DRAFT ANALYSIS OF ALTERNATIVES REPORT

Cahoon Parcel Off-Site

Site No. C859026

Prepared for:
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Table of Contents

List of Figures

List of Tables

Appendices

Section 1

Introduction

1.1 Site Background

The New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation (DER) has requested assistance from Camp Dresser McKee & Smith (CDM Smith) to update and refine the Remedial Alternatives Analysis (RAA) for the Cahoon Parcel Off-Site (herein referred to as the "Site"). The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that will be addressed by the remedy proposed by this RAA. The proposed remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment.

1.1.1 Current Site Use

The Site includes a portion of two parcels: 11865 Orchard Street (tax parcel 75117-11-655544) and 6162 W Port Bay Road (tax parcel 75117-11-613508) in Wolcott, NY. The site is a generally level, grass-covered vacant area, approximately 0.50 acres in size and is zoned as a commercial area. Properties adjacent to the Site include a baseball field and West Port Bay Road to the west, Electromark to the north, the Village Fire Department to the south, and the vacant Cahoon parcel to the west. A Site Location Map and Site and Surrounding Properties Map, included as **Figure 1-1** and **Figure 1-2,** respectively, illustrate the Site Areas of Concern (AOCs) boundaries and the adjacent properties.

The Site comprises the vegetated grass area between the Electromark and Village Fire Department buildings, which are surrounded by pavement. Overhead powerlines are present on the western portion of the Site. The Site is currently zoned for commercial use, and it is assumed future use will remain commercial.

Figure 1-1: Site Location Map
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 500 1,000 Feet

1 in = 750 ft

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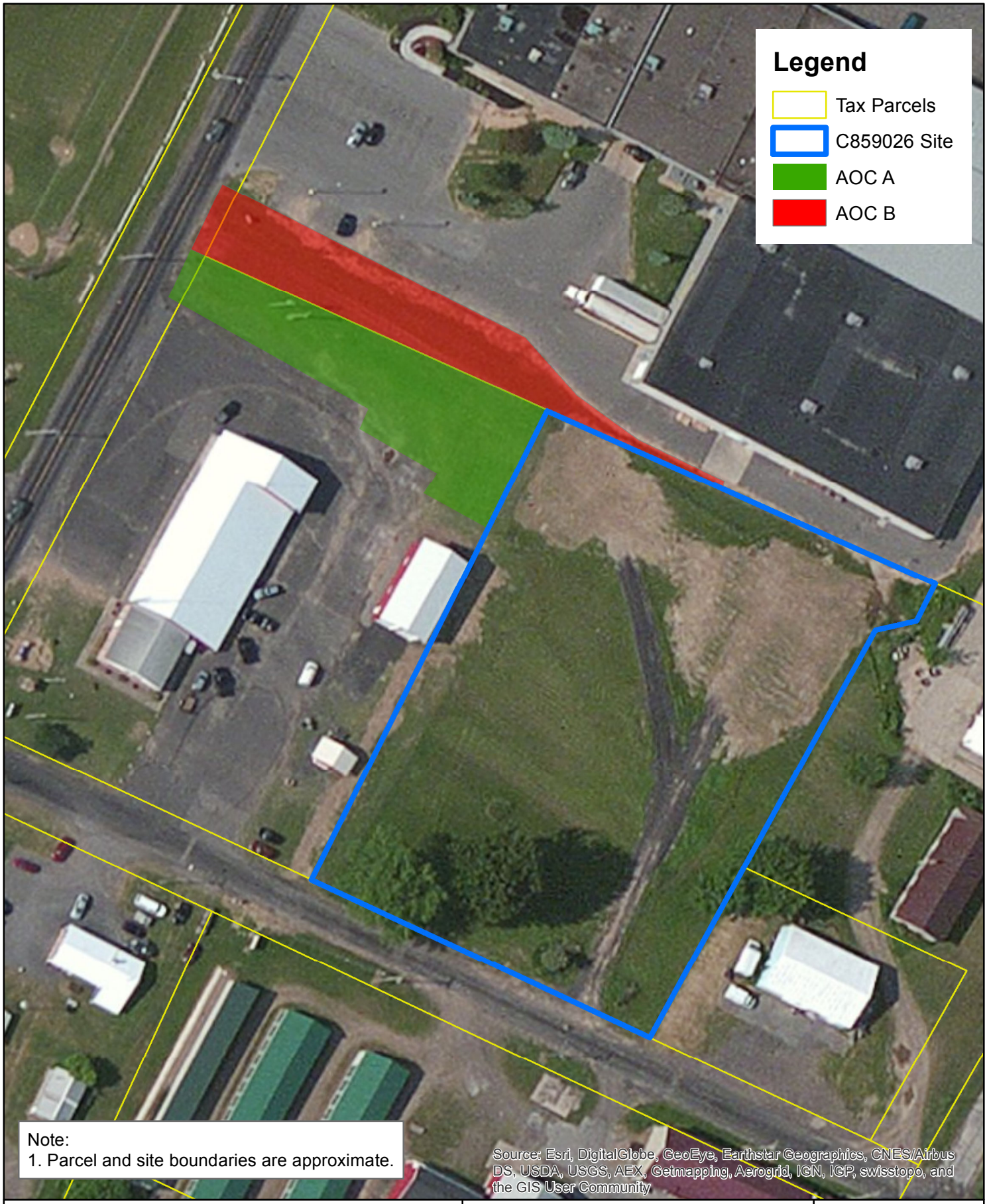

Figure 1-2: Site and Surrounding Properties Map
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 40 80 Feet

1 in = 80 ft

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1.1.2 Site History

The adjacent Cahoon Site Parcel (C859026) was remediated as part of the Brownfield Cleanup Program (BCP). Results from confirmatory sidewall soil samples indicated Mercury levels above 6 New York Codes, Rules and Regulations (NYCRR) Part 375 Restricted Commercial Use Soil Cleanup Objectives (SCOs) which is 2.8 milligram per kilogram (mg/kg). Based on these results, a remedial investigation (RI) was conducted by NYSDEC in 2015 and 2016 to delineate the extent of impacted soils (NYSDEC 2017).

The Site was historically owned by a gladiola grower who reportedly used a mercury-based fungicide from the early 1930s until the late 1940s to mid-1950s.

1.1.3 Adjacent Site History

Excavation and backfill remedial activities were conducted on the adjacent Cahoon Site Parcel (C859026) in 2010 as part of the BCP by LaBella Associates, P.C. (Labella 2011). The total quantity of impacted soil excavated and removed from the Cahoon Site Parcel was approximately 1,336 tons. Remedial excavation areas contain 1 or more feet of backfill material overlying mercury-impacted soils. The remaining mercury concentrations exceed Restricted Commercial Use SCOs in some locations. A total of 862.8 tons of imported granular fill (bank run gravel) and topsoil were imported from Smith Sand and Gravel pit in Sodus, NY to the Cahoon Site Parcel to backfill the excavations. The backfill samples were reported to contain no volatile organic compounds, semi-volatile organic compounds, pesticides, or polychlorinated biphenyls above laboratory method detection limits and no metals above Unrestricted Use SCOs.

Groundwater sampling conducted on the Cahoon Site Parcel indicated that mercury contamination in groundwater was not a concern and further investigation and/or remediation of groundwater was not warranted. Mercury above the reported laboratory method detection limits was not detected in post-remedial action groundwater samples .

An environmental easement for the Cahoon Site Parcel was filed with the Wayne County Clerk on October 14, 2011 to: (1) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and (2) limit the use and development of the Cahoon Site Parcel to commercial or industrial use only.

1.1.4 Physical Setting

The Site is in the Village of Wolcott within Wayne County, New York. It is surrounded by commercial properties and located in an area zoned for commercial use. Drinking water for the area is supplied by the Village of Wolcott. The nearest surface water body is an unnamed creek located approximately 1,200 feet west. Lake Ontario is located approximately 6 miles north of the Site. The Site lies at an elevation of between approximately 340 and 355 feet above mean sea level (amsl) and gently slopes to the west.

Surficial geology of the region is dominated by lacustrine silt and clay with pockets of till (Muller and Cadwell 1986). Lacustrine silt and clay generally consists of laminated clay and silt deposited in proglacial lakes. Till is the result of glacial deposition and consists of generally impermeable poorly sorted diamict with variable clast content. Both lacustrine silt and clay and till are generally calcareous with variable thickness throughout the region.

Soils encountered during the RI and supplemental sampling generally consisted of relatively coarse sand and gravel fill soils overlying fine-grained soils comprised primarily of silt and fine sand mixtures. Recent deep borings, conducted by CDM Smith, suggest that there are more coarse-grained soils comprised primarily of gravel and sand mixtures, with interbedded fine-grained material. Deeper borings up to 22.5 feet below ground surface (bgs) identify a rock layer, potentially claystone, at the termination of several soil borings. Surface water flows generally towards the west and northwest to a stormwater drain located along West Port Bay Road. Groundwater was encountered at the Site at depths of approximately 1 to 6 feet bgs and flowed to the north/northwest.

1.1.5 Summary of the Remedial Investigation

An RI was completed at the site in 2015 and 2016 by NYSDEC to further delineate impacted soils for remedial action. RI activities included sampling and analysis of soil at the site. Sample results from the NYSDEC investigation in 2015 and 2016 were used to locate additional soil borings/temporary wells in August 2021 to spatially represent the targeted hot spot area and previous soil borings for the entire site. The 2021 activities included sampling and analysis of soil and groundwater at the site.

A total of 62 soil borings (S01 through S62) were completed at the Site from November 2015 to July 2016 and were advanced to a maximum depth of 8 feet bgs. An additional 11 composite samples were analyzed for toxicity characteristic leaching procedure (TCLP) mercury to determine the mobility of the contaminants in the soil. All 11 samples were below the maximum concentration of contaminants for toxicity characteristic regulatory level of 0.2 milligrams per liter (mg/L). Four of the samples were non-detect. The highest TCLP mercury sample result was 0.0072 mg/L located at S57 which had a maximum total mercury concentration of 429 mg/kg.

A total of 12 soil borings (SB-01 through SB-12) were advanced at the Site in August 2021 to a maximum depth of 24 feet bgs (refusal). During the 2021 sampling event, 39 soil samples including field duplicates were collected and submitted to Eurofins TestAmerica for analysis of total mercury. Sample results ranged from non-detect to 120 mg/kg (SB-09 at a depth of 0.5 to 2.5 feet bgs). Mercury was detected above the Restricted Commercial Use SCO of 2.8 mg/kg in 11 of 39 samples at depths ranging from 0 to 17 feet bgs. Seven samples were also collected at various intervals from SB-03, SB-07, SB-08, SB-09, SB-10, and SB-11 for Synthetic Precipitation Leaching Procedure (SPLP) to determine the potential of mercury to leach into the groundwater. Results ranged from 0.00012 J mg/L to 0.042 mg/L, below the toxicity characteristic regulatory level of 0.2 mg/L. However, the results from samples collected from all locations except for SB-07 and SB-11 exceeded the NYSDEC Ambient Water Quality Standard of 0.0007 mg/L.

The RI concluded that the source of the mercury impacted soil appears to be the result of historical operations that included a gladiola grower who reportedly used a mercury-based fungicide from the early 1930s until the late-1940s to mid-1950s. The findings of the RI identified mercury impacted soil above Restricted Commercial Use SCOs throughout the Site at varying depths. The samples were taken from the surface to 24 feet bgs with results ranging from non-detect to 922 mg/kg at a depth of four to five feet bgs in boring S32. Composite sediment samples collected from three storm water drains did not exceed Restricted Commercial Use SCOs for mercury and no further action for stormwater drain line sediments on the Site is warranted.

Groundwater sampling at the Cahoon Parcel Site (C859026) was completed on August 17, 2021. Four monitoring wells are located at the site. NYSDEC had installed MW-01 and MW-02 in 2020 and collected unfiltered samples from each well. CDM Smith installed MW-03 and MW-04 during the 2021 sampling event. Filtered and unfiltered samples were collected from MW-02, MW-03, and MW-04 during the August 2021 event for mercury analysis. MW-01 was not located during the 2021 event and was therefore not sampled. All groundwater sample results collected in 2021 were below the NYSDEC Ambient Water Quality Standard of 0.0007 mg/L. Mercury was detected at concentrations of 1.4 and 2.2 mg/L, exceeding the water quality standard, in the samples collected by NYSDEC in 2020. The samples collected during the 2020 sampling event had a higher turbidity than those collected in 2021 which may have led to higher mercury results during the initial sampling event. The much lower mercury concentrations during the 2021 event indicate that mercury in groundwater is not an issue at the Site. In addition, the results of the TCLP and SPLP analysis were below the toxicity characteristic regulatory level of 0.2 mg/L, including those from locations with elevated mercury concentrations. Therefore, these results imply that much of the mercury at the Site is not leachable.

1.2 Purpose and Objectives

The purpose of this report is to provide an updated and refined RAA for the Site. The conceptual site model provides a basis to determine the efficacy of alternatives. This RAA identifies the preferred remedy, summarizes the other alternatives considered, and discusses the reasons for the preferred remedy.

Section 2

Remedial Goals and Objectives

Remedial action objectives (RAOs) are media-specific goals for protecting human health and the environment that serve as guidance for the development of remedial alternatives. The process of identifying the RAOs follows the identification of affected media and contaminant characteristics, evaluation of exposure pathways, contaminant migrations pathways and exposure limits, and the evaluation of chemical concentrations that will result in acceptable exposures. The RAOs are based on regulatory requirements that may apply to the various remedial activities being considered for the Site.

Remedial goals (RGs) are target chemical concentrations that the remedial action needs to achieve in order to protect human health and the environment. RGs were selected based on federal or state promulgated standards, with consideration also given to criteria, guidance, background concentrations, and other requirements such as analytical detection limits. These RGs were then used as a benchmark in the alternative development and detailed evaluation of alternatives presented in the subsequent sections of the RAA report.

2.1 Cleanup Goals

To determine AOCs on the Site, standards criteria and guidance (SCGs) were assessed. The SCGs assist in defining the extent of contamination and are used to evaluate the effectiveness of the remedy. Chemical-specific SCGs are health- or technology-based numerical values that establish concentration or discharge limits for specific chemicals or classes of chemicals. There are no chemical-specific Federal SCGs for cleanup of contaminated soil, but there is a New York State SCG for soil. Therefore, NYSDEC Unrestricted Use and Restricted Commercial Use Standard Cleanup Objectives (SCOs) are applicable requirements according to NYSDEC Inactive Hazardous Waste Disposal Site Remedial Program under 6 NYCRR Part 375 Subpart 375-2.

2.2 Remedial Action Objectives for Soil

RAOs are media-specific goals for the protection of human health and the environment and are developed based on aforementioned SCGs. Remedial action is warranted for soil media; however, no remedial action is warranted for groundwater. Therefore, RAOs were only developed for soil. The RAOs for the Site are as follows:

- RAOs for Public Health Protection: prevent ingestion/direct contact with contaminated soil.
- RAOs for Environmental Protection: prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

2.3 Contaminant(s) of Concern

Based on sampling performed on the Site, the contaminant of concern is mercury in soils.

2.4 Development of Remedial Goals

The RGs were developed based on the NYSDEC SCOs with consideration also given to background concentrations and other requirements such as analytical detection limits and guidance values. The primary site-related contaminant of interest is mercury.

The overall goal is to protect human health and the environment.

As per NYSDEC DER 10 Tables 375-6.8(a) and (b) two soil concentration goals must be considered:

- Restricted Commercial Use SCO: 2.8 mg/kg.
- Unrestricted Use SCO: 0.18 mg/kg.

2.5 Evaluation Criteria

The evaluation criteria are based upon the procedures outlined in DER-10 Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010). These criteria are classified into the following three groups are described below:

- Threshold Criteria
- Primary Balancing Criteria
- Modifying Criterion

2.5.1 Threshold Criteria

Threshold criteria are requirements that each alternative must meet to be considered for selection.

- **Overall Protection of Human Health and the Environment.** This criterion is an evaluation of the remedy's ability to protect public health and the environment, assessing how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, engineering controls (ECs), or institutional controls (ICs). The remedy's ability to achieve each of the RAOs is evaluated.
- **Compliance with New York State SCGs.** Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which NYSDEC has determined to be applicable on a case-specific basis.

2.5.2 Primary Balancing Criteria

These criteria are used to distinguish the relative effectiveness of each alternative so that decision makers compare the positive and negative aspects of each of the remedial strategies.

- **Long-term Effectiveness and Permanence.** This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If contamination or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: (1) the magnitude of the remaining risks, (2) the adequacy of the

engineering and/or institutional controls intended to limit the risk, and (3) the reliability of these controls.

- **Short-term Effectiveness.** The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.
- **Reductions of Toxicity, Mobility, or Volume.** Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility, or volume of the wastes at the site.
- **Implementability.** The technical and administrative feasibility of implementing each alternative is evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.
- **Cost-Effectiveness.** Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis.
- **Land Use.** This criterion evaluated the current, intended, and reasonably anticipated future use of the site and its surroundings.

2.5.3 Modifying Criterion

This criterion is considered after evaluating those above. It is evaluated after public comments have been received. This criterion is not evaluated in this RAA.

- **Community Acceptance.** Concerns of the community are evaluated. A responsiveness summary will be prepared that describes public comments received and the manner in which NYSDEC will address the concerns raised. If the selected remedy differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reason for the changes.

2.6 General Response Actions

General response actions to address the identified contamination in soil or fill can include one or more of the following:

- Treatment
- Containment
- Excavation
- Extraction
- Disposal

- Environmental engineering controls
- Institutional controls

The response actions are evaluated for application in addressing soil or fill contamination that exceeds applicated NYSDEC SCOs.

Section 3

Development of Remedial Alternatives

The alternatives considered for the site are directed at addressing contamination in soils and are presented below. The alternatives anticipate future site use remaining commercial.

3.1 Alternative A: No Action

The No Action alternative was retained as required by DER-10 to serve as a baseline for comparison with the other alternatives. No remedial actions or monitoring will be implemented as part of the No Action alternative. No environmental easement, institutional, or engineering controls will be implemented to manage contamination. The impacted portions of the site will remain virtually as is and change in property use will not be limited except by existing municipal land use controls.

3.2 Alternative B: Restricted Use Impacted Soil Removal and Disposal

Under this alternative, all on-site soils in the top one foot exceeding the Restricted Commercial Use SCO for mercury will be excavated. Based on a one-foot excavation, it is assumed approximately 730 cubic yards of soil will be excavated. Approximate excavation area is shown in **Figure 3-1**.

Standard earthwork heavy machinery (e.g., backhoes, bulldozers, and end-loaders) will be utilized to remove the contaminated soils. All excavation activities will need to consider the overhead powerlines and buried utilities or piping such as the underground electric utility and storm drain. Once excavated, the soils will be stored or stockpiled in a containment area on-site to prevent the spread of contaminants prior to sampling, analysis, and disposal. Soils classified as hazardous will be disposed of in an appropriate Subtitle C landfill. Soils classified as non-hazardous and high mercury will be disposed of in an appropriate Subtitle D landfill. Remaining materials classified as non-hazardous will be disposed of in a Subtitle D landfill. The determination of whether the contaminated material is hazardous or non-hazardous will be based on toxicity characteristic analysis of the excavated soils. High mercury classification per 40 CFR 268.40 is for any soils with total mercury concentrations greater than or equal to 260 mg/kg. No hazardous soils are anticipated on the Site and for purposes of cost estimation, it is assumed all excavated materials are classified as non-hazardous. For cost estimating purposes it is assumed eight percent of excavated soils may be classified as high mercury.

Saturated soils were encountered generally around five feet bgs; therefore, the excavation pit is not expected to require dewatering from groundwater but may encounter surface runoff. All water used in decontamination of equipment and materials used as part of the excavation activities will be collected in an onsite storage tank until the liquids are transported for off-site treatment and disposal. Like the excavated soils, collected liquids will be analyzed for chemical

composition. Upon acceptance of the analytical results, collected liquids will be disposed of properly.

Upon completion of the excavation a demarcation layer will be installed above the remaining on-site contamination to create a physical separation between the contamination and potential human exposures. The demarcation layer purpose is to provide a visual warning of the remaining contamination. The remaining mercury is considered stabilized in the subsurface and leaching due to runoff is not a concern. A one-foot layer of clean fill will be placed on top of the demarcation layer to serve as a cap and provide protection to human health and the environment (ECs). Additionally, a Site Management Plan (SMP) including the use of an environmental easement (ICs) will be implemented to control future site use and protect against human exposure to contaminated soils remaining on-site.

Figure 3-1: Alternative B
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 45 90 135 Feet

1 in = 90 ft

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3.3 Alternative C: Impacted Soil Removal and Disposal with Targeted Excavation

Under this alternative, all on-site soils which exceed the Restricted Commercial Use SCO for mercury will be excavated. Based on 12-foot and six-foot targeted excavation areas and a one-foot excavation of the remaining Site, it is estimated a total of 4,700 cubic yards of soil will be excavated. Approximate excavation area is shown in **Figure 3-2**.

Standard earthwork heavy machinery (e.g., backhoes, bulldozers, and end-loaders) will be utilized to remove the contaminated soils. All excavation activities will need to consider the overhead powerlines and buried electric utility and storm drain located within the limits of the excavation. Additionally, excavation support will be required to prevent collapse of the excavation walls. Confirmation samples will be collected on the bottom of the excavation and sidewalls in accordance with the frequencies presented in DER-10 to confirm removal of contaminated soils and identify the presence of remaining contamination.

Once excavated, the soils will be stored or stockpiled in a containment area onsite to prevent the spread of contaminants prior to sampling, analysis, and disposal. Soils classified as hazardous will be disposed of in an appropriate Subtitle C landfill. Soils classified as non-hazardous and high mercury will be disposed of in an appropriate Subtitle D landfill. Remaining materials classified as non-hazardous will be disposed of in a Subtitle D landfill. The determination of whether the contaminated material is hazardous or non-hazardous will be based on toxicity characteristic analysis and high mercury classification will be based on total mercury concentrations of the excavated soils. No hazardous soils are anticipated on the Site and for purposes of cost estimation, it is assumed all excavated materials are classified as non-hazardous. For cost estimating purposes it is assumed eight percent of excavated soils may be classified as high mercury.

Saturated soils were encountered generally around five feet bgs; therefore, it is assumed the excavation pit will require dewatering. All water used in decontamination of equipment and materials used as part of the excavation activities will be collected in an on-site storage tank until the liquids are transported for off-site treatment and disposal. Like the excavated soils, collected liquids will be analyzed for chemical composition. Upon acceptance of the analytical results, collected liquids will be disposed of properly.

Upon completion of the excavation, a demarcation layer will be installed, followed by clean fill meeting NYSDEC Restricted Commercial Use SCOs will be used to backfill the excavation area (ECs). Additionally, a SMP including the use of an environmental easement will be implemented to control future site use and protect against human exposure to contaminated soils remaining on-site (ICs).

Figure 3-2: Alternative C
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 45 90 135 Feet

1 in = 90 ft

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3.3 Alternative D: Knee of the Curve, Industrial Use Impacted Soil Removal and Disposal

Under this alternative, all on-site soils which exceed the Industrial Use SCO of 5.7 mg/kg will be excavated. By excavating to the Industrial Use SCO at least 97 percent of the mercury mass will be removed from the Site. Based on estimations of soil volumes and associated mercury concentrations, the Industrial Use SCO was determined to represent the "knee of the curve." A discussion of the "knee of the curve" calculations and analysis are provided in **Appendix A**. Excavation depths and locations are based on soil results from the remedial investigation. Based on five targeted excavations down to depths of 2, 5, 6, 7, and 12-feet, it is estimated that a total of 2,900 cubic yards of soil will be excavated. Approximate excavation areas are shown in **Figure 3-3**.

Standard earthwork heavy machinery (e.g., backhoes, bulldozers, and end-loaders) will be utilized to remove the contaminated soils. All excavation activities will need to consider the overhead powerlines and buried electric utility and storm drain located within the limits of the excavation. Additionally, excavation support will be required to prevent collapse of the excavation walls. Confirmation samples will be collected on the bottom of the excavation and sidewalls in accordance with the frequencies presented in DER-10 to confirm removal of contaminated soils and identify the presence of remaining contamination.

Once excavated, the soils will be stored or stockpiled in a containment area on-site to prevent the spread of contaminants prior to sampling, analysis, and disposal. Soils classified as hazardous will be disposed of in an appropriate Subtitle C landfill. Soils classified as non-hazardous and high mercury will be disposed of in an appropriate Subtitle D landfill. Remaining materials classified as non-hazardous will be disposed of in a Subtitle D landfill. The determination of whether the contaminated material is hazardous or non-hazardous will be based on toxicity characteristic analysis and high mercury classification will be based on total mercury concentrations of the excavated soils. No hazardous soils are anticipated on the Site and for purposes of cost estimation, it is assumed all excavated materials are classified as non-hazardous. Based on soil results for the remedial excavation, for cost estimating purposes it is assumed 30 percent of excavated soils may be classified as high mercury.

Saturated soils were encountered generally around five feet bgs; therefore, it is assumed the excavation pit will require dewatering. All water used in decontamination of equipment and materials used as part of the excavation activities will be collected in an on-site storage tank until the liquids are transported for off-site treatment and disposal. Like the excavated soils, collected liquids will be analyzed for chemical composition. Upon acceptance of the analytical results, collected liquids will be disposed of properly.

Upon completion of the excavation, a demarcation layer will be installed, followed by clean fill meeting NYSDEC Restricted Commercial Use SCOs will be used to backfill the excavation area (ECs). Additionally, a SMP including the use of an environmental easement will be implemented to control future site use and protect against human exposure to contaminated soils remaining on-site (ICs).

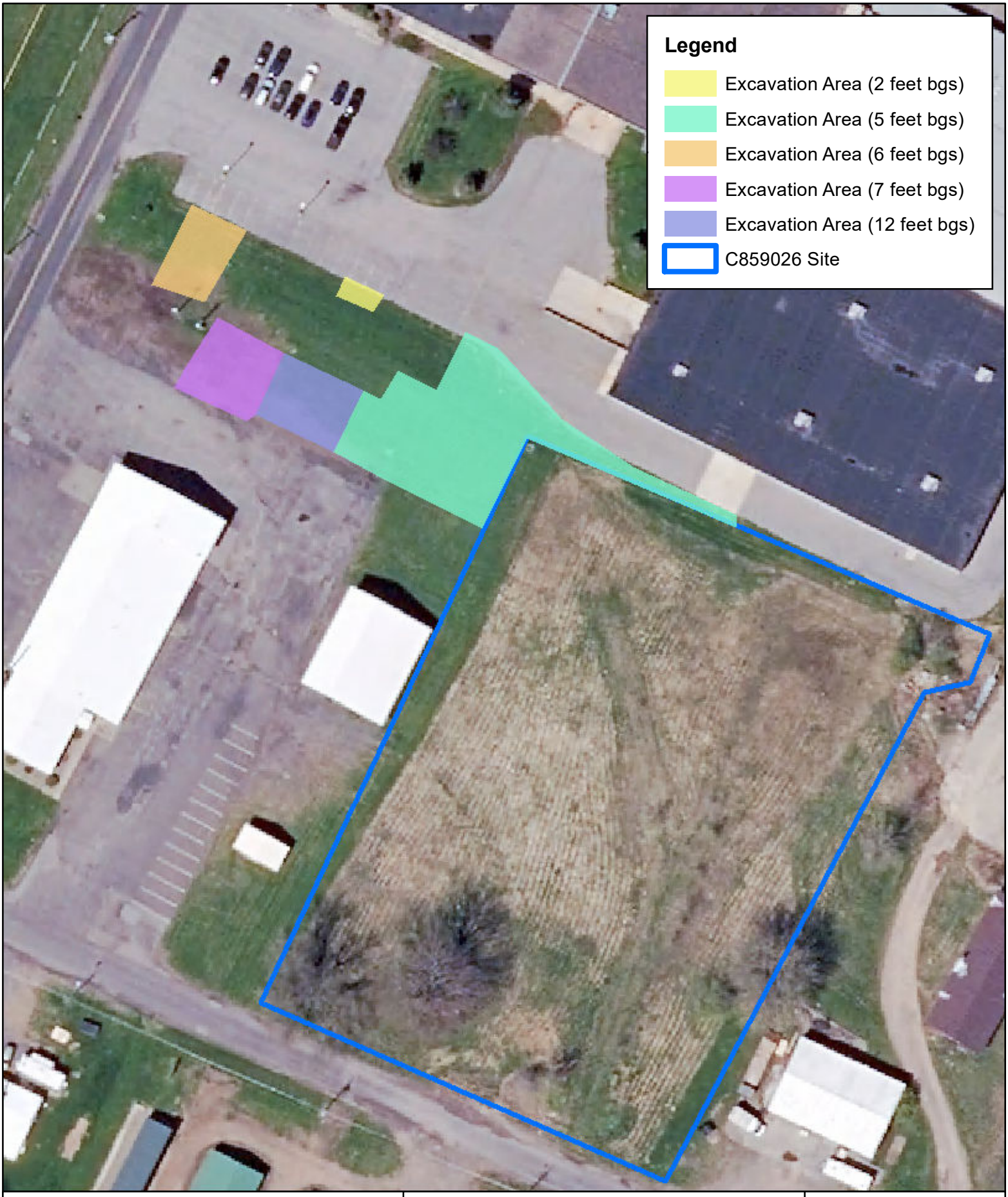

Figure 3-3: Alternative D
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 45 90 135 Feet

1 in = 90 ft

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3.4 Alternative E: Unrestricted Use Impacted Soil Removal and Disposal

Under this alternative, all on-site soils which exceed the Unrestricted Use SCO for mercury will be excavated. Based on a 20-foot excavation to bedrock, it is estimated that a total of 29,000 cubic yards of soil will be excavated. Excavation activities are anticipated to extend into paved areas and will require the removal and restoration of asphalt. Approximate excavation area is shown in **Figure 3-4**.

Standard earthwork heavy machinery (e.g., backhoes, bulldozers, and end-loaders) will be utilized to remove the contaminated soils. All excavation activities will need to consider the overhead powerlines and underground electric utility and storm drain. Additionally, excavation support will be installed to prevent collapse of the excavation walls. Confirmation samples will be collected on the bottom of the excavation and sidewalls in accordance with the frequencies presented in DER-10 to confirm removal of contaminated soils.

Once excavated, the soils will be stored or stockpiled in a containment area on-site to prevent the spread of contaminants prior to sampling, analysis, and disposal. Soils classified as non-hazardous and high mercury will be disposed of in an appropriate Subtitle D landfill. Remaining materials classified as non-hazardous will be disposed of in a Subtitle D landfill. The determination of whether the contaminated material is hazardous or non-hazardous will be based on toxicity characteristic analysis and high mercury classification will be based on total mercury concentration of the excavated soils. No hazardous soils are anticipated on the Site and for purposes of cost estimation, it is assumed all excavated materials are classified as non-hazardous. For cost estimating purposes it is assumed eight percent of excavated soils may be classified as high mercury.

Saturated soils were encountered generally around five feet bgs; therefore, the excavation pit will require dewatering. All water used in decontamination of equipment and materials used as part of the excavation activities will be collected in an on-site storage tank until the liquids are transported for off-site treatment and disposal. Like the excavated soils, collected liquids will be analyzed for chemical composition. Upon acceptance of the analytical results, collected liquids will be disposed of properly.

Upon confirmation of the clean fill meeting NYSDEC Unrestricted Use SCOs, the clean fill will be used to backfill the excavation area (EC). A SMP will not be required.

Figure 3-4: Alternative E
Cahoon Parcel Site Off-Site C859026A
6162 and 6188 West Port Bay Road
Village of Wolcott, Wayne County, NY

N

0 45 90 135 Feet

1 in = 90 ft

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Section 4

Detailed Evaluation of Alternatives

Individual evaluations of the alternatives are presented in this section. A comparative analysis of the alternatives is provided in **Table 4-1.**

4.1 Alternative A: No Action

The No Action alternative was retained for comparison purposes as required by DER-10. No remedial actions will be implemented as part of the No Action alternative. The soil in the impacted areas will remain in place as is and future site use and development will not be limited. This alternative does not include institutional controls or monitoring.

- **Overall Protection of Human Health and the Environment.** The No Action alternative does not provide overall protection of human health and the environment and does not meet the RAOs. This alternative does not prevent future exposure to contaminated soil. Since no remedial action will be implemented under this alternative, no means will be available to prevent current and future exposure.
- **Compliance with SCGs.** Due to the presence of mercury above the applicable SCOs, this alternative will not comply with SCGs for soil for a sustained period.
- **Long-term Effectiveness and Permanence.** The No Action alternative is not considered a permanent remedy. The contaminants will not be destroyed, and it is not anticipated that naturally occurring processes (e.g., natural attenuation) will result in reduction of contamination concentration in a reasonable time frame. This alternative will not provide adequate control of risks to human health or the environment because there are no mechanisms to prevent current and future exposure; therefore, this alternative will not be considered effective in the long term.
- **Short-term Effectiveness.** This alternative will not include a remedial action. Therefore, it will have no short-term impact to workers or the community. There will be no adverse environmental impacts to habitats or vegetation.
- **Reduction of Toxicity, Mobility, or Volume through Treatment.** The implementation of this alternative will not affect the toxicity, mobility, or volume of the contamination.
- **Implementability.** This alternative is easily implemented, since no services or permits will be required.
- **Land Use.** The site is currently occupied by the Fire Department and Electromark, a commercial business. It is anticipated that future site development will be limited to commercial use.
- **Cost.** The No Action alternative has no costs associated with it.
  Estimated Cost of "No Action" Alternative: $0

4.2 Alternative B: Restricted Use Impacted Soil Removal and Disposal

Under this alternative the top one foot of soils will be removed and disposed of off-site. A demarcation layer will be placed above any remaining contamination to provide a physical barrier between the contamination and protective clean fill cover. The excavations will be backfilled with clean fill from an off-site source to bring the excavation back to the surrounding grade, at minimum, and provide a cover system at the site. The material used for backfill will be evaluated in accordance with NYSDEC DER 10 Section 5.4.

In addition, a NYSDEC environmental easement will be recorded for the site to minimize the potential for future exposures. The easement will: (1) limit the use of the site and (2) require implementation of an SMP. The SMP will include procedures for properly handling and disposing of soil left in place with mercury levels above the site uses for approximately 30 years.

- **Overall Protection of Human Health and the Environment.** This alternative will provide protection of human health and the environment since all surface soils that are easily accessible to humans will be removed and capped with clean soils. A demarcation layer and environmental easement will limit the potential for contact with contaminated subsurface soils.

- **Compliance with SCGs.** This alternative will establish a cover with one foot of clean fill to meet the SCG values for Restricted Commercial Use. This alternative will not necessarily meet the SCG values for Unrestricted Use and thus will require the additional protection of an environmental easement to meet SCGs. Additionally, subsurface soils with concentrations greater than SCGs will remain on-site below a demarcation layer and will be managed with a SMP.

- **Long-term Effectiveness and Permanence.** The long-term effectiveness of this alternative will be sufficient since the use criteria will be achieved for the site, the environmental easement will remain in effect in perpetuity, and the mercury contamination in the soil is generally stabilized and immobile.

- **Short-term Effectiveness.** This alternative will increase short-term risks for the community and the workers during implementation of the alternative (i.e., potential exposure to particulates, truck traffic for hauling/disposing waste and importing clean soil); however, these can be minimized with the following measures:

  - Instituting a community health and safety plan (CHASP) and community air monitoring program (CAMP) to protect remedial workers and the surrounding community.

  - If necessary, taking measures to mitigate mobilization of metals-impacted particulates (dust suppression) during work.

  - Following NYSDOT and NYSDEC regulations related to transport and disposal of waste soils.

- **Reduction of Toxicity, Mobility, or Volume through Treatment.** This alternative will not result in the reduction of contaminant toxicity since no in-place treatment or contaminant destruction will occur; however, contaminant volume will be reduced through the removal of soil impacted with mercury above a specified contaminant level.

- **Implementability.** The implementability of this alternative is high. Excavation of soils with metals can be accomplished with limited disturbance to adjacent landowners and the community. Overhead power lines and subsurface utilities such as the storm drain and electric utility must be considered during excavation activities. In the event the electric utility will be affected, an alternative source of power, such as a generator, for the affected buildings will need to be implemented.

  In addition, development of an environmental easement and SMP is implementable and these have historical precedent with the NYSDEC on numerous impacted properties.

- **Land Use.** The site is currently occupied by the Fire Department and Electromark, a commercial business. Although contaminated soils may remain on-site, soils will be handled or reused on-site with guidance from a SMP that will apply to all future site owners. This alternative will be acceptable in relation to the use of the site.

- **Cost.** The costs associated with this alternative will be relatively low compared to the other alternatives and will include costs for soil excavation and disposal of approximately 730 cubic yards of impacted soil; 57 confirmation samples; and placement and analysis of a corresponding volume of clean imported backfill soil.

  Estimated Cost of Alternative B

Capital Cost:	$500,000
Annual Costs:	$2,000
Total Present Worth:	$525,000

4.3 Alternative C: Impacted Soil Removal and Disposal with Targeted Excavation

Under this alternative, soils above Restricted Commercial SCOs within the top 12 and 6 feet and within the top one foot of soils across the Site will be removed and disposed of off-site. A demarcation layer will be placed at the bottom of the excavation to provide a physical barrier between potential contamination and protective clean fill cover. Subsequent to the excavations, the excavations will be backfilled with clean backfill soil from an off-site source to bring the excavation back to the surrounding grade and provide a cover system at the site. The material used for backfill will be evaluated in accordance with the NYSDEC's DER-10 Section 5.4.

A NYSDEC environmental easement will be recorded for the site to minimize the potential for future exposures. The easement will: (1) limit the use of the site and (2) require implementation of an SMP. The SMP will include procedures for properly handling and disposing of soil left in place with mercury levels above the site uses for approximately 30 years.

- **Overall Protection of Human Health and the Environment.** This alternative will provide protection of human health and the environment since all soils above restricted commercial use will be removed and backfilled with clean soils. An environmental easement will limit the potential for contact with contaminated subsurface soils.

- **Compliance with SCGs.** This alternative will meet the SCG values for Restricted Commercial Use SCOs for soil contaminated with mercury. Some soil or fill material containing constituents at concentrations above the Unrestricted Use SCOs will remain on-site but will be managed with a SMP.

- **Long-term Effectiveness and Permanence.** The long-term effectiveness of this alternative will be sufficient since the use criteria will be achieved for the Site, the environmental easements will remain in effect in perpetuity, and metals present in the soil are generally immobile.

- **Short-term Effectiveness.** This alternative will increase short-term risks for the community and the workers during implementation of the alternative (i.e., potential exposure to particulates, truck traffic for hauling/disposing waste and importing clean soil); however, these can be minimized with the following measures:

  - Instituting a CHASP and CAMP to protect remedial workers and the surrounding community.

  - If necessary, taking measures to mitigate mobilization of metals-impacted particulates (dust suppression) during work.

  - Following NYSDOT and NYSDEC regulations related to transport and disposal of waste soils.

- **Reduction of Toxicity, Mobility, or Volume through Treatment.** This alternative will not result in the reduction of contaminant toxicity since no in-place treatment or contaminant destruction will occur; however, contaminant volume will be reduced through the removal of soil impacted with mercury above the Restricted Commercial Use SCO.

- **Implementability.** The implementability of this alternative is moderate. Excavation of soils with metals can be accomplished with limited disturbance to adjacent landowners and the community. Overhead power lines and subsurface utilities such as the storm drain and electric utility must be considered during excavation activities. In the event the electric utility will be affected, an alternative source of power, such as a generator, for the affected buildings will need to be implemented.

  In addition, development of the environmental easement and SMPs are implementable and have historical precedent with the NYSDEC on numerous impacted properties.

- **Land Use.** The site is currently occupied by commercial businesses. Although contaminated soils may remain on-site, soils will be handled or reused on-site with guidance from a SMP that will apply to all future site owners. This alternative will be acceptable in relation to the use of the site.

- **Cost.** The costs associated with this alternative will be moderately high and will include costs for soil excavation and disposal of approximately 4,700 cubic yards of impacted soil; 72 confirmatory and documentation soil samples; and placement and analysis of a corresponding volume of clean imported backfill soil.

  Estimated Cost of Alternative C

Capital Cost:	$2,746,000
Annual Costs:	$2,000
Total Present Worth:	$2,771,000

4.4 Alternative D: Knee of the Curve, Industrial Use Impacted Soil Removal and Disposal

Under this alternative, soils above the Industrial Use SCO of 5.7 mg/kg at various depths (2, 5, 6, 7, and 12 feet bgs) below the ground surface of the Site will be removed and disposed of off-site. A demarcation layer will be placed at the bottom of the excavation to provide a physical barrier between potential contamination and protective clean fill cover. After the excavations, the excavations will be backfilled with clean backfill soil from an off-site source to bring the excavation back to the surrounding grade and provide a cover system at the Site. The material used for backfill will be evaluated in accordance with the NYSDEC's DER-10 Section 5.4.

A NYSDEC environmental easement will be recorded for the site to minimize the potential for future exposures. The easement will: (1) limit the use of the site and (2) require implementation of an SMP. The SMP will include procedures for properly handling and disposing of soil left in place with mercury levels above the site uses for approximately 30 years.

- **Overall Protection of Human Health and the Environment.** This alternative will provide protection of human health and the environment since all surface soils that are easily accessible to humans will be removed and capped with clean soils. A demarcation layer and environmental easement will limit the potential for contact with contaminated subsurface soils.

- **Compliance with SCGs.** This alternative will remove soils that do not meet the SCG values for Restricted Industrial Use. This alternative will not necessarily meet the SCG values for Unrestricted Use and thus will require the additional protection of an environmental easement to meet SCGs. Additionally, subsurface soils with concentrations greater than SCGs will remain on-site below a demarcation layer and will be managed with a SMP.

- **Long-term Effectiveness and Permanence.** The long-term effectiveness of this alternative will be sufficient since industrial use criteria will be achieve and at least 97 percent of the mercury mass will be removed from the Site, including areas of high mercury concentration, the environmental easement will remain in effect in perpetuity, and the mercury contamination in the soil is generally stabilized and immobile.

- **Short-term Effectiveness.** This alternative will increase short-term risks for the community and the workers during implementation of the alternative (i.e., potential

exposure to particulates, truck traffic for hauling/disposing waste and importing clean soil); however, these can be minimized with the following measures:

- Instituting a CHASP and CAMP to protect remedial workers and the surrounding community.
- If necessary, taking measures to mitigate mobilization of metals-impacted particulates (dust suppression) during work.
- Following NYSDOT and NYSDEC regulations related to transport and disposal of waste soils.

- **Reduction of Toxicity, Mobility, or Volume through Treatment.** This alternative will not result in the reduction of contaminant toxicity since no in-place treatment or contaminant destruction will occur; however, contaminant volume will be reduced through the removal of soil impacted with mercury above the industrial use criteria.
- **Implementability.** The implementability of this alternative is moderate. Excavation of soils with metals can be accomplished with limited disturbance to adjacent landowners and the community. Overhead power lines and subsurface utilities such as the storm drain and electric utility must be considered during excavation activities. In the event the electric utility will be affected, an alternative source of power, such as a generator, for the affected buildings will need to be implemented.

  In addition, development of the environmental easement and SMPs are implementable and have historical precedent with the NYSDEC on numerous impacted properties.
- **Land Use.** The site is currently occupied by commercial businesses. Although contaminated soils may remain on-site, soils will be handled or reused on-site with guidance from a SMP that will apply to all future site owners. This alternative will be acceptable in relation to the use of the site.
- **Cost.** The costs associated with this alternative will be moderate and will include costs for soil excavation and disposal of approximately 2,900 cubic yards of impacted soil; 34 confirmatory and documentation soil samples; and placement and analysis of a corresponding volume of clean imported backfill soil.

  Estimated Cost of Alternative D

Capital Cost:	$2,206,000
Annual Costs:	$2,000
Total Present Worth:	$2,231,000

4.5 Alternative E: Unrestricted Use Impacted Soil Removal and Disposal

Under this alternative, soils above Unrestricted Use SCOs will be removed and disposed of off-site. After the excavations, the excavations will be backfilled with clean backfill soil from an off-

site source to bring the excavation back to the surrounding grade and provide a cover system at the site. The material used for backfill will be evaluated in accordance with the NYSDEC's DER-10 Section 5.4.

Institutional controls will not be required under this alternative.

- **Overall Protection of Human Health and the Environment.** This alternative will provide protection of human health and the environment since all soils above unrestricted use will be removed and backfilled with clean soils. Any soil remaining on site will not contain mercury in excess of the SCGs.
- **Compliance with SCGs.** This remedial alternative will result in compliance with SCGs since soil remaining on-site will not contain mercury above the most restrictive (lowest) concentration criteria.
- **Long-term Effectiveness and Permanence.** The long-term effectiveness of this alternative will be sufficient since no significantly impacted soil will remain on-site. This remedy is considered permanent.
- **Short-term Effectiveness.** This alternative will increase short-term risks for the community and the workers during implementation of the alternative (i.e., potential exposure to particulates, truck traffic for hauling/disposing waste and importing clean soil); however, these can be minimized with the following measures:
    - Instituting a CHASP and CAMP to protect remedial workers and the surrounding community.
    - If necessary, taking measures to mitigate mobilization of metals-impacted particulates (dust suppression) during work.
    - Following NYSDOT and NYSDEC regulations related to transport and disposal of waste soils.
- **Reduction of Toxicity, Mobility, or Volume through Treatment.** This alternative will not result in the reduction of contaminant toxicity since no in-place treatment or contaminant destruction will occur; however, contaminant volume will be reduced through the removal of soil impacted with mercury above the Unrestricted Use SCO.
- **Implementability.** The implementability of this alternative is low. This alternative may require excavation beneath the current asphalt pavement if any soils above the Unrestricted Use SCO criteria were detected in these areas. This will require the current owners to find additional space for parking, etc. during field activities. In addition, subsurface soils will be excavated down to the estimated depth of bedrock at the site, 20 feet bgs. Overhead power lines and subsurface utilities such as the storm drain and electric utility must be considered during excavation activities. In the event the electric utility will be affected, an alternative source of power, such as a generator, for the affected buildings will need to be implemented.

- **Land Use.** The site is currently occupied by the Fire Department and Electromark, a commercial business. It is anticipated that future site development will be limited to commercial use.

- **Cost.** The capital costs associated with this alternative will be prohibitively high and will include costs for soil excavation and disposal of approximately 29,000 cubic yards of impacted soil; 98 confirmatory soil samples; and placement and analysis of a corresponding volume of clean imported backfill soil. However, there will be no ongoing costs associated with Site Management.

  Estimated Cost of Alternative E

Capital Cost:	$9,984,000
Annual Costs:	$0
Total Present Worth:	$9,984,000

Table 4-1. Comparative Analysis of Alternatives

	Alternative				
	A. No Action	B. Restricted Use Impacted Soil Removal and Disposal	C. Impacted Soil Removal and Disposal with Targeted Excavation	D. Knee of Curve, Industrial Use Impacted Soil Removal and Disposal	E. Unrestricted Use Impacted Soil Removal and Disposal
Evaluation Criteria					
1. Protection of Public Health/Environment	No	Yes	Yes	Yes	Yes
2. Compliance with SCGs	No	Yes	Yes	Yes	Yes
3. Long-Term Effectiveness/Performance	None	Moderate	Moderate to High	Moderate to High	High
4. Short-Term Effectiveness	None	Low to Moderate	Moderate	Moderate	High
5. Reduction of Toxicity, Mobility, Volume	None	Low to Moderate	Moderate to High	Moderate to High	High
6. Implementability	Low	Low to Moderate	Moderate	Moderate	High
7. Land Use	Very Restrictive	Restrictive	Restrictive	Restrictive	Unrestricted
8. Total Costs	$0	$525,000	$2,771,000	$2,231,000	$9,984,000

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Section 5

Comparative Analysis of Alternatives and Recommended Actions

5.1 Comparison

- **Overall Protection of Human Health and the Environment.** All the alternatives except the No Action alternative will prevent current and future exposure to contaminated soils. Institutional controls such as an environmental easement will be required for Alternatives B, C, and D. Alternative E will not require institutional controls to meet overall protection of human health and the environment.

- **Compliance with SCGs.** All the alternatives except the No Action alternative will meet the Restricted Commercial SCO determined by future land use of the Site. Alternative E will provide additional protection in meeting the Unrestricted Use SCO. Alternatives B and C will require the use of a demarcation layer and institutional controls to meet SCGs.

- **Long-term Effectiveness and Permanence.** All the alternatives except the No Action alternative will permanently and effectively reduce potential human exposure to contaminated soils. Alternatives B, C, and D will require institutional controls to limit future usage of the Site.

- **Short-term Effectiveness.** There are no short-term impacts under the No Action alternative. Alternative B will have the least short-term impacts since it will be the fastest to implement and will require the least amount of excavation activities. Alternative E will have the greatest short-term impacts since it may require excavating underneath paved surfaces or down to bedrock. All short-term impacts are anticipated to be localized and temporary.

- **Reduction of Toxicity, Mobility, or Volume through Treatment.** The No Action alternative does not reduce the toxicity, mobility, or volume through treatment. None of the alternatives reduce the toxicity or mobility as no in-place destruction or treatment will occur. Alternatives B, C, D, and E will all reduce the volume of contamination present at the Site.

- **Implementability.** The alternatives are considered implementable. Overhead power lines and subsurface utilities such as the storm drain and electric utility must be considered during excavation activities. In the event the electric utility will be affected, an alternative source of power, such as a generator, for the affected buildings will need to be implemented. Considerations must be made to minimize affects to operational businesses around the site. Alternative E will be the most difficult to implement since it will involve temporary closure of parking/building access areas for excavation beneath paved surfaces on operational business properties.

- **Land Use.** The current, intended, and anticipated future use of the site is commercial. Except for the No Action alternative and Alternative D, all the alternatives will meet Restricted Commercial SCO regulations. Alternatives B, C, and D will utilize institutional controls that will potentially place restrictions on the current and future use of the site. Alternative E will not require restrictions on the current and future use of the site.

- **Cost.** Table 4-1 presents a summary of costs for all the remedial alternatives. Full cost estimations are presented in Appendix B.

5.2 Recommended Action

Based on the assessment detailed above, the recommended Remedial Action is Alternative B. This will consist of excavation and removal of the top one foot of soil above Restricted Commercial Use SCOs, placement of a demarcation layer, backfill of common fill meeting the chemical analysis requirements of DER-10 Section 5.4, implementation of an environmental easement to control future site use and protect against human exposure to contaminated soils remaining on-site, and a SMP describing procedures for properly handling and disposing of soil left in place for approximately 30 years.

Section 6

Summary of the Proposed Remedy

Alternative B is the recommended remedy. This alternative will meet the RAOs. The remedy will consist of the following elements:

- A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows:
  - Considering the environmental impacts of treatment technologies and remedy stewardship over the long term.
  - Reducing direct and indirect greenhouse gases and other emissions.
  - Increasing energy efficiency and minimizing use of non-renewable energy.
  - Conserving and efficiently managing resources and materials.
  - Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste.
  - Maximizing habitat value and creating habitat when possible.
  - Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals.
  - Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.
- Excavation and disposal of the top one foot of contaminated material. All soils in the top one foot which exceed the Restricted Commercial Use SCOs will be excavated and transported off-site for disposal. Approximately 730 cubic yards of contaminated soil will be removed from the site.
- Demarcation layer to provide physical separation of clean soils and stabilized contamination remaining in place. A demarcation layer will be placed above any contamination remaining on-site to provide physical separation. Rainwater and snow melt infiltration is not considered a concern to the remaining contamination.
- Clean fill cover consisting of soils meeting NYSDEC Restricted Commercial Use SCOs. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) will be brought in to complete the backfilling of the excavation and establish the designated grades at the site. The clean fill will act as a cover system and will be a minimum of one feet of clean soil with the upper six

inches of soil of sufficient quality to maintain a vegetative layer. Substitution of other materials and components may be allowed where such components already exist or are a component of the tangible properties to be placed as part of site redevelopment. Such components may include, but are not necessarily limited to pavement, concrete, paved surface parking areas, sidewalks, building foundations, and building slabs.

- An environmental easement is required for the site and will include:
  - Require the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8(h)(3).
  - Allow the use and development of the controlled property for Restricted Commercial Use as defined in Part 375-1.8(g), although land use is subject to local zoning laws.
  - Restrict the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Wayne County DOH.
- A SMP is required and will include:
  - An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:
    - *Institutional Controls: The Environmental Easement and groundwater use restriction.*
    - *Engineering Controls: The cover system.*
  - This plan includes, but may not be limited to:
    - *An Excavation Plan (including a CHASP and CAMP) which details the provisions for management of future excavations in areas of remaining contamination.*
    - *Descriptions of the provisions of the environmental easements including any land use and groundwater.*
    - *A provision that if a building foundation/slab or pavement is removed in the future, a cover system will be placed in any areas where the upper one foot of exposed surface soil exceeds the applicable SCOs.*
    - *Provisions for the management and inspection of the identified engineering control.*
    - *Maintaining site access controls and Department notification.*
    - *The steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.*

Section 7

References

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New York State Department of Environmental Conservation (NYSDEC), 2010. Final DER-10 Technical Guidance for Site Investigation on Remediation. May 2010.

U.S. Environmental Protection Agency (USEPA), 2020. Mercury: Chemistry and Behavior. February 2020.

U.S. Environmental Protection Agency (USEPA), 1996. Soil Screening Guidance: Technical Background Document. Washington, DC. May 1996.

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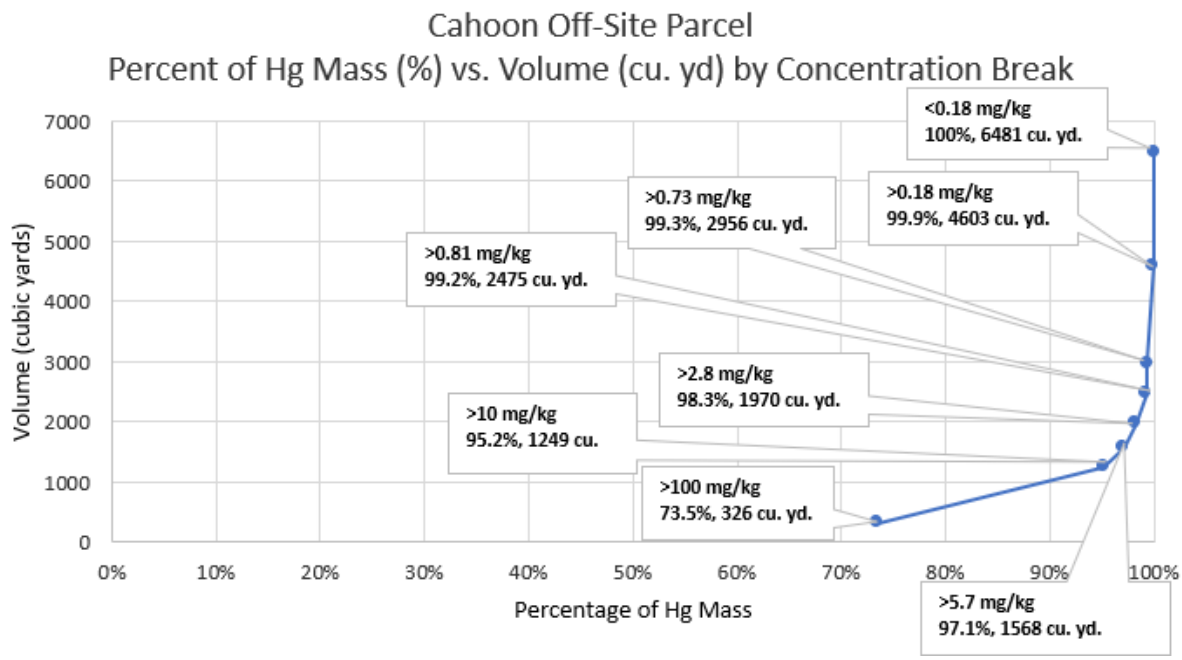
Appendix A

Knee of the Curve Analysis for Alternative D



The knee of the curve analysis is utilized to assess the effectiveness of mass removal against various cleanup levels. The knee of the curve is where the contaminant removal benefit is no longer increasing rapidly and is no longer worth the cost of further increases – a cutoff point of diminishing returns.

For the purposes of this analysis, Thiessen polygons were generated for each of the soil boring locations advanced at Cahoon Offsite Parcel Site. Each polygon surrounding the boring was used to represent the estimated surface area associated with each remedial investigation boring location. Each sample length was the multiplied by the representative surface area of the associated boring to calculate a sample volume. The mercury concentration detected at the associated sample interval was then used to represent this sample volume. A soil density of 1070.4 kilograms per cubic yards was utilized as the estimated soil density for all soils onsite. For each sample volume, the mass of mercury was then calculated.

The graph above presents the percentage of mercury mass present onsite above the identified soil cleanup criteria (10 mg/kg and 100 mg/kg are not currently soil cleanup criteria but were utilized in this analysis for reference) versus the associated volume of soil in cubic yards. Note that these associated soil volumes only represent areas where the respective criteria were exceeded. The soil volumes do not take in to account other material that would need to be removed as a part of necessity during excavation activities (i.e., benching, sloping) or practicality (i.e., volumes of less contaminated soil above soil that exceeds a less restrictive soil cleanup objective). These numbers are intended for comparison purposes only. For example, it is

estimated that the actual total volume that takes into account both soil that exceeds the industrial use criteria and soil that would need to be removed out of practicality is 2,900 cubic yards (as compared to the knee of the curve bare minimum estimate of 1,598 cubic yards).

Based on the graph, the industrial use SCO of 5.7 mg/kg represents the knee of the curve. Therefore, at minimum if all areas that exceeded the industrial use criteria were removed from the Site approximately 97 percent of the mercury mass would be removed. If the Site were to instead be cleaned up to the restricted commercial use criteria, only an additional 1.2 percent of the mercury mass would be removed. This would require, at minimum, a total of 400 cubic yards of additional material be removed. For additional reference, removing to the unrestricted use criteria only yields an additional 2.8 percent of mercury mass. This would require an additional 3,000 cubic yards of material to be removed, more than doubling the industrial use estimated removal volume.

Therefore, for Alternative D of the Analysis of Alternatives report the industrial use criteria is referenced as the knee of the curve value.

Appendix B

Cost Analyses of Alternatives

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CDM Smith	PROJECT:	Cahoon Parcel Off-site	COMPUTED BY :	LME	CHECKED BY: AER
	JOB NO.:	C859026A	DATE :	1/14/2022	DATE CHECKED: 1/26/2022
	CLIENT:	NYSDEC			

Description: **Individual Cost Item Backup for Alternative B**

01 - Construction Management & Operations - General Conditions

Project Schedule

Assume the following project schedule:

Pre-Construction Work Plans and Meetings (RA Work)	3	weeks		
Field Trailer Compound Establishment	0.5	weeks		
Site Preparation (Decon areas, stockpile areas, clearing)	1.5	weeks		
Shoring	0.0	weeks		
Remedial Excavation	0.2	weeks		
Transportation and Disposal (T & D)	0.20	weeks		
Backfill and Compaction (concurrent to T & D)	0.20	weeks		
Final Site Restoration and Demob	2	weeks		
Total Construction Duration	5	weeks		
	1.07	months		
Project Closeout	0.75	months		
Total Project Duration	**2.5**	**months**	**11**	**weeks**

General Condition Costs

A) Site Supervisory Staff (10 hours per week)

Project Manager	$160	per hour
Project Engineer	$120	per hour
Procurement staff (20 hours per week)	$100	per hour
Total for office support	**$42,000**	

Assume the following Site Supervisory Staff for duration of construction (see labor/equipment backup page for rates):

Site Superintendent	$110	per hour
Construction Foreman	$85	per hour
Environmental Technician (QC)	$100	per hour
Pickup Truck #1	$15	per hour
Pickup Truck #2	$15	per hour
per diem for superintendent and QC engineer	$96	per day
	$349.00	per hour
	$60,493	per month
Total Site Supervisory Staff for Construction Duration	**$65,000**	

B) Work Plan Preparation

Estimated # of Pre-Construction Work Plans Required:	1	work plans
Estimated # of Engineer Hours Required per Work Plan:	160	hours
Professional Engineer	$120	per hour
Project Manager	$160	per hour
Total Work Plan Preparation Cost:	**$44,800**	

C) Mobilization/Demobilization Fees

Assume 10 large pieces of equipment to be used throughout remedial action.

Includes erosion control and decontamination.

Per MEANS 01-54-36.50-0100 Mobilization, 50-mile round trip

Total Mobilization/Demobilization Cost: **$50,000**

TOTAL GENERAL CONDITION COST: **$202,000**

02 - Permits (Allowance)

TOTAL PERMIT COST: **$20,000**

03 - Safety and Health Requirements

Safety and Health Requirements to include the Site Health and Safety Officer, personnel protective equipment and supplies, and additional safety and air monitoring equipment/testing.

Total Construction Duration:	5	weeks	
	23	work days	

A) Site Health and Safety Officer

Part-time SHSO During Construction

Industrial Hygienist (SHSO)	$150	per hour	
			$6,000

B) PPE Costs

Assume PPE required for 10 people per work day for duration of demolition and construction.

Estimate $5 per day per worker for PPE and incidental safety equipment/testing. $2,000

C) Additional Safety and Air Monitoring Equipment

Add 20% to PPE Costs for additional safety and air monitoring equipment: $1,000

TOTAL SAFETY AND HEALTH REQUIREMENTS COST: $9,000

04 - Surveying

Assume surveying will be required for the following tasks/durations:

Existing Conditions Survey prior to Site Preparation	0.20	weeks
Excavation and Backfill Period (for depth verification, quantity measurement, waste char. samples, final grading)	0.40	weeks

Total Surveying Duration:	1	weeks
	3	work days

Survey Cost

Assume full-time 2-person survey team for the surveying work:

Surveyor #1	$85	per hour
Surveyor #2	$85	per hour
	$170	per hour
	$1,360	per day
As-built Drawing Preparation	$5,000	LS

TOTAL COST FOR SURVEYING: $10,000

05 - Excavation and Dewatering			
Excavation Area	19,700	square feet	
Excavation Perimeter	850	LF	
Excavation Depth	1	feet	
Excavation Volume	730	CY	
Contaminated Depth Interval	0 to 1	feet bgs	
Contaminated zone vertical thickness	1	feet	
Contaminated material volume	730	CY	
B) Excavation Duration			
Assume 420 SY/day production rate for pavement demolition per RS Means item # 02.41.1317.5050			
Assumed excavation product rate	750	CY/day	
Excavation cost	$ 7.96	CY	
Excavation Period, workdays			1 DAYS
Total Demo & Excavation Period, workdays			1 DAYS
Total Demo & Excavation Period, work hours (8 hours per day)			8 HOURS
Total Demo & Excavation Period, work weeks			0.2 WEEKS
Total Excavation Costs	$5,900		
D) Dewatering Costs			
Dewatering System weekly rental allowance	$8,000		
(assume bag filter treatment with all associated equipment and carbon polish treatment)			
Utilities & Carbon Usage Costs (weekly allowance)	$1,000		
Total dewatering cost	$4,000		
(during excavation and backfill periods only)			
TOTAL EXCAVATION COST	**$10,000**		
06 - Confirmation Sampling			
To check whether SCG requirements are met:			
1 sidewall sample per 30 LF			
pre and post staging area 1 per 900 SF			
pre and post decon pad 1 per 900 SF			
A) Estimated # of Confirmation Samples			
Total # of samples:	57	samples	
B) Laboratory Analysis Fees			
Analytical Cost per sample (Mercury)		**$26**	
Total Laboratory Analysis Costs:		**$1,482**	
C) Sample Collection			
Assume 1 hour per sample for an environmental technician to collect each sample			
Environmental Technician	$100	per hour	**$5,700**
D) Sample Packaging and Shipping Costs			
Assume shipping cost is 5% of analytical cost:			**$74**
TOTAL CONFIRMATION SAMPLING:	**$8,000**		

07 - Waste Characterization Sampling

To check whether TCLP requirements are met:

1 sample per 300 CY of total volume - soil, asphalt and debris

A) Estimated # of Waste Characterization Samples

Total # of samples:	3 samples	

B) Laboratory Analysis Fees

Waste Characterization Analytical Cost per sample		**$750**
Waste Characterization Total Mercury Cost per sample		**$26**
Total Laboratory Analysis Costs:		**$2,328**

C) Waste Characterization Sample Collection

Assume 1 hour per sample for an environmental technician to collect each sample

Environmental Technician	$100 per hour	**$595**

D) Sample Packaging and Shipping Costs

Assume shipping cost is 5% of analytical cost:	**$113**

TOTAL WASTE-CHARACTERIZATION SAMPLING: $4,000

08 - Transportation and Disposal

A) Transportation and Disposal Costs

a) Quantity Calculation at time of FS based on existing data

b) Add 25% additional volume to account for bulking between bank and loose cubic yards for soil.

c) Assumes 1.6 tons per CY soil density, 2 tons per CY for debris.

Waste Category	In-place Quantity (BCY)	Quantity after Excavation (LCY)	Quantity (tons)	Disposal Type
High Mercury - Soil (assumed 8% of total soil)	59	80	100	Subtitle D Landfill
Non-Hazardous Waste - Soil (assumed 92% of total soil)	672	840	1,100	Subtitle D Landfill
Subtotal Waste Volume	**731**	**920**	**1,200**	

Waste Category	Quantity (LCY)	Quantity (tons)	Transport & Disposal (per ton)	Extended Costs
High Mercury - Soil	80	100	$330	$33,460
Non-Hazardous Waste - Soil	840	1,100	$70	$77,000
Subtotal T&D Cost	**920**	**1,200**		**$110,460**

B) Labor and equipment costs for loading the truck for offsite disposal

Assume 50 trucks per day for offsite shipment (each truckload is 25 CY)

Time for loading the material for offsite disposal		1 days
Excavator, Hydraulic, 2 CY	$100 per hour	
Equip. Op. Heavy	$85 per hour	
Laborer (Semi-Skilled)	$60 per hour	
Laborer (Semi-Skilled)	$60 per hour	
Total rate per day	$2,440 per day	
Total Cost	**$2,500**	

Total Transportation and Disposal Costs $113,000

09 - Backfill and Restoration			
Total Excavation Volume	730	BCY	
(Bulking factor 0.25)	912	Loose Cubic Yards (LCY)	
Backfill & Restoration Duration			
Assume backfill has a production rate of 4000 CY/day			
Total Backfill Period, workdays			1 DAYS
Total Backfill Period, work hours (8 hours per day)			8 HOURS
Total Backfill Period, work weeks			0.2 WEEKS
Total Backfill Period, months			0.05 MONTHS
A) Backfill Labor/Equipment Costs			
Backfill Labor & Equipment Unit Rate	$8.79	per LCY	
Total Backfill Labor and Equipment Cost	**$8,100**		
B) Backfill Material Costs			
Backfill Material Costs:			
Common Fill Unit Cost	$11.60	per CY	
Fresh Backfill Material Quantity (with 0.25 bulking factor)		912	LCY
Backfill hauling unit cost	$20.49	per LCY	
Total backfill hauling costs	$18,688		
Backfill Material Cost	$10,580		
Total Backfill Material Costs:	**$29,300**		
C) Backfill Material Testing			
DER 10, analyzed for full parameters			
including sieve analyses, moisture content, and chemical compounds:			
# of Backfill Material Samples Required:			samples
Sieve and moisture content		$ 150	
9 VOC per 1000 CY		$ 493	$60
3 SVOC		$ 274	$100
3 PCB		$ 109	$40
3 Pesticides		$ 178	$65
3 Metals		$ 192	$70
3 PFAS		$ 616	$225
Backfill Testing Cost:	**$2,011**		
D) Soil Density Testing			
Assume $500 per visit by soil density testing technician, 2 visits per week, during backfill operations.			
# of Backfill Visits Required:			1 visits
Soil Density Testing Cost:	**$500**		
TOTAL BACKFILL AND RESTORATION COST:	**$40,000**		
Subtotal for Excavation	$ 416,000		
20% Subcontractor Markup (profit, insurance, etc.)	$ 83,200		
TOTAL EXCAVATION COST	**$ 500,000**		
10 - Present Worth of Annual Costs			
Annual Costs	$2,000		
Present Worth of Annual Costs	$25,000.00		
PRESENT WORTH OF ALTERNATIVE B	**$ 525,000**		

CDM Smith	PROJECT:	Cahoon Parcel Off-site	COMPUTED BY :	LME	CHECKED BY: AER
	JOB NO.:	C859026A	DATE :	1/14/2022	DATE CHECKED: 1/26/2022
	CLIENT:	NYSDEC			

Description: **Individual Cost Item Backup for Alternative C**

01 - Construction Management & Operations - General Conditions

Project Schedule

Assume the following project schedule:

Pre-Construction Work Plans and Meetings (RA Work)	3	weeks		
Field Trailer Compound Establishment	0.5	weeks		
Site Preparation (Decon areas, stockpile areas, clearing)	1.5	weeks		
Shoring	18.6	weeks		
Remedial Excavation	1.4	weeks		
Transportation and Disposal (T & D)	1.00	weeks		
Backfill and Compaction (concurrent to T & D)	0.40	weeks		
Final Site Restoration and Demob	2	weeks		
Total Construction Duration	25	weeks		
	5.91	months		
Project Closeout	0.75	months		
Total Project Duration	**7.4**	**months**	**32**	**weeks**

General Condition Costs

A) Site Supervisory Staff (10 hours per week)

Project Manager	$160	per hour
Project Engineer	$120	per hour
Procurement staff (20 hours per week)	$100	per hour
Total for office support	**$122,000**	

Assume the following Site Supervisory Staff for duration of construction (see labor/equipment backup page for rates):

Site Superintendent	$110	per hour
Construction Foreman	$85	per hour
Environmental Technician (QC)	$100	per hour
Pickup Truck #1	$15	per hour
Pickup Truck #2	$15	per hour
per diem for superintendent and QC engineer	$96	per day
	$349.00	per hour
	$60,493	per month
Total Site Supervisory Staff for Construction Duration		**$358,000**

B) Work Plan Preparation

Estimated # of Pre-Construction Work Plans Required:	1	work plans
Estimated # of Engineer Hours Required per Work Plan:	160	hours
Professional Engineer	$120	per hour
Project Manager	$160	per hour
Total Work Plan Preparation Cost:		**$44,800**

C) Mobilization/Demobilization Fees

Assume 10 large pieces of equipment to be used throughout remedial action.

Includes erosion control and decontamination.

Per MEANS 01-54-36.50-0100 Mobilization, 50-mile round trip

Total Mobilization/Demobilization Cost: **$50,000**

TOTAL GENERAL CONDITION COST: **$575,000**

02 - Permits (Allowance)

TOTAL PERMIT COST: **$20,000**

03 - Safety and Health Requirements

Safety and Health Requirements to include the Site Health and Safety Officer, personnel protective equipment and supplies, and additional safety and air monitoring equipment/testing.

Total Construction Duration:	25	weeks
	127	work days

A) Site Health and Safety Officer

Part-time SHSO During Construction

Industrial Hygienist (SHSO)	$150	per hour	
			$31,000

B) PPE Costs

Assume PPE required for 10 people per work day for duration of demolition and construction.

Estimate $5 per day per worker for PPE and incidental safety equipment/testing. $7,000

C) Additional Safety and Air Monitoring Equipment

Add 20% to PPE Costs for additional safety and air monitoring equipment: $2,000

TOTAL SAFETY AND HEALTH REQUIREMENTS COST: $40,000

04 - Temporary Facilities

Temporary Facilities to include the field trailers, utilities, cleaning services, and office equipment and supplies.

A) Field Trailers

Assume 1 project trailer required.

The trailer compound will be mobilized at project start and will be used for entire project duration (not just the construction).

Total Duration for Field Portion of Project: 25 weeks

MEANS 01-52-13.20-0550 Field Trailer Rental, 50' x 12', furnished	$405
MEANS 01-52-13.20-0700 Add for Air Conditioning	$46
	$451
Field Trailer Rental Cost per Trailer :	$3,000
Installation of Utility Connections (allowance):	$10,000
Total Field Trailer Rental Cost for 1 trailer:	**$13,000**

B) Utilities and Cleaning Services for Field Trailers

Assume following utilities per month per trailer:

Electricity	$600	per month per trailer
Phone/Internet	$80	per month per trailer
Water	$40	per month per trailer
Sewer	$30	per month per trailer
Cleaning Services	$50	per month per trailer
	$800	per month per trailer

Total Utilities and Cleaning Services for 1 trailer: $21,000

C) Miscellaneous Office Supplies

Item	QTY	UOM	Unit Cost	Extended Cost
Computers	2	each	$2,000	$4,000
Fax Machines	1	each	$300	$300
Printers	1	each	$500	$500
Office Supplies	7	months	$300	$2,100

Total Miscellaneous Office Equipment/Supplies: $7,000

TOTAL COST FOR TEMPORARY FACILITIES: $41,000

05 - Security

Assume for duration of construction requires 16-hour security guard for weekdays and 24-hour security guard for weekends.

Total Field Duration:	25	weeks	
	3,251	hours	

A) Security Guard

Security Guard	$40	per hour	
		Total Security Guard Cost:	**$131,000**

TOTAL COST FOR SITE SECURITY: **$131,000**

06 - Surveying

Assume surveying will be required for the following tasks/durations:

Existing Conditions Survey prior to Site Preparation	0.2	weeks
Excavation and Backfill Period (for depth verification, quantity measurement, waste char. samples, final grading)	1.80	weeks
Total Surveying Duration:	2	weeks
	10	work days

Survey Cost

Assume full-time 2-person survey team for the surveying work:

Surveyor #1	$85	per hour
Surveyor #2	$85	per hour
	$170	per hour
	$1,360	per day
As-built Drawing Preparation	$5,000	LS

TOTAL COST FOR SURVEYING: **$19,000**

07 - Sheet Pile Installation, Removal, and Monitoring

Excavation Perimeter	860	LF
Excavation Depth	12	feet bgs
Sheetpile Installation Depth	21	feet
Square footage	18,060	SF
Weight of Waler/Struts	24	lbs/sf
Tons of Waler/Struts Installed	217	tons
Sheeting - Total LF	860	LF

B) Sheeting Duration

Assumed installation rate	15	LF/day		
Assumed removal rate	25	LF/day		
Installation Period, workdays			58	DAYS
Removal Period, workdays			35	DAYS
		total	93	DAYS

C) Sheeting Equipment Costs

Mobilize Pile Driving Equipment	$ 10,000	LS	
Install/Remove Walers and Struts	$ 1,914	/ton	
Cost	$424,707		
Total Sheetpiling Installation/Removal Costs		$430,287	

D) Vibration Monitoring

Daily Vibration Monitoring System rental	$100	/day
Total Vibration Monitoring cost	$9,300	
(during sheetpile installation and removal periods only)		

TOTAL SHEETING COST **$440,000**

08 - Excavation and Dewatering			
Targeted Excavation Area (6-foot)			
Excavation Area		17,400	square feet
Excavation Depth		6	feet
Excavation Volume		3,867	CY
Contaminated Depth Interval		0 to 6	feet bgs
Contaminated zone vertical thickness		6	feet
Contaminated material volume		3,867	CY
Targeted Excavation Area (12-foot) Excavation Area			
Excavation Area		1,700	square feet
Excavation Depth		12	feet
Excavation Volume		756	CY
Contaminated Depth Interval		0 to 12	feet bgs
Contaminated zone vertical thickness		12	feet
Contaminated material volume		756	CY
Additional Excavation Area			
Excavation Area		3,500	square feet
Excavation Depth		1	feet
Excavation Volume		130	CY
Contaminated Depth Interval		0 to 1	feet bgs
Contaminated zone vertical thickness		1	feet
Contaminated material volume		130	CY
B) Excavation Duration			
Assume 420 SY/day production rate for pavement demolition per RS Means item # 02.41.1317.5050			
Assumed excavation product rate	750	CY/day	
Excavation cost	$ 7.96	CY	
Pavement demolition period, workdays	0.0	days	
Excavation Period, workdays			7 DAYS
Total Demo & Excavation Period, workdays			7 DAYS
Total Demo & Excavation Period, work hours (8 hours per day)			56 HOURS
Total Demo & Excavation Period, work weeks			1.4 WEEKS
Total Excavation Costs		$37,900	
D) Dewatering Costs			
Dewatering System weekly rental allowance		$8,000	
(assume air stripper treatment with all associated equipment and carbon polish treatment)			
Utilities & Carbon Usage Costs (weekly allowance)		$1,000	
Total dewatering cost		$17,000	
(during excavation and backfill periods only)			
TOTAL EXCAVATION COST		**$55,000**	

09 - Confirmation Sampling			
To check whether SCG requirements are met:			
1 sidewall samples per 30 LF, 1 bottom sample per 900 SF			
pre and post staging area 1 per 900 SF			
pre and post decon pad 1 per 900 SF			
A) Estimated # of Confirmation Samples			
Total # of samples:	72 samples		
B) Laboratory Analysis Fees			
Analytical Cost per sample (Mercury)		$26	
Total Laboratory Analysis Costs:		**$1,872**	
C) Sample Collection			
Assume 1 hour per sample for an environmental technician to collect each sample			
Environmental Technician	$100 per hour	**$7,200**	
D) Sample Packaging and Shipping Costs			
Assume shipping cost is 5% of analytical cost:		**$94**	
TOTAL CONFIRMATION SAMPLING:	**$10,000**		
10 - Waste Characterization Sampling			
To check whether TCLP requirements are met:			
1 sample per 300 CY of total volume - soil, asphalt and debris			
A) Estimated # of Waste Characterization Samples			
Total # of samples:	16 samples		
B) Laboratory Analysis Fees			
Waste Characterization Analytical Cost per sample		**$750**	
Waste Characterization Total Mercury Cost per sample		**$26**	
Total Laboratory Analysis Costs:		**$12,416**	
C) Waste Characterization Sample Collection			
Assume 1 hour per sample for an environmental technician to collect each sample			
Environmental Technician	$100 per hour	**$595**	
D) Sample Packaging and Shipping Costs			
Assume shipping cost is 5% of analytical cost:		**$600**	
TOTAL WASTE-CHARACTERIZATION SAMPLING:	**$14,000**		

11 - Transportation and Disposal

A) Transportation and Disposal Costs

a) Quantity Calculation at time of FS based on existing data

b) Add 25% additional volume to account for bulking between bank and loose cubic yards for soil.

c) Assumes 1.6 tons per CY soil density, 2 tons per CY for debris.

Waste Category	In-place Quantity (BCY)	Quantity after Excavation (LCY)	Quantity (tons)	Disposal Type
High Mercury - Soil (assumed 8% of total soil)	381	480	700	Subtitle D Landfill
Non-Hazardous Waste - Soil (assumed 92% of total soil)	4,372	5,470	7,000	Subtitle D Landfill
Subtotal Waste Volume	**4,753**	**5,950**	**7,700**	

Waste Category	Quantity (LCY)	Quantity (tons)	Transport & Disposal (per ton)	Extended Costs
High Mercury - Soil	480	700	$330	$231,460
Non-Hazardous Waste - Soil	5,470	7,000	$70	$490,000
Subtotal T&D Cost	**5,950**	**7,700**		**$721,460**

B) Labor and equipment costs for loading the truck for offsite disposal

Assume 50 trucks per day for offsite shipment (each truckload is 25 CY)

Time for loading the material for offsite disposal		5 days
Excavator, Hydraulic, 2 CY	$100	per hour
Equip. Op. Heavy	$85	per hour
Laborer (Semi-Skilled)	$60	per hour
Laborer (Semi-Skilled)	$60	per hour
Total rate per day	$2,440	per day
Total Cost	**$12,200**	

Total Transportation and Disposal Costs **$734,000**

12 - Backfill and Restoration				
Total Excavation Volume	3,867	BCY		
(Bulking factor 0.25)	4,833	Loose Cubic Yards (LCY)		
Backfill & Restoration Duration				
Assume backfill has a production rate of 4000 CY/day				
Total Backfill Period, workdays			2	DAYS
Total Backfill Period, work hours (8 hours per day)			16	HOURS
Total Backfill Period, work weeks			0.4	WEEKS
Total Backfill Period, months			0.09	MONTHS
A) Backfill Labor/Equipment Costs				
Backfill Labor & Equipment Unit Rate	$8.79	per LCY		
Total Backfill Labor and Equipment Cost	**$42,500**			
B) Backfill Material Costs				
Backfill Material Costs:				
Common Fill Unit Cost	$11.60	per CY		
Fresh Backfill Material Quantity (with 0.25 bulking factor)		4,833	LCY	
Backfill hauling unit cost	$20.49	per LCY		
Total backfill hauling costs	$99,035			
Backfill Material Cost	$56,067			
Total Backfill Material Costs:	**$155,200**			
C) Backfill Material Testing				
DER 10, analyzed for full parameters				
including sieve analyses, moisture content, and chemical compounds:				
# of Backfill Material Samples Required:			samples	
Sieve and moisture content		$ 150		
9 VOC per 1000 CY		$ 2,610	$60	
3 SVOC		$ 1,450	$100	
3 PCB		$ 580	$40	
3 Pesticides		$ 943	$65	
3 Metals		$ 1,015	$70	
3 PFAS		$ 3,263	$225	
Backfill Testing Cost:	**$10,010**			
D) Soil Density Testing				
Assume $500 per visit by soil density testing technician, 2 visits per week, during backfill operations.				
# of Backfill Visits Required:			1	visits
Soil Density Testing Cost:	**$500**			
TOTAL BACKFILL AND RESTORATION COST:	**$209,000**			
Subtotal for Excavation	$ 2,288,000			
20% Subcontractor Markup (profit, insurance, etc.)	$ 457,600			
TOTAL EXCAVATION COST	**$ 2,746,000**			
13 - Present Worth of Annual Costs				
Annual Costs	$2,000			
Present Worth of Annual Costs	$25,000.00			
PRESENT WORTH OF ALTERNATIVE C	**$ 2,771,000**			

CDM Smith	PROJECT: Cahoon Parcel Off-site	COMPUTED BY : LME	CHECKED BY: AER
	JOB NO.: C859026A	DATE : 1/14/2022	DATE CHECKED: 1/26/2022
	CLIENT: NYSDEC		

Description: **Individual Cost Item Backup for Alternative D**

01 - Construction Management & Operations - General Conditions

Project Schedule

Assume the following project schedule:

Pre-Construction Work Plans and Meetings (RA Work)	3	weeks		
Field Trailer Compound Establishment	0.5	weeks		
Site Preparation (Decon areas, stockpile areas, clearing)	1.5	weeks		
Shoring	14.4	weeks		
Remedial Excavation	0.8	weeks		
Transportation and Disposal (T & D)	0.60	weeks		
Backfill and Compaction (concurrent to T & D)	0.20	weeks		
Final Site Restoration and Demob	2	weeks		
Total Construction Duration	20	weeks		
	4.65	months		
Project Closeout	0.75	months		
Total Project Duration	**6.1**	**months**	**27**	**weeks**

General Condition Costs

A) Site Supervisory Staff (10 hours per week)

Project Manager	$160	per hour
Project Engineer	$120	per hour
Procurement staff (20 hours per week)	$100	per hour
Total for office support	**$103,000**	

Assume the following Site Supervisory Staff for duration of construction (see labor/equipment backup page for rates):

Site Superintendent	$110	per hour
Construction Foreman	$85	per hour
Environmental Technician (QC)	$100	per hour
Pickup Truck #1	$15	per hour
Pickup Truck #2	$15	per hour
per diem for superintendent and QC engineer	$96	per day
	$349.00	per hour
	$60,493	per month
Total Site Supervisory Staff for Construction Duration		**$282,000**

B) Work Plan Preparation

Estimated # of Pre-Construction Work Plans Required:	1	work plans
Estimated # of Engineer Hours Required per Work Plan:	160	hours
Professional Engineer	$120	per hour
Project Manager	$160	per hour
Total Work Plan Preparation Cost:		**$44,800**

C) Mobilization/Demobilization Fees

Assume 10 large pieces of equipment to be used throughout remedial action.

Includes erosion control and decontamination.

Per MEANS 01-54-36.50-0100 Mobilization, 50-mile round trip

Total Mobilization/Demobilization Cost: **$50,000**

TOTAL GENERAL CONDITION COST: **$480,000**

02 - Permits (Allowance)

TOTAL PERMIT COST: **$20,000**

03 - Safety and Health Requirements

Safety and Health Requirements to include the Site Health and Safety Officer, personnel protective equipment and supplies, and additional safety and air monitoring equipment/testing.

Total Construction Duration:	20	weeks
	100	work days

A) Site Health and Safety Officer

Part-time SHSO During Construction

Industrial Hygienist (SHSO)	$150	per hour	
			$24,000

B) PPE Costs

Assume PPE required for 10 people per work day for duration of demolition and construction.

Estimate $5 per day per worker for PPE and incidental safety equipment/testing. $5,000

C) Additional Safety and Air Monitoring Equipment

Add 20% to PPE Costs for additional safety and air monitoring equipment: $1,000

TOTAL SAFETY AND HEALTH REQUIREMENTS COST: $30,000

04 - Temporary Facilities

Temporary Facilities to include the field trailers, utilities, cleaning services, and office equipment and supplies.

A) Field Trailers

Assume 1 project trailer required.

The trailer compound will be mobilized at project start and will be used for entire project duration (not just the construction).

Total Duration for Field Portion of Project: 20 weeks

MEANS 01-52-13.20-0550 Field Trailer Rental, 50' x 12', furnished	$405
MEANS 01-52-13.20-0700 Add for Air Conditioning	$46
	$451
Field Trailer Rental Cost per Trailer :	$3,000
Installation of Utility Connections (allowance):	$10,000
Total Field Trailer Rental Cost for 1 trailer:	**$13,000**

B) Utilities and Cleaning Services for Field Trailers

Assume following utilities per month per trailer:

Electricity	$600	per month per trailer
Phone/Internet	$80	per month per trailer
Water	$40	per month per trailer
Sewer	$30	per month per trailer
Cleaning Services	$50	per month per trailer
	$800	per month per trailer

Total Utilities and Cleaning Services for 1 trailer: $16,000

C) Miscellaneous Office Supplies

Item	QTY	UOM	Unit Cost	Extended Cost
Computers	2	each	$2,000	$4,000
Fax Machines	1	each	$300	$300
Printers	1	each	$500	$500
Office Supplies	5	months	$300	$1,500

Total Miscellaneous Office Equipment/Supplies: $7,000

TOTAL COST FOR TEMPORARY FACILITIES: $36,000

05 - Security

Assume for duration of construction requires 16-hour security guard for weekdays and 24-hour security guard for weekends.

Total Field Duration:	20	weeks	
	2,560	hours	

A) Security Guard

Security Guard	$40	per hour	
		Total Security Guard Cost:	**$103,000**

TOTAL COST FOR SITE SECURITY: **$103,000**

06 - Surveying

Assume surveying will be required for the following tasks/durations:

Existing Conditions Survey prior to Site Preparation	0.2	weeks
Excavation and Backfill Period (for depth verification, quantity measurement, waste char. samples, final grading)	1.00	weeks

Total Surveying Duration:	1	weeks
	6	work days

Survey Cost

Assume full-time 2-person survey team for the surveying work:

Surveyor #1	$85	per hour
Surveyor #2	$85	per hour
	$170	per hour
	$1,360	per day

As-built Drawing Preparation	$5,000	LS

TOTAL COST FOR SURVEYING: **$14,000**

07 - Sheet Pile Installation, Removal, and Monitoring

Excavation Area (6-foot)		
Excavation Perimeter	215	LF
Excavation Depth	6	feet bgs
Sheetpile Installation Depth	11	feet
Square footage	2,258	SF
Weight of Waler/Struts	24	lbs/sf
Tons of Waler/Struts Installed	27	tons
Sheeting - Subtotal LF	215	LF
Excavation Area (7-foot)		
Excavation Perimeter	230	LF
Excavation Depth	7	feet bgs
Sheetpile Installation Depth	12	feet
Square footage	2,818	SF
Weight of Waler/Struts	24	lbs/sf
Tons of Waler/Struts Installed	34	tons
Sheeting - Subtotal LF	230	LF
Excavation Area (12-foot)		
Excavation Perimeter	225	LF
Excavation Depth	12	feet bgs
Sheetpile Installation Depth	21	feet
Square footage	4,725	SF
Weight of Waler/Struts	24	lbs/sf
Tons of Waler/Struts Installed	57	tons
Sheeting - Subtotal LF	225	LF
Sheeting - TOTAL LF	670	LF

B) Sheeting Duration

Assumed installation rate	15	LF/day

Assumed removal rate	25	LF/day		
Installation Period, workdays				45 DAYS
Removal Period, workdays				27 DAYS
			total	72 DAYS
C) Sheeting Equipment Costs				
Mobilize Pile Driving Equipment	$ 10,000	LS		
Install/Remove Walers and Struts	$ 1,914	/ton		
Cost	$235,035			
Total Sheetpiling Installation/Removal Costs		$239,355		
D) Vibration Monitoring				
Daily Vibration Monitoring System rental		$100	/day	
Total Vibration Monitoring cost		$7,200		
(during sheetpile installation and removal periods only)				
TOTAL SHEETING COST		**$247,000**		

08 - Excavation and Dewatering			
Excavation Area (5-feet)			
Excavation Area	7,380	square feet	
Excavation Depth	5	feet	
Excavation Volume	1,367	CY	
Contaminated Depth Interval	0 to 5	feet bgs	
Contaminated zone vertical thickness	5	feet	
Contaminated material volume	1,367	CY	
Excavation Area (2-feet)			
Excavation Area	240	square feet	
Excavation Depth	2	feet	
Excavation Volume	18	CY	
Contaminated Depth Interval	0 to 2	feet bgs	
Contaminated zone vertical thickness	2	feet	
Contaminated material volume	18	CY	
Excavation Area (6-feet)			
Excavation Area	1,310	square feet	
Excavation Depth	6	feet	
Excavation Volume	291	CY	
Contaminated Depth Interval	0 to 6	feet bgs	
Contaminated zone vertical thickness	6	feet	
Contaminated material volume	291	CY	
Excavation Area (7-feet)			
Excavation Area	1,735	square feet	
Excavation Depth	7	feet	
Excavation Volume	450	CY	
Contaminated Depth Interval	0 to 7	feet bgs	
Contaminated zone vertical thickness	7	feet	
Contaminated material volume	450	CY	
Excavation Area (12-feet)			
Excavation Area	1,660	square feet	
Excavation Depth	12	feet	
Excavation Volume	738	CY	
Contaminated Depth Interval	0 to 12	feet bgs	
Contaminated zone vertical thickness	12	feet	
Contaminated material volume	738	CY	
B) Excavation Duration			
Assume 420 SY/day production rate for pavement demolition per RS Means item # 02.41.1317.5050			
Assumed excavation product rate	750	CY/day	
Excavation cost	$ 7.96	CY	
Pavement demolition period, workdays	0.0	days	
Excavation Period, workdays			4 DAYS
Total Demo & Excavation Period, workdays			4 DAYS
Total Demo & Excavation Period, work hours (8 hours per day)			32 HOURS
Total Demo & Excavation Period, work weeks			0.8 WEEKS
Total Excavation Costs	$22,800		
D) Dewatering Costs			
Dewatering System weekly rental allowance	$8,000		
(assume air stripper treatment with all associated equipment and carbon polish treatment)			
Utilities & Carbon Usage Costs (weekly allowance)	$1,000		

Total dewatering cost	$9,000
(during excavation and backfill periods only)	
TOTAL EXCAVATION COST	**$32,000**

09 - Confirmation Sampling			
To check whether SCG requirements are met:			
1 sidewall samples per 30 LF, 1 bottom sample per 900 SF			
pre and post staging area 1 per 900 SF			
pre and post decon pad 1 per 900 SF			
A) Estimated # of Confirmation Samples			
Total # of samples:	85 samples		
B) Laboratory Analysis Fees			
Analytical Cost per sample (Mercury)		$26	
Total Laboratory Analysis Costs:		**$2,210**	
C) Sample Collection			
Assume 1 hour per sample for an environmental technician to collect each sample			
Environmental Technician	$100 per hour	**$8,500**	
D) Sample Packaging and Shipping Costs			
Assume shipping cost is 5% of analytical cost:		**$111**	
TOTAL CONFIRMATION SAMPLING:	**$11,000**		
10 - Waste Characterization Sampling			
To check whether TCLP requirements are met:			
1 sample per 300 CY of total volume - soil, asphalt and debris			
A) Estimated # of Waste Characterization Samples			
Total # of samples:	10 samples		
B) Laboratory Analysis Fees			
Waste Characterization Analytical Cost per sample		**$750**	
Waste Characterization Total Mercury Cost per sample		**$26**	
Total Laboratory Analysis Costs:		**$7,760**	
C) Waste Characterization Sample Collection			
Assume 1 hour per sample for an environmental technician to collect each sample			
Environmental Technician	$100 per hour	**$595**	
D) Sample Packaging and Shipping Costs			
Assume shipping cost is 5% of analytical cost:		**$375**	
TOTAL WASTE-CHARACTERIZATION SAMPLING:	**$9,000**		

11 - Transportation and Disposal

A) Transportation and Disposal Costs

a) Quantity Calculation at time of FS based on existing data

b) Add 25% additional volume to account for bulking between bank and loose cubic yards for soil.

c) Assumes 1.6 tons per CY soil density, 2 tons per CY for debris.

Waste Category	In-place Quantity (BCY)	Quantity after Excavation (LCY)	Quantity (tons)	Disposal Type
High Mercury - Soil (assumed 30% of total soil)	859	1,080	1,400	Subtitle D Landfill
Non-Hazardous Waste - Soil (assumed 70% of total soil)	2,005	2,510	3,300	Subtitle D Landfill
Subtotal Waste Volume	**2,864**	**3,590**	**4,700**	

Waste Category	Quantity (LCY)	Quantity (tons)	Transport & Disposal (per ton)	Extended Costs
High Mercury - Soil	1,080	1,400	$330	$462,460
Non-Hazardous Waste - Soil	2,510	3,300	$70	$231,000
Subtotal T&D Cost	**3,590**	**4,700**		**$693,460**

B) Labor and equipment costs for loading the truck for offsite disposal

Assume 50 trucks per day for offsite shipment (each truckload is 25 CY)

Time for loading the material for offsite disposal	3 days	
Excavator, Hydraulic, 2 CY	$100	per hour
Equip. Op. Heavy	$85	per hour
Laborer (Semi-Skilled)	$60	per hour
Laborer (Semi-Skilled)	$60	per hour
Total rate per day	$2,440	per day
Total Cost	**$7,400**	

Total Transportation and Disposal Costs **$701,000**

12 - Backfill and Restoration				
Total Excavation Volume	2,863	BCY		
(Bulking factor 0.25)	3,579	Loose Cubic Yards (LCY)		
Backfill & Restoration Duration				
Assume backfill has a production rate of 4000 CY/day				
Total Backfill Period, workdays			1	DAYS
Total Backfill Period, work hours (8 hours per day)			8	HOURS
Total Backfill Period, work weeks			0.2	WEEKS
Total Backfill Period, months			0.05	MONTHS
A) Backfill Labor/Equipment Costs				
Backfill Labor & Equipment Unit Rate	$8.79	per LCY		
Total Backfill Labor and Equipment Cost	**$31,500**			
B) Backfill Material Costs				
Backfill Material Costs:				
Common Fill Unit Cost	$11.60	per CY		
Fresh Backfill Material Quantity (with 0.25 bulking factor)		3,579	LCY	
Backfill hauling unit cost	$20.49	per LCY		
Total backfill hauling costs	$73,332			
Backfill Material Cost	$41,515.65			
Total Backfill Material Costs:	**$114,900**			
C) Backfill Material Testing				
DER 10, analyzed for full parameters				
including sieve analyses, moisture content, and chemical compounds:				
# of Backfill Material Samples Required:			samples	
Sieve and moisture content		$ 150		
9 VOC per 1000 CY		$ 1,933	$60	
3 SVOC		$ 1,074	$100	
3 PCB		$ 429	$40	
3 Pesticides		$ 698	$65	
3 Metals		$ 752	$70	
3 PFAS		$ 2,416	$225	
Backfill Testing Cost:	**$7,451**			
D) Soil Density Testing				
Assume $500 per visit by soil density testing technician, 2 visits per week, during backfill operations.				
# of Backfill Visits Required:			1	visits
Soil Density Testing Cost:	**$500**			
TOTAL BACKFILL AND RESTORATION COST:	**$155,000**			
Subtotal for Excavation	$ 1,838,000			
20% Subcontractor Markup (profit, insurance, etc.)	$ 367,600			
TOTAL EXCAVATION COST	**$ 2,206,000**			
13 - Present Worth of Annual Costs				
Annual Costs	$2,000			
Present Worth of Annual Costs	$25,000.00			
PRESENT WORTH OF ALTERNATIVE D	**$ 2,231,000**			

CDM Smith	PROJECT:	Cahoon Parcel Off-site	COMPUTED BY :	LME	CHECKED BY:	AER
	JOB NO.:	C859026A	DATE :	1/14/2022	DATE CHECKED:	1/26/2022
	CLIENT:	NYSDEC				

Description: **Individual Cost Item Backup for Alternative E**

01 - Construction Management & Operations - General Conditions

Project Schedule

Assume the following project schedule:

Pre-Construction Work Plans and Meetings (RA Work)	3	weeks		
Field Trailer Compound Establishment	0.5	weeks		
Site Preparation (Decon areas, stockpile areas, clearing)	1.5	weeks		
Shoring	20.2	weeks		
Remedial Excavation	8.6	weeks		
Transportation and Disposal (T & D)	6.00	weeks		
Backfill and Compaction (concurrent to T & D)	2.00	weeks		
Final Site Restoration and Demob	2	weeks		
Total Construction Duration	41	weeks		
	9.48	months		
Project Closeout	0.75	months		
Total Project Duration	**10.9**	**months**	**48**	**weeks**

General Condition Costs

A) Site Supervisory Staff (10 hours per week)

Project Manager	$160	per hour
Project Engineer	$120	per hour
Procurement staff (20 hours per week)	$100	per hour
Total for office support	**$183,000**	

Assume the following Site Supervisory Staff for duration of construction (see labor/equipment backup page for rates):

Site Superintendent	$110	per hour
Construction Foreman	$85	per hour
Environmental Technician (QC)	$100	per hour
Pickup Truck #1	$15	per hour
Pickup Truck #2	$15	per hour
per diem for superintendent and QC engineer	$96	per day
	$349.00	per hour
	$60,493	per month
Total Site Supervisory Staff for Construction Duration		**$574,000**

B) Work Plan Preparation

Estimated # of Pre-Construction Work Plans Required:	1	work plans
Estimated # of Engineer Hours Required per Work Plan:	160	hours
Professional Engineer	$120	per hour
Project Manager	$160	per hour
Total Work Plan Preparation Cost:		**$44,800**

C) Mobilization/Demobilization Fees

Assume 10 large pieces of equipment to be used throughout remedial action.
Includes erosion control and decontamination.
Per MEANS 01-54-36.50-0100 Mobilization, 50-mile round trip

Total Mobilization/Demobilization Cost: **$50,000**

TOTAL GENERAL CONDITION COST: **$852,000**

02 - Permits (Allowance)

TOTAL PERMIT COST: **$20,000**

03 - Safety and Health Requirements

Safety and Health Requirements to include the Site Health and Safety Officer, personnel protective equipment and supplies, and additional safety and air monitoring equipment/testing.

Total Construction Duration:	41	weeks	
	204	work days	

A) Site Health and Safety Officer

Part-time SHSO During Construction

Industrial Hygienist (SHSO)	$150	per hour	
			$49,000

B) PPE Costs

Assume PPE required for 10 people per work day for duration of demolition and construction.

Estimate $5 per day per worker for PPE and incidental safety equipment/testing. $11,000

C) Additional Safety and Air Monitoring Equipment

Add 20% to PPE Costs for additional safety and air monitoring equipment: $3,000

TOTAL SAFETY AND HEALTH REQUIREMENTS COST: $63,000

04 - Temporary Facilities

Temporary Facilities to include the field trailers, utilities, cleaning services, and office equipment and supplies.

A) Field Trailers

Assume 1 project trailer required.

The trailer compound will be mobilized at project start and will be used for entire project duration (not just the construction).

Total Duration for Field Portion of Project: 41 weeks

MEANS 01-52-13.20-0550 Field Trailer Rental, 50' x 12', furnished	$405
MEANS 01-52-13.20-0700 Add for Air Conditioning	$46
	$451
Field Trailer Rental Cost per Trailer :	$5,000
Installation of Utility Connections (allowance):	$10,000
Total Field Trailer Rental Cost for 1 trailer:	**$15,000**

B) Utilities and Cleaning Services for Field Trailers

Assume following utilities per month per trailer:

Electricity	$600	per month per trailer
Phone/Internet	$80	per month per trailer
Water	$40	per month per trailer
Sewer	$30	per month per trailer
Cleaning Services	$50	per month per trailer
	$800	per month per trailer

Total Utilities and Cleaning Services for 1 trailer: $33,000

C) Miscellaneous Office Supplies

Item	QTY	UOM	Unit Cost	Extended Cost
Computers	2	each	$2,000	$4,000
Fax Machines	1	each	$300	$300
Printers	1	each	$500	$500
Office Supplies	11	months	$300	$3,300

Total Miscellaneous Office Equipment/Supplies: $9,000

TOTAL COST FOR TEMPORARY FACILITIES: $57,000

05 - Security

Assume for duration of construction requires 16-hour security guard for weekdays and 24-hour security guard for weekends.

Total Field Duration:	41	weeks	
	5,218	hours	

A) Security Guard

Security Guard	$40	per hour	
		Total Security Guard Cost:	**$209,000**

TOTAL COST FOR SITE SECURITY: **$209,000**

06 - Surveying

Assume surveying will be required for the following tasks/durations:

Existing Conditions Survey prior to Site Preparation	0.2	weeks
Excavation and Backfill Period (for depth verification, quantity measurement, waste char. samples, final gradin	10.57	weeks

Total Surveying Duration:	11	weeks
	54	work days

Survey Cost

Assume full-time 2-person survey team for the surveying work:

Surveyor #1	$85	per hour
Surveyor #2	$85	per hour
	$170	per hour
	$1,360	per day

As-built Drawing Preparation	$5,000	LS

TOTAL COST FOR SURVEYING: **$79,000**

07 - Sheet Pile Installation, Removal, and Monitoring

Excavation Perimeter	936	LF
Excavation Depth	20	feet bgs
Sheetpile Installation Depth	35	feet
Square footage	32,760	SF
Weight of Waler/Struts	24	lbs/sf
Tons of Waler/Struts Installed	393	tons
Sheeting - Total LF	936	LF

B) Sheeting Duration

Assumed installation rate	15	LF/day		
Assumed removal rate	25	LF/day		
Installation Period, workdays			63	DAYS
Removal Period, workdays			38	DAYS
		total	101	DAYS

C) Sheeting Equipment Costs

Mobilize Pile Driving Equipment	$ 10,000	LS	
Install/Remove Walers and Struts	$ 1,914	/ton	
Cost	$762,259		
Total Sheetpiling Installation/Removal Costs			$768,319

D) Vibration Monitoring

Daily Vibration Monitoring System rental	$100	/day
Total Vibration Monitoring cost	$10,100	
(during sheetpile installation and removal periods only)		

TOTAL SHEETING COST **$779,000**

08 - Excavation and Dewatering

Excavation Area	39,000	square feet
Excavation Depth	20	feet
Excavation Volume	28,889	CY
Contaminated Depth Interval	0 to 20	feet bgs
Contaminated zone vertical thickness	20	feet
Contaminated material volume	28,889	CY
Asphalt Debris Volume (assume 6" thick)	269	CY

B) Excavation Duration

Assume 420 SY/day production rate for pavement demolition per RS Means item # 02.41.1317.5050

Assumed excavation product rate	750	CY/day	
Excavation cost	$ 7.96	CY	
Pavement demolition period, workdays parking lot?	3.8	days	
Excavation Period, workdays			39 DAYS
Total Demo & Excavation Period, workdays			43 DAYS
Total Demo & Excavation Period, work hours (8 hours per day)			343 HOURS
Total Demo & Excavation Period, work weeks			8.6 WEEKS

Total Excavation Costs $230,000

D) Dewatering Costs

Dewatering System weekly rental allowance $8,000

(assume air stripper treatment with all associated equipment and carbon polish treatment)

Utilities & Carbon Usage Costs (weekly allowance) $1,000

Total dewatering cost $96,000

(during excavation and backfill periods only)

TOTAL EXCAVATION COST **$326,000**

09 - Confirmation Sampling

To check whether SCG requirements are met:

1 sidewall samples per 30 LF, 1 bottom sample per 900 SF

pre and post staging area 1 per 900 SF

pre and post decon pad 1 per 900 SF

A) Estimated # of Confirmation Samples

Total # of samples: 97 samples

B) Laboratory Analysis Fees

Analytical Cost per sample (Mercury) $ 26

Total Laboratory Analysis Costs: **$2,522**

C) Sample Collection

Assume 1 hour per sample for an environmental technician to collect each sample

Environmental Technician $100 per hour **$9,700**

D) Sample Packaging and Shipping Costs

Assume shipping cost is 5% of analytical cost: **$126**

TOTAL CONFIRMATION SAMPLING: **$13,000**

10 - Waste Characterization Sampling

To check whether TCLP requirements are met:

1 sample per 300 CY of total volume - soil, asphalt and debris

A) Estimated # of Waste Characterization Samples

Total # of samples: 98 samples

B) Laboratory Analysis Fees

Waste Characterization Analytical Cost per sample	**$750**
Waste Characterization Total Mercury Cost per sample	**$26**
Total Laboratory Analysis Costs:	**$76,048**

C) Waste Characterization Sample Collection

Assume 1 hour per sample for an environmental technician to collect each sample

Environmental Technician	$100 per hour	**$595**

D) Sample Packaging and Shipping Costs

Assume shipping cost is 5% of analytical cost:	**$3,675**

TOTAL WASTE-CHARACTERIZATION SAMPLING: $81,000

11 - Transportation and Disposal

A) Transportation and Disposal Costs

a) Quantity Calculation at time of FS based on existing data

b) Add 25% additional volume to account for bulking between bank and loose cubic yards for soil.

c) Assumes 1.6 tons per CY soil density, 2 tons per CY for debris.

Waste Category	In-place Quantity (BCY)	Quantity after Excavation (LCY)	Quantity (tons)	Disposal Type
High Mercury - Soil (assumed 8% of total soil)	2,312	2,890	3,700	Subtitle D Landfill
Non-Hazardous Waste - Soil (assumed 92% of total soil)	26,578	33,230	42,600	Subtitle D Landfill
Subtotal Waste Volume	**28,890**	**36,120**	**46,300**	

Waste Category	Quantity (LCY)	Quantity (tons)	Transport & Disposal (per ton)	Extended Costs
High Mercury - Soil	2,890	3,700	$330	$1,221,460
Non-Hazardous Waste - Soil	33,230	42,600	$70.0	$2,982,000
Non-Hazardous Waste - Debris	261	20	$70.0	$1,400
Subtotal T&D Cost	**36,120**	**46,300**		**$4,207,650**

B) Labor and equipment costs for loading the truck for offsite disposal

Assume 50 trucks per day for offsite shipment (each truckload is 25 CY)

Time for loading the material for offsite disposal 30 days

Excavator, Hydraulic, 2 CY	$100	per hour
Equip. Op. Heavy	$85	per hour
Laborer (Semi-Skilled)	$60	per hour
Laborer (Semi-Skilled)	$60	per hour
Total rate per day	$2,440	per day

Total Cost **$73,200**

Total Transportation and Disposal Costs $4,281,000

12 - Backfill and Restoration

Total Excavation Volume 28,889 BCY

(Bulking factor 0.25)	36,111	Loose Cubic Yards (LCY)		
Backfill & Restoration Duration				
Assume backfill has a production rate of 4000 CY/day				
Total Backfill Period, workdays			10	DAYS
Total Backfill Period, work hours (8 hours per day)			80	HOURS
Total Backfill Period, work weeks			2.0	WEEKS
Total Backfill Period, months			0.46	MONTHS
Total Asphalt Restoration Period, days (assumes 5,000 SF/day production)			3	DAYS
A) Backfill Labor/Equipment Costs				
Backfill Labor & Equipment Unit Rate	$8.79	per LCY		
Total Backfill Labor and Equipment Cost	**$317,500**			
B) Backfill Material Costs				
Backfill Material Costs:				
Common Fill Unit Cost	$11.60	per CY		
Fresh Backfill Material Quantity (with 0.25 bulking factor)		36,111	LCY	
Backfill hauling unit cost	$20.49	per LCY		
Total backfill hauling costs	$739,917			
Backfill Material Cost	$418,889			
Total Backfill Material Costs:	**$1,158,900**			
C) Backfill Material Testing				
DER 10, analyzed for full parameters				
including sieve analyses, moisture content, and chemical compounds:				
# of Backfill Material Samples Required:			samples	
Sieve and moisture content		$ 150		
9 VOC per 1000 CY		$ 19,500	$60	
3 SVOC		$ 10,833	$100	
3 PCB		$ 4,333	$40	
3 Pesticides		$ 7,042	$65	
3 Metals		$ 7,583	$70	
3 PFAS		$ 24,375	$225	
Backfill Testing Cost:	**$73,817**			
D) Soil Density Testing				
Assume $500 per visit by soil density testing technician, 2 visits per week, during backfill operations.				
# of Backfill Visits Required:			4 visits	
Soil Density Testing Cost:	**$2,000**			
E) Asphalt Restoration Costs				
Area of asphalt restoration	2,000	square feet		
Unit costs for asphaltic concrete paving at parking lots and driveways			$3.60	per SF
(RS Means 32.12.1614.1180)				
Asphalt Restoration Costs	**$7,200**			
TOTAL BACKFILL AND RESTORATION COST:	**$1,560,000**			
Subtotal for Excavation	$ 8,320,000			
20% Subcontractor Markup (profit, insurance, etc.)	$ 1,664,000			
TOTAL EXCAVATION COST	**$ 9,984,000**			
PRESENT WORTH OF ALTERNATIVE E	**$ 9,984,000**			

CDM Smith	PROJECT:	Cahoon Parcel Off-site	COMPUTED BY :	LME	CHECKED BY:	AER
	JOB NO.:	C859026A	DATE :	1/14/2022	DATE CHECKED:	1/26/2022
	CLIENT:	NYSDEC				

Description: Present Worth Calculations

PRESENT WORTH CALCULATIONS

Assume discount rate is 7%:

This is a recurring cost every year for n years.

This is a problem of the form find (P given A, i, n) or (P/A,i,n)

P = Present Worth

A= Annual amount

i = interest rate

$$P = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

A. Long Term Monitoring - year 2- 30

Multiplier is (P/A) for 30 years

n =	30
i =	7%
The multiplier for $(P/A)_2$ =	**12.409**

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