referenced documents to the best of my knowledge

Signature of Fuss & O'Neill, Inc. Patrick J. Dowling, CPG	Associate Title	09/30/2022 Date

I hereby certify that the above-referenced documents are a complete and accurate representation of the contaminated site and the release and contain all available facts surrounding the release to the best of my knowledge.

Signature of Performing Party City of Woonsocket	DIRECTOR Title Planning & Development	10/3/22 Date

Michael Pelosse
Printed Name

5 References

Federal Emergency Management Agency, October 2015, FIRM Panel 44007C0069G. Scale = 1: [25,000].

Fuss & O'Neill, September 2019, Phase I Environmental Site Assessment, City of Woonsocket, Woonsocket, RI.

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Hermes, O.D, Gromet, L.P., and Murray, D.P (*compilers*) 1994, Bedrock Geologic Map of Rhode Island: Rhode Island Map Series No.1, University of Rhode Island, Kingston, scale = 1:100,000

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USGS, 1939, Providence, Rhode Island Quadrangle, 7.5-Minute Series Topographic Map; United States Department of the Interior, U.S. Geological Survey, Photo revised 1947.

6 Limitations of Work Product

This document was prepared for the sole use of the City of Woonsocket, the only intended beneficiaries of our work. Those who may use or rely upon the report and the services (hereafter "work product") performed by Fuss & O'Neill, Inc. and/or its subsidiaries or independent professional associates, subconsultants and subcontractors (collectively the "Consultant") expressly accept the work product upon the following specific conditions.

1. Consultant represents that it prepared the work product in accordance with the professional and industry standards prevailing at the time such services were rendered.

2. The work product may contain information that is time sensitive. The work product was prepared by Consultant subject to the particular scope limitations, budgetary and time constraints and business objectives of the Client which are detailed therein or in the contract between Consultant and Client. Changes in use, tenants, work practices, storage, Federal, state or local laws, rules or regulations may affect the work product.

3. The observations described and upon which the work product was based were made under the conditions stated therein. Any conclusions presented in the work product were based solely upon the services described therein, and not on scientific or engineering tasks or procedures beyond the scope of described services.

4. In preparing its work product, Consultant may have relied on certain information provided by state and local officials and information and representations made by other parties referenced therein, and on information contained in the files of state and/or local agencies made available at the time of the project. To the extent that such files which may affect the conclusions of the work product are missing, incomplete, inaccurate or not provided, Consultant is not responsible. Although there may have been some degree of overlap in the information provided by these various sources, Consultant did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this project. Consultant assumes no responsibility or liability to discover or determine any defects in such information which could result in failure to identify contamination or other defect in, at or near the site. Unless specifically stated in the work product, Consultant assumes no responsibility or liability for the accuracy of drawings and reports obtained, received or reviewed.

5. If the purpose of this project was to assess the physical characteristics of the subject site with respect to the presence in the environment of hazardous substances, waste or petroleum and chemical products and wastes as defined in the work product, unless otherwise noted, no specific attempt was made to check the compliance of present or past owners or operators of the subject site with Federal, state, or local laws and regulations, environmental or otherwise.

6. If water level readings have been made, these observations were made at the times and under the conditions stated in the report. However, it must be noted that fluctuations in water levels may occur due to variations in rainfall, passage of time and other factors and such fluctuations may affect the conclusions and recommendations presented herein.

7. Except as noted in the work product, no quantitative laboratory testing was performed as part of the project. Where such analyses have been conducted by an outside laboratory, Consultant has relied upon the data provided, and unless otherwise described in the work product has not conducted an independent evaluation of the reliability of these tests.

8. If the conclusions and recommendations contained in the work product are based, in part, upon various types of chemical data, then the conclusions and recommendations are contingent upon the validity of such data. These data (if obtained) have been reviewed and interpretations made by Consultant. If indicated in the work product, some of these data may be preliminary or screening-level data and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time and other factors.

9. Chemical analyses may have been performed for specific parameters during the course of this project, as described in the work product. However, it should be noted that additional chemical constituents not included in the analyses conducted for the project may be present in soil, groundwater, surface water, sediments or building materials at the subject site.

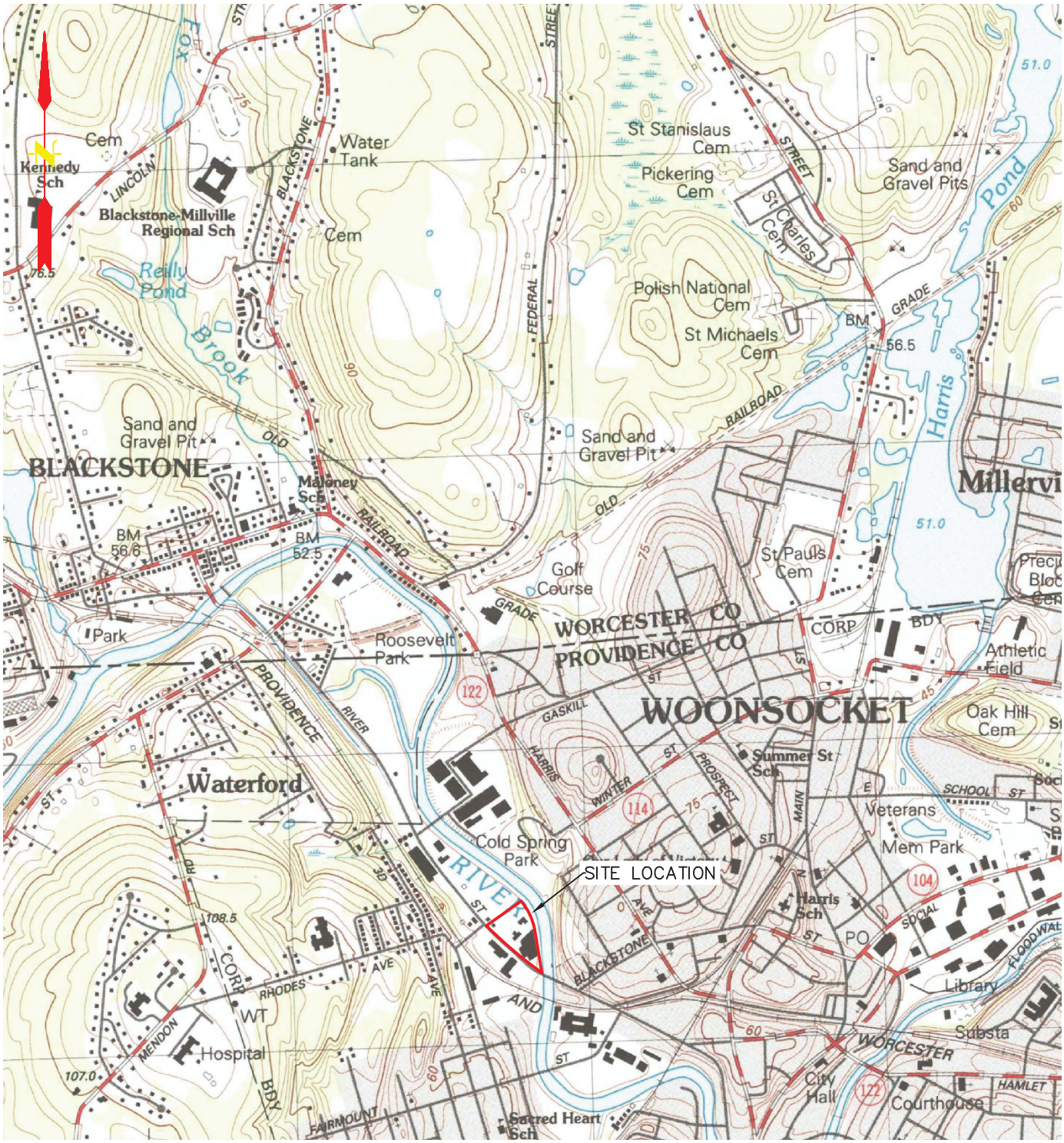
10. Ownership and property interests of all documents, including reports, electronic media, drawings, and specifications, prepared or furnished by Consultant pursuant to this project are subject to the terms and conditions specified in the contract between the Consultant and Client, whether or not the project is completed.

11. Unless otherwise specifically noted in the work product or a requirement of the contract between the Consultant and Client, any reuse, modification or disbursement of documents to third parties will be at the sole risk of the third party and without liability or legal exposure to Consultant.

12. In the event that any questions arise with respect to the scope or meaning of Consultant's work product, immediately contact Consultant for clarification, explanation or to update the work product. In addition, Consultant has the right to verify, at the party's expense, the accuracy of the information contained in the work product, as deemed necessary by Consultant, based upon the passage of time or other material change in conditions since conducting the work.

13. Any use of or reliance on the work product shall constitute acceptance of the terms hereof.

Figures



MAP REFERENCES AND NOTES

THIS MAP WAS PREPARED FROM THE FOLLOWING 7.5 x 15 MINUTE USGS TOPOGRAPHIC QUADRANGLES: UXBRIDGE MASSACHUSETTS

SOURCE: USGS TOPOVEIW

SCALE:	
HORZ.:	1" = 200'
VERT.:	
DATUM:	
HORZ.:	
VERT.:	

0 100 200

GRAPHIC SCALE

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CITY OF WOONSOCKET

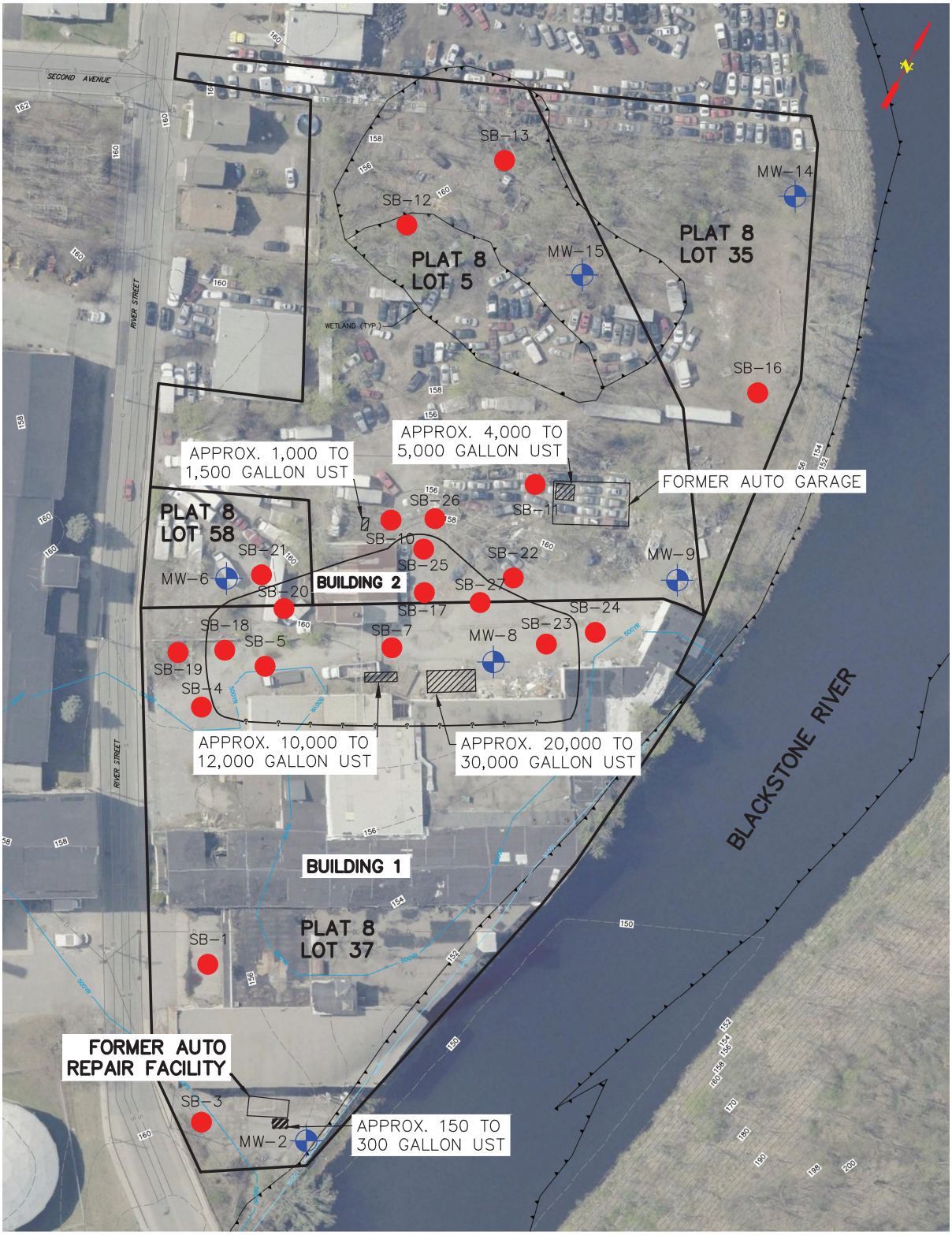
SITE LOCATION MAP

719 RIVER STREET

WOONSOCKET RHODE ISLAND

PROJ. No.: 20181545.B10
DATE: NOVEMBER 2021

FIGURE 1



LEGEND

MW-XX — MONITORING WELL

SB-XX — SOIL BORING

PARCEL BOUNDARY

UNDERGROUND STORAGE TANK (UST)

APPROXIMATE AREA OF PETROLEUM CONTAMINATED SOIL DETERMINED BY FIELD OBSERVATIONS (DASHED WHERE INFERRED)

MAP REFERENCES AND NOTES

THIS MAP WAS PREPARED FROM RIGIS COLOR ORTHO IMAGERY (2019)

SOURCE: THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM (RIGIS)

SITE FEATURES AND UST LOCATIONS ARE APPROXIMATE

SCALE: HORZ.: 1" = 70'
VERT.:
DATUM:
HORZ.:
VERT.:
0 35 70
GRAPHIC SCALE

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CITY OF WOONSOCKET

SITE PLAN

719 RIVER STREET (PLAT 8, LOTS 5, 35, 37 & 58)

WOONSOCKET RHODE ISLAND

PROJ. No.: 20181545.B10
DATE: NOVEMBER 2021

FIGURE 2

LEGEND

MW-XX — MONITORING WELL

XX.XX'

PARCEL BOUNDARY

GROUNDWATER FLOW DIRECTION

X.X' — GROUNDWATER ELEVATION EQUIPOTENTIAL CONTOUR

MAP REFERENCES AND NOTES

THIS MAP WAS PREPARED FROM RIGIS COLOR ORTHO IMAGERY (2019)

SOURCE: THE RHODE ISLAND GEOGRAPHIC INFORMATION SYSTEM (RIGIS)

SITE FEATURES ARE APPROXIMATE

SCALE:
HORZ.: 1" = 150'
VERT.:
DATUM:
HORZ.:
VERT.:
0 75 150
GRAPHIC SCALE

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CITY OF WOONSOCKET

GROUNDWATER CONTOUR MAP

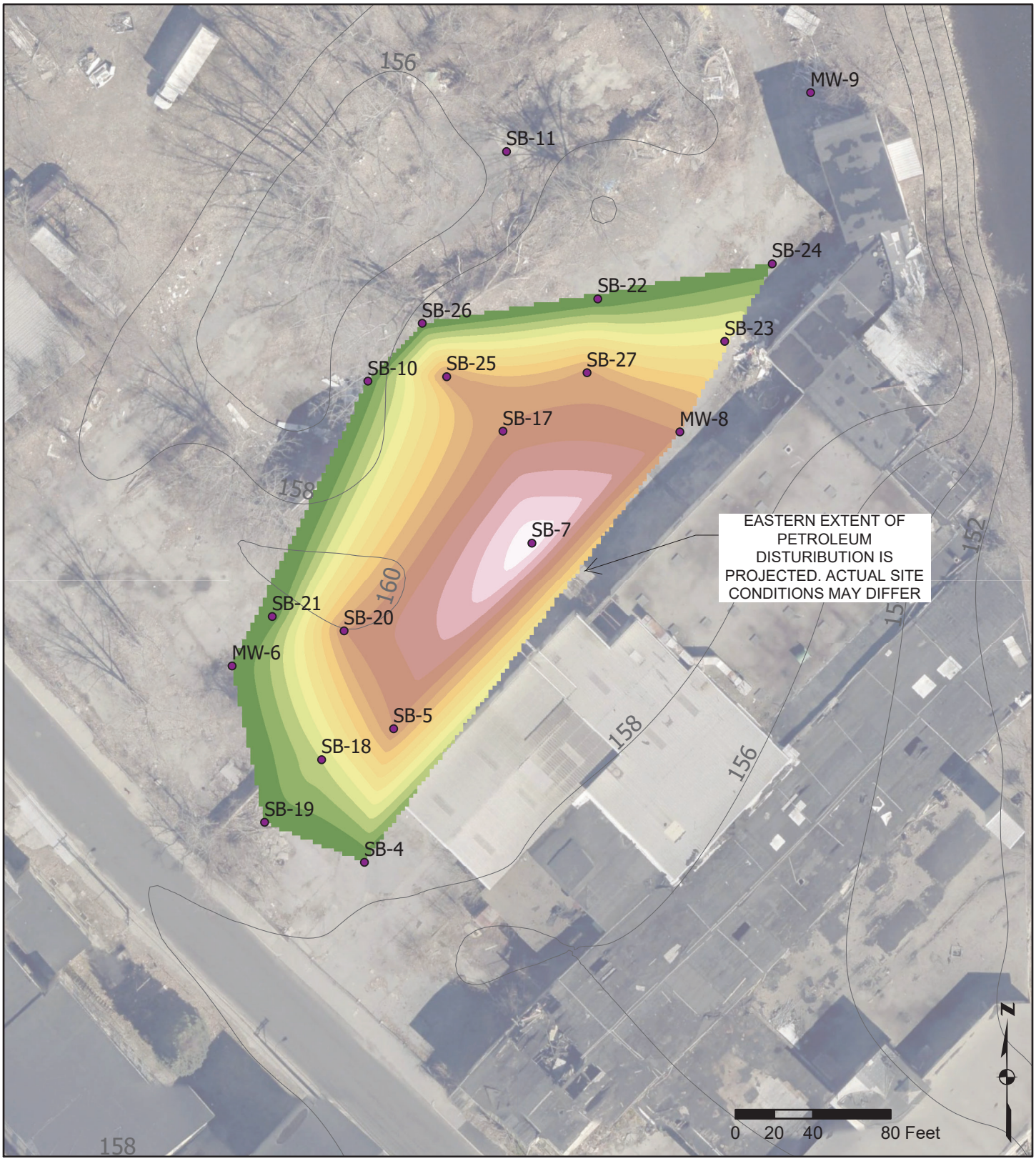
719 RIVER STREET

WOONSOCKET RHODE ISLAND

PROJ. No.: 20181545.B10
DATE: NOVEMBER 2021

FIGURE 3

File Path: J:\DWG\P20181545\B10\Environmental\Plan\719 River Street\20181545.B10_GW CONTOUR.dwg Layout: 08.5X11-P Plotted: Mon, November 08, 2021 - 9:17 AM User: msampson
Plotter: DWG TO PDF.PC3 CTB File: FO.STB
LAYER STATE:
MS VIEW:



THICKNESS OF PETROLEUM IMPACTED SOIL (FT)

VALUE		
0.001 - 1	5.01 - 6	11.1 - 12
1.01 - 2	6.01 - 7	12.1 - 13
2.01 - 3	7.01 - 8	13.1 - 14
3.01 - 4	8.01 - 9	14.1 - 15
4.01 - 5	9.01 - 10	SOIL BORING/ MONITORING WELL
	10.1 - 11	

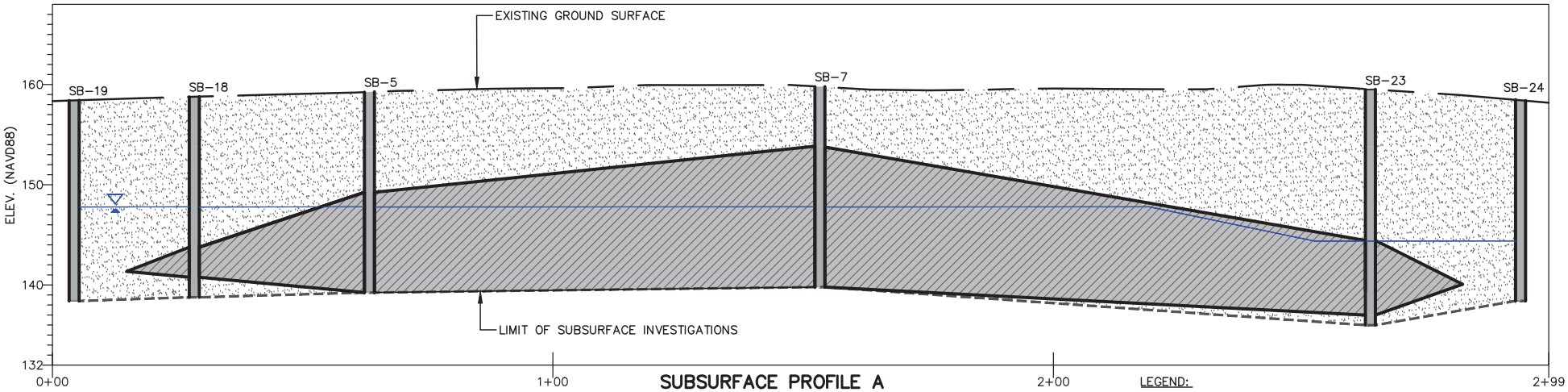
DISTIBUTION OF PETROLEUM IMPACTED SOIL

719 RIVER STREET
(PLAT 8, LOTS 5, 35, 37, & 58)
Woonsocket RI

FUSS & O'NEILL

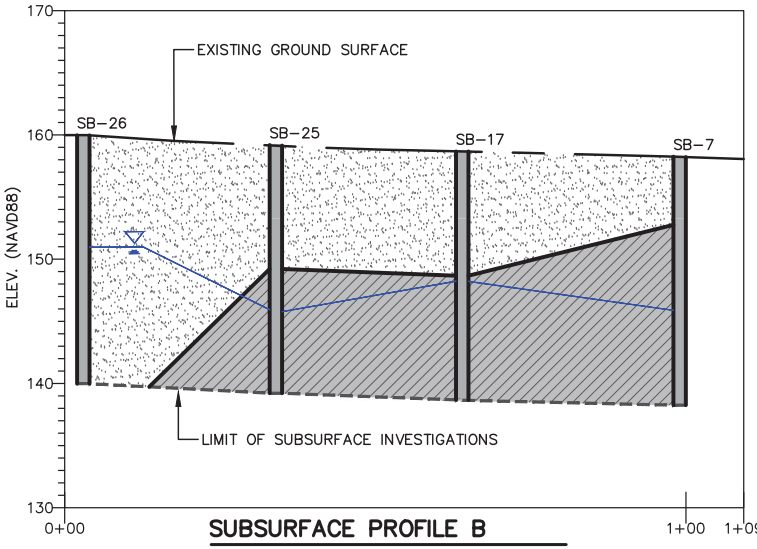
Figure #4

Folder: F:\P2018\1545\B10\Sites\719 River Street - Dorado\Deliverables\Corrective Action Plan\Reference Documents\GIS\719_River_Street\ Project: 719_River_Street Layout: Std_8.5x11_Portrait_Bottom Map: Main Data Frame Map Frame
Date Exported: 9/28/2022 1:40 PM User: ATevyaw Date Saved: 9/13/2022 3:00 PM



SUBSURFACE PROFILE A

1"=20' HORIZ., 1"=10' VERT.



SUBSURFACE PROFILE B

1"=20' HORIZ., 1"=10' VERT.

SUBSURFACE INVESTIGATION & PROFILE OVERVIEW

NOT TO SCALE

LEGEND:

- APPROXIMATE GROUNDWATER SURFACE
- NON-PETROLEUM IMPACTED (GRANULAR FILL OR NATIVE SANDS)
- PETROLEUM IMPACTED SOIL
- SB-16 MW-15 SOIL BORING/MONITORING WELL (TYP.)

NOTES:

1. SUBSURFACE INVESTIGATIONS WERE CONDUCTED FROM JUNE 28 TO JUNE 30, 2021.
2. THIS MAP IS NOT A PRODUCT OF A PROFESSIONAL SURVEY AND WAS CREATED BY FUSS & O'NEILL FOR GENERAL REFERENCE, INFORMATION, PLANING AND GUIDANCE.
3. USE OF THIS DIAGRAM IS LIMITED TO THE ILLUSTRATION OF THE APPROXIMATE LOCATION OF EXPLORATIONS AND SUBSURFACE SOIL CONDITIONS. ANY OTHER USE OF THIS DIAGRAM WITHOUT PERMISSION FROM FUSS & O'NEILL IS PROHIBITED.
4. DEPTH OF STRATUM SHOWN IN THE SUBSURFACE PROFILES WERE INTERPOLATED BETWEEN BORING LOCATIONS AND SHOULD BE UTILIZED FOR GENERAL REFERENCE. ACTUAL SITE CONDITIONS MAY VARY.
5. GROUNDWATER LEVEL FLUCTUATIONS CAN OCCUR DUE TO SEASONAL VARIATIONS IN RAINFALL, RUNOFF AND OTHER FACTORS NOT EVIDENT DURING THE EXPLORATIONS.
6. FOR ADDITIONAL SUBSURFACE INFORMATION SEE THE FINAL BORING LOGS.
7. VERTICAL PROFILE OF PETROLEUM IMPACTED SOIL POTENTIALLY BIASED DUE TO SMEARING OF PETROLEUM DOWNWARD DURING GEOPROBE ADVANCEMENT THROUGH ACTUAL PETROLEUM CONTAMINATED INTERVAL. PETROLEUM IMPACTED SOIL MAY BE VERTICALLY EXAGGERATED IN THIS FIGURE.

No.	DATE	DESCRIPTION	DESIGNER	REVIEWER

SCALE:
HORZ.: SEE PLAN
VERT.: SEE PLAN
DATUM:
HORZ.: NAD83
VERT.: NAVD88
0 10 20
GRAPHIC SCALE

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CITY OF WOONSOCKET

PETROLEUM IMPACTED SOIL PROFILE

719 RIVER STREET
(PLAT 8, LOT 5, 35, 37, & 58)

WOONSOCKET RHODE ISLAND

PROJ. No.: 20181545.B10
DATE: SEPTEMBER 2022

FIG 5

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