Evaluation of Existing Data
Eighteen Mile Creek Superfund Site
Operable Unit 2
City of Lockport, Niagara County
New York

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Revision 01

Prepared for:

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1.1 Introduction

This work is being performed under U.S. Environmental Protection Agency (EPA) RAC2 Contract Number EP-W-10-007. The Original Work Assignment Form (WAF) for the Remedial Investigation/Feasibility Study (RI/FS) to be performed by Los Alamos Technical Associates (LATA) for the Eighteen Mile Creek Site – Operable Unit 2 (OU2) (Site) was issued on September 23, 2013. Ecology and Environment, Inc. (E & E) is a Team Subcontractor to LATA on this contract and has the lead technical role in this project. WAF Amendment 001 was issued on December 27, 2013, to revise the project schedule based on the results of the December 18, 2013, Scoping Meeting. The information in this memorandum is included in the Revised Work Plan (Revision 01) for this Work Assignment.

1.2 Site Overview

Eighteen Mile Creek Superfund 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.

Eighteen Mile Creek Superfund Site (Site) is located in Niagara County, New York, on the south side of Lake Ontario (see Figure 1). The main branch of Eighteen Mile Creek (the Creek) flows north for approximately 15 miles and discharges into Lake Ontario in Olcott, New York. Much of the flow in the main branch of Eighteen Mile Creek comes from water diverted from the New York State Barge Canal (Canal). Eighteen Mile Creek watershed also includes the two main tributaries, the east branch and the Gulf Creek, and minor tributaries. The Site consists of contaminated sediments, soil, and groundwater in and around the Creek.

To address the cleanup of this Site, EPA has divided the Site into three separate operable units (OUs) as shown in Figure 2. OU1 will address contaminated soil at the Residential Properties on Water Street in Lockport, New York and also will address conditions of a building located on the former Flintkote Plant property (former Flintkote Building). EPA completed a Record of Decision (ROD) for OU1 on September 30, 2013. OU2 is part of Eighteen Mile Creek Corridor (the Creek Corridor), which extends from the Creek's headwaters at the Canal to Harwood Street in Lockport (see Figure 2 insert and Figure 3). OU2 will address

contaminated sediments and soil in other areas of the Creek Corridor including the banks of the Residential Properties of OU1. OU3 will address contaminated sediment in the Creek from the north end of the Creek Corridor in Lockport to the mouth of the Creek in Olcott, New York, where the Creek discharges into Lake Ontario (see Figure 2).

For OU1 and OU2 as defined by EPA, the New York State Department of Environmental Conservation (NYSDEC) completed a RI/FS and ROD for the Flintkote property and separate RI/FS and ROD for the remainder of the Creek Corridor. NYSDEC separated the site based on property boundaries. For OU3, EPA completed a RI under the Great Lakes Legacy Act (GLLA) program for the contaminated sediment in the Creek channel from Creek Corridor (OU2) to Burt Dam (CH2MHill and EEEPC 2012). The EPA GLLA RI for contaminated sediment also compiled and evaluated historical sediment data, which included the NYSDEC sediment data from OU2. Past studies, site information, and existing analytical data from these studies and others were evaluated to determine whether additional data are needed to develop a complete conceptual model of OU2, understand the fate and transport of sediment in the Creek, and assess risk to humans and ecological receptors at the contaminated properties in the Creek Corridor. The results of the evaluation are presented in this technical memorandum.

2 OU2 Background

This section includes a description of OU2 and summary of existing conditions and previous investigations. All of the reports reviewed for this technical memorandum are listed in Appendix A. A description of the data available from each report is presented in Table 1.

2.1 Site OU2 Description

The Creek Corridor is defined as the Creek channel from the New York State Canal to the Harwood Street and the adjacent properties (see Figure 3). OU2 encompasses the entire Creek Corridor except for the residential properties on Water Street and the former Flintkote building that are part of OU1. The adjacent properties are divided based on site ownership and are described below.

2.1.1 Creek Channel

The Creek channel consists of the Creek, contaminated sediments in the Creek, and Creek banks. To delineate boundaries between the sediment OU2 and the upland soil OUs, the bankfull width of the Creek was field delineated by NYSDEC in 2008. 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 3 represents the bankfull width. The headwaters of the Creek consist of an east and west branch, which begin immediately north of the Canal. Water from the Creek's 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 west branch originates from the dry dock on the north side of the Canal and then flows northward. The east branch and west branch converge just south of Clinton Street in Lockport.

According to the National Wetlands Inventory (NWI), two reaches of Eighteen Mile Creek within the Creek channel are considered palustrine, permanently flooded, diked/impounded wetlands (for more information, see EEEPC 2009a).

The Creek Corridor is bordered by several properties that are part of OU2. The Creek channel is included in the real property parcels of the individual properties as listed below. Descriptions of the Creek channel within the properties are included with each parcel.

The City of Lockport Comprehensive Plan (Nutter Assoc. 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 locks and improved fishing access. Therefore, future use scenarios need to consider the potential for increased visitors and recreational users.

2.1.2 The Former Flintkote Plant Site

The Former Flintkote Plant Site (198, 225, and 300 Mill Street) in the city of Lockport, Niagara County, New York, is bounded by Eighteen Mile Creek to the west, Mill Street to the east, a commercial property to the north, and vacant land of the Former United Paperboard Company to the south (see Figure 3). A small portion of the site, however, is located along the western bank of Eighteen Mile Creek, and is bounded to the south by residential properties along Water Street. This portion of the site is referred to as the Water Street Section (WSS). William Street, which is no longer open to vehicular traffic, bisects the site. A dam approximately 10 feet high diverts the Creek westward for approximately 300 feet along William Street (located on top of the dam). The Creek continues northward and returns to its original natural channel farther downstream. 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 empties into Eighteen Mile Creek (see Figure 3). The section of 300 Mill Street between Eighteen Mile Creek and the millrace is referred to as the island.

The Flintkote property was purchased from the Beckman Dawson Roofing Company in 1928 and was operated as a manufacturer of felt and felt products. Production of sound-deadening and tufting felt for use in automobiles began at Flintkote in 1935 and continued until operations ceased and the plant closed in December 1971. It is suspected that composite laminates observed at the southernmost demolished building on the 198 Mill Street Property may have also been manufactured at Flintkote. A portion of the Flintkote property at 300 Mill Street near William Street was formerly listed as Site No. 932072 in the Registry of Inactive Hazardous Waste Disposal Sites in New York State (NYS) because of seven drums containing sweepings, solid materials and polychlorinated biphenyl (PCB) transformer oil that were stored in the basement of an on-site building. In January 1984, these drums were removed from the site by a waste oil processor and the site was removed from the Registry in 1985. In 1989, a number of drums containing chemicals were found in various locations throughout the buildings at 300 Mill Street with 28 of these drums containing hazardous wastes. These drums were disposed of off-site in May 1991 during a NYSDEC drum removal action. Additional detail concerning the history of this property can be found in the ROD prepared by NYSDEC in March 2006 (NYSDEC 2006b).

The City of Lockport currently zones this parcel as heavy industrial (i.e., District I-3). The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of the Flintkote properties as industrial. Under the industrial zoning re-

quirements uses incompatible with industry are not to be permitted. The uses would include residential properties or day care centers. The City of Lockport has no future plans to change this use and designation of these areas.

2.1.3 The Former United Paperboard Company Property

The Former United Paperboard Company property is located at 62 and 70 Mill Street (see Figure 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 Eighteen Mile Creek to the west. An abandoned transformer pad and poles are present on the west bank of the Creek, immediately downstream of the dam located in the Creek behind the building on 62 Mill Street. 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. Water in the pond was high (close to the top of the dam), and flow beneath the dam was swift. Water from the pond leaks around the west side of the dam and flows adjacent to or over the top (during high flow conditions) of the abandoned transformer pad. 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.

In late 1880s and early 1890s, the 62 Mill Street United Paperboard property was owned and operated by the Jackson Lumber Company with the building designated as the Saw Mill and Sash & Blind Manufacturing. In 1892, Sash & Blind added a pulp mill and box facility to its operations. By 1898 the lumber company had shut down their operations and the area previously occupied by Sash & Blind became the Traders' Paper Company paper mill, which became United Box Board and Paper Company (Mutual Risk) in 1903. The 70 Mill Street United Paperboard property was owned by United Box Board Company in 1909. United Box Board Company became United Paper Board Company in 1914, which changed its name to United Paperboard Company in 1928, which then became United Board's Carton Corporation in 1948 and Beaverboard Company, Inc., in 1969. By 1969 the buildings had been vacated and dismantled.

The City of Lockport currently zones this parcel as heavy industrial (i.e., District I-3). The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of United Paper Board as industrial. Under the industrial zoning requirements uses incompatible with industry are not to be permitted. The uses would include residential properties or day care centers. The City of Lockport has no future plans to change this use and designation of these areas.

The area is also deemed to have "Archeological Sensitivity" by the New York State Historic Preservation Office (SHPO) (accessed at http://pwa.parks.ny.gov/nr/).

2.1.4 Upson Park

Upson Park is located at 100 Clinton Street in the city of Lockport, Niagara County, New York (see Figure 3). Upson Park is bordered by Clinton Street and a residential area to the north, the West Branch of Eighteen Mile 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.

In the mid 1880s, this property contained a canal boat building company that was no longer in operation by 1892. A pulp mill operated at the Upson Park property between 1919 and 1928 and the pulp company operated until at least 1928. In 1914, the mill company name changed to the United Paper Board Company. By 1948, operations at the mill had been shut down and the buildings on the property were vacant. By 1969, the buildings on the property had been demolished.

The City of Lockport currently zones this parcel as 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 Assoc. 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) (see Figure 4) and the area is also deemed to have "Archeological Sensitivity" by SHPO (accessed at http://pwa.parks.ny.gov/nr/).

2.1.5 White Transportation

The White Transportation property is located at 30-40 Mill Street in the city of Lockport, Niagara County, New York (see Figure 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 Eighteen Mile Creek to the west. All parcels associated with White Transportation (parcels 109.10-1-60, 109.10-1-61, 109.10-1-58, and 109.10-1-59) is owned by Gertrude W. White (estate attorney is Mr. Ben May). During the Supplemental Remedial Investigation (SRI), there were only three trailers on Site: one locked trailer located near the front of the Site building facing Mill Street and two trailers near the bank of the East Branch of Eighteen Mile Creek. One of the trailers along the bank contained 55-gallon drums, two of which were lying on the ground behind the trailer. One of the drums on the ground had an open bung and contained an oily liquid. The NYSDEC Spills Department was notified on the day of the inspection (October 25, 2006) by NYSDEC personnel present during the Site visit. The trailers and drums were

later removed from the property under the supervision of NYSDEC. The spill was closed by NYSDEC on January 30, 2008.

The northern portion of the White Transportation property operated as the New York Cotton Batting Company from at least 1909 until at least 1920, as the James O-Ring Company during the early 1940s, and White Transportation from 1948 until the late 1990s when operations ceased. Use of the northern portion of the White Transportation property during the 1920s and 1930s is unknown. The southern portion of the subject property operated as the Niagara Paper Mill from at least 1875 until approximately 1898, as a box factory by D.C. Graham in at least 1903, as a cold storage facility by L. Huston from at least 1903 until at least 1937, as the Lockport Leather Board Company from at least 1909 until sometime in 1914, as the Simon William Brewery from at least 1940 to 1952; and White Transportation from 1952 until the late 1990s, when operations ceased.

The City of Lockport currently zones this parcel as light industrial (i.e., District I-2). Under the industrial zoning requirements uses incompatible with industry are not to be permitted. The uses would include residential properties or day care centers. The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of White Transportation as commercial although there are no specific projects designated for this area in the plan. The City of Lockport current zoning requirements does not included zoning for commercial areas. According to the City of Lockport Building Inspection Department there are no future plans to change this use and designation of this area (Galloway 2014).

The area is also deemed to have "Archeological Sensitivity" by SHPO (accessed at http://pwa.parks.ny.gov/nr/).

2.2 OU2 Summary of Existing Site Conditions

Detailed descriptions of the existing site conditions are provided in previous study reports as listed in Table 1. A summary of key points is provided below.

- The most prominent topographic feature in Eighteen Mile Creek watershed is the Niagara Escarpment. The watershed is located within both the Ontario and Huron plains, two relatively flat plains that are separated by the escarpment, which runs generally east-west along the northern portion of the city of Lockport. OU2 lies at the top of escarpment where the elevation is highest at the Canal and drops 65 feet to just before the escarpment.
- The Canal is located at the most upstream portion of the Creek Corridor Site. Most of the water in the western portion of the Canal comes from the Lake Erie via the Niagara River and Tonawanda Creek via the Lockport locks. During the navigational season, water flows through the canal from the Niagara River to Lockport in a northeasterly direction. In the winter, a guard gate in Pendleton, New York, is lowered and the Canal is drawn down (NYS Canal Corp. 2000). During normal operating and drawdown

periods, water is discharged from the canal into Eighteen Mile Creek, resulting in an increase in flow volumes and potential hydrological link to Lake Erie. Drawdown primarily occurs in November after the canal is closed for the winter and the canal is drained into the Creek. During dry periods, the canal contributes the majority of the flow for the portion of Eighteen Mile Creek in the city of Lockport (NYSDEC 1997). Under terms of an agreement with the Federal Energy Regulatory Commission (FERC) for Burt Dam in Olcott New York, the New York State Department of Transportation (NYSDOT) issued a permit in which they agreed to provide a diversion of excess water from the Erie Canal to augment the natural flow of Eighteen Mile Creek to maintain a flow of 400 cubic feet per second (cfs) at the dam.

- The increased flow to Eighteen Mile Creek contributed by the early Erie Canal led to the construction of mills and dams on the Creek. The significance of the Erie Canal and the historic features along Creek will need to be addressed as cultural resources during the development of future remedial alternatives.
- Sediment contaminated with PCBs and metals has been identified along the entire 15-mile length of the main branch of Eighteen Mile Creek. The Creek Corridor Site (OU2) has been identified as source area. The source of the metals contamination appears to be the historic fill that is present throughout OU2. The extent of the fill is fairly well documented and it appears most of the channel banks are fill. The thickness of fill was difficult to determine as it was found mixed at different proportions with other overburden material, but it generally ranged from less than 1 foot to more than 10 feet thick.
- The primary PCB source is unknown but suspected to be historical operations from the Flintkote plant. Evidence indicates that PCB contamination may be present beneath the Flintkote building and this area may be the source of ongoing contamination.
- Most of the banks of the Creek channel are forested and steeply sloped, making access to the Creek channel difficult in most places. Almost all of the Flintkote property is overgrown with vegetation and fenced. Of the properties, approximately 75% of the surface area at OU2 is covered by grass/vegetation and some areas of exposed soils and fill, with the other 25% of the surface area covered by buildings and asphalt/stone.

2.3 OU2 Summary of Existing Data

The usability of data for evaluating fate and transport and assessing risk is summarized in Table 1 and discussed in Section 3. Table 1 also summarizes the sediment data that was included in the NYSDEC SRI. A general summary of the existing studies is presented below:

- Many of the early investigations in the 1990s focused on the evaluation of sediment and water quality to address impacts to the Creek below Burt

Dam within Eighteen Mile Creek Area of Concern. A limited number of older studies were conducted between Burt Dam and Lockport, New York. These investigations were completed under standard, state-wide monitoring protocols implemented by the New York State Department of Health (NYSDOH). The data are useful for understanding the fate and transport of contaminants of concern through the watershed. The earlier studies demonstrated the link between the Canal and a broad list of contaminants transported in water that could originated as far away Lake Erie and the Niagara River, and migrated to Eighteen Mile Creek via the Canal. The contaminants include specific PCBs, metals, pesticides, polychlorinated dibenzodioxins and dibenzofurans (dioxin/furan), and polynuclear aromatic hydrocarbons (PAHs).

- The early studies also identified potential sources of specific contamination for PCBs and metals in the Creek Corridor. The subsequent studies completed in the Creek Corridor focused on the nature and extent of these specific contaminants. Other contaminants, such as volatile organic compounds (VOCs), pesticides, and dioxin/furan, were not found at levels determined to be significant by NYSDEC in the Creek Corridor site investigations and, therefore, were not considered contaminants of concern for the Creek Corridor and thus were not analyzed in many samples. The concentrations were screened against the current NYSDEC guidance values at the time of the study including Technical Guidance for Screening Contaminated Sediments and NYSDEC's Technical and Administrative Guidance Memorandum (TAGM) No. 4046 surface soil cleanup objectives. Sediment screening values for organics are based on site-specific equilibrium partitioning and criteria were calculated as site specific based on the amount of organic carbon. Under this guidance the risk-based screening levels are calculated for: human health bioaccumulation, wildlife bioaccumulation, and benthic aquatic life acute and chronic toxicity.
- Previous investigations have focused on PCBs and select metals as the primary site related contaminants. More limited data are available for semivolatile organic compounds (SVOCs), other metals, and pesticides. Very limited data are available for dioxins/furans and VOCs. SVOC analyses were often limited to a list of 16 PAH.
- Evaluation of remedial alternatives and FS were completed for Flintkote for the Niagara County Department of Planning, Development and Tourism in cooperation with NYSDEC in 2005 (TVGA 2005b). Evaluation of remedial alternatives and FS were completed for NYSDEC for the rest Creek Corridor in 2009 (E & E 2009b). The extent of contamination and the extent of fill and excavation volumes were determined based on all the available historical data. These existing volume estimates are considered usable for the purpose of the FS. Volume estimates for Flintkote may be updated after the building has been removed. NYSDEC recommends that the extent of fill be confirmed with additional sampling as part of the predesign investigation.

3 Data Evaluation

The usability of data for evaluating fate and transport and assessing risk is summarized on Table 1. Data generated within the last 10 years are considered potentially usable and representative of current site conditions. Data are considered usable if the results were generated under acceptable quality practices and methods. Not all of the data has been formally validated, but if supporting analytical reports are available to perform validation, it is expected that the data would be found to be usable for risk assessment purposes. Table 1 indicates the studies that contain data that can be imported into a database for the current RI. Table 1 also indicates the reports that have data that will require validation prior to using the data for the current RI. Table 1 also summarizes the number of samples included in the NYSDEC Supplemental RI database. In addition, as part of the EPA GLLA RI all existing sediment data collected prior to 2012, including sediment data in OU2, were evaluated for usability and compiled into a sediment database. Table 2 summaries the number of sediment samples already compiled for PCBs and other contaminants. An estimate number of sample results available for specific data uses also are summarized in Table 1. However, additional evaluation for each contaminant and media is required.

The total number of samples from existing reports for the other properties is summarized in Tables 3 to 6. The sufficiency of the data for evaluating fate and transport of contaminants and assessing risk is described below. Data gaps identified as part of the data evaluation process are summarized in Section 5.

3.1 Fate and Transport of Contaminants

3.1.1 Groundwater

Fifteen groundwater monitoring wells were installed at Eighteen Mile Creek Corridor site in 2007 and 2009 as part of the Supplemental RI conducted for the NYSDEC (see Figure 5). All nine wells on the east side of the Creek and two on the west side of the Creek were installed as overburden wells, and the remaining four on the west side of the Creek were installed as bedrock wells. Bedrock was encountered at depths ranging from 9 feet below ground surface (BGS) to 26 feet BGS, and in some cases, bedrock was not encountered to depths of 26 feet BGS on the north side of the New York State Canal Upson Park and 30 feet BGS on the east side of the Creek in the northern parcel of the United Paperboard Company property.

Groundwater was investigated as part of the Flintkote Site Investigation Report for the Niagara County Department of Planning, Development and Tourism (see Figure 5), but was not investigated during the NYSDEC Supplemental RI of Eighteen Mile Creek Corridor site. Six of the Flintkote wells are overburden wells and seven are bedrock wells (see Figure 5). The depth to bedrock varies across the property, with the shallowest occurrences along Mill Street, Eighteen Mile Creek and the northern portion of the Island, which generally correspond to areas with limited fill materials. Fill materials vary in thickness from less than one foot thick to 24.9 feet thick. The fill materials were generally encountered directly at the ground surface or just below the thin topsoil layer. The thickness of the native soils, when encountered, ranged from 0.1 feet to 9.8 feet.

Geology

The overburden consists of glacial tills and lacustrine silts and clays with localized areas of fill material. Native materials consisted of brown silt to silty clay, and dark gray silty clay. Fill materials consist of ash (reddish-brown, black, white, and red); reworked cohesive soils (reddish-brown silts and clays); and reworked granular soils (silts with sand, gravel, coal, and slag).

Bedrock beneath the Flintkote site is red and white sandstone (Grimsby Formation), and bedrock beneath the Upson Park, United Paperboard, and Whiting sites consisted of light to dark gray dolostone with interbedded gray clay.

Hydrology

The groundwater hydrogeology is largely influenced by topography and the underlying geology (soils/bedrock). Groundwater occurs primarily in the fractured bedrock, but also occurs in the overburden in some areas, especially where bedrock was deeper. The depth to Groundwater also varied significantly with topography (approximately 5 to 18 feet BGS). Groundwater was encountered in the overburden in most of the wells, except MW09, MW15, and MW16 located on the west side of the Creek where bedrock was shallower (between 9 and 17 feet). Groundwater flow on both the east and west and west sides of the Creek is toward the Creek, and groundwater flow in the vicinity of the north side of the Canal near the White Transportation property is toward the Canal (see Figure 5).

Sample Analysis and Results

Flintkote groundwater samples were collected in October 2003 from 13 groundwater monitoring wells associated with the Flintkote site. The samples were tested for VOCs, SVOCs, PCBs, pesticides, and metals (both total and dissolved).

The impacts to groundwater appear to be limited to the PCBs detected in 198-F and pentachlorophenol detected in up-gradient monitoring well MW-1 RK above groundwater standards (see Figure 5). In general, the geochemistry of the overburden and bedrock groundwater is similar and no site-derived metals impacts to groundwater have been identified. The PCB detection is likely the result of leaching from the PCB impacted surface and subsurface fill materials identified on the 198 Parcel or from historical poor housekeeping practices resulting in past releas-

es. Pentachlorophenol was historically used as a pesticide and wood preservative. The presence of pentachlorophenol in the groundwater may be related to treated timbers typically used to construct railroads and railroad sidings, which were once located in the general area of MW-1 RK. The pentachlorophenol could also be the result of contaminant migration from an up-gradient, off-site source.

For the Supplemental RI, groundwater samples were collected in July 2007 from 14 of the 15 groundwater monitoring wells installed at the Corridor site located in OU-2. MW09 was not sampled because it had less than a foot of water and was purged dry. The samples were tested for VOCs, SVOCs, PCBs, pesticides, and metals (both total and dissolved). In February 2009, four wells (MW05, MW14, MW15, and MW16) were re-sampled to confirm the 2007 VOC sample results, thus these samples were only tested for VOCs.

The impacts to groundwater appear to be limited to cis-1,2-dichloroethene (cis-1,2-DCE) and trichloroethene (TCE) detected in MW-14 in Upson Park on the west side of the Creek, and cis-1,2-DCE in MW05 in United Paperboard also on the west side of the Creek (see Figure 5). Phenol was also detected above standards in one well (MW08) on the United Paperboard property. In general, the geochemistry of the overburden and bedrock groundwater was also found to be similar and no site-derived metals impacts to groundwater have been identified.

Data Gap Analysis for Groundwater

Due to the urban setting of the site, the presence of fill materials, and the former industrial activities conducted at the properties in the Corridor site, the presence of organic and inorganic compounds in soils and groundwater is not uncommon. However, although the fill materials could be the source of VOCs, the source or sources of the VOCs is considered unknown for the following reasons:

- The elevated levels of cis-1,2 DCE and TCE were detected in wells along the western side of the Creek, furthest from industrial activities;
- Soils collected as part of the Supplemental RI in the vicinity of these wells were not tested for VOCs, therefore, there it is difficult to determine whether or not the VOCs are present and thus leaching into the groundwater beneath the site; and
- The direction of groundwater flow in the vicinity of the VOC contaminated wells is from west to east toward the Creek. There are no up gradient wells to determine the quality of groundwater entering the site.

In addition, the elevated PCBs in 198-F is likely due to on-site sources; however, the source(s) of the elevated phenol on United Paperboard property and pentachlorophenol on the Flintkote property is also unknown.

3.1.2 Surface Water

Surface water has not been extensively sampled as part of previous investigations because of the high flow rates in the Creek and lack of standing water. Studies of

dissolved PCBs in water indicate that there is a source of PCBs to the surface water within OU2 (NYSDEC 2010c). It is expected that the source is beneath the Flintkote building.

3.1.3 Sediment

Sediment has been extensively sampled as part of previous investigations and is discussed further as part of the human health and ecological risk evaluation. Sediment transport and erosion are presented in Section 4.

3.1.4 Soils

Subsurface soils have been extensively sampled as part of previous investigations except for soils near and beneath the Flintkote buildings. Existing soil data were used to assess nature and extent and establish cleanup areas and volumes. The estimated volume is considered usable for the FS.

3.1.5 Additional Analytical Parameters

Tables 2 to 6 summarize the type of analytical data available for samples in various media by each property. Most all samples were analyzed for PCB and metals, primarily lead. PCBs were analyzed as PCB Aroclors and PCB congeners for some of the sediment samples. PCB Aroclor data were historically used for evaluating the nature and extent of contamination, because the majority of the existing samples were analyzed for Aroclors. PCB Aroclor data will be used for future evaluation of nature and extent of contamination. PCB congener data were used for some of the NYSDEC Lake Ontario and tributary monitoring studies. In general these data are not considered usable for the purposes of the RI. PCB congeners were analyzed in place of PCB Aroclors in situations where the Aroclor patterns are expected to be weathered (e.g., in low-level water analysis).

Most samples were analyzed for lead or select metals, including mercury, arsenic, chromium, copper, lead, and zinc. For the NYSDEC Supplemental RI all samples were analyzed for both Target Analyte List (TAL) metals for the bank cores and select metals (i.e., arsenic, chromium, copper, lead, and zinc) for samples tracing nature and extent of know contamination. The data set for complete metals may be limited and all planned sampling should be completed for TAL metals to provide additional data for risk assessment purposes. No samples in OU2 were analyzed for acid volatile sulfides/simultaneously extracted metals (AVS/SEM) and TOC to assess the bioavailability of divalent metals including cadmium, copper, lead, nickel, and zinc and monovalent silver.

Select samples were analyzed for lead by Toxicity Characteristic Leaching Procedures (TCLP) and the results were compared to hazardous waste levels (6 New York Codes, Rules and Regulations [NYCRR] 371). Several sample with high lead concentrations exceeded hazardous waste criteria. TCLP data compared to the total lead concentrations showed inconsistent correlation, suggesting that the leachability of the lead varies with the type of source material.

Dioxin/furans were chemicals of potential concern (COPCs) in historical studies because these contaminants are identified as critical in the lake-wide management plan for Lake Ontario. Dioxin and furans were included in the Eighteen Mile Creek AOC Remedial Action Plan, and select sediment samples from several early NYSDEC investigations were analyzed for dioxin and furans or 2,3,7,8-TCDD only. Dioxin/furans were detected in the sediment samples in the early studies at concentrations that exceed site-specific Technical Guidance for Screening Contaminated Sediments. NYSDEC performed a specific investigation in 1994 to identified dioxin/furan in the sediments of Eighteen Mile Creek. No specific sources of dioxin and furans in the Eighteen Mile Creek were identified, but the levels in the sediments were considered potential significant. The Flintkote property and Erie Canal were identified as potential sources. Eight ash samples collected during the NYSDEC Site Investigation of the Flintkote sited were also analyzed for dioxins and furans as these contaminants were detected in the two ash samples 1994 study. The total 2,3,7,8-TCDD toxic equivalent concentrations of the 1994 samples were 51.81 parts per trillion (ppt) and 871.50 ppt, respectively. Neither dioxins nor furans were detected in any of the ash samples collected during the Site Investigation (NYSDEC 2000). However, all samples (except one) that were submitted for dioxin/furan analysis were collected from depths ranging from 4 to 24 feet.

Dioxin/furans were not analyzed as part of the NYSDEC RI for the OU2 Corridor Site because dioxin and furans were not detected in the ash waste samples collected during the Site Investigation at the former Flintkote Plant site (NYSDEC 2000). The former Flintkote Plant site was then eliminated as potential source of dioxin/furan.

As part of 1997 -1998 NYS Canal Corp investigation of sediment quality in the Erie Canal (Canal Corp 1999), elevated levels of dioxin/furan contamination were encountered within the sediments under the Prospect Street Bridge in Lockport and are detectable in the sediments all the way to the Genesee River in Rochester. In some locations the 2,3,7,8 substituted TEQ levels exceed the NYSDEC Class C Sediment criteria of 50 ppt. In no case does the level of 2,3,7,8-TCDD TEQ found in the sediment exceed the EPA residential soil action limit at the time of 1 ppb or the NYSDEC Technical and Administrative Guidance Memorandum allowable soil concentration of 6 ppb. The study concluded that historical upstream sources need Tonawanda could potentially be contributing dioxin and furan to canal sediment. A recent study of sediment in the Erie Canal historical locks was completed to access the sediment for removal and disposal (Golder 2008). The sediment inside the locks would be representative of historical upstream sediment coming from above the locks. Dioxin and furans were detected in all the samples collected. Compared to the NYSDEC TOGS 5.1.9 Class A Sediment Quality Threshold Values for Dredging, Riparian, or in-water Placement threshold value calculated as toxic equivalent (TEQ) of 4.5 ppt), all samples except on exceeded this value. There are no studies to indicate current concentrations of dioxin and furan in sediment below the locks and in the OU2 Creek Corridor.

3.2 Human Health Risk Assessment

Eighteen Mile Creek Corridor area originally included residential properties on the west side of the Creek along Water Street, but these parcels were assessed separately as OU1. A Human Health Risk Assessment (HHRA) was completed for OU1 Water Street residences by EPA in July 2013. The remaining potential human exposure areas within OU2 include the following areas:

1. The Creek bed and Creek banks will be evaluated for sediment only, the creek bank soils will be assessed with each property. However, the Creek bank samples can be evaluated as a group for some parameters because the exposure areas are similar for all properties.
2. Flintkote – a 6-acre former industrial facility. The Creek bank soils immediate downstream of Flintkote will be considered part of the exposure area for this site. The Creek bank soils include samples on the opposite side that are part of the Water Street properties;
3. United Paperboard – an active 4.8-acre industrial facility. The Creek bank soils include samples on the opposite side that are part of the Water Street properties;
4. Upson Park – a 5.9-acre public park at the south end of the corridor that is mostly wooded with walking paths and a few picnic tables; and
5. White Transportation Property – an inactive 2.6-acre former commercial/industrial facility.
6. Groundwater will be assessed on an OU-wide basis based on the historical plume identified on the south side of the Creek in Upson Park and opposite United Paperboard.

Numerous studies have been conducted of the soil and sediment in the corridor area as listed in Table 1. In general terms, the contaminants that have been found in the area that might pose health risks to humans contacting soil and/or sediment include PCBs, metals, PAHs, and pesticides.

Potential exposure pathways and receptors are summarized in Figure 7, the conceptual site model (CSM) from the NYSDEC Supplemental RI Report and in Table 7 presented herein. Potential receptors include:

- Recreational users and groundkeepers/maintenance workers of Upson Park and the Downstream area;
- Workers, site visitors/trespassers and utility workers of the White Transportation, United Paperboard, and Flintkote parcels; and
- Anglers and other recreational users of the stream bed and banks.

Recreational users, visitors, workers and possible future residents might be exposed to site contaminants in soil and sediment via direct contact with these envi-

ronmental media, including incidental ingestion via hand-to-mouth contact, dermal contact, and inhalation of particles and/or vapors emanating from these media as a result of volatilization and wind erosion. In addition to these pathways, anglers and their families who might consume fish or crayfish caught from the stream might be exposed to contaminants absorbed by these organisms from Creek water and sediment. Groundwater is not currently used as a source of potable water in the OU2 area but it is classified GA by NYSDEC indicating that its best potential use is as a source of drinking water so hypothetical future use of groundwater in OU2 as potable water will be assessed.

Assessing potential exposures to site contaminants requires that sufficient data be available to make reliable estimates of contaminant concentrations in the various potential exposure areas. EPA estimates potential exposures based on a conservative estimate, typically the 95% upper confidence limit (95% UCL) on the average contaminant concentrations within an exposure area. EPA has developed the ProUCL statistical software package to evaluate the analytical data and perform the appropriate statistical calculations. The ProUCL Technical Guidance document recommends that at least eight to 10 detected values be available in order to calculate reliable estimates of the 95% UCL values. The 95% UCL or the maximum detected value in a dataset, whichever is lower, will be used as the exposure point concentration.

For technical reasons, lead is assessed differently from other contaminants. EPA's Superfund Lead Contaminated Residential Sites Handbook recommends that for parcels larger than 1 acre, one five-point composite sample be collected for each ¼ acre. The upland parcels in OU2 range from about 2.6 to 6 acres in size. The lead sampling guidance is not relevant to the upland parcels in OU2 for the Flintkote Plant Site, United Paperboard and White Transportation because the properties are presently designated for commercial/industrial use and there are no plans in the Lockport Comprehensive Plan to change that designation. The upland parcel in Upson Park is designated as a park and will continue for recreational use.

Future use plans for the Creek Channel indicate potential expansion as a trail and fishing location. The Creek Channel and the Creek banks are associated with individual properties but from an exposure standpoint the area is all similar. Therefore, samples collected in Creek banks and sediments can be considered as group for evaluating this exposure pathway for future recreational users.

3.2.1 Available Data for the Human Health Risk Assessment

The historical analytical data for soil samples in OU2 have been reviewed to determine whether data of sufficient quality and quantity is available to support the HHRA. The soil sample totals by depth are summarized on Table 8 because exposure assessments are based on sample depth. The properties with sample sets less than 10 samples per exposure area are highlighted on the table indicating a potential data gap. The number of soil samples available for the various upland areas appears to be fewer than those recommended by the guidance document cit-

ed previously. This is especially true for PAHs and pesticides. For example, most of the samples in Upson Park are located along the Creek banks and there are limited sample locations in the picnic area (see Figure 12). The upland samples for former United Paper Board and White Transportation are also limited, but most of these are paved or have buildings located on them.

Sediment data are summarized on Table 2 but the samples are not evaluated based on depth because all the samples are generally shallow. The data available for soil and sediment in the stream bed and banks in the Creek channel generally appears to be sufficient for most COPCs. Groundwater data for OU2 was collected prior to 2009 and is not acceptable for risk assessment. Groundwater monitoring in the designated plume area needs to be completed within one year and have a recommended two rounds of data.

3.2.2 Additional Analytical Parameters

In order to comply with EPA risk assessment guidance, the full Target Compound list/Target Analytical List (TCL/TAL) analyses are needed for at least some fraction of the samples to provide assurance that no significant COPCs are missed in the RI and risk assessment process. Some analytical parameters have limited data as described below.

Dioxins and furans have been detected in fish collected near the northern end of the Creek at concentrations higher than fish collected from Oak Orchard Creek, a reference creek to the east. Environmental media in the Creek Corridor have generally not been analyzed for dioxins and furans as part of the NYSDEC RIs, but earlier NYSDEC studies of the Canal and Creek channel suggest dioxin/furan is present in the sediments and therefore could contribute to the total risks.

Total chromium concentrations appear to be elevated in environmental media in Eighteen Mile Creek. Chromium can exist in two valence states, Cr(III), and Cr(VI). The Cr(VI) is generally much less common in environmental media, but it is much more toxic than Cr(III), therefore, it is important to know the chemical form of the chromium present. Historical evaluation of the industry in OU2 did not indicate any potential sources of Cr(VI) to the sediment and surface water and therefore Cr(VI) is not expected to be present in the sediments and surface water of OU3. Samples collected by EPA's Removal Program in the soils at the Water Street residential yards did not find Cr(VI). Therefore, further analyses for Cr(VI) for all samples are not recommended. However, about 10% of all samples also will be analyzed for Cr(VI) to confirm there are no other potential sources of Cr(VI) in OU2.

3.2.3 Additional Environmental Media

Some of the potential exposure scenarios that may occur in OU2 involve contact with surface water – swimming, wading and fishing, and consumption of fish and/or crayfish caught from the Creek. Data available for the Creek channel are summarized on Table 2. There is no analytical data available for fish or crayfish tissue from OU2. Fishing in OU2 has been reported by local residents and im-

proved fishing access is a potential future use. The Great Lakes Biomonitoring Project is currently under way by NYSDOH, which focuses on the Burmese in Buffalo and licensed anglers in Erie, Niagara, and Monroe counties. NYSDOH collected fish consumption data and blood and urine samples from approximately 200 Burmese participants. The data they collected did include general eating patterns of fish, including shellfish (e.g., mussels) and small mammals in this group (from all sources including the Great Lakes). Data are still under elevation but should be available in estimate exposure rates. There is little analytical data available for surface water from OU2. Swimming and wading have not reported by local residents and exposure to contaminated surface water is not expected to be a significant exposure pathway. Because most of the water in the Creek comes from the Canal, water quality from the Canal could be used to estimate surface water exposure. If the NYSDOH Great Lakes Biomonitoring Project data is available at the time the risk assessment is being prepared information from that study will be used to help in selecting exposure factor values. Further, if the Burmese (Hmong) population proves to be a sensitive or subsistence subpopulation, separate exposure and risk estimates will be prepared for that group.

3.2.4 Background and Reference Areas

A number of contaminants found in OU2 are naturally occurring (e.g., most metals such as iron, lead, copper, zinc, and aluminum), or are ubiquitous in environmental media (PAHs and dioxin/furan) as a result of natural processes like combustion or other regional or global human activities. Consequently it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures and risks from those found in the general western New York environment. For the NYSDEC site investigations, contaminant concentrations were compared with state screening standards so no background or reference data were collected for OU2. There are limited samples collected upstream of the Canal that may be considered background for sediment. The number of samples is not sufficient to establish statistical significance.

Consequently it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures, and risks from those found in the other Lake Ontario watersheds. Some tissue samples were collected from Oak Orchard Creek in 2007 (E & E 2009). Basin-wide monitoring programs also can be used as references for surface water and historical sediment data. EPA has developed several guidance documents describing:

- How background locations should be identified;
- How background concentrations should be determined (statistical procedures);
- How contaminant concentrations in site soil should be compared with background concentrations; and

- How background concentrations should be taken into consideration in CERCLA remedy selection decisions.

Specific guidance documents include *Determination of Background Levels of Inorganics in Soils and Sediments at Hazardous Waste Sites* (EPA 1994); *Guidance for Characterizing Background Chemicals In Soil at Superfund Sites* (EPA 2001); *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (EPA 2002a) and *Role of Background in the CERCLA Cleanup Program* (EPA 2002a) All of this guidance will be taken into consideration in developing and using background concentrations. Background concentrations will only be taken into consideration for inorganic chemicals for refining risk calculations.

3.3 Ecological Risk Assessment

Data available to support the Baseline Ecological Risk Assessment (BERA) for OU2 are presented in this section. A Screening Level Ecological Risk Assessment (SLERA) has not yet been conducted for OU2; however, it seems likely that an unacceptable screening level risk will be identified in OU2 when a SLERA is conducted, for at least two reasons:

1. Elevated levels of PCBs, copper, lead, zinc, and other contaminants in sediment and soil have been reported in OU2 in several recent investigations (e.g., CH2MHill and EEEPC 2012; EEEPC 2009a; NYSDEC 2006); and
2. Fish, wildlife, and other ecological receptors are abundant in and along the Creek in OU2 (EEEPC 2009a).

The information presented in this memorandum is intended to assist EPA with understanding the potential data needs to conduct a BERA for OU2, should EPA decide to do so.

Data evaluation for OU2 was designed to determine whether or not there are sufficient data to support a BERA for OU2, and was based on the following:

1. The preliminary ecological CSM for OU2 (see Figure 8);
2. The preliminary list of assessment endpoints, risk questions, and measures (see Table 9); and
3. A review of the available data for OU2 as presented in recent site investigation reports, including the Great Lakes National Program Office (GLNPO) Remedial Investigation Report (CH2MHill and EEEPC 2012), Final Supplemental Remedial Investigation Report for Eighteen Mile Creek Corridor Site (EEEPC 2009a), and other recent site reports.

As the risk assessment process for OU2 advances, it is expected that refinements will be made to the CSM and assessment and measurement endpoints. The following section summarizes available data for the Creek channel and each property in OU2. Recommendations to fill identified data gaps are presented in Section 5.

3.3.1 Available Data for Ecological Risk Assessment

Creek Channel

Table 2 provides a summary of existing data. The following points are noteworthy regarding the sufficiency of the available data to support a BERA for the Creek channel:

- Existing sediment chemistry data appear to be adequate for determining the extent of contamination.
- There are no data available to evaluate sediment toxicity and bioaccumulation or develop biota-sediment bioaccumulation factors.
- A surface water evaluation of dissolved PCBs was completed, but no other contaminants were analyzed for, and no studies of general water quality were done.
- No fish tissue data or benthic macroinvertebrate data have been collected within the Corridor site.

For the Creek sediment in OU3, there is much larger data set addressing toxicity and bioaccumulation factors. The OU3 may be useful addressing data gaps in the OU2 risk assessment sediment concentrations and areas are comparable. For example, *Lumbriculus* bioaccumulation tests were completed for OU3 in 2012 for PCBs. The data may be applied to determining bioaccumulation factors for OU2.

Flintkote Property

Table 3 provides a summary of existing data and the following points are noteworthy for evaluation of data for BERA. Figure 10 shows the locations of all the existing soil locations that are considered potentially usable.

- Sufficient data are available for surface soil/fill for some parameters (PCBs, metals, mercury, SVOCs), but not others (pesticides, dioxins/furans, and VOCs).
- No biological tissue data have been collected from the Flintkote Property.

United Paper Property

Table 4 provides a summary of existing data. The following points are noteworthy regarding the sufficiency of the available data to support a BERA for this property. Figure 11 shows the locations of all the existing soil locations that are considered potentially usable.

- Sufficient recent data are available for surface soil/fill for some parameters (PCBs, metals, mercury, SVOCs), but not others (SVOCs, pesticides, dioxins/furans, and VOCs).

- No biological tissue data have been collected from the United Paper Property.

Upson Park

Table 5 provides a summary of existing data. The following points are noteworthy regarding the sufficiency of the available data to support a BERA for this property. Figure 12 shows the locations of all the existing soil locations that are considered potentially usable.

- Insufficient surface soil data are available for the Upson Park property in the area above the Creek banks including the picnic area.
- Sufficient recent data are available for bank surface soil for some parameters (PCB Aroclors, metals, mercury, and SVOCs,), but not others (, pesticides, dioxins/furans, and VOCs).
- No biological tissue data have been collected from the Upson Park Property.

White Transportation

Table 6 provides a summary of existing data. The following points are noteworthy regarding the sufficiency of the available data to support a BERA for this property. Figure 13 shows the locations of all the existing soil locations that are considered potentially usable.

- Sufficient recent data are available for surface soil (property and bank combined) for some parameters (PCB Aroclors, metals, mercury, and SVOCs), but not others (SVOCs, pesticides, dioxins/furans, and VOCs).
- No biological tissue data have been collected from the White Transportation Property.

3.3.2 Additional Analytical Parameters

PCB congener data have been collected for Eighteen Mile Creek system in several investigations. Recently, all 209 PCB congeners were measured in fish and sediment samples collected to support a Trophic-Trace model for Eighteen Mile Creek in OU3 (E. Risk Sciences 2012). PCB congener data are useful for assessing exposure instances when PCB patterns from Aroclors are weathered or degraded and comparing to available historical tissue data from OU3.

Select samples from the escarpment to Burt Dam have been analyzed for AVS/SEM to evaluate the bioavailability of metals as part of the OU3 projects. The results indicate that the metals in Eighteen Mile Creek sediments are unlikely to be bioavailable or toxic. Actual toxicity studies are needed to confirm these results. There is no AVS/SEM or toxicity data available for OU2.

3.3.3 Background and Reference Areas

As described for the HHRA, a number of the contaminants found in OU2 are naturally occurring (metals), or are ubiquitous in environmental media (PAHs and dioxin/furan) as a result of natural processes like combustion or other regional or global human activities. Consequently, it is important to collect analytical data for environmental media in nearby reference or background areas in order to distinguish site-specific concentrations, exposures and risks from those found in the general Western New York environment.

For the NYSDEC site investigations, contaminant concentrations were compared with state screening standards so no background or reference data were collected for OU2.

For the BERA, exposure and risk at the site should be compared with exposure and risk at a reference area. For OU2, a suitable reference area for the terrestrial and aquatic portions of the site has not yet been identified. One possible reference area for OU2 is Oak Orchard Creek, which was used as a reference area for the Eighteen Mile Creek AOC Beneficial Use Impairment Investigation conducted in 2007 (E & E 2009). Oak Orchard Creek has many similarities with Eighteen Mile Creek. Both creeks are tributaries of Lake Ontario, are of similar size and surrounding geography, and are subject to water level fluctuations due to changes in lake water levels. In addition, each creek has a hydro-electric dam located some distance from their confluences with the lake. Oak Orchard Creek is not a Great Lakes AOC and was recommended as a suitable reference location by NYSDEC. Finally, the BUI investigation demonstrated that PCBs and dioxin/furans in brown bullheads (whole-body samples) collected from Eighteen Mile Creek were an order of magnitude greater than in brown bullheads collected from Oak Orchard Creek.

Other potential reference areas are the East Branch of Eighteen Mile Creek or upstream areas of Oak Orchard Creek closer to the Erie Canal. Aquatic and terrestrial habitats within these potential reference area or areas may be more comparable to the OU2 section of Eighteen Mile Creek.

4 Sediment Erosion and Deposition Analysis

Sediment erosion is of primary concern in OU2. The NYSDEC RI and SRI found concentrations of PCBs and metals in sediment exceeding screening criteria in the Creek and Flintkote millrace and in the soils on the properties located adjacent to the Creek. The SRI concluded that erosion of contaminated fill material from adjacent properties and runoff appears to be the primary mechanism for transport of PCBs and lead to the Creek.

The SRI indicated that the Canal is potentially a chronic source of PCB contamination to the Creek. PCB contaminated sediment in the Canal immediately upstream (to the west) of Eighteen Mile Creek was identified by an investigation performed by URS Corporation in 2006, the RI, and to a lesser ex-tent, during the SRI. The Additional Investigation (EEEPC 2009a) was conducted to determine whether the Canal is a significant source of contamination to Creek sediments. This investigation concluded that the Canal is not a significant contributor of PCBs and metals to Eighteen Mile Creek sediments at the Corridor. Therefore, the likelihood of re-contamination from the Canal after Creek sediments have been remediated is small. However, the investigation also concludes that one-time events, such as pulling the canal plug (allows water to drain from the Canal to the Creek) and significant discharges from combined sewer overflow (CSO) outfalls were not evaluated in the investigation. Such events could cause a slug of potentially contaminated sediments to enter the Creek. The NYSDEC FS assumed that a sediment re-lease from pulling the canal plug could be avoided through operational changes (i.e., use of pumps) to prevent such a potential slug release to the Creek. CSOs are being monitored under NYSDEC Division of Water, and it is therefore assumed that the sediment levels in the sewer system are being monitored for COCs for Eighteen Mile Creek. The latest CSO monitoring data from city of Lockport was collected in 2011 from two locations in OU2 (City of Lockport 2011). The samples were analyzed for fecal coliform and metals only.

In terms of deposition, the Creek has a relatively high velocity and constant flow which is at a maximum annually when the Canal is drained and during flood events. Sediment thickness was evaluated as part of the NYSDEC FS based on depth to refusal or bedrock of the sampling on transects for purposes of calculating volumes. In many areas, the Creek bed along the center of the channel is

comprised mostly of coarse sand and various sizes of gravel, stone, and rubble. A larger proportion of silt was observed along the Creek bottom in the West Branch of the Creek, as well as between Clinton Street and the Clinton Street Dam. However, sediment thickness is expected to change over time due to high flow rates and scour. High concentrations of PCBs and lead were found in the millrace adjacent to the Former Flintkote Plant Site. Based on Site hydrology, this area is clearly a depositional area with intermittent flow. Sediment deposition also is expected to occur behind the Clinton Street dam. However, the concentrations of PCBs and metals were higher below the dam than above the dam indicating that the sediment behind the dam may not be retained over time.

Deposition of sediments on floodplains during high water events was clearly demonstrated for the Residential Properties of OU1. The deposition of sediments on surrounding properties needs to be addressed as part of the overall remedy selection.

The following summarizes the Sediment Erosion and Deposition Analysis (SEDA) concerns:

- Sediment transport has not been modeled at the site but a general CSM of sediment movement is generally understood based on previous investigations.
- Sediment input is primarily from annual draining of Canal and erosion of banks. Sufficient data are available to understand the contribution of contamination from these sources. NYSDEC concluded that the erosion pathway from the banks must be eliminated as part of the remedy and that contributions from other sources can be controlled.
- Sediment bedload was evaluated in 2009 by NYSDEC. Sediment resuspension due to scour and settling is suspected to occur based on observations and chemical analysis but the extent is unknown.
- Sediment deposition was only clearly identified in one location in the Creek Corridor at the Flintkote millrace.
- Sediment transport off bank due to flooding and sediment transport downstream are well documented based on the measured extent of contamination.

The existing NYSDEC FS and ROD only evaluated two remedial alternatives for the Creek: No Action and Complete Removal and Bank Stabilization. Therefore, modeling of sediment transport is not required for this alternative. Other remedial alternatives such as in-situ capping, monitored natural recovery and in-site treatment were determined to not be effective for the Creek channel.

5 Data Gaps and Recommendations

The following data gaps and recommendations are based on the data evaluation presented in Section 3. The data gaps and sampling recommendations to address them are summarized below and on Tables 10 through 14 for the Creek channel and each of the properties within OU2. Figures 6 to 13 present the location of existing samples that are considered usable and proposed new sample locations. Table 15 provides a summary of all recommended samples and analytical parameters.

5.1 Fate and Transport

Several contaminants were detected at the Corridor sites in the various media sampled. The following are recommendations to fill data gaps by media:

5.1.1 Groundwater

Elevated metals detected in monitoring wells form all the sites is representative of ambient conditions in the area and no site-specific sources. However, there were some VOCs, SVOCs, and PCBs detected in some wells that are likely the result of on-site or off-site contaminant sources. For human health risk assessment, current groundwater results analyzed for all TCL/TAL is required in the area of the identified plume.

The Former Flintkote Plant Site

The presence of elevated level of pentachlorophenol in MW-1RK (see Figure 5) appears to be an isolated occurrence either from an onsite source or former railroad ties, thus no additional investigations are recommended at this time. However, the detection of PCBs in 198-F clearly indicates that PCBs from the Flintkote site are impacting groundwater. The screened interval in this well is close to the same elevation as the Creek, thus it is highly likely that PCB-contaminated groundwater is discharging to the Creek (coinciding with elevated PCBs in the Creek water downgradient of the Flintkote site). However, because there are plans to remediate the Flintkote site (i.e., building and soil removal in the area of 198-F, no additional groundwater investigations are warranted at this time. The groundwater contamination at the Flintkote site will be revisited once the building is demolished and additional soil data are collected. Passive sampling in the Creek Channel is recommended to assess the impacts of groundwater to the sediment (see Section 5.1.3).

Former United Paperboard

The presence of the elevated level of phenol in MW8 (see Figure 5) appears to be an isolated occurrence and likely from an onsite source, thus no additional investigations are recommended at this time. However, due to the uncertain nature of the source of the elevated levels of cis-1,2 DCE in MW05, one upgradient/offsite monitoring well (on Jackson Street north of Monroe Street) is recommended to be installed and sampled for VOCs to determine whether or not the contamination in MW14 is originating on- or off-site (see Figure 6). In addition, the two existing wells (i.e., MW05 and MW09) should also be sampled for VOCs. However MW-9 has been dry in past sampling events and therefore, if MW-09 cannot produce a sufficient amount of groundwater it will be replaced and sampled.

Upson Park

Due to the uncertain nature of the source of the elevated levels of cis-1,2 DCE and TCE in MW14 (Upson Park) (see Figure 5), one upgradient/off-site monitoring well (on Jackson Street approximately halfway between Clinton Street and Monroe Street) is recommended to be installed and sampled for VOCs to determine whether or not the contamination in MW14 is originating on- or off-site (see Figure 6). In addition, the four existing wells (MW14, MW15, MW16, and MW17) should also be sampled for VOCs.

White Transportation

Other than elevated metals which appear to be representative of ambient condition in the area, no other elevated contaminants were detected, therefore, no additional groundwater investigations are proposed at this time.

5.1.2 Surface Water

As stated above, studies of dissolved PCBs in water indicate that there is a source of PCBs to the surface water within OU2. It is expected that the source is beneath the Flintkote building. While no additional sampling is needed to evaluate fate and transport, some additional sampling is recommended as part of the human health and ecological risk evaluation.

5.1.3 Sediment

Sediment has been extensively sampled as part of previous investigations as shown on Figure 10 and summarized on Table 2. No additional sampling is needed to evaluate fate and transport; however, some additional sampling is recommended as part of the human health and ecological risk evaluation.

5.1.4 Soils

Subsurface soils have been extensively sampled as part of previous investigations except for soils near and beneath the Flintkote buildings. Additional sampling is needed to evaluate nature and extent of contamination once the building is demolished. Estimated number of samples is provided on Table 15. Proposed sample locations are shown on Figure 12. Samples will be collected at depth to characterize potential sources of PCBs. In addition, some additional surface soil sampling is recommended as part of the human health and ecological risk evaluation

to address requirements for the full list TCL/TAL parameters. A surface sample will be collected from the borings to support risk assessment.

5.2 Human Health Risk Assessment

As stated in Section 3, the data available for soil and sediment in the stream bed and banks generally appears to be sufficient for most COPCs. However the following additional sample parameters, sample locations, and environmental media are recommended:

5.2.1 Additional Samples

As noted on Table 8, several most of the properties have sufficient samples to meet HHRA guidelines for the majority of analytical parameters. In Upson Park, there are limited samples in the park area and additional sampling is recommended as noted on Table 13. Many of the areas have limited data for select parameters including pesticides, SVOCs, dioxin/furan and pesticides. Additional surface sampling is recommended to provide full TCL/TAL parameters. Surface water, sediment and soil samples will be collocated with samples for sediment and surface water toxicity and tissue sampling on the various properties as shown on Figures 9 to 13. These samples are also usable for risk assessment and should provide all the required data for non-site related contaminants.

5.2.2 Additional Environmental Media

Additional samples to assess exposure pathways from fish consumption are recommended as noted on Table 10.

5.2.3 Additional Sampling Locations

Suitable comparison or background areas need to be identified, sampled and analyzed to establish general area concentrations of chemicals that might be site-related COPCs. The background samples are summarized on Table 15.

5.3 Ecological Risk Assessment

Recommendations for further sampling are presented for the Creek channel and each individual property within the Creek Corridor.

5.3.1 Additional Samples

As discussed in Section 3, several the Creek channel and most properties in OU2 have sufficient sample data to assess contaminant exposure for the majority of analytical parameters, but there is not sufficient data for all parameters for all media. For example, previous investigations have not assessed biological uptake or toxicity of contaminated media to wildlife or other ecological receptors. Additional sampling is recommended as summarized below and noted on Tables 10 through 14. The locations of recommend samples are shown on Figures 9 to 13.

Creek Channel

Table 10 provides a summary of data gaps and recommended additional sampling to fill the data gaps. The recommendations are summarized below.

- Additional sampling is recommended to evaluate sediment toxicity and bioaccumulation for the BERA. Data collected for OU3 will be used to develop biota-sediment bioaccumulation factors until changing concentrations warranted OU2 specific factors.
- A surface water evaluation of dissolved PCBs was completed, but no other contaminants were analyzed for, and no studies of general water quality were done. Additional surface water sampling is recommended to evaluate surface water chemistry and toxicity for the BERA.
- Collection of fish-forage composite samples for analysis of site-related contaminants is recommended for the BERA.

Approximate locations for the sediment and surface water toxicity samples are shown on Figure 9. The specific locations will be chosen based on more detailed review of existing data. The samples collection should cover a range of contaminant concentrations (low, medium, high) so that both toxic and non-toxic samples are collected. Because contaminant concentrations in sediment vary with grain size, a range of sediment textures (sand, silt, etc.) should be sampled.

Flintkote Property

Table 11 provides a summary of data gaps and recommended additional sampling to fill the data gaps. The recommendations are summarized below.

- New soil data for select parameters is recommended; and
- Collection of vegetation, earthworm, and small mammal data are recommended for the BERA. Biota samples should be collocated with new soil samples so that site-specific biota soil accumulation factors can be developed for the site.

United Paper Property

Table 12 provides a summary of data gaps and recommended additional sampling to fill the data gaps. The recommendations are summarized below.

- New soil data for select parameters is recommended; and
- Collection of vegetation, earthworm, and small mammal data are recommended for the BERA. Biota samples should be collocated with new soil samples so that site-specific biota soil accumulation factors can be developed for the site.

Upson Park

Table 13 provides a summary of data gaps and recommended additional sampling to fill the data gaps. The recommendations are summarized below.

- Insufficient surface soil data are available for the Upson Park Property. Additional sampling is recommended to define the nature and extent of contamination and for risk assessment purposes; and
- Collection of vegetation, earthworm, and small mammal data are recommended for the BERA. Biota samples should be collocated with new soil samples so that site-specific biota soil accumulation factors can be developed for the site.

White Transportation

Table 14 provides a summary of data gaps and recommended additional sampling to fill the data gaps. The recommendations are summarized below.

- New soil data for select parameters is recommended; and
- Collection of vegetation, earthworm, and small mammal data are recommended for the BERA. Biota samples should be collocated with new soil samples so that site-specific biota soil accumulation factors can be developed for the site.

5.3.2 Additional Environmental Media

As noted above, for each property within OU2 collection of vegetation, earthworm, and small mammal data are recommended for the BERA. The number of samples and locations noted on the tables may be reduced based on the results of the SLERA that will be conducted for each property. For example, if no risks to herbivorous wildlife are found in the SLERA, then collection of plant tissues for chemical analysis will be necessary.

5.3.3 Additional Sampling Locations

Suitable comparison or background areas need to be identified and sampled to establish background concentrations of chemicals that might be site-related. One possible reference area is the East Branch of Eighteen Mile Creek, but additional field reconnaissance and data review is required to determine if suitable aquatic and terrestrial habitats exist therein.

5.4 Sediment Erosion and Deposition Analysis

The existing NYSDEC ROD recommended complete sediment excavation of Creek channel and therefore further modeling of existing conditions is not recommended. Modeling of sediment transport may be required to support further evaluation of alternatives other than complete removal alternative selected by NYSDEC.

However as part of future Remedial Design, hydraulic and hydrologic models need to be created for the Creek. The models are expected to be used for evaluating the impacts of the proposed design (including sediment excavation and dam removal). The models will need to address inputs from CSOs and runoff.

Tables

Table 1

Summary and Evaluation of Historical Data

Eighteen Mile Creek Superfund Site - Operable Unit 2

Investigations	Study Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use	Import Data for RI	Validate Data for RI	*Samples in Supplemental RI Database*			*Summary of Samples by Data Use*		
									Properties	PCBs	Other Tests	Risk	Nature and Extent	Fate and Transport
NYSDEC 1998. Eighteenmile Creek and Olcott Harbor Sediment Study.	NYSDEC 1998	OU 2 and 3	Sediment sampling at 8 sites on Eighteenmile Creek, tributaries, and Barge Canal. Sampling was completed in 1994.	The report provides detailed description of data collection and data validation procedures. Laboratory results are attached in the appendix. The data is only source of dioxin data for the sediment and therefore can be used for screening purposes. Surface contamination and toxicity results are greater than 10 years old and not representative of current conditions.	A partial data set is available electronically for PCBs, Dioxin and Furan and PCB Congener data from Trophic Trace Model. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites. Additional data entry is needed for other parameters and individual compounds.	Dioxin data will be used for risk assessment. Subsurface sediment will be used for nature and extent.			Creek	2	2	2	2	2
NYSDEC. 2000. Site Investigation Report. Former Flintkote Site 198 and 300 Mill Street.	NYSDEC 2000	OU 2 Flintkote and Creek Channel	Sediment, soil, waste, and surface water samples from NYSDEC sampling event in 1999. Report includes a summary of historical sediment data. The report reports only the positive detections and no data packages are provided. Report is the only evidence of dioxin analysis of waste samples in which dioxin was only detected in a few samples.	The report provides detailed description of data collection, but only reports positive hits for analytical data. Analytical data reports are not available. The data is only source of dioxin data for for soils and therefore will be used for screening purposes.	None of the data are available electronically. Sediments were handled under NYSDEC 2004 report. Results will need to entered from the summary tables and validation memos. NYSDEC should have coordinates from CAD drawings.	Data are not usable for risk assessment.			Flintkote and Creek Channel					
NYSDEC. 2004. Site Investigation Scope of Work. Eighteenmile Creek Corridor: New York State Barge Canal to North Transit Road.	NYSDEC 2004	OU1 and 2	The scope of work summarizes initial data collection for Eighteenmile Creek Corridor site and Water Street residential sampling including sediments from Flintkote SI (NYSDEC 2000). Data from historical investigations are compiled for PCBs and lead from select samples from NYSDEC 1998, 1999 and NYSDEC 2001.	Results are summarized from the previous DEC investigations include the 1998 and 2001 creek reports that are evaluated separately. Samples collected in 1996 and 1999 are presented by no data packages or details are available. Data are usable for risk assessment.	A partial data set is available electronically for PCBs and metals for 1996 and 1999 samples. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites.	Data are not usable for risk assessment.			Flintkote and Creek Channel		10			10
TVGA. 2005. Site Investigation Report. Former Flintkote Site 198 and 300 Mill Street.	NCDP 2005	OU2	Work was conducted to support the evaluation of alternatives for Flintkote by a TVGA under contract to Niagara Count Department of Planning. Samples include building, groundwater, and surface and subsurface soils. NYSDEC Site Investigation report is attached.	Data generated by TVGA are provided along with data validation memorandum. Full data packages were validated but not provided. Data latest sampling for most of the Flintkote property.	None of the data are available electronically. Results will need to entered from the summary tables and validation memos. NYSDEC should have coordinates from CAD drawings.	Data are usable for risk assessment and fate transport following entry of laboratory data.	Yes	Yes	Flintkote and Creek Channel	35	35	35	35	35
NYSDEC. 2006a. Remedial Investigation Report, Eighteenmile Creek Corridor, Lockport.	NYSDEC RI	OU1 and 2	Sediment and soil sampling in corridor site between NYS Barge Canal and the Flintkote Plant is presented. Sediment results include PCBs and select metals.	Sediment data are considered useable for nature and extent of contamination.	Sediment results for PCBs and lead were available electronically were imported into the GLNPO RI database. Additional data was entered from the original report for missing COPCs. Data from OU1 was validated and loaded into EPA Region 2 data format. Remaining data will be obtained from NYSDEC and validated as part of EPA RI.	Data are usable for risk assessment and fate transport following validation of data packages DEC provided.	Yes	Yes	Creek, Upson, White, and United Paperboard	85	85	85	85	85
EEEPC.2009a. Final Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor . Prepared for the NYSDEC.	NYSDEC SRI	OU1 and 2	Sediment, soil, waste, and groundwater samples from Upstream, Barge Canal, Upson Park, White Trans. Property, United Paperboard, Flintkote Plant, and downstream of Flintkote Plant are presented. PCB, TOC, Pesticides, PAH, and metals data are available for the sediments.	All data were formally validated and data packages and data usability memos are available. Data are considered usable for EPA RI.	Sediment data are included in the GLNPLO RI database, soils and water data need to be imported. SE matrix code indicates sediments from creek.	Data was validated and memos and field notes were provided in the DVD.	Yes		Creek, Upson, White, and United Paperboard	200	200	200	200	200

Table 1

Summary and Evaluation of Historical Data

Eighteen Mile Creek Superfund Site - Operable Unit 2

Investigations	Study Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use	Import Data for RI	Validate Data for RI	*Samples in Supplemental RI Database*			*Summary of Samples by Data Use*		
									Properties	PCBs	Other Tests	Risk	Nature and Extent	Fate and Transport
EEEPC. 2009b. Final Additional Investigation Addendum to the Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor . Prepared for the NYSDEC.	NYSDEC SRI-A	OU2	Report presents additional activities to support SRI, including groundwater, PISCES, and sediment samples from the Erie Canal were collected and analyzed for PCB, metals and TOC.	All data were formally validated and data packages and data usability memos are available. Data are considered usable for EPA RI.	Sediment data are included in the GLNPLO RI database, soils and water data need to be imported. SE matrix code indicates sediments from creek.	Data was validated and memos and field notes were provided in the DVD.	Yes		Erie Canal	12	12		12	12
NYSDEC. 2001a. Final Report, Eighteenmile Creek Sediment Study, Summary of August 17-20 and November 3, 1998 Results.	NYSDEC 2001	OU 2 and 3	Sediment sampling at 12 sites on Eighteenmile Creek, tributaries, and Barge Canal, water column sampling to evaluate sediment transport from Barge Canal to Eighteenmile Creek. Sampling was completed in 1998. Some of the sampling sites were the same location as the NYSDEC 1998. Provides a detailed description of dioxin and furan data. Report includes radiodating of cores behind Newfane and Burt Dam.	The report provides detailed description of data collection and data validation procedures. Laboratory results are attached in the appendix. The data is only source of dioxin data for the sediment and therefore can be used for screening purposes. Surface contamination and toxicity results are greater than 10 years old and not representative of current conditions.	A partial data set is available electronically for PCBs and metals as well as Dioxin/Furan and PCB Congener data from Trophic Trace Model. The available sediment data were imported into GLNPO RI database. Additional data was entered from the original report for missing COPCs. Only total concentrations were entered for PCBs, PAHs, and DDT metabolites. Additional data entry is needed for dioxins and individual compounds.	Dioxin data will be used for risk assessment. Subsurface sediment will be used for nature and extent. Radiodating will be used to evaluate historical deposition.			Creek	2	13	13		2
NYSDEC 2010c. Results From The Sampling Of Erie Canal Suspended Sediments And Creek Waters For PCBs. Eighteen Mile Creek Corridor Site.	NYSDEC 2010	OU2	Additional suspended sediment and water column above sediment sampling for PCB Aroclors in Erie Canal, creek, millrace, and offsite locations.	Data are used to evaluate fate and transport of sediment from Barge Canal. A limited set of pisces samples are available. Data may be useful for evaluation of alternatives.	Data could be usable for PCB comparison in the water column. Suspended sediment sampling was unsuccessful. Filter media used for sediment collection were cut submitted for PCB analysis (extracted, analyzed and reported similar to a "wipe" type samples). There were no positive detections found in these samples. Data were not available electronically and not directly related to nature and extent.	Data are usable for evaluating fateand transport.			Creek	6			6	0
Ecology and Environment, Inc. 2007. Final Report for the Eighteenmile Creek PCB Source Trackdown Project. Prepared for NCSWCD.	NCSWCD 2007	OU2	Presents sediment data from Reach 7 and tributaries. PCB and metals results from sediment cores and PCB screening results from sediment grab samples are available electronically.	Data was validated and data review memos are available. Sediment data from the cores are considered usable for the RI.	Sediment data are included in the GLNPO RI database.	Data are usable for risk assessment and fate and transport.	Yes		Creek	6	15	15	15	15
CH2MHILL and EEEPC 2012. Remedial Investigation Report. Eighteenmile Creek Area of Concern (AOC). Prepared for EPA GLNPO.	USEPA GLNPO	OU2 and OU3	Sediment data from Reaches 2 through 7 in the AOC. However sediment data was compiled for OU2 sediment samples only.	Summary of sediment results for PCB Aroclor, metals, PAHs, PCB Congeners and pesticide analysis. Results were evaluated for usability and verifyed against hard copy reports.	RI report is available electronically along with data packages. Sediment data are included in the GLNPO RI database.	Data are usable for risk assessment and fate and transport.			Creek	NA	NA	NA	NA	NA
						Totals	5	2		348	372	350	355	361

Table 2

Summary of Sampling Data for RI/FS OU2.

Eighteen Mile Creek Superfund Site - Creek Sediment (DEC OU1)

Sample Location	Number of Studies	Sample Date Range		Number of Samples												
				PCB Aroclors	PCB Congeners	Metals	Mercury	PAH/ SVOCs	Pesticides	Dioxins/ Furans	Total Organic Carbon	Lipids and Moisture Content	AVS/SEM	Sediment Toxicity	Sediment Bioaccumulation	Other
Sediment																
Creek	3	9/1/05	4/25/07	23	--	19	2	4	4	--	6	--	--	--	--	--
Creek	3	8/17/98	4/24/07	110	2	112	1	23	23	2	22	--	--	--	--	--
Creek_E	2	9/1/05	4/25/07	13	--	13	2	6	6	--	4	--	--	--	--	--
Totals				**146**	**2**	**144**	**5**	**33**	**33**	**2**	**32**	**0**	**0**	**0**	**0**	**0**
Canal	4	8/20/98	12/6/08	36	10	45	10	12	4	10	20	--	--	--	--	--
Upstream	1	8/17/98	4/25/07	2	1	3	--	3	3	1	2	--	--	--	--	--
Totals				**38**	**11**	**48**	**10**	**15**	**7**	**11**	**22**	**0**	**0**	**0**	**0**	**0**
Surface Water																
Creek	1	8/9/09	8/9/09	2	--	--	--	--	--	--	--	--	--	--	--	--
Creek	1	11/1/08	8/9/09	1	--	--	--	--	--	--	--	--	--	--	--	2
Creek_E	1	11/1/08	8/9/09	--	--	--	--	--	--	--	--	--	--	--	--	1
Totals				**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
Canal	1	11/1/08	8/9/09	2	--	--	--	--	--	--	--	--	--	--	--	3
Upstream	1			--	--	--	--	--	--	--	--	--	--	--	--	--
Totals				**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**
Biological																
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TOC = Total organic carbon
TSS = Total suspended solids

Table 3

Summary of Sampling Data for RI/FS OU2.

*Eighteen Mile Creek Superfund Site - **Flintkote Property (DEC OU2)***

Sample Location	Number of Studies	Sample Date Range		Number of Samples											
				PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	Toxicity	TCLP
Surface Soil/ Fill															
Property	2	9/15/03	2/1/09	18	--	22	18	12	12	--	--	--	--	--
South Bank	2	9/15/03	2/1/09	14	--	14	14	2	2	--	--	--	--	--
Totals				**32**	**0**	**36**	**32**	**14**	**14**	**0**	**0**	**0**	**0**	**0**
Subsurface Soil															
Property	1	9/8/03	9/25/03	23	--	23	23	23	23	--	23	--	--	--
South Bank	1	9/8/03	9/25/03	2	--	2	2	2	2	--	2	--	--	--
Totals				**25**	**0**	**25**	**25**	**25**	**25**	**0**	**25**	**0**	**0**	**0**
Groundwater															
Property/ Millrace	1	10/2/03	10/3/03	13	--	13	13	13	--	--	13	--	--	--
Totals				**13**	**0**	**13**	**13**	**13**	**0**	**0**	**13**	**0**	**0**	**0**
Biological															
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 4

Summary of Sampling Data for RI/FS OU2.

*Eighteen Mile Creek Superfund Site - **United Paper Property (DEC OU3)***

Sample Location	Number of Studies	Sample Date Range		Number of Samples									
				PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP
Surface Soil/ Fill													
Property	2	4/1/05	2/1/09	44	--	41	30	22	15	--	--	--	2
South Bank	2	4/1/05	2/1/09	3	--	3	3	3		--	--	--	--
Totals				**47**	**0**	**44**	**33**	**0**	**15**	**0**	**0**	**0**	**2**
Subsurface Soil													
Property	2	4/1/05	2/1/09	33	--	31	28	16	--	--	--	--	4
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--
Totals				**33**	**0**	**31**	**28**	**16**	**0**	**0**	**0**	**0**	**4**
Groundwater													
Property/South Bank	2	7/1/07	2/1/09	6	0	6	6	6	6	--	7	--	--
Totals				**6**	**0**	**6**	**6**	**0**	**6**	**0**	**7**	**0**	**0**
Biological													
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 5

Summary of Sampling Data for RI/FS OU2.

Eighteen Mile Creek Superfund Site - Upson Park (DEC OU4)

Sample Location	Number of Studies	Sample Date Range		Number of Samples									
				PCB Aroclors	PCB Congeners	Metals	Mercury	PAH/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP
Surface Soil/ Fill													
Creek Bank	2	4/1/05	2/1/09	26	--	26	22	11	7	0	--	--	0
Picnic Area	2	4/1/05	2/1/09	3	--	3	3	2	2	0	--	--	1
Totals				**29**	**0**	**29**	**25**	**13**	**9**	**0**	**0**	**0**	**1**
Subsurface Soil													
Property	2	4/1/05	2/1/09	19	--	19	20	4	--	--	--	--	6
Totals				**19**	**0**	**19**	**20**	**4**	**0**	**0**	**0**	**0**	**6**
Groundwater													
Property/South Bank	2	7/1/07	2/1/09	4	--	4	4	4	4	--	6	--	0
Totals				**4**	**0**	**4**	**4**	**4**	**4**	**0**	**6**	**0**	**0**
Biological													
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 6

Summary of Sampling Data for RI/FS OU2.

*Eighteen Mile Creek Superfund Site - **White Transportation Property (DEC OU5)***

Sample Location	Number of Studies	Sample Date Range		Number of Samples									
				PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP
Surface Soil/ Fill													
Property	2	4/1/05	2/1/09	20	--	20	16	10	6	--	--	--	1
Totals				**20**	**0**	**20**	**16**	**10**	**6**	**0**	**0**	**0**	**1**
Subsurface Soil													
Property	2	4/1/05	2/1/09	13	--	13	13	6	--	--	--	--	--
Totals				**13**	**0**	**13**	**13**	**6**	**0**	**0**	**0**	**0**	**0**
Groundwater													
Property/South Bank	1	7/1/07	2/1/09	4	--	4	4	4	4	--	4	--	0
Totals				**4**	**0**	**4**	**4**	**4**	**4**	**0**	**4**	**0**	**0**
Biological													
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Key:

SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 7

Preliminary Selection of Exposure Pathways for Human Health Risk Assessment Purposes

Eighteenmile Creek Superfund Site - Operable Unit 2

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current and Future	Soil	Soil	Upson Park	Site Visitors	Children, Adolescents and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Public Park; Contaminants may be present.
				Maintenance Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Area is mostly wooded but grassy areas may require groundskeeper maintenance.
			White Transportation	Site Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Active commercial facility; contaminants may be present.
				Construction/ Utility Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Construction and/or subsurface Utility maintenance work may occur.
				Site Visitors/ Trespassers	Adults and Adolescents	Ingestion, Dermal Contact, Inhalation	Qualitative	Exposure expected to be less than Site Workers
			United Paperboard	Site Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Active industrial facility; contaminants may be present.
				Construction/ Utility Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Construction and/or subsurface Utility maintenance work may occur.
				Site Visitors/ Trespassers	Adults and Adolescents	Ingestion, Dermal Contact, Inhalation	Qualitative	Exposure expected to be less than Site Workers
			Flintkote	Site Visitors/ Trespassers	Adults and Adolescents	Ingestion, Dermal Contact, Inhalation	Qualitative	Exposure expected to be less than Site Workers
				Construction/ Utility Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Construction and/or subsurface Utility maintenance work may occur.
			Eighteenmile Creek Banks	Anglers and other Site Visitors	Children and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Anglers and other Site Visitors use the creek banks; contaminants are known to be present.
	Sediment	Sediment	Eighteenmile Creek Bed	Anglers and other Site Visitors	Children, Adolsecents and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Anglers and other Site Visitors may wade in the creek; contaminants are known to be present.
	Fish Tissue	Fish Tissue	Eighteenmile Creek	Sport Anglers and their families	Children, Adolescents and Adults	Ingestion	Quantitative	Anglers and their families may consume fish caught from the creek. Fish caught from the creek are known to be contaminated.
				Hmong Anglers (subsistance fishers?) and their families	Children, Adolescents and Adults	Ingestion	Quantitative	Hmong anglers and their families may consume fish caught from the creek at subsistance levels. Fish caught from the creek are known to be contaminated.
Future	Soil	Soil	Flintkote	Site Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Former industrial facility; may be used as a commercial or industrial facility in the future; contaminants known to be present.
	Soil	Soil	Eighteenmile Creek Bed	Recreational users	Children, Adolsecents and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Recreational users hike along the banks if the Canalway trail is expanded; contaminants are known to be present.
	Sediment	Sediment	Eighteenmile Creek Bed	Recreational users	Children, Adolsecents and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Recreational users may wade in the creeks; contaminants are known to be present.
	Groundwater	Tap Water	OU2-wide	Residents	Children and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Groundwater might be used as a source of potable water in the future.

Table 8

Summary of Soil Sampling Data for RI/FS OU2, Data Gaps, and Recommended Additional Sampling Available for Human Health Risk Assessment Purposes

Eighteen Mile Creek Superfund Site - Operable Unit 2

				Sample Counts by Parameter Group							
Property	Area (acres)	Human Exposure Area	Sample Depth	PCB Aroclors	PCB Congeners	Metals	Mercury	PAH/ SVOCs	Pesticides	Dioxins/ Furans	VOCs
FORMER FLINTKOTE PLANT SITE	6	Plant Site	< 6 in	15		17	15	12	12		
		Plant Site	> 6 in < 1.5 ft	3		5	3				
		Across Bank	< 6 in	11		11	11	2	2		
		Across Bank	> 6 in < 1.5 ft	3		3	3				
		Total Surface		32		36	32	14	14		
		Plant Site	Subsurface	23		23	23	23	23		23
		Across Bank	Subsurface	2		2	2	2	2		2
FORMER UNITED PAPERBOARD COMPANY	4.8	Plant Site	< 6 in	32		31	22	18	13		
		Plant Site	> 6 in < 1.5 ft	10		8	6	2			
		Across Bank	< 6 in	3		3	3	3			
		Off Bank	< 6 in	2		2	2	2	2		
		Total Surface		47		44	33	25	15		
			Subsurface	33		31	28	16			
UPSON PARK	5.9	Creek Bank	< 6 in	17		17	15	9	7		
		Creek Bank	> 6 in < 1.5 ft	9		9	7	2			
		Picnic Area	< 6 in	3		3	3	2	2		
		Total Surface		29		29	25	13	9		
			Subsurface	19		19	20	4			
WHITE TRANSPORTATIO N	2.6	Plant Site	< 6 in	11		11	9	7	5		
		Plant Site	> 6 in < 1.5 ft	5		5	3	2			
		Off Bank	< 6 in	3		3	3	1	1		
		Off Bank	> 6 in < 1.5 ft	1		1	1	0			
		Total Surface		20		20	16	10	6		
			Subsurface	13		13	13	6			

Note: Highlight cells have sample counts below 10 the recommended frequency for ProUCL Tech Guide

Table 9

Preliminary List of Candidate Assessment Endpoints, Risk Questions, and Measures for the Baseline Ecological Risk Assessment

Eighteen Mile Creek Superfund Site - Operable Unit 2

Assessment Endpoint	Representative Species	Risk Question	Measure	Analysis Approach
Terrestrial Vegetation (OU2, all properties)				
Survival, growth, and reproduction of plants	All plants that obtain nutrients primarily from soil	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of plants?	Surface-soil contaminant concentrations.	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on plants.
Soil Invertebrates (OU2, all properties)				
Survival, growth, and reproduction of soil invertebrates	All soil invertebrates	Are contaminant concentrations in surface soil greater than screening levels for effects on survival, growth, or reproduction of soil invertebrates?	Surface-soil contaminant concentrations.	Compare surface-soil contaminant concentrations with literature-based soil screening levels for effects on soil invertebrates.
Herbivorous, Insectivorous and Carnivorous Terrestrial Birds (OU2, all properties)				
Survival, growth, and reproduction or terrestrial birds	Sparrow, American robin, Red-shouldered hawk	Does the daily dose of contaminants received from ingestion of soil or sediment, surface water, and food items exceed TRVs for survival, growth, or reproduction of birds?	Contaminant concentrations in soil, sediment, surface water, and food items.	Modeled dose from ingestion of soil or sediment, surface water, and food items compared with literature-based TRVs.
Herbivorous, Insectivorous and Carnivorous Terrestrial Mammals (OU2, all properties)				
Survival, growth, and reproduction or terrestrial mammals	Meadow vole, Short-tailed shrew, weasel	Does the daily dose of contaminants received from ingestion of soil or sediment, water, and food items exceed TRVs for survival, growth, or reproduction of mammals?	Contaminant concentrations in soil, sediment, surface water, and food items.	Modeled dose from ingestion of soil or sediment, surface water, and food items compared with literature-based TRVs.
Herbivorous, Insectivorous, and Carnivorous Aquatic-Dependent Mammals (OU2 [creek] and OU3)				
Survival, growth, and reproduction or aquatic mammals	Muskrat, Raccoon, Mink, Bat	Does the daily dose of contaminants received from ingestion of sediment, water, and food items exceed TRVs for survival, growth, or reproduction of mammals?	Contaminant concentrations in sediment, surface water, and food items.	Modeled dose from ingestion of sediment, surface water, and food items compared with literature-based TRVs.
Herbivorous, Insectivorous, and Carnivorous Aquatic-Dependent Birds (OU2 [creek] and OU3)				
Survival, growth, and reproduction or aquatic birds	Mallard, Swallow, Heron	Does the daily dose of contaminants received from ingestion of sediment, water, and food items exceed TRVs for survival, growth, or reproduction of birds?	Contaminant concentrations in sediment, surface water, and food items.	Modeled dose from ingestion of soil or sediment, surface water, and food items compared with literature-based TRVs.

Table 9

Preliminary List of Candidate Assessment Endpoints, Risk Questions, and Measures for the Baseline Ecological Risk Assessment

Eighteen Mile Creek Superfund Site - Operable Unit 2

Assessment Endpoint	Representative Species	Risk Question	Measure	Analysis Approach
Benthic Macroinvertebrates (OU2 [creek] and OU3)				
Survival, growth, and reproduction of benthic macroinvertebrates	All freshwater benthic macroinvertebrates	Are contaminant concentrations in sediment greater than screening levels for effects on survival, growth, or reproduction of benthos?	Contaminant concentrations in sediment.	Compare sediment contaminant concentrations with literature-based sediment screening levels for effects on benthic macroinvertebrates.
		Is the survival and growth of lab-reared benthic organisms in site sediment less than their survival and growth in clean control sediment and reference area sediment?	Sediment toxicity test results	Compare survival and growth in site sediment with survival and growth in clean control sediment and reference area sediment as described in EPA protocols.
Aquatic Biota Exposed to Surface Water (OU2 [creek] and OU3)				
Survival, growth, and reproduction of aquatic organisms exposed to surface water	Fish, invertebrates, amphibians, and plants	Are contaminant concentrations in surface water greater than water quality criteria for protection of aquatic organisms?	Surface-water contaminant concentrations.	Compare surface-water contaminant concentrations with water quality criteria and standards.
		Is survival and growth of laboratory-reared organisms in site surface water less than survival and growth in clean control water?	Surface water toxicity test results	Compare survival and growth in site surface water with survival and growth in clean control water as described in EPA testing protocol.
		Are contaminant concentrations in fish tissues from the site greater than or equal to critical fish tissue concentrations?	Contaminant concentrations in fish tissue samples	Compare contaminant concentrations in fish tissue samples with critical fish tissue concentrations for effects on fish.

Key:

BAP = Biological Assessment Profile (of index values, NYSDEC 2009, page 62).

EPA = Environmental Protection Agency

NYSDEC = New York State Department of Environmental Conservation

OU2 = Operational Unit 2 (Corridor Site)

OU3 = Operational Unit 3 (Rest of Creek)

TRV = Toxicity Reference Value

Table 10

Summary of Data Gaps and Recommended Additional Sampling.

Eighteen Mile Creek Superfund Site - Creek Sediment (DEC OU1)

Matrix and Data Gap	Note	Number of Samples													Remarks
		PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	Total Organic Carbon	Lipids and Moisture Content	AVS/SEM	Sediment Toxicity	Sediment Bioaccumulation	Other	
Sediment	***Existing data adequate for determining extent of contamination. Additional sediment data needed for HHRA and BERA purposes for missing parameters. Full TCL/TAL scan for new sediment samples for risk assessment purposes.***														
BERA Data Gap (Sediment Toxicity)	Sediment toxicity tests with benthic macroinvertebrates have not been conducted with Corridor site sediment. The tests provide direct evidence of sediment toxicity, or lack thereof, and are a critical element of the sediment quality triad approach. Standard EPA tests with *Hyalella* (amphipod) and *Chironomus* (midge) are available. Testing would be focused on depositional areas.	--	--	--	--	--	--	--	--	--	--	8	--	--	Three *Chironomus* (midge) tests and three *Hyalella* (amphipod) tests for a total of six tests. A reference area also will be sampled for both tests.
BERA Data Gap (Sediment Chemistry)	Co-located samples collected at locations were sediment toxicity and bioaccumulation are assessed. Sediment chemistry is another element of the sediment quality triad approach. AVS/SEM is recommended to help evaluate metals bioavailability. Full TCL/TAL scan typically needed for Superfund. Existing sediment chemistry data < 10 years old is assumed to be usable for risk assessment purposes.	4	--	4	4	4	4	4	4	--	4	--	--	--	Three site samples and one reference sample. Analyze samples for TCL/TAL parameters at two depths to provide additional data for risk assessment.
HHRA and BERA Reference (Sediment Chemistry)	Background data are needed for risk assessment. Full TCL/TAL scan typically needed for risk assessment. Data also can be used for OU3.	10	--	10	10	10	10	10	10	--	--	--	--	--	The reference sample collected for sediment toxicity can be used for one of the locations.
Surface Water	***A surface water evaluation of dissolved PCBs was completed, but no other contaminants were analyzed for and no studies of general water quality are done.***														
HHRA and BERA Data Gap (Surface Water Chemistry)	All aquatic organisms are exposed to surface water and wildlife consume water from the creek. Existing surface water data for the Corridor site (one sample for PCBs) is inadequate for BERA purposes. Other includes TSS, TOC, and water-quality parameters (field measured). Full TCL/TAL scan needed for Risk Assessment.	--	4	4	4	4	4	4	--	--	--	4	--	4	Three site samples and one reference sample. Sample locations are co-located with the sediment chemistry samples. For low level analysis, analyze for PCB congeners.
BERA Data Gap (Surface Water Toxicity)	Surface water bioassays with laboratory-reared organisms have not been conducted at the Corridor site. The tests provide direct evidence of surface water toxicity, or lack thereof. Standard EPA tests with the fathead minnow and *Ceriodaphnia* (water flea) are available.	--	--	--	--	--	--	--	--	--	--	8	--	--	Three fathead minnow tests and three *Ceriodaphnia* (water flea) tests for a total of six tests at the site. Each test will also be run wirh a reference area sample.
Biological	***No fish tissue data. Fish-eating wildlife in the Corridor site were observed in previous studies. Fish and other tissue data are recommended to perform the HHRA and BERA.***														
BERA Data Gap (Forage Fish)	No data for PCBs and metals in forage fish (e.g., juvenile sunfish) from the Corridor site are available. The data are needed to develop reliable exposure estimate for piscivorous wildlife to site-related contaminants. Full TCL/TAL scan needed for Risk Assessment.	20	--	20	20	20	20	20	--	20	--	--	--	--	Ten site and 10 reference area samples. Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Creek (lead, zinc, copper). Additional sampling may not be needed following SLERA. Reference locations may be shared with OU3.
HHRA Data Gap Sport Fish (Fillet)	No data for PCBs and metals in edible fish (e.g., largemouth bass, bullhead) from the Corridor site are available. The data are needed to develop reliable exposure estimate for human health to site-related contaminants. Full TCL/TAL scan needed for Risk Assessment.	20	--	20	20	20	20	20	--	20	--	--	--	--	Ten site and 10 reference area samples. Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Creek (lead, zinc, copper). Additional sampling may not be needed following screening level HHRA. Reference locations may be shared with OU3.

Key:

AVS/SEM = Acid Volatile Sulfide / Simultaneously Extracted Metals
BERA = Baseline ecological risk assessment
BSAF = Biota soil (or sediment) accumulation factor
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL/TAL = Target compound list/Target Analytical List
TOC = Total organic carbon
TSS = Total suspended solids

Table 11

Summary of Data Gaps and Recommended Additional Sampling.

Eighteen Mile Creek Superfund Site - Flintkote Property (DEC OU2)

Matrix and Data Gap	Note		Number of Samples										Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	Toxicity	
Surface Soil/ Fill	***Insufficient recent surface soil data are available for ecological risk assessment purposes or characterize extent of contamination. Data has not been validated for full usability and is close to > 10 years old. Full TCL/TAL are required for risk assessment purposes.***												
BERA and HHRA Data Gap	Full TCL/TAL scan required for risk assessment. Existing database does not include all historical data. Surface intervals will be collected in conjunction with the subsurface borings.		*10*	--	*10*	*10*	*10*	*10*	*10*	*10*	--	--	Additional analytical parameters are needed for risk asssesment. Additional parameters will be analyzed with the borings and colocated soils with terrestrial biota.
BERA Data Gap (Property)	Needed at locations were terrestrial biota samples are collected (see below) so that site-specific soil-to-organism bioaccumulation factors (BAFs) can be calculated (i.e., soil and biota samples will be collcated). Full TCL/TAL scan required for risk assessment.		6	--	6	6	6	6	6	6	--	--	Samples are expected to collected near the bank in active habitat areas. Samples can be grouped with samples from other properties. Samples are collected at two depths for risk assessment purposes and analyzed for Full TCL/TAL.
HHRA and BERA Background Data	Background data are needed for risk assessment. Full TCL/TAL scan typically needed for Superfund. Data also can be used for all properties.		7	--	7	7	7	7	7	7	--	--	Reference location in conjunction with the colocated biota samples may be used for a total of 10 samples. Samples should be collected at two depths to compare to onsite data.
Subsurface Soil	***Insufficient recent subsurface data under the building to characterize PCB contamination.***												
Data Gap	Additional 10 Borings and 30 Samples to assess PCB contamination beneath building. Samples will be collected at the surface as noted above and two subsurface depths. Additional samples may be needed if staining is present.		20	--	20	20	20	20	20	20	--	--	Additional analytical parameters are needed for risk asssesment. Additional parameters will be analyzed with the borings subsamples.
Groundwater	***Groundwater migration to the surface water is established. Further investigation not required due to full excavation. The potential migration of PCB groundwater to the Creek sediment has not been assessed.***												
	Passive samplers will be used to estimate the flux of PCBs to the sediment from groundwater.		--	--	--	--	--	--	--	--	15	--	
Biological	***No biological tissue data have been collected. Such data are recommended to perform the baseline ecological risk assessment as described below.***												
BERA Data Gap (Tissue Data)	No tissue data have been collected from this property. Vegetation, earthworm, and small mammal data are needed to develop reliable exposure estimate for herbivorous, omnivorous, and carnivorous terrestrial wildlife species at the site. Tissue and soil sample data from this property can be pooled with data from other commercial properties in the Corridor site to develop site-specific BSAF equations.	Vegetation	3	3	3	3	3	3	3	--	3	--	Based on the SLERA results, it may be possible to omit PCBs, pesticides, dioxins/furans, and perhaps other contaminants for plants and other tissue sample types, but this will not be known for certain until the SLERA is completed.
		Earthworms	3	3	3	3	3	3	3	--	3	--	
		Small Mammal	3	3	3	3	3	3	3	--	3	--	
BERA Background (Tissue Data)	Background data are needed for risk assessment. ata also can be used for all properties.	Vegetation	3	3	3	3	3	3	3	--	3	--	Based on the SLERA results, it may be possible to omit PCBs, pesticides, dioxins/furans, and perhaps other contaminants for plants and other tissue sample types, but this will not be known for certain until the SLERA is completed.
		Earthworms	3	3	3	3	3	3	3	--	3	--	
		Small Mammal	3	3	3	3	3	3	3	--	3	--	

Key:

BERA = Baseline ecological risk assessment
BSAF = Biota soil (or sediment) accumulation factor
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL/TAL = Target compound list/Target Analytical List
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lip

Table 12

Summary of Data Gaps and Recommended Additional Sampling.

Eighteen Mile Creek Superfund Site - United Paper Property (DEC OU3)

Matrix and Data Gap	Note		Number of Samples										Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	PAH/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP	
Surface Soil/ Fill	***Sufficient samples were collected for risk assessment and FS purposes for some parameters only. Additional sampling is recommended to evaluate the nature of contamination and to allow calculation of biota soil accumulation factors (biota samples and surface soil samples will be collocated for this purpose).***												
BERA Data Gap (Property)	Needed at locations were terrestrial biota samples are collected (see below) so that site-specific soil-to-organism bioaccumulation factors (BAFs) can be calculated (i.e., soil and biota samples will be collcated). Full TCL/TAL scan required for risk assessment.		3	--	3	3	3	3	3	3	--	--	Samples are expected to collected near the bank in active habitat areas. Samples can be grouped with samples from other properties. Samples are collected at two depths for risk assessment purposes and analyzed for Full TCL/TAL.
Subsurface Soil	***Sufficient samples were collected for risk assessment and FS. Additional sampling of to delineate fill may be needed as part of pre-design investigation.***												
	Sufficient samples were collected for risk assessment and FS except for pesticides. Pesticides are not expected to be found in subsurface samples because no sources were identied. Additional sampling of to delineate fill may be needed as part of pre-design investigation.		--	--	--	--	--	--	--	--	--	--	
Groundwater	***Groundwater contamination was found in well on west side of creek but attributed as upgradient not site-related contamination by DEC. Upgradient sources were not assessed. Contamination is same side as Upson Park.***												
Data Gap and HHRA	One additional upgradient well to assess the potential for offsite source of VOCs and metals and sampling of 2 existing monitoring wells. One well may be to be re-drilled.		3	--	3	3	3	--		3	--	--	Groundwater samples will be analyzed for full TCL/TAL for two rounds to provide current data for HHRA.
Biological	***No biological tissue data have been collected. Such data are recommended to perform the baseline ecological risk assessment as described below.***												
BERA Data Gap (tissue data)	No tissue data have been collected from this property. Vegetation, earthworm, and small mammal data are needed to develop reliable exposure estimate for herbivorous, omnivorous, and carnivorous terrestrial wildlife species at the site. Tissue and soil sample data from this property can be pooled with data from other commercial properties in the Corridor site to develop site-specific BSAF equations.	Vegetation	3	3	3	3	3	3	3	--	3	--	Based on the SLERA results, it may be possible to omit PCBs, pesticides, dioxins/furans, and perhaps other contaminants for plants and other tissue sample types, but this will not be known for certain until the SLERA is completed.
		Earthworms	3	3	3	3	3	3	3	--	3	--	
		Small Mammal	3	3	3	3	3	3	3	--	3	--	

Key:

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BSAF = Biota soil (or sediment) accumulation factor
ERA = Ecological risk assessment
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL/TAL = Target compound list/Target Analytical List
TOC = Total organic carbon
TSS = Total suspended solids

Table 13

Summary of Data Gaps and Recommended Additional Sampling.

Eighteen Mile Creek Superfund Site - Upson Park (DEC OU4)

Matrix and Data Gap	Note		Number of Samples										Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP	
Surface Soil/ Fill	***Samples collected along the creek bed were not analyzed for all TCL/TAL parameters. Only 2 samples were collected in the park area where potential exposure may be different for human health and /or ecological receptors.***												
BERA Data Gap (Property)	Needed at locations were terrestrial biota samples are collected (see below) so that site-specific soil-to-organism bioaccumulation factors (BAFs) can be calculated (i.e., soil and biota samples will be collcated). Full TCL/TAL scan required for risk assessment.		3	--	3	3	3	3	3	3	--	--	Samples are expected to collected near the bank in active habitat areas. Samples can be grouped with samples from other properties. Samples are collected at two depths for risk assessment purposes and analyzed for Full TCL/TAL.
BERA and HHRA Data Gap (Bank)	Full TCL/TAL scan required for risk assessment. Samples in the picnic area are insuffient to evaluate the risks as a separate exposure area.		10	--	10	10	10	10	10	10	--	--	Samples are collected at two depths for risk assessment purposes and analyzed for Full TCL/TAL.
Subsurface Soil	***Sufficient samples were collected for risk assessment and FS. Additional sampling of to delineate fill may be needed as part of pre-design investigation.***												
			--	--	--	--	--	--	--	--	--	--	
Groundwater	***Groundwater contamination was found in bedrock wells but attributed to upgradient not site-related contamination by DEC. Upgradient sources were not assessed.***												
Data Gap and HHRA	One additional upgradient well to assess the potential for offsite source of VOCs and metals and sampling of 4 existing monitoring wells.		5	--	5	5	5	5	--	5		--	Groundwater samples will be analyzed for full TCL/TAL for two rounds to provide current data for HHRA.
Biological/ Habitat	***No tissue data have been collected. Data are recommended to perform the ecological risk assessment.***												
BERA Data Gap (tissue data)	No tissue data have been collected from this property. Vegetation, earthworm, and small mammal data are needed to develop reliable exposure estimate for herbivorous, omnivorous, and camivorous terrestrial wildlife species at the site. Tissue samples should be collected at selected surface soil sample locations. Tissue and soil sample data from this property can be pooled with data from other commercial properties in the Corridor site to develop site-specific BSAF equations.	Vegetation	3	3	3	3	3	3	3	--	3	--	Based on the SLERA results, it may be possible to omit PCBs, pesticides, dioxins/furans, and perhaps other contaminants for plants and other tissue sample types, but this will not be known for certain until the SLERA is completed.
		Earthworms	3	3	3	3	3	3	3	--	3	--	
		Small Mammal	3	3	3	3	3	3	3	--	3	--	

Key:

BERA = Baseline ecological risk assessment
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ERA = Ecological risk assessment
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SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL/TAL = Target compound list/Target Analytical List
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 14

Summary of Data Gaps and Recommended Additional Sampling.

Eighteen Mile Creek Superfund Site - White Transportation Property (DEC OU5)

Matrix and Data Gap	Note		Number of Samples										Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	PAHs/ SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other	TCLP	
Surface Soil/ Fill	***Sufficient samples were collected for risk assessment and FS purposes for some parameters only. Additional sampling is recommended to evaluate the nature of contamination and to allow calculation of biota soil accumulation factors (biota samples and surface soil samples will be collocated for this purpose).***												
BERA Data Gap (Property)	Needed at locations were terrestrial biota samples are collected (see below) so that site-specific soil-to-organism bioaccumulation factors (BAFs) can be calculated (i.e., soil and biota samples will be collcated). Full TCL/TAL scan required for risk assessment.		3	--	3	3	3	3	3	3	--	--	Samples are expected to collected near the bank in active habitat areas. Samples can be grouped with samples from other properties. Samples are collected at two depths for risk assessment purposes and analyzed for Full TCL/TAL.
Subsurface Soil	***Sufficient samples were collected for risk assessment and FS. Additional sampling of to delineate fill may be needed as part of pre-design investigation.***												
			--	--	--	--	--	--	--	--	--	--	
Groundwater	***Groundwater contamination was not found to be significant by DEC. No additional sampling is recommended.***												
			--	--	--	--	--	--	--	--	--	--	
Biological	***No tissue data have been collected. Data are recommended to perform the ecological risk assessment.***												
BERA Data Gap (tissue data)	No tissue data have been collected from this property. Vegetation, earthworm, and small mammal data are needed to develop reliable exposure estimate for herbivorous, omnivorous, and carnivorous terrestrial wildlife species at the site. Tissue and soil sample data from this property can be pooled with data from other commercial properties in the Corridor site to develop site-specific BSAF equations.	Vegetation	3	3	3	3	3	3	3	--	3	--	Based on the SLERA results, it may be possible to omit PCBs, pesticides, dioxins/furans, and perhaps other contaminants for plants and other tissue sample types, but this will not be known for certain until the SLERA is completed.
		Earthworms	3	3	3	3	3	3	3	--	3	--	
		Small Mammal	3	3	3	3	3	3	3	--	3	--	

Key:

BERA = Baseline ecological risk assessment
BSAF = Biota soil (or sediment) accumulation factor
ERA = Ecological risk assessment
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SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL/TAL = Target compound list/Target Analytical List
TOC = Total organic carbon
TSS = Total suspended solids

Notes:

A = For sediment, TOC and water content. For surface water, TOC and water quality parameters (field measured). For biota, lipids and moisture content.

Table 15

RI/FS OU2 -- Summary of Recommended Samples and Analysis.

Eighteen Mile Creek Superfund Site - Operable Unit 2

Sample Media	Notes	Number of Samples					Number of Samples per Method								Number of Data Packages				
		Number of Locations	Number of Reference Locations	No. of Samples	No. of QA/QC Samples	Total	CLP Routine - Organic SOM01.2 PCBs	CLP Routine - Organic SOM01.2 Pest/ SVOCs	CLP Routine - Organic SOM01.2 VOCS	CLP Routine - Inorganic ISM01.3	CLP Non-Routine - Dioxin/Furan DLM02.2	CLP Non-Routine - CB Congeners CBC01.2	Hexavalent Chromium	Other TOC/ Lipids	CLP Routine - Organic SOM01.2	CLP Routine - Inorganic ISM01.3	CLP Non-Routine	Hexavalent Chromium	Other
Subsurface soil	Ten borings after the Flintkote building is removed. Depths: 0-6", 1-2', and selected in field based on staining. Samples for both characterization of PCB contamination and risk assessment purposes.	10		30	6	36	36	36	36	36	4	4	4		2	2	1	1	
Ground water	3 New and 5 Existing Wells in and upgradient of VOCs detected south of the creek. Data to characterize upgradient VOC sources and provide data for HHRA. Round One	8		8	2	10	10	10	10	10			1		1	1		1	
	3 New and 5 Existing Wells. A second round of sampling is recommended for HHRA.	8		8	2	10	10	10	10	10			1		1	1		1	
Sediment	Sediment samples for chemical analysis associated co-located with toxicity samples from 3 locations in creek and one reference location.	3	1	4	1	5	5	5	5	5	1	1	1		1	1	1	1	
	Sediment sample for chemical analysis from an additional 9 background location for statistical comparison to existing sediment data.		9	9	2	11	11	11		11	2				1	1	1		
Sediment Toxicity	EPA 100.4 - Hyalella azteca (amphipod), 42-day test. Three site samples and one reference area sample.	3	1	4	1	5								5					1
	EPA 100.4 - Chironomus dilutus (midge), life-cycle test. Three site samples and one reference area sample.	3	1	4	1	5								5					1
Surface Water	Surface water samples chemical analysis associated co-located with toxicity samples from 3 locations in creek and one reference location.	3	1	4	1	5		5	5	5	1	5	5		1	1	1	1	
Surface Water Toxicity	EPA 1000.0 - Fathead Minnow Larval Survival and Growth Test. Three site samples and one reference area sample.	3	1	4	1	5								5					1
	EPA 1000.2 - Ceriodaphnia dubia Survival and Reproduction Test. Three site samples and one reference area sample.	3	1	4	1	5								5					1
Biological Tissue	Vegetation from 3 locations on each property and 3 background locations.	12	3	15	2	17	17	17	17	17	2	2			1	1	1		
	Earthworms from 3 locations on each property and 3 background locations.	12	3	15	2	17	17	17	17	17	2	2			1	1			
	Tissues collected from small mammals from 3 locations on each property and 3 background locations..	12	3	15	2	17	17	17	17	17	2	2			1	1			
Fish	Forage Fish - Ten site samples and ten reference area samples.	1	1	20	2	22	22	22	22	22	3	3	3	22	2	2	1	1	2
	Sport Fish Fillets. Ten site samples and ten reference area samples.	1	1	20	2	22	22	22	22	22	3	3	3	22	2	2		1	
Surface Soil	Soils collected at the same location as the biological tissue samples.	12	3	30	2	32	32	32	32	32	16	4	4		2	2	1	1	
	Additional surface soil collected Upson Park Picnic Area. Surface soil (0 to 0.5 feet) and near surface soil (0.5 to 2 feet).	10		20	2	22	22	22	22	22	3	3	3		2	2			
	Additional surface soil collected from background location for statistical evaluation. Surface soil (0 to 0.5 feet) and near surface soil (0.5 to 2 feet).		7	14	4	18	18	18		18	9	2	2		1	1			
Passive Samplers	Passive Samplers to Access PCBs in PoreWater	15		15	4	19								19					1
IDW	Toxicity characteristic leaching procedure (TCLP) parameters except herbicides, PCBs, corrosivity, and ignitibility	10		10		10								10					1
	Totals	119	36	243	40	283	239	244	215	244	48	31	27	83	19	19	7		7

Figures

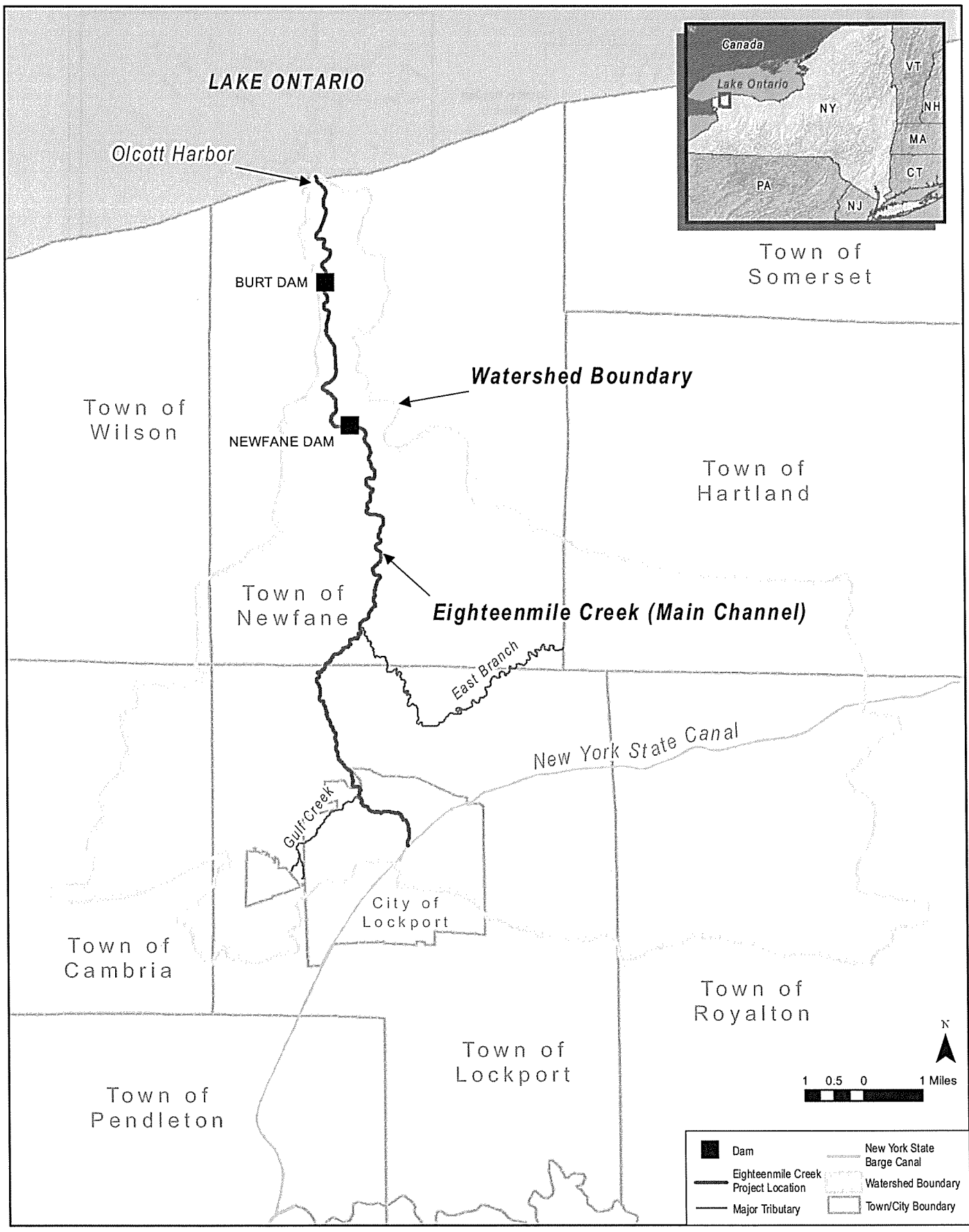


Figure 1 Eighteenmile Creek Site Location

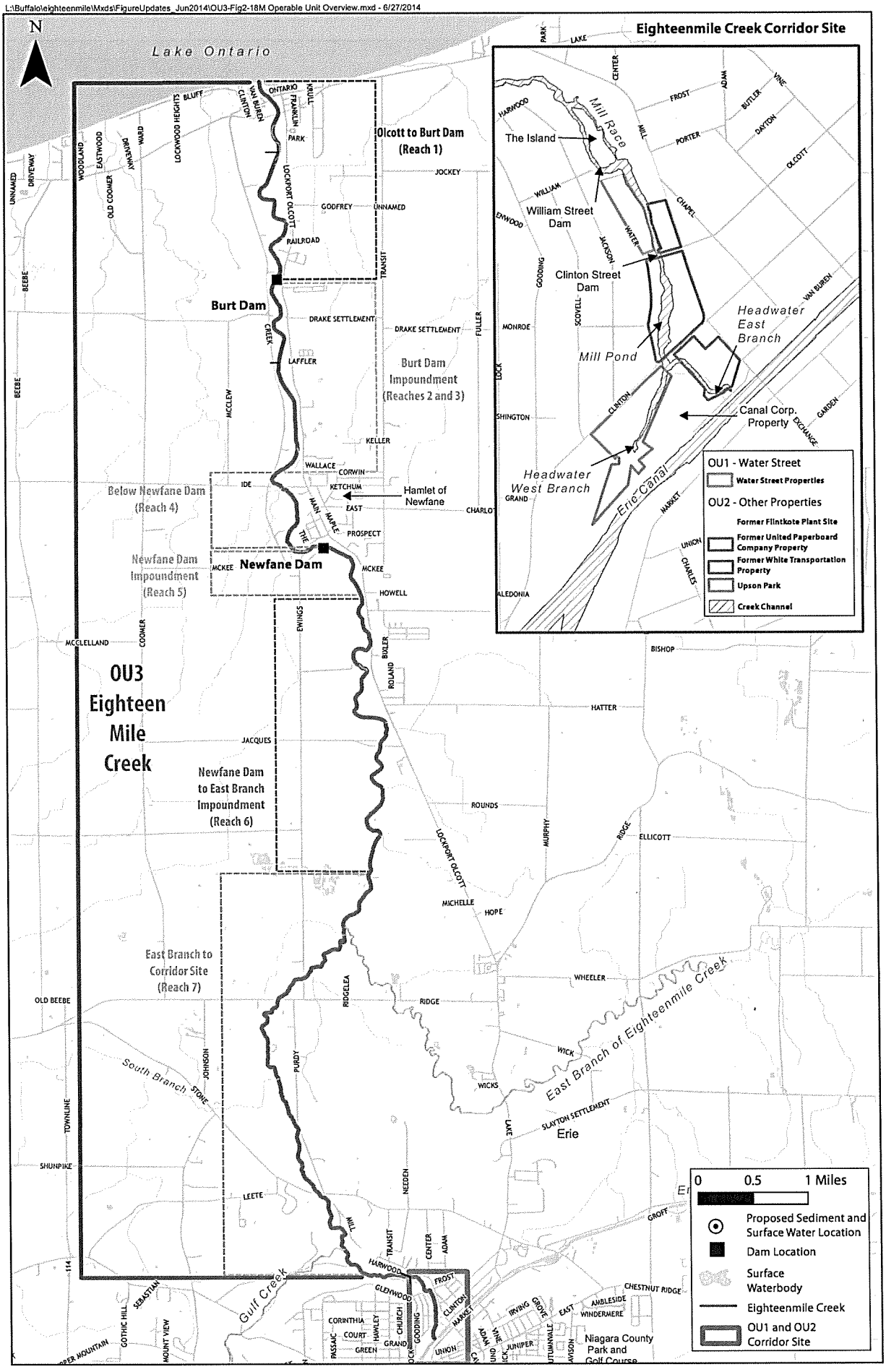


Figure 2 Eighteen Mile Creek Operable Unit Overview

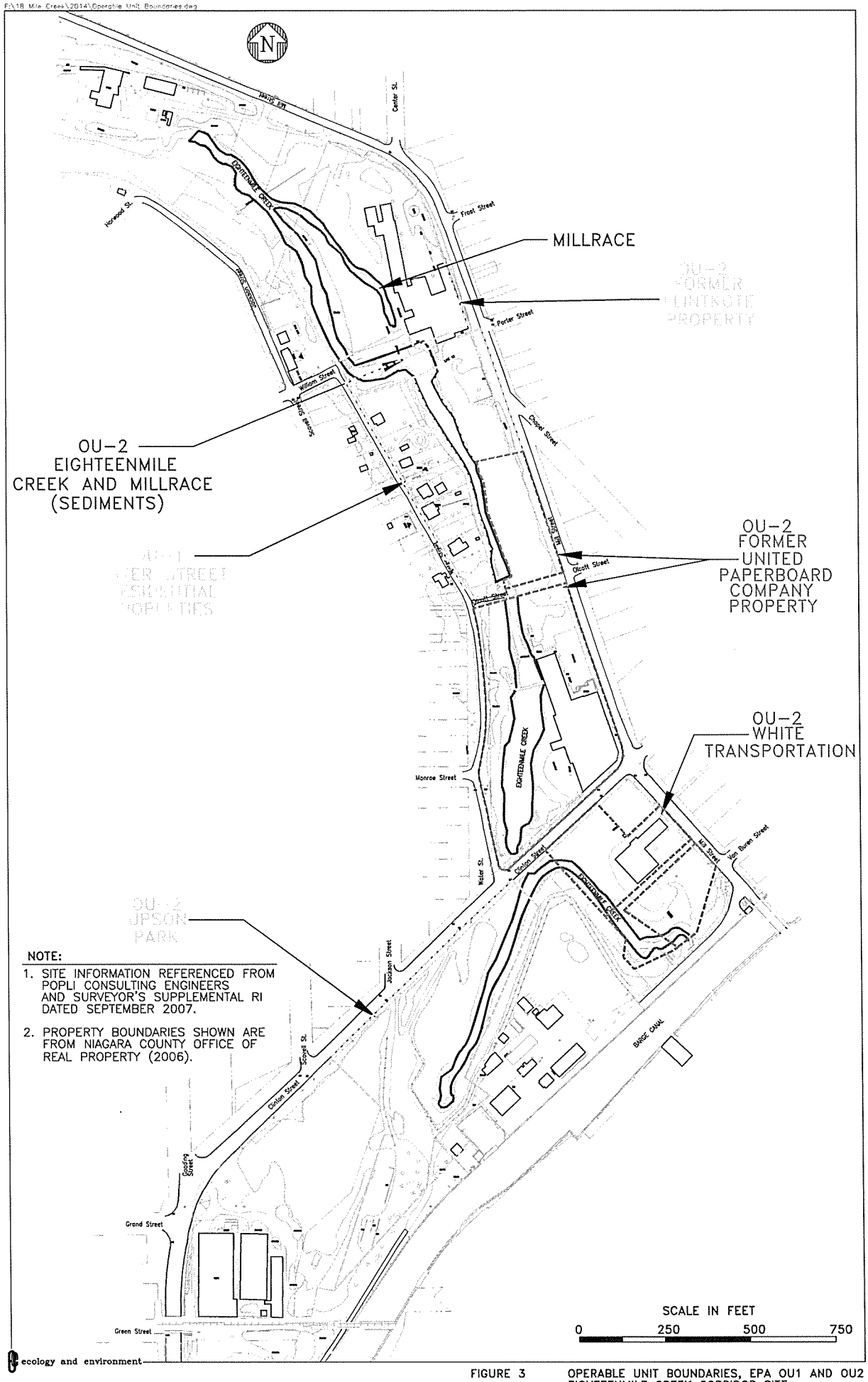


FIGURE 3 OPERABLE UNIT BOUNDARIES, EPA OU1 AND OU2 EIGHTEENMILE CREEK CORRIDOR SITE, LOCKPORT, NEW YORK

Google earth

feet 4000

km 1

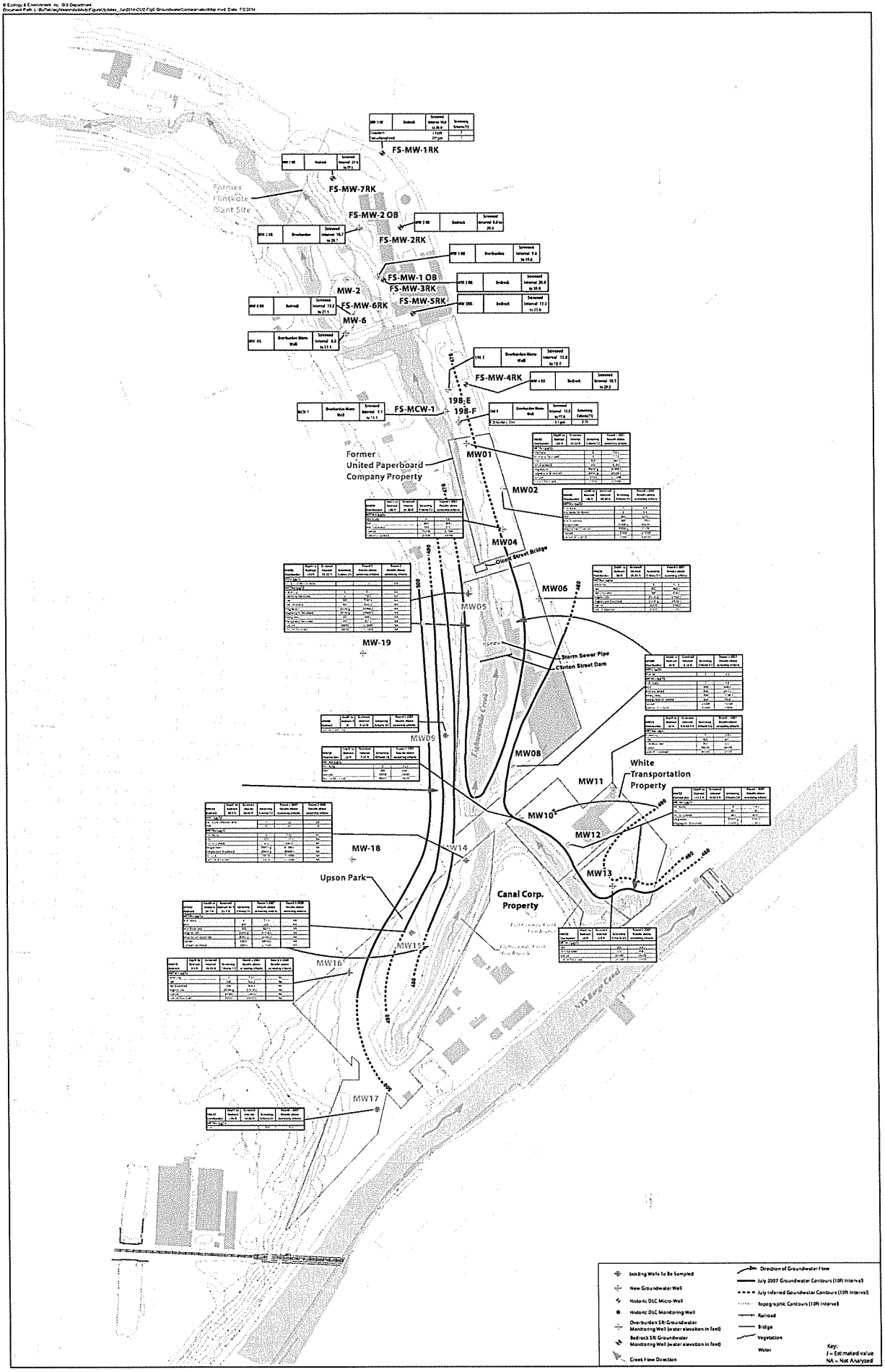


Figure 5. Groundwater Contamination OU2

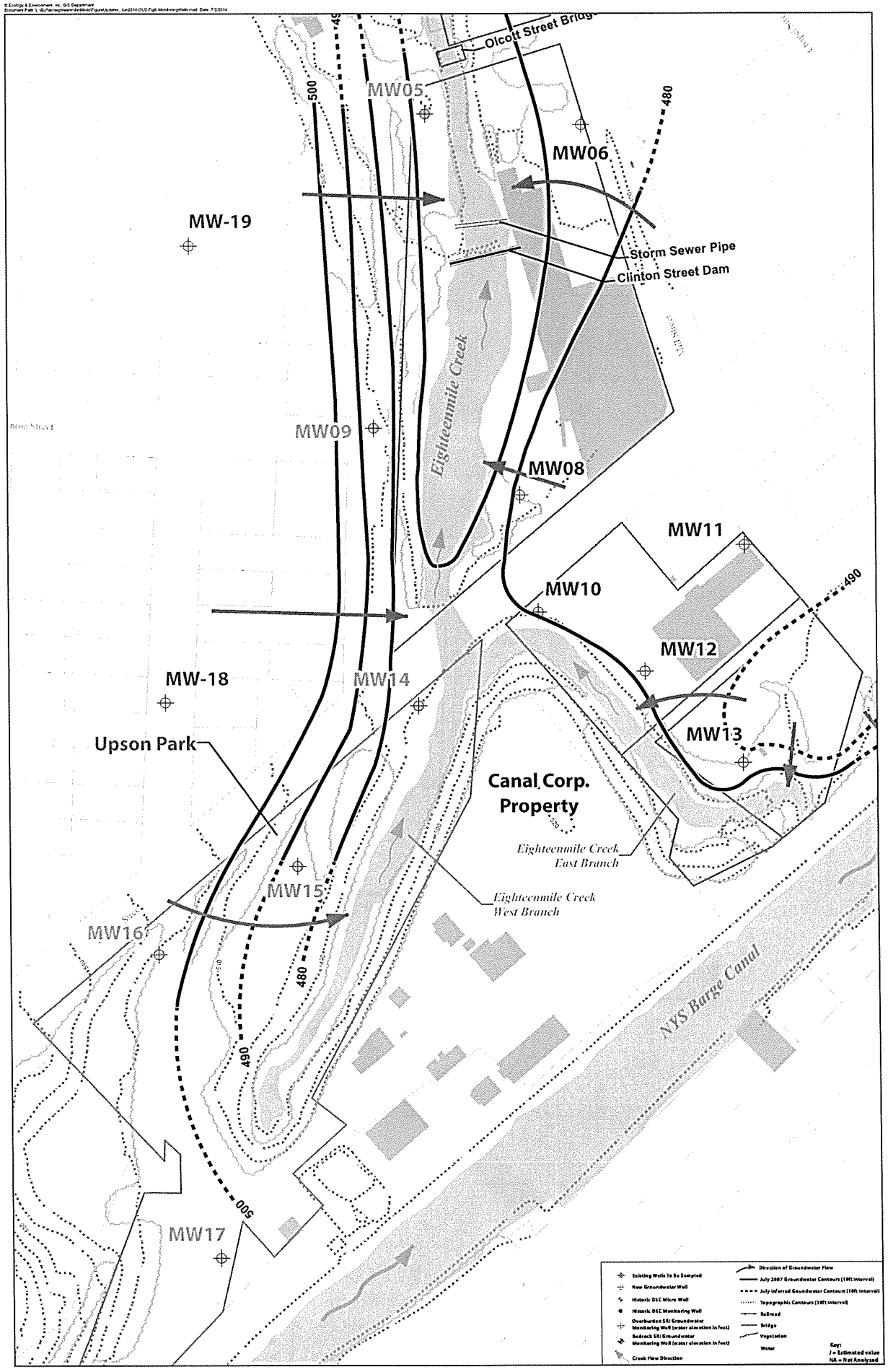


Figure 6. Eighteen Mile Creek OU2 Monitoring Well Locations

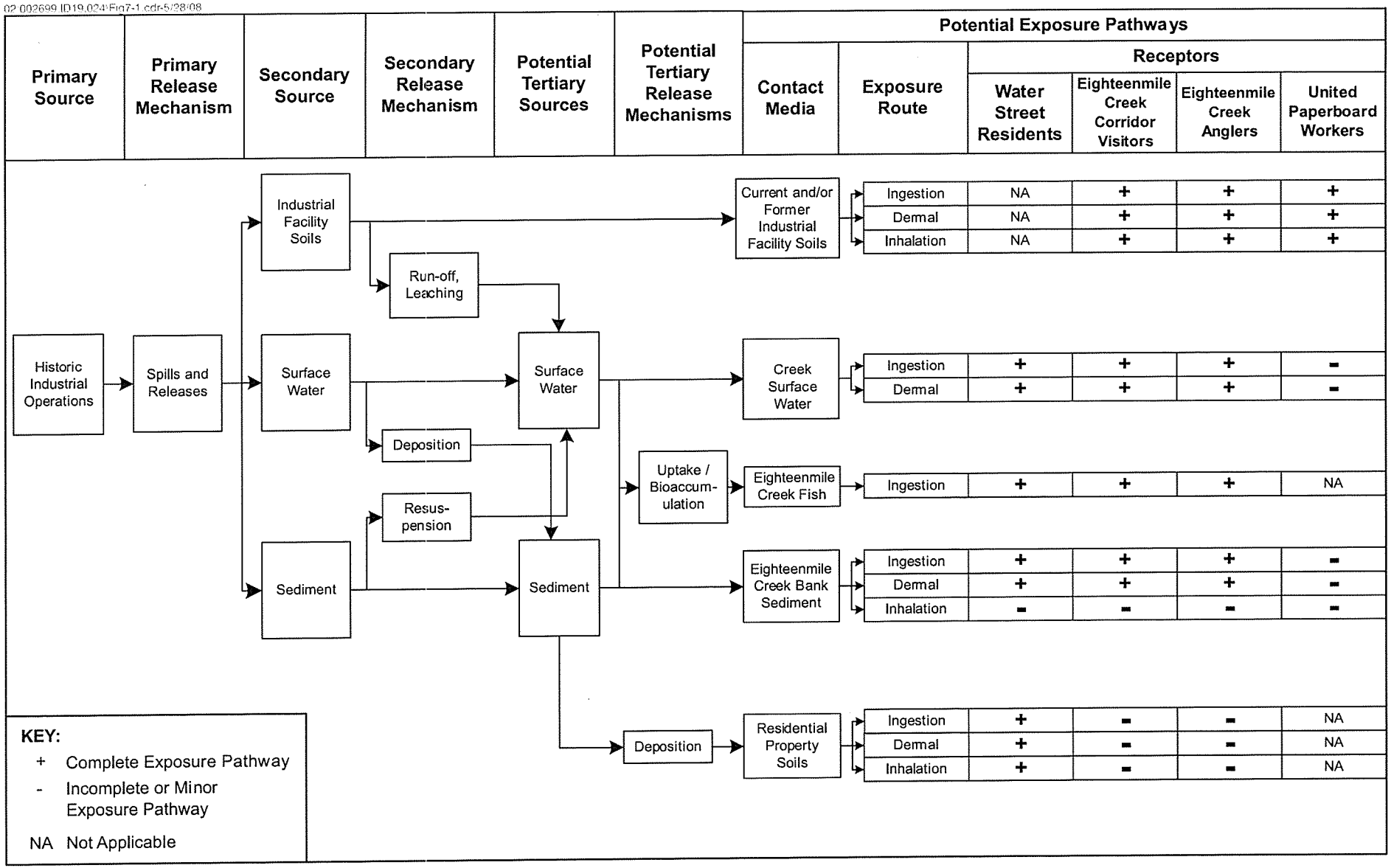
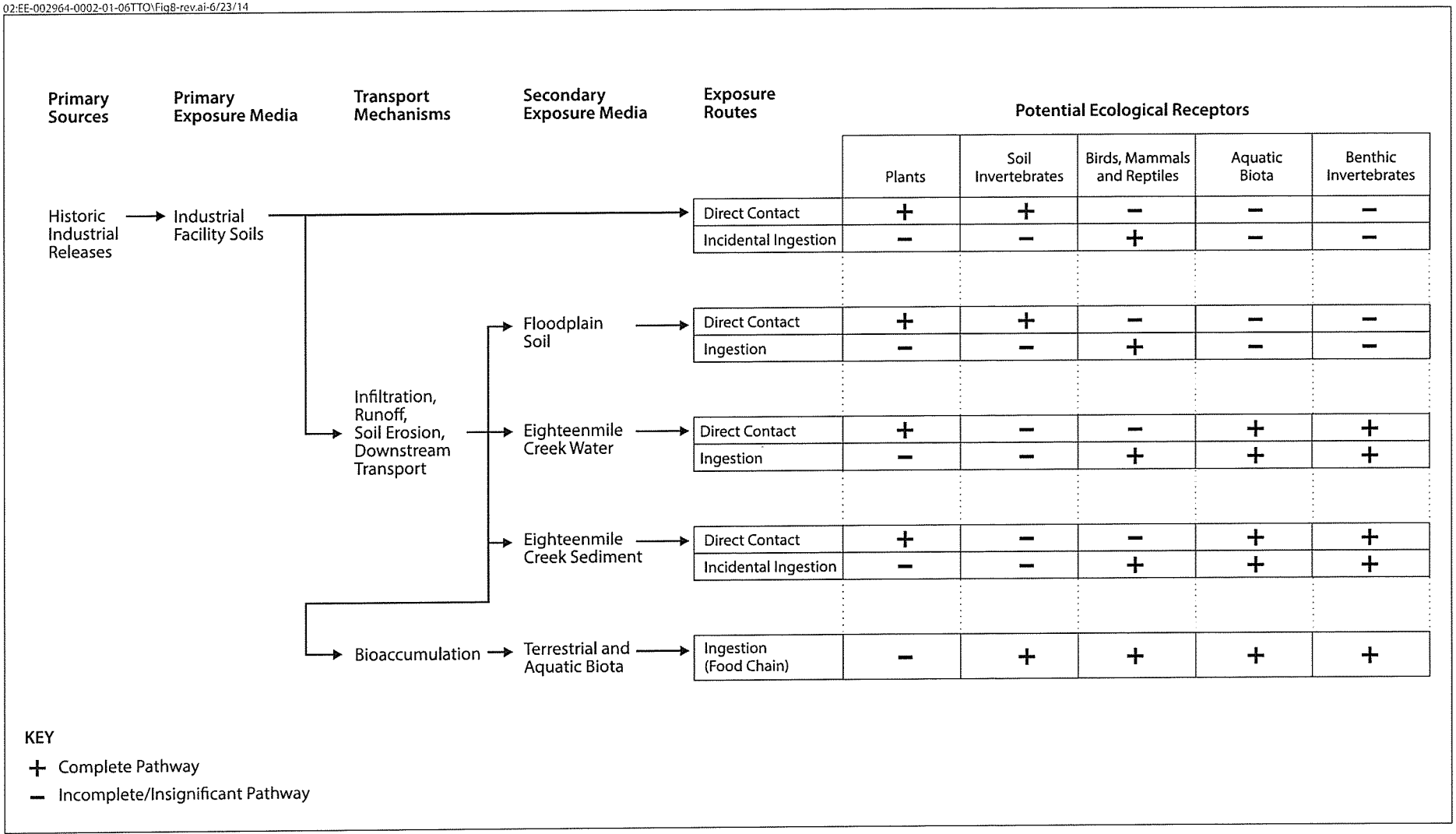


Figure 7-1 Conceptual Model of Potential Human Exposures to Contaminants in the Eighteenmile Mile Creek Corridor Site, Supplemental Remedial Investigation

02:EE-002964-0002-01-06TTO\Fig8-rev.ai-6/23/14



SOURCE: Ecology and Environment, Inc., 2014

Figure 8 Preliminary Ecological Conceptual Site Model, Eighteenmile Creek Corridor Site (OU2) and Downstream Areas (OU3)

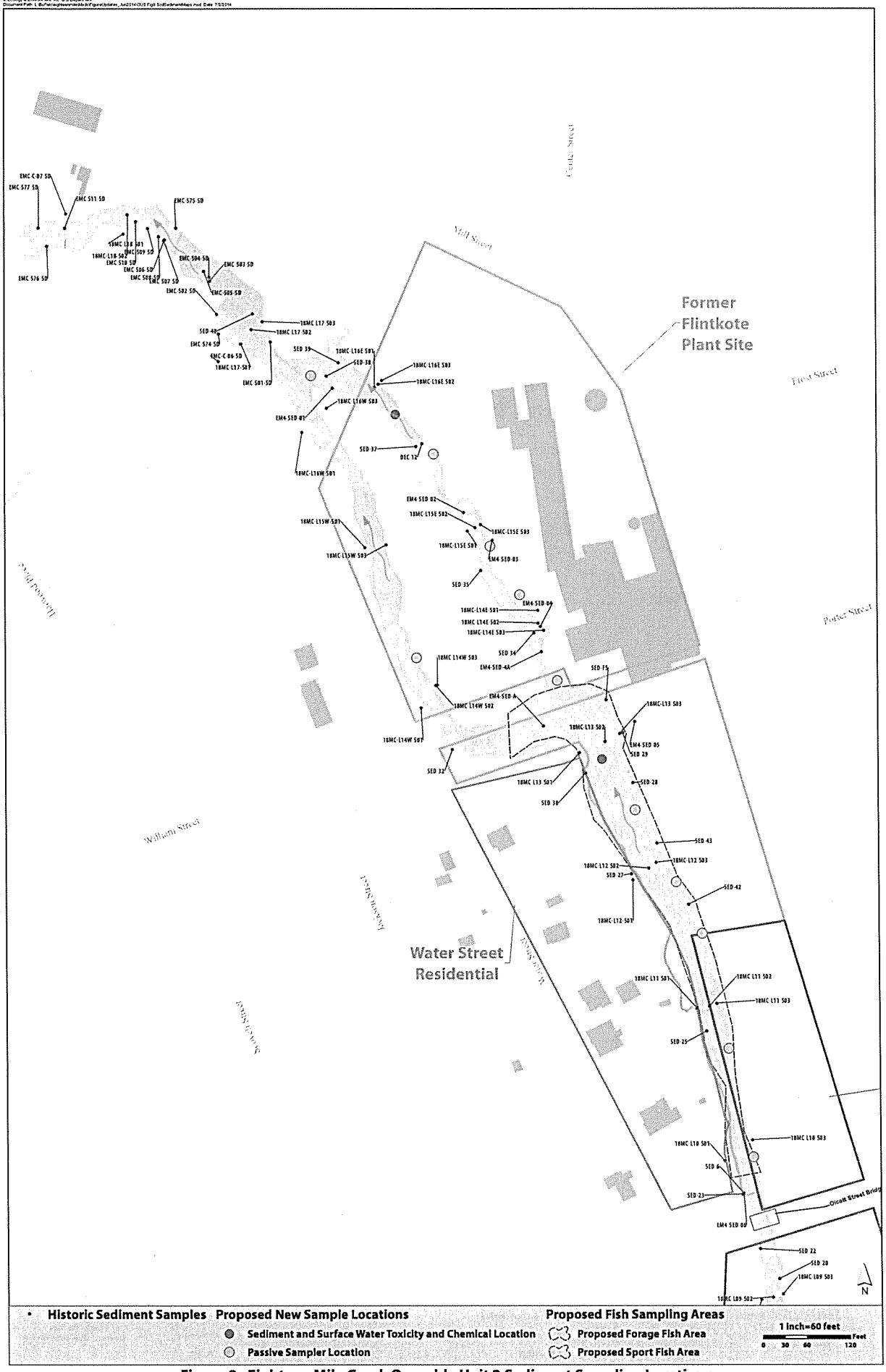


Figure 9. Eighteen Mile Creek Operable Unit 2 Sediment Sampling Locations
Creek Channel - Northern Section

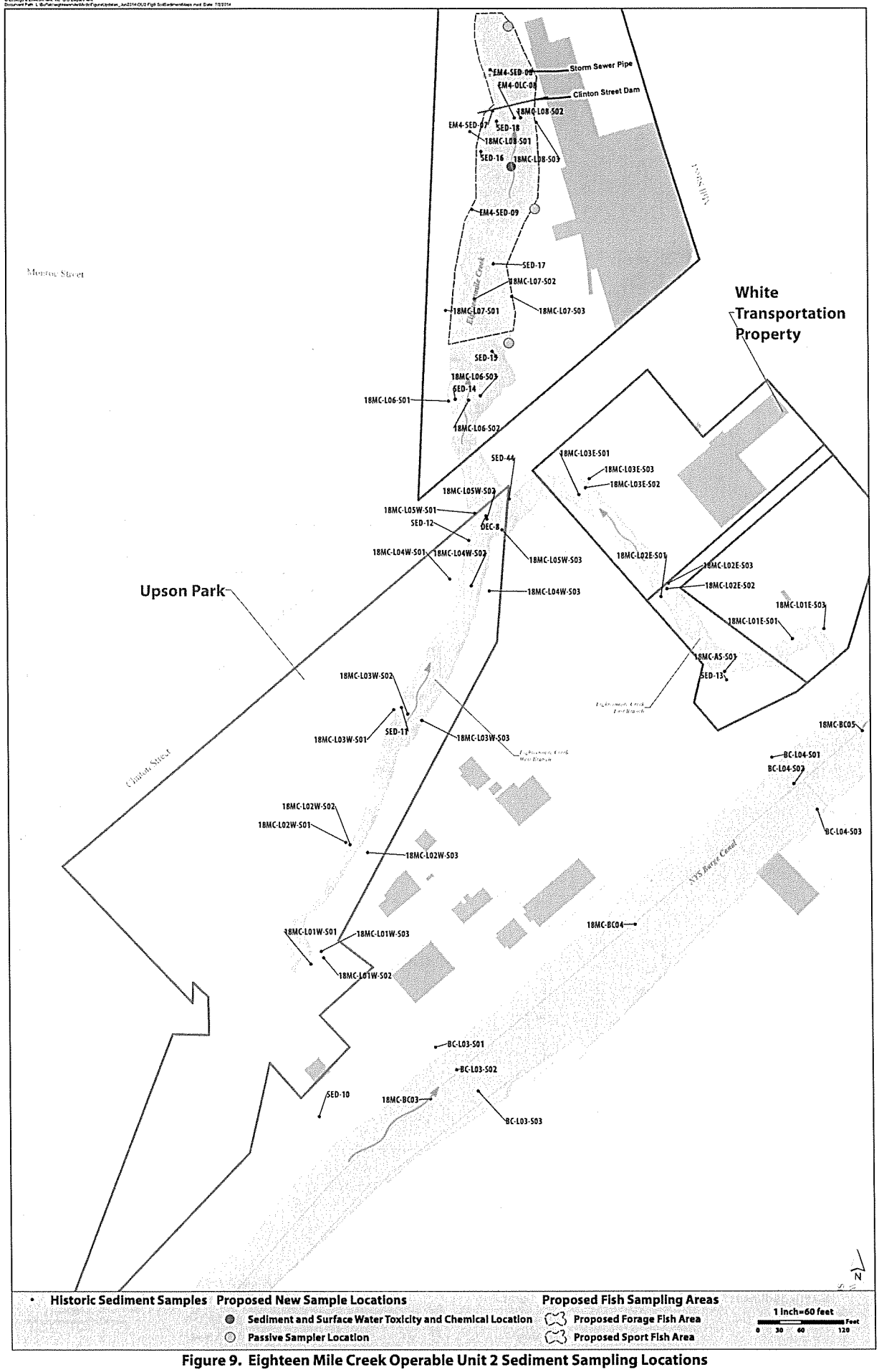


Figure 9. Eighteen Mile Creek Operable Unit 2 Sediment Sampling Locations
Creek Channel - Southern Section

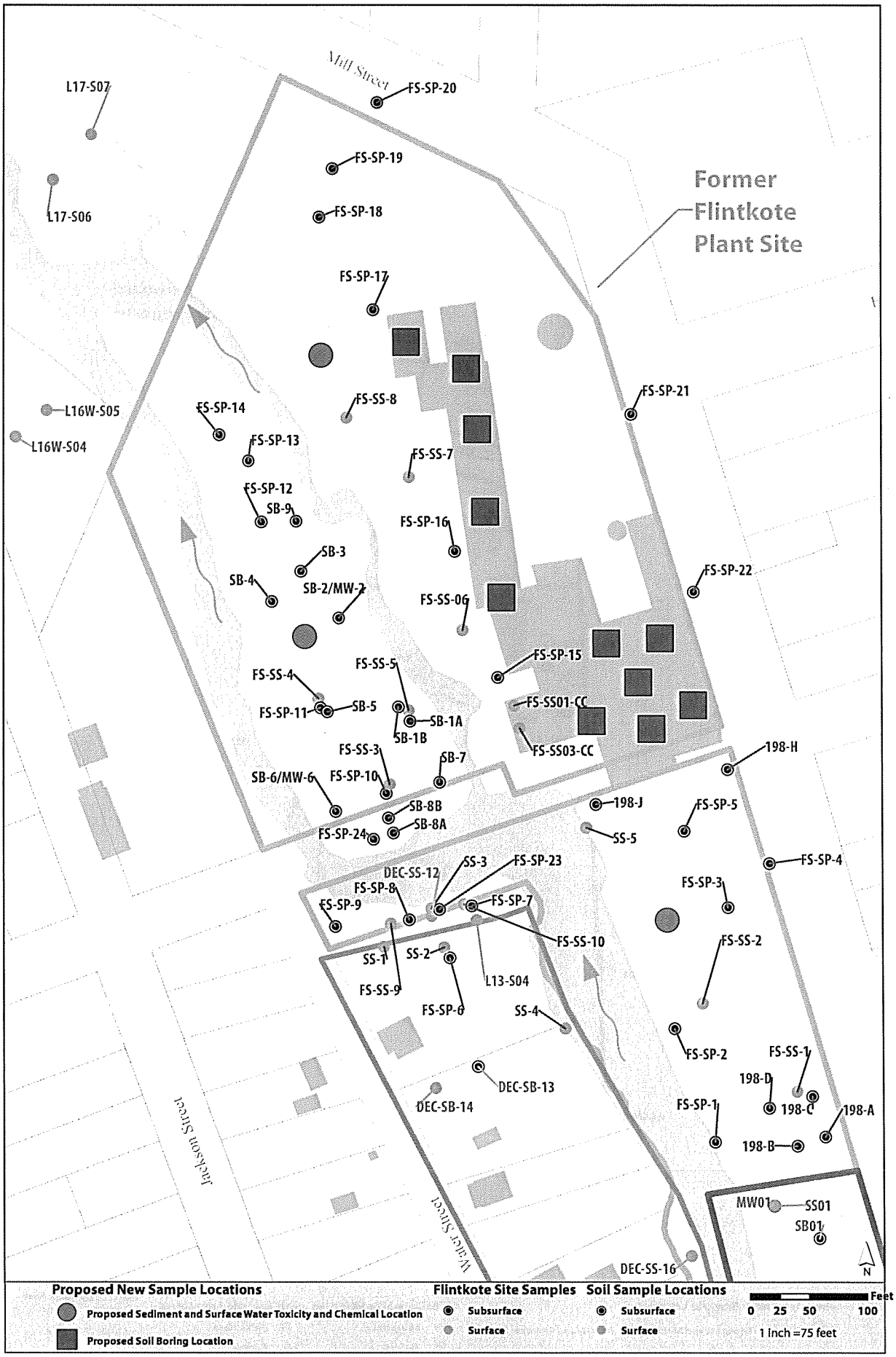


Figure 10. Eighteen Mile Creek OU 2 Soil Sample Locations - Historical and Proposed Former Flintkote Plant Site

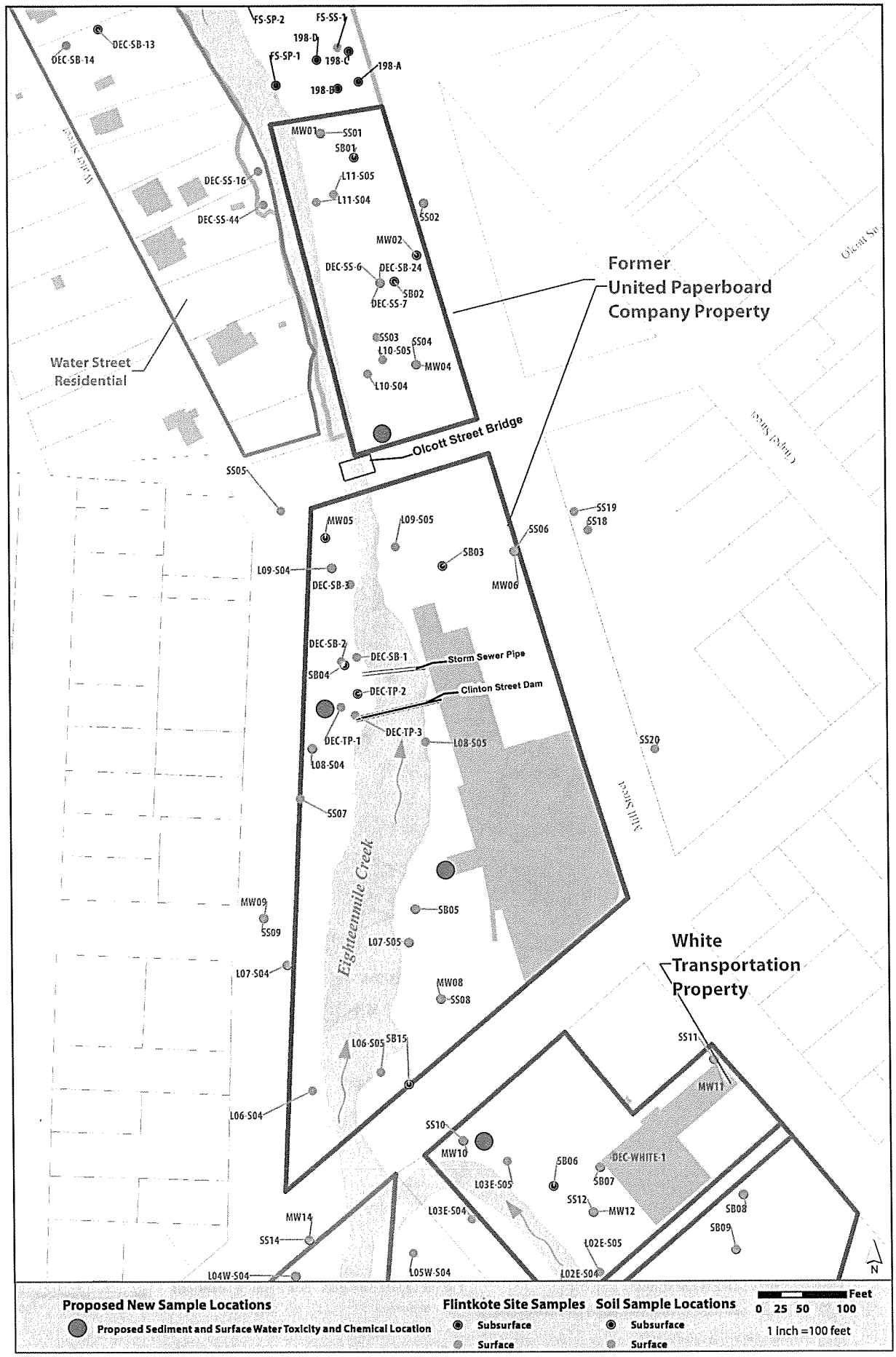


Figure 11. Eighteen Mile Creek OU 2 Soil Sample Locations - Historical and Proposed Former United Paperboard Site

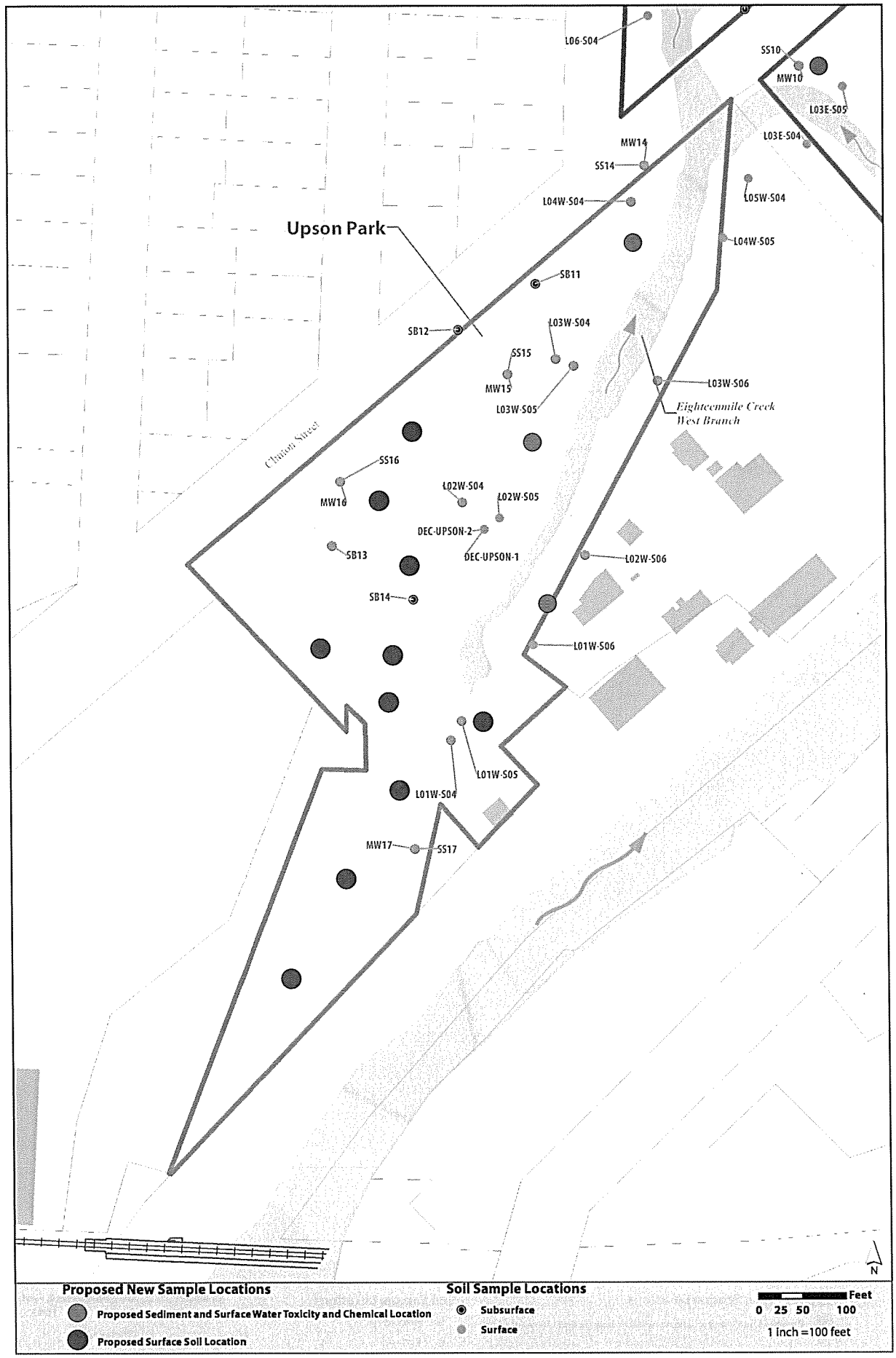


Figure 12. Eighteen Mile Creek OU 2 Soil Sample Locations - Historical and Proposed Upson Park

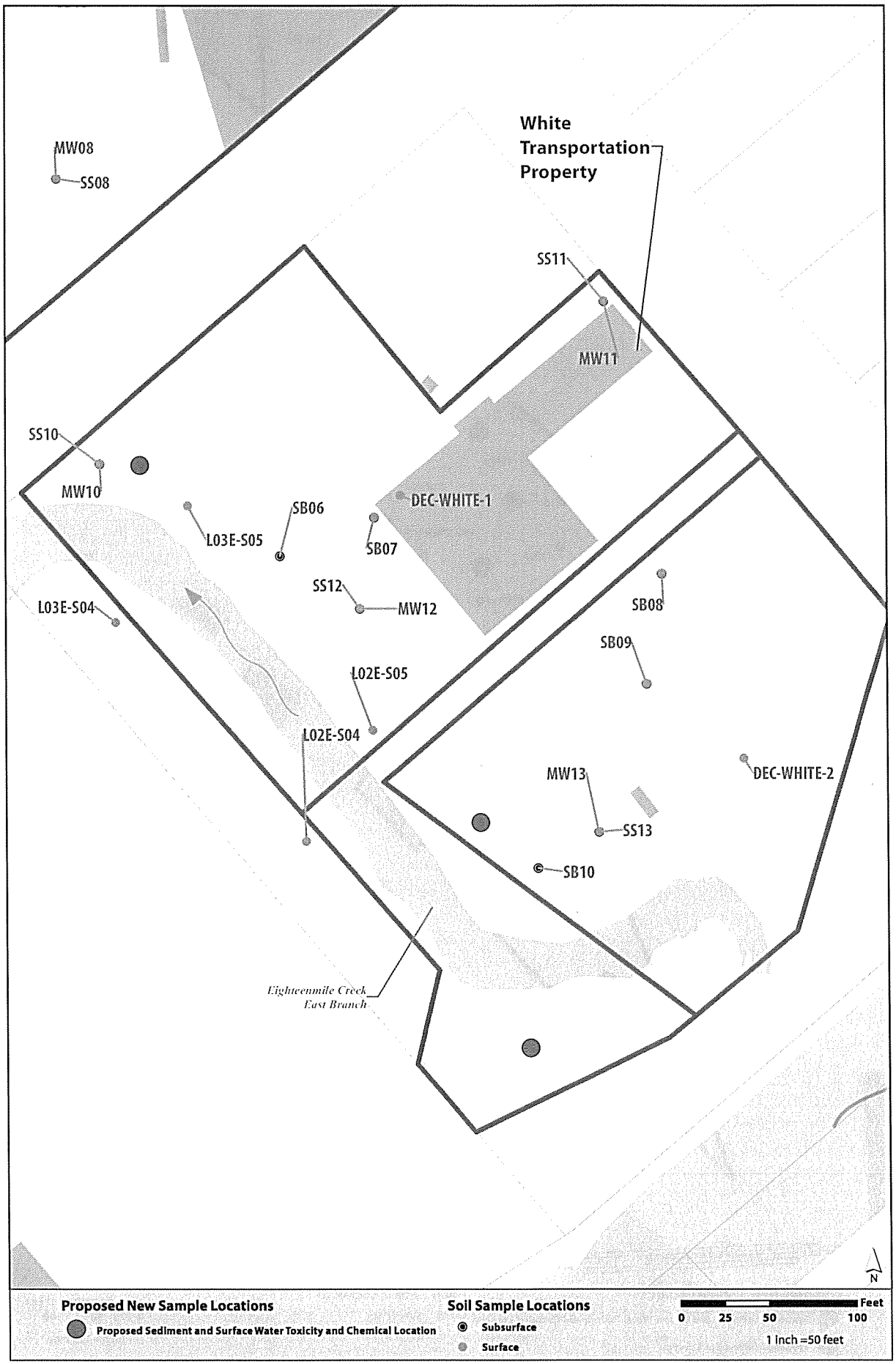


Figure 13. Eighteen Mile Creek OU 2 Soil Sample Locations - Historical and Proposed White Transportation

A Reports Reviewed

Table A-1
Inventory of Previous Studies and Guidance Reviewed
Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU2 and OU3	2005	Buffalo State Great Lakes Center (BSGLC). 2005. *Sediment Modeling for the Eighteenmile Creek Watershed, Niagara County.* Final project report. Prepared by Shreeram Inamdar, Ph.D., Great Lakes Center and Department of Geography, SUNY Buffalo State College, for the U.S. Army Corps of Engineers Buffalo District. December 2005.
	OU3	1983	Burt Dam Associates. 1983. *Application for Exemption for Licensing for the Burt Dam Hydroelectric Project*. Submitted to the Federal Energy Regulatory Commission.
	OU3	2009	CH2M HILL, Inc. and EEEPC. 2009a. *Phase 1 Reconnaissance Survey Eighteenmile Creek Area of Concern, Niagara County, New York, for the Remedial Investigation/Feasibility Study*. Prepared for the United States Environmental Protection Agency.
	OU3	2009	CH2M HILL, Inc. and EEEPC. 2009b. *Field Sampling Plan for the Eighteenmile Creek AOC Site Characterization, Niagara County, New York*.
	OU3	2011	CH2M HILL, Inc. and EEEPC. 2011. *Data Summary Report, Site Characterization Eighteenmile Creek Area of Concern, Niagara County, New York.*
USEPA GLNPO	OU2 and OU3	2012	CH2M HILL, Inc. and EEEPC. 2012. *Draft Remedial Investigation Report, Eighteenmile Creek, Remedial Investigation / Feasibility Study, Niagara County, New York.* Prepared for USEPA Region 5 RAC2 by CH2M HILL, E & E, and others. WA No. 139-RICO-1527/Contract No. EP-S5-06-01.
	OU1 and OU2	2011	City of Lockport. 2011. CSO Longterm Control Plan - Draft, Niagara County, New York. Prepared by the Clough Harbor and Associates, September 16, 2011.
	OU1 and OU2	2006	City of Lockport. 2006. City of Lockport Zoning Map, Niagara County, New York. Prepared by the City of Lockport Engineering Department, February 2006.
	OU2 and OU3	2007	E & E. 2007a. Eighteenmile Creek State of the Basin Report. Prepared for the U.S. Army Corps of Engineers.
NCSWCD 2007	OU2 and OU3	2007	E & E. 2007b. *Final Report for the Eighteenmile Creek PCB Source Trackdown Project*. Niagara County, New York.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU2	2007	E & E. 2007C. *Phase 1 Environmental Site Assessments, Eighteenmile Creek Corridor Sites: Upson Park, United Paperboard Company, and White Transportation. City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
	OU3	2009	E & E. 2009. *Eighteenmile Creek Beneficial Use Impairment Assessment*. Niagara County, New York. Prepared for the Niagara County Soil and Water Conservation District.
	OU3	2011	E & E. 2011. *Interim Eighteenmile Creek Area of Concern (AOC) Strategic Plan for Beneficial Use Impairment (BUI) Delisting, Contract Number W912P4-10-D-0002.* Prepared for the United States Army Corps of Engineers.
	OU3	2012	E & E. 2012a. Draft Eighteenmile Creek Baseline Fish Sampling Report. Prepared for Niagara County Soil and Water Conservation District, Lockport, NY by E & E, Lancaster, NY.
	OU3	2012	E & E. 2012b. Draft Eighteenmile Creek Baseline Benthic Community Sampling Report. Prepared for New York State Department of Environmental Conservation, Albany, NY by E & E, Lancaster, NY.
USACE 2010	OU3	2012	E Risk Sciences, LLP (ERS) and USACE. 2012. *Final Bioaccumulation Modeling and Ecological Risk Assessment, Eighteenmile Creek Great Lakes Area of Concern (AOC), Niagara County, New York.* Prepared by E Risk Sciences, LLP, Allston , Massachusetts, and U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, Mississippi.
	OU3	2011	EA Engineering P.C. and EA Science and Technology (EA Engineering). 2011. *Final Remedial Investigation Report Old Upper Mountain Road (932112) Lockport, New York, Site Number 932029, Town of Lockport, Niagara County* . Prepared for NYSDEC Region 9.
NYSDEC SRI	OU2	2009	EEEPC. 2009a. *Final Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor Site (Site No. 932121), City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
NYSDEC SRI-A	OU2	2009	EEEPC. 2009b. *Final Additional Investigation Addendum to the Supplemental Remedial Investigation Report for the Eighteenmile Creek Corridor Site (Site No. 932121), City of Lockport, New York* . Prepared for the New York State Department of Environmental Conservation.
	OU2	2009	EEEPC. 2009c. *Final Feasibility Study Report for the Eighteenmile Creek Corridor Sit (Site 932121) and Adjacent Upland Properties (Water Street Residential Properties, Former United Paperboard Company, White Transportation, and Upson Park)* . City of Lockport, New York. Prepared for New York State Department of Environmental Conservation, Albany, NY by E & E, Lancaster, NY.

Table A-1
Inventory of Previous Studies and Guidance Reviewed
Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU3	2011	Environment Canada et al. 2011. Lake Ontario Lakewide Management Plan, Annual Report 2011. Prepared by a binational partnership of Environment Canada, Fisheries and Oceans Canada, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Ontario Ministry of Environment, Ontario Ministry of Natural Resources and New York State Department of Environmental Conservation. Available online at: http://binational.net/lamp/lo_ar_2011_en.pdf.
	OU3	2007	NCSWCD. 2007. *Eighteenmile Creek Remedial Action Plan, 2006 Status Report*. Prepared with funding provided by the U.S. Environmental Protection Agency. March 2007.
	OU3	2011	NCSWCD. 2011. *Eighteenmile Creek Remedial Action Plan, Stage II - Update*. Prepared with funding provided by the U.S. Environmental Protection Agency. Final Draft, December 2011.
	OU3	2011	New York State Department of Health (NYSDOH). 2011. *Health Advice on Eating Fish You Catch for Erie, Niagara, Cattaraugus, Genesee, Orleans, Wyoming, and Chautauqua Counties.*
	OU3	1987	New York State Department of State (NYSDOS). 1987. Coastal Fish and Wildlife Habitat Rating Form for Eighteenmile Creek – Lake Ontario.
	OU2	1998	Nutter Associates. 1998. *City of Lockport Comprehensive Plan.* Prepared for City of Lockport, Niagara County, New York. May 1998.
	Reference Data	2009	NYS GIS Clearinghouse. 2009. GIS Metadata from NYS Cyber Security. "NIAGARA_County_Ortho_4bed_1ft." Remote sensing image. NYS Digital Ortho-Imagery Program 2008 imagery in Niagara County. NYSCSCIC, Albany, NY. Accessed online at http://gis.ny.gov/gateway/mg/2008/niagara/.
	OU2	2000	NYS Canal Corporation. 2000. Evaluation of Sediment Quality of the Erie Canal between the Niagara River and Rochester, NY.
	OU3	1996	NYSDEC. 1996. *Trackdown of Chemical Contaminants to Lake Ontario from New York State Tributaries.*
	OU3	1997	NYSDEC. 1997. Eighteenmile Creek Remedial Action Plan. Prepared by the Division of Water.

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Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
NYSDEC 1998	OU 2 and 3	1998	NYSDEC. 1998. Eighteenmile Creek and Olcott Harbor Sediment Study, Niagara County, New York.
	Guidance	1999	NYSDEC. 1999. Technical Guidance for Screening Contaminated Sediments. Prepared by the Division of Fish, Wildlife and Marine Resources, Albany, New York.
NYSDEC 2000	OU 2 Flintkote	2000	NYSDEC. 2000. Site Investigation Report, Former Flintkote Plant Site, 198 & 300 Mill Street, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation. September 2000.
NYSDEC 2001	OU 2 and 3	2001	NYSDEC. 2001a. Final Report, Eighteenmile Creek Sediment Study, Summary of August 17-20 and November 3, 1998 Results. Prepared by the Division of Water.
	OU2	2001	NYSDEC. 2001b. City of Lockport Sewer System, PCB Trackdown Project, 1998-2000, Draft Summary Report. Prepared by NYSDEC Division of Water. October 2001.
	OU 2 Flintkote	2002	NYSDEC. 2002. Sampling Report, Former Flintkote Plant Site, 143 Water Street, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation.
	OU1	2003	NYSDEC. 2003. Sampling Report, Water Street Properties, City of Lockport, Niagara County, New York. Prepared by the Division of Environmental Remediation.
NYSDEC 2004	OU1 and 2	2004	NYSDEC. 2004. Site Investigation Scope of Work. Eighteenmile Creek Corridor: New York State Barge Canal to North Transit Road. August 2003, revised February 2004.
	Guidance	2005	NYSDEC. 2005. New York State Comprehensive Wildlife Conservation Strategy. Available online at: http://www.dec.ny.gov/docs/wildlife_pdf/ontarioswtxt.pdf
NYSDEC RI	OU1 and 2	2006	NYSDEC. 2006a. Remedial Investigation Report, Eighteenmile Creek Corridor, Lockport, Niagara County, New York, Site Number 932121. Prepared by the Division of Environmental Remediation.

Table A-1
Inventory of Previous Studies and Guidance Reviewed
Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU 2 Flintkote	2006	NYSDEC. 2006b. Record of Decision for the Former Flintkote Plant Site.
	OU3	2007	NYSDEC. 2007a. Lake Ontario Annual Report 2007. Lake Ontario Tributary Creel Survey, Fall 2005 - Spring 2006, Fall 2006 - Spring 2007. Prepared by Scott Prindle and Daniel Bishop, Region 7 Fisheries, Cortland, New York.
	OU2	2007	NYSDEC. 2007b. PCB Sources - Flintkote. Internal Memorandum. Prepared by Glenn May August 2007.
	OU2 and OU3	2009	NYSDEC. 2009a. Toxic Chemicals in NYS Tributaries to Lake Ontario: A Report on Sampling Undertaken in 2007 and 2008 with Special Emphasis on the Polychlorinated Dibenzodioxins and Furans. Prepared for the U.S. Environmental Protection Agency.
	Guidance	2010	NYSDEC. 2010a. CP-51: Soil Cleanup Guidance Policy.

Table A-1
Inventory of Previous Studies and Guidance Reviewed
Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU1 and OU2	2010	NYSDEC. 2010b. Record of Decision for the Eighteenmile Creek Corridor Site Operable Unit Nos. 1,3,4,5 and 6, State Superfund Project Lockport, Niagara County, New York Site No. 932121.
NYSDEC 2010	OU2	2010	NYSDEC. 2010c. Results from the Sampling of Erie Canal Suspended Sediments and Creek Waters for PCBs, Eighteenmile Creek Corridor Site, Site No. 932123, City of Lockport, Niagara County, New York.
	OU3	2012	NYSDEC. 2012. Personal communication, letter dated January 17, 2012, from Jean Pietrusiak, NYSDEC Information Services, to Marcy Werth, E & E, Inc., in response to a data request regarding rare and state-listed animal and plant species.
	OU 2 Flintkote	2005	TVGA. 2005a. Site Investigation Report: Site Investigation/Remedial Alternatives Report (SI/RAR) Former Flintkote Site.
	OU 2 Flintkote	2005	TVGA. 2005b. Final Remedial Alternatives Report Former Flintkote Site.
	OU2	2006	URS Corporation. 2006. Summary Report for PCBs Detected in NYS Barge Canal Sediments During the Investigation of NYSEG's Transit Street and State road Former MGP Sites, Sites #9-32-098 and #9-32-109, Lockport, NY. New York State Electric and Gas, Binghamton, New York.
USACE 2004	OU3	2004	USACE. 2004a. *Volume I (Project Report Overview): Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek OAC, Olcott, New York.* Prepared for USACE Buffalo District, by USACE Engineer Research and Development Center, Vicksburg, MS.
	OU3	2004	USACE. 2004b. Volume II (Laboratory Reports): Sediment Sampling, Biological Analyses, and Chemical Analyses for Eighteenmile Creek AOC, Olcott, New York. Prepared for USACE Buffalo District, Buffalo, NY by USACE Engineer Research and Development Center, Vicksburg, MS.
USEPA 2008	OU3	2008	USACE. 2008. Eighteenmile Creek, Great Lakes Area of Concern (AOC), Niagara County, New York: Concentrations, Bioaccumulation and Bioavailability of Contaminants in Surface Sediments.
	OU3	2010	USACE. 2010. Memo from Karl Gustavson, Ph.D., and Sara Hendrix, U.S. Army Engineer Research and Development Center, and Katherine von Stackelberg, Sc.D., E Risk Sciences, LLP, to Bryan Hinterberger, and Scott Pickard, USACE, Buffalo District, and Victor DiGiacomo, Jr., Niagara County Soil & Water Conservation District, regarding Eighteenmile Creek Area of Concern Food Web Modeling: Final Data Gaps. August 3, 2010.

Table A-1

Inventory of Previous Studies and Guidance Reviewed

Eighteenmile Creek Superfund Site - Operable Unit 2 and 3

Reference Key	Area	Year	Reference
	OU3	2011	USACE. 2011. Memo from Katherine von Stackelberg, Sc.D., E Risk Sciences, LLP, and Karl Gustavson, Ph.D., U.S. Army Engineer Research and Development Center, to Bryan Hinterberger, USACE, Buffalo District, and Victor F. DiGiacomo, Jr., Eighteenmile Creek Remedial Action Plan Coordinator, Niagara County Soil & Water Conservation District, regarding Eighteenmile Creek Area of Concern: Final Conceptual Site Model (CSM). January 21, 2011.
	OU3	2013	USACE. 2013. Public Notice. Operationa and Maintenance Dredging and Dredged Material Placement. FY 14 Disaster Relief Appropriations Act (Hurricane Sandy) Supplemental Lake Ontario Harbor Maintenance Dredging. Notice No: LOHD-14
	Guidance	1989	USEPA. 1989. *Risk Assessment Guidance for Superfund, Volume I Human Health Evaluation Manual (Part A),* Office of Emergency and Remedial Response, EPA/540/1-89/002, Washington, D.C., December 1989
	OU3	2008	USEPA. 2008. *Field Data Report, Eighteenmile Creek Sediment*.
	OU3	2011	USEPA. 2011. *Field Data Report, Lake Ontario Tributaries 2009-2010.* USEPA Monitoring and Assessment Branch

Key:

EEEPC	Ecology and Environment Engineering, P.C.
USEPA	U.S. Environmental Protection Agency
USACE	U.S. Army Corps of Engineers
E & E	Ecology and Environment, Inc.
NYSDEC	New York State Department of Environmental Conservation
NCSWCD	Niagara County Soil and Water Conservation District