Final Supplemental FS Report – Eighteenmile Creek Superfund Site OU2, Niagara County, New York

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List of Abbreviations and Acronyms

AOC	area of concern
ARAR	applicable or relevant and appropriate requirements
BERA	baseline ecological risk assessment
BGS	below ground surface
BUD	Beneficial Use Determination
Canal	New York State Erie Canal
CC	creek channel
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	contaminant of potential concern
CP	(NYSDEC) Commissioner's Policy
CY	cubic yards
E & E	Ecology and Environment, Inc.
EC	engineering control
EEEPC	Ecology and Environment Engineering, P.C.
EMNR	enhanced monitoring and natural recovery
EPA	(United States) Environmental Protection Agency
ESA	Environmental Site Assessment
FS	Feasibility Study
GLLA	Great Lakes Legacy Act
GRA	general response action
HHRA	Human Health Risk Assessment
HPAH	high-molecular weight polycyclic aromatic hydrocarbons
IC	institutional control
LTM	long term monitoring
mg/kg	milligrams per kilogram
MNR	monitored natural recovery

List of Abbreviations and Acronyms (cont.)

NCP	National Contingency Plan
NPL	National Priorities List
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	perchloroethylene
PPE	personal protective equipment
ppm	parts per million
RA	reserved area
RAO	remedial action objective
RAR	Remedial Alternatives Report
RI	Remedial Investigation
ROD	Record of Decision
SCG	standards, criteria, and guidance
SCO	soil cleanup objective
SHPO	(New York) State Historic Preservation Office
SMP	site management plan
SVOC	semivolatile organic compound
TAGM	Technical and Administrative Guidance Memorandum
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
USACE	United States Army Corps of Engineers

1 Introduction

1.1 Purpose and Approach

This report for the Eighteenmile Creek Superfund Site Operable Unit 2 (OU2) (the Site) was prepared by Ecology and Environment Inc. (E & E) for the United States Environmental Protection Agency (EPA) under the United States Army Corps of Engineers (USACE) Northwestern Division Contract W912DQ-11-D-3006, Task Order 0009. The purpose of this report is to supplement the existing feasibility study (FS) reports with new data collected since their publication, results of risk assessments, and outcomes of the remedial measures completed as part of OU1.

1.2 Report Organization

The existing site conditions and remedial investigation (RI) results are summarized and updated based on new data collected in the 2014 to 2016 field investigations and risk assessments conducted (see Section 1.3). The Supplemental FS will reference the existing FS reports when the additional field investigations, completed in 2014 to 2016, and risk assessments do not yield results that would warrant new evaluation of alternatives. This Supplemental FS updates the existing alternatives analysis as follows:

Identification of Remedial Action Objectives and Standards, Criteria, Guidelines (Section 2)

- Remedial action objectives (RAOs) and cleanup levels are updated based on the additional field investigations, completed in 2014 to 2016, and risk assessments; and
- Contaminated sediment and soil volumes are updated based on the additional field investigations, completed in 2014 to 2016.

Technology Screening and Development of Remedial Alternatives (Section 3)

- Additional remedial technologies were screened; and
- Remedial alternatives were identified based on existing alternatives from the NYSDEC Remedial Alternatives Report (RAR) for the Former Flintkote Plant Property and the FS for the creek channel and additional remedial technologies.

Remedial Alternatives Evaluation (Section 4)

- Evaluate new and modified alternatives;
- Update the cost estimates for each of the existing alternatives to present-worth dollars incorporating any changes in volumes;
- Complete cost estimates for new or modified alternatives; and
- Update the comparative analysis of alternatives based on any new information since the original RAR and FS were completed.

1.3 Site Background

The Site is located in Niagara County, New York, on the south side of Lake Ontario (see Figure 1-1). The main channel of Eighteenmile Creek flows north from the New York State Erie Canal (Canal) for approximately 15 miles and discharges into Lake Ontario in Olcott, New York. The Eighteenmile Creek watershed also includes the two main tributaries, the East Branch and the Gulf Creek. The OU2 Eighteenmile creek corridor (the creek corridor) is the part of the Site which extends from the Canal to Harwood Street in the city of Lockport. The creek corridor includes Eighteenmile Creek and adjacent upland properties. The Site is a National Priorities List (NPL) hazardous waste site under investigation pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund. On September 16, 2011, the EPA proposed to place the Site on the NPL and on March 15, 2012, the EPA placed the Site on the NPL.

1.3.1 General Site Description

The EPA has divided Eighteenmile Creek into three separate OUs, as shown in Figure 1-2. OU1 includes contaminated soil at nine residential properties on Water Street in Lockport, New York, and the building at the Former Flintkote Plant Property (former Flintkote Building). The EPA issued a Record of Decision (ROD) for OU1 on September 30, 2013. Pursuant to the OU1 ROD, relocation of residents from five houses on six properties, demolition of the houses and the former Flintkote Building, and off-site disposal of the demolition debris were completed by the EPA in September 2015 (EPA 2013, EPA forthcoming). As indicated in the OU1 ROD, the portion of the remedial action involving the soil excavation at the nine residential properties will be performed during cleanup of the sediments in the OU2 creek corridor. OU2 comprises a portion of the creek channel (defined by New York State Department of Environmental Conservation [NYSDEC] as the Eighteenmile Creek corridor) and adjacent industrial properties, including the Former Flintkote Plant Property, Upson Park, White Transportation, and the Former United Paperboard Company Property, as shown in Figure 1-3. OU3 addresses the Eighteenmile Creek from the north end of the OU2 creek corridor (Harwood Street in Lockport) to the mouth of the Eighteenmile Creek in Olcott, New York, where it discharges into Lake Ontario (see Figure 1-2).

In March 2006, NYSDEC selected a remedy to address the Former Flintkote Plant Property (NYSDEC 2006a). In March 2010, NYSDEC selected a remedy to address the creek corridor, which comprises the Eighteenmile Creek channel from the Canal to Harwood Street and adjacent industrial properties, including Upson Park, White Transportation, and the Former United Paperboard Company (NYSDEC 2010a).

In order to satisfy federal regulations pertaining to selecting a remedy under CERCLA, past studies, site information, and existing analytical data were evaluated to determine the additional data/information needed to complete an RI/FS for OU2. The evaluation included the development of a complete conceptual model, understanding the fate and transport of sediment in the Eighteenmile Creek, and assessing risk to humans and ecological receptors at the contaminated properties in the OU2 creek corridor. As part of this process, additional data were collected to fill the identified data gaps and prepare risk assessments for OU2. The additional field investigations, completed in 2014 to 2016, are summarized in the Supplemental RI report (E & E 2016a).

1.3.2 Site History

NYSDEC listed a portion of the Former Flintkote Plant Property as a Class 3 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York State in 1983. NYSDEC listed the entire Eighteenmile Creek corridor as a Class 2 site in 2008 (NYSDEC 2010a). NYSDEC divided the Eighteenmile Creek corridor into the following six geographic OUs: NYSDEC OU1, Eighteenmile Creek corridor and millrace; NYSDEC OU2, Former Flintkote Plant Property; NYSDEC OU3, Former United Paperboard Company; NYSDEC OU4, Upson Park; NYSDEC OU5, White Transportation; and NYSDEC OU6, Water Street Residential Properties (Ecology and Environment Engineering, P.C. [EEEPC] 2009a).

NYSDEC, in conjunction with the Niagara County Department of Planning, Development, and Tourism, prepared a supplemental investigation report in July 2005 and an RAR in October 2005 for the Former Flintkote Plant Property site (TVGA Consultants 2005a, 2005b). NYSDEC selected a remedy for the Former Flintkote Plant Property (NYSDEC OU2) in 2006 (NYSDEC 2006a). NYSDEC prepared an RI report, supplemental RI report, and FS report for the remaining portions of the Eighteenmile Creek corridor OUs (NYSDEC 2006b; EEEPC 2009c, 2009b). NYSDEC selected a remedy and issued a ROD for the Eighteenmile Creek corridor (NYSDEC OU1, 3, 4, 5, and 6) in 2010 (NYSDEC 2010a).

In addition, in March 2015, EPA Region 5 completed an RI report under the Great Lakes Legacy Act (GLLA) program for the contaminated sediment in the creek channel from the north of the OU2 creek corridor to the mouth of the Eighteenmile Creek at Lake Ontario (i.e., Olcott Harbor) (CH2M Hill, Inc. and EEEPC 2015). The EPA GLLA RI report is relevant to OU2 because in addition to presenting the OU3 sediment data, the March 2015 GLLA RI report all presents sediment data previously collected by NYSDEC for OU2.

1.4 Investigation Summary by Site

OU2 encompasses the entire creek corridor except for the Water Street Residential Properties and the demolition area of the Former Flintkote building that are part of OU1. A brief summary of each area is provided below along with a description of the current and future land use and RI findings.

1.4.1 Creek Channel

The creek channel consists of contaminated sediments in Eighteenmile Creek and contaminated soils in the creek banks. To delineate boundaries between the sediment and the upland soil in OU2, the bankfull width of the creek was field delineated by NYSDEC in 2008 (EEEPC 2009b). The bankfull width is commonly known as the width at which water begins to leave the channel and discharge to the floodplain. The creek channel outlined in blue on Figure 1-3 represents the bankfull width. The headwaters of Eighteenmile Creek consist of an east and west branch, which begin immediately north of the Canal. The Canal is located at the most upstream portion of the creek corridor and is potential source area to OU2. Water from the headwater east branch originates at the spillway on the south side of the Canal, where it is directed northward underneath the Canal and the Mill Street Bridge through a culvert. Water from the headwater west branch originates from the dry dock on the north side of the Canal and then flows northward. The headwater east branch and west branch converge just south of Clinton Street in Lockport. The Canal contributes the majority of the flow for the OU2 portion of Eighteenmile Creek.

The City of Lockport Comprehensive Plan (Nutter Associates 1998) shows future use of the creek channel as park land and as a recreation opportunity area including a proposed nature trail. The Comprehensive plan proposes extension of the Canalway Trail west from the locks and improved fishing access. The City of Lockport Tourism Focus Area Nomination Study shows a similar future use scenario (Bergmann Associates 2015). Therefore, future use scenarios considered the potential for increased visitors and recreational users.

1.4.2 Former Flintkote Plant Property

The Former Flintkote Plant Property (198, 225, and 300 Mill Street) in the city of Lockport, Niagara County, New York, is bounded by Eighteenmile Creek to the west, Mill Street to the east, a commercial property to the north, and vacant land of the Former United Paperboard Company Property to the south (see Figure 1-3). A small portion of the site, however, is located along the western bank of Eighteenmile Creek, and is bounded to the south by the Water Street Residential Properties. A dam approximately 10 feet high diverts the creek westward for approximately 300 feet along William Street (located on top of the dam). The two sluice gates located at the east end of the dam have been closed for at least 30 years. A millrace containing a sluggish stream approximately 6 inches to 1 foot deep runs along the west side of the buildings at 300 Mill Street and the section of 300 Mill Street between Eighteenmile Creek and the millrace is referred to as the Island. The building structure on 300 Mill Street was demolished as part of the OU1 remedial action.

The Supplemental Investigation and RAR prepared for the Former Flintkote Plant Property (TVGA Consultants 2005a, 2005b) described seven areas of concern (AOCs). Two of these AOCs (AOC-5 and AOC-7) included the buildings on 198 and 300 Mill Street. These buildings have been demolished and are not considered in this FS.

The City of Lockport currently zones this parcel as industrial (City of Lockport 2006; Bergmann Associates 2015). The City of Lockport Comprehensive Plan (Nutter Associates 1998) shows future use of the Flintkote properties as industrial. Under the industrial zoning requirements uses incompatible with industry are not to be permitted, such as residential properties or day care centers. The City of Lockport Tourism Focus Area Nomination Study shows a future use as open space (Bergmann Associates 2015). Therefore, future use scenarios considered both industrial and open space uses.

1.4.3 Upson Park

Upson Park is located at 100 Clinton Street in the city of Lockport, Niagara County, New York (see Figure 1-3). Upson Park is bordered by Clinton Street and a residential area to the north, the West Branch of Eighteenmile Creek and the Canal Authority to the east, the Canal to the south, and a wooded area to the west. The land is currently a town park and contains picnic areas and a walking trail along the Canal. There is a parking area on the site, but no standing buildings. The City of Lockport Assessor's Office lists the parcel (Parcel ID 109.10-1-76) as consisting of 5.9 acres of land owned by the City of Lockport.

According to the City of Lockport zoning map (City of Lockport 2006; Bergmann Associates 2015), upland soils are zoned industrial, with the exception of Upson Park, which is zoned as a reserved area (RA). The purpose of the RA District is to delineate those areas where substantial development of the land in the form of buildings or structures is prohibited due to various conditions listed in the zoning regulations. Therefore, development of future structures is not anticipated for Upson Park. The City of Lockport Comprehensive Plan (Nutter Associates 1998) shows future use of Upson Park as park land and the area as designated as part of the Erie Canal Tourism Area. The park is also listed on the State and National Registers of Historic Places as the Lockport Industrial District (#90NR01975) and the area is also deemed to have "archeological sensitivity" by the New York State Historic Preservation Office, as listed in the Cultural Resource Information System (New York State Historic Preservation Office [SHPO] 2016). The City of Lockport Tourism Focus Area Nomination Study shows a similar future use scenario (Bergmann Associates 2015). Therefore, future use scenarios considered recreational area and maintenance of the area by a worker as primary future uses.

1.4.4 White Transportation Property

The White Transportation Property is located at 30-40 Mill Street in the city of Lockport, Niagara County, New York (see Figure 1-3). The property is bordered by the Canal to the south, Mill Street to the east, Clinton Street to the north, and

the East Branch of Eighteenmile Creek to the west. The property is currently inactive.

The City of Lockport currently zones this parcel as industrial (City of Lockport 2006; Bergmann Associates 2015). Under the industrial zoning requirements, uses incompatible with industry are not to be permitted, such as residential properties or day care centers. The City of Lockport Comprehensive Plan shows future use of the White Transportation Property as commercial although there are no specific projects designated for this area in the plan (Nutter Associates 1998). The City of Lockport current zoning requirements does not include zoning for commercial areas.

The City of Lockport Tourism Focus Area Nomination Study shows a future use as Waterfront Mixed Use (Bergmann Associates 2015). Therefore, future use scenarios considered both industrial and residential as potential future uses.

1.4.5 Former United Paperboard Company Property

The Former United Paperboard Company Property is located at 62 and 70 Mill Street (see Figure 1-3). Sixty-two Mill Street is the larger of the two parcels and is bordered by Olcott Street to the north, Mill Street to the east, Clinton Street to the south, and Water Street to the west. The property is currently occupied by Duraline Abrasives, Inc., and contains one warehouse building. Seventy Mill Street is a vacant lot with fill material and building ruins and is bordered by the Flintkote site to the north, Mill Street to the east, Olcott Street to the south, and Eighteenmile Creek to the west. The dam located in the creek channel behind the building on 62 Mill Street is called Clinton Street Dam and the ponded water behind the dam is referred to as the Mill Pond. A storm sewer line also crosses the creek approximately 25 to 50 feet downstream of the dam, and several sewer manholes were observed on both banks (east and west) of the creek. The City of Lockport Assessor's Office lists the parcel (Parcel ID 109.10-1-57) as consisting of 3.7 acres and Parcel 109.06-3-11 as consisting of 1.2 acres of land owned by Tri-Side LLC.

The City of Lockport currently zones this parcel as industrial (City of Lockport 2006; Bergmann Associates 2015). The City of Lockport Comprehensive Plan (Nutter Associates 1998) shows future use of the Former United Paper Board Property as industrial. Under the industrial zoning requirements uses incompatible with industry are not to be permitted, such as residential properties or day care centers. However, the City of Lockport Tourism Focus Area Nomination Study shows a future uses as Open Space and Waterfront Mixed Use (Bergmann Associates 2015). Therefore, future use scenarios considered both industrial and residential as potential future uses. The area is also deemed to have "archeological sensitivity" by SHPO, as listed in the Cultural Resource Information System (SHPO 2016).

1.5 Risk Assessment Summary by Site

As part of the RI for OU2, a baseline human health risk assessment (HHRA) and a baseline ecological risk assessment (BERA) were conducted to estimate the risks associated with the current and future effects of Site contaminants (E & E 2016b, 2016c). The EPA uses an HHRA as a tool to evaluate the likelihood and degree of chemical exposure and the possible adverse health effects as a result of exposure to one or more chemical or physical stressors, and ecological risk assessments to evaluate the likelihood of adverse ecological effects associated with such exposure. The reports use current EPA policy and guidance and site data and analyses to evaluate human health and ecological risks. The reports are "*Human Health Risk Assessment, Eighteenmile Creek Superfund Site OU2*" (E & E, 2016b) for human health; and "*Eighteenmile Creek Superfund Site OU2 Supplemental RI/FS, Final Base-line Ecological Risk Assessment* " (E & E, 2016c) for ecological assessment. These documents are referred to as the HHRA and BERA for human health and ecological risks, respectively. A summary of the risk assessments is presented in Appendix A. The specific risk drivers and contaminants of potential concern (COPCs) identified are provided in Appendix A, Tables A-1 and A-2 for human and ecological receptors, respectively.

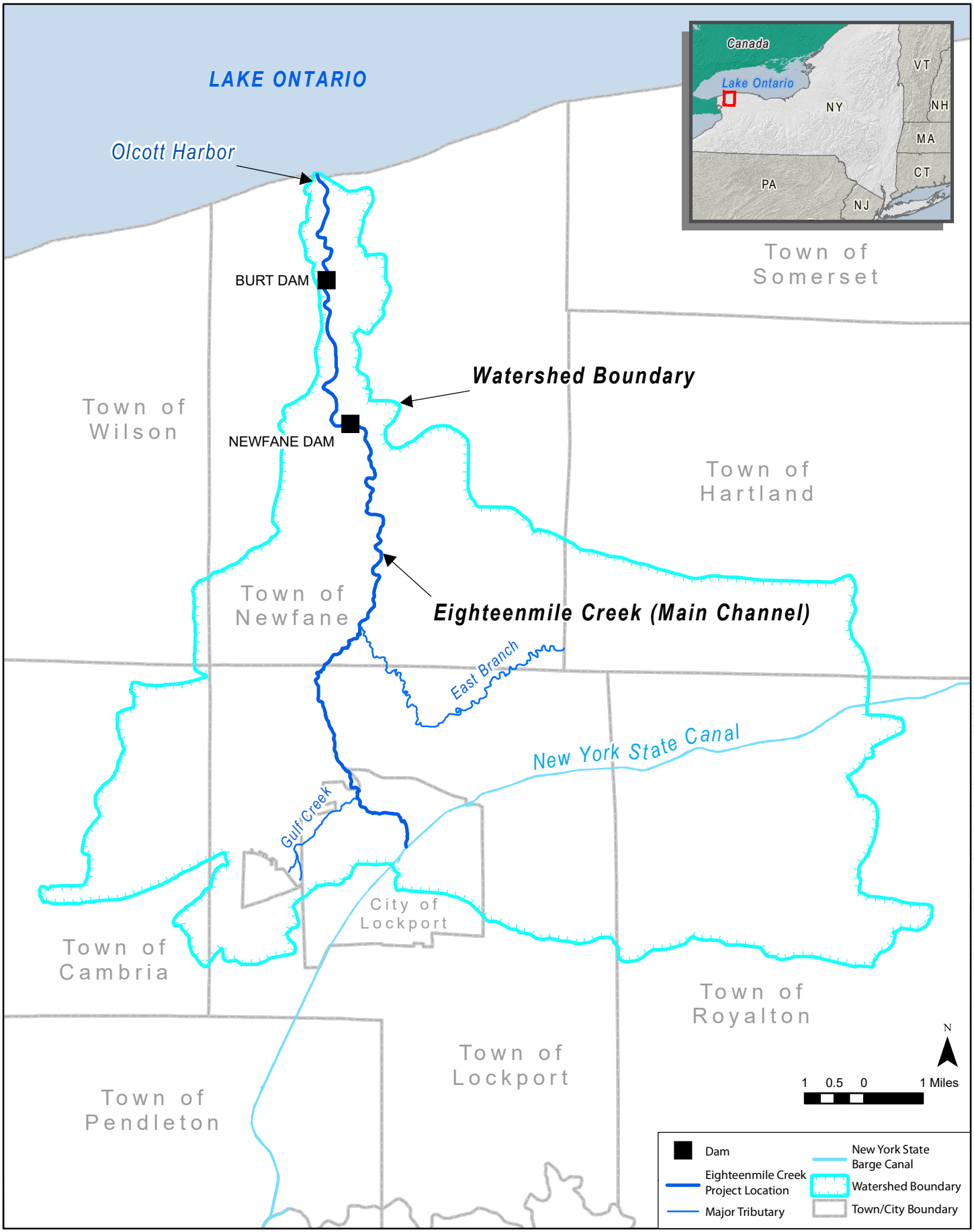

Figure 1-1 Site Location Map
Eighteenmile Creek Superfund Site
Lockport, NY

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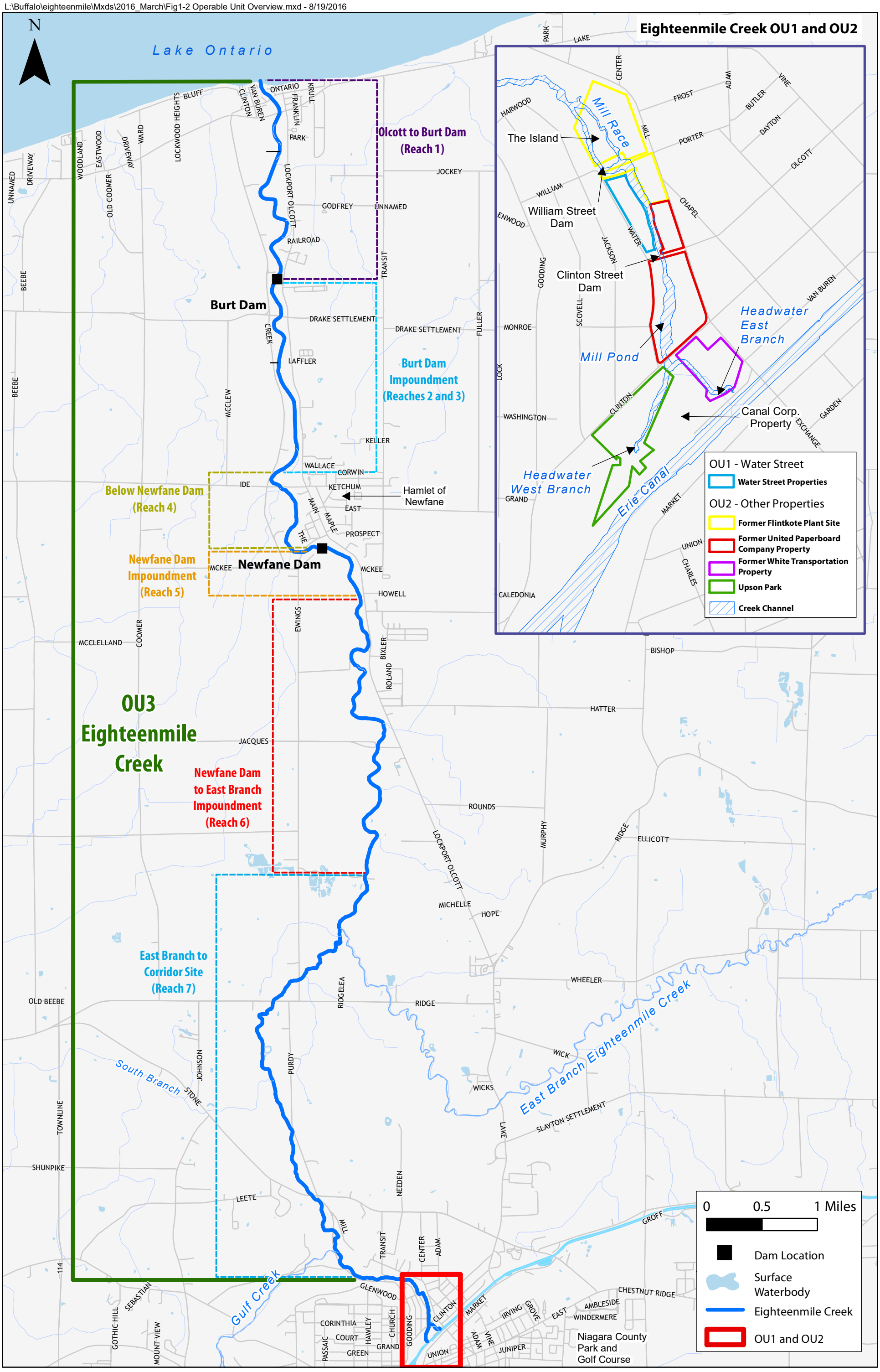

Figure 1-2 Operable Unit Overview, Eighteenmile Creek Superfund Site
Lockport, NY

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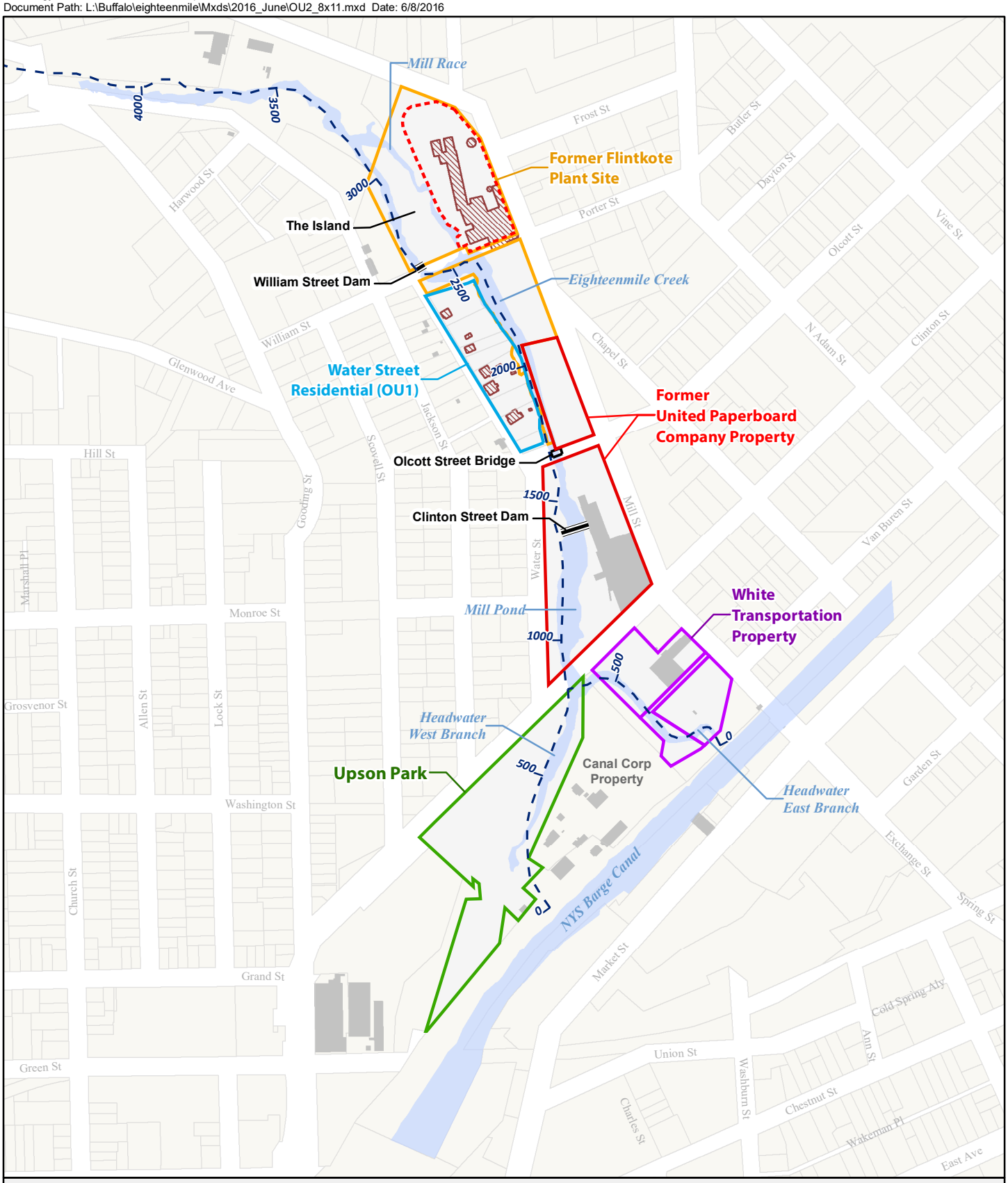

Eighteenmile Creek / Headwater East Branch Centerline (500-ft marker)

Building

Former Building Footprint

Demolition Area

Tax Parcels

Figure 1-3
Eighteenmile Creek RI OU2

0 200 400 800 Feet

N

Data Source: Esri 2012, Niagara County 2014.

2 Identification of Remedial Action Objectives and Standards, Criteria, Guidelines

The NYSDEC FS for the creek channel and other properties (Upson Park, Former United Paperboard Company, and White Transportation Property) and the RAR for the Former Flintkote Plant Property discussed RAOs, Standards, Criteria, and Guidance (SCGs), selected the cleanup objectives, and presented estimates of volumes of contaminated media based on the cleanup objectives (EEEPC 2009a; TVGA Consultants 2005a). RAOs, SCGs, soil cleanup levels, sediment action levels, and volumes of contaminated sediment and soil were updated based on the additional investigations and information from the baseline HHRA and the BERA (E & E 2016b, 2016c).

2.1 Remedial Action Objectives

RAOs are goals set for environmental media, such as sediment, soil, groundwater, and surface water (media-specific objectives), that are intended to protect human health and the environment. These RAOs form the basis for the FS by providing overall goals for site remediation. The RAOs are considered when identifying appropriate remedial technologies, formulating alternatives for the site, and during the evaluation of remedial alternatives. RAOs are based on engineering judgment, risk-based information established in the risk assessment, and potentially applicable or relevant and appropriate (ARARs) standards, to-be-considered criteria, and guidance.

The RAOs for each media were developed in the NYSDEC remedies based on the nature and extent of contamination, consideration of qualitative human health risk evaluation, fish and wildlife impact assessment, and potential ARARs and SCGs (NYSDEC 2010a, 2006a). Based on the results of the additional field investigations, completed in 2014 to 2016, and the HHRA and BERA, the updated RAOs for EPA's OU2 are:

- Reduce the cancer risks and non-cancer health hazards for people eating fish from the Eighteenmile Creek by reducing the concentration of PCBs and other site-related contaminants in fish;
- Reduce and/or eliminate risks to ecological receptors by reducing exposure to contaminated soils/fill and sediments;

- Reduce or eliminate potential human exposure to contaminated soils/fill at the Former Flintkote Plant, White Transportation, and Former United Paperboard Company properties to levels that are protective of commercial/industrial use, and protective of the environment;
- Reduce or eliminate exposure to contaminated soils/fill at Upson Park to levels that are protective of recreational use, and protective of the environment;
- Reduce or eliminate the migration of contamination in soils/fill from the Former Flintkote Plant, White Transportation, former United Paperboard Company, and Upson Park properties to adjacent properties, Eighteenmile Creek, and groundwater.

Based on the results of investigations performed to date, the highest levels of PCBs in sediments are found within the Creek Corridor, such that the Creek Corridor may be acting as a source of PCBs to the lower reaches of the Creek. Because further studies are required to fully understand the nature and extent of PCB contamination in Eighteenmile Creek, the EPA has determined that an action to address OU2 is not expected to fully address the fish consumption RAO. A comprehensive evaluation will subsequently be conducted of the entire length of the creek, including the creek channel (presumably as part of the OU3 remedial investigation), to develop final remediation goals for contaminated sediments.

2.2 Standards, Criteria, and Guidance

Standards and *criteria* refer to promulgated and legally enforceable rules or regulations. *Guidance* refers to policy documents that are non-promulgated and, therefore, are not legally enforceable. SCGs include ARARs, and other criteria to be considered (TBC):

- **Applicable Requirements** are legally enforceable cleanup or control standards or regulations and other substantive environmental protection requirements, criteria, or limitations promulgated under state or federal law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at an NPL site. "Applicability" implies that the remedial action or the circumstances at the site satisfy all of the jurisdictional prerequisites of a requirement, including the party subject to the law, the circumstances or activities that fall under the authority of the law, the time period during which the law is in effect, and the types of activities the statute or regulations require, limit, or prohibit.
- **Applicable or Relevant and Appropriate Requirements (ARARs)**, as defined in CERCLA Section 121(d), include those standards, requirements, criteria, or limitations that have been promulgated under federal or state law, whichever is more stringent, that may not be "applicable" to the specific contaminant released or the remedial actions contemplated but are sufficiently similar to site conditions TBC relevant and appropriate. If a relevant or appropriate requirement is well suited to a site, it carries the same weight as an applicable requirement during the evaluation of remedial alternatives.

- **To Be Considered (TBC) Criteria** are non-promulgated advisories or guidance issued by federal or state agencies that may be used to evaluate whether a remedial alternative is protective of human health and the environment in cases where there are no standards or regulations for a particular contaminant or site condition. TBCs are not potential ARARs because they are neither promulgated nor enforceable, although it may be necessary to consult TBCs to interpret ARARs, or to determine preliminary remediation goals when ARARs do not exist for particular contaminants, or are not sufficiently protective. Unlike ARARs, compliance with TBCs is not mandatory.

There are three types of SCGs: chemical-specific, location-specific, and action-specific SCGs.

- **Chemical-Specific SCGs** are usually health- or risk-based numerical values or methodologies that establish an acceptable amount or concentration of a chemical in the ambient environment. They are used to assess the extent of remedial action required and to establish cleanup levels for a site.
- **Location-Specific SCGs** are restrictions placed on the concentration of hazardous substances or the conduct of activity solely because the activities occur in special locations. Examples of location-specific SCGs include building code requirements and zoning requirements. Location-specific SCGs are commonly associated with features such as wetlands, floodplains, sensitive ecosystems, or historic buildings that are located on or close to the site. See Table 2-1 for the location-specific SCGs for OU2.
- **Action-Specific SCGs** are usually technology- or activity-based requirements that guide how remedial actions are conducted. These may include record-keeping and reporting requirements; permitting requirements; design and performance standards for remedial actions; and treatment, storage, and disposal requirements. Table 2-2 presents the action-specific SCGs for OU2.

Section 2.3 accounts for SCGs in the selection of sediment action levels and soil cleanup levels for COPCs. Section 2.4 presents estimates of contaminated volumes based on the sediment action levels and soil cleanup levels.

2.3 Selection of Cleanup Objectives

The NYSDEC FS and the Flintkote RAR established cleanup objectives by evaluating the available SCGs for each contaminant and each media as summarized below (EEEPC 2009a; TVGA Consultants 2005a). The EPA updated this evaluation for each media based on the results of the additional field investigations, completed in 2014 to 2016, and the baseline HHRA and BERA. As part of this evaluation, this Supplemental FS identifies sediment action levels and preliminary remediation goals (also referred to as cleanup levels in this report) for contaminated soil to address unacceptable risks posed by the Site.

2.3.1 Creek Channel Sediments

The NYSDEC FS included sediment cleanup objectives for the creek corridor and the Flintkote Millrace as described in the NYSDEC FS, Section 2.3.1 (EEEPC 2009a). Numerical values were derived from the 1999 Technical Guidance for Screening Contaminated Sediments (NYSDEC 1999). These values were updated in the 2014 Guidance, Screening and Assessment of Contaminated Sediment (NYSDEC 2014). The updated values are presented in Table 2-3 for the COPCs and risk drivers for sediment. The EPA will defer the selection of cleanup levels until a comprehensive evaluation of the sediments within the entire creek (OU2 and OU3) is completed. For the purpose of this Supplemental FS, the EPA has identified an action level of 1 part per million (ppm) for PCBs in sediment. This action level acts as a trigger for excavation of all sediments, bank to bank, within the creek channel.

2.3.2 Upland Soils

The NYSDEC FS (EEEPC 2009a) included the soil cleanup objectives (SCOs) for upland soils for Upson Park, the Former United Paperboard Company, and the White Transportation Property as described in the NYSDEC FS, Section 3.2.4. Numerical values were based on New York Codes, Rules, and Regulations (NYCRR) Part 375-6.8 (NYSDEC 2006c). This regulation presents SCOs for protection of ecological resources, groundwater, and public health. The SCOs for the Former Flintkote Plant Property were based on the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 Soil Cleanup Objectives (NYSDEC 1994). TAGM 4046 has since been replaced by the NYSDEC Commissioner Policy (CP) 51 for Soil Cleanup Guidance (NYSDEC 2010b) and the 6 NYCRR Part 375-6 Remedial Program SCO (NYSDEC 2006c).

Guidance values presented in NYSDEC's CP-51 Soil Cleanup Guidance were also considered for evaluation by EPA. As per CP-51, an acceptable presumptive remedy for soil where neither the unrestricted SCOs nor the ecological SCOs are applied in the remedial program may include a soil cleanup level for PCBs of 1 ppm in the surface soils and 10 ppm in subsurface soils. The subsurface soils are defined as soils beneath 1 foot of soil cover for commercial and industrial uses; or soil beneath 2 feet of soil cover for residential and restricted residential uses.

This Supplemental FS report identifies soil cleanup levels for COPCs and risk drivers, including values listed in NYCRR Part 375-6.8 for the protection of human health. For the upland soils at each property, restricted commercial use cleanup levels for protection of public health are provided (see description below). These values are presented in Table 2-4.

NYCRR Part 375-6.8 site use designations are as follows:

- **Unrestricted use.** A use without imposed restrictions, such as environmental easements or other land use controls; or
- **Restricted use.** A use with imposed restrictions, such as environmental easements, which, as part of the remedy selected for the site, require a site

management plan that relies on ICs or engineering controls to manage exposure to contamination remaining at a site. Restricted use is separated into four different categories:

1. **Residential use.** A land use category that allows a site to be used for any use other than raising livestock or producing animal products for human consumption. Restrictions on the use of groundwater are allowed, but no other institutional or engineering controls relative to the residential SCOs, such as a site management plan, would be allowed. This land use category will be considered for single family housing;
2. **Restricted-Residential use.** A land use category that shall only be considered when there is common ownership or a single owner/managing entity of the site. Restricted-residential use shall, at a minimum, include restrictions which prohibit any vegetable gardens on a site, although community vegetable gardens may be considered with NYSDEC's approval and single family housing. Active recreational uses, which are public uses with a reasonable potential for soil contact, such as parks, are also included under this category;
3. **Restricted-Commercial use.** A land use category for the primary purpose of buying, selling, or trading of merchandise or services. Commercial use includes passive recreational uses, which are public uses with limited potential for soil contact; and
4. **Restricted-Industrial use.** A land use category for the primary purpose of manufacturing, production, fabrication or assembly process and ancillary services. Industrial uses do not include any recreational component.

2.3.2.1 Creek Banks of Upland Soils

All creek channel remedial alternatives include bank stabilization measures along the length of OU2 Eighteenmile Creek in order to limit upland soils from eroding to the creek and causing recontamination. The creek banks are considered the area approximately 20 feet above the bankfull width of the sediments. For cost-estimating purposes, costs associated with stabilization measures for soil along the creek bank and embankment have been included with the Creek Channel and Millrace alternatives addressing contaminated sediments (CC1 through CC3). Costs associated with the excavation of contaminated soil along the creek bank and embankments for each of the properties have been incorporated into each of the remedial alternatives addressing the contaminated soil (S1 through S5). The FS assumes bank stabilization measures for the entire length of the Creek Channel, including the creek banks up to the top of the embankments. The stabilization measures will consist of a demarcation membrane and a combined 24-inch-thick layer of stone, gravel, fill, and soil. Assumptions used for cost-estimating purpose are provided in Section 3.2.1.2. The specifications for the bank stabilization measures will be developed during the remedial design.

2.4 Determination of Contaminated Sediment and Soil Volumes

The RAOs were developed to mitigate potential risks in two ways: by eliminating routes of exposure and/or by reducing the contaminant concentrations in impacted media to meet applicable chemical-specific standards at the site. The NYSDEC FS and Flintkote RAR calculated contaminated sediment and soil volumes based on soil and sediment cleanup objectives described above (EEEPC 2009a; TVGA Consultants 2005a). The NYSDEC volumes of contaminated sediments were based on PCBs and/or metals exceedances above the sediment cleanup objectives. Similarly, the NYSDEC volumes of contaminated soil were based on polychlorinated biphenyls (PCBs), semivolatile organic compounds (SVOCs), pesticides, and/or metals exceedances above the SCOs. NYSDEC labeled material in the creek sediments and soils as "Hazardous" based on samples with PCB concentrations greater than 50 ppm and samples failing the toxicity characteristic leaching procedure (TCLP) test for lead. NYSDEC labeled the remaining contaminated material as "Non-Hazardous." The EPA does not classify material in this way for Superfund remedial actions; however, to maintain consistency with the volumes determined by NYSDEC, the labels of "Hazardous" and "Non-Hazardous" were maintained where appropriate. Additional details on sediment and soil volumes and related COPC concentrations are provided in Appendix A.

2.4.1 Creek Channel Sediments

The EPA identified a sediment action level of 1 ppm for PCBs. All sediment sample locations within the OU2 Eighteenmile creek corridor and Flintkote Millrace boundaries exceed this action level except for some samples along the west branch of the Eighteenmile Creek headwaters and small isolated areas along the creek corridor. The sediments of the west branch of the creek headwaters have high concentrations of lead and the upland soils on the banks along this section have high concentrations of PCBs. The creek is a dynamic system and contamination found in sampling conducted by NYSDEC in 2007/2008 may or may not have been found at the same levels during subsequent sampling. Therefore, the volumes of the sediments in the west branch were retained in the remedial alternative evaluation. The volumes of contaminated sediments presented in the NYSDEC FS do no need to be modified based on EPA's selected action level and the additional information from the recent investigations. The following is a brief summary of how the NYSDEC creek channel sediment volumes were calculated.

An approximate volume of contaminated sediment requiring excavation was calculated in the NYSDEC FS and is described in the FS Section 2.2.3.2 (EEEPC 2009a). Sediment thickness, bankfull width, and stream length between transects were used to calculate volume. The extent of contaminated sediment is illustrated in Figure 2-1. The total in-place volume of contaminated sediment in Eighteenmile Creek, including both the East and West Headwater Branches and millrace, was estimated at 14,500 cubic yards (CY). The maximum thickness of sediment was approximately 4 to 5 feet. The estimated volume of waste with PCB concentrations above 50 ppm and lead concentrations above 5 ppm as a TCLP extract (designated "hazardous") is approximately 5,000 CY.

Additional sediment samples were collected as part of the Supplemental RI (E & E 2016a). Table A-3 in Appendix A summarizes the concentration of chemicals driving the risks for each transect area and volume developed as part of the NYSDEC FS.

2.4.2 Upland Soils

The EPA evaluated cleanup levels, including New York State's 6 NYCRR Part 375, in the development of alternatives to address contaminated upland soils. The EPA has identified New York State's 6 NYCRR Part 375 as an ARAR, a TBC, or an 'other guidance' to consider in addressing contaminated soil at OU2. As a result, the volumes of contaminated soils calculated under the NYSDEC FS do not need to be modified based on the cleanup levels identified in this Supplemental FS for the protection of human health. Because the active alternatives to address contaminated soil incorporate bank stabilization measures along the entire length of the creek within the OU2 site, the 24-inch-thick cover system is expected to greatly reduce exposure of ecological receptors to site-related contaminants and address any potential for site contaminants to enter the creek corridor. In addition, upland area at the properties provides limited ecological function and, as there is no observed or expected ecological function, identification of soil cleanup levels for protection of ecological resources, in addition to commercial/industrial cleanup levels, was deemed unnecessary.

Some changes to the contaminated soil volumes were needed based on the data collected during the recent investigations and the evaluation of volumes designated as "Hazardous" in the Flintkote RAR (TVGA Consultants 2005b). The following is a brief summary of how the NYSDEC upland soils volumes were calculated and modified for the purposes of this FS.

Using the method described in Section 3.2.4.3 of the NYSDEC FS (EEEPC 2009a), the volume of contaminated soils was estimated to be 4,600 CY for the Former United Paperboard Company Property; 7,000 CY for Upson Park; and 110 CY for the White Transportation Property. The total volume of contaminated soils to be addressed at these upland sites is approximately 11,710 CY. The maximum contamination depth is approximately 12 feet below ground surface (BGS) and is located near the Clinton Street Dam on the Former United Paperboard Company Property. The NYSDEC FS did not evaluate the depth of contamination based on CP-51 soil cleanup guidance for subsurface soils with PCB concentrations of less than 10 ppm. A subsequent evaluation of PCB subsurface soil concentrations indicated that in soils with PCB concentrations less than 10 ppm, lead concentrations were generally greater than 1,000 ppm. Therefore, the estimated contamination depths and volumes determined by NYSDEC was not adjusted by the EPA in the Supplemental FS.

Approximately 3,800 CY of soil at the Former United Paperboard Company Property and 4,900 CY of soil at Upson Park were designated as hazardous due to PCB concentrations above 50 ppm and lead concentrations above 1,000 ppm or 5

ppm as a TCLP extract. The total volume of contaminated soil at Upson Park was modified from 2,100 CY to 4,200 CY as hazardous and non-hazardous soil volumes were switched in the NYSDEC FS (EEEPC 2009a). Additional data that was collected from the site in 2014 through 2016 identified additional soil with PCB concentrations greater than 50 ppm, increasing the hazardous soil volume by 700 CY. Also, if the restricted residential SCO of 400 ppm lead was applied at Upson Park, then approximately 90 CY of additional soil would need to be excavated. The NYSDEC RI and Supplemental RI did not investigate the subsurface soil below existing structures at each of these sites. It is unknown whether this material exceeds selected cleanup levels. For purposes of this FS, these areas were not included in the contaminated soil volume; however, these areas should be addressed during the design phase (NYSDEC 2006b, EEEPC 2009b).

The process used to estimate contaminated soil volumes for the Former Flintkote Plant Property is described in the Flintkote RAR, Appendix A (TVGA Consultants 2005a). Remedial actions have been performed to demolish the buildings that were on site as part of OU1 and only their foundations remain. After accounting for these remedial actions, approximate volumes of contaminated soils at Flintkote are 29,400 CY at 300 Mill Street; 9,700 CY at 198 Mill Street; and 7,200 CY on the Island. At the Island, 315 CY were added to the volume estimate to account for an additional sample location with lead concentrations greater than 1,000 ppm, for a total volume of 7,515 CY. E & E evaluated the locations that were identified as hazardous in the original RAR based on whether soil samples from the locations failed the TCLP for lead or whether the soil had total PCB concentrations over 50 ppm (see Appendix A). Because only 20% of the sample locations failed TCLP for lead and no samples locations had concentrations of PCBs greater than 50 ppm, the NYSDEC designation of all soils as ‘hazardous” is overly conservative. For cost-estimating and planning purposes, the EPA estimates that at least 50% of the soil could either be stabilized and remain on site or disposed of as non-hazardous. This is called out in the descriptions of alternatives as “lead stabilization.” With this assumption, the total volume of soils that would be excavated and disposed off-site would be 8,600 CY and the total volume of soils that would be stabilized and treated as non-hazardous soils would be 8,600 CY. The volume of soils treated as non-hazardous would increase from a total of 29,400 CY as designated in the RAR to 38,000 CY. The total volume of contaminated soils at the Former Flintkote Plant Property would be 46,615 CY.

Additional soil samples were collected as part of the Supplemental RI (E & E 2016a). Table A-4 in Appendix A summarizes the concentration of chemicals driving the risks for soils in each excavation area and volume developed as part of the NYSDEC FS (see Figure 2-1). Table A-5 in Appendix A summarizes the concentration of chemicals driving the soils risks in areas outside the excavation areas. Figure 2-1 provides the extent of contamination to be further addressed in this FS for these upland properties.

Table 2-1 Location-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
State Location-Specific Guidance					
Environmental Conservation Law	Endangered and Threatened Species	6 NYCRR 182	Lists endangered and threatened species and species of special interest	No	FWIA (EEEPC 2009b) indicates no occurrences of rare or endangered species at the site
	Freshwater Wetlands	6 NYCRR 663-665	Establishes permit requirement regulations, wetland maps and classifications	No	FWIA (EEEPC 2009b) indicates no state wetlands within Corridor Site
	Floodplain Management Regulations Development Permits	6 NYCRR 500	Describes development permitting requirements for areas in floodplains	Yes	Floodplain exists along Eighteenmile Creek
	Use and Protection of Waters	6 NYCRR 608	Regulates the modification or disturbance of streams	Yes	
	Wild, Scenic, and Recreational Rivers	6 NYCRR 666	Regulations for administration and management	Yes	
	Floodplains	6 NYCRR 502	Contains floodplain management criteria for state projects	Yes	Floodplains exist along Eighteenmile Creek
Federal Location-Specific Guidance					
National Historical Preservation Act 16 USC Section 469	Preservation of archaeological and historical data	36 CFR Part 65	Action to recover and preserve artifacts	Yes	

Table 2-1 Location-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
National Historical Preservation Act Section 106 (16 USC 470)	Historic landmarks, property, or projects owned or controlled by federal agencies	36 CFR Part 800	Preserve historic property, minimize harm to National Historic Landmarks	Yes	
Endangered Species Act of 1973 (16 USC 1531, 661)	Endangered and Threatened species	50 CFR Part 200, 402 33 CFR Parts 320-330	Determine presence and conservation of endangered species	No	FWIA (EEEPC 2009b) indicates no current records of federally listed endangered species at the Site
Clean Water Act Section 404	Wetland Protection	40 CFR Parts 230 33 CFR Parts 320-330	Action to prohibit discharge into wetlands	No	No federal wetlands at the Corridor Site
Clean Water Act Part 6 Appendix A	Wetland Protection	40 CFR Part 6 Appendix A, section 4	Avoid adverse effects, minimize potential harm, preserve and enhance wetlands	No	No federal wetlands at the Corridor Site
Floodplain Management	Executive Order No. 11988	40 CFR 6.302 (b) (2005)	Regulates activities in a floodplain	Yes	Floodplains exist at the Corridor Site

Key:
CFR = Code of Federal Regulations
FWIA = Fish and Wildlife Impact Analysis
NYCRR = New York Codes, Rules and Regulations
SCG = Standards, criteria, and guidelines
USC = United States Code

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
Local Action-Specific Guidance					
Lockport City Code	Demolition of Buildings	Chapter 68	Involves permitting and requirements for removal of buildings and structures	Yes	Applicable to the removal of dams and structures within the creek channel
	Environmental quality review	Chapter 92	General regulations regarding environmental projects conducted within the city; requires enforcement of 6 NYCRR 617	Yes	
	Noise	Chapter 125	Places restrictions on unnecessary noise during certain time periods	Yes	Restrictions on noise from construction equipment/vehicles
	Parks	Chapter 129	Regulates various activities conducted in city parks	Yes	Applicable to activities conducted at Upson Park
	Sewers	Chapter 150	Regulates discharge of waters to city sewers	Yes	
	Streets and Sidewalks	Chapter 158	Regulates alterations of roads and sidewalks including excavation, widening, etc.	Yes	
	Trees	Chapter 176	Regulates cutting down and planting trees on public land	Yes	Applicable to clearing and restoration activities along Upson Park
	Vehicles and Traffic	Chapter 183	Places restrictions on vehicle traffic throughout the city, and defines truck routes and weight limits on certain streets	Yes	Applicable to any transporting of wastes off-site by vehicles on city roads
	Water	Chapter 185	Places restrictions on access and use of city water mains	Yes	Relevant and appropriate to construction activities or technologies requiring access to water

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
State Action-Specific Guidance					
New York State Vehicle and Traffic Law, Article 386; Environmental Conservation Law Articles 3 and 19.	Noise from Heavy Motor Vehicles	6 NYCRR 450	Defines maximum acceptable noise levels	Yes	Applicable to noise from over-the-road vehicles
Environmental Conservation Law, Articles 3 and 19	Prevention and Control of Air Contaminants and Air Pollution	6 NYCRR 200 - 202	Establishes general provisions and requires construction and operation permits for emission of air pollutants	Yes	
Environmental Conservation Law, Articles 1, 3, and 15	Dam Removal and Barrier Mitigation In New York State	6 NYCRR Part 673	Describes dam safety regulations, which regulate permitting for "application for permit for the construction, reconstruction or repair of a dam or other impoundment structure." Joint application package would include all applicable NYSDEC permits and permits for certain other agencies (Department of State, Office of General Services, and USACE)	Yes	Applicable to the removal of dams and structures within the creek channel
Environmental Conservation Law, Article 19; also Public Health Law Articles 1271 and 1276 (Part 288 only)	Air Quality Classifications and Standards	6 NYCRR 256, 257	Part 256: New York Ambient Air quality Classification System Part 257: Air quality standards for various pollutants including particulates and non-methane hydrocarbons	Yes	Applicable to remediation activities at the site that include a controlled air emission source

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
Environmental Conservation Law, Articles 1, 3, 8, 19, 23, 27, 52, 54, and 70	Solid Waste Management Facilities	6 NYCRR 360	360-1: General provisions; includes identification of "beneficial use" potentially applicable to non-hazardous oily waste/soil (360-1.15). 360-2: Regulates construction and operation of landfills, including construction and demolition debris landfills	Yes	Applicable for establishing off-site treatment and disposal options for excavated contaminated non-hazardous sediment and debris
New York Waste Transport Permit Regulations	Permitting Regulations, Requirements, and Standards for Transport	6 NYCRR 364	The collection, transport and delivery of regulated waste, originating or terminating at a location within New York, will be governed in accordance with Part 364	Yes	Applicable for transporting wastes off-site
Environmental Conservation Law, Articles 3, 19, 23, 27, and 70	Hazardous Waste Management System - General	6 NYCRR 370	Provides definition of terms and general standards applicable to 6 NYCRR 370 - 374, 376	Yes	Hazardous wastes have been identified at the site
	Identification and Listing of Hazardous Waste	6 NYCRR 371	Identifies characteristic hazardous waste (PCBs and metals) and lists specific wastes	Yes	Applies to transportation and all other hazardous waste management practices in New York State. Applicable as hazardous wastes have been identified on site (PCB and lead contaminated sediments)

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
	Hazardous Waste Manifest System and Related Standards	6 NYCRR 372	Establishes manifest system and record keeping standards for generators and transporters of hazardous waste and for treatment, storage, and disposal facilities	Yes	Applicable to transportation of hazardous material offsite
	Hazardous Waste Treatment, Storage, and Disposal Facility Permitting Requirements	6 NYCRR 373	Regulates treatment, storage, and disposal of hazardous waste	Yes	Applicable to off-site treatment/disposal of hazardous waste
	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	6 NYCRR 374	Subpart 374-1 establishes standards for the management of specific hazardous wastes	Yes	Hazardous wastes have been identified at OU1
Environmental Conservation Law, Articles 1, 3, 27, and 52; Administrative Procedures Act Articles 301 and 305	Inactive Hazardous Waste Disposal Site	6 NYCRR 375	Identifies process for investigation and remedial action at state funded Registry sites; provides exception from NYSDEC permits	Yes	
Environmental Conservation Law, Articles 3 and 27	Land Disposal Restrictions	6 NYCRR 376	Identifies hazardous wastes that are restricted from land disposal. Defines treatment standards for hazardous waste	Yes	Hazardous wastes have been identified at the Eighteenmile Creek Superfund Site

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
New York Environmental Quality Review Regulations		6 NYCRR 617	Implements provisions of SEQRA	Yes	
Environmental Conservation Law, Articles 11 and 17	Classifications – Surface Waters and Groundwaters	6 NYCRR 701	Classifies waters of the state	Yes	Applicable to any remediation-derived surface water discharges
	Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations	6 NYCRR 703	Provides qualitative and quantitative water quality standards based on water body classification	Yes	Applicable to any remediation-derived surface water discharges
Implementation of SPDES Program in New York	General Permit for Stormwater	6 NYCRR 750 – 758	Regulates permitted releases into waters of the state	Yes	
Primary and Principal Aquifer Determinations (5/87)		NYSDEC TOGS 2.1.3	Provides guidance on determining water supply aquifers in upstate New York	No	There are no primary aquifers in Niagara county
Environmental Justice and Permitting	Environmental Justice	Commissioner Policy 29	Policy incorporates environmental justice concerns into NYSDEC's public participation provisions and application of the State Environmental Quality Review Act	Yes	

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
Federal Action-Specific Guidance					
Comprehensive Environmental Response, Compensation, and Liability Act of 1980 and Superfund Amendments and Reauthorization Act of 1986	National Contingency Plan	40 CFR 300, Subpart E	Outlines procedures for remedial actions and for planning and implementing off-site removal actions	Yes	
Occupational Safety and Health Act	Worker Protection	29 CFR 1904, 1910, and 1926	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations. Includes training requirements and construction safety requirements	Yes	Under 40 CFR 300.38, requirements of OSHA apply to all activities that fall under jurisdiction of the National Contingency Plan
Executive Order	Delegation of Authority	Executive Order 12316 and Coordination with Other Agencies	Delegates authority contained in CERCLA and the NCP to federal agencies	Yes	
Clean Air Act	National Primary and Secondary Ambient Air Quality Standards	40 CFR 50	Establishes emission limits for six pollutants (SO_2, PM_{10}, CO, O_3, NO_2, and Pb)	Yes	Applicable to emissions from equipment and remediation systems
	National Emission Standards for Hazardous Air Pollutants	40 CFR 61	Provides emission standards for eight contaminants; Identifies 25 additional contaminants, including PCE and TCE, as having serious health effects but does not provide emission standards for these contaminants	Yes	Applicable to emissions from equipment and remediation systems

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
Toxic Substances Control Act	Rules for Controlling PCBs	40 CFR 761	Provides guidance on storage and disposal of PCB-contaminated materials	Yes	PCBs are contaminants of concern at the site
RCRA	Criteria for Municipal Solid Waste Landfills	40 CFR 258	Establishes minimum national criteria for management of non-hazardous waste	Yes	Relevant and appropriate to disposal at offsite solid waste landfills
	Hazardous Waste Management System - General	40 CFR 260	Provides definition of terms and general standards applicable to 40 CFR 260 - 265, 268	Yes	Applicable to remedial alternatives that involve generation of a hazardous waste (e.g., contaminated soil)
	Identification and Listing of Hazardous Waste	40 CFR 261	Identifies solid wastes that are subject to regulation as hazardous wastes	Yes	
	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Establishes requirements (e.g., EPA identification numbers and manifests) for generators of hazardous waste	Yes	
	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Establishes standards that apply to persons transporting manifested hazardous waste within the United States	Yes	Applicable to alternatives involving off-site disposal of hazardous wastes
	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Establishes the minimum national standards that define acceptable management of hazardous waste	Yes	Relevant and appropriate to offsite hazardous waste disposal facilities
	Standards for Owners of Hazardous Waste Facilities	40 CFR 265	Establishes interim status standards for owners and operators of hazardous waste treatment, storage, and disposal facilities	Yes	Relevant and appropriate to offsite hazardous waste disposal facilities

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments
	Land Disposal Restrictions	40 CFR 268	Identifies hazardous wastes that are restricted from land disposal	Yes	Relevant and appropriate to offsite hazardous waste disposal facilities
	Hazardous Waste Permit Program	40 CFR 270, 124	The EPA administers hazardous waste permit program for CERCLA/Superfund Sites. Covers basic permitting, application, monitoring, and reporting requirements for off-site hazardous waste management facilities	Yes	Relevant and appropriate to offsite hazardous waste disposal facilities
Clean Water Act	EPA Pretreatment Standards	40 CFR 403	Establishes responsibilities of federal, state, and local government to implement National pretreatment standards to control pollutants that pass through to a POTW	Yes	Relevant and appropriate to discharge made to a POTW
Clean Water Act	Disposal of Dredge or Fill Material Guidelines	40 CFR 230, 231	Identifies potential effects and permitting requirements for the discharge of dredge or fill materials in waters of the United States or ocean waters	Yes	Relevant and appropriate to alternatives using fill as a creek cap

Table 2-2 Action-Specific ARARs, TBCs, and Other Guidance, Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Act/Authority	Criteria/Issues	Citation	Brief Description	Yes/No	Comments

Key:

ARAR = applicable or relevant and appropriate requirements
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFR = Code of Federal Regulations
EPA = (United States) Environmental Protection Agency
NCP = National Contingency Plan
NYCRR = New York Codes, Rules and Regulations
NYSDEC = New York State Department of Environmental Conservation
OSHA = Occupational Safety and Health Administration
OU = Operable Unit
PCB = polychlorinated biphenyl
PCE = perchloroethylene
POTW = Publicly Owned Treatment Works
RCRA = Resource Conservation and Recovery Act
SCG = standards, criteria, and guidelines
SEQRA = State Environmental Quality Review Act
SPDES = State Pollutant Discharge Elimination System
TCE = trichloroethylene
TOGS = Technical and Operational Guidance Series
USACE = United States Army Corps of Engineers

Table 2-3 Contaminants of Potential Concern and Sediment Guidance Values Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Analyte	Sediment Guidance Values (mg/kg)[a]
PCBs	
Total PCBs	1
SVOCs	
Total PAHs	4
Pesticides	
Σ DDT	0.044
beta-BHC	0.0017[b]
Dieldrin	0.18
Endrin	0.09
Endrin ketone	0.00086[b]
2,3,7,8-TCDD TEQ	5.0×10^{-7}
Metals	
Barium	-
Copper	32
Lead	36
Mercury	0.2
Selenium	-
Thallium	-
Vanadium	-

Notes:

[a] The sediment guidance values for SVOCs, PCBs, pesticides, and metals are based on NYSDEC's 2014 "Screening and Assessment of Contaminated Sediment" unless otherwise noted.

[b] Sediment guidance value are based on NYSDEC's 1999 "Technical Guidance for Sediment Screening Levels." All sediment guidance values are for Class A sediments, with the exception of the sediment guidance value for PCBs, which is for Class C sediments.

Key:

mg/kg = milligrams per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyls
SVOC = Semivolatile organic compound
"-" = No guidance value found in NYSDEC 2014 or NYSDEC 1999

Table 2-4 NYSDEC SCOs for Contaminants of Potential Concern for Soils
Operable Unit 2, Eighteenmile Creek Superfund Site, Lockport, New York

Analyte	Cleanup Levels, Restricted Commercial (mg/kg)				Ecological Protection Levels, Corridor Soils[b]
	Upson Park Property[a]	White Transportation Property[a]	Former United Paperboard Company[a]	Former Flintkote Plant Property[a]	
Total PCBs	1[d]	1	1	1	1
Benzo(a)anthracene	-	-	-	5.6	-
Benzo(a)pyrene	-	-	-	1	-
Benzo(b)fluoranthene	-		-	5.6	-
Benzo(k)fluoranthene	-	-	-	56	-
Dibenzo(a,h)anthracene	-	-	-	0.56	-
Total HPAH	-	-	-	500[c]	500[c]
Σ DDT	-	-	-	-	0.0033
2,3,7,8-TCDD TEQ	-	-	-	-	0.000001[c]
Antimony	-	-	-	-*	12
Cadmium	-	-	-	-	4
Copper	-	-	-	-	50
Iron	-	-	-	-	-
Lead	1,000[d]	1,000	1,000	1,000	63
Mercury	-	-	-	-	0.18
Nickel	-	-	-	-	30
Selenium	-	-	-	-	3.9
Thallium	-	-	-	-	5[c]

Note that SCOs are not listed if the analyte was not determined to be a risk driver at the property.

Notes:
[a] Cleanup levels obtained from 6 New York Codes, Rules and Regulations Part 375-6.8 Soil Cleanup Objective Tables (December 14, 2006) are based on protection of human health unless otherwise noted.
[b] COPCs identified for ecological health on a sitewide basis (Appendix A, Table A-8). Values are determined as per Note (a) for Protection of Ecological Resources.
[c] New York State Department of Environmental Conservation Soil Cleanup Guidance CP-51 (Oct 2010) Supplemental Soil Cleanup Objectives.
[d] The cleanup levels for restricted residential use are 1 ppm for PCBs and 400 ppm for Lead.

Key:
HPAH = high-molecular weight polycyclic aromatic hydrocarbons
mg/kg = milligrams per kilogram
PCB = polychlorinated biphenyl
SVOC = semivolatile organic compound
DDT = dichlorodiphenyltrichloroethane
TCDD TEQ = tetrachlorodibenzodioxin toxicity equivalence
- = Not a risk driver at specified property
-* = No guidance value listed for risk driver in (a), (b), or (c)

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LEGEND:

- PROPERTY BOUNDARY
- NON-HAZARDOUS MATERIAL
- HAZARDOUS MATERIAL

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

WHITE TRANSPORTATION

UPSON PARK

Frost Street
Porter Street
Chapel Street
Olcott Street
Monroe Street
Clinton Street
Mill Street
Van Buren Street
Jackson Street
Scovell St.
Gooding Street
BARGE CANAL
William St.
Hudson Street

SCALE IN FEET
0 100 200 300

ecology and environment

FIGURE 2-1 EXTENT OF CONTAMINATION
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

3 Technology Screening and Development of Remedial Alternatives

3.1 Identification and Screening of Technologies

Development of the alternatives was based on the results of preliminary screening of general response actions (GRAs) and technologies. The purpose of the preliminary screening is to eliminate remedial actions that may not be effective based on anticipated on-site conditions, or cannot be implemented at the site. The GRAs considered are intended to include those actions that are most appropriate for the site and, therefore, are not exhaustive.

3.1.1 General Response Actions

Based on the information presented in the RI (EEEPC 2009c), Supplemental RI (EEEPC 2009b), and the July 2005 Site Investigation Report (TVGA Consultants 2005b), GRAs were identified in the NYSDEC FS (EEEPC 2009a) and the Flintkote RAR (TVGA Consultants 2005a). GRAs describe classes of technologies that can be used to meet the remediation objectives for contaminated site media.

Potential remedial actions, including GRAs and specific remedial technologies, have been evaluated during the preliminary screening on the basis of effectiveness, implementability, and relative cost. Past performance (e.g., demonstrated technology) and operating reliability were also considered in identifying and screening applicable technologies. Technologies that were not initially considered effective and/or technically or administratively feasible were eliminated from further consideration in the NYSDEC FS and the Flintkote RAR (EEEPC 2009a; TVGA Consultants 2005a).

GRAs identified for contaminated sediment in the NYSDEC FS and Flintkote RAR are as follows (EEEPC 2009a; TVGA Consultants 2005a):

- No action;
- Institutional controls (ICs);
- Monitored Natural Recovery (MNR);
- In situ capping;

- In situ treatment; and
- Removal technology.

GRAs identified for contaminated soil in the NYSDEC FS and Flintkote RAR are as follows (EEEPC 2009a; TVGA Consultants 2005a):

- No action;
- ICs;
- Containment;
- In situ treatment;
- Stabilization;
- Ex situ treatment; and
- On- and off-site disposal.

GRAs were not identified for surface water media. Treatment and/or disposal of contaminated surface water is limited to surface water associated with the Former Flintkote Plant building sumps and will be addressed in conjunction with the soil remediation alternatives. Contaminated water associated with construction may be addressed through on-site treatment and on-site discharge to a storm sewer or an approved, off-site disposal facility.

A summary of the retained general response actions and remedial technologies for sediment and soil is presented in Table 3-1.

3.1.2 Supplemental Screening of Remedial Technologies

E & E reviewed the sediment and soil GRAs and remedial technologies screened in the NYSDEC FS and the Flintkote RAR against technology advances since the reports were originally written (EEEPC 2009a; TVGA Consultants 2005a).

Sediment

In 2014, the Interstate Technology and Regulatory Council released an updated guidance document on *Contaminated Sediments Remediation, Remedy Selection for Contaminated Sediments*. E & E reviewed the guidance and identified two GRAs that were not originally screened: amended capping; and enhanced monitoring and natural recovery (EMNR).

While amended capping was not originally screened in the FS and RAR, in situ capping was screened. The screening concluded that "water depth of Eighteen-mile Creek may not be adequate to support the cap materials" (EEEPC 2009a). This screening has been revised, as the depth upstream of the Clinton Street Dam is sufficient to support cap materials. As a result, this technology is considered for the creek channel, only in the upstream area of Clinton Dam, and can only be used in combination with another technology, such as excavation.

The 2014 guidance document states that "EMNR should be considered for large areas with lower levels of contamination that are reasonably expected to decline in conjunction with active remediation of high risk and contaminated source areas. MNR and EMNR may also be preferred in areas where [Environmental Site Assessment] ESA species are located, areas of high value habitat, or areas where historical or cultural artifacts are likely to be present. Sediment areas that are not expected to recover within a reasonable time frame but are otherwise stable (such as those not subject to high shear forces) should be targeted for EMNR." PCBs are not known to readily degrade, so it is unlikely that EMNR would effectively address the contaminants on the Site. Hence, no new sediment remediation technologies were identified for supplemental screening.

Soil

The GRAs and technologies for soil remediation were screened in the NYSDEC FS and the Flintkote RAR and developed into alternatives. A comprehensive list of technologies that were screened based on the 2005 EPA guidance document, *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* were included. E & E's literature search was performed to identify potential advances in PCB and metal remediation. Also, EPA's 2012 Engineering Issue *Technology Alternatives for the Remediation of PCB Contaminated Soils and Sediments* was reviewed. The 2012 document provides an overview of the technologies suitable for PCB remediation and identifies the EPA's 2005 guidance document as the most current source for comprehensive guidance documentation on PCB remediation. The technologies identified in the 2012 EPA Engineering Issue were all previously screened and their screening conclusions remain applicable. No new soil remediation technologies were identified for supplemental screening.

Consideration of Principal Threat Waste Treatment

Based on EPA guidance for sites in industrial areas, PCBs at concentrations of 500 milligrams per kilogram (mg/kg) or greater will generally constitute a principal threat (EPA 1990). For sites in residential areas, principal threats will generally include soils contaminated at concentrations greater than 100 mg/kg PCBs. For floodplain soils, the EPA is using the more conservative guideline of 100 mg/kg total PCBs to define principal threat waste for this OU.

The NYSDEC FS Report screened in situ and ex situ technologies to treat the PCB-contaminated sediments and soils (EEEPC 2009a). The evaluation concluded that in-situ and ex-situ thermal desorption methods (thermal blankets/wells and high-temperature thermal desorption/incineration) could work for PCBs in soil, but would require the matrix to be homogeneous and would require space for implementation. Vitrification was screened out due to the high cost of construction of a vitrification facility. In-situ and ex-situ chemical and physical stabilization for soils was listed as effective in reducing the mobility and toxicity of heavy metals, but has not been proven for treating organics and PCBs in soil. Other methods, such as soil washing, dehalogenation, and solvent extraction, were screened out due to cost, available space, and unproven effectiveness. In-situ treatment for sediment was screened out due to the difficulty of obtaining direct

contact between the treatment matrix and contaminated material. These findings have not changed with the collection of additional data.

The Flintkote RAR did not include a technology screening, but included stabilization for soils contaminated with lead and cadmium in the alternative descriptions for materials on the Island and 198 Parcel (TVGA Consultants 2005a). Based on the findings of the NYSDEC FS (EEEPC 2009a), this remedial action can be retained, as in situ treatment of soils for heavy metals is a feasible treatment method. In terms of PCB treatment, the recent data collection from test pits has indicated that the heterogeneity of the soil matrix screens out the possibility of using thermal desorption for PCB treatment. As a result, treatment of the principal threat material for PCBs is not practical at this site.

The additional investigations in 2014 and 2016 did not indicate any significant change in nature of contamination or site conditions; therefore, no additional technologies need to be identified and screened.

3.2 Development and Screening of Alternatives

This Supplemental FS presents three alternatives for the OU2 creek channel sediments and five alternatives for the upland soils. Two alternatives were developed for the creek channel and six alternatives were developed for Upson Park, the Former United Paperboard Company Property, and the White Transportation Property in the NYSDEC FS (EEEPC 2009a). Five alternatives were developed for the Former Flintkote Plant Property in the Flintkote RAR (TVGA Consultants 2005a). Table 3-2 presents the EPA alternatives presented in this Supplemental FS and the equivalent NYSDEC alternatives. The alternatives generally fall within five different categories: no action, limited action, complete capping, combined excavation and capping, and excavation. Each is discussed in the following sections.

Bank stabilization will be implemented under the creek channel alternatives, except for the No Action Alternative, to limit erosion of upland soils to the creek. This will reduce the risk of recontamination of creek sediments.

3.2.1 Sediment

3.2.1.1 Alternative CC1 – No Action

The No Action Alternative is evaluated as a procedural requirement under the Superfund program and as a basis for comparison with the other alternatives. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

3.2.1.2 Alternative CC2 – Sediment Excavation and Creek Bank Stabilization

This alternative would consist of the complete removal of contaminated sediment in the OU2 creek channel, followed by restoration with appropriate substrate(s). To facilitate the removal of contaminated sediment, the Clinton Street Dam would

be removed. The creek will be dammed and diverted using pumps during sediment removal.

Creek sediments located within the creek and to the bankfull width elevation will be excavated and transported to approved, off-site disposal facilities. Creek bank soils are considered the soils located along the 20-foot width above the bankfull width elevation and will be stabilized in place. These areas are identified with a blue outline on Figure 3-1.

Prior to the start of excavation activities, the creek bank soils would be stabilized by constructing approximately 20-foot-wide gravel access roads along both sides of the creek channel. Construction of the access roads would serve the dual purposes of facilitating creek remediation and stabilizing the creek banks to protect them from erosion. Material excavated during access road construction that is considered to be hazardous waste or that exceeds soil cleanup levels would be transported to approved, off-site disposal facilities. It is assumed that this volume would be removed as part of the excavation of upland soils. Additional details are provided in the NYSDEC FS (EEEPC 2009a).

After completion of the sediment excavation activities, the access roads area would be stabilized using topsoil and seeding. Additionally, an estimated 10-foot-wide area located between the access roads and the upland properties would be covered in place with a demarcation barrier and a 24-inch-thick cover system. This area varies based on features along the length of the Creek. These bank stabilization measures are included as measures to protect the creek banks from erosion and future recontamination by upland soils.

Additionally, the Former Flintkote Building C sump and trench drain, the Building D remaining structures and turbines, and the included sediments would be removed. The steep slope along Mill Street and excavation around the turbine adjacent to the creek potentially poses the need for additional engineering measures to effectively perform excavation activities. A portion of the sediment from the outfall pipe to Eighteenmile Creek will be removed, and the pipe would be closed in place. Additional details are provided in the Flintkote RAR (TVGA Consultants 2005a). Monitoring and maintenance will be periodically performed after remediation to measure and review whether RAOs continue to be achieved, evaluate the integrity of the cap, and measure the effectiveness of bank stabilization measures.

3.2.1.3 Alternative CC3 – Combined Excavation and Capping

This new alternative involves the removal of contaminated sediment to the selected action levels within the creek and capping of the sediment located upstream of the Clinton Street Dam, which will require rehabilitation/repair. The downstream contaminated sediments will be excavated as the water depth is not adequate to support the installation of a cap. The creek will be dammed and diverted during sediment removal. Figure 3-2 illustrates the areas of contamination to be addressed under this alternative.

Approximately 40,000 square feet of creek channel will be capped between the Clinton Street Dam and Clinton Street. The purpose of the cap layer is to isolate underlying sediment contaminants, provide a clean sediment surface, and provide an appropriate substrate for habitat restoration, where applicable. This thickness includes the following layers from the channel bottom to top of the cap: 24 inches for the chemical isolation layer; 6 inches for bioturbation; and 6 inches for erosion protection. Bioturbation describes the redistribution of sediment by benthic fauna through burrowing, ingestion and excretion of sediments, and tube building. The erosion protection layer is placed above the bioturbation layer to provide adequate erosion protection over the life of the cap. The bioturbation layer will consist of gravel material and will also function as the filter layer. The erosion protection layer will likely consist of light New York State Department of Transportation (DOT) stone.

For cost-estimating and planning purposes, the FS makes certain assumptions regarding the cap thickness and composition. The cap thicknesses selected in the FS were selected to meet the minimum requirements. Further evaluation of the cap thicknesses shall be completed during the design. During the design phase, the cap will be designed specific to physical and chemical conditions of the area and using the procedures described by the USACE Waterway Experiment Station and the EPA guidance document (Palermo et al. 1998a, 1998b) to identify capping material selection, capping material sources, cap configuration, and cap placement methods.

Clean fill will be placed via a land-based excavator or crane with a clamshell bucket to achieve the necessary thickness for the chemical isolation layer and the bioturbation layer in the cap area. The cap materials will be stockpiled at a staging area, and will be transferred to the cap area by mechanical loading or by slurrying and pumping. Erosion protection will be placed on top of the chemical isolation and bioturbation layers using a land-based excavator or crane with a clamshell bucket.

For the creek channel that will not be capped, creek sediment will be excavated and transported to approved, off-site disposal facilities. Creek bank soils between the creek and bankfull width elevation will also be excavated. Prior to the start of excavation activities, 20-foot wide gravel access roads will be constructed on both sides of the creek channel beyond the bankfull width elevation. The construction of the access roads serves a dual purpose to facilitate creek remediation as well as stabilizing the banks to prevent erosion. Additionally, the soil and fill between the access roads and the top of the embankment will also be covered in place. Material excavated during access road construction that is considered hazardous waste, or exceeds soil cleanup levels, would be addressed as part of the upland soils alternatives. Additional details are provided in the NYSDEC FS (EEEPC 2009a). These bank stabilization measures will be constructed to prevent erosion and future recontamination by upland soils.

Additionally, the Former Flintkote Building C sump and trench drain, Building D remaining structures and turbines, and the included sediments would also be removed. The steep slope along Mill Street and excavation around the turbine adjacent to the creek potentially poses the need for additional engineering measures to effectively perform excavation activities. A portion of the sediment from the outfall pipe to Eighteenmile Creek will be removed and the pipe would be closed in place. Additional details are provided in the Flintkote RAR (TVGA Consultants 2005a). Monitoring will be periodically performed after remediation to measure and review whether RAOs continue to be achieved, evaluate the integrity of the cap, and measure the effectiveness of bank stabilization measures.

3.2.2 Upland Soil

3.2.2.1 Alternative S1 – No Action

The No Action Alternative is evaluated as a procedural requirement under the Superfund program and as a basis for comparison with the other alternatives. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment. No Action Alternatives for upland soils are considered for the following:

S1A Former Flintkote Plant Property

S1B White Transportation Property

S1C Former United Paperboard Company Property

S1D Upson Park

3.2.2.2 Alternative S2 – Limited Action

A limited action alternative would provide ICs and minimal engineering controls (ECs) to prevent exposure to contaminated soils as well as long-term monitoring. ICs would include access and use restrictions and development and implementation of a site management plan (SMP). Minimal ECs would include physical barriers, such as fencing with warning signs installed around soil and fill that exceeds the cleanup levels to limit human exposure to contaminated media. Long-term monitoring activities would include annual inspections of the fencing and signage. Approximate locations of proposed fencing and signage are shown on Figure 3-3.

Under CERCLA 121 (c), five-year reviews should be conducted for sites that implement remedial actions that, upon completion, will leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative will result in contaminated soil remaining on site, five-year reviews may be required at the site.

Limited action alternatives for upland soils are considered for the following:

S2A Former Flintkote Plant Property

S2B White Transportation Property

S2C Former United Paperboard Company Property

S2D Upson Park

3.2.2.3 Alternative S3 – Complete Capping

Complete capping alternatives consist of a 24-inch-thick soil cover with a demarcation layer installed over soil and fill that exceeds the cleanup levels, to reduce the potential for direct contact exposures and to prevent erosion of contaminated materials into Eighteenmile Creek. Asphalt parking areas on the Upson and United Properties will be brought up to grade with the cover and the asphalt will be replaced. The approximate areas requiring capping are shown on Figure 3-4.

Since contaminated soil and fill would remain on site following remediation, ICs, an SMP, and five-year reviews would be implemented as in the S2 - Limited Action Alternatives. Long-term monitoring would be conducted annually to visually inspect the soil cover.

Complete capping alternatives for upland soils are considered for the following:

S3A Former Flintkote Plant Property

S3B White Transportation Property

S3C Former United Paperboard Company Property

S3D Upson Park

3.2.2.4 Alternative S4 – Excavation

Excavation alternatives consist of excavation and off-site disposal of contaminated soil that exceeds the cleanup levels. Excavated soil will be disposed of at approved, off-site disposal facilities. Excavated areas will be restored with clean backfill and plantings. The approximate areas to be excavated are shown on Figure 3-5. Since contaminated soil above acceptable levels would remain on the properties following remediation, institutional controls would be implemented and may include environmental easements/restrictive covenants, deed notices, and/or zoning restrictions to limit future use of the properties. Steep slopes along the banks may require additional engineering measures to perform excavation activities. It is assumed that this will be addressed in the remedial design phase.

Excavation alternatives are considered for the following:

S4A Former Flintkote Plant Property

S4B White Transportation Property

S4C Former United Paperboard Company Property

S4D Upson Park

3.2.2.5 Alternative S5 – Combined Excavation and Capping

This alternative consists of capping of contaminated soils that exceeds the cleanup levels and the excavation of contaminated soil and fill at the properties containing PCBs with concentrations greater than 50 ppm and lead greater than 1,000 ppm. For cost-estimating and planning purposes, the FS assumed that concentrations of lead in soil greater than 1,000 ppm would exceed the TCLP extract threshold of 5 ppm for hazardous waste determination purposes. Approximately 25,915 CY of contaminated soil and fill would be excavated and transported off-site for proper disposal, as appropriate, based on the concentrations of contaminants in the excavated soil and fill. Steep slopes along the banks may require additional engineering measures to perform excavation activities. It is assumed that this will be addressed in the remedial design phase. Approximate areas of excavation and capping are shown in Figure 3-6.

Since contaminated soil above acceptable levels would remain on the properties following remediation, institutional controls would need to be implemented and may include environmental easements/restrictive covenants, deed notices, and/or zoning restrictions to limit future use of the properties.

Long-term monitoring would be conducted periodically to visually inspect the cover system. Because contaminated soil would be left in place as part of this alternative, review of the remedy would be required at least every five years.

Combined excavation and capping alternatives are considered for the following:

- S5A Former Flintkote Plant Property
- S5B White Transportation Property
- S5C Former United Paperboard Company Property
- S5D Upson Park

Table 3-1 Summary of Retained General Response Actions and Remedial Technologies for Sediment and Soil, OU2 Eighteenmile Creek Superfund Site

General Response Actions and Remedial Technology	Brief Description	Applicability
Sediment		
Passive Response Actions		
No Action	No further action to remedy sediment conditions at the Site	1, 2
Institutional Controls and LTM	Non-engineering measures to reduce exposure to hazardous substances by limiting land or resource uses, including fish consumption advisories and commercial fishing bans, waterway use restrictions, and land use restriction/structure maintenance agreements	1, 2
Containment		
In Situ Capping	Reduces risk by placing a cap over the contaminated sediment through physical/chemical isolation or sediment stabilization	1, 2
Removal Technologies		
Excavation/Dredging	Removes contaminated sediment when it is submerged (dredging) or dewatered (excavation).	1, 2
Sediment Dewatering	Decreases the water content of the excavated sediment for disposal. Staging area needed.	1, 2
Sediment Treatment	Generally classified as biological, chemical, extraction/washing, immobilization, thermal, and particle size separation	1, 2
Sediment Disposal	Offsite disposal of the excavated and dewatered sediment to a landfill	1, 2
Soil		
Passive Response Actions		
No Action	No further action to remedy soil conditions at the site	A, B, C, D
Institutional Controls and LTM	Include public notification, environmental easements, fencing, and signs	A, B, C, D
Containment		
Bituminous Concrete Cover (Asphalt)	Selective excavation and/or standard asphalt cover system including layer of stone, asphalt binder course, and final wearing course	B, C, D
Clay or Soil Cover	Cover system consisting of soil	A, B, C, D
Low-permeability cover system	Cover system with low-permeability. May include clay, asphalt or a synthetic material.	A

Table 3-1 Summary of Retained General Response Actions and Remedial Technologies for Sediment and Soil, OU2 Eighteenmile Creek Superfund Site

General Response Actions and Remedial Technology	Brief Description	Applicability
In Situ Treatment		
Solidification/ Stabilization	Solidification/stabilization treatment systems, sometimes referred to as fixation systems, seek to trap or immobilize contaminants within their "host" medium using chemical reactions instead of removing them through chemical or physical treatment	A
Removal Technologies		
On-site Disposal	Requires construction of a secure landfill that meets RCRA and state requirements.	A
Off-site Disposal	Involves the excavation and hauling of contaminated material to approved commercially licensed disposal facilities. The non-hazardous spoils would go to a non-hazardous/solid waste facility, while the hazardous spoils would go to a RCRA or Toxic Substances Control Act permitted facility.	A, B, C, D

Site Areas:
1 - Eighteenmile Creek and Millrace Sediments
2 - Former Flintkote Plant Property Sediments within the Outfall to Eighteenmile Creek
A - Upland soils at the Former Flintkote Plant Property (300 Parcel, 198 Parcel and Island).
B - Upland soils at the White Transportation Property
C - Upland soils at the Former United Paperboard Company Property
D - Upland soils at Upson Park

Key:
EPA = (United States) Environmental Protection Agency
FS = feasibility study
IC = institutional control
ISV = in situ vitrification
LTM = long-term monitoring
LCP = National Contingency Plan
NYCRR = New York Codes, Rules and Regulations
OU = operable unit
PCB = polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act
SVE = soil vapor extraction
VOC = volatile organic compound

Table 3-2 Alternative Development

Alternative Type	EPA Alternative	NYSDEC Alternative
Sediment[1]		
No Action	CC1 No Action	Alternative 1 No Action
Complete Capping	No alternative developed	No alternative developed
Complete Excavation	CC2 Sediment Excavation and Creek Bank Stabilization	Alternative 7 Sediment and Creek Bank Excavation with Restoration and LTM
Combined Excavation and Capping	CC3 Combined Excavation and Capping	No alternative developed
Upland Soils at Former Flintkote Plant Property[2]		
No Action	S1A No Action	Alternative 1 No Action
Limited Action	S2A Limited Action	No alternative developed
Complete Capping	S3A Complete Capping	Alternative 2 Exposure Pathway Removal
Excavation	S4A Excavation	Alternative 5 Complete Excavation
Combined Excavation and Capping	S5A Combination Excavation and Capping	Alternative 4 Excavation and Containment
Upland Soils at Former United Paper Board Property, Upson Park, and White Transportation Property[1]		
No Action	S1B, S1C and S1D No Action	Alternative 1 No Action
Limited Action	S2B, S2C and S2D Limited Action	Alternative 2 Institutional Controls with LTM
Complete Capping	S3B, S3C and S3D Complete Capping	Alternative 5 Complete Containment with LTM
Excavation	S4B, S4C and S4D Excavation	Alternative 4 Complete Excavation with Bank Stabilization and LTM
Combined Excavation and Capping	S5B, S5C and S5D Combination Excavation and Capping	Alternative 3 Hazardous Waste Removal with Bank Stabilization and LTM

Notes:
1. From NYSDEC 2010a. Record of Decision, Eighteenmile Creek Corridor Site, Operable Unit Nos. 1, 3, 4, 5 and 6, State Superfund Project, Lockport, Niagara County, New York. Site Number 932121.
2. From NYSDEC 2006. Record of Decision for the Former Flintkote Plant Site.

Site Areas:
A - Upland soils at the Former Flintkote Plant Property (300 Parcel, 198 Parcel and Island).
B - Upland soils at the White Transportation Property
C - Upland soils at the Former United Paperboard Company Property
D - Upland soils at Upson Park

Key:
CC = creek channel
EPA = United States Environmental Protection Agency
LTM = long-term monitoring
NYSDEC = New York State Department of Environmental Conservation

F:\18 Mile Creek\2018\3-2.dwg

AR 6

AR 5

AR 1

AR 2

AR 3

AR 4

BUILDING C & D DEBRIS

BUILDING C & D DEBRIS

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

CLINTON STREET DAM

WHITE TRANSPORTATION

UPSON PARK

EIGHTEEN MILE CREEK

BARGE CANAL

Frost Street

Porter Street

William Street

Olcott Street

Chapel Street

Monroe Street

Clinton Street

Mill Street

Van Buren Street

Jackson Street

Scovell St.

Gooding Street

Street

Transportation Center

LEGEND:

- PROPERTY BOUNDARY
- EXCAVATION AREA
- TEMPORARY ACCESS ROAD
- ACCESS ROAD/BANK STABILIZATION
- BUILDING C&D SUMP & REMAINING STRUCTURES
- TEMPORARY STAGING AREAS
- DEBRIS PILE LOCATION

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

SCALE IN FEET

0 100 200 300

ecology and environment

FIGURE 3-1

ALTERNATIVE CC2
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

F:\18 Mile Creek\2018\3-1.dwg

AR 6

AR 5

AR 1

AR 2

AR 3

AR 4

BUILDING C & D DEBRIS

BUILDING C & D DEBRIS

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

CLINTON STREET DAM

WHITE TRANSPORTATION

UPSON PARK

EIGHTEENMILE CREEK

BARGE CANAL

Frost Street

Porter Street

William Street

Olcott Street

Chapel Street

Monroe Street

Clinton Street

Mill Street

Van Buren Street

Jackson Street

Scovell St.

Gooding Street

LEGEND:

- PROPERTY BOUNDARY
- EXCAVATION AREA
- CAPPING AREA
- TEMPORARY ACCESS ROAD
- ACCESS ROAD/BANK STABILIZATION
- BUILDING C&D SUMP & REMAINING STRUCTURES
- TEMPORARY STAGING AREAS
- DEBRIS PILE LOCATION

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

SCALE IN FEET

0 100 200 300

ecology and environment

FIGURE 3-2 ALTERNATIVE CC3
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

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LEGEND:

- PROPERTY BOUNDARY
- HAZARDOUS MATERIAL
- NON-HAZARDOUS MATERIAL
- SIGN
- FENCING

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

CLINTON STREET DAM

FORMER UNITED PAPERBOARD COMPANY PROPERTY

WHITE TRANSPORTATION

UPSON PARK

18 MILE CREEK

Frost Street

Porter Street

Chapel Street

Olcott Street

Monroe Street

Mill Street

Van Buren Street

Jackson Street

Scovell St.

Clinton Street

Gooding Street

EIGHTEENMILE CREEK

WEST BRANCH EIGHTEENMILE CREEK

EAST BRANCH EIGHTEENMILE CREEK

BARGE CANAL

SCALE IN FEET

0 100 200 300

ecology and environment

FIGURE 3-3 ALTERNATIVE S2
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

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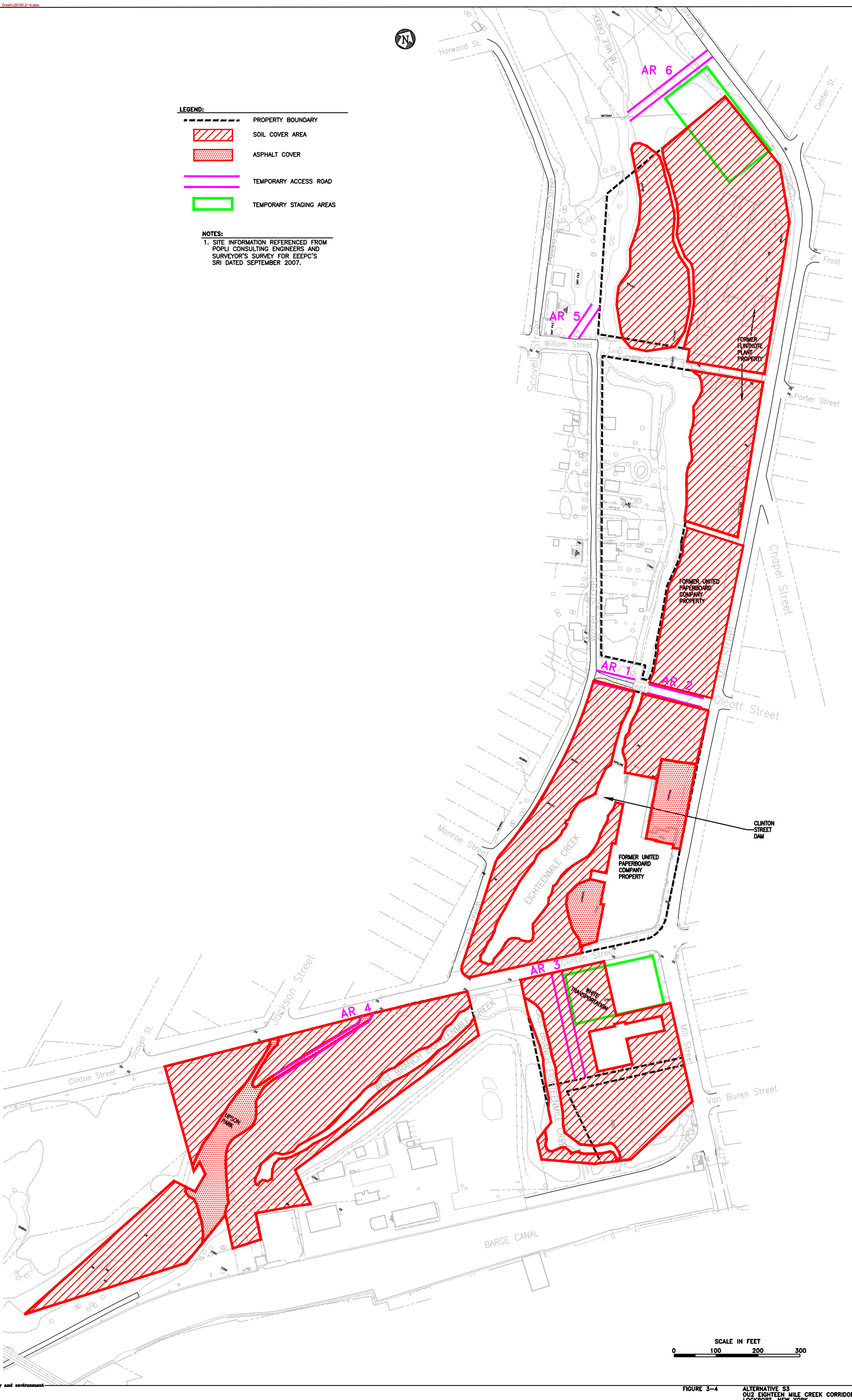
LEGEND:

- PROPERTY BOUNDARY
- SOIL COVER AREA
- ASPHALT COVER
- TEMPORARY ACCESS ROAD
- TEMPORARY STAGING AREAS

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.



ecology and environment

FIGURE 3-4 ALTERNATIVE S3
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

F:\18 Mile Creek\2016\3-5.dwg

LEGEND:

- PROPERTY BOUNDARY
- EXCAVATION AREA
- TEMPORARY ACCESS ROAD
- TEMPORARY STAGING AREAS

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

AR 6

AR 5

AR 1

AR 2

AR 3

AR 4

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

CLINTON STREET DAM

WHITE TRANSPORTATION

UPSON PARK

18 MILE CREEK

EIGHTEENMILE CREEK

WEST BRANCH EIGHTEENMILE CREEK

EAST BRANCH EIGHTEENMILE CREEK

BARGE CANAL

Frost Street

Porter Street

William Street

Olcott Street

Monroe Street

Clinton Street

Mill Street

Van Buren Street

Jackson Street

Scovell St.

Gooding Street

SCALE IN FEET

0 100 200 300

ecology and environment

FIGURE 3-5 ALTERNATIVE S4
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

F:\18 Mile Creek\2016\3-6.dwg

LEGEND:

- PROPERTY BOUNDARY
- EXCAVATION AREA
- CAPPING AREA
- TEMPORARY ACCESS ROAD
- TEMPORARY STAGING AREAS

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.

AR 1
AR 2
AR 3
AR 4
AR 5
AR 6

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

CLINTON STREET DAM

WHITE TRANSPORTATION

UPSON PARK

Mill Street
Center St.
Frost Street
Porter Street
Chapel Street
Olcott Street
William Street
Jackson Street
Scovell St.
Monroe Street
Clinton Street
Gooding Street
Van Buren Street
EIGHTEENMILE CREEK
WEST BRANCH EIGHTEENMILE CREEK
EAST BRANCH EIGHTEENMILE CREEK
BARGE CANAL
18 MILE CREEK

SCALE IN FEET
0 100 200 300

ecology and environment

FIGURE 3-6 ALTERNATIVE S5
OU2 EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

4 Remedial Alternative Evaluation

4.1 Introduction

This section summarizes the updates to the cost estimates for each existing alternative as well as addresses changes to the detailed analysis of alternatives from the original RAR and NYSDEC FS based on updated RAOs. For each newly developed alternative, a detailed analysis of the new alternative is presented (see Section 4.2) and new cost estimates were developed (see Section 4.3). The comparative analysis of alternatives from the original RAR and FS was also updated based on the new information (see Section 4.4).

4.2 Detailed Analysis of New Alternatives

4.2.1 Sediment: Alternative CC3 - Combined Excavation and Capping

This alternative involves the removal of contaminated sediment to the selected action levels within the creek and the capping of the sediment located upstream between Clinton Street Dam and Clinton Street. In addition to excavation/capping, the Clinton Street Dam would also be rehabilitated/repaired as part of this alternative. Figure 3-2 illustrates the areas of contamination to be addressed under this alternative.

The alternative includes capping of approximately 40,000 square feet of creek channel between the Clinton Street Dam and Clinton Street. The sediments in the creek channel that will not be capped will be excavated and disposed of off-site as described in Alternative CC2.

Capping was selected for a portion of the creek channel to isolate the contaminated sediment in the deeper portions of the creek. For the construction of the cap, the creek will be dammed and diverted using fabric dam bags during sediment removal. The installed cap should account for contaminant isolation, potential bioturbation of the cap by aquatic organisms, erosion due to creek flow during the design storm event, and localized outfall scour during the design storm event.

The purpose of the cap is to isolate underlying sediment contaminants, provide a clean sediment surface, and provide an appropriate substrate for habitat restoration, where applicable. The proposed cap will have a thickness of 36 inches that includes the following layers from the channel bottom to top of the cap: 24 inches for the chemical isolation layer; 6 inches for bioturbation; and 6 inches for erosion protection. Bioturbation describes the redistribution of sediment by benthic infauna through burrowing, ingestion and excretion of sediments, and tube build-

ing. The depth to which these activities affect the sediment surface is needed to calculate the required thickness of the cap. The erosion protection layer is placed above the bioturbation layer to provide adequate erosion protection over the life of the cap. The bioturbation layer will consist of gravel material and will also function as the filter layer. The erosion protection layer will consist of light DOT stone (or similar material).

Further evaluation of the cap thicknesses shall be completed during the design. During the design phase, the cap will be designed specific to physical and chemical conditions of the area and using the procedures described by the USACE Waterway Experiment Station and the EPA guidance document (Palermo et al. 1998a, 1998b) to identify capping material selection, capping material sources, cap configuration, and cap placement methods.

Selection of equipment and placement techniques will depend on the equipment's ability to provide controlled, accurate placement of cap materials and placement feasibility, given the extent of the area to be capped, including water depths, surface area, and accessibility.

Clean fill will be placed via a land-based excavator or crane with a clamshell bucket to achieve the necessary thickness for the chemical isolation layer and the bioturbation layer in the cap area. The cap materials will be stockpiled at a staging area, and will be transferred to the cap area by mechanical loading or by slurrying and pumping. Erosion protection will be placed on top of the chemical isolation and bioturbation layers using a land-based excavator or crane with a clamshell bucket.

Bank stabilization measures will be implemented similar to the methods described in Alternative CC2. Since contaminated material above the selected action levels will remain on site, a long-term monitoring plan consisting of annual inspections, monitoring and maintenance of the cap will need to be performed. Monitoring was assumed to occur annually, whereas maintenance of the cap will be performed as needed.

4.2.1.1 Analysis

Overall Protection of Human Health and Environment

Overall protection of human health and the environment would be achieved by reducing the concentration of contaminants in fish. To achieve this reduction, this alternative addresses sediments through a combination of excavation and capping. This alternative relies on a combination of excavation and effective cap placement to isolate contamination, followed by monitoring and maintenance for the protection of human health and the environment.

Bank stabilization measures will help retain upland soils in place and reduce the risk of soil erosion into the creek.

Compliance with SCGs

This alternative would comply with action, location, and chemical-specific ARARs. Off-site disposal will comply with all applicable land disposal restrictions and analytical requirements. Action- and location-specific ARARs include noise limitations, floodplain considerations, permits or permit equivalencies (as required), and Occupational Safety and Health Administration (OSHA) regulations.

To implement this alternative, permits or permit equivalencies will need to be obtained from the appropriate regulatory agencies, including the NYSDEC Division of Fish and Wildlife for potential impacts on ecological receptors, the NYSDEC Division of Water for wastewater discharge and stormwater, and the USACE for stream/wetland disturbance and dredging activities. In addition, access agreements with property owners will need to be obtained.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), a Stage 1B Cultural Resource Investigation would be performed during the design phase to evaluate the existence of cultural and archaeological resources within the creek corridor that could be impacted by the implementation of this alternative.

Long-term Effectiveness and Permanence

This alternative actively reduces residual risk by a combination of excavation and capping. The capping component of this alternative would require long-term monitoring and maintenance of the cap.

Sediment removal (with off-site disposal and treatment, as necessary) and sediment capping are reliable and proven technologies. Proper design, placement, and maintenance of the cap are required for its effectiveness, continued performance, and reliability. Cap monitoring and maintenance programs would provide for reasonable reliability. Though PCBs isolated under the cap would migrate into the cap very slowly through molecular diffusion, they would not be expected to compromise the integrity of the cap.

The fish consumption advisory would continue to provide some measure of protection of human health until concentrations in fish are reduced to the point where the fish consumption advisory can be relaxed or lifted by the New York State Department of Health.

Furthermore, the creek corridor would no longer be a source of contamination to downstream sections of the creek. Through bank stabilization, soil on the banks would be retained on the creek banks. Use of erosion control and stabilization measures that emphasize native materials/plantings will help to promote long-term permanence through the restoration of riparian habitat.

Reduction of Toxicity, Mobility, and Volume through Treatment

This alternative would permanently remove a significant volume of contaminated sediment from the creek corridor through excavation and off-site disposal, although not through treatment. In discussions with disposal facility representatives,

it is not anticipated that the excavated material would require treatment prior to disposal. Since the material would be disposed of in an engineered, permitted facility, the mobility of the contaminants would be greatly reduced.

The placement of a cap upstream of the Clinton Dam would provide reduction of mobility of the contaminated sediment through isolation of contaminants beneath the cap, not through treatment.

Short-term Impacts and Effectiveness

Several short-term impacts on the community and workers may arise during excavation and capping of contaminated sediment in the creek corridor. These include dust, noise, and potential spills during handling and transportation of contaminants. These short-term impacts would be similar to those outlined for Alternative CC2 (Sediment Excavation and Creek Bank Stabilization), except impacts would occur for a marginally longer construction time. Access agreements with property owners would be required to perform this work not only to access the creek but also to provide staging areas for material storage and handling. To minimize short-term impacts, site access will be restricted during construction and remediation activities. Health and safety measures, including air monitoring, use of appropriate personal protective equipment (PPE), and decontamination of equipment leaving the site, will be in place to protect the workers and surrounding community. Action levels will be set prior to any intrusive activities, and an appropriate correction action will be implemented if these action levels are exceeded.

Off-site transportation of contaminated sediment to the disposal facility will be performed by a licensed hauler. While there is a risk of spills due to accidents, this risk will be minimized by using closed and lined containers for transport.

This alternative involves a combination of removal and capping of the contaminated sediments from the site. The time frame to achieve remediation goals has not been calculated, however, the time frame is expected to be longer than for Alternative CC2 (Sediment Excavation and Creek Bank Stabilization). The time required to complete the construction phase of this alternative is estimated to be two years, assuming six-month construction seasons. LTM would continue for an assumed 30 years.

Methods for managing creek flows would be effective in the short term as methods would allow excavation and capping of sediment under “near dry conditions.”

Implementability

In general, this alternative is considered technically feasible in the creek corridor. While the design and construction methods of both capping and dredging are relatively standard, implementation of the dredging component is complicated by limited site access, steep slopes, creek bed type, and on-site sediment dewatering methods. The area amenable to capping in the creek corridor is limited due to the shallow water depth in significant portions the creek corridor. With a deeper wa-

ter depth, the placement of a cap in the area upstream of the Clinton Street Dam is technically feasible. Since the area targeted for capping is limited, this alternative would not involve large quantities of capping material and the necessary materials are expected to be available. Conditions in the area upstream of Clinton Street Dam targeted for capping are not expected to impact the ability to properly place the cap material nor significantly impact the depth of open water. Engineering consultants and contractors are readily available to design and complete such an alternative. Disposal would be coordinated with an appropriate disposal facility.

Although the management of creek flows poses implementation challenges, methods could be readily implemented using standard construction equipment and materials. Challenges to diversion by damming and pumping would include the continuous operation of several large capacity pumps needed to accommodate high flows in the creek corridor.

Cost

Total present-worth cost of this alternative based on a 30-year period is estimated to be $8,108,000 (see Section 4.3.1.2). Contractor quotes were considered for some of the sediment removal costs, while other cost estimating information was obtained from 2016 RS Means Cost Data series and engineering judgment.

4.2.2 Soil: Alternative S2 - Limited Action, Former Flintkote Plant Property

This alternative was presented in the NYSDEC FS (EEEPC 2009a) for the Former United Paperboard Company Property, Upson Park and White Transportation Property. ICs and minimal ECs would likely prevent exposure to contaminated soils and would include long-term monitoring. ICs would include access and use restrictions and development and implementation of an SMP. Minimal ECs would include physical barriers, such as fencing with warning signs installed around soil and fill that is considered hazardous or exceeds the SCOs, to limit human exposure to contaminated media. Long-term monitoring activities would include annual inspections of the fencing and signage.

Under CERCLA 121 (c), five-year reviews should be conducted for sites that implement remedial actions that, upon completion, will leave hazardous substances, pollutants, or contaminants on site above levels that allow for unlimited use and unrestricted exposure. Since the implementation of this alternative will result in PCBs and metals contamination above the 6 NYCRR Part 375 unrestricted use SCOs remaining on site, five-year reviews may be required at the site.

4.2.2.1 Analysis

Overall Protection of Human Health and the Environment

Placement of institutional controls would provide some protection to property owners/occupants from future exposure to contaminated soils. However, contaminated soils would remain in place above cleanup levels. Fencing and signs alone may not be adequate to prevent unauthorized access to the property by trespassers

(who could potentially directly contact contamination). In addition, fencing would provide limited protection for certain ecological receptors from direct contact and/or ingestion of site contaminants.

Compliance with ARARs

This alternative would not achieve cleanup levels for soil since no measures would be implemented to remove or treat the contaminants in soil, which exceed the cleanup levels. Action-specific and location-specific SCGs (e.g., safety regulations) would be included in the ICs and complied with for site activities.

Long-Term Effectiveness and Permanence

This alternative would not be permanent or as effective over the long term, since it does not involve removal, containment or treatment of contaminated soil. Contaminated soil would remain at the Property with concentrations above cleanup levels, and institutional controls might not reliably reduce future health risks to property owners and/or occupants associated with exposure to contaminated soils.

Reduction of Toxicity, Mobility, or Volume of Contamination through Treatment

This alternative does not involve the removal or treatment of contaminated soil. Therefore, neither the toxicity, nor mobility, nor volume of contamination is expected to be reduced.

Short-Term Impacts and Effectiveness

No significant short-term impacts (other than those existing) are anticipated during the implementation of this alternative since there are no construction activities, other than fence installation, involved. Control of future use and activities would protect the health of human receptors at the property. This alternative would provide some protection to the community by notifying the public of site hazards and limiting site access.

Implementability

The installation of fencing under this alternative can be implemented using conventional equipment and services that are readily available.

This alternative would, however, require the imposition of engineering and institutional controls to provide adequate protection of human health and the environment. The development of protective engineering and institutional controls that would be permanent, enforceable and acceptable to the private property owners cannot be assured.

Cost

Total present-worth costs of this alternative based on a 30-year period is estimated to be $189,000 (see Section 4.3.2.2). All cost estimating information was obtained from 2016 RS Means Cost Data series and engineering judgment.

4.3 Updated Cost Estimates

Cost estimates for the alternatives presented in the NYSDEC FS and Flintkote RAR were updated from 2009 and 2005 to 2016 to account for inflation (EEEPC 2009a; TVGA Consultants 2005a. Additional modifications to the cost estimate were completed and are described in detail in the sections below. Modifications include:

- Costs for staging area and access road construction (see Table 4-1a), bank stabilization and erosion control (see Table 4-1b), and soil stabilization and replacement (see Table 4-1c) were combined in separate tables and the costs were allocated to each alternative;
- Costs for Former Flintkote Plant Property were updated based on OU1 remedial actions (i.e., costs associated with AOC-5 and AOC-7 were removed);
- Costs for the Former Flintkote Plant Property were normalized with the costing approach for the other upland soils (i.e., contingency was increased from 15% to 20%, and legal, administrative, engineering fees, construction management of 10% were applied);
- Volumes and areas of contaminated sediment and soil were updated based on the new data collected in the 2014 to 2016 field investigations, HHRA, and BERA (see Table 4-2);
- Costs for all alternatives were updated from 2009 to 2016 using the RSMeans Historical Cost Indices; and
- An interest rate of 7% was applied based on *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study* (EPA 2000) and the preamble to the National Contingency Plan (NCP) (55 FR 8666).

4.3.1 Sediment

4.3.1.1 Alternative CC1 - No Action

There are no costs associated with this alternative. Hence, no updates were made.

4.3.1.2 Alternative CC2 – Sediment Excavation and Creek Bank Stabilization

This alternative includes the complete removal of contaminated sediment to predisposal conditions using a temporary dam-and-pump around diversion method, off-site disposal, bank stabilization, restoration of excavated areas, and periodic monitoring of the restored areas.

Table 4-3 presents the quantities, unit costs, and subtotal costs for the various items in this alternative.

4.3.1.3 Alternative CC3 - Combined Excavation and Capping

NYSDEC FS (EEEPC 2009a) screened out capping as a technology. However, a combined excavation and capping alternative was developed for this Supplemental FS. This alternative includes capping sediment upstream of the Clinton Street Dam, restoration of the dam and complete removal of contaminated sedi-

ment downstream of the dam using an in-channel creek flow diversion method, off-site disposal, bank stabilization, restoration of excavated areas, and periodic monitoring of the restored areas. Costs for capping and dam restoration were added. For the present-worth analysis, assumptions are made regarding the interest rate applicable to borrowed funds and the average inflation rate.

Table 4-4 presents the quantities, unit costs, and subtotal costs for the various items in this alternative.

4.3.2 Upland Soils

4.3.2.1 Alternative S1 – No Action

There are no costs associated with this alternative. Hence, no updates were made.

4.3.2.2 Alternative S2 – Limited Action

This alternative includes institutional controls and long-term monitoring to limit the potential for human exposure to contaminated site soils at the Former United Paperboard Company Property, Upson Park, and White Transportation Property. A limited action alternative was prepared for the Former Flintkote Plant Property based on the alternatives for the other upland properties.

Tables 4-5a through 4-5d present the quantities, unit costs, and subtotal costs for the various items in this alternative for each upland property.

4.3.2.3 Alternative S3 – Complete Capping

Complete capping alternatives include S3A, S3B, S3C and S3D for the Former Flintkote Plant Property, Former United Paperboard Company Property, Upson Park, and White Transportation Property. This alternative includes institutional and access controls to limit the human exposure to the affected media and construction of a soil cover cap consisting of a geotextile fabric, demarcation layer, and 24-inch-thick soil cover (18 inches of unclassified fill and 6 inches of topsoil). Alternatives S3B, S3C, S3D do not include limited excavation of soils that exceed cleanup levels as described in the NYSDEC FS (EEEPC 2009a). In addition, institutional controls and long-term monitoring will also be completed.

Tables 4-6a through 4-6d present the quantities, unit costs, and subtotal costs for the various items for Alternatives S3A, S3B, S3C, and S3D.

4.3.2.4 Alternative S4 – Excavation

Excavation alternatives include S4A, S4B, S4C, and S4D for the Former Flintkote Plant Property, Former United Paperboard Company Property, Upson Park, and White Transportation Property. Alternative S4A includes excavation, lead stabilization, and off-site disposal of the contaminated soil that exceeds cleanup levels at the Site. Specifically, Alternative S4A includes the following:

- Excavation of contaminated fill materials that exceed the cleanup levels at the site;

- If determined to be appropriate, stabilization of an estimated 50% of the excavated hazardous soils (from the 198 Parcel and the Island) using portland cement to convert them into non-hazardous soils. The 50% estimate is for cost-estimating and planning purposes only;
- Off-site disposal of the remaining portion (50%) of the excavated hazardous soils;
- Off-site disposal of stabilized non-hazardous soils (from 198 Parcel and Island) and non-hazardous soils from the 300 Parcel; and
- Backfill (using clean fill) and restoration of excavated areas to meet existing grades or promote positive drainage.

Alternatives S4B, S4C, and S4D include complete excavation and off-site disposal of on-site soils that exceed cleanup levels.

Tables 4-7a through 4-7d present the quantities, unit costs, and subtotal costs for the various items for Alternatives S4A, S4B, S4C, and S4D.

4.3.2.5 Alternative S5 – Combined Excavation and Capping

Capping alternatives include S5A, S5B, S5C, and S5D for the Former Flintkote Plant Property, Former United Paperboard Company Property, Upson Park, and White Transportation Property. Alternative S5A includes partial excavation, lead stabilization, and capping of non-hazardous contaminated soil in place. Specifically, Alternative S5A includes:

- Excavation of hazardous fill materials on the 198 Parcel and the Island that exceed cleanup levels and lead concentrations of 1,000 ppm;
- If determined to be appropriate, stabilization of an estimated 50% of the excavated hazardous soils using portland cement to convert them into non-hazardous soils. The 50% estimate is for cost-estimating and planning purposes only;
- Off-site disposal of the remaining portion (50%) of the excavated hazardous soils;
- Placement of stabilized non-hazardous soils on the 300 Parcel for capping;
- Construction of a cap over all fill materials on the 300 Parcel consisting of a 24-inch-thick soil cover (18 inches of unclassified fill and 6 inches of topsoil with a demarcation membrane) and;
- Backfill (using clean fill) and restoration of excavated areas (198 Parcel and Island to meet existing grades or promote positive drainage.

Alternatives S5B, S5C, and S5D include limited excavation of soils that both exceed the cleanup levels in Table 2-4 and have PCBs with concentrations greater than 50 ppm and/or lead greater than 1,000 ppm or 5 ppm as a TCLP extract. The excavated materials will be disposed of at approved, off-site disposal facilities. These alternatives also include capping (in-place) of soils that exceed the selected

cleanup levels but do not exceed concentrations of 50 ppm for PCBs and 1,000 ppm for lead.

Institutional controls and long-term monitoring will also be completed for all alternatives.

Tables 4-8a through 4-8d present the quantities, unit costs, and subtotal costs for the various items for Alternatives S5A, S5B, S5C, and S5D.

4.4 Comparative Analysis of Alternatives

This section presents a comparative analysis of remedial alternatives. The alternatives for each specific media were based on the seven evaluation criteria. This comparative analysis is based on the evaluations provided in Section 4.2, NYSDEC FS (EEEPC 2009a), and Flintkote RAR (TVGA Consultants 2005a).

4.4.1 Creek Channel Sediments

Overall Protection of Human Health and the Environment

Alternatives CC2 and CC3 are protective of human health and the environment because all contaminated sediment found above action levels will be removed or capped in place. Alternative CC1 is not protective of human health and the environment because contamination remains on site.

Compliance with SCGs

Alternatives CC2 complies with SCGs because sediments above action levels will be removed. Alternative CC3 would not fully comply with SCGs because contaminated sediments will remain under the proposed cap. Alternative CC1 does not comply with SCGs because contamination will not be removed.

Long-term Effectiveness and Permanence

Alternatives CC2 is effective in the long-term because all sediment contamination will be removed and the banks of the creek will be stabilized to facilitate future permanence by limiting erosion and recontamination by upland soils. Some contaminated soils will remain under the proposed cap for Alternative CC3. However, long-term monitoring and maintenance will promote the long-term effectiveness of the cap in Alternative CC3. Alternative CC1 is not effective in the long-term.

Reduction of Toxicity, Mobility, and Volume through Treatment

None of the alternatives involve treatment of contamination, so reduction of toxicity through treatment cannot be achieved. However, alternatives CC2 and CC3 will reduce the volume of contaminated material at the site, thereby reducing concerns of toxicity and mobility. Contaminated sediments will be disposed of at a designated permitted facility, where contaminant mobility will be effectively reduced. Contamination levels are not expected to be significantly reduced over time in Alternative CC1.

Short-term Impacts and Effectiveness

There is the potential for some negative short-term impacts for Alternatives CC2 and CC3 as a result of construction activities. Alternative CC1 does not have short-term impacts since no remediation activities will take place.

Implementability

Alternatives CC2 and CC3 can be readily implemented at the site. However, there may be some challenges due to the limited availability of space at the site and steep slopes along the banks. There are no actions to implement for Alternative CC1. The steep slope along Mill Street and excavation around the turbine adjacent to the creek potentially poses the need for additional engineering measures to effectively perform excavation activities.

Cost

Alternative CC1 calls for no action, and thus incurs no cost. Alternative CC3 will actively remediate the site at a cost with lower present worth than Alternative CC2 due to the lower capital cost of capping a portion of the sediments compared with complete sediment excavation and disposal. Annual operation and maintenance (O&M) costs are slightly higher for Alternative CC3 due to anticipated maintenance of the sediment cap. All present worth values for the alternatives are summarized in Table 4-14.

4.4.2 Upland Soils

Overall Protection of Human Health and the Environment

Since Alternative S1 employs no action, contaminated site soils will remain on site, providing no protection for potential future exposure. Alternatives S2, S3, S4, and S5 are more protective of human health and the environment, each at different levels. By only using ICs in Alternative S2, fencing and signage could reduce human exposure; however, inadequate enforcement could lead to potential health risks. Wildlife may also not be properly protected under this alternative. Alternative S3 provides a higher level of protection as the entire site would be covered to reduce exposure to any contamination. Similarly, Alternative S5 provides a higher level of protection since contaminated soil/fill would either be removed from the properties or contained in place and institutional controls would be in place. However, contaminated soil/fill would remain in place above the cleanup levels. Alternative S4 provides the greatest protection since soil/fill with concentrations of contaminants above the cleanup levels would be removed and properly disposed of off-site. In addition, institutional controls and the site management plan would limit the future use of the properties and the potential for the disturbance of contamination exceeding unrestricted residential use criteria.

Compliance with SCGs

The concentrations of PCBs and metals are not expected to naturally decrease over time. Alternatives S1, S2, S3, and S5 do not fully comply with SCGs because contaminated soils will remain on site. Alternative S4 complies with chemi-

cal-specific SCGs for designated cleanup levels, since soils exceeding the cleanup levels will be excavated and properly disposed of off-site.

Long-term Effectiveness and Permanence

Since Alternative S1 employs no action, contaminated soil will remain on site providing no protection for potential future exposure. Alternative S2 is somewhat effective, provided proper enforcement of environmental easements and access restrictions. Alternatives S3 and S5 are effective in the long-term, as long as the soil covers and bank stabilization measures are properly maintained. Alternative S4 has the highest degree of long-term effectiveness since contaminated soils will be excavated and removed from the site.

Reduction in Toxicity, Mobility, or Volume of Contamination through Treatment

Reduction in toxicity, mobility, or volume through treatment will not be achieved in Alternatives S1, S2 and S3, since no treatment will be performed. However, in Alternatives S4 and S5, the volume of contaminated material will be reduced through excavation and off-site disposal. Additionally, a portion of the excavated material will be treated, thereby reduce the toxicity of soils on site. Contaminated soils will be disposed of at a designated permitted facility, where contaminant mobility will be effectively reduced where the material would be contained in an engineered containment facility. Alternative S3 will reduce concerns of the mobility of the contaminants on site through the cover.

Short-term Impacts and Effectiveness

Short-term impacts are not anticipated for Alternative S1 since no remediation activities will take place. Minor short-term impacts will be expected for Alternative S2 due to construction of fencing and stabilization of the creek banks. Several short-term impacts may affect the community during remedial activities for Alternatives S3, S4, and S5, such as dust and noise due to excavation of contaminated soil and transportation of cover material. There is also the potential for spills of contaminated soils and off-site tracking of contamination during transport. It is expected that engineering and administrative controls, such as the use of PPE, community air monitoring, and effective decontamination of trucks, will mitigate these impacts.

Implementability

There are no actions to implement for Alternative S1. Alternatives S2, S3, S4, and S5 can be readily implemented using standard construction means and methods. Contractors and local disposal facilities for hazardous and non-hazardous waste have been identified for implementation. It is assumed that the locations identified for staging areas should be sufficient for staging and support areas, but that assumption may need revision in the final project plan. Alternatives S4 and S5 would be the most difficult to implement because they require the use of heavy equipment to remove large volumes of contaminated soil/fill along steep slopes in some areas. Alternative S5, which involves a combination of capping and removal, would be slightly easier to implement than Alternative S4 because less materi-

al will be removed using heavy equipment. The largest volume of soil requiring excavation at the upland properties is found at the Former Flintkote Plant property.

Cost

Alternative S1 calls for no action, and thus incurs no costs. Alternative S2 has a lower total estimated present worth cost than Alternatives S3, S4, and S5 because no major capital costs are incurred. Alternatives S3 and S5 have lower estimated present cost than Alternative S4 because less soil would be excavated and disposed of off-site. However, these alternatives have higher annual and periodic O&M estimated costs due to anticipated maintenance of the soil cover. Capital, annual and periodic estimated costs are summarized by property and alternative for the creek channel, Former Flintkote Plant Property, White Transportation, Former United Paperboard Company and Upson Park in Tables 4-9 through 4-13. All estimated costs present worth values for the alternatives are summarized in Table 4-14.

Table 4-1a Staging Area and Access Road Construction Estimates, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Site Clearing of Access Roads					
Cut and chip heavy trees	Large trees and dense vegetation along access roads	0.4	Acre	$16,100	$5,800
Grub stumps and remove - heavy	Along access roads into site	0.4	Acre	$8,625	$3,100
Staging Area and Access Road Construction & Removal					
Grading of the Staging area and access roads	Grade subgrade for base course for small irregular areas	9,222	SY	$2.93	$27,100
Access Road Construction	8" gravel fill; incl labor + materials	2,278	SY	$13.60	$31,000
Staging Area Construction	8" gravel fill and liner; incl labor + materials	6,944	SY	$13.60	$94,500
Front End Loader	To manage material at the staging area; assumed available for 6 months	132	Day	$1,179.90	$155,800
Excavate Gravel Staging Area and Access Roads	Hydraulic Excavator, 1 CY bucket	2,049	BCY	$2.49	$5,200
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	3,074	Ton	$20.46	$62,900
Disposal at Disposal Facility (Non-haz)	Non-hazardous material	3,074	Ton	$26.03	$80,100
Topsoil (Material)	For access roads and staging area; assume 8" of material	3,074	Ton	$18.09	$55,700
Haul Topsoil		2,357	LCY	$15.25	$36,000
Spread Topsoil	Large trees and dense vegetation along access roads	2,357	LCY	$2.39	$5,700
Compact Topsoil	Along access roads into site	2,049	BCY	$0.95	$2,000
Finish grading, large area	Steep slopes	83	MSF	$29.50	$2,500
Hydroseeding large areas		9,222	SY	$0.82	$7,600
				Capital Cost Subtotal:	$575,000

Notes:

1. Add all access roads lengths, as shown in Figure 2-2

Length Access Road 1	75	LF		
Length Access Road 2	125	LF		
Length Access Road 3	250	LF		
Length Access Road 4	250	LF		
Length Access Road 5	125	LF		
Length Access Road 6	200	LF		
Width of Access Roads	20	LF		
Total Access Road Area:	20,500	SF	or	2278 SY

2. Assume access roads 1-3, 5 and 6 will need clearing and grubbing; Access Road 4 will not need clearing or grubbing because it takes advantage of an existing dirt parking lot.

3. Total access road area requiring clearing:	15,500	SF		
4. Number of Staging Areas	2			
5. Dimensions of Staging Area	250	LF	by	125 LF
6. Total Surface Area per Staging Area	31,250	SF	or	3472.2 SY
7. Conversion from BCY to LCY (dewatered material):	1.15	LCY/BCY		
8. Conversion from BCY to tons (dewatered material):	1.5	tons/BCY		

9. Costs presented are based on conventional contracting methods.

10. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

11. Waste Management (Non-Haz) Taxes and Fees

NYS Tax	8.75%
Environmental Fee	11.00%
RCR Fee	3.60%

Table 4-1a Staging Area and Access Road Construction Estimates, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-1b Bank Erosion Control and Creekside Access Roads Estimates, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Site Clearing of Access Roads along creek banks					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks	3.8	Acre	$16,100	$61,900
Grub stumps and remove - heavy	Along creek banks	3.8	Acre	$8,625	$33,200
Construction of Access Roads Along Creek Banks					
Access Road Grading	Grade subgrade for base course for small irregular areas	18,600	SY	$2.93	$54,500
Geofabric		18,600	SY	$1.42	$26,500
Gravel	8" gravel fill; incl labor + materials	18,600	SY	$13.60	$253,000
Bank Stabilization for Access Roads Constructed Along the Creek constructed as part of Creek Channel excavation					
Topsoil (Material)	16" layer, 20' width, along the length of the creek, both banks	10,783	Ton	$18.09	$195,100
Haul Topsoil	Large trees and dense vegetation along creek banks	8,267	LCY	$15.25	$126,100
Spread Topsoil	Spread dumped material, no compaction	8,267	LCY	$2.39	$19,800
Compact Topsoil	6" lifts, vibrating roller	7,188	BCY	$0.95	$6,900
Jute Mesh (Erosion Control Mat)		18,600	SY	$1.81	$33,700
Hydroseeding large areas		18,600	SY	$0.82	$15,300
Extra Stabilization between the upland property boundary and Creek Bank access road					
Geotextile Fabric	For additional protection along the creek banks at a width of 10'	9,300	SY	$1.42	$13,300
Clean stone	Assume 1' layer thick at a width of 10' over the geotextile fabric	3,100	LCY	$64.70	$200,600
				Capital Cost Subtotal:	$1,039,900
				Capital Cost per Linear Foot of Shoreline:	$124

Notes:

1. Bank Access Road width (assumed) 20 LF
2. Estimated Length of Shoreline at Former United Paperboard Company
   - Both Banks 1,950 LF
3. Estimated Length of Shoreline at Upson Park
   - Both Banks 1,440 LF
4. Estimated Length of Shoreline at White Transportation
   - Both Banks 1,130 LF
5. Estimated Length of Shoreline at Flinkote Property
   - Both Banks 2,830 LF
6. Estimated Length of Shoreline between properties 1,020 LF
7. Estimated Length of Creek within OU2 (both banks) 8,370 LF
8. Conversion from BCY to LCY (dewatered material): 1.15 LCY/BCY
9. Conversion from BCY to tons (dewatered material): 1.5 tons/BCY
10. Costs for planting trees along banks is included in Backfill and Site Restoration lines in individual cost estimates
11. Costs presented are based on conventional contracting methods.
12. Assume tree and shrub planting grid spacing 25 LF
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Table 4-1b Bank Erosion Control and Creekside Access Roads Estimates, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-1c Soil Stabilization and Replacement Estimates, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Loading Soil to Mixer	1.5 CY Track-Mounted Loader	1.0	LCY	$2.55	$2.55
Stabilization	Ex-situ w/Portland cement, volumetric site mixed, 300 psi, 1 CY mixed/discharged	0.1	LCY	$213.00	$21.30
Stabilized Soil Transportation	On-site transportation to place of origin, 10% more material after cement addition	1.1	LCY	$3.68	$4.05
Placement of Stabilized Soils	Spreading w/ dozer, 10% more material	1.1	LCY	$2.39	$2.63
				Capital Cost per Cubic Yard of Soil, Stabilization and Replacement:	$31
				Capital Cost per Cubic Yard of Soil, Stabilization Only:	$24

Notes:

1. Stabilization will be completed after soil is transported to staging area for verification and disposal sampling.

Table 4-2 Summary of Relevant Measurements & Values for All Alternatives, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Alternative	Volume of Contaminated Material[1] CY	Surface Area of Contaminated Material[2] SF	Length of the Creek Channel[3] LF	Notes
Sediment				
CC1 - No Action	0			
CC2 - Sediment Excavation and Creek Bank Stabilization	**14500**	**169600**	**8370**	
Excavated Hazardous[4] Sediment	5000			PCBs >50 ppm or Lead >1000ppm/TCLP Fail
Excavated non-Hazardous Sediment	9500			
CC3 - Combined Excavation and Capping	**14500**	**169600**	**8370**	
Excavated Hazardous[4] Sediment	4662	59775		
Excavated non-Hazardous Sediment	5259	70700		
Capped Hazardous[4] Sediment	339	3225		Hazardous sediment located between transects 8&9 (assumed to be 25%)
Capped non-Hazardous Sediment	4241	35900		Non-Hazardous sediment located between transects 3E&5W (around 25%), 6&7 and 7&8
Upland Soils				
S1 - No Action	0			
S2 - Limited Action	0			
S3 - Capping		502200		Total surface area being capped on all properties
S4 - Excavation	58325			Total volume being excavated on all properties
S5 -Partial Removal and Capping	25915	124700		Volume = sum of haz volumes being excavated, Surface Area = sum of non-haz areas being capped
A - Upland soils at the Former Flintkote Plant Property (300 Parcel, 198 Parcel & Island)[5].	**46615**		**2830**	Does not include surface area of building footprint post removal.
300 Mill Street Non-hazardous	29400	92200		
198 Parcel Hazardous[4]	9700	29700	695	Perimeter measured using Niagara County GIS: gis2.erie.gov/GC/NiagaraCountyNY/
Island - Hazardous[4]	7515	42128		Small volume/area added to include FS-SP-12
Total - Hazardous[4] Soils	17215	71828		
Total - Non-hazardous Soils	29400	92200		
Surface Area of Complete Soil Cover		175800		

Table 4-2 Summary of Relevant Measurements & Values for All Alternatives, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Alternative	Volume of Contaminated Material[1] CY	Surface Area of Contaminated Material[2] SF	Length of the Creek Channel[3] LF	Notes
B - Upland soils at the White Transportation	**110**		**1130**	
Hazardous[4] Soils	0			
Non-hazardous Soils	110	1100	140	From NYSDEC FS 2009 (EEEPC, 2009a)
Asphalt Cover Area		0		From NYSDEC FS 2009 (EEEPC, 2009a)
Surface Area of Complete Soil Cover		80900		From NYSDEC FS 2009 (EEEPC, 2009a)
C - Upland soils at the Former United	**4600**		**1950**	
Hazardous[4] Soils	3800	11000		From NYSDEC FS 2009 (EEEPC, 2009a)
Non-hazardous Soils	800	10200		From NYSDEC FS 2009 (EEEPC, 2009a)
Asphalt Cover Area		24000		From NYSDEC FS 2009 (EEEPC, 2009a)
Surface Area of Complete Soil Cover		95900		From NYSDEC FS 2009 (EEEPC, 2009a)
D - Upland soils at Upson Park	**7000**		**1440**	
Hazardous[4] Soils	4900	21200		Added new cross sectional area based on results of additional investigations (E & E, 2016a)
Non-hazardous Soils	2100	21200		From NYSDEC FS 2009 (EEEPC, 2009a)
Asphalt Cover Area		46000		From NYSDEC FS 2009 (EEEPC, 2009a)
Surface Area of Complete Soil Cover		149600		From NYSDEC FS 2009 (EEEPC, 2009a)
Estimated Length of Creek not associated with the four upland soil properties (both banks)			1020	

Notes:

1. Unless noted - Volumes for creek sediments were calculated by multiplying surface area of bankfull width between transects by average sediment depth for transects, volumes for soils were calculated cross-sectional area of contaminated soil by distance between transects (see NYSDEC FS Section 3.2.4.3).
2. Surface area was measured using CAD drawings for United, White and Upson and taken from the DEC RAR (2005) for Flinkote.
3. Length denotes length of creek within property (measured in GIS unless noted otherwise) or perimeter around contaminated area for fencing (measured in CAD unless noted otherwise).
4. Defined in NYSDEC FS as PCB concentrations greater than 50 ppm and samples failing the TCLP test for lead or greater 1000 ppm.
   Percentage of hazardous soils that can be stabilized and replaced for each property is listed below

Flinkote	50%
White	0%
United	0%
Upson	0%

5. Volumes are based on the thickness of the fill material presented on Figure 10 — Fill Material Isopach Plan in the Flintkote RAR (TVGA 2005b).

The following rates are used for all cost estimates:

Discount rate is assumed to be:	7.0%	
Legal, Administrative and Engineering Fees are assumed to be:	10%	of capital costs
Contingency Fees are assumed to be:	20%	of capital costs

Table 4-3 Cost Estimate, Alternative CC2 - Sediment Excavation and Creek Bank Stabilization, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation					
Mobilization/Demobilization	Includes mobilizing equipment and personnel; assume trailers, site prep, staging, and access roads included in upland terrestrial OUs	1	LS	$196,000	$196,000
Health and Safety Requirements	Officer; assume on-site 100% of project duration	256	Day	$800	$204,800
Permits and Studies	Incl permits and supporting hydraulic and floodplain study	1	LS	$100,000	$100,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume total of 20 days for pre-, during, and after construction surveys	20	Day	$1,600	$32,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	128	Day	$600	$76,800
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Bank Stabilization for Access Roads Constructed Along the Creek constructed as part of Creek Channel excavation					
Bank Erosion Control	see Table 4-1b; cost assessed per linear foot of bank	8,370	LF	$124.24	$1,039,900
Sediment Dewatering Pits					
Covered Enclosure - Delivery and Installation	Assume approx 150' x 50'	4	EA	$25,310	$101,300
Covered Enclosure - Rental	Assumes 2 enclosures to remain onsite during and between construction seasons	36	Mo	$4,314	$155,400
Excavation	1 CY bucket	1111	BCY	$18.45	$20,500
Liner	add 10% to quantity to account for anchoring and overlapping	14,300	SF	$2.11	$30,200
Drainage Piping	4" dia drainage piping	400	LF	$1.53	$700
Stone Bedding		185	BCY	$35.40	$6,600
Filter Fabric		14,300	SF	$2.21	$31,700
Sump/Manhole	6' deep manhole	4	EA	$2,257.00	$9,100
Pump	50 gallons per minute	4	EA	$1,600	$6,400
Wastewater Storage Tank	Rental of two 21,000 gal tanks	24	Mo	$2,100	$50,400
Wastewater Disposal	Assume disposal at local WWTP	1,100	kGal	$4.00	$4,400
Front End Loader	To manage material at the staging area; assume 100% of project duration	256	Day	$947.30	$242,600
Sediment Removal					
Creek Diversion	*Method assumes damming the creek in 6 sections, pumping dry, and diverting water around dammed sections*				
Temporary Dams	assume dam bags will be purchased for 2 temporary dams and relocated as necessary	2	EA	$2,301	$4,700
Dewatering Pumps	Pumps for dewatering dammed creek sections, 6" submersible pump, 400 gpm	3	EA	$7,000	$21,000
Rental of Diversion Pumps / Equipment	Costs are for monthly rental of (5) 8000-gpm pumpsets, including controls, valves, and influent piping	12	Mo	$87,170	$1,046,045
Transportation Costs	Delivery and pickup of diversion pumps / equipment	2	EA	$35,435	$70,869
Corrugated Plastic Pipes	60" diameter, to convey diverted water; assume 2 pipes are needed (based on flow to be diverted)	2,000	LF	$150	$300,000
Installation / Relocation	*Assume 1 week to install / move dams, pumps, and equipment; assume 6 moves needed*				
Labor and Equipment	Includes costs for an excavator, 2 laborers, an operator, and a foreman	6	EA	$15,000	$90,000

Table 4-3 Cost Estimate, Alternative CC2 - Sediment Excavation and Creek Bank Stabilization, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Pump Setup (By Vendor)	Includes costs to connect pipe and set up pumps	6	EA	$31,638	$189,828
Turbidity Curtain		8,370	LF	$17.26	$144,500
Sediment Excavation	Assume use of excavator with clamshell bucket; 1 CY bucket	14,500	BCY	$18.45	$267,600
Material Transportation On-site (from creek to staging areas)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	16,240	LCY	$3.68	$59,800
Paint Filter Test		23	EA	$50.00	$1,200
Disposal Sampling	PCBs and TCLP metals analysis; 1 day turnaround	23	EA	$1,078	$24,800
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	14,250	Ton	$20.46	$291,600
Disposal at Disposal Facility (Non-haz)	assume non-hazardous material	14,250	Ton	$26.03	$371,000
Transport to Disposal Facility (Haz)	assumes transport of material to Model City, NY	7,500	Ton	$28.00	$210,000
Disposal at Disposal Facility (Haz)	disposal of hazardous material	7,500	Ton	$190	$1,425,000
Clinton Street Dam Removal					
Dam Demolition	Assume dam is a reinforced concrete structure 20 ft high.	100	LF	$915	$91,500
Transport to Disposal Facility (Non-Haz)	Assume disposal 28 tons/load to Chaffee Landfill, Chaffee, NY; add 50% to material for unknowns (dam thickness, internal material, foundation, etc.)	2,524	Ton	$20.46	$51,700
Disposal at Disposal Facility (Non-Haz)		2,524	Ton	$26.03	$65,800
Removal of Dewatering Pits					
Excavate Gravel	1 CY bucket	185	BCY	$18.45	$3,500
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	139	Ton	$20.46	$2,900
Disposal at Disposal Facility (Non-haz)	assume non-hazardous material	139	Ton	$26.03	$3,700
Transport to Disposal Facility (Haz)	assumes transport of material to Model City, NY; assume half of the gravel in the sediment pits will need to be disposed of as hazardous	139	Ton	$28.00	$3,900
Disposal at Disposal Facility (Haz)	disposal of hazardous material	139	Ton	$190	$26,400
Creek Backfill and Restoration (Bank stabilization estimate includes restoration above bankfull elevation)					
Synthetic geotextile	Geotextile fabric; Assume extends 10' horizontally into the creek from the bankfull elevation; includes anchoring	9,300	SY	$1.42	$13,300
Clean Stone	Small to medium sized stone for repair of banks and anchoring geotextile fabric.	2,674	LCY	$64.50	$172,500
Plantings	live stakings one per foot; along both banks	8,370	LF	$2.05	$17,200
Replacement Hydraulic Controls - only necessary if dam is removed					
Engineered Rock Riffles	to control hydraulic gradient in place of Clinton Street Dam; assumed to have crest height of 24" and sloped downstream for 40 feet; assume 8 are needed				
Stone (Heavy)	DOT heavy sized	36	LCY	$71.44	$2,600
Stone (Light)	DOT light sized	356	LCY	$89.77	$32,000
Haul Material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	391	LCY	$15.25	$6,000
Place / Spread Stone	Front end loader, 3 CY bucket	391	LCY	$15.45	$6,100
Limited Sediment Removal (changed from Building C Sump/Trench to Building D turbines)					
Demolish/Remove Building C Sump/Trench and Building D Turbine	Demolish all buildings and remaining structures. Assumed to be half of previous Flintkote estimate.	1	LS	$150,000	$150,000
Non-Haz Material Transportation/Disposal	Debris	3,000	Ton	$46.48	$139,442
Non-Haz Material Transportation/Disposal	Non-haz sediment	1,000	Ton	$46.48	$46,481
Plug Inlet/Outfall Pipes	Materials	2	EA	$200.00	$400

Table 4-3 Cost Estimate, Alternative CC2 - Sediment Excavation and Creek Bank Stabilization, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Drainage Features (Outfall Pipe) located on the Flintkote Property					
Remove Sediments/ Grout In-Place	Three man crew (2 Laborers and a Forman)	1	Day	$1,731.70	$1,732
Close In-Place	Materials	1	EA	$500.00	$500
Non-Haz Sediment Transportation/Disposal	Non-haz sediment (1 Ton). Assume one truck/driver will be needed at the site for at least 4 hours	4	HR	$160.24	$641
				Capital Cost Subtotal:	$7,805,100
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$7,969,100
				10% Legal, administrative, engineering fees, construction management:	$797,000
				20% Contingencies:	$1,753,300
				Capital Cost Total:	**$10,519,000**
Annual Costs					
Site Monitoring	Visual survey of creek banks, etc., assume 2-persons @ $100/hr; 10 hr/day for 1 day per each of 2 events	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
Sediment Sampling	5 sediment samples; assume 5 locations/day, 2-persons @ $100/hr, 10hr/day	1	Events	$2,000	$2,000
Analytical Costs (PCBs and metals)	Samples from 5 sediment locations; standard turnaround	5	EA	$127	$700
Data Evaluation and Reporting		20	HR	$100	$2,000
Creek Bank Repair	Assume 5% of initial costs for bank stabilization	1	LS	$10,200	$10,200
				Periodic Cost Subtotal:	$14,900
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$15,300
				10% Legal, Administrative and Engineering Fees:	$1,600
				20% Contingencies:	$3,400
				Periodic Cost Total:	**$20,300**
				30-year Present Worth of Periodic Costs:	**$44,000**
				2016 Total Present Worth Cost:	**$10,666,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (under "Staging and Access Roads" Cost Sheet) and was evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

Table 4-3 Cost Estimate, Alternative CC2 - Sediment Excavation and Creek Bank Stabilization, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads has been included under the "Bank Erosion Control" Estimate.					
3. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
4. Assume parts of both staging areas will be converted into sediment dewatering pits. Assume:		4	pits		
		100	ft length		
		25	ft wide		
		3	ft deep		
		6	in thick layer of stone		
5. Total contaminated sediment volume:		14,500	BCY		
Volume of Hazardous Sediment		5,000	BCY		
Volume of non-hazardous sediment		9,500	BCY		
Length of entire Creek (both banks)		8,370	LF		
6. Soil excavated for the sediment dewatering pits will be backfilled in its original location, thus eliminating the need to import fill material.					
7. Construction duration estimate (assumes standard 5-day work week):					
Total Project Time		12	mo		
		6	mo/construction season		
		2	construction seasons, 6 months each		
8. Bank Dimensions					
Average Depth at Bankfull Elevation		3	feet		
Assumed Width from Bankfull Elevation to bottom of creek bed		5	feet		
Assume banks slope linearly from bankfull elevation to creek bed.					
9. Assumed average number of vertically stacked rows of dam bags to account for water depths greater than 4'		2			
10. Assume dam bags will be purchased for and reused and moved for the remaining length of creek		30	feet		
11. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
12. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
13. Conversion from BCY to LCY (saturated material):		1.12	LCY/BCY		
14. Conversion from BCY to tons (saturated material):		1.7	tons/BCY		
15. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
16. Costs presented are based on conventional contracting methods.					
17. Assumed pore space for sediments (assume sand)		35	%		
18. Conversion from CY to gallons		202	gallons/ CY		
19. Unit costs obtained from 2016 RS Means Cost Data books.					
20. Assumed Dimensions/Properties for Clinton Street Dam (Based on Photos and Site Survey)					
Width		100	feet		
Height		15	feet		
Thickness at Top		5	feet		
Thickness at Base		25	feet		
Material	Reinforced Concrete				
Assume trapezoidal dam cross section					

Table 4-3 Cost Estimate, Alternative CC2 - Sediment Excavation and Creek Bank Stabilization, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
21. Engineered Riffle Assumptions					
Crest Height		2	feet		
Upstream Slope		25	%		
Downstream Slope		5	%		
Length of Riffle		40	feet		
Average Creek Width		30	feet		
Width of Riffle Toe		40	feet		
Typical Width of DOT Heavy Stone		2	feet		
Volume of Heavy Stone Required		35.6	CY		
Volume of Light Stone Required		355.6	CY		
Number of Riffles Needed		8			
22. Density of Concrete		2.0	tons/LCY		
23. Waste Management Taxes & Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			
24. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
25. Dam and pump around diversion method used for in-channel construction					

Key:

BCY = Bank cubic yards.
CY = Cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
PCB = Polychlorinated biphenyl.
SF = Square feet.
SY = Square yards.
TCLP = Toxicity characteristic leaching procedure.
WWTP = Wastewater treatment plant.

Table 4-4 Cost Estimate, Alternative CC3 - Combined Excavation and Capping, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation					
Mobilization/Demobilization	Includes mobilizing equipment and personnel; assume trailers, site prep, staging, and access roads included in upland terrestrial OUs	1	LS	$115,000	$115,000
Health and Safety Requirements	Officer; assume on-site 100% of project duration	256	Day	$800	$204,800
Permits and Studies	Incl permits and supporting hydraulic and floodplain study	1	LS	$100,000	$100,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume total of 20 days for pre-, during, and after construction surveys	20	Day	$1,600	$32,000
Traffic Control (Labor)	For roads adjacent to the site, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	128	Day	$600	$76,800
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Bank Stabilization for Access Roads Constructed Along the Creek constructed as part of Creek Channel excavation					
Bank Erosion Control	see Table 4-1b; cost assessed per linear foot of bank	8,370	LF	$124.24	$1,039,900
Sediment Dewatering Pits					
Covered Enclosure - Delivery and Installation	Assume approx 150' x 50'	2	EA	$25,310	$50,700
Covered Enclosure - Rental	Assumes 1 enclosure to remain onsite during and between construction seasons	18	Mo	$4,314	$77,700
Excavation	1 CY bucket	556	BCY	$18.45	$10,300
Liner	add 10% to quantity to account for anchoring and overlapping	7,150	SF	$2.11	$15,100
Drainage Piping	4" dia drainage piping	200	LF	$1.53	$400
Stone Bedding		93	BCY	$35.40	$3,300
Filter Fabric		7,150	SF	$2.21	$15,900
Sump/Manhole	6' deep manhole	2	EA	$2,257.00	$4,600
Pump	50 gallons per minute	2	EA	$1,600	$3,200
Wastewater Storage Tank	Rental of two 21,000 gal tanks	24	Mo	$2,100	$50,400
Wastewater Disposal	Assume disposal at local WWTP	1,100	kGal	$4.00	$4,400
Front End Loader	To manage material at the staging area; assume 100% of project duration	256	Day	$947.30	$242,600
Sediment Removal (Partial)					
Creek Diversion	Assumes the use of 4' x 4' x 4' fabric dam bags, for each 200' length of creek, for half the width of the creek; Need to stack bags in areas where creek depth is greater than 4'	45	EA	$11,505	$517,800
Turbidity Curtain		8,370	LF	$17.26	$144,500
Sediment Excavation	Assume use of excavator with clamshell bucket; 1 CY bucket	9,921	BCY	$18.45	$183,100
Material Transportation On-site (from creek to staging areas)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	11,111	LCY	$3.68	$40,900
Paint Filter Test		16	EA	$50.00	$800
Disposal Sampling	PCBs and TCLP metals analysis; 1 day turnaround	16	EA	$1,078	$17,300
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	7,889	Ton	$20.46	$161,400
Disposal at Disposal Facility (Non-haz)	assume non-hazardous material	7,889	Ton	$26.03	$205,400
Transport to Disposal Facility (Haz)	assumes transport of material to Model City, NY	6,992	Ton	$28.00	$195,800
Disposal at Disposal Facility (Haz)	disposal of hazardous material	6,992	Ton	$190	$1,328,600

Table 4-4 Cost Estimate, Alternative CC3 - Combined Excavation and Capping, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Clinton Street Dam Rehabilitation					
Restore the Dam Structure	Repair the existing dam structure prior to installation of a cap	100	LF	$1,000	$100,000
Cap Installation behind the Clinton Street Dam					
Chemical Isolation Layer (Sand)	Assume 2 feet of clean fill will be placed over the contaminated soils in the Mill Pond Area	4,347	Tons	$5.53	$24,040
Haul Clean Fill	12 CY dump truck, 20 miles round trip, 0.4 load/hr	3,333	LCY	$15.25	$50,826
Spread Fill	Spread dumped material, no compaction; Increased unit costs by 100% to acount for difficulty in placement, tight working areas/slopes	3,333	LCY	$4.78	$15,931
BioTurbation Layer (Gravel)	Assume 6 inches for bioturbation layer	1,087	Tons	$17.94	$19,494
Haul Gravel material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	833	LCY	$15.25	$12,707
Spread Gravel	Spread dumped material, no compaction; Increased unit costs by 100% to acount for difficulty in placement, tight working areas/slopes	833	LCY	$4.78	$3,983
Armor Layer	Assume 6 inches of light DOT stone	1,087	LCY	$89.77	$97,563
Haul Armor Layer material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	833	LCY	$15.25	$12,707
Spread Gravel	Spread dumped material, no compaction; Increased unit costs by 100% to acount for difficulty in placement, tight working areas/slopes	833	LCY	$4.78	$3,983
Removal of Dewatering Pits					
Excavate Gravel	1 CY bucket	93	BCY	$18.45	$1,800
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	69	Ton	$20.46	$1,500
Disposal at Disposal Facility (Non-haz)	assume non-hazardous material	69	Ton	$26.03	$1,900
Transport to Disposal Facility (Haz)	assumes transport of material to Model City, NY; assume half of the gravel in the sediment pits will need to be disposed of as hazardous	69	Ton	$28.00	$2,000
Disposal at Disposal Facility (Haz)	disposal of hazardous material	69	Ton	$190	$13,200
Creek Backfill and Restoration (Bank stabilization estimates include restoration above bankfull elevation)					
Synthetic geotextile	Geotextile fabric; Assume extends 10' horizontally into the creek from the bankfull elevation; includes anchoring	9,300	SY	$1.42	$13,300
Clean Stone	Small to medium sized stone for repair of banks and anchoring geotextile fabric.	2,674	LCY	$64.50	$172,500
Plantings	live stakings one per foot; along both banks	8,370	LF	$2.05	$17,200
Limited Sediment Removal (changed from Building C Sump/Trench to Building D turbines)					
Demolish/Remove Building C Sump/Trench and Building D Turbine	Demolish all buildings and remaining structures. Assumed to be half of previous Flintkote estimate.	1	LS	$150,000	$150,000
Non-Haz Material Transportation/Disposal	Debris	3,000	Ton	$46.48	$139,442
Non-Haz Material Transportation/Disposal	Non-haz sediment	1,000	Ton	$46.48	$46,481
Plug Inlet/Outfall Pipes	Materials	2	EA	$200.00	$400

Table 4-4 Cost Estimate, Alternative CC3 - Combined Excavation and Capping, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Drainage Features(Outfall Pipe) located on the Flintkote Property					
Remove Sediments/ Grout In-Place	Three man crew (2 Laborers and a Foreman)	1	Day	$1,731.70	$1,732
Close In-Place	Materials	1	EA	$500.00	$500
Non-Haz Sediment Transportation/Disposal	Non-haz sediment (1 Ton). Assume one truck/driver will be needed at the site for at least 4 hours	4	HR	$160.24	$641
				Capital Cost Subtotal:	$5,886,600
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,010,300
				10% Legal, administrative, engineering fees, construction management:	$601,100
				20% Contingencies:	$1,322,300
				Capital Cost Total:	**$7,934,000**
Annual Costs					
Site Monitoring	Visual survey of creek banks, etc., assume 2-persons @ $100/hr; 10 hr/day for 1 day per each of 2 events	2	Events	$2,000	$4,000
Cap Monitoring	Visual survey of the installed cap, assume 2-persons @$100/hr; 4 hours/day for 2 events per year	2	Events	$800	$1,600
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$7,600
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$7,800
				10% Legal, Administrative and Engineering Fees:	$800
				20% Contingencies:	$1,800
				Annual Cost Total:	**$10,400**
				30-year Present Worth of Annual Costs:	**$130,000**
Periodic Costs (Every 5 Years)					
Sediment Sampling	5 sediment samples; assume 5 locations/day, 2-persons @ $100/hr, 10hr/day	1	Events	$2,000	$2,000
Analytical Costs (PCBs and metals)	Samples from 5 sediment locations; standard turnaround	5	EA	$127	$700
Data Evaluation and Reporting		20	HR	$100	$2,000
Creek Bank Repair	Assume 5% of initial costs for bank stabilization	1	LS	$10,200	$10,200
				Periodic Cost Subtotal:	$14,900
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$15,300
				10% Legal, Administrative and Engineering Fees:	$1,600
				20% Contingencies:	$3,400
				Periodic Cost Total:	**$20,300**
				30-year Present Worth of Periodic Costs:	**$44,000**
				2016 Total Present Worth Cost:	**$8,108,000**

Table 4-4 Cost Estimate, Alternative CC3 - Combined Excavation and Capping, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (under "Staging and Access Roads" Cost Sheet) and was evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads has been included under the "Bank Erosion Control" Estimate.

3. Assume parts of both staging areas will be converted into sediment dewatering pits. Assume:	2	pits	
	100	ft length	
	25	ft wide	
	3	ft deep	
	6	in thick layer of stone	
4. Area of the Creek channel that will be capped:	39,125	SF	
5. Total contaminated sediment volume:	14,500	BCY	
Total Volume of hazardous sediment	5,000	BCY	
Total Volume of non-hazardous sediment	9,500	BCY	
Volume of hazardous sediment to be capped in place	339	BCY	
place	4,241	BCY	
Volume of hazardous sediment to be excavated	4,662	BCY	
Volume of non-hazardous sediment to be excavated	5,259	BCY	
Length of entire Creek (both banks)	8,370	LF	

6. Soil excavated for the sediment dewatering pits will be backfilled in its original location, thus eliminating the need to import fill material.

7. Construction duration estimate (assumes standard 5-day work week, 10 hr days):

Total Project Time	12	mo	
	6	mo/construction season	
	2	construction seasons, 6 months each	

8. Bank Dimensions

Depth at Bankfull Elevation	3	feet	
Assumed Width from Bankfull Elevation to bottom of creek bed	5	feet	

Assume banks slope linearly from bankfull elevation to creek bed.

9. Assumed average number of vertically stacked rows of dam bags to account for water depths greater than 4'	2		
10. Assume dam bags will be purchased for	2,093	feet of creek	

and reused and moved for the remaining length of creek

11. Conversion from BCY to LCY (dewatered material):	1.15	LCY/BCY	
12. Conversion from BCY to tons (dewatered material):	1.5	tons/BCY	
13. Conversion from BCY to LCY (saturated material):	1.12	LCY/BCY	
14. Conversion from BCY to tons (saturated material):	1.7	tons/BCY	
15. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).			7.0%

16. Costs presented are based on conventional contracting methods.

17. Assumed pore space for sediments (assume sand)	35	%	
18. Conversion from CY to gallons	202	gallons/ CY	

19. Unit costs obtained from 2016 RS Means Cost Data books.

Table 4-4 Cost Estimate, Alternative CC3 - Combined Excavation and Capping, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
20. Assumed Dimensions/Properties for Clinton Street Dam (Based on Photos and Site Survey)					
Width		100	feet		
Height		15	feet		
Thickness at Top		5	feet		
Thickness at Base		25	feet		
Material	Reinforced Concrete				
Assume trapezoidal dam cross section					
21. Density of Concrete		2.0	tons/LCY		
22. Waste Management Taxes & Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			
23. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
24. In-creek dam and diversion method used for in-channel construction					

Key:

BCY = Bank cubic yards.
CY = Cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
PCB = Polychlorinated biphenyl.
SF = Square feet.
SY = Square yards.
TCLP = Toxicity characteristic leaching procedure.
WWTP = Wastewater treatment plant.

Table 4-5a Cost Estimate, Alternative S2A - Limited Action, Former Flintkote Plant site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$10,000	$10,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation					
Mobilization / Demobilization		1	LS	$1,500	$1,500
Fencing	Chain link industrial, 6' High, 6 gauge wire with 3 strands barb wire	695	LF	$32.00	$22,300
Signage	Reflectorized 24"x24" sign mounted to fence	1	EA	$110.00	$200
Site Clearing					
Cut and chip heavy trees	At fencing areas, assume 10 foot width for clearing	0.16	Acre	$16,100	$2,600
				Capital Cost Subtotal:	$56,600
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$57,800
				10% Legal, administrative, engineering fees, construction management:	$5,800
				20% Contingencies:	$12,800
				Capital Cost Total:	**$77,000**
Annual Costs					
Site Monitoring	Visual survey of environmental easement, assume 1-persons @ $100/hr; 10 hr/day for 2 events	2	Events	$1,000	$2,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$4,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$4,100
				10% Legal, Administrative and Engineering Fees:	$500
				20% Contingencies:	$1,000
				Annual Cost Total:	**$5,600**
				30-year Present Worth of Annual Costs:	**$70,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Fence Maintenance	Assume 5% of fence replaced	35	LF	$32.00	$1,200
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$14,200
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$14,500
				10% Legal, Administrative and Engineering Fees:	$1,500
				20% Contingencies:	$3,200
				Periodic Cost Total:	**$19,200**
				30-year Present Worth of Periodic Costs:	**$42,000**
				2016 Total Present Worth Cost:	**$189,000**

Table 4-5a Cost Estimate, Alternative S2A - Limited Action, Former Flintkote Plant site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Notes:

1. Estimated Fencing Perimeter along road/to creek	695 ft	
2. Construction Duration (Assuming 5 day work week)		
Mobilization / Demobilization	2 mo	
Construction of Fencing	0.5 mo	
Total Project time	2.5 mo	
3. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).		7.0%

4. Costs presented are based on conventional contracting methods.

5. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-5b Cost Estimate, Alternative S2B - Limited Action, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$10,000	$10,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation					
Mobilization / Demobilization		1	LS	$1,000.00	$1,000
Fencing	Chain link industrial, 6' High, 6 gauge wire with 3 strands barb wire	140	LF	$32.00	$4,500
Signage	Reflectorized 24"x24" sign mounted to fence (1 per fenced area)	1	EA	$110.00	$200
Site Clearing					
Cut and chip heavy trees	At fencing areas, assume 10 foot width for clearing	0.03	Acre	$16,100	$600
				Capital Cost Subtotal:	$36,300
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$37,100
				10% Legal, administrative, engineering fees, construction management:	$3,800
				20% Contingencies:	$8,200
				Capital Cost Total:	**$50,000**
Annual Costs					
Site Monitoring	Visual survey of environmental easement, assume 1-persons @ $100/hr; 10 hr/day for 2 events	2	Events	$1,000	$2,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$4,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$4,100
				10% Legal, Administrative and Engineering Fees:	$500
				20% Contingencies:	$1,000
				Annual Cost Total:	**$5,600**
				30-year Present Worth of Annual Costs:	**$70,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting	Assume review conducted simultaneously with other upland sites	80	HR	$100	$8,000
Fence Maintenance	Assume 5% of fence replaced	7	LF	$32.00	$300
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$13,300
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$13,600
				10% Legal, Administrative and Engineering Fees:	$1,400
				20% Contingencies:	$3,000
				Periodic Cost Total:	**$18,000**
				30-year Present Worth of Periodic Costs:	**$39,000**
				2016 Total Present Worth Cost:	**$159,000**

Table 4-5b Cost Estimate, Alternative S2B - Limited Action, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Notes:

1. Estimated Perimeter of Contaminated Areas (for Fencing)	140	LF	
Mobilization / Demobilization	2	mo	
Construction of Fencing	0.5	mo	
2. Construction Duration (Assuming 5 day work week)	2.5	mo	
3. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).			7.0%

4. Costs presented are based on conventional contracting methods.

5. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-5c Cost Estimate, Alternative S2C - Limited Action, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$10,000	$10,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation					
Mobilization / Demobilization		1	LS	$2,200	$2,200
Fencing	Chain link industrial, 6' High, 6 gauge wire with 3 strands barb wire	1,456	LF	$32.00	$46,600
Signage	Reflectorized 24"x24" sign mounted to fence (1 per fenced area)	5	EA	$110.00	$600
Site Clearing					
Cut and chip heavy trees	At fencing areas, assume 10 foot width for clearing	0.3	Acre	$16,100	$5,400
				Capital Cost Subtotal:	$84,800
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor:	$86,600
				10% Legal, administrative, engineering fees, construction management:	$8,700
				20% Contingencies:	$19,100
				Capital Cost Total:	**$115,000**
Annual Costs					
Site Monitoring	Visual survey of environmental easement, assume 1-persons @ $100/hr; 10 hr/day for 2 events	2	Events	$1,000	$2,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$4,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$4,100
				10% Legal, Administrative and Engineering Fees:	$500
				20% Contingencies:	$1,000
				Annual Cost Total:	**$5,600**
				30-year Present Worth of Annual Costs:	**$70,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting	Assume review conducted simultaneously with other upland sites	80	HR	$100	$8,000
Fence Maintenance	Assume 5% of fence replaced	73	LF	$32.00	$2,400
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$15,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$15,800
				10% Legal, Administrative and Engineering Fees:	$1,600
				20% Contingencies:	$3,500
				Periodic Cost Total:	**$20,900**
				30-year Present Worth of Periodic Costs:	**$46,000**
				2016 Total Present Worth Cost:	**$231,000**

Table 4-5c Cost Estimate, Alternative S2C - Limited Action, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Notes:

1. Estimated Perimeter of Contaminated Areas (for Fencing)	1,456	LF
Mobilization / Demobilization	2	mo
Construction of Fencing	0.5	mo
2. Construction Duration (Assuming 5 day work week)	2.5	mo
3. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).	7.0%	

4. Costs presented are based on conventional contracting methods.

5. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-5d Cost Estimate, Alternative S2D - Limited Action, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$10,000	$10,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation					
Mobilization / Demobilization		1	LS	$1,900	$1,900
Fencing	Chain link industrial, 6' High, 6 gauge wire with 3 strands barb wire	1,119	LF	$32.00	$35,900
Signage	Reflectorized 24"x24" sign mounted to fence (1 per fenced area)	1	EA	$110.00	$200
Site Clearing					
Cut and chip heavy trees	At fencing areas, assume 10 foot width for clearing	0.3	Acre	$16,100	$4,200
				Capital Cost Subtotal:	$72,200
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$73,800
				10% Legal, administrative, engineering fees, construction management:	$7,400
				20% Contingencies:	$16,300
				Capital Cost Total:	**$98,000**
Annual Costs					
Site Monitoring	Visual survey of environmental easement, assume 1-persons @ $100/hr; 10 hr/day for 2 events	2	Events	$1,000	$2,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$4,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$4,100
				10% Legal, Administrative and Engineering Fees:	$500
				20% Contingencies:	$1,000
				Annual Cost Total:	**$5,600**
				30-year Present Worth of Annual Costs:	**$70,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting	Assume review conducted simultaneously with other upland sites	80	HR	$100	$8,000
Fence Maintenance	Assume 5% of fence replaced	56	LF	$32.00	$1,800
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$14,800
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$15,200
				10% Legal, Administrative and Engineering Fees:	$1,600
				20% Contingencies:	$3,400
				Periodic Cost Total:	**$20,200**
				30-year Present Worth of Periodic Costs:	**$44,000**
				2016 Total Present Worth Cost:	**$212,000**

Table 4-5d Cost Estimate, Alternative S2D - Limited Action, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Notes:

1. Estimated Perimeter of Contaminated Areas (for Fencing)	1,119	LF	
Mobilization / Demobilization	2	mo	
Construction of Fencing	0.5	mo	
2. Construction Duration (Assuming 5 day work week)	2.5	mo	
3. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).			7.0%

4. Costs presented are based on conventional contracting methods.

5. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-6a Cost Estimate, Alternative S3A - Complete Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Unit	Unit Cost	Cost
Institutional Controls					
Environmental Easements		1	LS	$20,000	$20,000
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation, Engineering and Access Controls					
Health and Safety requirements	Officer; assume on-site 100% of project duration	55	Day	$800	$44,000
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$23,500	$23,500
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,383.63
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	2	Setups	$3,000	$6,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	28	Day	$600	$16,500
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	28	Day	$1,600.00	$44,000
Site Fencing	Six foot high	1,465	LF	$29.00	$42,485
Site Gates	Six foot high swing gate, 12' double	2	EA	$1,050.00	$2,100
Secure Building	Fencing for building, assume 1000 LF, 3 strands, barb wire, 2" post @10' O.C., set in concrete, 6' H. 9 ga. Wire, galv in concrete, vinyl coated fabric	1,000	LF	$33.12	$33,120
Signage	Eight 2 ft x 2 ft reflective warning signs	8	EA	$110.00	$880
Site Clearing (300 and 198-Parcels and Island)					
Cut and chip heavy trees	Large trees and dense vegetation at 198 parcel and on Island	1.6	Acre	$16,100	$26,600
Clear and Grub	Clear, Grub and haul	5	acres	$9,175.00	$45,875
Monitoring Well Decomissioning	Five Micro Wells	95	LF	$5.00	$475
Monitoring Well Decomissioning	Two Overburden Wells	55	LF	$12.00	$660
Monitoring Well Decomissioning	Seven Bedrock Wells	220	LF	$18.00	$3,960
Grading	300-parcel	5	Day	$1,869.44	$9,347
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Containment (Soil Cover: 300 and 198 Parcels and Island)					
Geotextile Fabric	12 oz woven geotextile	19,534	SY	$1.42	$27,738
High Visibility Demarcation Layer		175,800	SF	$0.30	$52,800
Clean Fill	18" for 300 parcel, 198 parcel and Island	12,739	Ton	$5.53	$70,405
Topsoil	Exterior portions of the site, 6"	4,246	Ton	$18.09	$76,805
Haul Soil & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	13,022	LCY	$15.25	$198,589
Spread Soil & Topsoil	Spread dumped material, no compaction	13,022	LCY	$2.39	$31,123
Compact Soil	12" lifts, vibrating roller	11,324	BCY	$0.95	$10,757
Finish grading, large area	Steep slopes	176	MSF	$29.50	$5,186
Hydroseeding large areas		19,533	SY	$0.82	$16,017

Table 4-6a Cost Estimate, Alternative S3A - Complete Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Unit	Unit Cost	Cost
				Capital Costs Subtotal:	$966,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$986,700
				10% Legal, administrative, engineering fees, construction management:	$98,700
				20% Contingencies:	$217,100
				Capital Cost Total:	**$1,303,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile/demarcation, pavement)	Assume 5% of initial cover cost	1	LS	$7,400	$7,400
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$20,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$20,900
				10% Legal, Administrative and Engineering Fees:	$2,100
				20% Contingencies:	$4,600
				Periodic Cost Total:	**$27,600**
				30-year Present Worth of Periodic Costs:	**$60,000**
				2016 Total Present Worth Cost	**$1,466,000**

Notes:

1. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666). 7.0%

2. Costs presented are based on conventional contracting methods.

3. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

4. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

Table 4-6a Cost Estimate, Alternative S3A - Complete Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Unit	Unit Cost	Cost
5. Estimated Volumes, Areas and Lengths at Flinkote					
Length of Creek adjacent to property (both banks)		2,830	LF		
Length of Excavated Areas along creek		0	LF		
Length of Cover Areas along creek		0	LF		
Surface Area of 300-parcel		92,200	SF		
Surface Area of 198-parcel		29,700	SF		
Surface Area of Island (hazardous)		42,128	SF		
Surface Area of Soil Cover Areas		175,800	SF		
6. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
7. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
8. WM Taxes & Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			
9. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
10. Construction Duration (Assuming 5 day work week, total for all sites - Flinkote, White, United, Upson & Creek Channel)					
Total Project Time		3	mo		
		1	construction season		

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.

Table 4-6b Cost Estimate, Alternative S3B - Complete Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$15,000	$15,000
Health and Safety requirements	Officer; assume on-site 100% of project duration	55	Day	$800	$44,000
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	28	Day	$1,600	$44,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	28	Day	$600	$16,500
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	1.9	Acre	$16,100	$30,000
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	1.9	Acre	$8,625	$16,100
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Containment (Soil Cover)					
Geotextile Fabric		8,989	SY	$1.42	$12,800
High Visibility Demarcation Layer		80,900	SF	$0.30	$24,300
Clean soil	18" thick over entire cover area	6,742	Ton	$5.53	$37,300
Topsoil (Material)	6" of topsoil for planting	2,247	Ton	$18.09	$40,700
Haul Soil & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	6,891	LCY	$15.25	$105,100
Spread Soil & Topsoil	Spread dumped material, no compaction	6,891	LCY	$2.39	$16,500
Compact Soil	12" lifts, vibrating roller	5,993	BCY	$0.95	$5,700
Finish grading, large area	Steep slopes	81	MSF	$29.50	$2,400
Hydroseeding large areas		8,989	SY	$0.82	$7,400
Upgrade of Asphalt Areas					
Clean Soil	Assume 12"; needed to bring parking areas up to grade with surrounding soil covers, material only	0	Ton	$5.53	$0
Spread Soil	Spread dumped material, no compaction	0	LCY	$2.39	$0
Compact Soil	12" lifts, vibrating roller	0	BCY	$0.95	$0
Crushed Stone Base	Assume 1-1/2" stone, 8" thick, spread and compacted	0	SY	$11.05	$0
Asphalt Binder Course	Assume 2-1/2" thick, includes material and labor	0	SY	$11.80	$0
Asphalt Wearing Course	Assume 1-1/2" thick, includes material and labor	0	SY	$8.09	$0
Haul Material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	0	LCY	$15.25	$0

Table 4-6b Cost Estimate, Alternative S3B - Complete Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
				Capital Cost Subtotal:	$609,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$621,800
				10% Legal, administrative, engineering fees, construction management:	$62,200
				20% Contingencies:	$136,800
				Capital Cost Total:	**$821,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile, pavement)	Assume 5% of initial cover cost	1	LS	$12,000	$12,000
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$25,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$25,600
				10% Legal, Administrative and Engineering Fees:	$2,600
				20% Contingencies:	$5,700
				Periodic Cost Total:	**$33,900**
				30-year Present Worth of Periodic Costs:	**$74,000**
				2016 Total Present Worth Cost:	**$998,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.
2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.
3. Width of Access Roads along Creek 20 LF

Table 4-6b Cost Estimate, Alternative S3B - Complete Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at White Transportation					
Volume of Hazardous Material		0	BCY		
Volume of NonHazardous Material (to be excavated)		110	BCY		
Surface Area of Excavated Material		1,100	SF		
Surface Area of Soil Cover Areas		80,900	SF		
Length of Creek adjacent to property (both banks)		1,130	LF		
Length of Excavated Areas along creek		0	LF		
Length of Cover Areas along creek		500	LF		
Surface Area of Asphalt Cover Areas		0	SF		
5. Estimated Total Site Perimeter (for Upson, White and United)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Time		3	mo		
		1	construction season		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-6c Cost Estimate, Alternative S3C - Complete Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$18,000	$18,000
Health and Safety requirements	Officer; assume on-site 100% of project duration	55	Day	$800	$44,000
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	2	Setups	$3,000	$6,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	28	Day	$1,600	$44,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	28	Day	$600	$16,500
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	2	Acre	$16,100	$35,500
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	2	Acre	$8,625	$19,000
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Containment (Soil Cover)					
Geotextile Fabric		10,656	SY	$1.42	$15,200
High Visibility Demarcation Layer		95,900	SF	$0.30	$28,800
Clean soil	18" thick over entire cover area	7,992	Ton	$5.53	$44,200
Topsoil (Material)	6" of topsoil for planting	2,664	Ton	$18.09	$48,200
Haul Soil & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	8,169	LCY	$15.25	$124,600
Spread Soil & Topsoil	Spread dumped material, no compaction	8,169	LCY	$2.39	$19,600
Compact Soil	12" lifts, vibrating roller	7,104	BCY	$0.95	$6,800
Finish grading, large area	Steep slopes	96	MSF	$29.50	$2,900
Hydroseeding large areas		10,656	SY	$0.82	$8,800
Upgrade of Asphalt Areas					
Clean Soil	Assume 12"; needed to bring parking areas up to grade with surrounding soil covers, material only	1,159	Ton	$5.53	$6,408
Spread Soil	Spread dumped material, no compaction	889	LCY	$2.39	$2,124
Compact Soil	12" lifts, vibrating roller	773	BCY	$0.95	$734
Crushed Stone Base	Assume 1-1/2" stone, 8" thick, spread and compacted	889	SY	$11.05	$9,822
Asphalt Binder Course	Assume 2-1/2" thick, includes material and labor	889	SY	$11.80	$10,489
Asphalt Wearing Course	Assume 1-1/2" thick, includes material and labor	889	SY	$8.09	$7,191
Haul Material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	1,778	LCY	$15.25	$27,111

Table 4-6c Cost Estimate, Alternative S3C - Complete Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
				Capital Cost Subtotal:	$734,200
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$749,700
				10% Legal, administrative, engineering fees, construction management:	$75,000
				20% Contingencies:	$165,000
				Capital Cost Total:	**$990,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile, pavement)	Assume 5% of initial cover cost	1	LS	$17,400	$17,400
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$30,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$31,100
				10% Legal, Administrative and Engineering Fees:	$3,200
				20% Contingencies:	$6,900
				Periodic Cost Total:	**$41,200**
				30-year Present Worth of Periodic Costs:	**$89,000**
				2016 Total Present Worth Cost:	**$1,182,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.
2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.
3. Width of Access Roads along Creek 20 LF

Table 4-6c Cost Estimate, Alternative S3C - Complete Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at Former United Paperboard Company					
Volume of Hazardous Material		3,800	BCY		
Volume of NonHazardous Material		800	BCY		
Surface Area of Soil Cover Areas		95,900	SF		
Length of Creek adjacent to property (both banks)		1,950	LF		
Length of Cover Areas along creek		1,900	LF		
Surface Area of Asphalt Cover Areas		24,000	SF		
5. Estimated Total Site Perimeter (for Upson, White and United)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Time		3	mo		
		1	construction season		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
14. Waste Management (Non-Haz) Taxes and Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-6d Cost Estimate, Alternative S3D - Complete Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$24,300	$24,300
Health and Safety requirements	Officer; assume on-site 100% of project duration	55	Day	$800	$44,000
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	28	Day	$1,600	$44,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	28	Day	$600	$16,500
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	3	Acre	$16,100	$55,300
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	3	Acre	$8,625	$29,700
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Containment (Soil Cover)					
Geotextile Fabric		16,622	SY	$1.42	$23,700
High Visibility Demarcation Layer		149,600	SF	$0.30	$44,900
Clean soil	18" thick over entire cover area	12,467	Ton	$5.53	$68,900
Topsoil (Material)	6" of topsoil for planting	4,156	Ton	$18.09	$75,200
Haul Soil & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	12,744	LCY	$15.25	$194,400
Spread Soil & Topsoil	Spread dumped material, no compaction	12,744	LCY	$2.39	$30,500
Compact Soil	12" lifts, vibrating roller	11,081	BCY	$0.95	$10,600
Finish grading, large area	Steep slopes	150	MSF	$29.50	$4,500
Hydroseeding large areas		16,622	SY	$0.82	$13,700
Upgrade of Asphalt Areas					
Clean Soil	Assume 12"; needed to bring parking areas up to grade with surrounding soil covers, material only	2,222	Ton	$5.53	$12,281
Spread Soil	Spread dumped material, no compaction	1,704	LCY	$2.39	$4,072
Compact Soil	12" lifts, vibrating roller	1,481	BCY	$0.95	$1,407
Crushed Stone Base	Assume 1-1/2" stone, 8" thick, spread and compacted	1,704	SY	$11.05	$18,826
Asphalt Binder Course	Assume 2-1/2" thick, includes material and labor	1,704	SY	$11.80	$20,104
Asphalt Wearing Course	Assume 1-1/2" thick, includes material and labor	1,704	SY	$8.09	$13,783
Haul Material	12 CY dump truck, 20 miles round trip, 0.4 load/hr	3,407	LCY	$15.25	$51,963

Table 4-6d Cost Estimate, Alternative S3D - Complete Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
				Capital Cost Subtotal:	$993,900
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$1,014,800
				10% Legal, administrative, engineering fees, construction management:	$101,500
				20% Contingencies:	$223,300
				Capital Cost Total:	**$1,340,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile, pavement)	Assume 5% of initial cover cost	1	LS	$28,300	$28,300
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$41,300
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$42,200
				10% Legal, Administrative and Engineering Fees:	$4,300
				20% Contingencies:	$9,300
				Periodic Cost Total:	**$55,800**
				30-year Present Worth of Periodic Costs:	**$121,000**
				2016 Total Present Worth Cost:	**$1,564,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.
2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.
3. Width of Access Roads along Creek 20 LF

Table 4-6d Cost Estimate, Alternative S3D - Complete Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at Upson Park					
Volume of Hazardous Material		4,900	BCY		
Volume of NonHazardous Material		2,100	BCY		
Surface Area of Soil Cover Areas		149,600	SF		
Length of Creek adjacent to property (both banks)		1,440	LF		
Length of Cover Areas along creek		1,300	LF		
Surface Area of Asphalt Cover Areas		46,000	SF		
5. Estimated Total Site Perimeter (for Upson, White and United)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Time		3	mo		
		1	construction season		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
14. Waste Management (Non-Haz) Taxes and Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-7a Cost Estimate, Alternative S4A - Excavation, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation, Engineering and Access Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$209,800	$209,800
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000.00	$3,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	2	Day	$600.00	$1,200
Health and Safety requirements	Officer; assume on-site 100% of project duration	195	Day	$800.00	$156,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	97.5	Day	$1,600.00	$156,000
Site Clearing (300 and 198-Parcels and Island)					
Clear and Grub	Clear, Grub and haul	4	Acre	$9,175.00	$36,700
Cut and chip heavy trees	Large trees and dense vegetation at 198 parcel and on Island	1.6	Acre	$16,100	$26,600
Monitoring Well Decomissioning	Five Micro Wells	95	FT	$5.00	$475
Monitoring Well Decomissioning	Two Overburden Wells	55	FT	$12.00	$660
Monitoring Well Decomissioning	Seven Bedrock Wells	220	FT	$18.00	$3,960
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction & Removal	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal (300-Parcel, 198-Parcel and Island)					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	46,615	BCY	$1.81	$84,374
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	53,607	LCY	$3.68	$197,300
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	270	EA	$254	$68,600
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	71	EA	$1,234	$87,700
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	12,911	Ton	$28.00	$361,519
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	12,911	Ton	$190	$2,453,166
Soil Stabilization, No Replacement	see Table 4-1c	9,899	LCY	$23.85	$236,085
Non-Haz Soil Transportation/Disposal (300-Parcel)	Non-haz soil	57,011	Ton	$46.48	$2,649,923

Table 4-7a Cost Estimate, Alternative S4A - Excavation, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Unit Cost	Cost
Backfill and Site Restoration (300 and 198 Parcels and Island)					
Clean Fill	Unclassified fill, 18" lifts	65,953	Ton	$5.53	$364,500
Topsoil	6" lifts	3,970	Ton	$18.09	$71,807
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	53,607	LCY	$15.25	$817,514
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	53,607	LCY	$2.39	$128,122
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	46,615	BCY	$0.95	$44,284
Finish grading, large area	Steep slopes	164	MSF	$29.50	$4,839
Hydroseeding large areas		18,226	SY	$0.82	$14,945
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	263	Ea	$202.00	$53,200
				Capital Costs Subtotal:	$8,389,700
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$8,565,900
				10% Legal, administrative, engineering fees, construction management:	$856,600
				20% Contingencies:	$1,884,500
				Capital Cost Total:	**$11,307,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
				Periodic Cost Subtotal:	$8,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$8,200
				10% Legal, Administrative and Engineering Fees:	$900
				20% Contingencies:	$1,900
				Periodic Cost Total:	**$11,000**
				30-year Present Worth of Periodic Costs:	**$24,000**
				2016 Total Present Worth Cost:	**$11,331,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek 20 LF

Table 4-7a Cost Estimate, Alternative S4A - Excavation, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at Flinkote					
Volume of Hazardous Material		17,215	CY		
Volume of NonHazardous Material		29,400	CY		
Surface Area of 300-parcel		92,200	SF		
Surface Area of 198-parcel		29,700	SF		
Surface Area of Island		42,128	SF		
Length of Creek adjacent to property (both banks)		2,830	LF		
Length of Excavated Areas along creek		0	LF		
5. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
6. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
7. WM Taxes & Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			
8. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
9. Construction Duration (Assuming 5 day work week)					
Total Project Duration		9.0	months		
		2	construction seasons		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).					7.0%
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		

Key:

BCY = Bank cubic yards.
CY = Cubic Yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards.
LF = Linear feet.
LS = Lump sum.
Mo = Month
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.

Table 4-7b Cost Estimate, Alternative S4B - Excavation, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$5,900	$5,900
Health and Safety requirements	Officer; assume on-site 100% of project duration	22	Day	$800	$17,600
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	11	Day	$1,600	$17,600
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	11	Day	$600	$6,600
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation Areas	**double counted from access road costs**				
Cut and chip heavy trees	Large trees and dense vegetation at excavation areas	0.03	Acre	$16,100	$500
Grub stumps and remove - heavy	at excavation areas	0.03	Acre	$8,625	$300
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	110	BCY	$1.81	$200
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	127	LCY	$3.68	$500
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	2	EA	$254	$500
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	1	EA	$1,234	$1,300
Soil Stabilization, No Replacement	see Table 4-1c	0	LCY	$23.85	$0
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	165	Ton	$20.46	$3,400
Disposal at Disposal Facility (Non-haz)	Non-hazardous material	165	Ton	$26.03	$4,300
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	0	Ton	$28.00	$0
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	0	Ton	$190	$0

Table 4-7b Cost Estimate, Alternative S4B - Excavation, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		138	Ton	$5.53	$800
Topsoil (Material)	6" of top soil at surface	27	Ton	$18.09	$500
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	127	LCY	$15.25	$2,000
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	127	LCY	$2.39	$400
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	110	BCY	$0.95	$200
Finish grading, large area	Steep slopes	1	MSF	$29.50	$100
Hydroseeding large areas		122	SY	$0.82	$200
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	2	Ea	$202.00	$400
				Capital Cost Subtotal:	$234,500
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$239,500
				10% Legal, administrative, engineering fees, construction management:	$24,000
				20% Contingencies:	$52,700
				Capital Cost Total:	**$317,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
				Periodic Cost Subtotal:	$8,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$8,200
				10% Legal, Administrative and Engineering Fees:	$900
				20% Contingencies:	$1,900
				Periodic Cost Total:	**$11,000**
				30-year Present Worth of Periodic Costs:	**$24,000**
				2016 Total Present Worth Cost:	**$341,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek 20 LF

Table 4-7b Cost Estimate, Alternative S4B - Excavation, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at White Transportation					
Volume of Hazardous Material		0.0	BCY		
Volume of NonHazardous Material		110	BCY		
Surface Area of Contaminated Material		1100	SF		
Length of Creek adjacent to property (both banks)		1,130	LF		
Length of Excavated Areas along creek		0	LF		
5. Estimated Total Site Perimeter (Upson, United and White Transportation)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Duration		1.0	months		
		1	construction seasons		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
14. Waste Management (Non-Haz) Taxes and Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
LTM = Long-term monitoring.
Mo = Month.
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-7c Cost Estimate, Alternative S4C - Excavation, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$45,400	$45,400
Health and Safety requirements	Officer; assume on-site 100% of project duration	44	Day	$800	$35,200
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	2	Setups	$3,000	$6,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	22	Day	$1,600	$35,200
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	22	Day	$600	$13,200
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation Areas					
Cut and chip heavy trees	Large trees and dense vegetation at excavation areas	0.5	Acre	$16,100	$7,900
Grub stumps and remove - heavy	Along creek banks and at excavation areas	0.5	Acre	$8,625	$4,200
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	4,600	BCY	$1.81	$8,400
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	5,290	LCY	$3.68	$19,500
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	34	EA	$254	$8,700
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	8	EA	$1,234	$9,900
Soil Stabilization, No Replacement	see Table 4-1c	0	LCY	$23.85	$0
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	1,200	Ton	$20.46	$24,600
Disposal at Disposal Facility (Non-haz)	Non-hazardous material	1,200	Ton	$26.03	$31,300
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	5,700	Ton	$28.00	$159,600
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	5,700	Ton	$190	$1,083,000

Table 4-7c Cost Estimate, Alternative S4C - Excavation, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		6,388	Ton	$5.53	$35,400
Topsoil (Material)	6" of top soil at surface	512	Ton	$18.09	$9,300
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	5,290	LCY	$15.25	$80,700
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	5,290	LCY	$2.39	$12,700
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	4,600	ECY	$0.95	$4,400
Finish grading, large area	Steep slopes	21	MSF	$29.50	$700
Hydroseeding large areas		2,356	SY	$0.82	$2,000
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	34	Ea	$202.00	$6,900
				Capital Cost Subtotal:	$1,812,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$1,850,500
				10% Legal, administrative, engineering fees, construction management:	$185,100
				20% Contingencies:	$407,200
				Capital Cost Total:	**$2,443,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
				Periodic Cost Subtotal:	$8,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$8,200
				10% Legal, Administrative and Engineering Fees:	$900
				20% Contingencies:	$1,900
				Periodic Cost Total:	**$11,000**
				30-year Present Worth of Periodic Costs:	**$24,000**
				2016 Total Present Worth Cost:	**$2,467,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.
2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.
3. Width of Access Roads along Creek 20 LF

Table 4-7c Cost Estimate, Alternative S4C - Excavation, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at Former United Paperboard Company					
Volume of Hazardous Material		3,800	BCY		
Volume of NonHazardous Material		800	BCY		
Surface Area of Contaminated Material		21,200	SF		
Length of Creek adjacent to property (both banks)		1,950	LF		
Length of Excavated Areas along creek		0	LF		
5. Estimated Total Site Perimeter (Upson, United and White Transportation)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Duration		2.0	months		
		1	construction seasons		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
14. Waste Management (Non-Haz) Taxes and Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
LTM = Long-term monitoring.
Mo = Month.
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-7d Cost Estimate, Alternative S4D - Excavation, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$60,000	$60,000
Health and Safety requirements	Officer; assume on-site 100% of project duration	44	Day	$800	$35,200
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	22	Day	$1,600	$35,200
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	22	Day	$600	$13,200
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation Areas					
Cut and chip heavy trees	Large trees and dense vegetation at excavation areas	1.0	Acre	$16,100	$15,700
Grub stumps and remove - heavy	Along creek banks and at excavation areas	1.0	Acre	$8,625	$8,400
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	7,000	BCY	$1.81	$12,700
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	8,050	LCY	$3.68	$29,700
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	68	EA	$254	$17,300
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	11	EA	$1,234	$13,600
Soil Stabilization, No Replacement	see Table 4-1c	0	LCY	$23.85	$0
Transport to Disposal Facility (Non-haz)	assumes 28 tons/load transport to Chaffee Landfill in Chaffee, NY	3,150	Ton	$20.46	$64,500
Disposal at Disposal Facility (Non-haz)	Non-hazardous material	3,150	Ton	$26.03	$82,000
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	7,350	Ton	$28.00	$205,800
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	7,350	Ton	$190	$1,396,500

Table 4-7d Cost Estimate, Alternative S4D - Excavation, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		9,476	Ton	$5.53	$52,400
Topsoil (Material)	6" of top soil at surface	1,024	Ton	$18.09	$18,600
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	8,050	LCY	$15.25	$122,800
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	8,050	LCY	$2.39	$19,300
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	7,000	ECY	$0.95	$6,700
Finish grading, large area	Steep slopes	42	MSF	$29.50	$1,300
Hydroseeding large areas		4,711	SY	$0.82	$3,900
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	68	Ea	$202.00	$13,800
				Capital Cost Subtotal:	$2,399,800
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$2,450,200
				10% Legal, administrative, engineering fees, construction management:	$245,100
				20% Contingencies:	$539,100
				Capital Cost Total:	**$3,235,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
				Periodic Cost Subtotal:	$8,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$8,200
				10% Legal, Administrative and Engineering Fees:	$900
				20% Contingencies:	$1,900
				Periodic Cost Total:	**$11,000**
				30-year Present Worth of Periodic Costs:	**$24,000**
				2016 Total Present Worth Cost:	**$3,259,000**

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek 20 LF

Table 4-7d Cost Estimate, Alternative S4D - Excavation, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
4. Estimated Volumes, Areas and Lengths at Upson Park					
Volume of Hazardous Material		4,900	BCY		
Volume of NonHazardous Material		2,100	BCY		
Surface Area of Contaminated Material		42,400	SF		
Length of Creek adjacent to property (both banks)		1,440	LF		
Length of Excavated Areas along creek		0	LF		
5. Estimated Total Site Perimeter (Upson, United and White Transportation)		5,125	LF		
6. Assume verification sampling grid spacing:		25	ft		
7. Construction Duration (Assuming 5 day work week)					
Total Project Duration		2.0	months		
		1	construction seasons		
8. Conversion from BCY to LCY (dewatered material):		1.15	LCY/BCY		
9. Conversion from BCY to tons (dewatered material):		1.5	tons/BCY		
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).				7.0%	
11. Costs presented are based on conventional contracting methods.					
12. Assume tree and shrub planting grid spacing every		25	ft		
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.					
14. Waste Management (Non-Haz) Taxes and Fees					
NYS Tax		8.75%			
Environmental Fee		11.00%			
RCR Fee		3.60%			

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
LTM = Long-term monitoring.
Mo = Month.
MSF = 1000 square feet.
OU = Operable Unit.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-8a Cost Estimate, Alternative S5A - Combined Excavation and Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Cost/Unit	Cost
Institutional Controls					
Environmental Easements		1	LS	$20,000	$20,000
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Site Preparation, Engineering and Access Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$117,600	$117,600
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	47	Day	$600	$28,200
Health and Safety requirements	Officer; assume on-site 100% of project duration	94	Day	$800.00	$75,200
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	47	Day	$1,600.00	$75,200
Site Clearing (300 and 198-Parcels and Island)					
Cut and chip heavy trees	Large trees and dense vegetation at 198 parcel and on Island	1.6	Acre	$16,100	$26,600
Clear and Grub	Clear, Grub and haul	3.8	Acre	$9,175	$34,865
Monitoring Well Decomissioning	Five Micro Wells	95	LF	$5	$475
Monitoring Well Decomissioning	Two Overburden Wells	55	LF	$12	$660
Monitoring Well Decomissioning	Seven Bedrock Wells	220	LF	$18	$3,960
Grading	300-parcel, 198-parcel and the Island.	30	Day	$1,869	$56,082
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Containment (300-Parcel)					
Geotextile Fabric	12 oz woven geotextile	10,245	SY	$1.42	$14,548
High Visibility Demarcation Layer		92,200	SF	$0.30	$27,700
Clean Fill	Unclassified fill, 18" lifts	6,682	Ton	$5.53	$36,929
Topsoil	6" lifts	2,228	Ton	$18.09	$40,298
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	6,831	LCY	$15.25	$104,173
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	6,831	LCY	$2.39	$16,326
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	5,940	BCY	$0.95	$5,643
Finish grading, large area	Steep slopes	92	MSF	$29.50	$2,720
Hydroseeding large areas		10,245	SY	$0.82	$8,401

Table 4-8a Cost Estimate, Alternative S5A - Combined Excavation and Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Cost/Unit	Cost
Soil Removal (Haz Areas: 198-Parcel and Island)					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	17,215	BCY	$1.81	$31,160
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	19,797	LCY	$3.68	$72,900
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	120	EA	$254	$30,500
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	27	EA	$1,234	$33,400
Soil Stabilization and Replacement	see Table 4-1c; Assume 50% of the Hazardous soils from the 198 Parcel and Island can be stabilized and placed back on the 300 parcel and capped	9,899	LCY	$30.53	$302,179
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY, Assume 50% of the hazardous soils from the 198 Parcel and Island	12,911	Ton	$28.00	$361,519
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	12,911	Ton	$190	$2,453,166
Backfill and Site Restoration (198 Parcel and Island Haz Area)					
Clean Fill	Unclassified fill, excavation volume less topsoil volume	24,083	Ton	$5.53	$133,098
Topsoil	6" lifts	1,740	Ton	$18.09	$31,472
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	19,797	LCY	$15.25	$301,912
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	19,797	LCY	$2.39	$47,316
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	17,215	BCY	$0.95	$16,354
Finish grading, large area	Steep slopes	72	MSF	$29.50	$2,119
Hydroseeding large areas		7,981	SY	$0.82	$6,544
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	115	Ea	$202.00	$23,300
				Capital Cost Subtotal	$4,702,919
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$4,801,700
				10% Legal, administrative, engineering fees, construction management:	$480,200
				20% Contingencies:	$1,056,400
				Capital Cost Total:	**$6,339,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**

Table 4-8a Cost Estimate, Alternative S5A - Combined Excavation and Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Cost/Unit	Cost
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile)	Assume 5% of initial cover cost	1	LS	$12,900	$12,900
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$25,900
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$26,500
				10% Legal, Administrative and Engineering Fees:	$2,700
				20% Contingencies:	$5,900
				Periodic Cost Total:	**$35,100**
				30-year Present Worth of Periodic Costs:	**$76,000**
				Total Project Cost	**$6,518,000**

Notes:

1. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666). 7.0%

2. Costs presented are based on conventional contracting methods.

3. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

4. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

5. Estimated Volumes, Areas and Lengths at Flinkote

Volume of Hazardous Material	17215	CY
Length of Creek adjacent to property (both banks)	2,830	LF
Length of Excavated Areas along creek	0	LF
Length of Cover Areas along creek	0	LF
Surface Area of 300-parcel	92,200	SF
Surface Area of 198-parcel	29,700	SF
Surface Area of Island (hazardous)	42,128	SF

6. Conversion from BCY to LCY (dewatered material): 1.15 LCY/BCY

7. Conversion from BCY to tons (dewatered material): 1.5 tons/BCY

8. WM Taxes & Fees

NYS Tax	8.75%
Environmental Fee	11.00%
RCR Fee	3.60%

9. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.

Table 4-8a Cost Estimate, Alternative S5A - Combined Excavation and Capping, Former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Item	Note	Quantity	Unit	Cost/Unit	Cost
10. Construction Duration (Assuming 5 day work week)					
Total Project Duration		4.3	months		
		1	construction seasons, 6 months each		
11. Assume tree and shrub planting grid spacing		25	ft		

Key:
BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-8b Cost Estimate, Alternative S5B - Combined Excavation and Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$6,200	$6,200
Health and Safety requirements	Officer; assume on-site 100% of project duration	23	Day	$800	$18,400
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	12	Day	$1,600	$18,400
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	12	Day	$600	$6,900
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation & Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	0.03	Acre	$16,100	$500
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	0.03	Acre	$8,625	$300
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal (Haz Areas)					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	0	BCY	$1.81	$0
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	0	LCY	$3.68	$0
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	0	EA	$254	$0
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	0	EA	$1,234	$0
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	0	Ton	$28.00	$0
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	0	Ton	$190	$0
Soil Stabilization and Replacement	see Table 4-1c	0	LCY	$30.53	$0
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		0	Ton	$5.53	$0
Topsoil (Material)	6" of top soil at surface	0	Ton	$18.09	$0
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	0	LCY	$15.25	$0
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	0	LCY	$2.39	$0
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	0	BCY	$0.95	$0
Finish grading, large area	Steep slopes	0	MSF	$29.50	$0
Hydroseeding large areas		0	SY	$0.82	$0
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	0	Ea	$202.00	$0

Table 4-8b Cost Estimate, Alternative S5B - Combined Excavation and Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Containment					
Geotextile Fabric		122	SY	$1.42	$200
High Visibility Demarcation Layer		1,100	SF	$0.30	$400
Clean soil	1.5' thick over areas of contamination not excavated	80	Ton	$5.53	$500
Topsoil (Material)	6" of top soil at surface	27	Ton	$18.09	$500
Haul Soil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	81	LCY	$15.25	$1,300
Spread Soil	Spread dumped material, no compaction	81	LCY	$2.39	$200
Compact Soil	12" lifts, vibrating roller; incl cut-back volume	71	BCY	$0.95	$100
Finish grading, large area	Steep slopes	1	MSF	$29.50	$100
Hydroseeding large areas		122	SY	$0.82	$200
				Capital Cost Subtotal:	$245,400
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$250,600
				10% Legal, administrative, engineering fees, construction management:	$25,100
				20% Contingencies:	$55,200
				Capital Cost Total:	**$331,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor:	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile)	Assume 5% of initial cover cost	1	LS	$200	$200
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$13,200
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$13,500
				10% Legal, Administrative and Engineering Fees:	$1,400
				20% Contingencies:	$3,000
				Periodic Cost Total:	**$17,900**
				30-year Present Worth of Periodic Costs:	**$39,000**
				2016 Total Present Worth Cost:	**$473,000**

Table 4-8b Cost Estimate, Alternative S5B - Combined Excavation and Capping, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek	20	LF
4. Estimated Volumes, Areas and Lengths at White Transportation		
Volume of Hazardous Material	0.0	BCY
Volume of NonHazardous Material (to be excavated)	110	BCY
Surface Area of Contaminated Material	1,100	SF
Surface Area of Cover Areas	1,100	SF
Length of Creek adjacent to property (both banks)	1,130	LF
Length of Excavated Areas along creek	0	LF
Length of Cover Areas along creek	60	LF
5. Estimated Total Site Perimeter (Upson, United and White Transportation)	5,125	LF
6. Assume verification sampling grid spacing:	25	ft
7. Construction Duration (Assuming 5 day work week)		
Total Project Duration	1.0	months
	1	construction seasons, 6 months each
8. Conversion from BCY to LCY (dewatered material):	1.15	LCY/BCY
9. Conversion from BCY to tons (dewatered material):	1.5	tons/BCY
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).	7.0%	
11. Costs presented are based on conventional contracting methods.		
12. Assume tree and shrub planting grid spacing	25	ft
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.		
14. Waste Management (Non-Haz) Taxes and Fees		
NYS Tax	8.75%	
Environmental Fee	11.00%	
RCR Fee	3.60%	

Key:

BCY = Bank cubic yards.
EA = Each.
ECY = Embankment cubic yards.
HR = Hour.
kGal = Thousand gallons.
LCY = Loose cubic yards
LF = Linear feet.
LS = Lump sum.
Mo = Month.
MSF = 1000 square feet.
SF = Square feet.
SY = Square yards.
WWTP = Wastewater treatment plant.

Table 4-8c Cost Estimate, Alternative S5C - Combined Excavation and Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$43,500	$43,500
Health and Safety requirements	Officer; assume on-site 100% of project duration	39	Day	$800	$31,200
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	2	Setups	$3,000	$6,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	20	Day	$1,600	$31,200
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	20	Day	$600	$11,700
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation & Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	0.3	Acre	$16,100	$4,100
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	0.3	Acre	$8,625	$2,200
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal (Haz Areas)					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	3,800	BCY	$1.81	$6,900
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	4,370	LCY	$3.68	$16,100
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	10	EA	$254	$2,600
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	7	EA	$1,234	$8,700
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	5,700	Ton	$28.00	$159,600
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	5,700	Ton	$190	$1,083,000
Soil Stabilization and Replacement	see Table 4-1c	0	LCY	$30.53	$0
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		5,681	Ton	$5.53	$31,400
Topsoil (Material)	6" of top soil at surface	19	Ton	$18.09	$400
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	4,370	LCY	$15.25	$66,700
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	4,370	LCY	$2.39	$10,500
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	3,800	BCY	$0.95	$3,700
Finish grading, large area	Steep slopes	1	MSF	$29.50	$100
Hydroseeding large areas		89	SY	$0.82	$100
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	1	Ea	$202.00	$300

Table 4-8c Cost Estimate, Alternative S5C - Combined Excavation and Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Containment					
Geotextile Fabric		1,133	SY	$1.42	$1,700
High Visibility Demarcation Layer		10,200	SF	$0.30	$3,100
Clean soil	2' thick over areas of contamination not excavated, including 6" of topsoil for planting	1,133	Ton	$5.53	$6,300
Haul Soil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	869	LCY	$15.25	$13,300
Spread Soil	Spread dumped material, no compaction	869	LCY	$2.39	$2,100
Compact Soil	12" lifts, vibrating roller; incl cut-back volume	756	BCY	$0.95	$800
Finish grading, large area	Steep slopes	10	MSF	$29.50	$400
Hydroseeding large areas		1,133	SY	$0.82	$1,000
				Capital Cost Subtotal:	$1,736,900
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$1,773,400
				10% Legal, administrative, engineering fees, construction management:	$177,400
				20% Contingencies:	$390,200
				Capital Cost Total:	**$2,341,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile)	Assume 5% of initial cover cost	1	LS	$1,500	$1,500
Institutional Controls	Maintain / Update Documentation	1	LS	$5,000	$5,000
				Periodic Cost Subtotal:	$14,500
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$14,900
				10% Legal, Administrative and Engineering Fees:	$1,500
				20% Contingencies:	$3,300
				Periodic Cost Total:	**$19,700**
				30-year Present Worth of Periodic Costs:	**$43,000**
				2016 Total Present Worth Cost:	**$2,487,000**

Table 4-8c Cost Estimate, Alternative S5C - Combined Excavation and Capping, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek	20	LF
4. Estimated Volumes, Areas and Lengths at Former United Paperboard Company		
Volume of Hazardous Material	3,800	BCY
Volume of NonHazardous Material	800	BCY
Volume of NonHazardous Material (to be excavated)	300	BCY
Surface Area of Contaminated Material	11,000	SF
Surface Area of Cover Areas	10,200	SF
Length of Creek adjacent to property (both banks)	1,950	LF
Length of Excavated Areas along creek	0	LF
Length of Cover Areas along creek	200	LF
5. Estimated Total Site Perimeter (Upson, United and White Transportation)	5,125	LF
6. Assume verification sampling grid spacing:	25	ft
7. Construction Duration (Assuming 5 day work week)		
Total Project Duration	1.8	months
	1	construction seasons, 6 months each
8. Conversion from BCY to LCY (dewatered material):	1.15	LCY/BCY
9. Conversion from BCY to tons (dewatered material):	1.5	tons/BCY
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).	7.0%	
11. Costs presented are based on conventional contracting methods.		
12. Assume tree and shrub planting grid spacing	25	ft
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.		
14. Waste Management (Non-Haz) Taxes and Fees		
NYS Tax	8.75%	
Environmental Fee	11.00%	
RCR Fee	3.60%	

Key:

BCY = Bank cubic yards.	LF = Linear feet.
EA = Each.	LS = Lump sum.
ECY = Embankment cubic yards.	Mo = Month.
HR = Hour.	MSF = 1000 square feet.
kGal = Thousand gallons.	SF = Square feet.
LCY = Loose cubic yards	SY = Square yards.
	WWTP = Wastewater treatment plant.

Table 4-8d Cost Estimate, Alternative 5D - Combined Excavation and Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Capital Costs					
Work Plan / Final Report	Includes submittals, meetings	1	LS	$25,000	$25,000
Institutional Controls	Environmental Easements	1	LS	$20,000	$20,000
Site Preparation and Engineering Controls					
Mobilization/Demobilization	Include site prep, trailers, staging ,etc. and demobilization	1	LS	$54,200	$54,200
Health and Safety requirements	Officer; assume on-site 100% of project duration	42	Day	$800	$33,600
Community Air Monitoring	Particulate meters	2	Ea	$8,692	$17,400
Decontamination Pad & Containment	For equipment, personnel, and departing site vehicles	1	Setups	$3,000	$3,000
Surveying	2-person crew @ $100/hr, 8hr/day; assume 50% of project duration	21	Day	$1,600	$33,600
Traffic Control (Labor)	For roads adjacent to the commercial properties, including Clinton St, Mill St, and Water St. Assume 1 person for 50% of project duration, $75/hr, 8hr/day	21	Day	$600	$12,600
Fencing	Chain link fence rental, 6' high, around perimeter of sites	1,708	LF	$6.30	$10,800
Site Clearing of Excavation & Cover Areas					
Cut and chip heavy trees	Large trees and dense vegetation along creek banks and at excavation / cover areas	0.5	Acre	$16,100	$7,900
Grub stumps and remove - heavy	Along creek banks and at excavation / cover areas	0.5	Acre	$8,625	$4,200
Staging Area and Access Road Construction & Removal					
Staging Area and Access Road Construction	see Table 4-1a; assume 1/5th of cost	0.2	LS	$575,000	$115,000
Soil Removal (Haz Areas)					
Soil Excavation	Hydraulic Excavator, 2 C.Y. bucket; 165 C.Y./hr	4,900	BCY	$1.81	$8,900
Material Transportation On-site (from excavations to staging area)	12 CY Dump truck, 0.5 mi roundtrip, 3.6 loads / hr	5,635	LCY	$3.68	$20,800
Verification Sampling	PCBs and metals analysis, assumes 24-hr turnaround	20	EA	$254	$5,100
Disposal Sampling	PCBs, metals, and TCLP metals analysis, 24 hr turnaround	8	EA	$1,234	$9,900
Transport to Disposal Facility (Haz)	assumes transport of material from Eighteenmile Creek to Model City, NY	7,350	Ton	$28.00	$205,800
Disposal at Disposal Facility (Haz)	Hazardous material either for PCBs or Lead	7,350	Ton	$190	$1,396,500
Soil Stabilization and Replacement	see Table 4-1c	0	LCY	$30.53	$0
Backfill and Site Restoration (of Excavated Area)					
Clean Fill (Material only)		7,094	Ton	$5.53	$39,300
Topsoil (Material)	6" of top soil at surface	256	Ton	$18.09	$4,700
Haul Fill & Topsoil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	5,635	LCY	$15.25	$86,000
Spread Fill & Topsoil	Spread dumped material, no compaction; incl cut-back volume	5,635	LCY	$2.39	$13,500
Compact Fill & Topsoil	12" lifts, vibrating roller; incl cut-back volume	4,900	BCY	$0.95	$4,700
Finish grading, large area	Steep slopes	11	MSF	$29.50	$400
Hydroseeding large areas		1,178	SY	$0.82	$1,000
Plantings (Trees)	Assume Norway Maple is representative (Based on SRI)	17	Ea	$202.00	$3,500

Table 4-8d Cost Estimate, Alternative 5D - Combined Excavation and Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost
Containment					
Geotextile Fabric		1,178	SY	$1.42	$1,700
High Visibility Demarcation Layer		10,600	SF	$0.30	$3,200
Clean soil	2' thick over areas of contamination not excavated, including 6" of topsoil for planting	1,178	Ton	$5.53	$6,600
Haul Soil	12 CY dump truck, 20 miles round trip, 0.4 load/hr	903	LCY	$15.25	$13,800
Spread Soil	Spread dumped material, no compaction	903	LCY	$2.39	$2,200
Compact Soil	12" lifts, vibrating roller; incl cut-back volume	785	BCY	$0.95	$800
Finish grading, large area	Steep slopes	11	MSF	$29.50	$400
Hydroseeding large areas		1,178	SY	$0.82	$1,000
				Capital Cost Subtotal:	$2,167,100
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$2,212,700
				10% Legal, administrative, engineering fees, construction management:	$221,300
				20% Contingencies:	$486,800
				Capital Cost Total:	**$2,921,000**
Annual Costs					
Site Monitoring	Visual survey of soil cover, etc., assume 2-persons @ $100/hr; 10 hr/day	2	Events	$2,000	$4,000
Data Evaluation and Reporting		20	HR	$100	$2,000
				Annual Cost Subtotal:	$6,000
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor:	$6,200
				10% Legal, Administrative and Engineering Fees:	$700
				20% Contingencies:	$1,400
				Annual Cost Total:	**$8,300**
				30-year Present Worth of Annual Costs:	**$103,000**
Periodic Costs (Every 5 Years)					
5-yr Review, Data Evaluation, and Reporting		80	HR	$100	$8,000
Cover Maintenance (replacing soil, geotextile)	Assume 5% of initial cover cost	1	LS	$1,500	$1,500
Institutional Controls	Maintain / Update Documentation	7	LS	$5,000	$35,000
				Periodic Cost Subtotal:	$44,500
				Adjusted Capital Cost Subtotal for Niagara Falls, New York Location Factor (1.021):	$45,500
				10% Legal, Administrative and Engineering Fees:	$4,600
				20% Contingencies:	$10,100
				Periodic Cost Total:	**$60,200**
				30-year Present Worth of Periodic Costs:	**$130,000**
				2016 Total Present Worth Cost:	**$3,154,000**

Table 4-8d Cost Estimate, Alternative 5D - Combined Excavation and Capping, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Comments	Quantity	Units	Unit Cost	Cost

Notes:

1. For access roads and staging areas, it was assumed that 6 access roads and 2 staging areas constructed for the remediation of upland soils on adjacent properties will be used. The costs for constructing these access roads have been estimated separately (Table 4-14a) and are evenly distributed among the costing sheets for the Creek Channel, Flintkote, United, Upson and White Transportation cost estimates.

2. Access roads will be constructed on both sides of the Creek Channel for completing the creek remediation activities as well as to act as a bank stabilization alternative. The costs for constructing these access roads were estimated separately (Table 4-14b) and are included in the Creek Channel remediation cost estimates.

3. Width of Access Roads along Creek	20	LF
4. Estimated Volumes, Areas and Lengths at Upson Park		
Volume of Hazardous Material	4,900	BCY
Volume of NonHazardous Material	2,100	BCY
Surface Area of Contaminated Material	21,200	SF
Surface Area of Cover Areas	10,600	SF
Length of Creek adjacent to property (both banks)	1,440	LF
Length of Excavated Areas along creek	0	LF
Length of Cover Areas along creek	250	LF
5. Estimated Total Site Perimeter (Upson, United and White Transportation)	5,125	LF
6. Assume verification sampling grid spacing:	25	ft
7. Construction Duration (Assuming 5 day work week)		
Total Project Duration	1.9	months
	1	construction seasons, 6 months each
8. Conversion from BCY to LCY (dewatered material):	1.15	LCY/BCY
9. Conversion from BCY to tons (dewatered material):	1.5	tons/BCY
10. 30-year present worth of costs assumes 7% annual interest rate per "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 540-R-00-002 August 2000) and the preamble to the NCP (55 FR 8666).	7.0%	
11. Costs presented are based on conventional contracting methods.		
12. Assume tree and shrub planting grid spacing	25	ft
13. Historical Cost Indices from 2016 RSMeans Site Work and Landscape Cost Data 35th Ed. were used to escalate costs.		
14. Waste Management (Non-Haz) Taxes and Fees		
NYS Tax	8.75%	
Environmental Fee	11.00%	
RCR Fee	3.60%	

Key:

BCY = Bank cubic yards.	LS = Lump sum.
EA = Each.	Mo = Month.
ECY = Embankment cubic yards.	MSF = 1000 square feet.
HR = Hour.	SF = Square feet.
kGal = Thousand gallons.	SY = Square yards.
LCY = Loose cubic yards	WWTP = Wastewater treatment plant.
LF = Linear feet.	

Table 4-9 Summary of Total Present Worth Values of Alternatives, Creek Channel, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Alternative CC1 No Action	Alternative CC2 Sediment Excavation and Creek Bank Stabilization	Alternative CC3 Combined Excavation and Capping
Total Project Duration (Years)	0	2	30
Capital Cost	$0	$10,519,000	$7,934,000
30-year Present Worth of Annual O&M Cost	$0	$103,000	$130,000
30-year Present Worth of Periodic O&M Cost	$0	$44,000	$44,000
2016 Total Present Worth Value of Alternatives	**$0**	**$10,666,000**	**$8,108,000**

Note:
All costs are presented in 2016 Dollars.

Table 4-10 Summary of Total Present Worth Values of Alternatives, former Flintkote Plant Site, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Alternative 1A No Action	Alternative 2A Limited Action	Alternative 3A Complete Capping	Alternative 4A Excavation	Alternative 5A Combined Excavation and Capping
Total Project Duration (Years)	0	30	30	2	30
Capital Cost	$0	$77,000	$1,303,000	$11,307,000	$6,339,000
30-year Present Worth of Annual O&M Cost	$0	$70,000	$103,000	n/a	$103,000
30-year Present Worth of Periodic O&M Cost	$0	$42,000	$60,000	$24,000	$76,000
2016 Total Present Value of Alternatives	**$0**	**$189,000**	**$1,466,000**	**$11,331,000**	**$6,518,000**

Note:

All costs are in 2016 Dollars

n/a - No annual costs for this alternative

Table 4-11 Summary of Total Present Worth Values of Alternatives, White Transportation, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Alternative 1B No Action	Alternative 2B Limited Action	Alternative 3B Complete Capping	Alternative 4B Excavation	Alternative 5B Combined Excavation and Capping
Total Project Duration (Years)	0	30	30	1	30
Capital Cost	$0	$50,000	$821,000	$317,000	$331,000
30-year Present Worth of Annual O&M Cost	$0	$70,000	$103,000	n/a	$103,000
30-year Present Worth of Periodic O&M Cost	$0	$39,000	$74,000	$24,000	$39,000
2016 Total Present Value of Alternatives	**$0**	**$159,000**	**$998,000**	**$341,000**	**$473,000**

Note:

All costs are in 2016 Dollars

n/a - No annual costs for this alternative

Table 4-12 Summary of Total Present Worth Values of Alternatives, Former United Paperboard Company, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Alternative 1C No Action	Alternative 2C Limited Action	Alternative 3C Complete Capping	Alternative 4C Excavation	Alternative 5C Combined Excavation and Capping
Total Project Duration (Years)	0	30	30	1	30
Capital Cost	$0	$115,000	$990,000	$2,443,000	$2,341,000
30-year Present Worth of Annual O&M Cost	$0	$70,000	$103,000	n/a	$103,000
30-year Present Worth of Periodic O&M Cost	$0	$46,000	$89,000	$24,000	$43,000
2016 Total Present Value of Alternatives	**$0**	**$231,000**	**$1,182,000**	**$2,467,000**	**$2,487,000**

Note:

All costs are in 2016 Dollars

Table 4-13 Summary of Total Present Worth Values of Alternatives, Upson Park, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Description	Alternative 1D No Action	Alternative 2D Limited Action	Alternative 3D Complete Capping	Alternative 4D Excavation	Alternative 5D Combined Excavation and Capping
Total Project Duration (Years)	0	30	30	1	30
Capital Cost	$0	$98,000	$1,340,000	$3,235,000	$2,921,000
30-year Present Worth of Annual O&M Cost	$0	$70,000	$103,000	n/a	$103,000
30-year Present Worth of Periodic O&M Cost	$0	$44,000	$121,000	$24,000	$130,000
2016 Total Present Value of Alternatives	**$0**	**$212,000**	**$1,564,000**	**$3,259,000**	**$3,154,000**

Note:

All costs are in 2016 Dollars

n/a - No annual costs for this alternative

Table 4-14 Summary of Total Present Worth Values of All Alternatives, OU2 Eighteenmile Creek Corridor Site, Lockport, New York

Alternative	Sediment	Upland Soil				2016 Total Present Value of Alternatives
	Creek	A	B	C	D	
Sediment						
CC1 - No Action	$0					$0
CC2 - Sediment Excavation and Bank Stabilization	$10,666,000					$10,666,000
CC3 - Combined Excavation and Capping	$8,108,000					$8,108,000
Upland Soils						
S1 - No Action		$0	$0	$0	$0	$0
S2 - Limited Action		$189,000	$159,000	$231,000	$212,000	$791,000
S3 - Complete Capping		$1,466,000	$998,000	$1,182,000	$1,564,000	$5,210,000
S4 - Excavation		$11,331,000	$341,000	$2,467,000	$3,259,000	$17,398,000
S5 - Combined Excavation and Capping		$6,518,000	$473,000	$2,487,000	$3,154,000	$12,632,000

Site Areas:
A - Upland soils at the Former Flintkote Plant Property (300 Parcel, 198 Parcel & Island).
B - Upland soils at the White Transportation Property
C - Upland soils at the Former United Paperboard Company Property
D - Upland soils at Upson Park

Note: All Alternatives have a project duration of 30 years.

5 Conclusions

The Eighteenmile Creek Corridor Site (OU2) has been identified in historical reports as a potential source of pollutants to areas downstream. This Supplemental FS presents reasonable approaches to remediate both soil and sediment source areas within the Project area. While these source areas have been separated by property and by soils and sediments for this report, the implementation of OU2 remedial efforts must include a comprehensive approach that would address both the soils and sediments within the Site regardless of the property boundaries.

The comparative analysis of alternatives presented in Section 4.4 provides the basis for selecting the preferred alternative for soils and sediments. The selected preferred alternative must meet the threshold criteria of Overall Protection of Human Health and the Environment and Compliance of ARARs, while also balancing the other primary evaluation criteria, such as cost, in the selection process. Table 4-14 presents an overall summary of total costs for all the remedial alternatives.

The preferred alternative, which will be described in the proposed plan, will be selected from among these three alternatives for the sediment and five alternatives for the soils. In accordance with the NCP, the preferred alternative will be presented to the public for review and comment. Public input on the alternatives is paramount in the selection process. Based on the comments received, the preferred remedy may be modified. The final remedy will be selected by the EPA and presented in a ROD.

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A Calculation of PRGs

A.1 Risk Assessment Contaminants of Potential Concern

The baseline Human Health Risk Assessment (HHRA) and Baseline Ecological Risk Assessment (BERA) determined site-specific contaminants of potential concern (COPCs) or risk drivers based on exceedance of risk goals. The risk-based preliminary remedial goals (PRGs) determined for those risk drivers are described below.

A.1.1 Baseline HHRA

The HHRA quantitatively evaluated both cancer risks and non-cancer health hazards from exposure to contaminants in Eighteenmile Creek. The HHRA evaluated both current and future risks to young children, adolescents, and adults in the absence of any remedial action and institutional controls (e.g., fish consumption advisories).

The basic steps of the Superfund HHRA are as follows: (1) data collection and analysis to determine the nature and extent of chemical contamination in environmental media, such as sediment, surface water, and fish; (2) exposure assessment, which includes identification of potentially exposed populations and an estimation of human chemical intake through exposure routes such as ingestion, inhalation, or dermal (skin) contact; (3) toxicity assessment, which is an evaluation of chemical toxicity, including cancer and non-cancer health hazards from exposure to chemicals; and (4) risk characterization, which describes the likelihood and degree of chemical exposure at a site and the possible adverse health effects associated with such exposure.

Adults, adolescents, and young children were identified as receptors potentially exposed to COPCs in Eighteenmile Creek due to a number of activities as described for each Exposure Unit at the Site, i.e., Creek Banks, Flintkote, Upson Park, White Transportation, and former United Paperboard. Cancer risks and non-cancer health hazards were calculated for each of these receptors. To protect human health and provide a full characterization of the cancer risks and non-cancer health hazards, both an average (central tendency) exposure estimate and a reasonable maximum exposure (RME) estimate were calculated. The RME is the maximum exposure that is reasonably expected to occur in Eighteenmile Creek under baseline conditions; it is not a worst-case scenario. The RME is the basis for decisions under the Superfund program consistent with the National Contingency Plan (NCP).

The EPA uses the cancer risks and non-cancer Hazard Quotient (HQ) for individual chemicals and the Hazard Index (HI) for total chemicals calculated based on the RME. COPCs and risk drivers were determined based on cancer risks above the acceptable risk range and the non-cancer HI >1. Below is a brief summary of the results of the HHRA by location and receptor:

- Creek Banks – adult, adolescent, and child exposures to the COPCs PCBs and mercury through consumption of fish from the creek.
- Flintkote – young child visitor/trespasser and adult outdoor worker exposed to PCBs and PAHs in surface soils; exposure of construction workers to PCBs and antimony in subsurface soils.
- Upson Park – young child, adolescent, and outdoor worker exposed to surface soils contaminated with PCBs and the construction worker exposed to PCBs in subsurface soils.
- White Transportation – future resident young child exposed to soils with multiple chemicals; health risk effect does not exceed an HQ of 1.
- United Paperboard – young child, adolescent visitor/trespasser exposed to PCBs in surface soils; indoor worker exposed to PCBs in dust; outdoor worker exposed to PCBs in surface soils; and construction worker exposed to PCBs in subsurface soils.

Lead concentrations exceeded the screening levels for residential properties at the Former United Paperboard, and screening levels for adult workers were exceeded at the Flintkote property.

PRGs

COPCs for protection of human health represent media contaminant concentrations that result in either an HQ greater than 1 or a cancer risk of greater than 1 x 10^{-4}. These COPCs are listed on Table A-1 for each media and property along with range of background concentrations and the exposure point concentration (EPC) in the media for which the risk was calculated.

Risk-based PRGs were back-calculated using the exposure equations and parameters from Section 7 of the baseline HHRA for Eighteenmile Creek OU2 to determine the concentration for which the HQ =1 or the cancer risk = 1 x 10^{-4} (E & E 2016b). Risk-based PRGs were calculated for fish tissue but the EPA did not determine PRGs for the sediment based on these fish consumption values because the EPA deferred the selection of sediment PRGs until a comprehensive evaluation of the sediments within the entire creek (OU2 and OU3) is completed. The soil PRGs listed on Table A-1 are derived from exposure scenarios for the receptors found to be most at risk from contaminants in the media and locations at the OU2 site (E & E 2016b).

Background contaminant concentrations for fish and soil also are listed in Table A-1. The background concentrations in soils, sediment, and fish tissue are presented with descriptive statistics in Section 5 of the Supplemental RI Report, Eighteenmile Creek Superfund Site OU2 (E & E 2016a). More statistically rigorous evaluation, as outlined in the EPA guidance Role of Background in the CERCLA Cleanup Program (EPA 2002), was completed for contaminants for which the sample measurements and background measurements overlap. For fish tissue, the EPC for PCB Aroclors lies within the background range, suggesting that fish tissue remedial goals for Aroclors should be background-based instead of risk-based. For soils, iron and mercury concentrations at the Former United Paperboard Company Property were identified as possible contaminants that did not significantly differ from background. The Mann-Whitney U test was completed for both and its results indicated that neither iron nor mercury measurements were significantly different than background measurements at the Former United Paperboard Company Property. An evaluation was also completed for mercury in sediment and the Mann Whitney U test indicated that the concentration of mercury in sediment was significantly different than concentrations of mercury in background sediment measurements at an alpha of 0.05.

A.1.2 BERA

The primary purpose of the BERA was to identify a final list of COPCs for ecological receptors at the OU2 site by assessment endpoint. For each assessment endpoint, contaminants were considered COPCs if the HQ exceeded 1, or if the contaminant was detected in site media and no toxicity information was available for that contaminant. For wildlife, HQs were calculated based on No Observed Adverse Effect Level (NOAEL) and Lowest Observed Adverse Effect Level (LOAEL) Toxicity Reference Values (TRVs).

Overall, the contaminants that resulted in the greatest HQs for the greatest number of receptors were total PCBs, copper, lead, and PAHs (E & E 2016c). Copper and lead were found to pose a potential risk to terrestrial plants, soil invertebrates, benthos, and terrestrial and aquatic dependent wildlife (especially invertivorous species). Total PCBs were found to pose the greatest potential risk to aquatic-dependent receptors, with HQs that were several orders of magnitude greater than 1 for the swallow and bat, and one to two orders of magnitude greater than 1 for benthos.

PRGs for protection of ecological receptors were back-calculated using the exposure equations, exposure parameters, and bioaccumulation factors from Section 4 of the BERA for Eighteenmile Creek OU2 (E & E 2016c). The PRGs represent soil or sediment contaminant concentrations that result in a HQ of 1 based on either the NOAEL or LOAEL.. The values are listed in Table A-2a. The sediment PRGs are based on exposure scenarios for the little brown bat (*Myotis lucifugus*) and tree swallow (*Tachycineta bicolor*) because these two receptors were found to be most at risk from contaminants in sediment at the OU2 site (E & E 2016c). The surface soil PRGs are based on exposure scenarios for the American Robin (*Turdus migratorius*), short-tailed shrew (*Blarina brevicauda*), and meadow vole

(*Microtus pennsylvanicus*) because these three receptors were found to be most at risk from contaminants in surface soil at the OU2 site (E & E 2016c). The method used to calculate the PRGs is described below.

Wildlife receptors may be exposed to contaminants in soil (or sediment) by two main pathways: (1) incidental ingestion of soil (or sediment) while feeding and (2) ingestion of food items that have become contaminated due to uptake from soil (or sediment). The general equation used to estimate the risk from exposure via these two pathways is:

$$HQ = ([SIR * C_s] + [FIR * C_b] * ED * SUF) / TRV$$

Where:

HQ = hazard quotient (unitless)
SIR = soil (or sediment) ingestion rate, body-weight normalized (kg dry weight/kg body weight/day)
FIR = food ingestion rate, body weight normalized (kg dry weight/kg body weight/day)
C_s = contaminant concentration in soil (mg/kg dry weight)
C_b = contaminant concentration in food (mg/kg dry weight)
TRV = toxicity reference value (NOAEL or LOAEL)
ED = exposure duration
SUF = site use factor

Ecological PRGs were calculated by solving the above equation to find the soil (or sediment) concentration (C_s) that corresponds to an HQ value of 1. Input values for FIR, SIR, ED, SUF, TRV, and diet composition were taken from the final BERA for the Eighteenmile Creek OU2 site (E & E 2016c) and are provided in Tables A-2b and A-2c.

A receptor's diet was assumed to consist exclusively of its preferred prey (see Table A-2c). For example, the diets of the American robin and short-tailed shrew were assumed to consist entirely of soil invertebrates (e.g., earthworms).

The site use factor (SUF) indicates the portion of an animal's home range represented by the site. If the home range is larger than the site, the SUF equals the site area divided by the home range area. If the site area is greater than or equal to the home range, the SUF is equal to 1. Home range size was taken from EPA (1993) or other reputable sources. Exposure duration (ED) is the fraction of the year spent at the site. Site presence was assumed to be 7 months for the American robin, 5 months for the tree swallow, and 8.5 months for the little brown bat. For the meadow vole, the ED and SUF were assumed to be 1. The SUF and ED for these receptors are listed in Table A-2c. For wildlife receptors for which both the ED and SUF were < 1, only one factor (the lower of the two) was used, as requested by the EPA.

The uptake equations used to calculate C_b from C_s also were taken from the final BERA and are provided in Tables A-2d, A-2e, and A-2f for earthworms, terrestrial plants (vegetative tissues), and benthic macroinvertebrates, respectively.

Background contaminant concentrations for soil and sediment also are listed in Table A-2a. The sediment PRGs for five metals (barium, copper, selenium, thallium, and vanadium) lie within the background range. Also, the sediment PRG for total PCBs and high-molecular-weight polycyclic aromatic hydrocarbons (HPAHs) lies within the background range. These results suggest that sediment remedial goals for barium, copper, selenium, thallium, vanadium, total PCBs, and HPAHs should be background-based instead of risk-based. For soil, the PRGs for nickel and selenium lie within the background concentration range, suggesting that the soil remedial goals for these two metals should be background-based.

A.2 Sediment and Soil Concentrations

As part of the NYSDEC FS for the creek corridor and RAR for Flintkote, NYSDEC determined areas and volumes of contaminated soils and sediments that required remedial action. The concentrations of the COPCs determined by the EPA within these NYSDEC remedial action areas were examined for the primary risk drivers. Tables A-3 and A-4 list the frequency of detection, average, minimum and maximum concentrations and relevant sample locations for each remedial action area for sediment and soil, respectively. These remedial action areas and sample locations are identified on Figures A-1 and A-2. Table A-5 details the same information for soil outside the remedial action areas. Table A-5 also shows soil concentrations that are outside excavation or capping areas but close enough to the creek to be addressed as part of the bank stabilization measures. Values that exceed EPA soil clean-up levels are highlighted. The results demonstrate that, except for Upson Park and the Island, no changes to the remedial action areas delineated by NYSDEC are required based on soil concentrations. Samples from soils outside the delineated remedial action areas have concentrations that exceed cleanup goals for lead in areas on Water Street. These areas were addressed under EPA's OU1 ROD.

A.3 Soil Volume Classification

The NYSDEC FS (EEEPC 2009a) used the concentrations of lead and PCBs to determine hazardous sediment and soil classification. Soil volumes were designated as "Hazardous" if PCB concentrations were above 50 ppm and samples failing the toxicity characteristic leaching procedure (TCLP) test for lead. The PCB and TCLP lead results for samples within areas designated as "Hazardous" are outlined in Table A-6. For the Flintkote areas designated as hazardous in the NYSDEC RAR, less than 20% of the locations failed TCLP and no locations had high PCB concentrations.

A.4 References

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Table A-1 Preliminary Remedial Goals for Protection of Human Health and Site-Specific Background Concentrations, Eighteenmile Creek OU2 Site, Lockport, New York

Medium & Location	Contaminant	Background (units ppm)	Exposure Point Concentration (EPC)[a] (units ppm)	Risk Based PRG (units ppm)	Risk Derivation Method
Fish Tissue					
Creek Channel	PCBs	0.006 - 0.2	0.12	0.05 mg/kg in fish fillet	HI = 1, 0.5 lb consumed per week
	Mercury	0.05 - 0.1	0.28	0.25 mg/kg in fish fillet	
Soil					
Flinkote (surface, 0 to 2 feet)	benzo(a)anthracene	0.019 - 0.54	77	128	V/T, young child: Cancer Risk = 10^{-4}
	benzo(a)pyrene	0.014 - 0.49	5.9	23	
	benzo(b)fluoroanthene	0.023 - 0.65	107	229	
	benzo(k)fluoroanthene	0.032 - 0.24	133	2220	
	dibenzo(a,h)anthracene	0.012 - 0.075	4.2	22	
	PCBs	<0.22	46.1	15	V/T, young child: HI = 1
Flinkote (subsurface, 0 to 10 feet)	Antimony	1.6 - 1.9	329	145	CW: HI = 1
	PCBs	<0.22	35	6	
Upson Park (surface, 0 to 2 feet)	PCBs	<0.22	52	7.3	RU, young child: HI = 1
Upson Park (subsurface, 0 to 10 feet)	PCBs	<0.22	48	6	CW: HI = 1
United Paperboard (surface, 0 to 2 feet)	PCBs	<0.22	31	15	V/T, young child: HI = 1
United Paperboard (subsurface, 0 to 10 feet)	PCBs	<0.22	61	6	CW: HI = 1

Table A-1 Preliminary Remedial Goals for Protection of Human Health and Site-Specific Background Concentrations, Eighteenmile Creek OU2 Site, Lockport, New York

Medium & Location	Contaminant	Background (units ppm)	Exposure Point Concentration (EPC)[a] (units ppm)	Risk Based PRG (units ppm)	Risk Derivation Method
Lead					
Surface soil (0 to 2 feet)	Lead[c]	23 - 102	Creek – 827	800[d]	Lead is evaluated consistent with recommendations from the Lead Technical Review Workgroup (http://www.epa.gov/superfund/lead-superfund-sites-technical-assistance)
			Flintkote - 1000		
			Upson Park – 460		
			United – 934		
			White – 297		
Subsurface soil (0 to 10 feet)	Lead[c]	12 - 109	Creek – N/A	800[d]	
			Flintkote - 1350		
			Upson Park – 419		
			United – 1015		
			White – 333		

Note:

[a] = Exposure Point Concentrations are 95% UCL of the concentrations in the media used to calculate risk.

[b] = These values were not significantly different than the background concentrations (Mann-Whitney U test, $p > 0.1$).

[c] = EPCs were not calculated for lead.

[d] = Commercial/industrial lead screening level. The restricted residential/residential screening level is 400 ppm.

Key:

FR = Future Resident
CW = Construction Worker
RU = Recreational User
HI = Hazard Index
V/T = Visitor/Trespasser
PCB = polychlorinated biphenyl

Table A-2a Preliminary Remedial Goals for Protection of Ecological Receptors and Site-Specific Background Concentrations, Eighteenmile Creek OU2 Site, Lockport, New York

Medium and Analyte	Background Concentration (mg/kg dry)	Exposure Point Concentration (mg/kg dry)[a]	Ecological Preliminary Remedial Goal (mg/kg dry)	Basis[b]
Sediment				
PCB, Total	0.018 - 0.34	35.6	0.0188	LBB: LOAEL-HQ
Barium	51 - 110	125	110	TS: LOAEL-HQ
Copper	24 - 140	476	90	TS: LOAEL-HQ
Lead	25 - 92	802	290	TS: LOAEL-HQ
Selenium	0.95 - 1.3	0.87	0.59	LBB: LOAEL-HQ
Thallium	0.13 - 0.47	0.48	0.16	LBB: NOAEL-HQ
Vanadium	12 - 23	16.7	8.4	TS: LOAEL-HQ
HPAH sum	1.035 - 5.69	169	3.6	LBB: LOAEL-HQ
beta-BHC	0.00039[c]	0.19	0.058	LBB: NOAEL-HQ
Dieldrin	0.00011 - 0.00029	0.13	0.063	LBB: LOAEL-HQ
Endrin	0.00017 - 0.002	0.036	0.029	TS: NOAEL-HQ
Endrin ketone	0.00013 - 0.0011	0.16	0.029	TS: NOAEL-HQ
2,3,7,8-TCDD TEQ	not detected	0.000043	0.000011	LBB: NOAEL-HQ
Surface Soil				
PCB, Total	not detected	6.5	1.6	AR: LOAEL-HQ
Antimony	not detected	31.4	10.2	MV: NOAEL-HQ
Cadmium	0.20 - 0.37	7.9	7.5	STS: NOAEL-HQ
Copper	11.5 - 25.6	1400	250	STS: LOAEL-HQ
Lead	11.9 - 109	1176	160	AR: LOAEL-HQ
Nickel	11.8 - 31.9	68	11.9	STS: LOAEL-HQ
Selenium	0.67 - 0.98	1.6	0.65	STS: LOAEL-HQ
Thallium	not detected	2.7	0.45	STS: LOAEL-HQ
HPAH sum	0.148 - 1.78	57	38.5	STS: LOAEL-HQ
Σ DDT	0.001 - 0.008	0.18	0.183	STS: NOAEL-HQ
2,3,7,8-TCDD TEQ	not detected	0.0000106	0.0000016	STS: NOAEL-HQ

Table A-2a Preliminary Remedial Goals for Protection of Ecological Receptors and Site-Specific Background Concentrations, Eighteenmile Creek OU2 Site, Lockport, New York

Note:

a = 95% UCL of the average concentrations in the media used to calculate risk.

b = For a given receptor, if only the NOAEL-based HQ exceeded 1, then a NOAEL-based PRG is listed. If both the NOAEL- and LOAEL-based HQ exceeded 1 for a given receptor, then a LOAEL-based PRG is listed.

c = Detected in only one background sample

Key:

AR = American robin

DDT = dichlorodiphenyltrichloroethane

HPAH = high molecular weight PAHs

HQ = Hazard Quotient

LBB = Little brown bat

LOAEL = Lowest observed adverse effect level

MV = Meadow vole

NOAEL = No observed adverse effect level

OU2 = operable unit 2

PAHs = polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

STS = Short-tailed shrew

TCDD = tetrechlorodibenzo-p-dioxin

TEQ = toxic equivalent

TS = Tree swallow

UCL = upper confidence limit

Gray shading = value lies below or within background concentration range.

Table A-2b. TRVs for Wildlife Used for Calculation of Preliminary Remedial Goals for Soil and Sediment, Eighteenmile Creek Operable Unit 2, Lockport, New York.[a]

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Metals						
Antimony	Birds	na	na	na	na	na
	Mammals	0.059	Reproduction	0.59	Reproduction	USEPA (2005i). Highest bounded NOAEL (0.059 mg/kg-d) for growth or reproduction below lowest bounded LOAEL (0.59 mg/kg-d) for growth or reproduction from 20 laboratory toxicity studies.
Barium	Birds	20.8	Survival	41.7	Survival	Sample et al. (1996).
	Mammals	51.8	Reproduction, growth, and survival	121	Growth and survival	USEPA (2005c). Geometric mean NOAEL for growth, reproduction, and survival from 12 laboratory toxicity studies.
Cadmium	Birds	1.47	Reproduction, growth, and survival	2.37	Reproduction	USEPA (2005e). Geometric mean NOAEL for growth, reproduction, and survival from 49 laboratory toxicity studies.
	Mammals	0.77	Growth	1	Growth	USEPA (2005e). Highest bounded NOAEL (0.77 mg/kg-d) for reproduction, growth, or survival less than the lowest bounded LOAEL (1.0 mg/kg-d) from 141 laboratory toxicity studies.
Copper	Birds	4.05	Reproduction	4.68	Growth	USEPA (2007a). Highest bounded NOAEL for reproduction, growth, or survival (4.05 mg/kg-day) lower than the lowest bounded LOAEL for reproduction, growth, or survival (4.68 mg/kg-day).
	Mammals	5.6	Reproduction	6.79	Growth	USEPA (2007a). Highest bounded NOAEL for reproduction, growth, or survival (5.6 mg/kg-day) lower than the lowest bounded LOAEL for reproduction, growth, or survival (6.79 mg/kg-day).
Lead	Birds	1.63	Reproduction	1.94	Reproduction	USEPA (2005g). Highest bounded NOAEL (1.63 mg/kg-d) for growth, reproduction, or survival lower than the lowest bounded LOAEL (1.94 mg/kg-d) for growth, reproduction, or survival based on 57 laboratory toxicity studies.
	Mammals	4.7	Growth	5	Growth	USEPA (2005g). Highest bounded NOAEL (4.7 mg/kg-d) for growth, reproduction, or survival lower than the lowest bounded LOAEL (5 mg/kg-d) for growth, reproduction, or survival based on 220 laboratory toxicity studies.
Nickel	Birds	6.71	Growth and survival	11.5	Growth	USEPA (2007c). Geometric mean NOAEL for reproduction and growth. Lowest bounded LOAEL for reproduction or growth greater than geometric mean NOAEL.
	Mammals	1.7	Reproduction	2.71	Reproduction	USEPA (2007c). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
Selenium	Birds	0.291	Survival	0.368	Reproduction	USEPA (2007d). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
	Mammals	0.143	Growth	0.145	Reproduction	USEPA (2007d). Highest bounded NOAEL for reproduction, growth, or survival below lowest bounded LOAEL for reproduction, growth, or survival.
Thallium	Birds	NA	NA	NA	NA	NA
	Mammals	0.0074	Reproduction	0.074	Reproduction	Sample et al. (1996).

Table A-2b. TRVs for Wildlife Used for Calculation of Preliminary Remedial Goals for Soil and Sediment, Eighteenmile Creek Operable Unit 2, Lockport, New York.[a]

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments
Vanadium	Birds	0.344	Growth	0.413	Reproduction	USEPA (2005h). Highest bounded NOAEL (0.344 mg/kg-d) for growth, reproduction, or survival less than lowest bounded LOAEL (0.413 mg/kg-d) for reproduction, growth, or survival based on 94 laboratory toxicity studies.
	Mammals	4.16	Reproduction and growth	5.11	Growth	USEPA (2005h). Highest bounded NOAEL (4.16 mg/kg-d) for growth or reproduction less than lowest bounded LOAEL (5.11 mg/kg-d) for growth, reproduction, or survival based on 94 laboratory toxicity studies.
Polychlorinated Biphenyls (PCBs)						
PCBs (sum of congeners or Aroclors) - **Primary**	Birds	0.012	Reproduction	0.12	Reproduction	Lillie et al. (1974).
	Mammals	0.0034	Reproduction	0.0034	Reproduction	Restum et al. (1998). Used in BERA for mink, weasel, and bat.
		0.068	Reproduction	0.68	Reproduction	McCoy et al. 1995 as cited in Sample et al. 1996. Use for vole, muckrat, and shrew.
Pesticides						
DDT and metabolites	Birds	0.227	Reproduction	0.281	Reproduction	USEPA (2007h). Highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth and survival.
	Mammals	0.147	Reproduction	0.274	Reproduction	USEPA (2007h). Highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival.
beta-BHC	Birds	0.56	Reproduction	2.25	Reproduction	Sample et al. (1996) for BHC mixed isomers.
	Mammals	0.014	Reproduction	0.14	Reproduction	Sample et al. (1996) for BHC mixed isomers.
Dieldrin	Birds	0.071	Reproduction	0.179	Survival	USEPA (2005j). Highest bounded NOAEL lower than the lowest bounded LOAEL for reproduction, growth, and survival.
	Mammals	0.015	Reproduction	0.03	Reproduction	USEPA (2005j). Highest bounded NOAEL below lowest bounded LOAEL for reproduction, growth, or survival.
Endrin	Birds	0.01	Reproduction	0.1	Reproduction	Sample et al. (1996).
	Mammals	0.092	Reproduction	0.92	Reproduction	Sample et al. (1996).
Endrin ketone	Birds	0.01	Reproduction	0.1	Reproduction	Sample et al. (1996) for endrin
	Mammals	0.092	Reproduction	0.92	Reproduction	Sample et al. (1996) for endrin
Dioxins and Furans						
2,3,7,8-TCDD	Birds	0.000014	Reproduction	0.00014	Reproduction	Sample et al. (1996).
	Mammals	0.000001	Reproduction	0.00001	Reproduction	Sample et al. (1996).
Polycyclic Aromatic Hydrocarbons						
HPAHs[a]	Birds	2	Growth	20	Growth	USEPA (2007g); from Appendix 5.2 for European starling.
	Mammals	0.615	Survival	3.07	Survival	USEPA (2007g). Highest bounded NOAEL (0.615 mg/kg-day) below the lowest bounded LOAEL (3.07 mg/kg-day) for reproduction, growth, or survival.

Notes:

a. From final BERA for Eighteenmile Creek OU2 Site (E&E 2016c).

b. Sum of benz(a)anthracene, total benzofluoranthenes, benzo(a)pyrene, chrysene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3,-c,d)pyrene, fluoranthene, and pyrene.

Table A-2b. TRVs for Wildlife Used for Calculation of Preliminary Remedial Goals for Soil and Sediment, Eighteenmile Creek Operable Unit 2, Lockport, New York.[a]

Analyte	Wildlife Class	NOAEL (mg/kg-day)	Critical Effect	LOAEL (mg/kg-day)	Critical Effect	Reference and Comments

Key:
BERA = baseline ecological risk assessment
HPAH = high molecular weight PAH
LOAEL = lowest observed adverse effect level
mg/kg/day = milligrams per kilogram per day
na = not available
NOAEL = no observed adverse effect level
NYSDEC = New York State Department of Environmental Conservation
PAH = polycyclic aromatic hydrocarbon
TRV = toxicity reference value
USEPA = United States Environmental Protection Agency

Table A-2c. Wildlife Exposure Parameters used to Calculate Preliminary Remedial Goals for Soil and Sediment, Eighteenmile Creek OU2 Site, Lockport, New York[c]

Species	Assumed Diet	Home Range (ha or km)	Site Use Factor (SUF) (unitless)[g]	Exposure Duration (ED) (unitless)[h]	Body Weight (kg)	Food IR (kg dw/kg BW/d)	Fraction Soil in Diet	Soil or Sed. IR (kg dw/kg BW/d)	Water IR (L/kg BW/d)
Terrestrial Wildlife									
American Robin[a]	100% soil invertebrates	0.42 ha	1	0.58	0.08	0.141	0.10	0.014	0.137
Short-Tailed Shrew[b]	100% soil invertebrates	0.22 ha	1	1	0.015	0.209	0.03	0.0063	0.220
Meadow Vole[b]	100% herbaceous plants	0.037 ha	1	1	0.044	0.088	0.032	0.0028	0.136
Aquatic-Dependent Wildlife									
Tree Swallow[d]	100% benthic invertebrates	0.1 km	1	0.42	0.0208	0.240	0.0	0.0	0.212
Little Brown Bat[e]	100% benthic invertebrates	0.1 km	1	0.71	0.007	0.114	0.0	0.0	0.157

Key:

BW = body weight
dw = dry weight
ha = hectare
IR = Ingestion rate
kg = kilogram
kg dw/kg BW/d = kilograms dry weight per kilograms body weight per day.
L/kg BW/d = Liters per kilogram body weight per day.
OU2 = Operable Unit 2
Shading = Lower of SUF or ED used in exposure assessment.

Notes:

a. EPA (1999) for BW, BW-normalized food-IR (wet), fraction soil in diet, and water IR. Food moisture content of 68% assumed to convert wet food-IR to dry food IR (0.44 kg wet/kg BW/day x [1 − 0.68] = 0.141 kg dry/kg BW/day). Robin home range from Sample and Suter (1994).

b. EPA (2007) for BW-normalized food-IR and fraction soil in diet. Sample and Suter (1994) for BW and water-IR. EPA (1993) for home range for shrew and vole.

c. Exposure parameters taken from Final Baseline Ecological Risk Assessment for the Eighteenmile Creek OU2 Site (E&E 2016c).

d. TAMS (1999) for BW, food-IR (dry), fraction soil in diet, and water-IR. Mink and mallard home range from EPA (1993). Tree swallow and heron home range from TAMS (1999).

e. TAMS (1999) for BW, food-IR (wet), fraction soil in diet, water-IR, and home range. Food moisture content of 68% assumed to convert wet food-IR to dry food-IR (wet food-IR x [1 - 0.68] = dry food-IR).

g. Site use factor estimated by dividing the terrestrial area of the site (7.72 ha) by the minimum home range size in hectares, or by dividing the length of the creek in OU2 (1.2 km) by the home range size in km. Resulting values > 1 were set equal to 1.

h. Exposure duration equals fraction of year spent at site. Site presence assumed to be 8 months for dove, hawk, mallard, and heron; 7 months for robin; 5 months for swallow; and 8.5 months for bat.

Table A-2d. Soil-to-Earthworm Bioaccumulation Equations Used to Calculate Preliminary Remedial Goals for Soil Based on Exposure Senarios for American Robin and Short-Tailed Shrew, Eighteenmile Creek OU2 Site, Lockport, New York.

Analyte	Soil-to-Earthworm Bioaccumulation Equation[c]	Source
Polychlorinated Biphenyls (PCBs)		
Sum of Aroclors	$C_e = (10 \wedge (1.1455*\log(C_s / 0.205) + 0.0359)) * 0.11$	Site-specific (see note a)
Metals		
Antimony	$\log(C_e) = 0.6996*\log(C_s) - 1.1196$	Site-specific (see note b)
Cadmium	$\log(C_e) = 0.1392*\log(C_s) + 0.4174$	Site-specific (see note b)
Copper	$\log(C_e) = 0.4232*\log(C_s) + 0.3885$	Site-specific (see note b)
Lead	$\log(C_e) = 0.8885*\log(C_s) - 1.0950$	Site-specific (see note b)
Nickel	$C_e = 1.059 * C_s$	Sample et al. 1998
Selenium	$\ln(C_e) = 0.733 * \ln(C_s) - 0.075$	EPA 2007i
Thallium	$C_e = 0.763 * C_s$	Site-specific (see note b)
Polycyclic Aromatic Hydrocarbons (PAHs)		
HPAH sum	$C_e = (10 \wedge (0.5176*\log(C_s / 0.205) + 0.3333)) * 0.11$	Site-specific (see note a)
Pesticides		
Σ DDT	$C_e = 7.07 * C_s * f_L/f_{OC}$	Site-specific (see note a)
Dioxins/Furans		
2,3,7,8-TCDD TEQ	$\ln(C_e) = 1.182 * \ln(C_s) + 3.533$	Sample et al. 1998

Key:

BERA = baseline ecological risk assessment
C_e = chemical concentration in earthworm
C_s = chemical concentration in soil
DDT = dichlorodiphenyltrichloroethane
f_L = fraction lipid in earthworm
f_{OC} = fraction organic carbon in soil
HPAH = high molecular weight PAH
LPAH = low molecular weight PAH
NDs = non detects
OU2 = Operable Unit 2
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyls
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration

Notes:

a. Site-specific bioaccumulation equations and BSAFs for organic contaminants developed from soil contaminant data (dry weight), soil organic carbon (OC) data (dry weight), earthworm contaminant data (dry weight), and earthworm lipid data (dry weight) from Eighteenmile Creek OU2 (see BERA Appendix C [E & E 2016c] for details). To estimate contaminant levels in native earthworms from OU2, we used site-specific soil OC of 20.5% dry weight and an assumed earthworm lipid content of 11% dry weight (equivalent to 1.9 % lipids wet weight assuming 83% moisture content for earthworms).

b. Site-specific bioaccumulation equations and BSAFs for metals developed from soil contaminant data (dry weight) and earthworm contaminant data (dry weight) from Eighteenmile Creek OU2 (see BERA Appendix C [E & E 2016c] for details).

c. From final BERA for Eighteenmile Creek OU2 Site (E & E 2016c).

Table A-2e. Soil-to-Plant Bioaccumulation Equations Used to Calculate Preliminary Remedial Goals for Soil Based on Meadow Vole Exposure Scenario, Eighteenmile Creek OU2 Site, Lockport, NY.

Analyte	Soil-to-Plant Bioaccumulation Equation[a, b]	Source
Polychlorinated Biphenyls		
Sum of Aroclors	$C_p = 0.017 * C_s$	Travis & Arms 1988 for Aroclor 1254
Metals		
Antimony	$\ln(C_p) = 0.938 * \ln(C_s) - 3.233$	EPA 2007i
Cadmium	$\ln(C_p) = 0.546 * \ln(C_s) - 0.475$	EPA 2007i
Copper	$\ln(C_p) = 0.394 * \ln(C_s) + 0.668$	EPA 2007i
Lead	$\ln(C_p) = 0.561 * \ln(C_s) - 1.328$	EPA 2007i
Nickel	$\ln(C_p) = 0.748 * \ln(C_s) - 2.223$	EPA 2007i
Selenium	$\ln(C_p) = 1.104 * \ln(C_s) - 0.677$	EPA 2007i
Thallium	$C_p = 0.004 * C_s$	Baes et al. 1984
Polycyclic Aromatic Hydrocarbons (PAHs)		
HPAH sum	$\ln(C_p) = 0.9469 * \ln(C_s) - 1.7026$	EPA 2007i
Pesticides		
Σ DDT	$\ln(C_p) = 0.7524 * \ln(C_s) - 2.5119$	EPA 2007i
Dioxins/Furans		
2,3,7,8-TCDD TEQ	$C_p = 0.0135 * C_s$	Travis & Arms 1988 (Table 3)

Key:
BERA = baseline ecological risk assessment
C_p = plant contaminant concentration
C_s = soil contaminant concentration
DDT = dichlorodiphenyltrichloroethane
HPAH = high molecular weight PAH
OU2 = Operable Unit 2
PAH = polycyclic aromatic hydrocarbon
TCDD = tetrachlorodibenzo-p-dioxin
TEQ = toxic equivalent concentration

Notes:
a. Soil-to-plant vegetative (leafy) tissues.
b. From final BERA for Eighteenmile Creek OU2 Site (E & E 2016c).

Table A-2f. Sediment-to-Benthos Bioaccumulation Equations Used to Calculate Preliminary Remedial Goals for Sediment Based on Exposure Senarios with the Tree Swallow and Little Brown Bat, Eighteenmile Creek OU2 Site, Lockport, New York.

Analyte	Sediment-to-Benthos Bioaccumulation Equation[d]	Source
Polychlorinated Biphenyls (PCBs)		
Sum of Aroclors	$C_b = 15.82 * C_s * f_L/f_{OC}$	Site-specific (see note b)
Metals		
Barium	$C_b = 0.583 * C_s / (1 - 0.84)$	USACE 2004 (see note a)
Copper	$C_b = 0.517 * C_s$	Site-specific (see note c)
Lead	$C_b = 0.067 * C_s$	Site-specific (see note c)
Selenium	$C_b = 3.04 * C_s$	Site-specific (see note c)
Thallium	$C_b = 0.561 * C_s$	Site-specific (see note c)
Vanadium	$C_b = 0.079 * C_s / (1 - 0.84)$	USACE 2004 (see note a)
Polycyclic Aromatic Hydrocarbons (PAHs)		
HPAH sum	$C_b = 7.48 * C_s * f_L/f_{OC}$	Site-specific (see note b)
Pesticides		
beta-BHC	$C_b = 2.12 * C_s * f_L/f_{OC}$	Site-specific (see note b)
Dieldrin	$C_b = 4.19 * C_s * f_L/f_{OC}$	Site-specific (see note b)
Endrin	$C_b = 2.45 * C_s * f_L/f_{OC}$	Site-specific (see note b) for endrin ketone
Endrin ketone	$C_b = 2.45 * C_s * f_L/f_{OC}$	Site-specific (see note b)
Dioxins/Furans		
2,3,7,8-TCDD TEQ	$\log(C_b) = 1.110 * \log(C_s) + 0.59$	Bechtel Jacobs 1998b for PCBs

Key:

BERA = baseline ecological risk assessment

BSAF = biota sediment accumulation factor

C_b = benthic-invertebrate contaminant concentration

C_s = sediment contaminant concentration

f_L = fraction lipid in organism

f_{OC} = fraction organic carbon in sediment

HPAH = high molecular weight PAH

OC = organic carbon

OU2 = Operable Unit 2

TCDD = tetrachlorodibenzo-p-dioxin

TEQ = toxic equivalent concentration

Notes:

a. BSAF developed from contaminant data for sediment and Lumbriculus tissue from USACE 2004 (see Appendix B for details). Water content of 84% assumed to convert wet weight invertebrate contaminant concentration to dry weigh basis.

b. Site-specific BSAFs developed from sediment contaminant data (dry weight), sediment organic carbon (OC) data (dry weight), Lumbriculus contaminant data (dry weight), and Lumbriculus lipid data (dry weight) from Eighteenmile Creek OU2 (see BERA Appendix C [E & E 2016c] for details). To estimate contaminant levels in native benthos at OU2, we used site-specific sediment OC of 6.32% (dry weight) and assumed native benthos lipid content of 8.9% dry weight (equivalent to 1% lipids assuming 89% moisture content).

c. Site-specific BSAFs for metals developed from soil contaminant data (dry weight) and Lumbriculus contaminant data (dry weight) from Eighteenmile Creek OU2 (see BERA Appendix C [E & E 2016c] for details).

d. From final BERA for Eighteenmile Creek OU2 Site (E & E 2016c).

Table A-3 Summary Sediment Volumes and Risk Drivers in OU2 Creek Corridor Sediment Samples; Eighteenmile Creek RI OU2

Area	Volume (CY)	DEC Description	Transects	Averge Depth (ft)	Unit	Frequency of Detection					Average Conc					Minimum Conc				
						LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY
1	**438**	NonHazardous	1W - 2W	2.4	mg/kg	14/14	6/14	3/3	3/3	/	377	0.06	0.005	0.97	--	29	0.01	0.002	0.30	--
2	**613**	NonHazardous	2W - 3W	3.5	mg/kg	12/12	5/12	2/2	2/2	/	275	0.29	0.006	0.37	--	29	0.01	0.002	0.30	--
3	**807**	NonHazardous	3W - 4W	3.6	mg/kg	9/9	6/9	3/3	3/3	/	264	0.27	0.007	4.1	--	47	0.06	0.001	0.4	--
4	**379**	NonHazardous	4W - 5W	3.9	mg/kg	13/13	10/13	4/5	5/5	1/1	237	0.13	0.019	6.9	0.06	47	0.03	0.001	0.5	0.06
5	**554**	NonHazardous	1E - 2E	1.6	mg/kg	10/10	10/10	4/5	5/5	2/2	209	0.47	0.10	4.1	0.14	63	0.01	0.01	1.9	0.11
6	**337**	NonHazardous	2E - 3E	2.3	mg/kg	7/7	7/7	2/2	2/2	/	326	0.72	0.11	22	--	165	0.03	0.04	7	--
7	**592**	NonHazardous	3E - 5W	3.6	mg/kg	12/12	11/12	3/4	4/4	1/1	273	0.20	0.03	15	0.06	59	0.03	0.02	2	0.06
8	**1858**	NonHazardous	6 - 7	3.7	mg/kg	15/15	14/15	3/3	3/3	/	435	2.6	0.04	6.84	--	15	0.01	0.01	0.43	--
9	**2235**	NonHazardous	7 - 8	2.8	mg/kg	17/17	13/17	3/5	5/5	3/3	363	5.5	0.04	30	0.4	46	0.04	0.01	1	0.32
10	**1354**	Hazardous	8 - 9	2.8	mg/kg	13/13	11/13	4/4	4/4	1/1	3518	23	0.55	16	1.1	46	0.04	0.00	0.05	1.1
11	**850**	Hazardous	9 - 10	2.8	mg/kg	13/13	13/14	2/3	3/3	1/1	1886	26	0.41	5.4	1.3	136	0.06	0.00	0.05	1.3
12	**342**	NonHazardous	10 - 11	2.0	mg/kg	8/8	8/8	1/1	1/1	/	826	1.6	0.03	101	--	98	0.4	0.03	101	--
13	**554**	NonHazardous	11 - 12	2.3	mg/kg	9/9	8/9	2/2	2/2	/	658	0.50	0.017	50	--	84	0.04	0.003	0.31	--
14	**767**	Hazardous	12 - 13	2.3	mg/kg	17/17	14/17	1/3	3/3	1/1	1182	16	0.003	1.7	6.2	44	0.04	0.003	0.3	6.2
15	**1237**	Hazardous	13 - 14W	2.0	mg/kg	13/13	8/13	1/4	4/4	2/2	1252	8.2	0.036	9.8	0.8	11	0.01	0.036	0.1	0.7
16	**484**	Hazardous	14W - 15W	1.7	mg/kg	6/6	3/6	0/1	1/1	/	661	0.5	--	0.10	--	11	0.01	--	0.10	--
17	**345**	NonHazardous	15W - 16W	1.3	mg/kg	4/4	4/4	/	/	/	170	3.0	--	--	--	55	0.04	--	--	--
18	**220**	Hazardous	14 E - 15E	1.5	mg/kg	12/12	12/12	2/3	3/3	/	798	80	0.58	216	--	18	0.20	0.30	13	--
19	**236**	Hazardous	15E - 16 E	1.5	mg/kg	10/10	10/10	0/2	2/2	/	1012	42	--	305	--	214	5	--	11	--
20	**397**	NonHazardous	17 - 18	1.1	mg/kg	10/10	19/26	1/3	3/3	2/2	357	6.5	0.001	5.4	1.6	33	0.01	0.001	1.6	0.6
21	**341**	NonHazardous	16W - 17	1.2	mg/kg	14/14	14/17	1/3	3/3	2/2	442	5.9	0.001	4.4	2.2	63	0.01	0.001	0.3	1.9

Sediment Action Level	
Risk Driver	mg/kg
PCB, Total	1

Note: All shaded values exceed action levels.

Table A-3 Summary Sediment Volumes and Risk Drivers in OU2 Creek Corridor Sediment Samples; Eighteenmile Creek RI OU2

				Maximum Conc					Sample Maximum				
Area	Volume (CY)	DEC Description	Transects	LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	LEAD	PCB, Total	DDT, Total	PAH, Mixture	Mercury
1	**438**	NonHazardous	1W - 2W	1660	0.10	0.010	1.9	--	18MC-L01W-S02-Z2	SED-10	18MC-L02W-S02-Z1	18MC-L01W-S02-Z2	
2	**613**	NonHazardous	2W - 3W	951	0.73	0.010	0.44	--	18MC-L02W-S02-Z1	18MC-L03W-S01-Z1	18MC-L02W-S02-Z1	18MC-L03W-S02-Z1	
3	**807**	NonHazardous	3W - 4W	552	0.73	0.018	11	--	18MC-L03W-S01-Z1	18MC-L03W-S01-Z1	18MC-L04W-S02-Z1	18MC-L04W-S02-Z1	
4	**379**	NonHazardous	4W - 5W	857	0.34	0.036	16	0.06	18MC-L05W-S03-Z1	18MC-L05W-S02-Z2	18MC-L05W-S02-Z2	18MC-L05W-S02-Z2	OU2-SED05-Z1
5	**554**	NonHazardous	1E - 2E	807	3.8	0.19	6.6	0.174	18MC-L02E-S01-Z1	18MC-L02E-S01-Z1	18MC-L01E-S03-Z1	18MC-L02E-S02-Z1	18MC-AS-S01-Z2
6	**337**	NonHazardous	2E - 3E	807	3.8	0.18	37	--	18MC-L02E-S01-Z1	18MC-L02E-S01-Z1	18MC-L02E-S02-Z1	18MC-L03E-S02-Z1	
7	**592**	NonHazardous	3E - 5W	857	0.72	0.04	37	0.06	18MC-L05W-S03-Z1	18MC-L03E-S02-Z1	18MC-L03E-S02-Z1	18MC-L03E-S02-Z1	OU2-SED05-Z1
8	**1858**	NonHazardous	6 - 7	2720	23	0.08	19	--	SED-15B	18MC-L07-S02-Z1	18MC-L07-S02-Z1	18MC-L07-S02-Z1	
9	**2235**	NonHazardous	7 - 8	1020	35	0.08	122	0.48	SED-17B	18MC-L08-S03-Z1	18MC-L07-S02-Z1	OU2-SED02-Z1	OU2-SED04-Z1
10	**1354**	Hazardous	8 - 9	25400	85	1.39	43	1.1	SED-7	OU2-SED03-Z1	OU2-SED03-Z1	OU2-SED03-Z1	OU2-SED03-Z1
11	**850**	Hazardous	9 - 10	15000	201	0.81	16.0	1.3	18MC-L09-S03-Z1	SED-22	18MC-L09-S02-Z1	18MC-L09-S02-Z1	OU2-SED09-Z1
12	**342**	NonHazardous	10 - 11	2530	4.0	0.03	101	--	18MC-L11-S02-Z1	SED-25	18MC-L11-S02-Z1	18MC-L11-S02-Z1	
13	**554**	NonHazardous	11 - 12	2530	1.65	0.030	101	--	18MC-L11-S02-Z1	18MC-L11-S01-Z1	18MC-L11-S02-Z1	18MC-L11-S02-Z1	
14	**767**	Hazardous	12 - 13	6840	150	0.003	3.1	6.2	SED-29B	SED-28B	18MC-L12-S02-Z1	18MC-L13-S02-Z1	OU2-SED07-Z1
15	**1237**	Hazardous	13 - 14W	6840	46	0.036	35	0.9	SED-29B	18MC-L13-S03-Z1	OU2-SED01-Z1	OU2-SED01-Z1	OU2-SED06-Z1
16	**484**	Hazardous	14W - 15W	1780	1.4	--	0.10	--	18MC-L14W-S03-Z1	18MC-L15W-S01-Z1		18MC-L14W-S02-Z1	
17	**345**	NonHazardous	15W - 16W	356	10.3	--	--	--	18MC-L15W-S01-Z1	18MC-L16W-S01-Z1			
18	**220**	Hazardous	14 E - 15E	1850	390	0.85	599	--	18MC-L15E-S03-Z1	SED-34B	18MC-L14E-S02-Z1	18MC-L15E-S02-Z1	
19	**236**	Hazardous	15E - 16 E	2040	234	--	599	--	18MC-L16E-S03-Z1	SED-37B		18MC-L15E-S02-Z1	
20	**397**	NonHazardous	17 - 18	951	50	0.0013	13	2.5	SED-40B	TRK-C-07-SD-C	18MC-L17-S02-Z1	18MC-L18-S02-Z1	TRK-C-06-SD-A
21	**341**	NonHazardous	16W - 17	2040	38	0.0013	11	2.5	18MC-L16E-S03-Z1	18MC-L16E-S01-Z1	18MC-L17-S02-Z1	18MC-L16E-S02-Z1	TRK-C-06-SD-A

Sediment Action Level	
Risk Driver	mg/kg
PCB, Total	1

Note: All shaded values exceed action levels.

Table A-4 Summary Soil Volumes and Concentrations of Risk Drivers in OU2 Creek Corridor; Eighteenmile Creek RI OU2

					Frequency of Detection					Average Conc					Minimum Conc				
Area	Volume (CY)	DEC Description	Maximum Depth (ft)	Unit	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY
FA	**29400**	Nonhazardous	25	mg/kg	17/17	2/17	13/17	15/17	17/17	201	0.03	0.034	128	2.2	2.9	0.02	0.0003	0.34	0.02
FB	**9700**	Hazardous	20	mg/kg	8/6	3/6	3/6	7/6	7/6	2826	1.5	0.023	62	5.6	41	0.5	0.020	0.22	0.03
FC	**7200**	Hazardous	10	mg/kg	7/8	3/8	2/7	6/8	7/8	3334	5.2	0.025	11.4	3.6	7.6	4.3	0.003	2.5	0.04
FD	**200**	Hazardous	6	mg/kg	7/7	1/7	5/6	6/6	7/7	1241	0.25	0.025	6.6	2.8	7.3	0.25	0.012	0.35	0.06
FF	**0**	Building	0	mg/kg	18/18	17/18	13/18	17/18	18/18	4798	8.9	0.024	42	4.4	1.0	0.004	0.000	3.1	0.04
UA	**2376**	Hazardous	12	mg/kg	6/6	1/6	2/2	5/5	6/6	3050	0.08	0.090	97	0.29	6.0	0.08	0.047	1.8	0.01
UB	**341**	NonHazardous	5	mg/kg	2/2	1/2	1/1	1/1	2/2	664	0.26	0.062	0.19	0.32	434	0.26	0.062	0.19	0.30
UC	**306**	NonHazardous	3	mg/kg	2/2	2/2	/	/	2/2	2785	3.8	--	--	1.1	2120	0.2	--	--	0.45
UD	**130**	NonHazardous	2	mg/kg	3/3	3/3	0/1	1/1	3/3	281	17	--	101	0.51	176	1	--	101	0.04
UE	**1406**	Hazardous	12	mg/kg	3/3	3/3	/	/	3/3	775	209	--	--	5.7	396	0.02	--	--	2.9
UPRA	**532**	Nonhazardous	4	mg/kg	7/7	5/7	1/2	3/4	7/7	1650	0.48	0.07	6.6	4.8	83	0.01	0.07	3.5	0.10
UPRB	**1505**	Nonhazardous	4	mg/kg	6/6	5/6	1/1	1/1	6/6	688	1.0	0.008	2	0.66	98	0.1	0.008	2	0.34
UPRC	**1755**	Hazardous	12	mg/kg	1/1	8/8	1/1	1/1	1/1	2080	23	0.062	1	12	2080	0.04	0.062	1	12
UPRD	**2324**	Hazardous	12	mg/kg	4/4	3/4	/	1/2	4/4	20979	34	--	3.1	5.8	946	0.09	--	3.1	0.23
UPRE	**794**	Hazardous	3	mg/kg	2/2	7/8	1/2	2/2	2/2	188	65	6.7	3.5	0.35	175	0.19	6.7	2.1	0.05
WA	**103**	Nonhazardous	2	mg/kg	3/3	3/3	/	/	3/3	2457	0.37	--	--	0.12	1030	0.23	--	--	0.09

Cleanup Levels		
Risk Driver	mg/kg	Property
Lead	1000	All
PCB, Total	1	All
PAH, Mixture	500	Flintkote

Volume Area	Property	Region
FA	Flintkote	300 Mill Street Non-hazardous
FB	Flintkote	198 Parcel Hazardous
FC	Flintkote	Island - Hazardous
FD	Flintkote	WSS - Hazardous
FF	Flintkote	Building Footprint
UA	United	A
UPRA	Upson	A
UPRB	Upson	B
UPRC	Upson	C
UPRD	Upson	D
UPRE	Upson	Added
WA	White	A

Table A-4 Summary Soil Volumes and Concentrations of Risk Drivers in OU2 Creek Corridor; Eighteenmile Creek RI OU2

				Maximum Conc					Sample Maximum				
Area	Volume (CY)	DEC Description	Maximum Depth (ft)	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY
FA	**29400**	Nonhazardous	25	2050	0.03	0.108	1359	19	OU2-SB03-Z2	OU2-SS16-Z1	OU2-SB02-Z2	FS-SS06-S-O	OU2-SB03-Z2
FB	**9700**	Hazardous	20	7610	2.1	0.025	191	20	FS-SS02-S-O	FS-SS02-S-O	FS-SP02-D26-S-O	FS-MW04RK-D35-S-O	FS-MW04RK-D35-S-O
FC	**7200**	Hazardous	10	10000	6.6	0.059	41	8	FS-SP11-D410-S-O	FS-SP11-D410-S-O	FS-SS04-S-O	FS-SP12-D02-S-O	FS-SS05-S-O
FD	**200**	Hazardous	6	3230	0.25	0.044	15	11	FS-SP09-D14-S-O	18MC-L13-S04-Z1	FS-SS10-S-O	FS-SP09-D14-S-O	FS-SP23-D14-S-O
FF	**0**	Building	0	46000	127	0.080	380	23	OU2-TP06-01	FS-BLDG-D-SED-O	OU2-ARCH-Z1	OU2-TP09-Z2	OU2-TP06-01
UA	**2376**	Hazardous	12	7430	0.08	0.132	288	0.77	18MC-L09-S04-Z2	18MC-SS05-Z1	18MC-L09-S04-Z1	18MC-L09-S04-Z1	SB-3
UB	**341**	NonHazardous	5	894	0.26	0.062	0.19	0.34	18MC-L08-S04-Z2	18MC-L08-S04-Z1	18MC-L08-S04-Z1	18MC-L08-S04-Z1	18MC-L08-S04-Z1
UC	**306**	NonHazardous	3	3450	7.4	--	--	1.7	18MC-L09-S05-Z2	18MC-L09-S05-Z2			18MC-L09-S05-Z2
UD	**130**	NonHazardous	2	386	38	--	101	1.1	OU2-SS20-Z1	OU2-SS20-Z1		OU2-SS20-Z1	OU2-SS20-Z1
UE	**1406**	Hazardous	12	1150	626	--	--	10	18MC-SB15-Z1	18MC-SB15-Z1			18MC-SB15-Z2
UPRA	**532**	Nonhazardous	4	3480	1.6	0.07	8.8	22	18MC-L03W-S05-Z1	UPSON-1	18MC-L03W-S04-Z1	18MC-L03W-S04-Z1	UPSON-1B
UPRB	**1505**	Nonhazardous	4	1390	4.0	0.008	2.4	1.4	18MC-L02W-S04-Z3	18MC-L02W-S04-Z3	18MC-L02W-S04-Z1	18MC-L02W-S04-Z1	18MC-L02W-S04-Z3
UPRC	**1755**	Hazardous	12	2080	180	0.062	1.4	12	OU2-SS24-Z1	OU2-SS12-Z3	OU2-SS24-Z1	OU2-SS24-Z1	OU2-SS24-Z1
UPRD	**2324**	Hazardous	12	77300	80	--	3.1	11	18MC-SB14-Z2	UPSON-2B		UPSON-2	UPSON-2
UPRE	**794**	Hazardous	3	201	390	6.7	5.0	0.65	OU2-SS09-Z1	OU2-SS09-Z2	OU2-SS09-Z2	OU2-SS09-Z2	OU2-SS09-Z2
WA	**103**	Nonhazardous	2	3750	0.46	--	--	0.15	18MC-L02E-S05-Z1	18MC-L02E-S05-Z2			18MC-L02E-S05-Z2/D

Cleanup Levels

Risk Driver	mg/kg	Property
Lead	1000	All
PCB, Total	1	All
PAH, Mixture	500	Flintkote

Table A-5 Summary Soil Samples Outside Excavation Area and Risk Drivers in OU2 Creek Corridor; Eighteenmile Creek RI OU2

Property Designation	Area	Erosion Area	Samples in Bank Stabilization Area	Unit	Frequency of Detection					Average Conc					Minimum Conc				
					Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY
Flintkote	295 JACK	BANK		mg/kg	11/11	2/11	2/3	3/3	11/11	257	0.07	0.023	12	0.28	16	0.02	0.004	2.6	0.05
Flintkote	330 MILL	BANK	Y	mg/kg	9/9	4/9	1/1	1/1	9/9	234	0.4	0.004	34	1.0	8.5	0.0	0.004	34	0.01
Flintkote	OUT			mg/kg	1/1	0/1	1/1	1/1	1/1	71	--	0.004	10	0.36	71.1	--	0.004	9.6	0.36
Flintkote	OUT	BANK		mg/kg	1/1	0/1	1/1	0/1	0/1	2.7	--	0.019	--	--	3	--	0.019	--	--
Flintkote	OUT	ISLAND		mg/kg	1/1	0/1	0/1	1/1	0/1	7.5	--	--	0.06	--	7.5	--	--	0.06	--
United	OUT			mg/kg	4/4	1/4	1/1	2/4	1/4	50	0.06	0.044	4.5	0.14	8.7	0.06	0.044	0.13	0.14
United	OUT	BANK	Y	mg/kg	59/59	21/59	12/15	23/27	45/50	181	0.39	0.059	7.7	0.26	1.7	0.005	0.001	0.04	0.01
Upson	OUT			mg/kg	26/26	3/26	17/20	21/22	25/26	133	0.09	0.04	19	0.18	7.9	0.006	0.007	0.088	0.01
Upson	OUT	BANK	Y	mg/kg	27/27	15/27	7/8	9/10	26/27	177	0.11	0.02	8	0.17	11.3	0.01	0.01	0.09	0.01
Water Street	OUT	BANK	Y	mg/kg	31/31	17/27	/	4/5	4/5	795	2.1	--	24	0.87	11	0.03	--	0.42	0.14
Water Street	OUT	Yards		mg/kg	22/22	7/14	0/1	2/2	1/2	469	2.2	--	10	0.05	5	0.07	--	0.03	0.05
White	OUT			mg/kg	6/6	3/6	1/1	2/2	5/6	81	0.18	0.014	0.8	0.05	13	0.02	0.014	0.67	0.01
White	OUT	BANK	Y	mg/kg	26/26	8/26	4/5	14/14	21/26	136	0.13	0.10	2.2	0.14	1.7	0.01	0.010	0.01	0.01

Cleanup Levels		
Risk Driver	mg/kg	Property
Lead	1000	All
PCB, Total	1	All
PAH, Mixture	500	Flintkote

Area	Property
295 JACK	Flintkote
330 MILL	Flintkote
OUT	
BANK	
Yards	
Y	Access Roads

Note: All shaded values exceed cleanup levels.

Table A-5 Summary Soil Samples Outside Excavation Area and Risk Drivers in OU2 Creek Corridor; Eighteenmile Creek RI OU2

Property Designation	Area	Erosion Area	Samples in Bank Stabilization Area	Maximum Conc					Sample Maximum				
				Lead	PCB, Total	DDT, Total	PAH, Mixture	MERCURY	LEAD	PCB, Total	DDT, Total	PAH, Mixture	MERCURY
Flintkote	295 JACK	BANK		1240	0.13	0.043	28	0.8	18MC-L16W-S04-Z2	18MC-L16W-S04-Z1	18MC-L16W-S04-Z1	18MC-L16W-S04-Z1	18MC-L16W-S04-Z2
Flintkote	330 MILL	BANK	Y	603	0.8	0.004	34	3.2	18MC-L18-S05-Z1	18MC-L18-S07-Z1	18MC-L18-S07-Z1	18MC-L18-S07-Z1	18MC-L18-S05-Z2/D
Flintkote	OUT			71	--	0.004	10	0.36	FS-SP21-D45-S-O		FS-SP21-D45-S-O	FS-SP21-D45-S-O	FS-SP21-D45-S-O
Flintkote	OUT	BANK		2.7	--	0.019	--	--	FS-SP03-D04-S-O		FS-SP03-D04-S-O		
Flintkote	OUT	ISLAND		7.5	--	--	0.06	--	FS-SP13-D0.53.5-S-O			FS-SP13-D0.53.5-S-O	
United	OUT			152	0.06	0.044	8.9	0.14	18MC-SS06-Z1	18MC-SS06-Z1	18MC-SS06-Z1	18MC-SS06-Z1	18MC-SS06-Z1
United	OUT	BANK	Y	1430	4.3	0.18	83	2.7	TP-3	18MC-L07-S05-Z1	18MC-SS07-Z1	18MC-SS09-Z1	18MC-SS09-Z1
Upson	OUT			424	0.26	0.14	189	0.47	OU2-SS04-Z2	OU2-SS07-Z2	OU2-SS07-Z2	OU2-SS02-Z2	OU2-SS02-Z1
Upson	OUT	BANK	Y	980	0.66	0.06	42	0.61	18MC-L02W-S06-Z2	18MC-SS15-Z1	18MC-L04W-S04-Z1	18MC-L04W-S04-Z1	OU2-SS10-Z2
Water Street	OUT	BANK	Y	4630	27	--	73	1.9	OU1-SS-10	SS-29		SB-19	SB-13B
Water Street	OUT	Yards		1360	8.0	--	20	0.05	OU1-SS-9	OU1-SS-9		OU1-SB-20	OU1-SB-20
White	OUT			265	0.48	0.014	0.8	0.17	18MC-SS11-Z1	18MC-SB09-Z1	18MC-SS11-Z1	18MC-MW11-Z1	18MC-SB09-Z2
White	OUT	BANK	Y	836	0.67	0.28	13	0.49	18MC-MW13-Z1	18MC-SS13-Z1	18MC-L02E-S04-Z1	18MC-SS10-Z1	18MC-SB10-Z2

Cleanup Levels

Risk Driver	mg/kg	Property
Lead	1000	All
PCB, Total	1	All
PAH, Mixture	500	Flintkote

Note: All shaded values exceed cleanup levels.

Table A-6 Summary of Hazardous Classification of Samples by Volume Area

Property	Volume Area	Area Type	Lead[1]	PCB[2]	Location	Percentage
Flintkote	FB	HAZ			FS-MCW-1	
Flintkote	FB	HAZ			198-B	
Flintkote	FB	HAZ			198-G	
Flintkote	FB	HAZ			198-I	
Flintkote	FB	HAZ			198-J	
Flintkote	FB	HAZ			FS-MW04RK	
Flintkote	FB	HAZ			FS-SP-2	
Flintkote	FB	HAZ			FS-SS-1	
Flintkote	FB	HAZ			FS-SS-2	
Flintkote	FB	HAZ	Yes		198-D	
Flintkote	FB	HAZ	Yes		198-E	
FB Count			**2**		**11**	**18%**
Flintkote	FC	HAZ			FS-MW06RK	
Flintkote	FC	HAZ			FS-SP-11	
Flintkote	FC	HAZ			FS-SS-3	
Flintkote	FC	HAZ			FS-SS-4	
Flintkote	FC	HAZ			FS-SS-5	
Flintkote	FC	HAZ			OU2-SS17	
Flintkote	FC	HAZ			SB-1	
Flintkote	FC	HAZ			SB-2	
Flintkote	FC	HAZ			SB-3	
Flintkote	FC	HAZ			SB-5	
Flintkote	FC	HAZ			SB-6	
Flintkote	FC	HAZ			W-1	
Flintkote	FC	HAZ			W-2	
Flintkote	FC	HAZ			W-7	
Flintkote	FC	HAZ	Yes		SB-6	
Flintkote	FC	HAZ	Yes		W-3	
Flintkote	FC	HAZ	Yes		W-4	
FC Count			**3**		**17**	**18%**
United	UA	HAZ			18MC-SS05	
United	UA	HAZ			DEC-SB-3	
United	UA	HAZ	Yes		18MC-L09-S04	
United	UA	HAZ	Yes		18MC-MW05	
UA Count			**2**		**4**	**50%**
United	UE	HAZ	Yes	Yes	18MC-SB15	
UE Count			**1**	**1**	**1**	**100%**
Upson	UPRC	HAZ			OU2-SS11	
Upson	UPRC	HAZ		Yes	OU2-SS12	
Upson	UPRC	HAZ			OU2-SS24	

Table A-6 Summary of Hazardous Classification of Samples by Volume Area

Property	Volume Area	Area Type	Lead[1]	PCB[2]	Location	Percentage
UPRC Count			**0**	**1**	**3**	**33%**
Upson	UPRD	HAZ		Yes	DEC-UPSON-2	
Upson	UPRD	HAZ	Yes		18MC-SB14	
UPRD Count			**1**	**1**	**2**	**100%**
Upson	UPRE	HAZ		Yes	OU2-SS09	
Upson	UPRE	HAZ			OU2-SS13	
Upson	UPRE	HAZ			OU2-SS14	
UPRE Count			**0**	**1**	**3**	**33%**

Note:

1 = Samples failed the toxicity characteristic leaching procedure (TCLP) test for lead.

2 = Sample had a measured PCB concentration of 50 ppm or higher.

Property	Volume Area	Region	Property	Volume Area	Region
Upson	UPRA	A	Flintkote	FA	300 Mill Street Non-hazardous
Upson	UPRB	B	Flintkote	FB	198n Parcel Hazardous
Upson	UPRC	C	Flintkote	FC	Island - Hazardous
Upson	UPRD	D	Flintkote	FD	WSS - Hazardous
Upson	UPRE	Added	Flintkote	FF	Building Footprint
White	WA	A	United	UA	A
			United	UB	B
			United	UC	C
			United	UD	D
			United	UE	E

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LEGEND:

- SAMPLE LOCATION INSIDE OF PROPERTY BOUNDARIES
- SAMPLE LOCATION OUTSIDE OF PROPERTY BOUNDARIES
- APPROXIMATE SAMPLE LOCATION
- PROPERTY BOUNDARY
- ACCESS ROAD
- NON-HAZARDOUS MATERIAL
- HAZARDOUS MATERIAL
- DEBRIS PILE LOCATION
- LINE 16 — TRANSECT LOCATION

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.
2. THERE ARE ADDITIONAL SAMPLE LOCATIONS THAT DO NOT FALL WITHIN THE EXTENT SHOWN.

Transects	Average Sediment Thickness (ft)
1W – 2W	2.4
2W – 3W	3.5
3W – 4	3.6
4 – 5	3.9
1E – 2E	1.3
2E – 3E	2.3
3E – 5	3.6
6 – 7	3.7
7 – 8	2.8
8 – 9	2.8
9 – 10	2.5
10 – 11	1.6
11 – 12	2.3
12 – 13	2.3
13 – 14W	2.0
14W – 15W	1.5
15W – 16W	0.9
14E – 15E	1.5
15E – 16E	1.5
16 – 17	1.1
17 – 18	1.1

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.
2. FIELD DELINEATED BANKFULL ELEVATION (OUTLINE OF CONTAMINATED SEDIMENT) IS ESTIMATED AS IS THE FEMA 100-YEAR FLOODPLAIN. DISCREPANCIES BETWEEN THE TWO BOUNDARIES HAVE NOT BEEN RESOLVED FOR THE PURPOSES OF THIS FS.
3. TRANSECTS SHOWN WERE OBTAINED FROM THE SRI (EEEPC 2008).
4. HAZARDOUS AND NON-HAZARDOUS AREAS ASSUMED BASED ON ANALYTICAL DATA COLLECTED DURING THE RI (NYSDEC 2006) AND SRI (EEEPC 2008).
5. PROPERTY BOUNDARIES SHOWN ARE FROM NIAGARA COUNTY OFFICE OF REAL PROPERTY (2006).
6. FLOODPLAIN DATA OBTAINED FROM 1996 FEMA FLOODPLAIN MAPS.
7. AVERAGE SEDIMENT THICKNESS DETERMINED FROM DATA COLLECTED DURING THE SRI (EEEPC 2008)

AOC #5 C & D DEBRIS

AOC #5 C & D DEBRIS

OU-3 FORMER UNITED PAPERBOARD COMPANY PROPERTY

OU-3 FORMER UNITED PAPERBOARD COMPANY PROPERTY

OU-5 WHITE TRANSPORTATION

OU-4 UPSON PARK

SCALE IN FEET
0 250 500 750

ecology and environment

FIGURE A-1 CONTAMINATED SEDIMENT VOLUMES WITHIN CREEK AND MILLRACE
EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK

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BUILDING C & D DEBRIS

AREA FA

AREA FC

BUILDING C & D DEBRIS

AREA FB

AREA UC

AREA UA

AREA UD

AREA UB

AREA UE

AREAS UPRA AND B

AREAS UPRC, D AND E

AREA WA

FORMER FLINTKOTE PLANT PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

FORMER UNITED PAPERBOARD COMPANY PROPERTY

OU-5 WHITE TRANSPORTATION

UPSON PARK

LEGEND:

- SAMPLE LOCATION INSIDE OF PROPERTY BOUNDARIES
- SAMPLE LOCATION OUTSIDE OF PROPERTY BOUNDARIES
- APPROXIMATE SAMPLE LOCATION
- PROPERTY BOUNDARY
- ACCESS ROAD
- NON-HAZARDOUS MATERIAL
- HAZARDOUS MATERIAL
- DEBRIS PILE LOCATION
- LINE 16 TRANSECT LOCATION

NOTES:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SURVEY FOR EEEPC'S SRI DATED SEPTEMBER 2007.
2. THERE ARE ADDITIONAL SAMPLE LOCATIONS THAT DO NOT FALL WITHIN THE EXTENT SHOWN.

SCALE IN FEET

0 100 200 300

ecology and environment

FIGURE A-2 CONTAMINATED SOIL VOLUMES AT UPLAND PROPERTIES
EIGHTEEN MILE CREEK CORRIDOR SITE
LOCKPORT, NEW YORK