



Dunkirk Site

106 Point Drive North, Dunkirk, New York

Remediation Alternative – Engineered Cover System Over Historic Fill with Excavation and Off-Site Disposal of Source Area Soils

Description of Alternative

This remedy alternative is a cover system with source area soil removals that consists of a combination of soil/asphalt/and concrete cover system based on cleanup requirements for future restricted-residential or active-recreational park reuse on the Former NRG Coal Plant Dunkirk Site (Site). Currently, there are many variables and assumptions for the bases of this alternative and estimated budget. When the final investigation is completed a revised elevation of the selected remedy and associated cost estimate can be refined. At this time, the alternative and estimated budget is based on our Phase I ESA report findings and assumptions related to the following primary historic site uses and environmental subsurface conditions.

- Steam power electric generation from the 1950 through 1964;
- Coal power electric generation from 1965 to 2015;
- Coal pile storage;
- Petroleum bulk storage and chemical bulk storage;
- Railroad spur;
- PCB contaminated subsurface;
- Metals impacts to groundwater and soils;
- Coal ash lagoons; and
- Buried cinders and ash.

The engineered cover system is estimated to extending over approximately 25-acres of the approximately 75-acre parcel, consisting of two-foot thickness over the historic fill (ash, cinder, coal, and lagoon coal ash waste) and will consist of a combination of appropriate cover materials (hardscape, clean fill material, topsoil, trail, asphalt, or building). The engineered cover system (cover system) would be designed in accordance with the potential reuse of future multi-unit residences, commercial buildings, park space, and landscape design, following NYSDEC DER-10 requirements and geotechnical recommendations. This future engineering design will consider that the Site subsurface conditions include historic fill materials, foundation remnants, non-hazardous wastes, and other deleterious materials that may settle. Therefore, the engineering design will include provisions to avoid significant long-term environmental and engineering maintenance requirements that would require correction and replacement of the cover system. Future maintenance of the cover system will be documented in the Site Management Plan (SMP). As part of the evaluation of estimated cost for the cover system, it is assumed that approximately 60% of the cover system would be pavement/granular soil for parking lot/roadway areas and 40% would consist of the future multi-unit residential housing and or park buildings with concrete slab-on-grade as ground level floor. However, this may change depending upon the final design of the proposed structures or reuse options. The remedial design will finalize these issues after the required investigation are completed.



Proposed Remedial Design

The three-part Cover System over twenty-five 25 acres will include the following:

1. Concrete Cap Cover – constructed at sidewalks and residential housing/ building slabs
 - Granular sub-base approximately 6-inches thick with 4 inches of concrete
2. Soil Cap Cover – constructed at lawn and landscaped area for the future redevelopment even though none is planned at this time.
 - Low permeability soils 22-inches thick with 2-inches of topsoil
3. Pavement Cap Cover – constructed at parking lot, sidewalk, and roadway areas with granular sub-base 12-inches thick and 6-inches of asphalt.
4. A woven geotextile material will be placed directly over the historic fill under the cover system (cap) as a demarcation marker. Redevelopment of the Site may require grading and or backfill to future design elevations.
5. The on-Site historic fill materials may be used for backfilling and grading during the grading activities, and also to backfill the excavations to remove the source area soils as long as the limits of the historic fill materials is below the demarcation layer (marker).
6. Petroleum impacted soil removal with off-site disposal – Assumes 15,000 tons of non-hazardous petroleum impacted soils and or soils with elevated volatile organic compounds.
7. Lagoon Stabilization – Assumes tasks required to stabilize sediments in three (3) lagoons, prior to installation of soil cap cover.

Remedial Objective

The objective of the engineered cover system would be to:

- (1) Minimize the potential for direct human exposure.
- (2) Minimize potential for surface run off erosion and off-site migration of contaminated soils by wind and control drainage flow to storm water system and away from the Oswego River.
- (3) Significantly reduce the amount of precipitation infiltration through the impacted historic fill soils and into the overburden groundwater table and Oswego River.

Cover System

The cover system is estimated to be installed over 25-acres on the Site that represents the former power plant footprints and associated improvements and lagoons. The primary goals of the cover system are to provide a barrier to human exposure, reduce surface run-off with less contact of infiltrating groundwater with historic fill materials (soils). The thickness of the cover system to achieve restricted-residential/active-recreational park reuse would be a two-foot cover of clean soils, four (4) inches for concrete, and six (6) inches for pavement. The cover system will also reduce impact to the groundwater quality at the site. When the cover system is breached in the future to allow for site re-development and or install/service underground utilities during maintenance work, the excavation areas will be managed pursuant to the Site Management Plan (SMP).

It should be noted that for cost estimation purposes, it was assumed that removal and off-site disposal of some surface soils may be required due to re-grading, drainage improvements, building slab construction, and source area soil contamination. However, it is also important to note this is an initial estimate and the final cost estimate will not be known until the final investigation is completed, and reuse/redevelopment plans are finalized. Long-term institutional and engineering controls, including a SMP and environmental easement, will prevent direct contact with contaminated soils beneath the engineered cover system. The budget cost for a cover system over 25-acres is approximately **\$15,000,000**. This cost is inclusive of preparation of the SMP, cover engineering, field oversight, reporting, and associated meetings and document control.

Source Area Soil Removal

In addition, this alternative includes an excavation and off-site disposal of the source area soils, which will be performed to remove the limited areas of the historic fill with non-hazardous petroleum impacts or soils that are impacted with Volatile Organic Compounds (VOCs) characteristics when compared to the rest of the historic fill (coal, ash, and cinders). These characteristics may include elevated organic vapors, black stained soil color with petroleum odors, elevated concentrations of mid-range diesel organics, and Polychlorinated Biphenyl (PCB) impacted soils. Soils in these areas have the highest contaminant levels on the site (source areas) that pose a soil vapor intrusion risk to future buildings and/or residential housing. An Excavation Work Plan will be part of the SMP that provides the method for soil removals and disposal of source area soils. The approximate quantity is not known, however, for the purpose of this estimated budget, an estimate of 15,000 tons of historic fills soil that is petroleum, Semi-Volatile Organic Compounds (SVOCs) related, and/or PCB impacted and classified as non-hazardous. It should be noted that the volume of soil to be excavated under this alternative is estimated and will require verification pending future investigation(s). The actual quantity would be finalized in the field during site excavation activities. Dewatering is not anticipated during the soil source removal excavation activities under this alternative. However, shoring will be required during excavation activities. The budget cost for source area soil removal of 15,000 tons is approximately **\$2,000,000**.

Lagoon Stabilization

The goal of the lagoon stabilization is to prepare the physical condition of the three (3) lagoon areas to allow for installation of the cover system over the lagoon areas. Stabilization may include limited dewatering and filling of the lagoons and or placement of amendments such as bentonite to aide in filling and grading of these areas. The budget cost for lagoon stabilization is approximately **\$3,000,000**.

Institutional Controls and Engineering Controls

This alternative would also require the use of Institutional Controls (ICs) and Engineering Controls (ECs) to protect human health and the environment against exposure to residual contaminants under the cover system. ICs would include imposition of an environmental easement to restrict land use to ground floor restricted-residential/active-recreational park use (no basements or crawl spaces), prohibit the use of groundwater beneath the site, and require the development and implementation of an SMP, to be implemented during any future intrusive (excavation) activities. The primary EC would be the cover system. These controls would be memorialized by a formal environmental easement, which will run with the land and required all future owners and operators of the site to comply with the Site-wide ECs and ICs should this future project be part of a NYS Brownfield Cleanup Program.

Specifically, the Soil Management Plan in the SMP would be prepared to:

- (1) Identify known locations of any remaining impacted soil at the site;
- (2) evaluate the requirements for sub-slab depressurization systems for residential housing;

- (3) establish appropriate controls for future disturbances of site soil;
- (4) set forth the inspection and maintenance activities for the cover system cap;
- (5) establish the monitoring protocols and frequencies for maintenance; and
- (6) establish a sampling and analysis groundwater monitoring program.

The SMP would be a means to address potential future soil excavation if required to occur. In addition, an environmental easement may be required for all future owners and operators to comply with the SMP and restrict the site use to restricted-residential/active-recreational park uses and prohibit groundwater use.

Since, contaminants will remain at the site under the cover system, it will also be necessary to institute a groundwater monitoring program for a minimum of two (2) years after the active remedial activities are completed. The anticipated frequency of groundwater monitoring will be quarterly for a minimum of two (2) years. During the design, the need to install additional soil borings or monitoring wells will be evaluated. It should be noted that the estimated cost for this alternative includes re-grading and placement of a two-foot engineered soil cover system that may also incorporate future parking lots /roadways (pavement) and concrete improvements (foundations/walkways) over the 25-acres is only an estimate to be refined in the Remedial Action Work Plan (RAWP).

Assessment of Alternative

The following table provides a summary of the detailed assessment for an engineered cover system over historic fill soils with excavation and off-site disposal of source area soils.

Assessment of Alternative

Criterion	Discussion
Protection of Human Health & the Environment	<p><i>Advantages:</i></p> <ul style="list-style-type: none"> • The site contaminants will be isolated, preventing direct human contact and off-site migration of soils by erosion and windblown soil particles. • Site-wide cover system will reduce the cross-media migration of contaminants of concern from the historic fill soils into the overburden groundwater by limiting the infiltration of precipitation (surface run off). • The Excavation Work Plan contained in the future Site Management Plan will provide guidance for contactors and developers for proper management of future exposed contaminated soils during excavation work to minimize and protect potential exposure to human health and the environmental receptors. • The source area soils will be removed from the site that will substantially reduce the potential petroleum VOCs impact to human health and the environment. Source area soil removal will also substantially reduce the potential for vapor intrusion in future site buildings or residential housing. • Long-term protection from contaminants and redevelopment of the site for public access is feasible as a result of implementation of the cover system, source area soil removal and long-term ICs and ECs.



Criterion	Discussion
Protection of Human Health & the Environment (etc.)	<p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• Natural attenuation will not decrease the concentration of the metals (inorganic contaminants) in soils or groundwater at the Site after implementation of this alternative.• May take decades for Site contaminants in fill material to attenuate.
Compliance with SCGs	<p><i>Advantages:</i></p> <ul style="list-style-type: none">• Is protective of human health and the environment under a restricted residential (Track 4) remedial scenario since the environmental groundwater receptor, human receptors are protected by the cover system, and the most contaminated source area soils are removed. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• Majority of contaminants will remain in historic fill soil beneath the covered area. Most COCs will remain in groundwater some may attenuate over time and• Metals in the subsurface will not attenuate.
Long-Term Effectiveness & Permanence	<p><i>Advantages:</i></p> <ul style="list-style-type: none">• Placing a site-wide cover system over the contaminated historic fill soils would reduce human exposure to the COCs.• Removal of the source area soils would result in permanent reduction of the amount of contaminated historic fill on Site and significant reduction of potential vapor intrusion issues in future Site buildings. Land use with green remediation. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• Most COCs will remain in the groundwater due to Site-wide historic fill for an extended period.• Land use controls (IC) would be necessary to ensure long-term protection for human health and the environment.



Criterion	Discussion
Reduction in Toxicity, Mobility, & Volume	<p><i>Advantages:</i></p> <ul style="list-style-type: none">• Eventually, VOCs, SVOC, PCBs and metals contamination in groundwater would stabilize and should not increase in concentration.• The soil in the areas of the soil source area would be removed, reducing the volume of VOCs contaminants at the Site and also reducing potential vapor intrusion issues for the future Site building. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• Majority of contaminated media remains on Site.• Reduction in toxicity, mobility, or volume of metals and SVOC contaminants in remaining soils through natural attenuation is relatively low and slow.• Contaminated soil is moved to another disposal location.• There would be no reduction of inorganic (metals) contaminants through natural attenuation.
Short-Term Effectiveness	<p><i>Advantages:</i></p> <ul style="list-style-type: none">• Development for public park access and or restricted residential site reuse is possible in a relatively short period and with minimal potential for exposure to neighbors from dust and organic vapors. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• ECs and ICs would still need to be implemented to reduce human and environmental exposures but less short-term impacts since there will be limited excavation.
Implantability	<p><i>Advantages:</i></p> <ul style="list-style-type: none">• Readily implemented.• Limited soil quantity to be transported off-site, dewatering system not required for soil removal excavation.• Minimal maintenance after active remediation and redevelopment <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• Long-term groundwater monitoring program would be required. <p><i>Disadvantages:</i></p> <ul style="list-style-type: none">• ECs and ICs required during and after physical remediation are completed.• Long-term groundwater monitoring program would be required.
Costs	<ul style="list-style-type: none">• Total Capital costs – \$20,000,000.00• Annual maintenance cost – \$50,000/year (to maintain EC/IC and groundwater monitoring/reporting)

Due to the fact that contamination would remain in place under this alternative, a SMP would need to be prepared to detail the IC and EC future Site monitoring requirements as well as the procedures that would be developed to protect the remedy and minimize human exposure during future intrusive Site activities. This



remedy would have a carbon footprint impact due to temporary truck traffic associated with the truck traffic for the source area soil removal/installation of the cover system part of the remedy. However, this impact is outweighed by the environmental benefits associated with remediation of the site and community benefits.

The following assumptions have been made regarding this Alternative

- It is assumed that some of the historic fill materials can be used as backfill during grading at the site under the cover system. In addition, soils removed from future re-development or underground utility installations would be placed below the cover system.
- Costs assume that historic fill surface soils will require some removal and re-grading for installation of the cover system.
- At this time, final re-grading plans have not been developed for the final redevelopment project. However, it is assumed that the site can be appropriately graded to install the engineered cover system, enhance preferred drainage and construct building slabs, walkways and pavement parking lot in a manner so that the entire Site will be covered with the cover system and will be maintained without significant settlement or cracking.
- The thickness of the cover system will be a minimum of two (2) feet (or equivalent concrete/pavement thicknesses) and in some areas two (2) feet to maintain the integrity of the cover system and to reduce the frequency of potential future settlement and cracks.
- Assumes that hazardous waste will not be encountered in a volume that would require removal/cleanup and would be allowed to remain under the cover system.
- All off-site soil disposal is non-hazardous and approximated at 15,000 tons; and
- Cover system cap is based on approximately 25-acres requiring a cover system.
- Final investigation results and final plans for site re-use are required to allow for a refined cost estimate to complete required remediation at the site for restricted-residential or active-recreational re-use.