ANALYSIS OF BROWNFIELDS CLEANUP ALTERNATIVES & CONCEPTUAL REMEDIAL ACTION PLAN, REV. 0
COMB BLOCK SOIL REMEDIATION
70 E OXFORD STREET
PORTLAND, MAINE

Prepared for

PORTLAND HOUSING AUTHORITY
970 Baxter Boulevard
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1.0 INTRODUCTION AND BACKGROUND

Sevee & Maher Engineers, Inc. (SME) prepared this Analysis of Brownfields Cleanup Alternatives (ABCA) to evaluate remedial alternatives for previously identified environmental conditions associated with the COMB Block Property located at 70 E Oxford Street in the City of Portland, Cumberland County, Maine (the "Site"). This property is referenced as COMB Block (REM03630) in the Maine Department of Environmental Protection (MEDEP) sites database.

This report summarizes the evaluation of remedial alternatives for the Site and includes a discussion of each remedial option, a cost estimate, the degree of effectiveness, ease of implementation for each remedial alternative, and the resilience of each option from extreme weather (i.e., flooding, rain events, etc.). This report also contains a discussion of the recommended remedial alternative for the Site, as well as a conceptual Remedial Action Plan (RAP) for the selected alternative. This report was prepared on the behalf of Portland Housing Authority (PHA) using United States Environmental Protection Agency (U.S.EPA) Brownfields Cleanup Grant No. BF00A01960.

1.1 Purpose and Scope

The purpose of this report is to evaluate potential remedial alternatives to mitigate previously identified adverse environmental conditions associated with the Site. The overall objectives of this ABCA include the following:

1. Identifying potential remedial alternatives and evaluating those alternatives against specific criteria, including overall protection of human health and the environment, technical practicality, ability to implement, reduction of toxicity, mobility, and volume of the contaminant; time required until remedial action objectives are attained; costs; and resiliency to extreme weather conditions (i.e., flooding, rain events, etc.);
2. Selecting the remedial alternative that best meets the objectives and considerations of the project/owner, as well as the evaluation criteria identified above. Cleanup alternatives which support redevelopment goals for the Site were given additional consideration; and
3. Developing a conceptual RAP, with associated estimated cleanup costs, for implementing the selected remedial alternative which will serve as the basis for future Site remediation activities.

1.2 Site Description and Surrounding Land Use

The Site consists of an approximately 1.53-acre parcel of land located at 70 E Oxford Street (formerly 9 Boyd Street, 20 Mayo Street, 24 Mayo Street, and 25 Boyd Street), in the City of Portland, Cumberland County, Maine. The Site is referred to as the COMB Block and is identified by City of Portland's Assessor's Office as Parcel ID 022 H001001. The Site is located in a residential and commercial area of Portland. The Site is bounded by multi-family residential properties and commercial businesses to the north and east, a public park to the west, and an education facility and church to the south.

The Site is currently improved with four, three-story, multi-family residential structures, totaling 40 units. These structures were constructed in 1972 with no basement or attic areas in any of the buildings. Paved driveways are located in the northern portion of the Site between the north and west buildings, and along the western portion of the Site between the west and south buildings. Small, paved pathways are located throughout the Site and connect the buildings and parking lots. The buildings are served with public water provided by the Portland Water District and are connected to public sewer. Based on Site observations, municipal records, and information provided by PHA, the on-site buildings are currently heated by hot water/steam provided by natural gas-fired boilers. Each building has a boiler room that contains a dedicated boiler, hot water tank, expansion tanks, and associated piping. The Site is currently vacant; in March 2024, PHA vacated the on-site buildings due to unsafe living conditions (hazardous building materials, mold, and poor indoor air quality).

Historical documentation indicates that multiple generations of residential structures have been constructed and demolished on-site; at least 20 different structures have improved the Site between the first recorded construction in 1886 and the most recent period of construction in 1972. Based on historic documentation, the majority of these structures are believed to have been used for residential purposes; however, one historic auto garage was identified east of the Site on historical records from 1943 and 1949.

Please refer to Figure 1, Site Location Map, to view the general location of the Site on a 7.5-minute topographic quadrangle. Please refer to Figure 2, Proposed Remedial Actions, for the layout of the Site and locations of proposed remedial actions.

It should be noted that PHA is currently in the process of demolishing the on-site buildings through a separate cleanup contract. Abatement and demolition activities are proposed to occur in the winter of 2026 (January-March). As such, for the purposes of this ABCA/RAP, it will be assumed that the Site will be vacant when soil remediation and clean-up actions begin.

1.3 Potential Future Site Use

As part of the COMB Block redevelopment project, PHA proposes the demolition of existing buildings and the redevelopment of the Site with multi-family residential structures with over 150 units of new, modern, and energy-efficient affordable housing. Site redevelopment work will be constructed in three phases, and the first phase of work (COMB Block Phase I) will occur in the northwestern portion of the Site and will include development of a single, six-story building (approx. 65,000 square feet) with 55 mixed-income multi-family units. Of these residential units, 50 will be reserved for Low- and Very Low-Income Households and five will be market-rate units. COMB Block Phase I will also include site improvements including parking, outdoor greenspace, and streetscape improvements. Phase III and Phase II construction will be located in the northeastern corner and southern portion of the Site, respectively. See Figure 3 for a proposed Site redevelopment plan. The COMB Block Soil Remediation project (the subject of this ABCA/RAP) encompasses the entirety of the Site and will support all three phases of construction.

1.4 Site Geology and Hydrogeology

According to the 2012 Surficial Geology Map of the Portland West Quadrangle, Maine, on-site soils are primarily identified as till. Till is poorly sorted variable compacted sediment that had been directly deposited by the receding glaciers during the ice age. This is a heterogenous mixture of clay, sand, silt, gravel, and some boulders. U.S. Department of Agriculture Soil Conservation Service mapping indicates that soil across the majority of the Site is Deerfield loam with fine sand with Hinkley loam sand across southern portions of the Site.

In March 2024, SME completed a Phase II investigation at the Site, which consisted of the advancement of nine geotechnical borings. Based on observations made during this investigation, approximately 3 to 8 feet of urban fill material was observed below the ground surface. These urban fill materials were observed to be comprised of brown sand with brick, black ash, and other debris. Below the urban fill layer, Site soils were observed to be composed of brown sand and silt with some gravel, over grey silt with some clay.

According to the 1985 Bedrock Geology of the Portland West Quadrangle Map, bedrock on the Site is identified as Spring Point formation. Spring Point formation is medium greenish gray actinolite-biotite-chlorite-plagioclase-quartz schist and amphibolite. No bedrock outcroppings were observed at the Site.

No surface water bodies are located at the Site. The closest water body is Back Cove, which is located 0.43 miles northwest of the Site. Based on the City of Portland Preliminary Flood Insurance Rate Map (FIRM) (Community Panel Number 23005C0692F, effective June 20, 2024), the Site is not located in a Flood Zone. The direction of groundwater flow has not been established on-site; however, groundwater is suspected to flow northwest towards Back Cove.

2.0 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The following paragraphs present a summary of historic environmental investigations that have been completed for the Site. Copies of these reports have been previously filed with the Maine Department of Environmental Protection (MEDEP) Voluntary Response Action Program (VRAP), and/or submitted to various MEDEP Agencies. Copies can be provided upon request.

- “Phase I Environmental Site Assessment, COMB Block, 9 Boyd St., 20 Mayo St., 24 Mayo St. 25 Boyd St., Portland, Maine,” Sevee & Maher Engineers., January 2024;
- “Additional Environmental Services, COMB Block, 9 Boyd St., 20 Mayo St., 24 Mayo St. 25 Boyd St., Parcel ID 022 H001001 Portland, Maine,” Sevee & Maher Engineers., January 2024;
- “Phase II Environmental Site Assessment, COMB Block, 9 Boyd St., 20 Mayo St., 24 Mayo St. 25 Boyd St., Portland, Maine,” Sevee & Maher Engineers., March 2024; and
- “Asbestos-Containing Materials Inspection and Universal Waste Determination COMB Block, 9 Boyd St., 20 Mayo St., 24 Mayo St. 25 Boyd St., Portland, Maine,” Sevee & Maher Engineers, March 2024.
- Soil Vapor Sampling in accordance with Site-Specific Quality Assurance Project Plan (SSQAPP) Addendum No. 32 to Sevee & Maher Engineers, Inc.’s Generic Quality Assurance Project Plan for Brownfield Sites in the State of Maine (RFA No. 23194), conducted on October 10, 2025.

SME conducted a Phase I ESA for the Site in January 2024. The Phase I ESA identified recognized environmental conditions (RECs) including the following:

- A 1949 Sanborn fire insurance map and a 1943 City Directory indicated that an auto facility was formerly operated on the east side of the Site. There is potential that the historic auto facility impacted on-site soils and/or groundwater through the use and storage of petroleum products and solvents, undocumented spills/release, or through drains or discharge to Site soils; and
- Adjoining properties and properties within 0.25 miles of the Site have been identified as historical auto facilities and historical landfill areas; some of these properties have known/identified contaminated soil remaining on the property, and other properties have documented releases (or database listings) without adequate cleanup or remedial documentation. Additionally, area properties have been identified to have utilized imported debris and urban fill materials from off-site sources.

Based on the findings of the Phase I ESA, SME recommended that additional investigation be performed to confirm or dismiss the RECs identified above, to identify potential exposure risks at the Site, and to evaluate the suitability of the Site for redevelopment.

In December 2023, SME performed limited surficial soil sampling at the Site; four surficial soil samples (0 to 6 inches below grade) were collected from within the drip-zone surrounding each of the Site buildings. A surficial soil sample collected from 9 Boyd Street had lead concentrations which exceeded the applicable MEDEP Remedial Action Guideline (RAG) for the “Residential” exposure scenario, with a concentration of 378 mg/kg. All of the surficial soil samples had lead concentrations which were below the MEDEP RAGs for the “Construction Worker” exposure scenario of 460 mg/kg. Based on these results, it was concluded that lead was a contaminant of concern in surficial soils on-site and would require proper management during Site redevelopment activities.

SME completed a Phase II ESA at the Site in March 2024. The Phase II ESA identified evidence of fill materials up to 7 feet-below ground surface (bgs) characterized by ash, brick, and debris. This investigation determined that surficial soils and urban fill soils were found to contain arsenic, lead, and polycyclic aromatic hydrocarbons (PAH) compounds at concentrations exceeding applicable MEDEP RAGs (November 15, 2023). SME recommended that these soils be properly managed during any future disturbance which should include the preparation of an Environmental Media Management Plan (EMMP).

In conjunction with this Phase II ESA, SME conducted an Asbestos-Containing Materials (ACM) Inspection and Universal Waste Determination for the on-site buildings. This inspection identified asbestos-containing “mudded” fittings, floor tile, and foundation waterproofing, as well as the presence of universal waste. This report recommended the abatement of ACM and proper removal and disposal of universal waste prior to redevelopment or any disturbance of identified materials.

On October 8, 2025, five soil vapor samples were collected at the Site to evaluate the potential for vapor intrusion into future Site buildings. Two soil vapor samples (SV101 and SV102) were collected in the northern portion of the Site, from an area proximate to the former automotive facility, and a current (vacant) residential structure. The remaining soil vapor samples (SV103 through SV105) were collected from the locations of the three other on-site (vacant) residential structures (i.e., one sample was collected in each building footprint). Results from this sampling program have not yet been evaluated.

3.0 SITE CHARACTERIZATION AND CLEANUP GOALS

Previous environmental investigations completed at the Site identified environmental contamination; the identified contamination, exposure pathways, and appropriate cleanup goals are summarized below.

3.1 Soils

In 2023, surficial soil sampling conducted at the Site identified lead in surficial soils (0 to 2 feet-bgs) in the southern portion of the Site at concentrations which exceeded the MEDEP RAG for "Residential" exposure scenario. All surficial soils tested had lead concentrations that were below the MEDEP RAG for the "Construction Worker" exposure scenario. The 2024 Phase II ESA identified evidence of urban fill materials at Site from 0 to 7 feet-bgs, characterized by ash, brick, and debris; these urban fill soils were found to contain arsenic, lead, and PAH compounds at concentrations which exceeded the applicable MEDEP RAGs for the "Residential" exposure scenarios. As such, all soils on-site (0-7 feet-bgs, inclusive of urban fill materials) potentially represent an exposure risk to current and future Site residents and should be managed prior to, or in conjunction with, Site redevelopment.

Potential exposure pathways associated with on-site soil includes the accidental inhalation of airborne dust particles or soil particles (especially during Site redevelopment activities), accidental ingestion, and physical off-site transport of particles through stormwater runoff, dust, or physical transport of particles on people or equipment.

The cleanup goal relative to on-site soils is to reduce/eliminate the risk of human exposure to contaminated soils in the current and future Site setting (residential use), reduce/eliminate the risk of human exposure to contaminated soils during earthwork and redevelopment activities, and to prevent off-site transport of soils and relative impacts to the environment.

3.2 Groundwater

Municipal water is provided to the Site and area properties; therefore, human exposure risks associated with potentially contaminated groundwater is not expected. If groundwater is encountered during Site redevelopment, it will need to be dewatered and managed in accordance with MEDEP and City of Portland requirements, as well as a MEDEP-approved EMMP. For these reasons, groundwater will not be evaluated further in this ABCA/RAP.

3.3 Soil Vapor

A soil vapor sampling program was recently conducted at the Site, and results have not yet been evaluated. If impacted soil vapor is present, the primary exposure risks would be related to vapor migration into occupied buildings. As outlined above, the on-site buildings are scheduled to be demolished in the winter of 2026 (January-March); as such, vapor intrusion into existing buildings does not currently, and will not represent a human exposure risk. As part of future Site redevelopment, vapor mitigation systems and radon systems are proposed to be installed in any new building construction; as such, potential contaminated vapor intrusion would be mitigated. For these reasons, soil vapor will not be evaluated further in this ABCA/RAP.

3.4 Hazardous Building Materials

Previous environmental investigations have identified the presence of hazardous building materials within the existing COMB Block buildings that will require management in conjunction with building demolition. As noted above, the PHA is currently overseeing abatement activities and demolition of the on-site buildings (scheduled to occur between January and March, 2026). As such, for the purposes of this ABCA/RAP, it will be assumed that the Site will be vacant when soil remediation and clean-up actions begin, and hazardous building materials will not be evaluated further in this ABCA/RAP.

4.0 DESCRIPTION OF EVALUATION CRITERIA

The comparison of the remediation alternatives was conducted using the evaluation and threshold criteria described below.

4.1 Overall Protection of Human Health and the Environment

Alternatives must pass this threshold criterion to be considered for implementation as the recommended alternative. The goal of this criterion is to determine whether a remediation alternative provides adequate protection of human health and the environment. It also addresses how identified risks are eliminated, reduced, or controlled. Protection of human health is assessed by evaluating how site risks from each exposure route are eliminated, reduced, or controlled through the specific alternative. Protection of the environment is assessed by evaluating how the remedial alternative prevents on-site contamination from impacting off-site areas, sensitive receptors, or other environmental media.

4.2 Technical Practicality

The focus of this evaluation criterion is to determine technical practicality of instituting the specific alternative. This criterion evaluates the likelihood that the alternative will meet project specifications, Site redevelopment goals, and appropriate regulatory requirements.

4.3 Ability to Implement

This criterion analyzes technical feasibility and the availability of services and materials. Technical feasibility assesses the ability to implement and monitor the effectiveness of the alternative. Availability of services and materials evaluates the need for off-site treatment, storage, or disposal services and the availability of such services. Necessary equipment, specialists, and additional resources are also evaluated.

4.4 Reduction of Toxicity, Mobility, and Volume

This criterion evaluates the ability of the remediation alternative to significantly achieve reduction of the toxicity, mobility, and volume of the impacted soils present at the Site. This analysis evaluates the quantity of impacted media to be removed, the degree of expected reduction in toxicity, the type and quantity of residuals to be reduced, and the manner in which the principal threat is addressed through the remediation alternative.

4.5 Short Term Effectiveness/Construction Timeline

This criterion addresses the period of time needed to complete the remediation, potential adverse impacts on human health and the environment that may exist until the cleanup goals are achieved, and the timeframe for accomplishing the associated reduction in the identified environmental conditions.

4.6 Resiliency to Environmental Conditions and Extreme Weather

This criterion evaluates the resilience of the remediation alternative to environmental conditions such as: increasing/decreasing temperatures; increasing/decreasing precipitation; extreme weather events; rising sea level; changing flood zones; and higher/lower groundwater tables, among others. In order to properly evaluate potential extreme weather impacts, federal and authoritative resources will be used to evaluate the site including, but not limited to, Federal Emergency Management Agency (FEMA) flood maps, National Oceanic and Atmospheric Administration (NOAA) sea level rise predictors, U.S.EPA Climate Resources, the U.S. Department of Agriculture (USDA) wildfire data, and the National Risk Index.

4.7 Preliminary Cost

The preliminary cost criterion for the remediation alternatives evaluates the estimated capital, operation, and maintenance costs of each alternative. Capital costs include direct capital costs, such as materials and equipment, and indirect capital costs, such as engineering, sampling contingencies, and licenses. Costs were developed as a balancing criterion for the remedial alternatives and should not be construed as bid costs or engineer’s cost estimates. Cost may be used as a distinguishing factor in the selection of the remedial action. The preliminary costs developed should in no way be construed as a cost proposal, but rather a guide for selecting a remedial action.

5.0 EVALUATION OF REMEDIATION ALTERNATIVES

Based on the evaluation criteria outlined in the previous section and the potential exposure pathways identified for the Site, the remedial actions selected for the Site should accomplish the following objectives:

- Minimize the potential for human exposure to contaminated soils (currently and during proposed Site redevelopment);
- Reduce the toxicity, mobility, and volume of contaminated soils on-site;
- Facilitate and support future Site redevelopment; and
- Conduct the remedial action in a feasible, resilient, expedient, and cost-effective way.

To achieve these objectives, three (3) remediation options were considered and are discussed in the following subsections. These remedial alternatives are specific to the clean-up of the impacted soil, and include: 1) No Action Alternative, 2) Soil Removal Alternative, and 3) Cover System Alternative. These alternatives were evaluated using the criteria described in Section 4.0 and are summarized below. The attached Table 1 includes a Summary of the Evaluation and Comparison of the Remedial Alternatives.

5.1 No Action Alternative

A No Action Alternative signifies that no soil remediation activities would be conducted. The Site would remain a vacant, grass/dirt parcel. Because contaminated surficial soils are present, the Site would need to be fenced/secured indefinitely; this would include capital costs associated with the construction of a permanent fencing system, as well as ongoing inspection and maintenance.

The No Action Alternative is not protective of human health; does not reduce the toxicity, mobility, or volume of contaminated soils on-site; and does allow for Site redevelopment. As such, this alternative does not meet the overall project objectives.

The No Action Alternative does not include a means for mitigating exposure to identified adverse environmental conditions or unacceptable risks remaining from contaminated soil. Therefore, the potential for human exposure via direct contact, ingestion, and/or inhalation continues to exist for current Site users and trespassers. The No Action Alternative is also not protective of the environment; contaminated surficial soils on-site could migrate off-site through stormwater runoff or dust.

For these reasons, the No Action Alternative was not selected for implementation or further consideration.

5.2 Soil Removal Alternative

The second soil remedial alternative evaluated in this ABCA is the "Soil Removal Alternative."

This alternative would utilize redevelopment plans and grades to guide the excavation of contaminated soils across the Site. Soils and urban fill would be excavated in order to develop clean utility corridors, match proposed building grades (e.g., foundations footings, slab elevations, etc.), and establish site features like stormwater management and retaining walls. The goal would be to remove impacted soils that would otherwise be encountered and require management during Site redevelopment. Excess and/or structurally unsuitable soils may also need to be excavated in support of Site redevelopment. Once removed, marker layers would be installed, and the site would be restored in accordance with redevelopment plans. Site redevelopment infrastructure (building foundations, parking lots, landscaping, etc.) would act as soil cover systems for any remaining underlying soil which is present at depth.

Impacted soils that were removed from the Site would be transported off-site and disposed at a licensed receiving facility. The depth of soil removal would vary across the Site, but it is estimated that all surficial soil (0-2 feet-bgs) would be removed from the Site. Based on preliminary redevelopment plans, it is estimated that approximately 5,700 cubic yards of soil would need to be removed as part of Phase I construction, and 9,200 cubic yards of soil would need to be removed as part of Phase II and Phase III construction.

After soil removal activities occurred, an EMMP would be developed to establish soil management procedures for the Site during any future excavation activities or subsequent redevelopment. As necessary (i.e., areas where the soil cover system depth is less than two feet-bgs) a Cover System Maintenance Plan would be developed, and regular inspection and maintenance would be required.

5.2.1 Overall Protection of Human Health and the Environment

This alternative provides protection of human health by eliminating the potential risk of exposure to current and future Site residents through the removal of impacted surficial soils. This alternative is also protective of Site redevelopment earthwork contractors by removing soils to match redevelopment grades and constructing clean corridors.

This alternative provides protection of the environment by eliminating the potential of contaminated soils from being transported off-site due to stormwater runoff or dust, because no contaminated surficial soil would remain on-site.

5.2.2 Technical Practicality

This cleanup alternative is technically practical and is a common approach for remediation of impacted soils. Removing impacted soil would meet appropriate regulatory requirements (i.e., MEDEP RAGs) and would achieve the objectives of the overall cleanup program. This alternative is the most supportive of

Site redevelopment, and would allow the proposed redevelopment plans to be implemented without additional soil management costs.

5.2.3 Ability to Implement

Soil removal activities are a relatively common remedial practice. This type of work can be easily implemented, and earthwork contractors capable of performing this work are readily available. However, this alternative presents a large volume of soil which would require excavation, transport, and off-site disposal. This work will require significant coordination related to waste characterization sampling, transportation coordination and truck traffic in the neighborhood, and coordination with a receiving facility. The logistics associated with large-scale soil excavation, as well as associated dust control, erosion and sedimentation control, and overall Site maintenance would need to be carefully monitored and coordinated by the Owner, QEP, and clean-up contractor.

5.2.4 Reduction of Toxicity, Mobility, and Volume

The toxicity, mobility, and volume of impacted soils would be greatly reduced under this alternative.

5.2.5 Short Term Effectiveness/Construction Schedule

The remedial action objectives would be attained upon completion of the removal and off-site disposal of impacted soils. Based on the ability of the selected contractor and the conditions encountered during removal, this would likely occur within two to three months upon notice to proceed.

5.2.6 Resiliency to Environmental Conditions and Extreme Weather

Although the Site is not located in a FEMA flood zone, it is located relatively close to Back Cove and areas of the City that are prone to flooding. Therefore, extreme weather events and increased rainfall, impacts from rising sea level, and changing flood zones could represent a threat to the Site.

This alternative would remove the majority of the impacted soils and all of the surficial soils (0-2 feet-bgs) from the Site, which would eliminate the potential of this soil coming into contact with flood waters, extreme rain/weather events, or rising sea levels. As such, this remedial approach is resilient to changing environmental conditions.

5.2.7 Preliminary Cost

The estimated costs associated with this remedial alternative are outlined in the attached Table 2 – Soil Removal Alternative. Capital costs include direct capital costs, such as materials and equipment, and indirect capital costs, such as engineering and contingencies for confirmatory soil sampling. The preliminary costs provided were developed to compare alternatives and should not be considered final engineering cost estimates.

5.3 Cover System Alternative

The third alternative evaluated in this ABCA to address impacted soils at the Site is the "Cover System" alternative. This alternative would involve minor regrading of the Site to facilitate overland stormwater runoff, and the construction of a Soil Cover System over the entire Site. As part of this alternative, no soil would be removed from the Site, and Site redevelopment would be limited to reuse options that could be accomplished with existing Site grades (i.e., parking lots, green space, etc.).

Cover systems would consist of a marker layer and no less than 12 inches of clean fill materials (e.g., 12 inches of structural gravel; a combination of 8 inches of fill and 4 inches of seeded loam; a combination of 10 inches of structural gravel and 2 inches of pavement; or building foundations). For the purposes of this ABCA/RAP, we have assumed that under this alternative, 40 percent of the Site would be redeveloped as paved surface parking areas, and 60 percent of the Site would be redeveloped as green space.

Because impacted soils would remain beneath the cover system, an EMMP would need to be prepared and implemented for the Site and a Post-Closure Cover System Maintenance Plan would need to be prepared and implemented, regular cover system inspections would need to occur, and long-term maintenance must be conducted.

5.3.1 Overall Protection of Human Health and the Environment

This alternative provides protection of human health by reducing the risk of human exposure to impacted soil by covering those impacted soils with MEDEP-approved cover systems, as long as the cover system is intact and maintained.

This alternative also provides protection of the environment by reducing the potential for contaminated soils from migrating offsite through stormwater runoff, dust, or physical transport on shoes or equipment, as long as the cover system is intact and maintained.

5.3.2 Technical Practicality

This alternative is technically practical and is a common and effective action for remediation of contaminated soils. Construction of covers systems would meet appropriate regulatory requirements (i.e., MEDEP RAGs) and would achieve some of the objectives of the overall cleanup program.

However, this alternative is not supportive of the proposed Site redevelopment, and its implementation would prevent PHA from fully redeveloping the Site in the manner which is currently proposed. As such, this alternative does not meet the cleanup objectives.

5.3.3 Ability to Implement

Soil cover systems are relatively common and can be easily designed and constructed. Earthwork contractors capable of performing this work are readily available.

However, ongoing maintenance and repair of the cover system would be required through the implementation of a Post-Closure Cover System Maintenance Plan. This sort of long-term operations program can be difficult to maintain, especially on residential sites.

5.3.4 Reduction of Toxicity, Mobility, and Volume

The construction of a cover system would not reduce the toxicity or volume of impacted soils on-site; however, this alternative would reduce the likelihood of contact or that impacted soils could be mobilized.

5.3.5 Short Term Effectiveness/Construction Schedule

The remedial action objectives would be attained upon construction of the cover systems. Based on the ability of the selected contractor, this would likely occur within four to six weeks upon notice to proceed.

Long-term inspection and maintenance of the cover system would be necessary to confirm the integrity of the cover system and ensure that impacted soils located beneath the cover system are adequately contained.

5.3.6 Resiliency to Environmental Conditions and Extreme Weather

Although the Site is not located in a FEMA flood zone, it is located relatively close to Back Cove and areas of the City that are prone to flooding. Therefore, extreme weather events and increased rainfall, impacts from rising sea level, and changing flood zones could represent a threat to the Site.

This alternative provides partial resilience to extreme weather events. Covering the impacted soils would minimize contact with rain, flood waters and extreme weather; however, these risks would not be completely reduced, since contaminated soils would remain on-site.

5.3.7 Preliminary Cost

The estimated costs associated with this remedial alternative are outlined in the attached Table 3 – Cover System Alternative. Capital costs include direct capital costs, such as materials and equipment, and indirect capital costs, such as engineering and contingencies for confirmatory soil sampling. The preliminary cost provided were developed to compare alternatives and should not be considered final engineering cost estimates.

5.4 Selection of Proposed Remediation Alternative

Based on the results of the initial screening of each alternative, Alternative 2: Soil Removal alternative has been selected as the preferred remediation alternative. This alternative was evaluated against the ranking alternatives outlined in Section 4.0 and the remedial objectives outlined in Section 5.0. A summary of this evaluation is presented in Table 1, and in the ranking table, below.

Alternatives	DECISION CRITERIA							
	Overall Protection of Human Health and the Environmental	Technical Practicality	Ability to Implement	Reduction of Toxicity, Mobility, and Volume	Short Term Effectiveness/ Construction Schedule	Resiliency to Extreme Weather Conditions	Preliminary Costs	Subtotal
1. No Action/ Access Restrictions	**1**	**0**	**5**	**0**	**5**	**0**	**5**	**16**
2. Soil Removal	**5**	**5**	**1**	**5**	**3**	**5**	**1**	**25**
3. Soil Cover Systems	**3**	**3**	**3**	**3**	**4**	**3**	**3**	**22**
Ranking Scale: 5 = Fully meets decision criteria; 3 = Partially meets decision criteria; 0 = Does not meet decision criteria								

Although Alternative 2 is the most expensive alternative, it is also the most protective of human health and the environment, and is the only alternative which is supportive of, and allows for PHA's Site redevelopment to occur as proposed. With proper project oversight and management, this project can be implemented in a feasible, resilient, expedient, and cost-effective way. Additionally, as part of the final cleanup design for the Site, there may be opportunities to reevaluate the proposed building grades and cut/fill estimates to minimize the amount of soil that needs to be removed from the Site.

See Section 6.0 for a conceptual Remedial Action Plan that has additional information on the implementation of the Soil Removal alternative at the Site.

6.0 CONCEPTUAL REMEDIAL ACTION PLAN

The Soil Removal Alternative has been selected for implementation at the Site. This alternative protects human health and the environment and supports the current Site redevelopment plans. With proper management, this remedial alternative can be completed in a feasible, resilient, expedient, and cost-effective manner. The following paragraphs present a conceptual Remedial Action Plan for soil remediation activities at the Site.

6.1 Soil Removal

Contaminated soils are present at depths ranging from 0 to 7 feet-bgs across this Site; as such, it is assumed that all soil which is proposed for excavation as part of the proposed Site redevelopment would be considered contaminated and require proper management and off-site disposal. Excess and/or structurally unsuitable soils may also need to be excavated in support of Site redevelopment.

Soil and urban fill would be excavated to match proposed redevelopment grades. See Figure 3 for a layout of the proposed Site redevelopment (site layout and design grades by others). Excavation would be conducted to include development of clean utility corridors, excavation down to match proposed building grades (e.g., foundations footings, slab elevations, etc.), and excavation down for site features like stormwater management, tree pits, and retaining walls. Impacted soils that were removed from the Site would be transported off-site and disposed at a licensed receiving facility. The depth of soil removal would vary across the Site, but it is estimated that all surficial soil (0-2 feet-bgs) would be removed from the Site. Based on preliminary redevelopment plans, it is estimated that approximately 5,700 cubic yards of soil would need to be removed as part of Phase I construction, and 9,200 cubic yards of soil would need to be removed as part of Phase II and Phase III construction.

To facilitate future off-site disposal of soils, SME will collect soil waste characterization samples as required by the receiving facility for laboratory analysis of RCRA 8 Metals, volatile organic compounds (VOCs), semi-VOCs (SVOCs), pesticides, herbicides, polychlorinated biphenyls (PCBs), ignitability/flash, corrosivity/pH, reactive sulfide, and reactive cyanide. TCLP analysis will be performed as necessary. Samples will be collected from areas considered “representative” of the soil that will be removed from Site. Although the ultimate disposal location has yet to be determined, results will be compared to typical disposal facilities acceptance criteria. One waste characterization sample is required for every 500 tons of soil received by the receiving facility; as such, we anticipate that up to 45 samples may need to be collected.

6.2 Site Restoration and Soil Cover Systems

Once the soil has been excavated down to redevelopment grades, marker layers would be installed, and the site would be restored in accordance with redevelopment plans. Site redevelopment infrastructure (building foundations, parking lots, landscaping, etc.) would be constructed as to serve as soil cover systems for any remaining underlying soil which is present at depth.

6.3 Environmental Media Management Plan

There is the potential that after excavation activities are complete, impacted soil will remain on-site at depths greater than 2 feet-bgs. Potential exposure risks to human health and the environment from these soils will be mitigated through the preparation and implementation of an EMMP, which will outline procedures that any future construction or earthwork contractors must follow and will provide guidance on the handling of impacted soil and groundwater, if encountered.

6.4 Project Oversight

The remedial actions proposed in this plan will be coordinated with and conducted under the oversight of a Qualified Environmental Professional (QEP). The QEP will develop a final cleanup design, which will be reviewed and approved by the MEDEP and U.S.EPA, and will develop soil management procedures to minimize the volume of soil which will require off-site disposal. A cleanup contractor will be selected through a competitive bid process (as appropriate).

Once a Contractor has been selected, the selected QEP will oversee the cleanup activities and conduct Site observations to monitor the cleanup contractor and document that work is conducted in accordance with the design plans and applicable regulations and requirements. At the completion of the cleanup activities, the QEP will prepare a closure report detailing the remedial activities occurring during this portion of the overall Brownfields cleanup, as necessary.

6.5 Green and Sustainable Remediation

U.S.EPA Region 1's Land, Chemicals, and Redevelopment Division is committed to using and promoting strategies and practices that reduce the environmental footprint during cleanup and restoration activities, to the extent feasible and consistent with applicable statutes, regulations, and guidance, with the goal of minimizing total energy use, maximizing use of renewable energy, minimize air emissions and greenhouse gas generation, minimizing impacts to water resources, reusing/recycling materials and wastes, and minimizing adverse impacts to land and ecosystems.

For this project, we have proposed specific green remediation principles that will be incorporated into the engineering and cleanup process, as follows. This list is not intended to be a comprehensive list, but rather examples of typical actions that will be incorporated into the different phases of the cleanup project, as feasible.

- The cleanup contractors will comply with the U.S.EPA's Clean and Greener Policy and the ASTM Standard Guide for Greener Cleanups (ASTM E2893-25, May 29, 2025, "Updated ASTM Guide for Greener Cleanups" https://store.astm.org/e2893-25.html).
- Contractors will be encouraged to use energy-efficient vehicles and construction equipment, use fuel-efficient/alternative fuel vehicles, maximize use of machinery equipped with advanced emission controls, and incorporate anti-idling policies. Contractors will be encouraged to use diesel engines that meet the most stringent U.S.EPA on-road emissions standards available upon time of project's implementation.
- Contractors will be encouraged to recycle disposal and clean-up byproducts to the highest extent, and the QEP will review disposal manifests to confirm recycling quantities. The contractor will be encouraged to seek disposal facilities with the closest proximity to the Site that still meet regulatory requirements.
- The project will be designed such that clean-up contractors can minimize the number of mobilizations to the Site.
- Best management practices for erosion and stormwater management, dust control, and site security will be incorporated into the design plans.

These green and sustainable measures will be tracked and reported by the QEP during cleanup activities.

TABLES

SEVEE & MAHER
ENGINEERS

TABLE 3: REMOVAL COST FOR COVER SYSTEM ALTERNATIVE
COMB BLOCK SOIL REMEDIATION
PORTLAND, MAINE

	Number	Units	Unit Cost	Total
Cover Systems [(1)]				
Earthwork, Site Re-Grading, Dust Control, Sedimentation Control	1	LS	$150,000	$150,000
Asphalt Parking Lots Cover System [(2)]	24,040	SF	$45	$1,081,800
Soil/Landscaped Areas Cover System [(3)]	36,060	SF	$20	$721,200
QEP Costs				
Programmatic Assistance, ABCA, SSQAPP, HASP	1	LS	$23,500	$23,500
CIP & Public Outreach	1	LS	$9,500	$9,500
Cleanup Design	1	LS	$30,000	$30,000
Bidding & Construction Phase Services	1	LS	$11,500	$11,500
Construction Oversight	250	Hrs	$125	$31,250
VRAP Closure Report & Grant Closure	1	LS	$15,500	$15,500
Subtotal				*$2,074,250*
Contingency 10% [(4)]				$292,100
TOTAL				**$2,366,350**

1 Cover systems shall be constructed across the entirety of the Site (approximately 1.4 acres, or 60,100 square feet)
2 Cover system includes geogrid marker layer, 12" of structural gravel and 2" of binder asphalt pavement.
3 Cover system includes geogrid marker layer and 12" of clean fill.
4 Covers previously unidentified issues or changes in redevelopment plans that may occur at the Site.

FIGURES

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ENGINEERS

BASEMAP ADAPTED FROM 7.5 MIN USGS TOPO QUADS
PORTLAND EAST, ME - 2021
PORTLAND WEST, ME - 2021

FIGURE 1
SUBJECT PROPERTY LOCATION MAP
COMB BLOCK
9 BOYD STREET. 20 MAYO STREET
24 MAYO STREET. 25 BOYD STREET
PORTLAND, MAINE

1000 0 2000 FEET

SME
SEVEE & MAHER ENGINEERS

DWG: SITELOC LMN: LMN CTB: SME-STD.CTB REV: 11/6/2025

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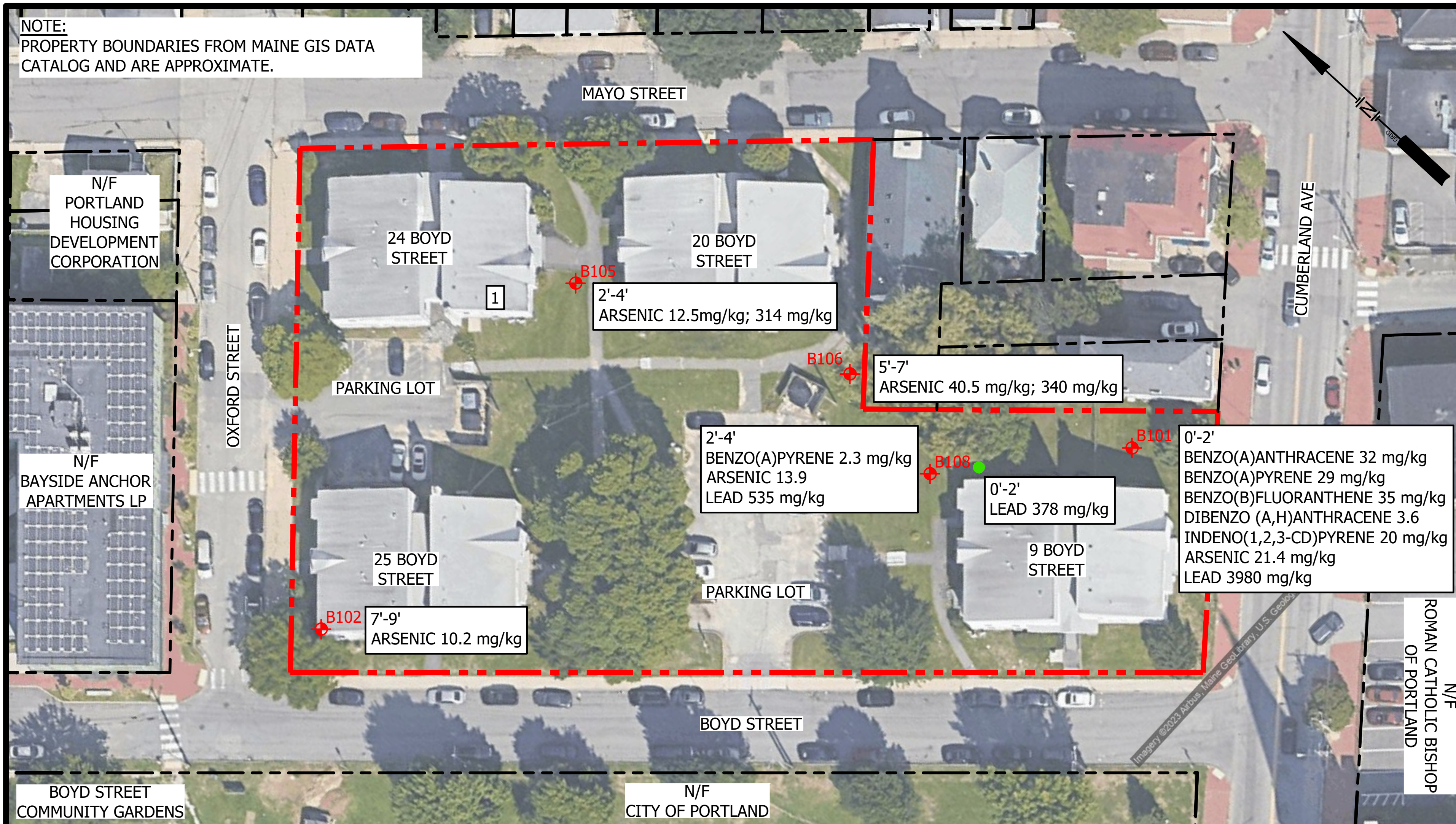

LEGEND

APPROXIMATE SITE BOUNDARY

N/F — NOW OR FORMERLY

SURFICIAL SOIL SAMPLE LOCATION AND LABORATORY RESULTS - DECEMBER 2023

B108 — PHASE II SAMPLE LOCATION AND LABORATORY RESULTS - MARCH 2024

mg/kg — MILLIGRAMS PER KILOGRAM

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION REMEDIAL ACTION GUIDELINES NOVEMBER 2023:

	RESIDENTIAL	CONSTRUCTION WORKER
BENZO(A)ANTHRACENE	16 mg/kg	1,700 mg/kg
BENZO(A)PYRENE	1.6 mg/kg	10 mg/kg
BENZO(B)FLUORANTHENE	16 mg/kg	17,000 mg/kg
DIBENZO(A,H)ANTHRACENE	1.6 mg/kg	170 mg/kg
INDENO(1,2,3-CD)PYRENE	16 mg/kg	1,700 mg/kg
ARSENIC	9.3 mg/kg	54 mg/kg
LEAD	200 mg/kg	460 mg/kg

30 0 60 FEET

FIGURE 2
PREVIOUS ENVIRONMENTAL INVESTIGATION RESULTS: MEDEP RAG EXCEEDANCES
COMB BLOCK
9 BOYD STREET. 20 MAYO STREET
24 MAYO STREET. 25 BOYD STREET
PORTLAND, MAINE

SME
SEVEE & MAHER ENGINEERS

DWG: BASE LMN: MEDEP RAGS CTB: SME-STD.CTB REV: 10/30/2025

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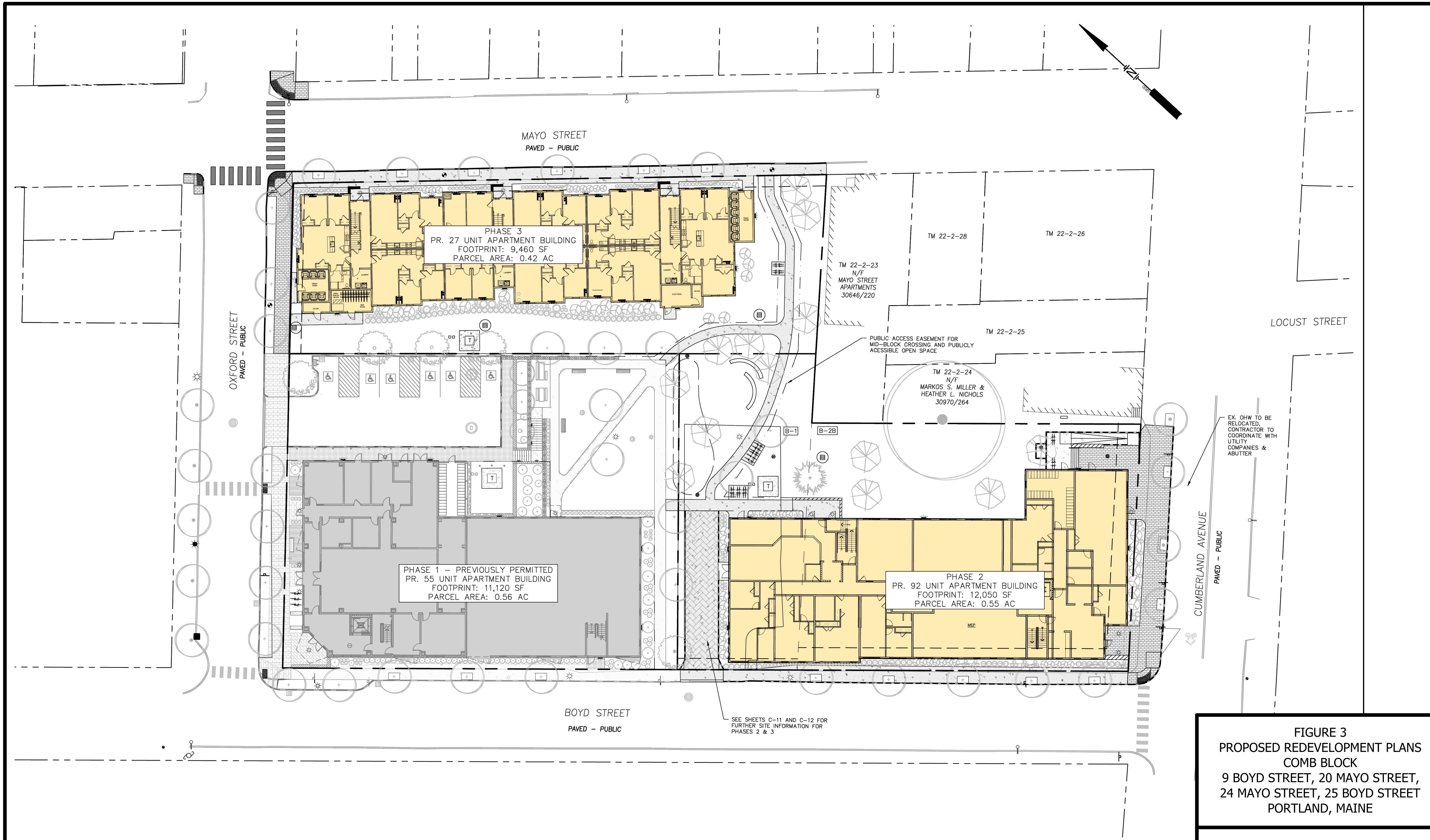

FIGURE 3
PROPOSED REDEVELOPMENT PLANS
COMB BLOCK
9 BOYD STREET, 20 MAYO STREET,
24 MAYO STREET, 25 BOYD STREET
PORTLAND, MAINE

SME
SEVEE & MAHER
ENGINEERS

DWG: REDEV LMN: NONE CTB: SME-STD.CTB JOB#: 250855.03 REV: 10/31/2025

\\lserver\cfs\Portland Housing Authority\COMB Block\ABCA\Soil Remediation\ACAD\REDEV.dwg, B_FIG 3, 10/31/2025 1:42:30 PM, sjm