Franklin, Massachusetts

# Former Nu-Style Jewelry Factory Property

*21 Grove Street*

*June 2025*

# ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES

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June 2025

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# 1.0 Introduction

## 1.1 Purpose

On behalf of the Town of Franklin, BETA Group, Inc. (BETA) has developed this Analysis of Brownfields Cleanup Alternatives (ABCA) Report for the former Nu-Style Jewelry Factory property located at 21 Grove Street in Franklin, Massachusetts ("the site"). This report has been prepared under Franklin's FY23 Brownfield Cleanup Grant Number BF-00A01140 funded by the United States Environmental Protection Agency (USEPA).

This ABCA was prepared in accordance with USEPA guidelines and in general accordance with the regulatory requirements of the Massachusetts Contingency Plan (MCP), 310 CMR 40.0000. The ABCA was available for public comment for a period of 30 days from May 30, 2025 through June 30, 2025. A public meeting on the ABCA was held on June 17, 2025 at the Franklin Town Hall, 355 East Central Street, Franklin, MA.

This ABCA presents an evaluation of feasible remedial alternatives to address hazardous material contamination (chlorinated volatile organic compounds [cVOCs] and petroleum) in soil and groundwater and hazardous building materials (asbestos containing materials [ACMs]) associated with the existing building.

## 1.2 Site Redevelopment Plan

The Town of Franklin, the site owner, has established plans to clean up and prepare the site for potential future mixed-use redevelopment, possibly including an expansion of the nearby industrial park and construction of an access road.

## 1.3 Applicable Laws and Regulations

Laws and regulations that are applicable to remedial and assessment response actions include the following:

- Massachusetts Contingency Plan (MCP) - 310 CMR 40.0000
- Massachusetts Hazardous Waste Regulations - 310 CMR 30.0000
- OSHA Safety and Health Regulations for Construction (Asbestos) - 29 CFR 1926.1101
- National Emission Standards for Hazardous Air Pollutants (NESHAP) – 40 CFR 61.145
- MassDEP Asbestos Regulation – 310 CMR 7.15
- Federal Small Business Liability Relief and Brownfields Revitalization Act
- Federal Davis-Bacon Act
- Town of Franklin by-laws.

Contaminated soil, groundwater, and sub-slab soil gas at the site are regulated under the MCP. It is anticipated that remedial response actions (involving soil, groundwater and/or sub-slab soil gas) will be performed as an MCP Release Abatement Measure (RAM).

Asbestos containing materials (ACMs) at the site will be regulated under the OSHA Safety and Health Regulations for Construction (Asbestos), National Emission Standards for Hazardous Air Pollutants (NESHAP), and MassDEP Asbestos Regulations.

# 2.0 GENERAL SITE INFORMATION

The property appears on the United States Geological Survey (USGS) Topographic Quadrangle – Franklin, Massachusetts. See Figure 1 for details. The property encompasses approximately 0.825 acres of land and consists of one parcel designated by the Town of Franklin as Map 276, Lot 22. The Town acquired former adjacent Lots 22 and 27 via tax takings in 2002 and 2005, respectively. The two lots were subsequently combined and are now referred to as Lot 22 (the site). The site is bound by Grove Street to the east, Mine Brook and a residential property to the west, and commercial properties to the north and south.

The site was operated by Unionville Woolen Mills in the late 1800s. It is noted that the former industrial property comprised Lot 22, former Lot 27, and the abutting Lots 26 and 28. The site and adjacent parcel south of Mine Brook were occupied by the Franklin Paint Company in the 1950s. The site was subsequently operated by Nu-Style Company, Inc. and Image Jewelry as a jewelry factory in 1969 until the late 1980s. Manufacturing processes included electroplating and metals finishing.

The site, subject to this ABCA, is currently improved by a 4,307 square foot collapsing building constructed circa 1945, situated in the western portion of the site. The collapsing site building shares a wall with the abutting building at the northerly adjacent property. Refer to Figure 2.

According to Figure 1, elevation at the site is approximately 240 feet above mean sea level (MSL). Topography of the site and site vicinity can be categorized as generally flat except at the banks of Mine Brook where topography drops steeply to the riverbed. Previous subsurface investigations determined that groundwater flows towards the south/southeast.

## 2.1 SURROUNDING LAND USE

Visual observations and review of historical sources revealed the following current and historical uses of adjoining properties as described in Table 1.

**Table 1: Current and Historical Uses of Adjoining Properties**

| ADJOINING PROPERTIES | DIRECTION | CURRENT USE | HISTORICAL USE |
|---|---|---|---|
| Waterview Marble and Granite | North/Northeast | Commercial | Commercial / Industrial |
| Grove Street | East | Roadway | Roadway / Wetland |
| Old Forge Road | South | Roadway / Driveway | Roadway |
| Mine Brook | West/South | Brook | Brook |
| America's Best Defense | South/Southeast | Commercial | Commercial / Industrial |
| Jancon Exteriors | East/Northeast (across Grove St) | Commercial | Commercial / Industrial |

## 2.2 POTENTIAL RECEPTORS

The site structure is currently unoccupied and fenced off from the public/trespassers. BETA's review of the MassDEP Phase I Site Assessment Map revealed that the site is not located within a MassDEP-designated Public Water Supply Protection Area, a Potentially Productive Aquifer, or within a Current or Potential Drinking Water Source Area. See Figure 3 for details.

The southern portion of the site is located within a 100-year floodplain. There are no known private or public potable water supply wells located within 500 feet of the Site. Zone II Wellhead Protection Areas are located within 0.5-mile southeast and northwest of the Site. Mine Brook abuts the southern and western boundaries of the site property.

The following are potential receptors of oil and/or hazardous material in overburden soil and groundwater:

- Site workers
- Construction and utility workers
- Trespassers

## 2.3 CLIMATE CHANGE AND SITE-SPECIFIC RISK FACTORS

Climate projections from the Massachusetts Climate and Hydrologic Risk Project for the Charles River Watershed based on the Representative Concentration Pathway (RCP) 8.5 warming scenario[1] indicate that the Site will experience an annual average increase in temperature of 8.1 degrees F, with an average of 39 days per year above 90 degrees F by 2070, and up to 17 days per year above 95 degrees F by 2070. These projections for 2070 also suggest that the Site will experience a 22.3% increase in maximum precipitation, with up to two additional days with rainfall over 1 inch[2]. Based on the Massachusetts Climate Change Projections Dashboard,[3] rainfall depths for the 24-hour, 100 year rain event for the area near the Site:

| Planning Horizon | Predicted Rainfall |
|---|---|
| 2030 | 9.4” |
| 2050 | 10.1” |
| 2070 | 11.1” |
| 2090 | 11.9” |

These climate factors will impact both the Site’s exposure to natural hazards and vulnerability of the selected remediation alternatives. Examples of site-specific risk factors include more severe rain events, riverine flooding, and increasing temperatures.

An increase in precipitation poses a risk to the Site, as Mine Brook, which flows along the southern and western property boundaries, has a FEMA-mapped 100-year floodplain with a mapped Base Flood Elevation of 227 ft and 221.3 ft (NAVD88) respectively. While the contaminants onsite are primarily located outside of the flood hazard, increases in precipitation may alter the floodplain and expose areas of the Site to additional flooding. Increased precipitation will exacerbate areas with existing flood risk. These floodwaters may then interact with subsurface contaminants. Increased rainfall may also cause unexpected changes to the water table, increasing the interaction of contaminants with groundwater.

[1] A comparatively high greenhouse gas emissions scenario
[2] Climate change projections developed for the Massachusetts Climate and Hydrologic Risk Project (Phase 1) by the Massachusetts Executive Office of Energy and Environmental Affairs (EEA) in partnership with Cornell University, U.S. Geological Survey and Tufts University.
[3] MA Hydro Risk Climate Dashboard

Increasing temperatures may also result in stress and mortality of vegetation and alter hydrology on the Site, which may lead to erosion and expose Mine Brook to sedimentation and possible contamination through migration of subsurface contaminants.

Due to these factors, alternatives that remove COCs from the Site entirely would be most effective at mitigating the long-term risks posed by potential climate change hazards. Best management practices should be implemented onsite during soil-disturbing activities to minimize soil migration from the Site to the River during larger rain events. Finally, contractors working on the site should be made aware of the flood risks associated with Mine Brook so the work is staged appropriately and the site is able to be secured during construction should a significant rain event be forecasted to minimize impacts to the River and the Site.

# 3.0 Disposal Site History

## 3.1 MassDEP Disposal Site

MassDEP has assigned one Release Tracking Number (RTN) to the site. In July 2007, Fuss & O'Neill, Inc. (Fuss & O'Neill) conducted a Phase II Environmental Site Assessment (ESA) at the site (Lots 22, 27, and 26). The site address was 87 Grove Street at that time. Fuss & O'Neill identified the release of metals, chlorinated volatile organic compounds (cVOCs), and polycyclic aromatic hydrocarbons (PAHs) to soil at the site. They also identified a release of lead and cVOCs to groundwater. MassDEP assigned RTN 2-16694 to the site in May 2007.

MCP Release Abatement Measure (RAM) activities in 2012 and 2013 were completed by Fuss & O'Neill and were limited to the eastern portion of the site (former lot 27). The building on lot 27 was demolished and soils impacted by metals were excavated and disposed of off-site.

Approximately 400 tons of soil were transported off-site for disposal. During the demolition of the former lot 27 building, an underground raceway structure was encountered extending to the existing building on lot 22 (western portion of the site). Refer to Section 3.2.3 for further details. Additional remedial and/or assessment response actions are required to achieve regulatory closure for RTN 2-16694.

## 3.2 Summary of Assessment and Remedial Response Actions Completed to Date

### *3.2.1 Site Investigation – IES, Inc. (IES) 1990 to 1992*

In 1990, IES completed a Chapter 21E Site Evaluation at the site which included the advancement of five soil borings, the installation of three groundwater monitoring wells, and the analysis of soil and groundwater. Analytical results did not reveal concentrations of VOCs above laboratory limits. In 1991, IES oversaw the advancement of four additional soil borings and installation of monitoring wells to assess if there were any releases associated with several existing underground storage tanks (USTs) at the site. CVOCs were detected in soil and groundwater samples collected downgradient of the USTs. Four USTs that reportedly contained chlorinated solvents were removed from the site in 1990.

### *3.2.2 Site Investigation – USEPA 1992*

In January 1992, USEPA conducted Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal action at the subject property after previous investigation revealed drums and containers not properly labeled at the subject property. As noted in the 2010 Phase II Site Assessment performed by Fuss & O'Neill, USEPA identified the chemicals "at the subject property included: sodium cyanide, chromic acid, potassium cyanide, tetrachloroethylene (PCE), zinc cyanide, nickel sulfate, and copper cyanide". Actions performed by USEPA included the offsite disposal of hazardous waste, impacted soil and debris, and product from USTs.

### *3.2.3 Site Investigation – Fuss & O'Neill 2006 to 2013*

Fuss & O'Neill completed a Phase I Environmental Site Assessment May 2006 (updated in February 2007), which identified the following:

- the site had a history of at least 90 years of manufacturing (including textiles and jewelry),
- the presence of two potential USTs on the western side of the Lot 27 building,
- tunnel beneath lot 22, historically used for waste disposal for the lot 22 and 27 buildings,
- reported release of chlorinated solvents to soil and groundwater identified on Lot 26, which was owned and operated by the same operator as lot 22 & 27,
- a pond was present on the southern portion of the site that was filled with unknown fill material circa 1960.

Between November 2006 to May 2007 Fuss & O'Neill conducted numerous site activities including a ground-penetrating radar (GPR) survey, soil borings, installation of groundwater monitoring wells, and the collection and analysis of soil, sediment, surface water, and groundwater. The GPR survey revealed three anomalies resembling potential USTs on Lot 27 at the southwest corner of the building, northeast of the loading dock, and at the northern edge of the building.

In 2006, twelve soil borings were advanced throughout the site at a depth up the 12 feet below grade. Soil analytical results revealed concentrations of beryllium, lead, nickel, tetrachloroethylene (PCE), trichloroethylene (TCE), benzo(a)pyrene, and fluorene in one or more soil samples at concentrations exceeding their applicable MCP Reportable Concentrations (RCs).

Groundwater samples were collected from the newly installed wells which revealed concentrations of lead, PCE, and TCE exceeding their applicable RCs in several samples. Four sediment samples were collected from the banks of Mine Brook. Analytical results revealed concentrations of PAHs exceeding their corresponding sediment screening values in the most downstream sediment sample collected in Mine Brook.

In May 2007, Fuss & O'Neill oversaw the removal of a 5,000-gallon #2 heating oil UST from beneath a raised concrete pad at the southwest corner of the former building. Six (6) confirmation samples were collected from the limits of the excavation for laboratory analysis. A UST Closure Assessment Report was prepared by Fuss & O'Neill and submitted to MADEP in July 2007. Based on BETA's review of the results of a subsequent GPR survey completed at the site by others in 2023, there is no evidence of potential USTs at the other two GPR anomaly locations identified by Fuss & O'Neill in 2006.

In October to November 2007, Fuss & O'Neill conducted supplemental activities at the site including the advancement of soil borings, installation of overburden and bedrock groundwater monitoring wells, and the collection of soil, sediment, and groundwater samples for laboratory analysis. PCE was detected in surficial soil samples collected at concentrations exceeding applicable MCP Method 1 Soil Cleanup Standards. Concentrations of PCE and TCE exceeded their applicable Method 1 Groundwater Cleanup Standards in overburden and bedrock groundwater. Analytical results revealed PAHs in sediments at concentrations greater than their applicable sediment screening values. Fuss & O'Neill attributed these exceedances to historic urban fill and/or to historic releases from the former industrial facility.

In 2010, Fuss & O'Neill completed Phase II Site Assessment for activities performed at the site. They oversaw the installation of two monitoring wells in the basement of the Lot 27 building in the vicinity of the boiler room. Fuss & O'Neill gauged and sampled the ten monitoring wells throughout the site and submitted samples for laboratory analysis. Analytical results revealed concentrations of chlorinated VOCs in bedrock groundwater located beneath the Lot 27 building at concentrations exceeding MCP Method 1 standards.

In April 2013, Fuss & O'Neill submitted a Release Abatement Measure (RAM) Completion report for additional remediation activities performed at the site between May 2012 and February 2013. During that time, the Lot 27 building was demolished and material was either recycled or transported off-site for disposal. An underground raceway was discovered during demolition activities. Sediment and samples of standing water were collected from the raceway for laboratory analysis. Analytical results revealed concentrations of lead and chromium in water and sediment exceeding typical soil and groundwater concentrations previously identified at the site. PAHs in sediment also exceeded MassDEP soil standards. The raceway was demolished and PAH-contaminated sediment was removed for off-site disposal, totaling approximately 523 tons. Between August 2012 and January 2013 approximately 407 tons of additional impacted soil were removed from the site.

### *3.2.4 Targeted Brownfields Assessment – Nobis Engineering, Inc (Nobis) 2013*

In May 2013, Nobis oversaw the installation of twelve bedrock groundwater monitoring wells across Lot 27, installed as couplets with one shallow and one deep well. Soil samples were screened and analyzed for VOCs and Priority Pollutant metals. Analytical results revealed concentrations of metals above detection limits, but below applicable MCP Method 1 Soil Standards. One VOC (cis-1,2-dichloroethylene) was detected in one soil sample immediately above the weathered bedrock above its applicable MCP Method 1 Standard. No other compounds were detected at concentrations exceeding their applicable MCP Method 1 Soil Standards.

Groundwater samples were collected in May and August 2013. Analytical results revealed detectable concentrations of several metals and VOCs. PCE and/or TCE exceeded applicable MCP Method 1 groundwater standards in several of the groundwater samples collected from the bedrock wells. Additionally, vinyl chloride was detected at a concentration exceeding the applicable MCP Method 1 groundwater standard in one groundwater sample.

Nobis concluded that the extent of contamination at the site has not been delineated due to the presence of active underground utilities and supplemental soil boring and bedrock wells are necessary at the site.

### *3.2.5 Passive Soil Gas Survey & Permanent Solution with Conditions Statement – Tata & Howard (T&H) 2015*

In 2015, T & H installed forty-two passive soil vapor samplers across the site and abutting properties. Samplers were installed for a ten-day period before being removed for analysis. Elevated readings of CVOCs were detected in several samplers, with the highest PCE and TCE readings detected in samplers located west of the building on Lot 28, in the northern portion of the Site, and to the northwest, east, and southwest of the existing site building. Elevated PCE readings were recorded west of the building on Lot 26.

In October 2015, T & H completed a Partial Permanent Solution with Conditions for Lot 27 based on previous assessment completed at the site by Fuss & O'Neill. In May 2014, T & H collected groundwater samples from six monitoring wells located on the site. Analytical results revealed TCE and PCE exceeding their applicable standards in two of the six wells. In June 2015, the two wells were resampled and results were similar to the previous round. T & H concluded that based on the work completed at the site (removing UST, operations ceased, and main building razed), the source of contamination was removed from lot 27, and groundwater conditions are unlikely to worsen. T & H determined a condition of no significant risk has been met on a portion of Lot 27 site, excluding the southwestern portion of Lot 27. T

& H also concluded that additional assessment is needed to further delineate the extent of the disposal site and to evaluate risk at the remainder of the site property.

### *3.2.6 Phase II Comprehensive Sie Assessment (CSA) & Remedial Action Plan (RAP) – Verdantas LLC (Verdantas) 2023 to 2024*

In February 2024, Verdantas submitted a Phase II Comprehensive Site Assessment (CSA), summarizing recent and historic assessment activities that were performed at the site. In September 2023, Verdantas completed a ground-penetrating radar (GPR) survey, soil borings, groundwater sampling, and sediment sampling at the site. The GPR survey did not reveal potential USTs or other anomalies at the site. Verdantas oversaw the advancement of four soil overburden and bedrock well couplets. Soil samples were collected from each boring and sent for laboratory analysis. Analytical results revealed concentrations of constituents of concern below their applicable MCP Method 1 Soil Standards. Groundwater samples were collected from the newly installed wells and existing wells. Analytical results revealed levels of PCE and/or TCE above MCP Method 1 GW-2 Standards in multiple wells. TCE exceeded the MCP Method 1 GW-3 Standard in one well. Four sediment samples were collected from accessible areas of Mine Brook. Analytical results revealed 1,2-DCE and cis-1,2-DCE were detected at a concentration of 0.00063 mg/kg in the sediment sample SED-102, however MassDEP Stage 1 Sediment Screening Criteria values or EPA Region III Freshwater Sediment Screening Benchmark values are not set.

Based on work completed at the site between 2006 and 2023, Verdantas concluded that: both overburden and bedrock groundwater are impacted by cVOCs; cVOC impacted soil is present in the northern and southwestern portions of the site; the source of cVOC impacts to soil and groundwater are attributable to historic manufacturing operations; localized PAH impacts are present in surficial soils in the vicinity of MW-2 and MW-3 in the western portion of the Site; and additional assessment activities are recommended.

In May 2024, Verdantas submitted a Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan (Phase III RAP) to address contamination at the site. The RAP summarizes the release and site history of the property and remedial activities performed at the site. Verdantas evaluated remedial activities for the site to achieve a Temporary or Permanent Solution by reducing source impacts and mitigating potential vapor intrusion impacts. Verdantas proposed six remedial alternatives for the site including: no remedial action, institutional controls, passive containment and/or mitigation measures, active treatment/removal/containment, in-situ technologies, and monitoring. Refer to Section 5.0 for further details.

## 3.3 Hazardous Building Materials Survey

In August 2014, FLI Environmental (FLI) completed an Inspection for Asbestos Containing Materials Report for the existing, partially collapsed site structure. Bulk building material samples were collected, including window glazing, roofing materials, 12”x12” floor tile, floor tile mastic, gypsum board, felt paper, and joint compound.

Analytical results revealed the following building materials that were confirmed to be ACMs: window glazing, roofing, 12”x12” floor tile, and floor tile mastic. These ACMs must be managed properly and in accordance with the MA Asbestos Regulations 310 CMR 7.15 during demolition / removal of the structure.

## 3.4 Constituents of Concern (COCs)

The source of contamination is likely associated with the former historical industrial manufacturing activities at the site. The MCP defines an Exposure Point as a location of potential contact between a human or environmental receptor and a release of oil and/or hazardous material. An Exposure Point may describe an area or zone of potential exposure, as well as a single discrete point.

Exposure Point Concentration (EPC) means the concentration of oil or hazardous material in a specific medium which a human or environmental receptor may contact at an Exposure Point.

As part of their 2024 Phase II CSA activities, Verdantas calculated EPCs in soil, groundwater, sediment, and surface water for the contaminant compounds detected during previous site assessment activities and compared the EPC values to applicable MCP Method 1 standards for soil and groundwater, applicable MassDEP Stage 1 Sediment Screening Criteria for sediments, and USEPA recommended water quality criteria for surface water. Based on this evaluation, Verdantas identified the following constituents of concern (COCs) for the site:

### *3.4.1 COCs in Soil*

The following COCs were identified in soil at the site:

- Trichloroethylene (TCE)
- Cis-1,2-dichloroethylene (DCE)

### *3.4.2 COCs in Groundwater*

The following COCs have been identified in groundwater at the Site:

- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)

### *3.4.3 COCs in Sediment*

- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Chrysene
- Dibenzo(a,h)anthracene
- Fluoranthene
- Phenanthrene
- Pyrene

### *3.4.4 Surface Water*

- None

## 3.5 Constituents of Concern (COCs) – Hazardous Building Materials

Hazardous building materials identified to date include:

- Asbestos containing materials (ACM)

# 4.0 Soil and Groundwater Categories

## 4.1 Groundwater Category

The site is not located within a MassDEP-designated Zone II, Interim Wellhead Protection Area (IWPA), Potentially Productive Aquifer (Medium or High), or within a USEPA-designated Sole Source Aquifer. There are no known private water supply wells located at the site or within 500 feet of the site. Therefore, Method 1 Groundwater Category 1 (GW-1) does not apply to the site.

Based on previously performed site investigations performed in 2010 Fuss & O'Neill, groundwater depth ranged from 4.2 feet below grade to 9.2 feet below grade. Groundwater within 30 feet of the abutting building is categorized as Method 1 GW-2 because it is located within 30 feet of an occupied building and groundwater is less than 15 feet below grade. Since redevelopment of the Site may include new buildings, groundwater laboratory results are compared to the GW-2 cleanup standards.

All groundwaters within the Commonwealth are considered potential source of discharge to surface waters and shall be categorized, at a minimum, as Method 1 GW-3. Therefore, the applicable Method 1 Groundwater Categories for future unrestricted site use are identified as GW-2 and GW-3.

## 4.2 Soil Category

Soil categorization is based upon three soil criteria and the type of potential receptor: frequency of use, intensity of use, and accessibility of soil. The site is currently unoccupied commercial / industrial property; therefore, children are considered not present, and adults are assumed present at a low frequency and low intensity, with the exception of construction and/or utility workers, who would be considered present at a low frequency and high intensity.

Impacted soil is located in paved and unpaved areas at the site at depths both less than and greater than three feet below grade. Therefore, these soils are considered "accessible" or "potentially accessible." Based on these factors, impacted exterior soils at the site are categorized as Soil Category S-2 and S-3 for current site uses. The applicable Method 1 Soil Categories are identified as S-2/GW-2, S-2/GW-3, S-3/GW-2 and S-3/GW-3.

In accordance with the MCP, for future, unrestricted site uses, all soils would be classified as Soil Category S-1. For future, unrestricted site uses, the applicable Method 1 Soil Categories are identified as S-1/GW-2 and S-1/GW-3.

# 5.0 Initial Screening of Remedial Action Alternatives

## 5.1 Remedial Objectives

The objectives for remedial response actions to address contaminated environmental media and hazardous building materials at the site include:

1. Achieve a condition of *No Significant Risk* (as defined by MassDEP) for groundwater by reducing concentrations in groundwater to below MCP Method 1 GW-2 and GW-3 risk standards.
2. Achieve a condition of *No Significant Risk* for soil by reducing the exposure point concentrations to meet the applicable Method 1 soil risk standards or demonstrating *No Significant Risk* through a Method 3 risk characterization with the potential need for an Activity and Use Limitation (AUL).
3. Meet the requirements of a Permanent or Temporary Solution as defined by MassDEP.
4. Properly remove and dispose of hazardous building materials prior to or during building demolition.

## 5.2 Identification and Initial Screening of Remedial Alternatives

As part of the ABCA process, BETA reviewed the Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan (the Phase III RAP), dated May 2024, and prepared by Verdantas in association with MassDEP Release Tracking Number (RTN) 2-16694.

The Phase III RAP was submitted to MassDEP on May 21, 2024, and represents the current plan for remedial and assessment response actions to be conducted at the site under the state MCP cleanup plan. The Phase III RAP is attached to this ABCA for reference and includes detailed analysis of the remedial alternatives.

Verdantas performed an initial screening of the available remediation technologies (RT) to identify if the alternatives are feasible based on these criteria:

- The technologies to be employed would be reasonably likely to reduce risks to human health and the environment to levels that would achieve a Permanent Solution; and
- The technologies would be technically and economically feasible.

The available remediation alternatives screened by Verdantas included:

1. No Remedial Action
2. Institutional Controls
3. Passive Containment and/or Mitigation Measures
4. Active Treatment / Removal / Containment
5. In-Situ Treatment Technologies
6. Monitoring

### *5.2.1 No Remedial Action*

As stated in Verdantas' Phase III RAP, "The 'No Remedial Action' alternative assumes that no additional remedial efforts are implemented to address Site impacts. This option can provide a basis for assessing the effects of implementing remedial actions; however, it does not directly reduce the toxicity, mobility, or volume of impacted environmental media. This RAA does not reduce site risks associated with impacted soil or groundwater, and provides no additional protection to human health or public welfare. Additionally, the constituents of concern are at concentrations that are unlikely to attenuate below standards in a reasonable timeframe, and therefore, 'No Remedial Action' would not reduce potential risks to human health and/or the environment in the long term.

Conclusion: The 'No Remedial Action' alternative does not reduce the toxicity, mobility, or volume of impacted environmental media. Because a Condition of NSR does not currently exist at the Site, the 'No Remedial Action' alternative does not maintain a Temporary Solution or achieve a Permanent Solution. However, this RT was retained for future consideration."

### *5.2.2 Institutional Controls*

As stated in Verdantas' Phase III RAP, "Institutional controls are mechanisms to limit access to impacted media and include alternatives such as fencing, barriers, and Notices of Activity Use Limitations (AULs) in the form of deed restrictions. While institutional controls do not eliminate impacted media, they can provide an effective, low cost means of reducing exposure potential, and thus risk, if properly maintained and enforced.

Institutional controls may be effective in mitigating exposure to impacted media at locations at which it may be infeasible to achieve background conditions. Implementation of a Notice of AUL on a site to restrict access to impacted groundwater (other than as 'exposure pathway elimination measures' or to restrict access to drinking water) is not supported by MassDEP. However, Notices of AUL may be implemented to ensure that engineering controls be maintained to mitigate potential risk.

Conclusion: This RT is a viable option that will be retained for further consideration."

### *5.2.3 Passive Containment and/or Mitigation Measures*

As stated in Verdantas' Phase III RAP, "The primary purpose of containment technologies is to isolate impacted media, and thus control potential exposure risks. Passive containment involves placement of horizontal physical barriers, such as a cap, sealant or membrane, or vertical barriers such as a grout curtain, slurry wall, or sheet piling in the impacted areas. Asphalt pavement, concrete and building slabs also serve as barriers to impacted soils.

Conclusion: This RT is a viable option that will be retained for further consideration."

#### 5.2.3.1 Vertical Barriers

As stated in Verdantas' Phase III RAP, "A vertical barrier, such as a permeable reactive barrier (PRB), is defined as an in-situ method for remediating impacted groundwater that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron, chelators, sorbents, and microbes to address a wide variety of constituents of concern in groundwater, such as CVOCs, other organics, metals, inorganics, and radionuclides. The constituents of concern are concentrated and either degraded or retained in the barrier material, which may need to be replaced periodically. For vertical barriers, such as slurry walls, hydraulic capture may also be required (i.e., an active groundwater recovery/treatment system), since slurry walls divert groundwater flow. Although passive vertical containment may be designated as a feasible RT for containment of constituents of concern /sources, this RT does not address source removal.

Conclusion: This RT is a viable option that will be retained for further consideration."

#### 5.2.3.2 Horizontal Barriers

As stated in Verdantas' Phase III RAP, "The primary purpose of passive containment technologies is to isolate impacted media, and thus control potential exposure risks. Passive containment using horizontal barriers involves placement of physical barriers, such as a cap, in order to limit the potential for exposure to impacted media. A vapor barrier is considered as a horizontal barrier for future occupied buildings at the Site property and an engineered cap is considered for impacted soils and transmission of CVOCs.

The purpose of a cap is to protect human and environmental receptors from constituents of concern by means of physical separation. A cap consists of a physical barrier that can range widely in composition and can consist of a single or multiple layers. Caps are designed to be either permeable or impermeable. Permeable caps are intended to provide a physical barrier to exposure and typically consist of soil or stone, sometimes supplemented with synthetic materials (e.g., geotextiles). Impermeable caps are designed to prevent infiltration of precipitation or migration of gases and typically include a synthetic membrane or low-permeability soil layer. Caps are usually accompanied with a Notice of Activity and Use Limitation (AUL) in order to prevent the possibility of future exposure as a result of a change in site use. In addition, a visual marker (i.e., geotextile fabric) is installed under the cap to delineate clean versus impacted soil and assist in identifying when cap erosion has occurred.

Vapor barriers may be composed of high-density polyethylene (HDPE), low density polyethylene (LDPE), very-low density polyethylene (VDPE) materials; spray-applied materials composed of a rubberized asphalt emulsion or epoxy; or any other chemical resistant membrane that prevents the transmission of CVOCs.

Conclusion: Passive containment measures (horizontal barriers/cap) may be feasible for the Site. This RT (horizontal barriers/cap) is a viable option that will be retained for further consideration."

#### 5.2.3.3 Passive Sub-Slab Depressurization System (SSDS)

As stated in Verdantas' Phase III RAP, "A Passive SSDS serves as a venting system to create a preferential pathway to divert the vapors from the subsurface to the ambient air above future occupied buildings. Passive mitigation measures include the installation of a barrier or barriers to prevent the migration of CVOC vapors to the indoor air, or a venting system to create a preferential pathway to divert the vapors from the subsurface to the ambient air above the building. These measures are considered 'passive' because they do not employ a fan or blower or other electro-mechanical device as a component of the mitigation system. Passive mitigation measures are considered Passive Exposure Pathway Mitigation Measures under the MCP (as defined at 310 CMR 40.0006(12)).

SSDS are based upon traditional radon-mitigation technology and consist of a fan or blower that draws soil vapor from beneath the building slab. When an existing building is retrofitted with an SSDS, extraction points are installed through the building slab. In most cases these points are installed vertically. In cases where vertical extraction points are not able to influence all areas where vapors enter through the slab, horizontal extraction points may be required.

Passive venting mitigates the vapor intrusion pathway by intercepting sub-slab soil gas with a series of perforated pipes (typically 4-in. diameter), installed below the slab within a permeable bedding material, such as sand or gravel. The perforated piping is typically connected to solid piping and vented to the atmosphere above the roof line. Where possible, a vapor barrier, should be used in conjunction with a passive venting system.

A passive venting system relies on temperature and pressure differences, and wind speed to induce soil gas flow and removal. As a result, to ensure its effectiveness, the system must include sufficient interception piping and highly permeable bedding, and the barrier system must be properly installed. Passive venting systems should be designed so that a fan can be easily added to transform the system to an active SSDS if a greater reduction in the concentrations of CVOCs is necessary to achieve mitigation goals.

Pre-fabricated floor systems that create a continuous aerated space beneath the slab or raised aerated floor above an existing slab are a form of passive venting system that eliminates the need for passive vent piping and permeable bedding material. Aerated floor systems may also, when fitted with a fan or blower, be converted to an active SSDS.

As with a vapor barrier, passive venting systems are more easily installed in and generally better suited to new construction, where the appropriate amount and type of sub-slab bedding material can be specified, verified, and proper installation can be assured.

Conclusion: A passive SSDS may be feasible for the Site for future occupied buildings. This RT is a viable option that will be retained for further consideration."

### *5.2.4 ACTIVE TREATMENT/REMOVAL/CONTAINMENT SYSTEMS*

#### 5.2.4.1 GROUNDWATER RECOVERY AND/OR TREATMENT

As stated in Verdantas' Phase III RAP, "Groundwater recovery may be utilized solely for containment purposes or may also be used for groundwater treatment. Groundwater extraction/recovery and treatment ('pump and treat') is a proven technology for the recovery of impacted groundwater. This method is also a conventional means to induce hydraulic containment of a groundwater table surface. Implementation of these systems may involve the installation of multiple large diameter extraction wells, treatment equipment, and a means to discharge treated effluent. The effectiveness of groundwater pump and treat systems is highly dependent on factors such as secondary groundwater quality (iron content, hardness, pH), source location and volume, and soil type, permeability, and saturated thickness.

Soil permeability and well field design will directly influence well yields, and determine whether the system will operate intermittently or continuously. Excessive intermittent operation of a system or 'cycling' can be detrimental to system components. Although groundwater recovery and treatment is successful in establishing groundwater plume capture, the limitations and challenges of this technology include high utility costs, numerous extraction wells for larger plumes, and generation of high quantities of groundwater.

Conclusion: This RT is a not a viable option and will not be retained for additional consideration."

#### 5.2.4.2 SOIL VAPOR EXTRACTION AND AIR SPARGING

As stated in Verdantas' Phase III RAP, "Soil vapor extraction (SVE) is a proven remedy for reducing concentrations of CVOCs in unsaturated soils. To be effective, the SVE system must move large volumes of air through the soil, which alters the equilibrium conditions and induces desorption of chlorinated solvents from soil and volatilize into the soil vapor. The soil vapor is removed and CVOCs captured or destroyed by an air treatment system.

At the Site, overburden groundwater was encountered at depths ranging from 4 to 7 feet bgs. Additionally, CVOC impacted soil has generally been identified in a limited area of the northern portion of the Site. CVOC impacts to soil beneath the existing Site building has not been assessed. While evaluating SVE, it is important to consider air treatment requirements for the extracted soil vapor, short-circuiting of air flow, and SVE blower noise issues to avoid a nuisance condition.

Air sparging involves forcing pressurized air into groundwater. The injected air is driven by buoyancy and moves upward through the soil where it can volatilize CVOCs adsorbed to soil in the vadose zone. The air enters the unsaturated zone, where it can be captured by the SVE system. A secondary benefit of air sparging is that it can also volatize CVOCs from groundwater.

Current analytical results have detected limited CVOC impacts to soil within the vadose zone at the Site. Considerations for air sparging include the permeability of soil, and effective capture of volatile soil vapor with the SVE system. Additionally, air sparging may alter hydrogeological conditions in overburden and bedrock groundwater and has the potential to accelerate downward migration of impacted groundwater through fractured bedrock.

Conclusion: This RT is a not viable option and will not be retained for additional consideration."

#### 5.2.4.3 ACTIVE EXPOSURE PATHWAY MITIGATION MEASURES (AEPMMS)

As stated in Verdantas' Phase III RAP, "An Active SSDS is effective at mitigating vapor intrusion impacts to receptors in buildings, due to volatile constituents of concern in groundwater that can accumulate in the vadose zone and impact indoor air. Vapor intrusion mitigation systems that employ a fan or blower to draw CVOC vapors into collection points and discharge them away from the affected building are considered 'active' mitigation systems. Active mitigation systems are considered Active Exposure Pathway Mitigation Measures or AEPMMs under the MCP (as defined at 310 CMR 40.0006(12)), measures directed at an Exposure Pathway which rely on the continual or periodic use of a mechanical or electro-mechanical device to reduce exposures and meet applicable performance standards. Active systems require ongoing monitoring and maintenance and the use of telemetry or remote monitoring measures.

Active sub-membrane depressurization (SMD) systems are typically used in buildings with earthen floor basements or crawlspaces. SMD systems are similar to SSD systems with the exception that depressurization occurs below an impermeable membrane instead of a concrete slab. The best approach for using an SMD system is to place various lengths of perforated piping horizontally over the earthen floor and cover the piping with a vapor barrier. To prevent the impermeable membrane from blocking the perforations in the piping when a vacuum is drawn, highly permeable material (gravel or pea stone) can be packed between and on top of the piping. Vapor barriers used in SMD systems should be chemical resistant membranes that prevent the transmission of CVOCs.

Conclusion: This RT is a viable option and will be retained for further consideration for future occupied buildings."

#### 5.2.4.4 EX-SITU TREATMENT

As stated in Verdantas' Phase III RAP, "The primary purpose of ex-situ treatment technologies is to remove impacted media, and thus control potential exposure risks. Excavation involves the removal of impacted soil that presents a potential direct contact risk, along with soil which may serve as a continuing source of impacts to groundwater. The impacted soil is removed from its current setting and transported off-Site for constituent of concern removal, recycling and/or disposal. CVOC impacted soil remains in the northern and southwestern portions of the Site. The majority of CVOC impacted soil was identified in the upper six feet bgs; however, isolated impacts have been identified at the bedrock interface. Dewatering would be required to remove isolated subsurface soil, which would also require treatment and management of impacted groundwater. Dewatered groundwater would be temporarily stored on-site using fractionation (frac) tanks and following treatment through the use of granulated activated carbon units may be discharged to a municipal utility under a permit, or to a catch basin/water body under a US EPA Dewatering and Remediation General Permit (DRGP); or, disposed to a licensed acceptance facility under a MassDEP Bill of Lading (BOL), or managed as hazardous remediation waste.

Conclusion: This RT is a viable option and will be retained for further consideration."

### *5.2.5 IN-SITU TREATMENT*

As stated in Verdantas' Phase III RAP, "In-situ (organic or inorganic/chemical) treatment or augmentation technologies are most dependent upon the ability to deliver the treatment material to the affected subsurface area, and the sustainability or effective life of the material. CVOC constituents in Site groundwater are amenable to chemical oxidative technologies (ozone, permanganate, persulfate, oxygen releasing compounds (ORC), and hydrogen peroxide), aerobic and anaerobic biological technologies, and chemical reducing technologies (zero valent iron). To effectively assess performance, bench-scale treatability studies and pilot testing is recommended prior to implementation.

In-situ chemical oxidation (ISCO) is a remediation process in which constituents of concern are chemically converted to less toxic compounds (water, oxygen, and carbon dioxide). There are several types of commercially available oxidants that have been demonstrated to be effective in reducing CVOC constituents of concern in groundwater. Effective distribution of the reagents and the reactivity of the selected oxidant with the constituents of concern are crucial in achieving reduction in CVOC concentrations. Soil oxidant demand varies with soil type, the nature of the site groundwater, and soil composition. Oxidant demand is based upon total mass of impacted media and mass distribution. Groundwater monitoring is essential in evaluating the performance of this remedy. Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous compounds to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing and reducing agents most commonly used for treatment of hazardous constituents in soil and groundwater are zero valent iron, hydrogen peroxide, catalyzed hydrogen peroxide, potassium permanganate, sodium permanganate, sodium persulfate, and ozone. Each reagent has advantages and limitations, and while applicable to soil and some source zone impacts, they have been applied primarily toward remediating groundwater.

Bioremediation uses microorganisms to degrade organic constituents in soil, sludge, and solids either excavated or in-situ. The microorganisms break down constituents of concern by using them as a food source or co-metabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas.

In-situ techniques stimulate and create a favorable environment for microorganisms to grow and use constituents as a food and energy source. Generally, this means providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH adjustment. Sometimes, microorganisms that have been adapted for degradation of specific constituents are applied to enhance the process.

Conclusion: This RT is a viable option and will be retained for further consideration. To effectively assess performance, bench-scale treatability studies and pilot testing is recommended prior to implementation."

#### *5.2.6 Monitoring*

As stated in Verdantas' Phase III RAP, "Groundwater monitoring is conducted as a measure to assess the effectiveness of the cleanup. Groundwater is collected from monitoring wells at and/or hydraulically downgradient of the cleanup area. This option is also effective for assessing groundwater conditions surrounding impacted areas that have been capped.

Monitoring of Active and Passive Containment Systems includes inspections and sampling and analysis to evaluate system effectiveness.

Conclusion: This RT is a viable option that will be retained for additional consideration."

### 5.3 Remedial Alternative Evaluation

Verdantas retained the six alternatives and developed details for each through a detailed evaluation using the following criteria:

- Comparative Effectiveness
- Comparative Reliability
- Comparative Difficulty in Implementation
- Comparative Cost
- Comparative Risks
- Comparative Benefits
- Comparative Timeliness

- Comparative Effect Upon Non-Pecuniary Interests

Verdantas concluded that "a number of remediation technologies are required to remediate site impacts and to mitigate potential impacts to receptors for site constituents of concern."

Upon review of the Phase III RAP, it is BETA's opinion that Verdantas screened and evaluated appropriate remediation technology alternatives for the site. BETA also performed an evaluation of the same six alternatives to determine if we concur with the outcome of Verdantas' evaluation. For efficiency, the alternatives evaluation is summarized in tabular form; see Table 2 attached. In Table 2, a qualitative, comparative rating (1 = least favorable, 5 = most favorable) has been assigned to each criterion for each alternative.

To account for the relative importance of the criteria, the ratings for Effectiveness, Reliability, Implementability, Costs and Timeliness are weighted at 100% of their value. The ratings for Risks, Benefits, and Non-Pecuniary Interests are weighted at 50%.

#### *5.3.1 Comparative Effectiveness*

- No Remedial Action – Alternative is ineffective at reducing concentration of COC at the site.
- Institutional Controls – Alternative is low in effectiveness at reducing concentrations of COC at the site, effectiveness increases if combined with additional alternatives.
- Passive Containment and/or Mitigation Measures – Alternative is effective at limiting direct contact exposure and contamination migration.
- Active Treatment/Removal/Containment – Alternative is effective at removing COC from building demo, and impacted soils.
- In-Situ Technologies – Alternative is effective at reducing COC impacts in soil and groundwater at the site.
- Monitoring – Alternative is effective at monitoring the effectiveness of other alternatives, but does not provide its own effectiveness at reducing the COC at the site.

#### *5.3.2 Comparative Reliability*

- No Remedial Action - Alternative is unreliable at reducing concentration of COC at the site.
- Institutional Controls – Alternative is reliable at addressing engineering controls at the site.
- Passive Containment and/or Mitigation Measures – Alternative is reliable at reducing contact exposure and mitigation of COC at the site.
- Active Treatment/Removal/Containment – Alternative is highly reliable at removing the source of COC in soil and building at the site.
- In-Situ Technologies – Alternative is highly reliable at reducing concentrations of COC in soil and groundwater at the site.
- Monitoring – When alternative is paired with other alternatives, reliability is moderate.

#### *5.3.3 Comparative Difficulty in Implementation*

- No Remedial Action – Alternative is readily implemented.
- Institutional Controls – Alternative is easily implemented at the site.
- Passive Containment and/or Mitigation Measures – Alternative has moderate technical complexity to be implemented at the site.
- Active Treatment/Removal/Containment – Alternative requires a high technical complexity to be implemented at the site.
- In-Situ Technologies – Alternative requires a high technical complexity to be implemented at the site.

- Monitoring – Alternative is easily implemented at the site.

### *5.3.4 Comparative Cost*

- No Remedial Action – Alternative has minimal cost to be implemented at the site.
- Institutional Controls – Alternative has low cost to be implemented at the site.
- Passive Containment and/or Mitigation Measures – Alternative has moderate technology cost to be implemented at the site.
- Active Treatment/Removal/Containment – Alternative has high technology cost to be implemented at the site.
- In-Situ Technologies – Alternative has a moderate technology cost to be implemented at the site
- Monitoring – Alternative has low cost associated with short term monitoring and high cost associated with long term monitoring at the site.

### *5.3.5 Comparative Risk*

- No Remedial Action – Alternative has a high risk due to COCs not being addressed.
- Institutional Controls – Alternative has high risk due to COCs remaining on site.
- Passive Containment and/or Mitigation Measures – Alternative has moderate risk associated with initial implementation, then risk becomes low
- Active Treatment/Removal/Containment– Alternative has moderate risk associated with initial implementation, then risk becomes low
- In-Situ Technologies– Alternative has moderate risk associated with initial implementation, then risk becomes low
- Monitoring – Alternative has moderate to low risk when combined with other alternatives.

### *5.3.6 Comparative Benefits*

- No Remedial Action – Alternative does not address COCs at the site.
- Institutional Controls - Alternative does not address levels of COCs at the site
- Passive Containment and/or Mitigation Measures – Alternative reduces impacts from COCs at the site, and allows for reuse of the site.
- Active Treatment/Removal/Containment– Alternative reduces impacts from COCs at the site, and allows for reuse of the site.
- In-Situ Technologies– Alternative reduces impacts from COCs at the site, and allows for reuse of the site.
- Monitoring – Alternative alone does not address COCs at the site, but when combined shows reduction of COCs from other alternatives.

### *5.3.7 Comparative Timeliness*

- No Remedial Action – Alternative will not reach NSR in a reasonable time.
- Institutional Controls – Alternative will take a moderate period of time to reach NSR.
- Passive Containment and/or Mitigation Measures – Alternative will take a moderate period of time to reach NSR.
- Active Treatment/Removal/Containment– Alternative will take a moderate period of time to reach NSR.
- In-Situ Technologies – Alternative will take a moderate period of time to reach NSR.
- Monitoring – Alternative will take a long period to reach NSR.

#### *5.3.8 Comparative Effect Upon Non-Pecuniary Interests*

- No Remedial Action – Alternative has high effect on non-pecuniary values, since COCs are not addressed.
- Institutional Controls – Alternative has low effect on non-pecuniary values.
- Passive Containment and/or Mitigation Measures – Alternative has low effect on non-pecuniary values.
- Active Treatment/Removal/Containment – Alternative has a moderate impact on non-pecuniary values during activities, but provides a long-term positive for the community.
- In-Situ Technologies – Alternative has a moderate impact on non-pecuniary values during activities, but provides a long-term positive for the community.
- Monitoring - Alternative has low effect on non-pecuniary values.

### 5.4 Remedial Action Alternative Conclusion

As noted, BETA performed a comparative evaluation of the remedial alternatives for the six criteria described above, as summarized on Table 2. The Summary Rating was developed by calculating a weighted average of the evaluation criteria ratings. The most favorable remediation alternative was determined to be "Active Treatment / Removal / Containment" and the least favorable alternative was "No Remedial Action." BETA agrees with Verdantas' conclusion that multiple alternatives should be implemented to remediate this site.

## 6.0 Selected Remedial Action Alternative

Verdantas selected a combination of the evaluated technologies as the proposed Remedial Action Alternative (RAA). The only alternative not included as part of the selected RAA was "No Remedial Action." The other five technologies will be implemented as part of the Comprehensive Remedial Actions. BETA agrees that a combined approach is appropriate and warranted for this site.

### 6.1 Description of Selected Remedial Alternative

The combined approach will utilize aspects from Alternatives 2 through 6 to address impacted media throughout the site. Remedial actions will include the following:

- An AUL implemented on the site
- Building abatement and demolition and implementation of structural engineering controls
- A horizontal barrier (cap) may be implemented at areas for which ex-situ technologies are infeasible
- The excavation of surficial and shallow soils
- In-situ technologies to reduce impacts to groundwater
- Groundwater monitoring

### 6.2 Implementation Schedule

The implementation of remedial response actions at the site is anticipated to be initiated by Summer of 2025 and estimated completion date is 2030; however, the effectiveness of the remedial technologies will drive project duration.

### 6.3 Green and Sustainable Remediation Considerations

The Town of Franklin will consider green and sustainable remediation options during the implementation of the selected remedial alternatives. The Best Management Practices (BMPs) issued under ASTM Standard E-2893: Standard Guide for Greener Cleanups will be used as a reference in this effort. In addition, The Town of Franklin intends to ask bidding cleanup contractors to propose additional green remediation techniques in their response to the Request for Proposals for the cleanup contract.

As part of the project, the Town is also reviewing opportunities to stabilize the bank of Mine Brook with biodegradable materials and native vegetation to minimize erosion, enhance habitat, and improve water quality. The buffer zone to the Brook will be evaluated to determine opportunities for restoration. Additional native vegetation along the Brook will provide treatment of overland stormwater flow and may also provide shade along the Bank.

## 7.0 Report Limitations

This ABCA Report was prepared for the exclusive use of the Town of Franklin and the USEPA. Future investigations, and/or information that were not available at the time of the analysis, may result in a modification of the findings stated in this report. No other warranty is expressed, written, or implied. Reproduction of this report or its contents is prohibited without prior written approval from the Town of Franklin and/or BETA Group, Inc. BETA Group, Inc. is not responsible for independent conclusions, opinions, or recommendations made by others based on the information contained herein.

**FIGURES**

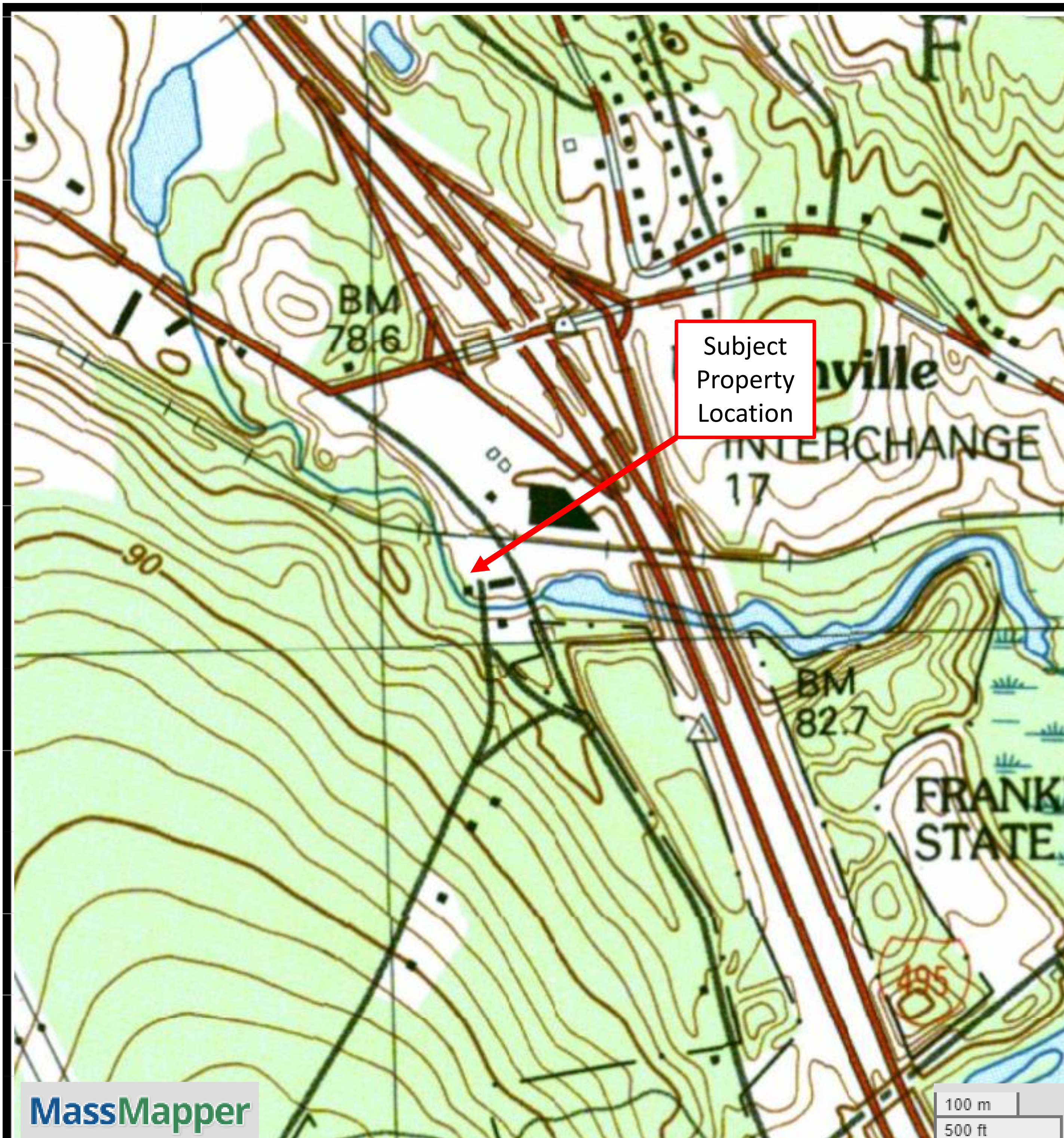



**FIGURE 1**

**Site Location Map**

U.S.G.S. Topographic Quadrangle
21 Grove Street
Franklin, Massachusetts

BETA

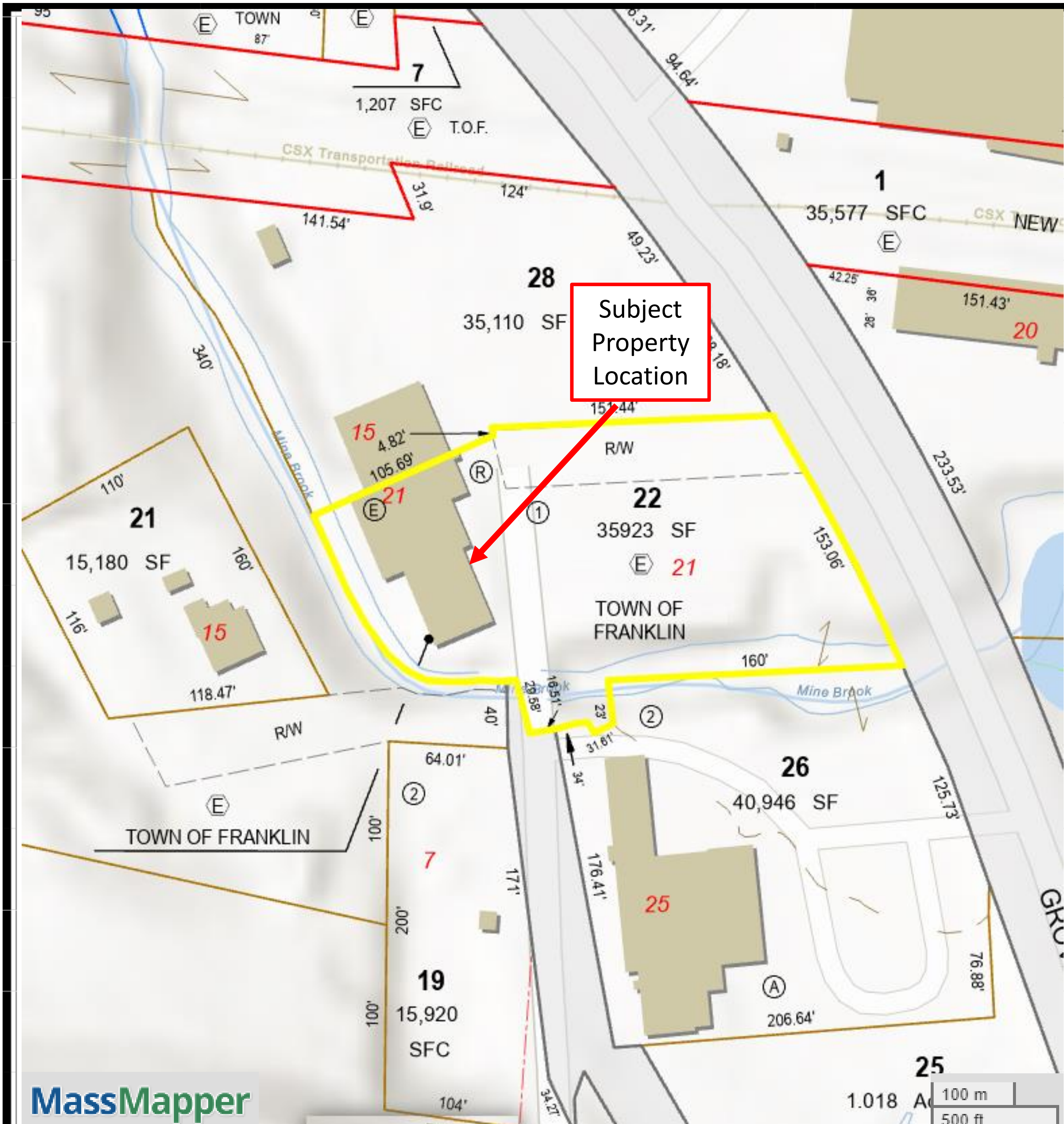



**FIGURE 2**

Town of Franklin Assessors Map
21 Grove Street
Franklin, Massachusetts
Job No: 24.11526.00

# MassDEP - Bureau of Waste Site Cleanup

## Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

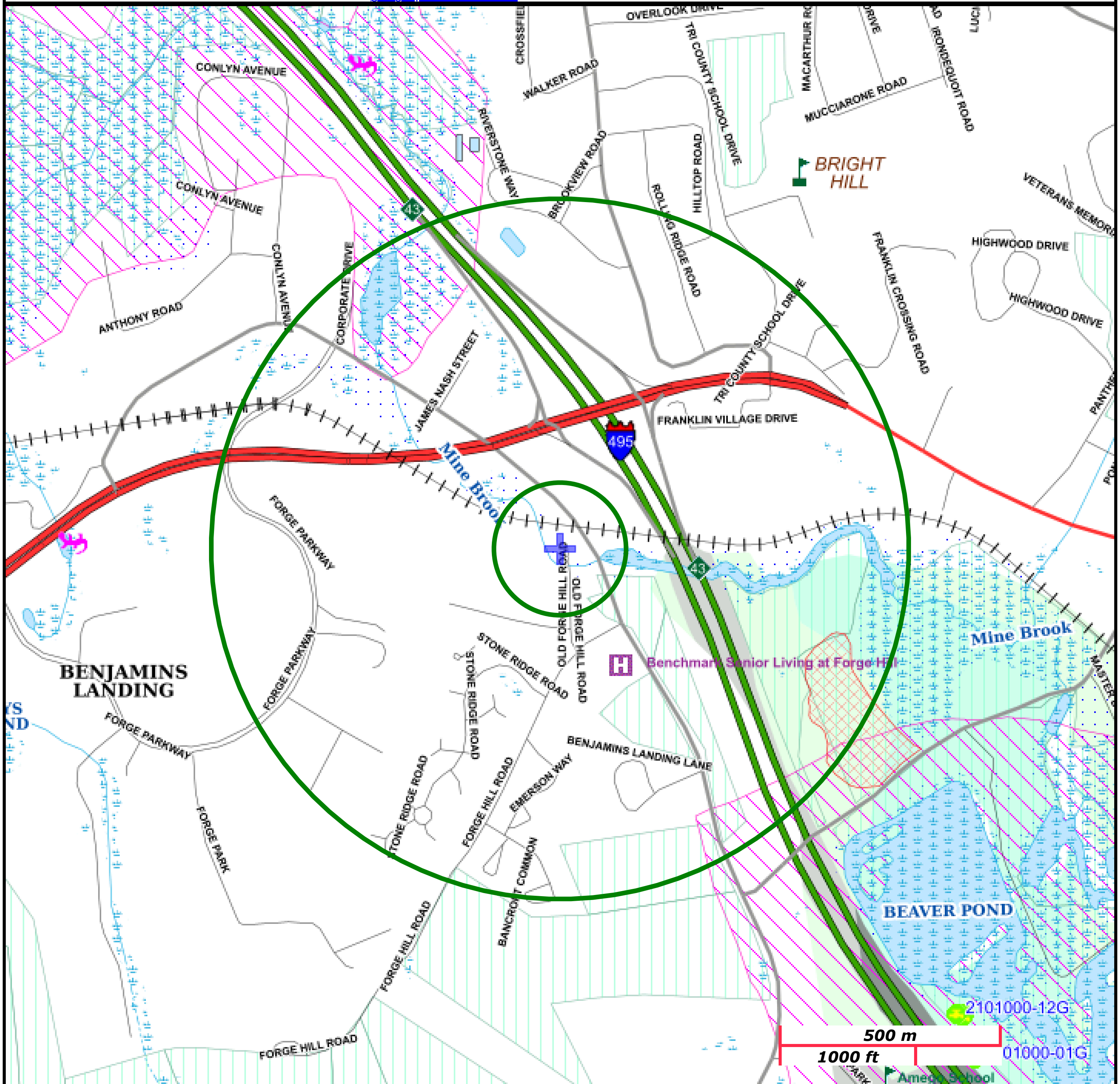
**Site Information:**

21 GROVE STREET FRANKLIN, MA

NAD83 UTM Meters:
4662314mN , 299167mE (Zone: 19)
March 11, 2025

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at:
https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection




Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam

Aquifers: Medium Yield, High Yield, EPA Sole Source

Non Potential Drinking Water Source Area: Medium, High (Yield)

PWS Protection Areas: Zone II, IWPA, Zone A

Hydrography: Open Water, PWS Reservoir, Tidal Flat

Wetlands: Freshwater, Saltwater, Cranberry Bog

FEMA 100yr Floodplain; Protected Open Space; ACEC

NHESP Pri-Hab of Rare Species; Vernal Pool: Cert., Potential

Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

## TABLES

### Table 2: Comparison of Remedial Alternatives to Evaluation Criteria

TABLE 2: COMPARISON OF REMEDIAL ALTERNATIVES TO EVALUATION CRITERIA

| Alternatives | | Evaluation Criteria and Ranking[1] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| No. | Description | Effectiveness | Reliability | Implementation | Costs | Risks (50% weighted) | Benefits (50% weighted) | Timeliness | Non-Pecuniary (50% weighted) | Summary Rating [2] |
| 1 | No Action | 1 | 1 | 5 | 5 | 1 | 1 | 4 | 1 | 2.69 |
| 2 | Institutional Controls | 2.5 | 2 | 4 | 4.5 | 3 | 2.5 | 3 | 4 | 3.19 |
| 3 | Passive Horizontal Containment | 3 | 3 | 4 | 3 | 3.5 | 3 | 2.5 | 3.5 | 3.15 |
| 4 | Active Treatment/ Removal/ Containment | 4 | 4 | 3 | 2.5 | 4 | 4 | 3.5 | 3.5 | 3.50 |
| 5 | In-Situ Technologies | 3.5 | 4 | 3 | 3 | 3.5 | 4 | 3.5 | 3 | 3.42 |
| 6 | Monitoring | 3 | 3 | 4 | 3 | 3.5 | 3 | 2 | 2.5 | 3.00 |

Notes:

1. Qualitative comparative ranking between alternatives: 1 = least favorable to 5 = most favorable.
2. Weighted average of evaluation criteria rankings: Effectiveness, Reliability, Implementation, Costs and Timeliness weighted at 100%, and Risks, Benefits and Non-pecuniary at 50%.

**ATTACHMENTS**

***Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan*** **(the Phase III RAP), dated May 2024, and prepared by Verdantas**

# PHASE III IDENTIFICATION, EVALUATION, AND SELECTION OF COMPREHENSIVE REMEDIAL ACTION ALTERNATIVES AND REMEDIAL ACTION PLAN

**FORMER NU-STYLE PROPERTY**
**21 GROVE STREET**
**FRANKLIN, MASSACHUSETTS**
**MASSDEP RELEASE TRACKING NUMBER (RTN) 2-16694**

**May 2024**

**Prepared For:**

Town of Franklin
355 East Central Street
Franklin, Massachusetts 02038

**Prepared By:**

Verdantas LLC
46 Eastman Street
South Easton, Massachusetts 02375
Tel: 508-226-1800

Ref: Z:\Project Files\EA-FZ\Franklitwn\17356 - Town Of Franklin-Nustyle Brownfields Ass\Working\Documents\Phase III Report\Phase III Remedial Action Plan.Docx

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### FIGURES



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### APPENDIX

# 1.0 INTRODUCTION

On behalf of the Town of Franklin, Massachusetts (the Town) Verdantas LLC (Verdantas) has prepared this Phase III Identification, Evaluation, and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan (Phase III RAP) to address a release of chlorinated volatile organic compounds (CVOCs) to soil and groundwater at the former Nu-Style Property located at 21 Grove Street, Franklin, Massachusetts (the Site). The Site is identified by the Massachusetts Department of Environmental Protection (MassDEP) under Release Tracking Number (RTN) 2-16694. The Site is classified by MassDEP as "Tier II".

The Site is in an area of mixed residential, industrial, and commercial use. The Site consists of an approximately 0.83-acre parcel, identified as Lot 22. The Site is improved with an approximately 4,000-square-foot (SF) collapsing building constructed circa 1945, situated at the western portion of the Site. The remainder of the Site consists of landscaped areas. The Site is currently vacant. Access to the building is restricted by a fence. A former building at the eastern portion of the Site (formerly referenced as 87 Grove Street/Lot 27) was demolished in 2012. The Town acquired Lot 22 in 2002 and Lot 27 in 2005 as tax takings. The two lots were subsequently combined and are referred to as Lot 22. Mine Brook flows along the western and southern perimeter of the Site. The Site is abutted by a stone countertop commercial business to the north/northeast; a Massachusetts Bay Transportation Authority (MTBA) commuter rail line to the north; Grove Street to the east/southeast; and Old Forge Road to the west/southwest.

The Site was developed by at least the early 1890s and was occupied by the Unionville Woolen Mills. The existing Site building was constructed circa 1945 and the former Site building was constructed circa 1900. The Site and adjacent parcel south of Mine Brook was occupied by the Franklin Paint Company in the 1950s. The Site was purchased in 1969 by Carol and Richard Armstrong and was used for jewelry manufacturing until the late 1980s as the Nu-Style Jewelry Factory (Nu-Style). A 1975 plan for a proposed addition to the former Lot 27 building indicated that this building was a manufacturing plant, and the Lot 22 building was a garage. The Lot 22 building was used by a construction company for vehicular repair until it was vacated in 1989. Operations on both parcels ceased in late 1989.

The MassDEP assigned RTN 2-16694 to the Site in May 2007 following identification of a release of metals (beryllium, lead, and nickel), CVOCs (tetrachloroethylene [PCE] and trichloroethylene [TCE]), and polycyclic aromatic hydrocarbons (PAHs; benzo(a)pyrene and fluorene) to soil and release of lead and CVOCs (PCE and TCE) in groundwater at the Site. The Site is classified by MassDEP as "Tier II".

The following conclusions can be made based upon the results of the comprehensive site assessment activities completed at the Site:

1. Based upon the results of groundwater collected between 2006 and 2023, both overburden and bedrock groundwater are impacted by CVOCs, with PCE and

TCE detected at concentrations exceeding their applicable Massachusetts Contingency Plan (MCP) Method 1 Groundwater Standards:

i. The vertical and horizontal extents of CVOC impacts to overburden and bedrock groundwater have not been fully delineated.
ii. It is unclear if CVOC impacts identified south of Mine Brook are originating from the Site or from an off-Site source (i.e., Lot 26).
iii. Concentrations trends of CVOCs in groundwater appear to be generally stable or decreasing in Site overburden and bedrock monitoring wells.
iv. Based upon recent groundwater analytical results there is no evidence of vapor intrusion impacts to the south of Mine Brook.

2. CVOC impacted soil is present in the northern and southwestern portions of the Site. The majority of CVOC impacted soil was identified in the upper six feet below ground surface (bgs); however, localized impacts have been identified at the bedrock interface. Data gaps exist within the footprint of the current Site building.

3. The source of CVOC impacts to soil and groundwater are attributable to historic manufacturing operations.

4. Localized PAH impacts are present in surficial soils in the vicinity of MW-2 and MW-3 in the western portion of the Site. The suspect source is attributed to the historic placement of fill or other historic Site operations. PAH impacts to sediment within Mine Brook are attributable to releases from historic manufacturing operations and/or placement of fill during channelization of the brook. PAH and metal impacts to soils within a former raceway structure are attributable to releases from historic manufacturing operations. Remediation activities were conducted in the eastern portion of the raceway in 2012, and similar impacts are likely present within the intact portion of the raceway in the western portion of the Site.

5. The Partial PSSC supports the implementation of remedial measures to mitigate potential vapor intrusion impacts to future receptors, which is consistent with portions of the Site at which there is evidence of CVOC impacts exceeding MCP Method 1 GW-2 Groundwater concentrations and localized areas of CVOC impacts to soils.

6. Additional assessment activities are recommended to address data gaps related to the extent of CVOC impacts to soil and overburden and bedrock groundwater. A Method 3 Risk Characterization is recommended to characterize the risk of harm to health, public welfare, and the environment for sediment, surface water, and indoor air at the Site.

This report was prepared in accordance with 310 CMR 40.0850 of the Massachusetts Contingency Plan (MCP).

## 1.1 PURPOSE

The purpose of this Phase III RAP is to evaluate Remedial Action Alternatives (RAAs) for remediation and/or mitigation of CVOCs which have impacted to Site environmental media. This Phase III RAP evaluates a number of potential RAAs and selects Institutional Controls, Passive Containment, Active Treatment, *In-Situ* Technologies, and Monitoring.

In accordance with the MCP (310 CMR 40.0850), the goal of the Phase III RAP is to identify, evaluate, and select RAAs that: (1) are likely to achieve a level of No Significant Risk (NSR) at the Site; and (2) address MCP issues regarding source elimination/control and restoration to background. The RAA evaluation is summarized in the RAP Section of this report in accordance with 310 CMR 40.0861 of the MCP. This report contains a narrative describing the proposed remediation.

## 1.2 SCOPE OF THE REPORT

The scope of work for the preparation of the Interim Phase III RAP Section included:

1. Identifying and screening potential remedial technologies;
2. Developing RAAs;
3. Performing a comparative evaluation of RAAs; and
4. Selecting the preferred RAA.

This report is organized as follows:

1. Section 1.0 presents the Introduction.
2. Sections 2.0 through 5.0 contain background information, including a summary of the Site history, previous studies, the nature and extent of identified constituents of concern (COCs) at the Site.
3. Section 6.0 outlines the remedial objectives for the Site.
4. Section 7.0 provides the Identification of RAAs.
5. Section 8.0 provides the evaluation of RAAs, including general classes of remedial technologies applicable at sites exhibiting similar conditions and presents a preliminary applicability assessment for these classes based upon site-specific factors. Following this assessment, retained technologies are screened to identify their applicability to site conditions.
6. Section 9.0 provides a description of the selected RAAs and justification for selection, as well as a discussion of the feasibility of achieving background conditions in accordance with 310 CMR 40.0860.
7. Section 10.0 is the Phase III Completion Statement.

# 2.0 SITE BACKGROUND

This section presents a brief general description and history of the Site, and a summary of the nature and extent of constituents of concern at the Site including the nature and extent of impacts to Site soil and groundwater.

## 2.1 SITE LOCATION AND DESCRIPTION AND SURROUNDING USE

The Site consists of an approximately 0.83-acre parcel, identified as Lot 22, and is located in an area of mixed-use. The Site is improved with an approximately 4,000-SF collapsing building constructed circa 1945, situated at the western portion of the Site. The remainder of the Site consists of landscaped areas. The Site is currently vacant/unoccupied. Access to the building is restricted by a fenced enclosure.

The Site is in an area of mixed residential, industrial, and commercial use. Mine Brook flows along the western and southern perimeter of the Site. The Site is abutted by a stone countertop commercial business to the north/northeast; a Massachusetts Bay Transportation Authority (MTBA) commuter rail line to the north; Grove Street to the east/southeast; and Old Forge Road to the west/southwest. A Site Locus Map and Site Plan are provided as Figures 1 and 2, respectively.

Based upon a review of the MassDEP Phase I Site Assessment Map, included as Appendix A, the Site lies within a 100-year FEMA floodplain. There are no Public Water Supply Protection Areas at the Site or within 500 feet of the Site. Zone II Wellhead Protection Areas are located within 0.5-mile southeast and northwest of the Site.

## 2.2 NATURE AND EXTENT OF RELEASE

The following summarizes the nature and extent of the release based upon the data collected at the Site.

1. Soils: Localized CVOC impacts have been identified at the bedrock interface in a sample collected from MW-105D. Localized PAH impacts have been identified in shallow soils in the western (MW-2 and MW-3) portion of the Site. Remedial activities conducted to date have addressed CVOC impacts to soil at the northern and southwestern portions of the Site; however, post-excavation confirmatory results indicate that CVOC impacted soil remains in the northern portion of the disposal site. CVOC impacts to soil beneath the existing Site building are unknown. Additional assessment is warranted following demolition.
2. Groundwater: Based upon the results of groundwater results collected between 2006 and 2023, both overburden and bedrock groundwater are impacted by CVOCs. As shown on Figure 3, the horizontal extent of CVOC impacts to overburden and bedrock groundwater have not been fully delineated. It is unclear if CVOC impacts identified south of Mine Brook are originating from the Site or from an off-Site source. The vertical extent of CVOC impacts in bedrock groundwater has not been fully delineated.

3. Raceway sediments: There is evidence of PAH and metals impacts to raceway sediments.
4. River sediments: PAHs have historically been detected in sediments in the downstream portion of Mine Brook at the Site.

# 3.0 DISPOSAL SITE HISTORY

## 3.1 HISTORY OF OWNER AND OPERATIONS

Based upon historic reports and records reviewed, the Site was developed by at least the early 1890s and was occupied by the Unionville Woolen Mills. The existing Site building was constructed circa 1945 and the former Site building was constructed circa 1900. The Site and adjacent parcel south of Mine Brook was occupied by the Franklin Paint Company in the 1950s. The Site was purchased in 1969 by Carol and Richard Armstrong and was used for jewelry manufacturing until the late 1980s as the Nu-Style Jewelry Factory. A 1975 plan for a proposed addition to the former Lot 27 building indicated that this building was a manufacturing plant, and the Lot 22 building was a garage. The Lot 22 building was used by a construction company for vehicular repair until it was vacated in 1989. Operations on both parcels ceased in late 1989. The Town acquired Lot 22 in 2002 and Lot 27 in 2005 as tax takings.

## 3.2 WASTE MANAGEMENT HISTORY

Four underground storage tanks (USTs) were removed from the Site in 1990, which included two 2,000-gallon tanks, one 5,000-gallon tank, and a 1,000-gallon tank. One or more of these tanks reportedly contained chlorinated solvents. Additionally, one 5,000-gallon No. 2 fuel oil UST, located west of the former Site building, was removed from the Lot 27 parcel in 2007.

Manufacturing processes conducted at the Site included electroplating and metals finishing, and chemical use/storage including heavy metals (nickel and chromium), acids, bases, cyanides, oils, and chlorinated solvents. The United States Environmental Protection Agency (US EPA) conducted an inspection of the property in 1992. The inspection documented the presence of chemicals and process equipment associated with the historic manufacturing facility which were abandoned at the Site when Nu-Style declared bankruptcy in approximately 1991. The US EPA subsequently conducted Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) removal actions which included the removal and off-Site disposal of hazardous waste, impacted soil and debris, and product associated with process equipment.

# 4.0 RELEASE HISTORY

## 4.1 RELEASE NOTIFICATION AND MCP COMPLIANCE

In July 2007, Fuss & O'Neill, Inc. (Fuss & O'Neill) conducted a Phase II Environmental Site Assessment (ESA) at the Site on behalf of the County of Norfolk, Massachusetts as part of the County Hazardous Materials Brownfield Program. A release of metals (beryllium, lead, and nickel), CVOCs (PCE and TCE), and PAHs (benzo(a)pyrene and fluorene) were identified in soil. A release of lead and CVOCs (PCE and TCE) was also identified in groundwater at the Site. These conditions represented a 120-day reporting condition and the MassDEP assigned RTN 2-16694 in May 2007.

In May 2008 Fuss & O'Neill prepared a Phase I Initial Site Investigation Report and tier classification.

Tata & Howard (T&H) prepared a Partial Permanent Solution with Conditions (PPSC) Report in 2015 for a portion of the Site located south of Mine Brook (currently identified as Lot 26). To support the PPSC, T&H collected groundwater samples from the existing monitoring wells south of Mine Brook in May 2015. Groundwater samples were recollected from monitoring wells MW-101S and MW-101D in June 2015. Analytical results detected TCE and PCE at concentrations exceeding their applicable MCP GW-2 and GW-3 criteria in the groundwater samples collected from MW-101S and MW-101D during both sampling events. No other constituents of concern were detected at concentrations exceeding their applicable MCP Method 1 Groundwater Standards in the remaining monitoring wells sampled by T&H. T&H concluded that the portion of the disposal site south of Mine Brook and east of monitoring wells MW-101S and MW-101D meet the criteria for a PSSC, noting that if a building is constructed a vapor barrier or sub-slab depressurization system may be necessary to mitigate vapor intrusion.

# 5.0 SUMMARY OF REMEDIAL ACTIVITIES

## 5.1 UNDERGROUND STORAGE TANK (UST) REMOVAL

In May 2007, Fuss & O'Neill oversaw the removal of a 5,000-gallon UST containing No. 2 fuel oil, located southwest of the former Lot 27 building. Soil samples were collected from the tank grave and submitted for laboratory analysis of metals, volatile organic compounds (VOCs), and petroleum hydrocarbons. Analytical results did not detect concentrations of constituents of concern at concentration greater than their applicable MCP Reportable Concentrations (RCs) or Method 1 Soil Standards.

## 5.2 RELEASE ABATEMENT MEASURE ACTIVITIES

In May 2012, Fuss & O'Neill prepared a Release Abatement Measure (RAM) Plan which proposed the demolition of the former Lot 27 building, and excavation and disposal of overburden soil impacted with CVOCs and metals. It is noted that these activities were limited to Lot 27, and did not include remediation at Lot 22.

RAM activities were completed between May 2012 to February 2013, and included the demolition of the building and excavation of impacted soils. CVOC impacted soil was excavated from the northwestern portion of the Site to a depth of approximately four feet below ground surface (bgs); however, excavations were halted when a sewer line was damaged. Lead impacted soils were excavated in the northeastern portion of the Site (designated as the "MW-05 area") to an approximate depth of six feet bgs. Additionally, CVOC impacted soils were excavated in the southwestern portion of the Site (designated as the "B-4 Excavation Area") to a depth of approximately 7 feet bgs. Confirmatory soil sampling was performed in each of these areas, and Fuss & O'Neill concluded that the excavations were successful in significantly reducing concentrations of CVOCs and metals to the "extent feasible". It is noted that an area of CVOC impacted soils remains in the northern portion of the Site where excavations were limited due to the sewer line, and several of the post-excavation confirmatory samples collected from the northwestern excavation area contained concentrations of TCE and PCE above their applicable MCP Method 1 Soil Standards. A total of 406.53 tons of soil was transported for off-Site disposal from the three excavation areas. Soil excavation areas are provided on Figure 2.

During demolition of the former Lot 27 building a stone-lined raceway structure, trending east-west, was encountered at the Site which extended to the existing building on Lot 22 (Figure 2). This structure was demolished between August 2012 and January 2013. Analytical results of soil samples collected from the raceway detected metals (chromium and lead) and PAHs at concentrations exceeding their applicable MCP Method 1 Soil Standards. Surface water samples from the raceway detected elevated concentrations of petroleum hydrocarbons, metals, and the CVOC cis-1,2-dichloroethylene (DCE), with concentrations of lead exceeding its applicable MCP Method 1 Groundwater Standards. Concentrations of constituents of concern in impacted soil and surface water in the raceway were noted to be higher than concentrations typically encountered in Site soil and groundwater. A total of 116.4 tons of soil was excavated and transported for off-Site disposal from the raceway.

Following completion of RAM activities, the Site was backfilled with a combination of crushed brick, concrete, and masonry rubble generated from the building demolition as well as sand and gravel acquired from off-Site locations.

# 6.0 PHASE III REMEDIAL OBJECTIVES

The remedial objectives for the Site are to achieve a Temporary or Permanent Solution by reducing source impacts and mitigating potential vapor intrusion impacts to receptors.

The remedial performance standards applicable to this Site were assessed based upon the results of a Phase II Comprehensive Site Assessment, which included a Method 1 Risk Characterization (addressing soil and groundwater impacts) and MCP-defined requirements for achieving a Permanent or Temporary Solution.

## 7.0 PHASE III - IDENTIFICATION OF REMEDIAL ACTION ALTERNATIVES

This section presents the identification of potential technologies for addressing remediation of Site constituents of concern.

To develop a set of RAAs for detailed analysis, an initial screening of available remediation technologies (RTs) was performed. These RTs, which address the nature and extent of the impacted media, are described and considered in this section.

An RT was judged to be acceptable for further evaluation if: (1) it was likely to reduce risks to human health and the environment to levels which would permit the achievement of a Permanent Solution; and (2) the technology appeared to be technically and economically feasible for the Site.

Seven general classes of potentially applicable RTs for the Site have been identified and screened (see Table 1 and below) that may reduce levels of CVOCs and petroleum hydrocarbons to soil and groundwater. Technologies in each of these categories were evaluated during the preliminary screening to facilitate a comprehensive review of technologies applicable for the Site. Alternatives from the following categories were evaluated during the preliminary screening:

1. No Remedial Action;
2. Institutional Controls;
3. Passive Containment;
4. Active Treatment/Removal/Containment;
5. *In-Situ* Treatment Technologies; and
6. Monitoring.

An overview of the classes of technologies and a general description of the ranking of each class of technology developed during the screening process is presented below. Table 1 presents a summary of the initial screening of potential RTs.

### 7.1 NO REMEDIAL ACTION

The "No Remedial Action" alternative assumes that no additional remedial efforts are implemented to address Site impacts. This option can provide a basis for assessing the effects of implementing remedial actions; however, it does not directly reduce the toxicity, mobility, or volume of impacted environmental media. This RAA does not reduce site risks associated with impacted soil or groundwater, and provides no additional protection to human health or public welfare. Additionally, the constituents of concern are at concentrations that are unlikely to attenuate below standards in a reasonable timeframe, and therefore, "No Remedial Action" would not reduce potential risks to human health and/or the environment in the long term.

Conclusion: The "No Remedial Action" alternative does not reduce the toxicity, mobility, or volume of impacted environmental media. Because a Condition of NSR does not currently exist at the Site, the "No Remedial Action" alternative does not maintain a

Temporary Solution or achieve a Permanent Solution. However, this RT was retained for future consideration.

## 7.2 INSTITUTIONAL CONTROLS

Institutional controls are mechanisms to limit access to impacted media and include alternatives such as fencing, barriers, and Notices of Activity Use Limitations (AULs) in the form of deed restrictions. While institutional controls do not eliminate impacted media, they can provide an effective, low cost means of reducing exposure potential, and thus risk, if properly maintained and enforced.

Institutional controls may be effective in mitigating exposure to impacted media at locations at which it may be infeasible to achieve background conditions. Implementation of a Notice of AUL on a site to restrict access to impacted groundwater (other than as "exposure pathway elimination measures" or to restrict access to drinking water) is not supported by MassDEP. However, Notices of AUL may be implemented to ensure that engineering controls be maintained to mitigate potential risk.

Conclusion: This RT is a viable option that will be retained for further consideration.

## 7.3 PASSIVE CONTAINMENT AND/OR MITIGATION MEASURES

The primary purpose of containment technologies is to isolate impacted media, and thus control potential exposure risks. Passive containment involves placement of horizontal physical barriers, such as a cap, sealant or membrane, or vertical barriers such as a grout curtain, slurry wall, or sheet piling in the impacted areas. Asphalt pavement, concrete and building slabs also serve as barriers to impacted soils.

Conclusion: This RT is a viable option that will be retained for further consideration.

### 7.3.1 Vertical Barriers

A vertical barrier, such as a permeable reactive barrier (PRB), is defined as an *in-situ* method for remediating impacted groundwater that combines a passive chemical or biological treatment zone with subsurface fluid flow management. Treatment media may include zero-valent iron, chelators, sorbents, and microbes to address a wide variety of constituents of concern in groundwater, such as CVOCs, other organics, metals, inorganics, and radionuclides. The constituents of concern are concentrated and either degraded or retained in the barrier material, which may need to be replaced periodically. For vertical barriers, such as slurry walls, hydraulic capture may also be required (i.e., an active groundwater recovery/treatment system), since slurry walls divert groundwater flow. Although passive vertical containment may be designated as a feasible RT for containment of constituents of concern /sources, this RT does not address source removal.

Conclusion: This RT is a viable option that will be retained for further consideration.

### 7.3.2 Horizontal Barriers

The primary purpose of passive containment technologies is to isolate impacted media, and thus control potential exposure risks. Passive containment using horizontal barriers involves placement of physical barriers, such as a cap, in order to limit the potential for exposure to impacted media. A vapor barrier is considered as a horizontal barrier for future occupied buildings at the Site property and an engineered cap is considered for impacted soils and transmission of CVOCs.

The purpose of a cap is to protect human and environmental receptors from constituents of concern by means of physical separation. A cap consists of a physical barrier that can range widely in composition and can consist of a single or multiple layers. Caps are designed to be either permeable or impermeable. Permeable caps are intended to provide a physical barrier to exposure and typically consist of soil or stone, sometimes supplemented with synthetic materials (e.g., geotextiles). Impermeable caps are designed to prevent infiltration of precipitation or migration of gases and typically include a synthetic membrane or low-permeability soil layer. Caps are usually accompanied with a Notice of Activity and Use Limitation (AUL) in order to prevent the possibility of future exposure as a result of a change in site use. In addition, a visual marker (i.e., geotextile fabric) is installed under the cap to delineate clean versus impacted soil and assist in identifying when cap erosion has occurred.

Vapor barriers may be composed of high-density polyethylene (HDPE), low density polyethylene (LDPE), very-low density polyethylene (VDPE) materials; spray-applied materials composed of a rubberized asphalt emulsion or epoxy; or any other chemical resistant membrane that prevents the transmission of CVOCs.

Conclusion: Passive containment measures (horizontal barriers/cap) may be feasible for the Site. This RT (horizontal barriers/cap) is a viable option that will be retained for further consideration.

### 7.3.3 Passive Sub-Slab Depressurization System (SSDS)

A Passive SSDS serves as a venting system to create a preferential pathway to divert the vapors from the subsurface to the ambient air above future occupied buildings. Passive mitigation measures include the installation of a barrier or barriers to prevent the migration of CVOC vapors to the indoor air, or a venting system to create a preferential pathway to divert the vapors from the subsurface to the ambient air above the building. These measures are considered "passive" because they do not employ a fan or blower or other electro-mechanical device as a component of the mitigation system. Passive mitigation measures are considered Passive Exposure Pathway Mitigation Measures under the MCP (as defined at 310 CMR 40.0006(12)).

SSDS are based upon traditional radon-mitigation technology and consist of a fan or blower that draws soil vapor from beneath the building slab. When an existing building is retrofitted with an SSDS, extraction points are installed through the building slab. In most cases these points are installed vertically. In cases where vertical extraction points are not able to influence all areas where vapors enter through the slab, horizontal extraction points may be required.

Passive venting mitigates the vapor intrusion pathway by intercepting sub-slab soil gas with a series of perforated pipes (typically 4-in. diameter), installed below the slab within a permeable bedding material, such as sand or gravel. The perforated piping is typically connected to solid piping and vented to the atmosphere above the roof line. Where possible, a vapor barrier, should be used in conjunction with a passive venting system.

A passive venting system relies on temperature and pressure differences, and wind speed to induce soil gas flow and removal. As a result, to ensure its effectiveness, the system must include sufficient interception piping and highly permeable bedding, and the barrier system must be properly installed. Passive venting systems should be designed so that a fan can be easily added to transform the system to an active SSDS if a greater reduction in the concentrations of CVOCs is necessary to achieve mitigation goals.

Pre-fabricated floor systems that create a continuous aerated space beneath the slab or raised aerated floor above an existing slab are a form of passive venting system that eliminates the need for passive vent piping and permeable bedding material. Aerated floor systems may also, when fitted with a fan or blower, be converted to an active SSDS.

As with a vapor barrier, passive venting systems are more easily installed in and generally better suited to new construction, where the appropriate amount and type of sub-slab bedding material can be specified, verified, and proper installation can be assured.

Conclusion: A passive SSDS may be feasible for the Site for future occupied buildings. This RT is a viable option that will be retained for further consideration.

## 7.4 ACTIVE TREATMENT/REMOVAL/CONTAINMENT SYSTEMS

### 7.4.1 Groundwater Recovery and/or Treatment

Groundwater recovery may be utilized solely for containment purposes or may also be used for groundwater treatment. Groundwater extraction/recovery and treatment (“pump and treat”) is a proven technology for the recovery of impacted groundwater. This method is also a conventional means to induce hydraulic containment of a groundwater table surface. Implementation of these systems may involve the installation of multiple large diameter extraction wells, treatment equipment, and a means to discharge treated effluent. The effectiveness of groundwater pump and treat systems is highly dependent on factors such as secondary groundwater quality (iron content, hardness, pH), source location and volume, and soil type, permeability, and saturated thickness.

Soil permeability and well field design will directly influence well yields, and determine whether the system will operate intermittently or continuously. Excessive intermittent operation of a system or "cycling" can be detrimental to system components. Although groundwater recovery and treatment is successful in establishing groundwater plume capture, the limitations and challenges of this technology include high utility costs, numerous extraction wells for larger plumes, and generation of high quantities of groundwater.

Conclusion: This RT is a not viable option and will not be retained for additional consideration.

#### 7.4.2 Soil Vapor Extraction and Air Sparging

Soil vapor extraction (SVE) is a proven remedy for reducing concentrations of CVOCs in unsaturated soils. To be effective, the SVE system must move large volumes of air through the soil, which alters the equilibrium conditions and induces desorption of chlorinated solvents from soil and volatilize into the soil vapor. The soil vapor is removed and CVOCs captured or destroyed by an air treatment system.

At the Site, overburden groundwater was encountered at depths ranging from 4 to 7 feet bgs. Additionally, CVOC impacted soil has generally been identified in a limited area of the northern portion of the Site. CVOC impacts to soil beneath the existing Site building has not been assessed. While evaluating SVE, it is important to consider air treatment requirements for the extracted soil vapor, short-circuiting of air flow, and SVE blower noise issues to avoid a nuisance condition.

Air sparging involves forcing pressurized air into groundwater. The injected air is driven by buoyancy and moves upward through the soil where it can volatilize CVOCs adsorbed to soil in the vadose zone. The air enters the unsaturated zone, where it can be captured by the SVE system. A secondary benefit of air sparging is that it can also volatize CVOCs from groundwater.

Current analytical results have detected limited CVOC impacts to soil within the vadose zone at the Site. Considerations for air sparging include the permeability of soil, and effective capture of volatile soil vapor with the SVE system. Additionally, air sparging may alter hydrogeological conditions in overburden and bedrock groundwater and has the potential to accelerate downward migration of impacted groundwater through fractured bedrock.

Conclusion: This RT is a not viable option and will not be retained for additional consideration

#### 7.4.3 Active Exposure Pathway Mitigation Measures (AEPMMs)

An Active SSDS is effective at mitigating vapor intrusion impacts to receptors in buildings, due to volatile constituents of concern in groundwater that can accumulate in the vadose zone and impact indoor air. Vapor intrusion mitigation systems that employ a fan or blower to draw CVOC vapors into collection points and discharge them away from the affected building are considered "active" mitigation systems. Active mitigation systems are considered Active Exposure Pathway Mitigation Measures or AEPMMs under the MCP (as defined at 310 CMR 40.0006(12)), measures directed at an Exposure Pathway which rely on the continual or periodic use of a mechanical or electro-mechanical device to reduce exposures and meet applicable performance standards. Active systems require ongoing monitoring and maintenance and the use of telemetry or remote monitoring measures.

Active sub-membrane depressurization (SMD) systems are typically used in buildings with earthen floor basements or crawlspaces. SMD systems are similar to SSD systems with the exception that depressurization occurs below an impermeable membrane instead of a concrete slab. The best approach for using an SMD system is to place various lengths of perforated piping horizontally over the earthen floor and cover the piping with a vapor barrier. To prevent the impermeable membrane from blocking the perforations in the piping when a vacuum is drawn, highly permeable material (gravel or pea stone) can be packed between and on top of the piping. Vapor barriers used in SMD systems should be chemical resistant membranes that prevent the transmission of CVOCs.

<u>Conclusion</u>: This RT is a viable option and will be retained for further consideration for future occupied buildings.

#### 7.4.4 EX-SITU TREATMENT

The primary purpose of *ex-situ* treatment technologies is to remove impacted media, and thus control potential exposure risks.

Excavation involves the removal of impacted soil that presents a potential direct contact risk, along with soil which may serve as a continuing source of impacts to groundwater. The impacted soil is removed from its current setting and transported off-Site for constituent of concern removal, recycling and/or disposal. CVOC impacted soil remains in the northern and southwestern portions of the Site. The majority of CVOC impacted soil was identified in the upper six feet bgs; however, isolated impacts have been identified at the bedrock interface. Dewatering would be required to remove isolated subsurface soil, which would also require treatment and management of impacted groundwater. Dewatered groundwater would be temporarily stored on-site using fractionation (frac) tanks and following treatment through the use of granulated activated carbon units may be discharged to a municipal utility under a permit, or to a catch basin/water body under a US EPA Dewatering and Remediation General Permit (DRGP); or, disposed to a licensed acceptance facility under a MassDEP Bill of Lading (BOL), or managed as hazardous remediation waste.

<u>Conclusion:</u> This RT is a viable option and will be retained for further consideration.

### 7.5 IN-SITU TREATMENT

*In-situ* (organic or inorganic/chemical) treatment or augmentation technologies are most dependent upon the ability to deliver the treatment material to the affected subsurface area, and the sustainability or effective life of the material. CVOC constituents in Site groundwater are amenable to chemical oxidative technologies (ozone, permanganate, persulfate, oxygen releasing compounds (ORC), and hydrogen peroxide), aerobic and anaerobic biological technologies, and chemical reducing technologies (zero valent iron). To effectively assess performance, bench-scale treatability studies and pilot testing is recommended prior to implementation.

*In-situ* chemical oxidation (ISCO) is a remediation process in which constituents of concern are chemically converted to less toxic compounds (water, oxygen, and carbon dioxide). There are several types of commercially available oxidants that have been demonstrated to be effective in reducing CVOC constituents of concern in groundwater. Effective distribution of the reagents and the reactivity of the selected oxidant with the constituents of concern are crucial in achieving reduction in CVOC concentrations. Soil oxidant demand varies with soil type, the nature of the site groundwater, and soil composition. Oxidant demand is based upon total mass of impacted media and mass distribution. Groundwater monitoring is essential in evaluating the performance of this remedy. Chemical oxidation typically involves reduction/oxidation (redox) reactions that chemically convert hazardous compounds to nonhazardous or less toxic compounds that are more stable, less mobile, or inert. Redox reactions involve the transfer of electrons from one compound to another. Specifically, one reactant is oxidized (loses electrons) and one is reduced (gains electrons). The oxidizing and reducing agents most commonly used for treatment of hazardous constituents in soil and groundwater are zero valent iron, hydrogen peroxide, catalyzed hydrogen peroxide, potassium permanganate, sodium permanganate, sodium persulfate, and ozone. Each reagent has advantages and limitations, and while applicable to soil and some source zone impacts, they have been applied primarily toward remediating groundwater.

Bioremediation uses microorganisms to degrade organic constituents in soil, sludge, and solids either excavated or *in-situ*. The microorganisms break down constituents of concern by using them as a food source or co-metabolizing them with a food source. Aerobic processes require an oxygen source, and the end products typically are carbon dioxide and water. Anaerobic processes are conducted in the absence of oxygen, and the end products can include methane, hydrogen gas, sulfide, elemental sulfur, and dinitrogen gas.

*In-situ* techniques stimulate and create a favorable environment for microorganisms to grow and use constituents as a food and energy source. Generally, this means providing some combination of oxygen, nutrients, and moisture, and controlling the temperature and pH adjustment. Sometimes, microorganisms that have been adapted for degradation of specific constituents are applied to enhance the process.

Conclusion: This RT is a viable option and will be retained for further consideration. To effectively assess performance, bench-scale treatability studies and pilot testing is recommended prior to implementation.

### 7.6 MONITORING

Groundwater monitoring is conducted as a measure to assess the effectiveness of the cleanup. Groundwater is collected from monitoring wells at and/or hydraulically downgradient of the cleanup area. This option is also effective for assessing groundwater conditions surrounding impacted areas that have been capped.

Monitoring of Active and Passive Containment Systems includes inspections and sampling and analysis to evaluate system effectiveness.

Conclusion: This RT is a viable option that will be retained for additional consideration.

## 8.0 PHASE III - EVALUATION OF REMEDIAL ACTION ALTERNATIVES

As discussed earlier, six potential RTs are evaluated from the set of viable technologies at this Site for addressing impacted media at the Site. The following RAAs have been developed and are summarized below and in Table 1.

1. RAA-1: No Remedial Action;
2. RAA-2: Institutional Controls;
3. RAA-3: Passive Containment and/or Mitigation Measures;
4. RAA-4: Active Treatment/Removal/Containment;
5. RAA-5: *In-Situ* Technologies; and
6. RAA-6: Monitoring.

The identified RAAs were evaluated with respect to the criteria established in the MCP for a detailed evaluation (310 CMR 40.0858). These criteria are:

1. Comparative Effectiveness. This criterion provides an evaluation of the effectiveness of the RAAs in achieving a Permanent or Temporary Solution; reusing, recycling, destroying, detoxifying, or treating oil or hazardous material (OHM); and reducing levels of residual OHM to background levels.
2. Comparative Reliability. This criterion evaluates the degree of certainty that the RAA will be successful, and the effectiveness of any measures required to treat residues or remaining waste, or control emissions or discharges to the environment.
3. Comparative Difficulty in Implementation: This criterion evaluates the comparative difficulty in implementing the RAA. It includes an evaluation of:

- The technical complexity of the RAA;
- Integration of the RAA with facility operations or other remedial actions;
- Necessary monitoring, operations, maintenance or site access;
- Availability of necessary services, materials, equipment or specialists;
- Availability, capacity and location of off-Site treatment, storage, and disposal facilities; and
- Whether the RAA meets the requirements for any necessary regulatory approvals, permits or licenses.

4. Comparative Cost. This criterion includes evaluation of implementation costs, including design, construction and, if necessary, operation and maintenance costs, costs of environmental restoration, and costs of consumption of energy resources.
5. Comparative Risks. This criterion includes an evaluation of short-term on-Site and off-Site risks posed by implementation of the RAA associated with excavation, transport, disposal, containment, construction, operation or maintenance activities, or discharges from the remedial system; on-Site and off-Site risks posed by the RAA until the remedial objectives are attained; and potential risks to human health, public welfare, the environment posed by residual impacted media once the remedial action is completed.

6. Comparative Benefits. This criterion includes an evaluation of the benefit of restoring natural resources, providing for the productive reuse of the Site, the avoided costs associated with relocating people, and the avoided lost property value of the Site.
7. Comparative Timeliness. This criterion includes an evaluation of timeliness of the RAA in eliminating uncontrolled sources and attaining a condition of NSR.
8. Comparative Effect Upon Non-Pecuniary Interests. This includes an evaluation of the RAAs effect on non-pecuniary issues such as aesthetic issues.

## 8.1 COMPARATIVE EVALUATIONS

The comparative evaluation of each of these criteria is discussed below and is summarized in Table 2A. In order to quantify the benefits of each alternative and select the most appropriate RAA, a criteria-based numerical scoring of each of the RAAs has been conducted and is presented in Table 2B. In this evaluation, each of these criteria is given equal weight of importance. For a given RAA, a score ranging from 1 (lowest ranking) to 5 (highest ranking) was assigned for each criterion based upon that RAAs ability to satisfy the criterion. The RAA with the highest overall score was judged to be the most appropriate RAA for the Site (Tables 2A and 2B).

### 8.1.1 Comparative Effectiveness

In accordance with 310 CMR 40.0858, "the effectiveness of each RAA was evaluated in terms of a) achieving a Permanent or Temporary Solution under 310 CMR 40.1000; (b) reusing, recycling, destroying, detoxifying, or treating oil and hazardous material at the disposal Site; and (c) reducing levels of untreated OHM at the Site to concentrations that achieve or approach background." The relative effectiveness of a Permanent Solution is judged based upon the RAAs ability to reduce the mobility, toxicity, or volume. Refer to Tables 2A and 2B.

1. RAA-1: No Remedial Action: This RAA is ineffective at reducing concentrations of constituents of concern at the Site.
2. RAA-2: Institutional Controls: A Notice of AUL is implemented to effectively address engineering controls, if combined with another RAA.
3. RAA-3: Passive Containment: This technology is effective at mitigating potential direct contact exposure to impacted media. A vapor barrier can effectively mitigate exposure to CVOC impacts to indoor air in future occupied buildings. A Passive SSDS can effectively mitigate exposure to constituents of concern in indoor air in future occupied buildings and is more effective when combined with a vapor barrier.
4. RAA-4: Active Treatment/Removal/Containment: This technology is effective at remediating impacted soil, but requires combination with other RAAs. An AEPMM is an effective RT to mitigate CVOC impacts to indoor air in future occupied buildings.
5. RAA-5: *In-Situ* Technologies: are an effective RT to reduce CVOC impacts to Site soil and groundwater.

6. RAA-6: Monitoring: Monitoring is effective to monitor the effectiveness of other RAAs. Groundwater monitoring is an effective measure to evaluate the effectiveness of *in-situ* technologies, along with potential vapor intrusion impacts. However, this measure is ineffective at reducing Site impacts in areas where source removal is not conducted. Monitoring of passive and active remedial systems and monitoring of vapor barriers are effective RTs to evaluate the conditions and effectiveness of these RTs.

### 8.1.2 Comparative Reliability

In accordance with 310 CMR 40.0858 (2), the short and long-term reliability for each of the RAAs were evaluated based upon "(a) the degree of certainty that the RAA would be successful; and (b) the effectiveness of measures required to manage residues or remaining wastes or control emissions or discharges to the environment." Specific factors considered in judging the short and long-term reliability include: protection of workers and the community during construction, environmental impacts resulting from implementation of the remedial response action, the time required to achieve protection and long-term reliability of management controls providing protection from residual wastes. Refer to Tables 2A and 2B.

1. RAA-1: No Remedial Action: This RAA is ineffective at controlling discharges to the environment and has a low degree of certainty of success in reliability since no remediation is conducted.
2. RAA-2: Institutional Controls: A Notice of AUL is a reliable measure to address engineering controls associated with impacted soils but ineffective for remediation of site impacts without another RT.
3. RAA-3: Passive Containment and/or Mitigation Measures: A clean cap is a reliable measure to mitigate potential direct contact exposure to impacted soils and prevent infiltration of rainwater. A vapor barrier, in combination with a passive SSDS, is a moderately reliable measure to mitigate exposure to constituents of concern in indoor air in future occupied buildings.
4. RAA-4: Active Treatment/Removal/Containment: Excavation of impacted soil is a reliable measure to remove sources of constituents of concern at the Site, but requires management of waste soil and groundwater if dewatering is required. An AEPMM is a reliable RT to mitigate CVOC impacts to indoor air in future occupied buildings.
5. RAA-5: *In-Situ* Technologies: *In-situ* technologies are reliable measures to reduce Site constituent impacts to soil and groundwater.
6. RAA-6: Monitoring**:** Groundwater monitoring is conducted to assess monitored natural attenuation and potential migration of impacted groundwater. Monitoring of indoor air and groundwater are reliable measures to evaluate the effectiveness of source removal/treatment technologies. Monitoring, when combined with maintenance, are reliable measures to evaluate the condition of passive and active remedial RTs.

#### 8.1.3 Comparative Difficulty in Implementation

In accordance with 310 CMR 40.0858(3), difficulty in implementation of each of the alternatives was evaluated based upon: "(a) the technical complexity of the alternative; (b) where applicable the integration of the alternative with existing facility operations and other current or potential remedial actions; (c) any necessary monitoring, operations, maintenance or site access requirements or limitations; (d) the availability of necessary services, materials, equipment, or specialists; (e) the availability, capacity and location of necessary off-Site treatment, storage and disposal facilities; and (f) whether the alternative meets regulatory requirements for likely approvals, permits or licenses required by MassDEP or other state, federal or local agencies." Refer to Tables 2A and 2B.

1. RAA-1: <u>No Remedial Action:</u> There is no technical complexity associated with this alternative.
2. RAA-2: <u>Institutional Controls:</u> There is low to moderate technical complexity associated with implementation.
3. RAA-3: <u>Passive Containment and/or Mitigation Measures:</u> There is moderate technical complexity associated with implementation.
4. RAA-4: <u>Active Treatment/Removal/Containment:</u> There Is moderate to high technical complexity associated with implementation.
5. RAA-5: <u>In-Situ Technologies:</u> There is moderate to high technical complexity associated with implementation.
6. RAA-6: <u>Monitoring:</u> There is low to moderate technical complexity associated with implementation.

#### 8.1.4 Comparative Costs

In accordance with 310 CMR 40.0858 (4), the cost to implement each alternative was evaluated based upon (a) costs of implementing the alternative, including without limitation: design, construction, equipment, site preparation, labor, permits, disposal, operation, maintenance and monitoring costs; (b) costs of environmental restoration, potential damages to natural resources, including consideration of impacts to surface waters, wetlands, wildlife, fish and shellfish habitat; and (c) the relative consumption of energy resources in the operation of the alternatives, and externalities associated with the use of those resources.

1. RAA-1: <u>No Remedial Action:</u> Total estimated costs are high due to long-term OM&M.
2. RAA-2: <u>Institutional Controls:</u> There are low costs to implement this action.
3. RAA-3: <u>Passive Containment and/or Mitigation Measures:</u> There are low to moderate costs associated with this technology.
4. RAA-4: <u>Active Treatment/Removal/Containment:</u> There is moderate to high technical cost associated with implementation.
5. RAA-5: <u>In-Situ Technologies:</u> There are moderate costs associated with this technology.

6. RAA-6: Monitoring: There are low to moderate costs associated with short term monitoring and reporting, and moderate to high costs associated with long term monitoring and reporting.

### 8.1.5 Comparative Risks

In accordance with 310 CMR 40.0858(5), the risks associated with each RAA were evaluated based upon: (a) the short-term on-site and off-site risks posed during implementation of the RAA associated with any excavation, transport, disposal, containment, construction, operation or maintenance activities, or discharges to the environment from remedial systems; (b) the on-site and off-site risks posed over the period of time required for the RAA to attain applicable remedial standards, including risks associated with ongoing transport, disposal, containment, operation or maintenance activities, or discharges from remedial systems; and (c) the potential risk of harm to health, safety, public welfare or the environment posed to human or environmental receptors by any oil and/or hazardous material remaining at the disposal site after the completion of the remedial action.

1. RAA-1: No Remedial Action: There are high risks associated with this action as impacted media would not be remediated.
2. RAA-2: Institutional Controls: There are moderate risks associated with this action. However, there is a moderate risk of harm to human and environmental receptors if impacted media remains in place without additional RTs.
3. RAA-3: Passive Containment and/or Mitigation Measures: There are low to moderate risks associated with this technology.
4. RAA-4: Active Treatment/Removal/Containment: There are moderate risks associated with this technology.
5. RAA-5: *In-Situ* Technologies: There are moderate short-term risks associated with this technology, which are mitigated by proper Health and Safety measures.
6. RAA-6: Monitoring: There are low to moderate risks associated with implementation of this activity.

### 8.1.6 Comparative Benefits

In accordance with 310 CMR 40.0858(6), the benefits of each RAA were evaluated based upon: "(a) the benefit of restoring natural resources; (b) providing for the productive reuse of the Site; (c) the avoided costs of relocating people, businesses, or providing RAA water supplies; and (d) the avoided lost value of the Site."

1. RAA-1: No Remedial Action: There is no benefit associated with this alternative.
2. RAA-2: Institutional Controls: This measure is beneficial as it provides administrative control and provides productive Site reuse.
3. RAA-3: Passive Containment and/or Mitigation Measures: These technologies are moderately beneficial in mitigating exposure to impacted media. However, this technology is most feasible after source removal.
4. RAA-4: Active Treatment/Removal/Containment: This measure is beneficial in mitigating exposure to impacted media.

5. RAA-5: _*In-Situ* Technologies:_ This is a beneficial technology to reduce constituent of concern impacts and allow for productive Site reuse.
6. RAA-6: Monitoring: Monitoring is a beneficial measure in combination with other RAAS.

#### 8.1.7 Comparative Timeliness

In accordance with 310 CMR 40.0858(7), a review is required of "the comparative timeliness of the RAAs in terms of eliminating any uncontrolled sources of oil and/or hazardous material and achieving a level of No Significant Risk as described in 310 CMR 40.0900."

1. RAA-1: No Remedial Action: This alternative will not achieve a level of NSR in a reasonable timeframe.
2. RAA-1: Institutional Controls: A Notice of AUL can be implemented within a short time period (weeks) to achieve NSR, assuming successful implementation of other RTs.
3. RAA-2: Passive Containment and/or Mitigation Measures: Passive containment is moderate in the timeliness to achieve NSR and assumes combination with other RTs.
4. RAA-3: Active Treatment/Removal/Containment: This RT can be implemented within a short time period (weeks) to achieve NSR, assuming implementation of additional RTs.
5. RAA-4: *In-Situ* Technologies: This technology can be conducted within a moderate time period (weeks to months) to achieve NSR.
6. RAA-5: Monitoring: Groundwater monitoring is anticipated to be conducted within a long time period to achieve NSR.

#### 8.1.8 Comparative Effect Upon Non-Pecuniary Interests

The non-pecuniary interests of each RAA were evaluated based upon aesthetics and interests of the local community in accordance with 310 CMR 40.0858(8), "the relative effect of the RAAs upon non-pecuniary interests, such as aesthetic values" was evaluated.

1. RAA-1: No Remedial Action: This alternative has a high effect on non-pecuniary values within the community.
2. RAA-1: Institutional Controls: A Notice of AUL has a minimal impact on the interests of the local community and no impact on aesthetics.
3. RAA-2: Passive Containment and/or Mitigation Measures: Implementation of this RAA will have a low effect on aesthetics and disturbance to the community.
4. RAA-3: Active Treatment/Removal/Containment: Implementation of this RAA will have a short-term moderate impact on aesthetics and disturbance to the community but provide a long-term positive effect on aesthetics.
5. RAA-4: *In-Situ* Technologies: Implementation of this RAA would have a short-term moderate effect on aesthetics and disturbance to the community.

6. RAA-5: Monitoring: Groundwater monitoring is anticipated to have a moderate effect on aesthetics and disturbance to the community, due to the visible presence of wells and monitoring activities.

## 8.2 FEASIBILITY EVALUATION

In accordance with 310 CMR 40.0860, a feasibility evaluation has been performed.

Reducing concentrations of constituents of concern in Site groundwater to levels approaching "GW-2" and "GW-3" Standards appears to be feasible in overburden and bedrock groundwater. A number of RTs are required to remediate Site impacts and to mitigate potential impacts to receptors for Site constituents of concern.

# 9.0 PHASE III - SELECTION OF REMEDIAL ACTION ALTERNATIVE

RAAs were selected based upon the detailed evaluation criteria addressed in previous sections of this report and in compliance with the provisions set forth in 310 CMR 40.0850, 40.0900 and 40.1000. The following RAAs were selected as feasible measures to remediate Site constituents of concern. Based upon the results of the Interim Phase II CSA, Ransom has selected a combination of RAAs, which include the following:

1. Institutional Controls: A Notice of AUL is anticipated to be implemented at the Site as an administrative control.
2. Passive Containment: Passive containment, including a vapor barrier and passive SSDSs will be implemented on future Site buildings as a measure to mitigate potential vapor intrusion impacts.
3. Active Treatment/Removal/Containment: CVOC impacted soil in the northern portion of the Site, and impacted sediment within the raceway will be excavated for off-Site disposal. An active SSDS or SMD system may be implemented as an AEPMM on future Site buildings as a measure to mitigate potential vapor intrusion impacts.
4. *In-Situ* Technologies: *In-Situ* technologies (chemical/biological) will be implemented to reduce constituent of concern sources and mitigate vapor intrusion impacts to receptors. This will result in a reduction of concentrations in constituents of concern groundwater at abutting and downgradient properties and mitigate the threats to indoor air to existing and future buildings.
5. Monitoring: Groundwater monitoring will be conducted to assess the effectiveness of the remediation. Monitoring of passive and active containment systems will be performed to assess condition and effectiveness.

# 10.0 PHASE III COMPLETION STATEMENT

In accordance with CMR 40.0862 requirements, the following opinions are rendered:

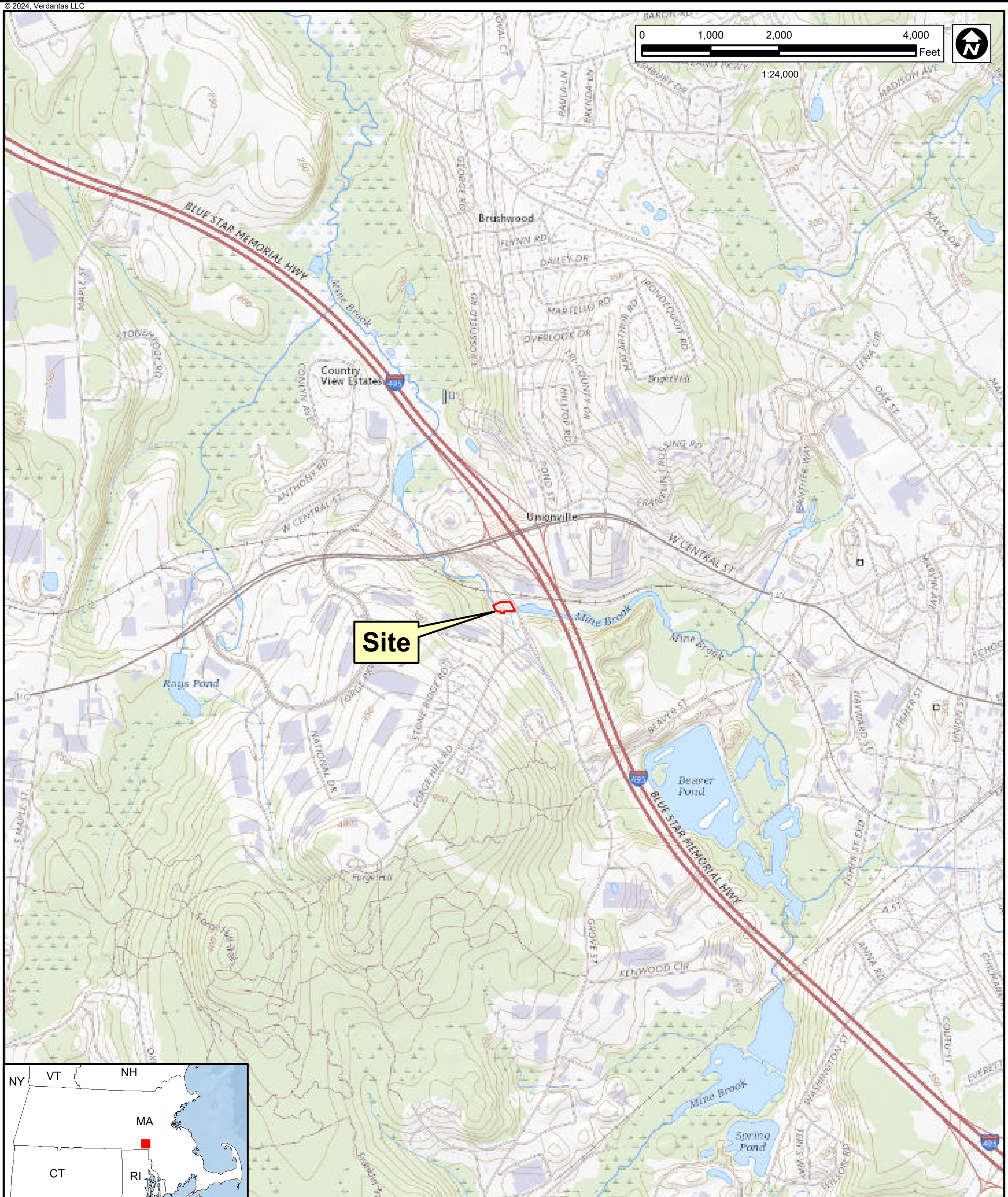
1. This Phase III RAP conforms to applicable requirements and meets the Phase III performance standards.
2. The selected RAAs are anticipated to achieve a MCP Permanent or Temporary Solution.
3. The selected RAAs are anticipated to mitigate potential exposure impacts to environmental and human receptors.
4. A combination of RAAs is a feasible option to reduce constituent of concern impacts within a timely and cost-effective manner that reduces risk and is beneficial to the community and contributes to the overall aesthetics of the Site.
5. Implementation of the selected RAAs are likely to achieve a level of NSR at the Site.

# 11.0 LIMITATONS

This report was prepared for the use of the Town of Franklin. The findings provided by Verdantas in this report were based solely upon the information reported in this document. Should additional information become available in the future, this information should be reviewed by Verdantas and the findings presented herein may be modified.

The response actions completed at the Site have been undertaken in accordance with generally accepted consulting engineering practices. No other warranty, expressed or implied, is made. It is Verdantas' understanding that this report is to be used exclusively by the Town of Franklin until it is filed with MassDEP, at which time it will become a part of the public record. Until this report is filed with the MassDEP, the content of this report may not be copied, provided to, or otherwise communicated to any party not directly involved in this response, in whole or in part, without written consent of Verdantas.

## FIGURES




verdantas
PEOPLE FOCUSED FUTURE

Legend

Subject Property

Latitude 42°05'14"N
Longitude 71°25'42"W

Source: The USGS topo quad is from The National Geographic Society, i-cubed web service "USA Topo Maps".

January 2024

Former NuStyle Property
Town of Franklin

Site Location Map

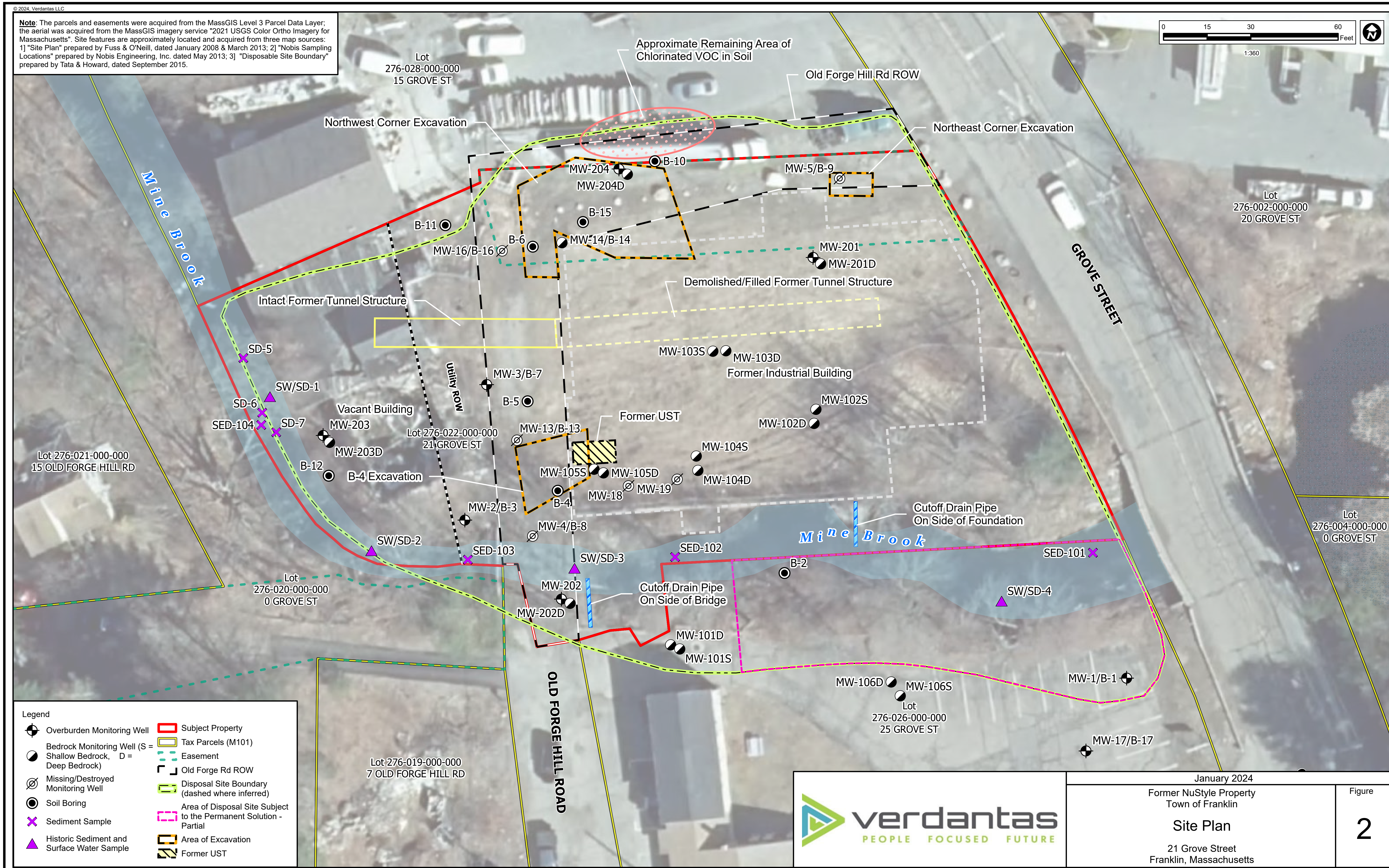
21 Grove Street
Franklin, Massachusetts

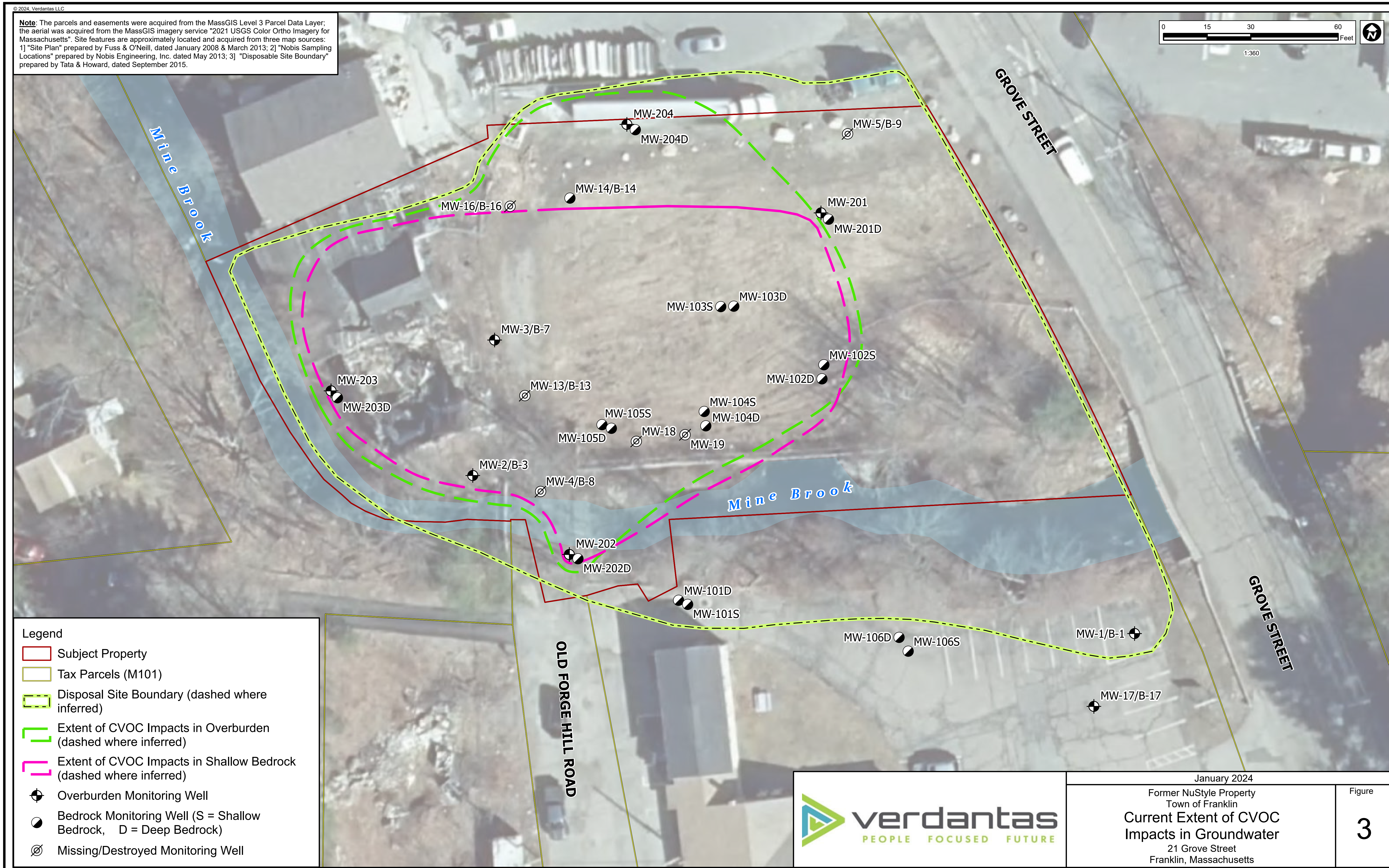
Figure

1

Produced Using Esri's ArcGIS Software

File:Z:\GIS\Projects\028\0000017356_NuStyle_Franklin\Projects\17356_Franklin.aprx Edited: 1/31/2024 User: drolls


© 2024, Verdantas LLC
Note: The parcels and easements were acquired from the MassGIS Level 3 Parcel Data Layer; the aerial was acquired from the MassGIS imagery service "2021 USGS Color Ortho Imagery for Massachusetts". Site features are approximately located and acquired from three map sources: 1] "Site Plan" prepared by Fuss & O'Neill, dated January 2008 & March 2013; 2] "Nobis Sampling Locations" prepared by Nobis Engineering, Inc. dated May 2013; 3] "Disposable Site Boundary" prepared by Tata & Howard, dated September 2015.
0 15 30 60 Feet
1:360
Lot 276-028-000-000 15 GROVE ST
Approximate Remaining Area of Chlorinated VOC in Soil
Old Forge Hill Rd ROW
Northwest Corner Excavation
Northeast Corner Excavation
Mine Brook
MW-204
MW-204D
B-10
MW-5/B-9
Lot 276-002-000-000 20 GROVE ST
B-15
B-11
B-6
MW-14/B-14
MW-16/B-16
MW-201
MW-201D
GROVE STREET
Demolished/Filled Former Tunnel Structure
Intact Former Tunnel Structure
SD-5
MW-103S
MW-103D
Former Industrial Building
Utility ROW
MW-3/B-7
SW/SD-1
B-5
SD-6
Vacant Building
MW-102S
SED-104
SD-7
MW-203
Former UST
MW-102D
Lot 276-022-000-000 21 GROVE ST
MW-13/B-13
MW-203D
MW-104S
Lot 276-021-000-000 15 OLD FORGE HILL RD
B-12
B-4 Excavation
MW-105S
MW-105D
MW-104D
MW-18
MW-19
B-4
MW-2/B-3
Cutoff Drain Pipe On Side of Foundation
MW-4/B-8
Lot 276-004-000-000 0 GROVE ST
SW/SD-2
SED-103
Mine Brook
SED-102
SW/SD-3
SED-101
B-2
Lot 276-020-000-000 0 GROVE ST
MW-202
Cutoff Drain Pipe On Side of Bridge
SW/SD-4
MW-202D
MW-101D
MW-101S
OLD FORGE HILL ROAD
MW-106D
MW-106S
MW-1/B-1
Lot 276-026-000-000 25 GROVE ST
MW-17/B-17
Lot 276-019-000-000 7 OLD FORGE HILL RD
Legend
Overburden Monitoring Well
Bedrock Monitoring Well (S = Shallow Bedrock, D = Deep Bedrock)
Missing/Destroyed Monitoring Well
Soil Boring
Sediment Sample
Historic Sediment and Surface Water Sample
Subject Property
Tax Parcels (M101)
Easement
Old Forge Rd ROW
Disposal Site Boundary (dashed where inferred)
Area of Disposal Site Subject to the Permanent Solution - Partial
Area of Excavation
Former UST
verdantas
PEOPLE FOCUSED FUTURE
January 2024
Former NuStyle Property
Town of Franklin
Site Plan
21 Grove Street
Franklin, Massachusetts
Figure
2
Produced Using Esri's ArcGIS Software
File: Z:\GIS\Projects\028\0000017356_NuStyle_Franklin\Projects\17356_Franklin.aprx Edited: 1/31/2024 User: drolls


© 2024, Verdantas LLC
Note: The parcels and easements were acquired from the MassGIS Level 3 Parcel Data Layer; the aerial was acquired from the MassGIS imagery service "2021 USGS Color Ortho Imagery for Massachusetts". Site features are approximately located and acquired from three map sources: 1] "Site Plan" prepared by Fuss & O'Neill, dated January 2008 & March 2013; 2] "Nobis Sampling Locations" prepared by Nobis Engineering, Inc. dated May 2013; 3] "Disposable Site Boundary" prepared by Tata & Howard, dated September 2015.
0 15 30 60 Feet
1:360
Mine Brook
GROVE STREET
MW-204
MW-204D
MW-5/B-9
MW-14/B-14
MW-16/B-16
MW-201
MW-201D
MW-103S
MW-103D
MW-3/B-7
MW-102S
MW-102D
MW-203
MW-203D
MW-13/B-13
MW-104S
MW-104D
MW-105S
MW-105D
MW-18
MW-19
MW-2/B-3
MW-4/B-8
Mine Brook
MW-202
MW-202D
MW-101D
MW-101S
MW-106D
MW-106S
MW-1/B-1
MW-17/B-17
GROVE STREET
OLD FORGE HILL ROAD
Legend
Subject Property
Tax Parcels (M101)
Disposal Site Boundary (dashed where inferred)
Extent of CVOC Impacts in Overburden (dashed where inferred)
Extent of CVOC Impacts in Shallow Bedrock (dashed where inferred)
Overburden Monitoring Well
Bedrock Monitoring Well (S = Shallow Bedrock, D = Deep Bedrock)
Missing/Destroyed Monitoring Well
verdantas
PEOPLE FOCUSED FUTURE
January 2024
Former NuStyle Property
Town of Franklin
Current Extent of CVOC Impacts in Groundwater
21 Grove Street
Franklin, Massachusetts
Figure
3
Produced Using Esri's ArcGIS Software
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## TABLES

**TABLE 1**
**INITIAL SCREENING OF POTENTIAL REMEDIAL ACTION ALTERNATIVES**
Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan
21 Grove Street
Franklin, Massachusetts
MassDEP Release Tracking No. (RTN) 2-16694

| General Remedial Action Technology | Specific Remedial Technology | Description | Effectiveness | Reliability | Implementability | Cost | Viability |
|---|---|---|---|---|---|---|---|
| 1. No Remedial Action | No Remedial Effort | The no action alternative assumes no additional efforts are made to mitigate chemical constituents in the soil or groundwater at the Site. | Effective as a Temporary Solution, but does not provide any mitigation of constituents of concern or any protection for human and environmental receptors. | Low reliability. | Readily implementable. | Low costs. | Retained for further consideration. |
| 2. Institutional Controls | AULs, Deed Restrictions | Limits future Site uses to those that pose acceptably low risk of human exposure to Site impacts and requires specific health and safety protocols for subsurface work. | Effective for protection of human health by limiting exposures to Site soils and/or groundwater if enforced. AULs cannot be used to mitigate the risk posed by impacted groundwater. Does not reduce toxicity or volume of compounds. | Low to Moderate Reliability. | Readily implementable. | Low costs. | Viable technology as an administrative control. Retained for further consideration. |
| 3. Passive Containment | Vertical and Horizontal Barriers<br><br>Passive Subslab Depressurization System (SSDS) | Passive mitigation measures include the installation of a barrier or barriers to prevent the migration of impacted vapors to the indoor air. Passive containment involves placement of horizontal physical barriers, such as a cap or geotextile barrier, or vertical barriers, such as a grout curtain, slurry wall, sheet piling. Asphalt pavement, concrete and building slabs also serve as barriers to impacted soils.<br><br>Vapor barriers may be composed of high density polyethylene (HDPE), low density polyethylene (LDPE), very-low density polyethylene (VDPE) materials; spray-applied materials composed of a rubberized asphalt emulsion or epoxy; or any other chemical resistant membrane that prevents the transmission of volatile organic compounds (VOCs).<br><br>A Passive SSDS serves as a venting system to create a preferential pathway to divert the vapors from the subsurface to the ambient air above the building | Vertical barrier (i.e., permeable reactive barrier [PRB]) may be effective after source reduction, as a measure to mitigate off-site migration of a plume, rather than remediate source.<br><br>Horizontal barrier (i.e., cap, vapor barrier) is a feasible RT to mitigate vapor intrusion.<br><br>A Passive SSDS is an effective measure to mitigate vapor intrusion and may be used alone or in combination with a barrier (i.e., vapor barrier) under conditions of lower VOC concentrations. | For a vertical barrier, moderate to high reliability.<br><br>A horizontal barrier is reliable if properly constructed and maintained.<br><br>A passive SSDS is less reliable than an Active SSDS under conditions of high VOC concentrations. However, its reliability is increased when used in combination with another measure, such as a vapor barrier. | A vapor barrier is implementable for future construction, including underground utilities. May need to include groundwater control technologies to mitigate potential off-Site migration of impacted groundwater. A Passive SSDS is implementable. | Horizontal passive containment/mitigation: Moderate capital costs.<br><br>Vertical barrier: High capital costs. | Horizontal and vertical barriers are retained for further consideration. |
| 4. Active Treatment/ Removal/ Containment | Treatment of and/or mitigation of impacted media | Recover impacted groundwater by pumping to the surface and treating. Provides hydraulic containment and can be used to lower water table and treat groundwater.<br><br>Vapor intrusion mitigation systems that employ a fan or blower to draw VOC vapors into collection points and discharge them away from the affected building are considered "active" mitigation systems. Active mitigation systems are considered Active Exposure Pathway Mitigation Measures or AEPMMs under the MCP (as defined at 310 CMR 40.0006(12)), measures directed at an Exposure Pathway which rely on the continual or periodic use of a mechanical or electro-mechanical device to reduce exposures and meet applicable performance standards.<br><br>Excavation and off-site disposal of impacted soil. Excavation of isolated subsurface soil within the water table would also require dewatering and management of impacted groundwater.<br><br>Soil vapor extraction (SVE) with air sparging (AS) circulates air through overburden and saturated soils to induce desorption of chlorinated solvents from soil and | Groundwater recovery/treatment effective for protection of human health and the environment by limiting exposures and in controlling groundwater flow and in treatment of impacted groundwater.<br><br>AEPMM is effective for mitigating exposure to constituents of concern attributable to vapor intrusion.<br><br>Removal of impacted soil is effective for protection of human health and the environment by limiting exposure and removes a source of ongoing impacts.<br><br>While SVE and AS is generally effective at reducing concentrations of CVOCs in saturated and unsaturated soil, constituents of concern in soil are generally located in isolated portions of the Site. AS has the secondary benefit to volatilize CVOCs from groundwater. | Low to High reliability. | Groundwater recovery and treatment unlikely to remediate impacted bedrock groundwater.<br><br>AEPMM are implementable at existing and future buildings.<br><br>Soil excavation is readily implementable.<br><br>SVE and AS are implementable, but unlikely to significantly remediate impacted bedrock groundwater. | High costs associated with groundwater recovery and treatment.<br><br>AEPMM: Moderate implementation costs. Moderate operation, monitoring and maintenance (OM&M) costs.<br><br>Soil excavations are moderate to high costs.<br><br>SVE and AS costs are moderate to high implementation costs with high OM&M costs. | Groundwater recovery and treatment is not retained for further consideration.<br><br>AEPMM is retained for further consideration.<br><br>Soil excavation is retained for further consideration.<br><br>SVE and AS are not retained for further consideration. |
| 5. *In-Situ* Technologies | *In-Situ* Chemical Oxidation (ISCO)<br><br>*In-Situ* Chemical Reduction (ISCR)<br><br>*In-Situ* Bioremediation (ISB) | Injection of oxidants, chemicals, reducing compounds and/or microbes and potentially coamendments directly across the Site. | Moderately to highly effective in reducing chlorinated volatile organic compound (CVOC) concentrations . | Moderate to high reliability. | Readily implementable. | Moderate to high costs. Moderate OM&M costs. | A viable technology. Retained for further consideration. |
| 6. Monitoring | Monitoring to assess effectiveness of other RAAs. | Visual monitoring of passive/active containment measures to assess condition, along with collection and analysis of samples (i.e., indoor air, groundwater) based on measurement of specific parameters. | Effective after active measures have stabilized and/or reduce concentrations of constituents of concern impact. | Moderate to high reliability. | Readily implementable. | Moderate costs. | Viable technology. Retained for further consideration. |

**TABLE 2A**
**COMPARATIVE EVALUATION OF REMEDIAL ACTION ALTERNATIVES**
Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan
21 Grove Street
Franklin, Massachusetts
MassDEP Release Tracking No. (RTN) 2-16694

| Evaluation Criteria | Remedial Action Alternative 1<br>No Remedial Action | Remedial Action Alternative 2<br>Institutional Controls | Remedial Action Alternative 3<br>Passive Containment and/or Mitigation Systems | Remedial Action Alternative 4<br>Active Treatment/Removal/ Containment | Remedial Action Alternative 5<br>*In-Situ* Technologies | Remedial Action Alternative 6<br>Monitoring |
|---|---|---|---|---|---|---|
| **1. Effectiveness** | | | | | | |
| a) ***Ability to Achieve a Permanent or Temporary Solution*** | This alternative may not achieve a Permanent Solution. | This alternative may achieve a Permanent Solution when combined with at least one RT. | This alternative may achieve a Permanent Solution when combined with another RT. | This alternative may achieve a Permanent Solution when combined with another RT. | This alternative may achieve a Permanent Solution. | This alternative may achieve a Permanent Solution when combined with another RT. |
| b) ***Ability to Reuse, Recycle, Destroy, Detoxify, or Treat*** | This alternative does **not** reuse, recycle, destroy, detoxify, or treat impacted media. | This alternative does **not** reuse, recycle, destroy, detoxify, or treat impacted media. | This alternative does **not** reuse, recycle, destroy, detoxify, or treat impacted media. | This alternative does reuse, recycle, destroy, detoxify, or treat impacted media. | This alternative does reuse, recycle, destroy, detoxify, or treat impacted media. | This alternative does not reuse, recycle, destroy, detoxify, or treat impacted media. |
| c) ***Ability to Achieve or Approach Background*** | This alternative is not anticipated to achieve but it may approach background over time. | This alternative is not anticipated to achieve or approach background. | This alternative is not anticipated to achieve or approach background. | This alternative is not anticipated to achieve but it may approach background. | This alternative is not anticipated to achieve but it may approach background. | This alternative is not anticipated to achieve but it may approach background. |
| **Effectiveness Ranking** | 1 | 2 | 3 | 4 | 5 | 3 |
| **2. Reliability (Short-term and Long-term)** | | | | | | |
| a) ***Degree of Certainty of Success*** | This alternative has a low degree of certainty of success in reliability, since no remediation is conducted. | This alternative has a moderate degree of certainty of success in reliability, when combined with another alternative. | This alternative has a moderate degree of certainty of success in reliability. | This alternative has a moderate to high degree of certainty of success in reliability. | This alternative has a moderate to high degree of certainty of success in reliability. | This alternative has a moderate certainty of success in reliability, since it relies on other technologies. |
| b) ***Effectiveness in Managing Residues and Wastes*** | No wastes generated. | No wastes generated. | Minimal wastes generated. | Minimal waste generated during construction of active exposure pathway mitigation measures (AEPMMS). For *ex-situ* treatment, w aste will be generated for soil disposal, and groundwater if dewatering is required. | Minimal waste will be generated for injection well installation. | Minimal wastes generated during monitoring. |
| c) ***Effectiveness in Controlling Emissions or Discharges*** | No effectiveness in controlling constituent of concern sources. | Administrative control only. | Health & Safety measures will be implemented. Effective in controlling exposure to constituent of concern sources. | Health & Safety measures will be implemented. Effective in controlling exposure to constituent of concern source. | Effective in controlling discharges, assuming that groundwater mounding is controlled and migration pathways are protected. | Not effective in controlling emissions or discharges, but may be effective in assessing the presence thereof. |
| **Reliability Ranking** | 1 | 2 | 3 | 4 | 5 | 3 |
| **3. Ease of Implementation** | | | | | | |
| a) ***Technical Complexity*** | No technical complexity associated with implementation of this alternative. | Low to moderate technical complexity associated with implementation of this alternative. | Moderate technical complexity associated with implementation of this alternative. | Moderate to high technical complexity associated with implementation of this alternative. | Moderate to high technical complexity associated with implementation of this alternative. | Low technical complexity associated with implementation of this alternative. |
| b) ***Integration with Existing/Future Facility Operations*** | Not easily integrated, due to exposure associated with future development. | Easily integrated. | Moderate integration. | Moderate integration, since majority of Site is unoccupied. | Moderate integration, since majority of Site is unoccupied. | Low integration, since majority of Site is unoccupied |
| c) ***Operations, Monitoring, and Maintenance (OM&M) Requirements or Limitations*** | OM&M required to assess Site conditions. | Not applicable. | Low OM&M measures required. | Moderate to high OM&M measures required. | Moderate to high OM&M measures required. | Low to moderate OM&M required. |
| d) ***Site Access Requirements or Limitations*** | Ongoing access limitations. | No access limitations during implementation. | Temporary access limitations during implementation. | Temporary access limitations during implementation. | Temporary access limitations during implementation. | Temporary access limitations during implementation. |
| e) ***Availability of Services, Materials, Equipment or Specialists*** | Specialized materials, equipment, or specialists not required for implementation. | Specialized materials, equipment, or personnel not required for implementation. | Specialized materials, equipment, or specialists will be required for implementation. | Specialized materials, equipment, or specialists will be required for implementation. | Specialized materials, equipment, or specialists will be required for implementation. | Specialized materials, equipment, or specialists will be required for implementation. |
| f) ***Availability, Capacity and Location of Offsite Treatment, Storage and Disposal Facilities*** | No level of capacity required. | No level of capacity required. | Low level of capacity required. | Moderate level of capacity required. | Low to Moderate level of capacity required. | Low level of capacity required. |
| g) ***Meets Requirements for Required Permits or Licenses*** | No. | Yes. | No specific permits/licenses. | Permits required for discharge. | Adhere to MCP requirements for discharges near water body. | No specific requirements/permits. |
| **Implementation Ranking** | 2 | 4 | 4 | 2 | 3 | 4 |

**TABLE 2A**
**COMPARATIVE EVALUATION OF REMEDIAL ACTION ALTERNATIVES**
Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan
21 Grove Street
Franklin, Massachusetts
MassDEP Release Tracking No. (RTN) 2-16694

| Evaluation Criteria | Remedial Action Alternative 1<br>No Remedial Action | Remedial Action Alternative 2<br>Institutional Controls | Remedial Action Alternative 3<br>Passive Containment and/or Mitigation Systems | Remedial Action Alternative 4<br>Active Treatment/Removal/ Containment | Remedial Action Alternative 5<br>*In-Situ* Technologies | Remedial Action Alternative 6<br>Monitoring |
|---|---|---|---|---|---|---|
| **4. Comparative Cost** | | | | | | |
| a) ***Estimated Cost of Implementation (Design, Construction and Operation)*** | Total Est. Costs -High-Due to ongoing OM&M. | Low to moderate. | Total Est. Costs -Low to moderate. | Total Est. Costs -Moderate to high. | Total Est. Costs -Moderate to high. | Total Est. Costs - Low to Moderate-Short term; Moderate to high long term. |
| b) ***Estimated Cost of Environmental Restoration*** | Included in above estimated cost calculations | Included in above estimated cost calculations | Included in above estimated cost calculations | Included in above estimated cost calculations | Included in above estimated cost calculations | Included in above estimated cost calculations. |
| c) ***Estimated Cost for Energy Resources During Operation*** | Included in above estimated cost calculations. | Included in above estimated cost calculations. | Included in above estimated cost calculations. | Included in above estimated cost calculations | Included in above estimated cost calculations. | Included in above estimated cost calculations. |
| **Comparative Cost Ranking** | 1 | 4 | 4 | 3 | 2 | 3 |
| **5. Risk** | | | | | | |
| a) ***Short-term Risk During Implementation*** | High short term risk as a result impacted media. | Low short term risk implementation. | Low short term risk implementation. | Moderate short term risks associated with initial implementation; Long-term risks are mitigated by OM&M. | Moderate short term risk as a result of the need for OM&M during implementation. | Low risk associated with exposure to impacted media during sampling. |
| b) ***On-site and Off-site Risk During Operation*** | Not applicable. | Not applicable. | Moderate. | Moderate to high during operation. | Moderate to high during operation. | Low risk associated with exposure to impacted media during sampling. |
| c) ***Potential Risk Associated with Remaining OHM*** | High risk, due to potential risk associated with exposure to impacted media if not remediated. | High risk, due to impacted media. | Low to Moderate risk. | Moderate to high risk. | Low risk, assuming OHM is contained/isolated and reduced/mitigated. | Low risk associated with exposure to impacted media during sampling. |
| **Risk Ranking** | 1 | 4 | 4 | 4 | 4 | 4 |
| **6. Benefits** | | | | | | |
| a) ***Restores Natural Resources*** | Does not restore natural resources. | Does not restore natural resources. | Reduces some potentially negative impacts of OHM to natural resources. | Reduces some potentially negative impacts of OHM to natural resources. | Reduces potentially negative impacts of OHM to natural resources. | Reduces some potentially negative impacts of OHM to natural resources. |
| b) ***Provides Productive Reuse of Site*** | Limits productive use of the Site for long-term. | Limits some productive use of portions of the Site for long-term. | Provides moderate productive reuse of site for lower concentrations of constituent of concern impacts. | Limits some productive use of portions of the Site for short-term but provides productive reuse long-term. | Limits some productive use of portions of the Site for short-term but provides productive reuse long-term. | Limits some productive use of portions of the Site for long-term. |
| **Benefit Ranking** | 1 | 2 | 3 | 4 | 4 | 3 |
| **7. Timeliness** | | | | | | |
| a) **Estimated Duration to Achieve No Significant Risk** | High. | Moderate, assuming combination with additional successful RTs. | Moderate to high. | Moderate. | Moderate. | High. |
| **Timeliness Ranking** | 1 | 2 | 2 | 4 | 5 | 2 |
| **8. Non-Pecuniary Interests** | | | | | | |
| a) **Relative Effect on Aesthetic Value and Interests of Community** | High effect on non-pecuniary values. | Low since measure accommodates redevelopment but restricts some measures. | Low since measure accommodates redevelopment. | Moderate effect, since technology has visible features that impact aesthetics; has short-term impacts and supports redevelopment. | Moderate effect, since technology has few visible features that impact aesthetics; has short-term impacts and supports redevelopment. | Moderate effect on aesthetics, due to visible sampling locations (i.e., monitoring wells). |
| **Non-Pecuniary Interests Ranking** | 1 | 4 | 3 | 3 | 4 | 3 |

**Notes:**

1. Rankings are comparative with the greatest number possible (5) being the most favorable and the lowest number possible (1) being the least favorable

**TABLE 2B**
**REMEDIAL ACTION ALTERNATIVES EVALUATION MATRIX**
Phase III Identification, Evaluation and Selection of Comprehensive
Remedial Action Alternatives and Remedial Action Plan
21 Grove Street
Franklin, MA
MassDEP Release Tracking No. (RTN) 2-16694

| Remedial Alternative | Description | Effectiveness | Reliability | Implementation | Cost | Risk | Benefits | Timeliness | Non-Pecuniary Interests | Total Score | Overall Ranking |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | No Remedial Action | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | **9** | 6th |
| 2 | Institutional Controls | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 4 | **24** | 5th |
| 3 | Passive Containment | 3 | 3 | 4 | 4 | 4 | 3 | 2 | 3 | **26** | 3rd |
| 4 | Active Treatment/Removal/ Containment | 4 | 4 | 2 | 3 | 4 | 4 | 4 | 3 | **28** | 2nd |
| 5 | *In-Situ* Technologies | 5 | 5 | 3 | 2 | 4 | 4 | 5 | 4 | **32** | 1st |
| 6 | Monitoring | 3 | 3 | 4 | 3 | 4 | 3 | 2 | 3 | **25** | 4th |

**Notes:**
1. Rankings are comparative with the greatest number possible (5) being the most favorable and the lowest number possible (1) being the least favorable
2. Total Score = Sum of the individual rankings for the eight evaluation criteria

**TABLE 3**
**COST ESTIMATE FOR SELECTED REMEDIAL ACTION ALTERNATIVES**
Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan
21 Grove Street
Franklin, Massachusetts
MassDEP Release Tracking No. (RTN) 2-16694

| Task | Description | Estimated Quantity | Unit Cost | Estimated Cost |
|---|---|---|---|---|
| **Institutional Controls** | | | | |
| **Engineering Costs** | | | | |
| LSP Services/AUL Implementation | | 1 job | $10,000 | $10,000 |
| **Subtotal Engineering Costs** | | | | **$10,000** |
| **Engineering and Capital Contingency** | | 15% of subtotal | | **$1,500** |
| **TOTAL ESTIMATED ENGINEERING & CAPITAL COSTS-INSTITUTIONAL CONTROLS** | | | | **$11,500** |
| **Passive Containment and/or Mitigation Measures** | | | | |
| **Engineering Costs** | | | | |
| Engineering Services | Design, procurement, permitting | 15% of capital costs | | $13,500 |
| Regulatory Reporting | | 1 reports | $5,000 report | $5,000 |
| **Capital Costs** | | | | |
| Vapor Barrier | Assume one (10,000 SF) building | 1 job | | $30,000 |
| SSDS | Assume one (10,000 SF) building | 1 job | | $60,000 |
| **Subtotal Capital and Engineering Costs** | | | | **$108,500** |
| **Capital and Engineering Contingency** | | 15% of subtotal | | **$16,275** |
| **Project Management** | | 3% of subtotal | | **$3,255** |
| **TOTAL ESTIMATED ENGINEERING & CAPITAL COSTS-PASSIVE TREATMENT** | | | | **$130,000** |
| **Active Treatment/ Removal/Containment** | | | | |
| **Engineering Costs** | | | | |
| Engineering Services | Design, procurement, permitting | 15% of capital costs | | $54,371 |
| Regulatory Reporting | | 1 reports | $5,000 report | $5,000 |
| **Capital Costs** | | | | |
| SSDS | Assume 10,000 SF building | 1 job | | $80,000 |
| Excavation of shallow CVOC impacted soil | Assumes 450 tons | 1 job | | $177,525 |
| Excavation of impacted raceway soil | assumes 100 tons | 1 job | | $84,950 |
| Regulatory Reporting | LSP Services/MCP Reporting | 1 job | | $20,000 |
| **Subtotal Capital and Engineering Costs** | | | | **$421,846** |
| **Capital and Engineering Contingency** | | 15% of subtotal | | **$63,277** |
| **TOTAL ESTIMATED ENGINEERING & CAPITAL COSTS-ACTIVE TREATMENT** | | | | **$490,000** |
| **IN-SITU TECHNOLOGIES-Remedial Injections** | | | | |
| **Engineering and Capital Costs** | | | **Low Range (1 event)** | **High Range (2 events)** |
| Bench Scale and Pilot Testing | | 1 job | $10,000 | $20,000 |
| Design and Project Management | | 1 job | $20,000 | $40,000 |
| Baseline soil and groundwater sampling | Design, procurement, permitting | 1 job | $15,000 | $30,000 |
| *In-Situ* Remediation -overburden/ bedrock | remedial injections | 1 job | $188,500 | $377,000 |
| Meetings | | 4 ea | $1,000 | $2,000 |
| Regulatory Reporting | LSP Services/MCP Reporting | 1 job | $20,000 | $40,000 |
| **Subtotal Engineering and Capital Costs** | | | **$244,500** | **$489,000** |
| Engineering and Capital Contingency | | 20% of subtotal | $48,900 | $97,800 |
| **TOTAL ESTIMATED ENGINEERING & CAPITAL COSTS-IN-SITU TECHNOLOGIES (RANGE)** | | | **$300,000** | **$600,000** |
| **MONITORING** | | | | |
| **Engineering Costs** | | | **Low Range** | **High Range** |
| Engineering Services | Design, well installation | | $10,000 | $20,000 |
| Regulatory Reporting (low range) | Status Reports (5 years) | 10 reports | $30,000 | |
| Regulatory Reporting (high range) | Status Reports (20 years) | 40 reports | | $120,000 |
| **Capital Costs** | | | | |
| Monitoring (Assume 5 years) (low range) | Sampling/analysis (1st yr quarterly; subsequent years bi-annually) | | $120,000 | $150,000 |
| Meetings (2/year) | Assume $500/meeting | | $5,000 | $20,000 |
| **Subtotal Capital and Engineering Costs** | | | **$165,000** | **$310,000** |
| **Capital and Engineering Contingency** | | 10% of subtotal | **$16,500** | **$31,000** |
| **TOTAL ESTIMATED ENGINEERING & CAPITAL COSTS-MONITORING (RANGE)** | | | **$180,000** | **$340,000** |
| **TOTAL RANGE OF ESTIMATED COSTS** | | | **$1,100,000** | **$1,600,000** |

# APPENDIX A

**MASSDEP PHASE I SITE ASSESSMENT MAP**

# MassDEP - Bureau of Waste Site Cleanup

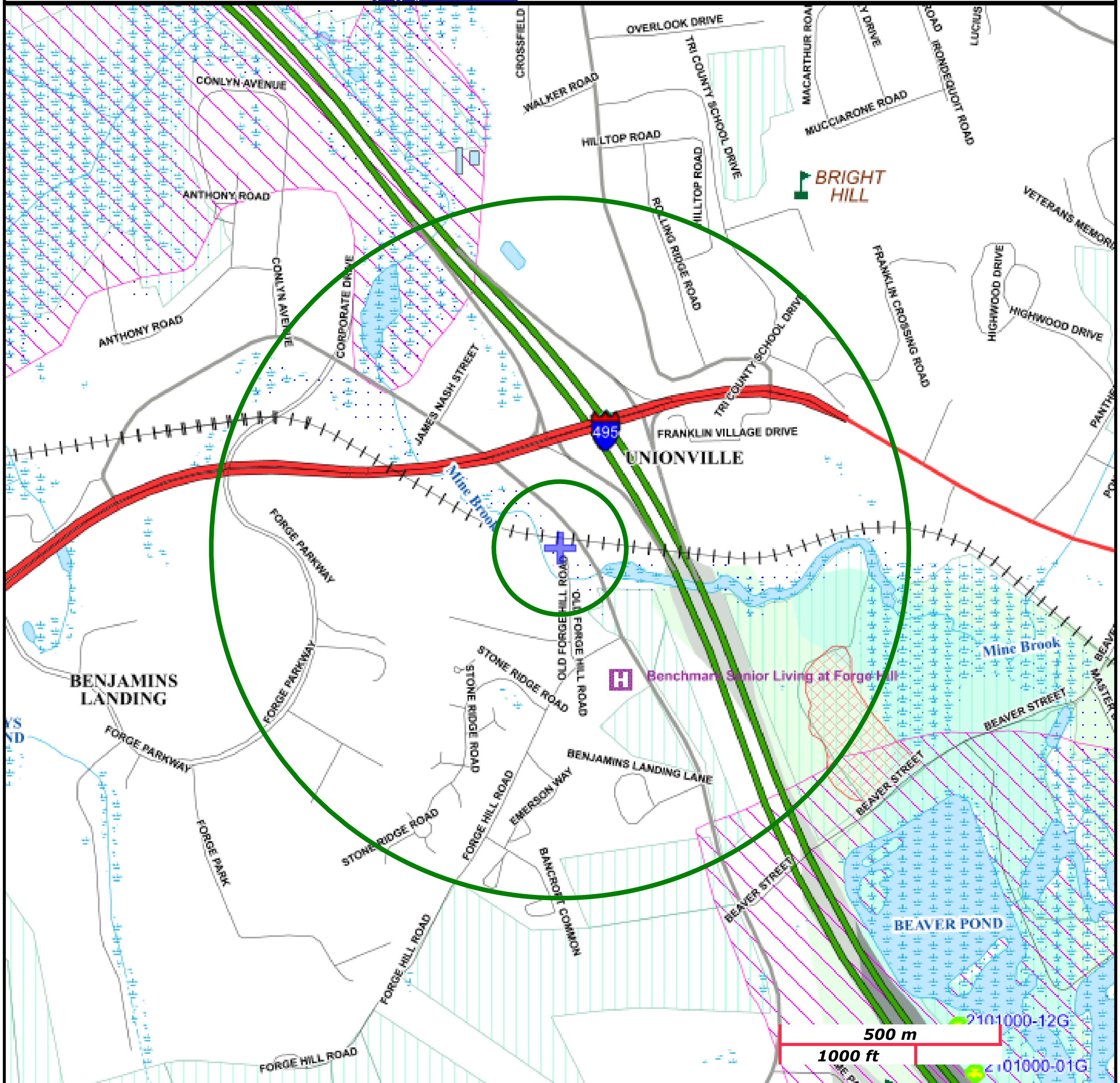
## Phase 1 Site Assessment Map: 500 feet & 0.5 Mile Radii

**Site Information:**
NUSTYLE
21 GROVE STREET FRANKLIN, MA

**NAD83 UTM Meters:**
4662346mN , 299167mE (Zone: 19)
October 10, 2022

The information shown is the best available at the date of printing. However, it may be incomplete. The responsible party and LSP are ultimately responsible for ascertaining the true conditions surrounding the site. Metadata for data layers shown on this map can be found at: https://www.mass.gov/orgs/massgis-bureau-of-geographic-information.

MassDEP
Commonwealth of Massachusetts
Department of Environmental Protection




Roads: Limited Access, Divided, Other Hwy, Major Road, Minor Road, Track, Trail

Boundaries: Town, County, DEP Region; Train; Powerline; Pipeline; Aqueduct

Basins: Major, PWS; Streams: Perennial, Intermittent, Man Made Shore, Dam

Aquifers: Medium Yield, High Yield, EPA Sole Source

Non Potential Drinking Water Source Area: Medium, High (Yield)

PWS Protection Areas: Zone II, IWPA, Zone A

Hydrography: Open Water, PWS Reservoir, Tidal Flat

Wetlands: Freshwater, Saltwater, Cranberry Bog

FEMA 100yr Floodplain; Protected Open Space; ACEC

NHESP Pri-Hab of Rare Species; Vernal Pool: Cert., Potential

Solid Waste Landfill; PWS: Com.GW,SW, Emerg., Non-Com.

# APPENDIX B

**PUBLIC NOTIFICATION LETTERS**

verdantas
PEOPLE FOCUSED FUTURE

May 24, 2024 Verdantas Project 17356

Jamie Hellen
Town Administrator
Franklin Town Hall
355 East Central Street
Franklin, MA 02038

Cathleen Liberty, MPH
Health Director
Franklin City Hall
355 East Central Street
Franklin, MA 02038

Re: Phase III Remedial Action Plan Report
Former Nu-Style Property
21 Grove Street
Franklin, Massachusetts
MassDEP Release Tracking Number: 2-16694

As required by the Massachusetts Contingency Plan (MCP), notice is hereby given that a Phase III Identification, Evaluation and Selection of Comprehensive Remedial Action Alternatives and Remedial Action Plan Report has been submitted electronically to the Massachusetts Department of Environmental Protection (MassDEP) for the above referenced site. The report can be viewed on-line by searching for the MassDEP Release Tracking Number using the Massachusetts' Department of Energy and Environmental Affairs Data Portal (https://eeaonline.eea.state.ma.us/portal#!/wastesite/2-0016694). You may also contact MassDEP's Central Regional Office located at 8 New Bond Street in Worcester, Massachusetts (508-792-7650).

If you have any questions, please contact our office at 508-226-1800.

Sincerely,
VERDANTAS LLC

Daniel J. Curran

Daniel Curran
Project Manager

Tracey A. Costa, LSP, CHMM, TURP, ENV-SP, LEED Green Associate
AVP/ Northeast Brownfields Leader