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

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1 Overview

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 will be included in the Draft Work Plan for this Work Assignment.

1.2 Site Overview

Eighteenmile 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.

Eighteenmile 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 Eighteenmile 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 Eighteenmile Creek comes from water diverted from the New York State Barge Canal (Canal). Eighteenmile 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). 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 Eighteenmile Creek Corridor (the Creek Corridor), which extends from the Creek's headwaters at the Canal to Harwood Street in Lockport (see Figure 2). 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 (CH2MHill and EEEPC 2012). The EPA GLLA RI for contaminated sediment also compiled historical sediment data some which included some of 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.

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 Eighteenmile 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.

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 Eighteenmile Creek to the west, Mill Street to the east, a commercial property to the north, and vacant land of the Former United Paperboard Company to the south (see Figure 3). A small portion of the site, however, is located along the western bank of Eighteenmile 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 Eighteenmile Creek (see Figure 3). The section of 300 Mill Street between Eighteenmile 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. The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of the Flintkote properties as industrial.

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 Eighteenmile 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. The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of United Paper Board as industrial. 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 Eighteenmile Creek and the Canal Authority to the east, the Canal to the south, and a wooded area to the west. The land is currently a town park and contains picnic areas and a walking trail along the canal. There is a parking area on the Site, but no standing buildings. The City

of Lockport Assessor's Office lists the parcel (Parcel ID 109.10-1-76) as consisting of 5.9 acres of land owned by the City of Lockport.

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. The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of Upson Park as park land. 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 Eighteenmile Creek to the west. All parcels associated with White Transportation (parcels109.10-1-60, 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 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 Eighteenmile 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. The City of Lockport Comprehensive Plan (Nutter Assoc. 1998) shows future use of White Transportation as commercial. 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 Eighteenmile 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 Eighteenmile 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 Eighteenmile 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 Eighteenmile Creek to maintain a flow of 400 cubic feet per second (cfs) at the dam.
- The increased flow to Eighteenmile 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 Eighteenmile 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 diffi-

cult 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

Detailed descriptions of existing data are provided in the previous study reports listed in Table 1 The usability of data evaluating fate and transport and assessing risk is summarized on Table 1 and discussed in Section 3. A general understanding of contaminant fate and transport in OU2 is presented below.

- 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 have been formally validated but if supporting analytical reports are available to perform validation, it is expected that the data will be found usable for risk assessment purposes.
- 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 Eighteenmile 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 Eighteenmile Creek via the Canal. 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 polychlorinated dibenzodioxins and dibenzofurans (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.

- 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 polynuclear aromatic hydrocarbons (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 pre-design investigation.

3 Data Evaluation

The usability of data for evaluating fate and transport and assessing risk is summarized on Table 1. If the data were considered usable, the number and type of samples and the type of analysis were counted for each OU2 property and the Creek channel. The total number of samples is summarized on Tables 2 to 6. The sufficiency of the available 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 Eighteenmile Creek Corridor site in 2007 as part of the Supplemental Remedial Investigation (SRI) 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 6), but was not investigated during the NYSDEC RI of Eighteenmile Creek Corridor site. However, groundwater monitoring wells were installed and sampled at the Creek Corridor site in 2007 and 2009 as part of the SRI conducted for the NYSDEC (see Figure 5). Six of the Flintkote wells are overburden wells and seven are bedrock wells. All of the nine SRI 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 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 in Upson Park and 30 feet BGS on the east side of the Creek in the northern parcel of the United Paperboard Company property.

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. In general, the geochemistry of the overburden and bedrock groundwater are 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 releases. 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 SRI, 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 SRI 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 upgradient 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 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.

3.2 Human Health Risk Assessment

Eighteenmile 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 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.
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;
3. United Paperboard – an active 4.8-acre industrial facility;
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.

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 SRI Report and in Table 7 presented herein. Potential receptors include:

- Recreational users of Upson Park and the Downstream area;
- Workers, site visitors/trespassers and potential future residents 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 environmental 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 and friends 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 used as a source of potable water in the OU2 area so use of groundwater as potable water in OU2 is not considered a complete exposure pathway at this time.

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. 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 relevant to the upland parcels in OU2 because, although they are presently designated for commercial/industrial use by the Lockport Comprehensive Plan, they might be converted to residential use at some point in the future.

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. 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 chemicals of potential concern (COPCs). However the number of soil samples available for the various upland areas appears to be fewer than those recommended by the guidance document cited previously. This is especially true for PAHs and pesticides.

3.2.2 Additional Analytical Parameters

In order to comply with EPA risk assessment guidance, full Hazardous Substance List analyses are needed for at least some fraction of the samples to provide assurance that no significant COPCs are missed in the RI/Risk Assessment process. Some analytical parameters have limited data as described below.

Dioxins/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/furans as part of the RI, but earlier NYSDEC studies of the Canal and Creek channel suggest dioxin/furan is present in the sediments and therefore could contribute to the cumulative risks.

Total chromium concentrations appear to be elevated in environmental media in Eighteenmile 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. In the HHRA for the residential properties comprising OU1, the form of the chromium was unknown so it was conservatively assumed to be the more toxic Cr(VI) for the risk estimates prepared for OU1 properties and as a result Cr(VI) completely dominated the risk estimates for those properties.

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. The Great Lakes Biomonitoring Project is currently under way by NYSDOH which focused 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.

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.

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 Assess-

ment (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, and 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 Eighteenmile 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.

Flintkote Property

Table 3 provides a summary of existing data and the following points are noteworthy for evaluation of data for BERA:

- Sufficient data are available for surface soil/fill for some parameters (PCBs, metals, mercury, PAHs), but not others (SVOCs, 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:

- Sufficient recent data are available for surface soil/fill for some parameters (PCBs, metals, mercury, PAHs), 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:

- Insufficient surface soil data are available for the Upson Park property in the area above the Creek banks.
- Sufficient recent data are available for bank surface soil for some parameters (PCB Aroclors, metals, mercury, PAHs, and pesticides), but not others (PCB congeners, SVOCs, 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:

- Sufficient recent data are available for surface soil (property and bank combined) for some parameters (PCB Aroclors, metals, mercury, and PAHs), but not others (PCB congeners, 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 Eighteenmile 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 Eighteenmile 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.

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.

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 Eighteenmile 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 Eighteenmile 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 Eighteenmile 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.

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.

The Former Flintkote Plant Site

The presence of elevated level of pentachlorophenol in MW-1RK (see Figure 6) 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) no additional groundwater investigations are warranted at this time.

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 Water 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 Table 12). In addition, the two existing wells (MW05 and MW09 should also be sampled for VOCs.

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 Water 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 Table 13). In addition, the three existing wells (MW14, MW15, and MW16) 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 ecological risk evaluation.

5.1.3 Sediment

Sediment has been extensively sampled as part of previous investigations. No additional sampling is needed to evaluate fate and transport; however, some additional sampling is recommended as part of the ecological risk evaluation.

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 11. In addition, some additional surface soil sampling is recommended as part of the human health and ecological risk evaluation.

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.

Also additional samples need to be collected and analyzed for both forms of chromium.

5.2.3 Additional Environmental Media

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

5.2.4 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.

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.

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 and develop biota-sediment bioaccumulation factors for the BERA.
- 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.
- A benthic community survey is also recommended to be conducted in the Corridor site following NYSDEC (2009a) protocols to determine the level of impairment, or lack thereof, as done for the area below Burt Dam (E & E 2012b).

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.

5.3.3 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.

5.3.4 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 Eighteenmile 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

Eighteenmile Creek Superfund Site - Operable Unit 2

Investigations	Reference Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use
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. Additonal 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.
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.
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. Additonal 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.
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.
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.

Table 1

Summary and Evaluation of Historical Data

Eighteenmile Creek Superfund Site - Operable Unit 2

Investigations	Reference Key	Area	Data Summary	Data Evaluation	Data Availability and Status	Data Use
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 and transport following validation of data packages DEC provided.
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.	Data are usable for risk assessment and 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.	Data are usable for risk assessment and fate and transport.
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.
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 GLNPLO RI database.	Data are usable for risk assessment and fate and transport.

Table 2

Summary of Sampling Data for RI/FS OU2.

Eighteenmile 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**	**0**	**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**	**0**	**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**	**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**	**0**	**3**
Biological																	
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Totals				**0**	**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.

Eighteenmile 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	1	9/15/03	9/18/03	7	--	7	7	7	--	7	--	--	--	--	--
Island	1	9/15/03	9/18/03	3	--	3	3	3	--	3	--	--	--	--	--
South Bank	1	9/15/03	9/18/03	2	--	2	2	2	--	2	--	--	--	--	--
Totals				**12**	**0**	**12**	**12**	**12**	**0**	**12**	**0**	**0**	**0**	**0**	**0**
Subsurface Soil															
Property	1	9/8/03	9/25/03	9	--	9	9	9	--	7	--	--	--	--	--
Island	1	9/8/03	9/25/03	4	--	5	5	4	--	3	--	--	--	--	--
South Bank	1	9/8/03	9/25/03	4	--	4	4	4	--	2	--	--	--	--	--
Totals				**17**	**0**	**18**	**18**	**17**	**0**	**12**	**0**	**0**	**0**	**0**	**0**
Ground water															
Property/ Millrace	1	10/2/03	10/3/03	13	--	13	13	13	--	--	--	--	--	--	--
Totals				**13**	**0**	**13**	**13**	**13**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Biological															
Property		N/A	N/A	--	--	--	--	--	--	--	--	--	--	--	--
Totals				**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

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.

Eighteenmile 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	PAH	SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP
Surface Soil/ Fill														
Property	2	4/1/05	2/1/09	26	--	22	21	15	--	--	--	--	--	2
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--	--
Totals				**26**	**0**	**22**	**21**	**15**	**0**	**0**	**0**	**0**	**0**	**2**
Subsurface Soil														
Property	2	4/1/05	2/1/09	44	--	44	40	16	--	--	--	--	--	4
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--	--
Totals				**44**	**0**	**44**	**40**	**16**	**0**	**0**	**0**	**0**	**0**	**4**
Groundwater														
Property/South Bank	1	7/1/07	2/1/09	6	0	6	6	6	--	6	0	7	--	--
Totals				**6**	**0**	**6**	**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**	**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.

Eighteenmile 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														
Property	2	4/1/05	2/1/09	2	--	2	2	2	--	2	--	--	--	0
Bank	2	4/1/05	2/1/09	16	--	16	16	9	--	9	--	--	--	1
Totals				**18**	**0**	**18**	**18**	**11**	**0**	**11**	**0**	**0**	**0**	**1**
Subsurface Soil														
Property	2	4/1/05	2/1/09	30	--	30	30	*4*	--	--	--	--	--	6
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--	--
Totals				**30**	**0**	**30**	**30**	**4**	**0**	**0**	**0**	**0**	**0**	**6**
Groundwater														
Property/South Bank	1	7/1/07	2/1/09	4	--	4	4	4	--	4	0	4	--	0
Totals				**4**	**0**	**4**	**4**	**4**	**0**	**4**	**0**	**4**	**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 6

Summary of Sampling Data for RI/FS OU2.

Eighteenmile 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	PAH	SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP
Surface Soil/ Fill														
Property	2	4/1/05	2/1/09	10	--	10	10	15	--	--	--	--	--	1
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--	--
Totals				**10**	**0**	**10**	**10**	**15**	**0**	**0**	**0**	**0**	**0**	**1**
Subsurface Soil														
Property	2	4/1/05	2/1/09	23	--	23	23	8	--	--	--	--	--	2
South Bank	2	4/1/05	2/1/09	--	--	--	--	--	--	--	--	--	--	--
Totals				**23**	**0**	**23**	**23**	**8**	**0**	**0**	**0**	**0**	**0**	**2**
Groundwater														
Property/South Bank	1	2/1/09	2/1/09	6	--	6	6	6	--	6	0	7	--	0
Totals				**6**	**0**	**6**	**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**	**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 and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Public Park; Contaminants may be present.
				Maintenance Workers	Adults	Ingestion, Dermal Contact, Inhalation	Qualitative	Area is mostly wooded. No significant maintenance required.
			White Transportation	Site Workers	Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Active commercial facility; contaminants may be present.
				Site Visitors	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.
				Site Visitors	Adults and Adolescents	Ingestion, Dermal Contact, Inhalation	Qualitative	Exposure expected to be less than Site Workers
			Flintkote	Site Visitors	Adults and Adolescents	Ingestion, Dermal Contact, Inhalation	Qualitative	Exposure expected to be less than Site Workers
			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 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	Anglers and their families	Children and Adults	Ingestion	Quantitative	Anglers and their families may consume rfish caught from the creek. Fish caught from the creek are known to be contaminated.
Future	Soil	Soil	White Transportation	Residents	Children and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Property may be converted to residential use in the future; contaminants may be present.
			United Paperboard	Residents	Children and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Property may be converted to residential use in the future; contaminants may be present.
			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.
				Residents	Children and Adults	Ingestion, Dermal Contact, Inhalation	Quantitative	Property may be converted to residential use in the future; contaminants may be present.

Table 8

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

Eighteenmile Creek Superfund Site - Operable Unit 2

Human Exposure Area	Area (acres)	Minimum Soil Sampling Recommendations		Sample Counts by Parameter Group						
		Lead SLCRSH Handbook (5 point comps)	ProUCL Tech Guide	Total Surface or Shallow Soils		Suface Soil	Off-Bank Soils		Subsurface Soils	
				0-2ft	2-5 ft		0-2 ft	2-5 ft	0-2 ft	2-5 ft
Upson Park	5.9	24	10	33	7	4	28	5	1	2
SVOCs/PAHs				13	0	4	9	0	0	0
Pesticides				9	0	4	5	0	--	--
PCB - Aroclors				33	7	4	28	5	1	2
Metals				33	7	4	28	5	1	2
White Transportation	2.6	10	10	22	1	4	13	0	5	1
SVOCs/PAHs				10	0	4	6	0	0	0
Pesticides				6	0	4	2	0	--	--
PCB - Aroclors				22	1	4	13	0	5	1
Metals (All/Selected)				22	1	4	13	0	5	1
United Paperboard	4.8	19	10	48	6	17	23	1	8	5
SVOCs/PAHs				22	2	12	7	0	3	2
Pesticides				16	0	9	7	0	--	--
PCB - Aroclors				48	6	17	23	1	8	5
Metals				48	6	17	23	1	8	5
FlintKote	6	24	10	35	7	12	18	0	5	7
SVOCs/PAHs				20	7	12	3	0	5	7
Pesticides				20	7	12	3	0	5	7
PCB - Aroclors				35	7	12	18	0	5	7
Metals				35	7	12	18	0	5	7

Note: Highlight cells have sample counts below recommended frequency

Table 9

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

Eighteenmile 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 prey exceed TRVs for survival, growth, or reproduction of birds?	Contaminant concentrations in soil, sediment, and surface water.	Modeled dose from ingestion of soil or sediment, surface water, and prey 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 prey exceed TRVs for survival, growth, or reproduction of mammals?	Contaminant concentrations in soil, sediment, and surface water.	Modeled dose from ingestion of soil or sediment, surface water, and prey 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 prey exceed TRVs for survival, growth, or reproduction of mammals?	Contaminant concentrations in sediment, surface water, and prey	Modeled dose from ingestion of sediment, surface water, and prey 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 prey exceed TRVs for survival, growth, or reproduction of birds?	Contaminant concentrations in sediment, surface water, and prey	Modeled dose from ingestion of soil or sediment, surface water, and prey compared with literature-based TRVs.

Table 9

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

Eighteenmile 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?	Sediment toxicity test results	Compare survival and growth in site sediment with survival and growth in clean control sediment as described in EPA protocols.
		Is the composition of the benthic macroinvertebrate community in Eighteenmile Creek impaired based on NYSDEC protocols and, if so, what is the level of impairment?	Benthic community survey	Quantify composition and abundance of benthic macroinvertebrates and calculate impairment score (e.g. BAP) as per NYSDEC 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.

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.

Eighteenmile Creek Superfund Site - Creek Sediment (DEC OU1)

Matrix and Data Gap	Note	Number of Samples															Remarks
		PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAH	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 ERA purposes. Full TCL scan suggested for new sediment samples for Superfund 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.	--	--	--	--	--	--	--	--	--	--	--	--	6	--	--	Three *Chironomus* (midge) tests and three *Hyalella* (amphipod) tests for a total of six tests.
BERA Data GAP (Bioaccumulation)	Standardized tests with site sediment and a laboratory-reared freshwater oligochaete (*Lumbriculus variegatus*) can be used to evaluate bioaccumulation of contaminants from sediment to worm tissue. The test data can be used to develop site-specific biota sediment accumulation factors (BSAFs) and/or used directly as exposure point concentrations for insectivorous wildlife.	3	3	--	--	--	--	--	3	3	--	3	--	--	3	--	Adequate *Lumbriculus* tissue mass should be used for the bioaccumulation tests to allow for analysis of PCBs and other bioaccumulative contaminants of interest.
BERA Data Gap (Sediment Chemistry)	Needed 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 scan typically needed for Superfund. Existing sediment chemistry data < 10 years old is assumed to be usable for risk assessment purposes.	3	3	3	3	3	--	3	3	3	3	--	3	--	--	--	
HHRA and BERA Reference (Sediment Chemistry)	Background data are needed for risk assessment. Full TCL scan typically needed for Superfund. Data also can be used for OU3.	10	10	10	10	10	--	10	10	10	10	--	--	--	--	--	Assuming a reference area can be determined.
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 ERA purposes. Other includes TSS, TOC, and water-quality parameters (field measured). Full TLC scan needed for Superfund.	3	3	3	3	3	3	3	3	3	--	--	--	3	--	3	None.
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.	--	--	--	--	--	--	--	--	--	--	--	--	6	--	--	Three fathead minnow tests and three *Ceriodaphnia* (water flea) tests for a total of six tests.
Biological	***No tissue data or benthic survey data. Fish-eating wildlife in the Corridor site were observed in previous studies. Fish and other tissue data are recommended to perform the ecological risk assessment.***																
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.	10	10	10	10	--	--	--	10	10	--	10	--	--	--	--	Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Corridor site (lead, zinc, copper).
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.	10	10	10	10	--	--	--	10	10	--	10	--	--	--	--	Metals to be analyzed for may be limited to those that are highly elevated in creek sediment in the Corridor site (lead, zinc, copper).
HHRA and BERA Reference (Fish tissue)	Background data are needed for risk assessment. Data also can be used for OU3.	10	10	10	10	--	--	--	10	10	--	10	--	--	--	--	Assuming a reference area can be determined.

Table 10

Summary of Data Gaps and Recommended Additional Sampling.

Eighteenmile Creek Superfund Site - Creek Sediment (DEC OU1)

Matrix and Data Gap	Note	Number of Samples															Remarks
		PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAH	SVOCs	Pesticides	Dioxins/ Furans	Total Organic Carbon	Lipids and Moisture Content	AVS/SEM	Sediment Toxicity	Sediment Bioaccumulation	Other	
BERA Data Gap (Benthic Survey)	No studies have directly evaluated the condition of the resident benthic community in the Corridor site. Such studies provide a direct measure of benthic community health and are an element of the sediment quality triad approach. Standardized sampling and analysis methods are available based on USEPA and NYSDEC protocols, and have been applied elsewhere in Eighteenmile Creek to evaluate impairment. A decision regarding impairment can be reached without reference area comparisons using NYSDEC protocols. We suggest that three riffle and three pool habitat locations be surveyed.	--	--	--	--		--	--	--	--	--	--	--	--	--	6	EPA suggested not conducting a benthic survey during a conference call in early January 2014. However, there is much riffle habitat within the Corridor site where a survey could be done. Pool habitats also are present in the Corridor site and could be surveyed. A recent study conducted a benthic survey of riffle, run, and pool habitats below Burt Dam to successfully evaluate the level of impairment in that area without the need for reference area comparisons (E&E 2012b).

Key:

AVS/SEM = Acid Volatile Sulfide / Simultaneously Extracted Metals
BERA = Baseline ecological risk assessment
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 = Target compound list
TOC = Total organic carbon
TSS = Total suspended solids

Table 11

Summary of Data Gaps and Recommended Additional Sampling.

Eighteenmile Creek Superfund Site - Flintkote Property (DEC OU2)

Matrix and Data Gap	Note		Number of Samples													Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAHs	SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	Toxicity	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***															
BERA and HHRA Data Gap	Full TCL scan required for Superfund. Exiting database for surface soil should be supplemented accordingly.		--	--	--	--	7	--	--	10	10	10	10	--	--	Additional analytical parameters are needed for risk asssesment. Some samples may be collected at depth with a hand auger.
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. Some parameters are not listed in this row because they are included in the row above.		3	3	3	3	3	3	--	--	--	--	--	--	--	
HHRA and BERA Background Data	Background data are needed for risk assessment. Full TCL scan typically needed for Superfund. Data also can be used for all properties.		10	10	10	10	10	10	--	10	10	10	--	--	--	Assuming a reference area can be determined.
Subsurface Soil	***Insufficient recent subsurface data under the building.***															
Data Gap	Additional 10 Borings and 30 Samples to assess PCB contamination beneath building.		30	--	30	--	30	--	10	3	3	3	--	--	--	Assume 10% of new samples for missing parameters.
Groundwater	***Groundwater migration to the surface water is established. Further investigation not required due to full excavation***															
			--	--	--	--		--	--	--	--	--	--	--	--	
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
ERA = Ecological risk assessment
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL = Target compound 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 12

Summary of Data Gaps and Recommended Additional Sampling.

Eighteenmile Creek Superfund Site - United Paper Property (DEC OU3)

Matrix and Data Gap	Note		Number of Samples												Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	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.***														
BERA and HHRA Data Gap	Full TCL scan required for Superfund. Exiting database for surface soil should be supplemented accordingly.		--	--	--	--	7	--	--	10	10	10	--	--	Additional analytical parameters are needed for risk asssesment. Some samples may be collected at depth with a hand auger.
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. Some parameters are not listed in this row because they are included in the row above.		3	3	3	3	3	3	--	--	--	--	--	--	
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 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	One additional upgradient well to assess the potential for offsite source of VOCs and metals and sampling of 2 existing monitoring wells.		--	--	3	3		--	--	--	--	3	--	--	
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:

BERA = Baseline ecological risk assessment
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 = Target compound 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 13

Summary of Data Gaps and Recommended Additional Sampling.

Eighteenmile Creek Superfund Site - Upson Park (DEC OU4)

Matrix and Data Gap	Note		Number of Samples												Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAH	SVOCs	Pesticides	Dioxins/ Furans	VOCs	Other[A]	TCLP	
Surface Soil/ Fill	***Samples collected along the creek bed were not analyzed for all TCL parameters. Only 2 samples were collected in the park area where potential exposure may be different for human health and /or ecological receptors.***														
BERA and HHRA Data Gap (Property)	Additional 10 Samples in the Park Area at 0-12" to support human health risk assessment and baseline ERA. Full TCL scan required for Superfund. Samples will be co-located for assessing bioaccumulation.		10	10	10	10	10	--	10	10	10	10	--	--	Additional analytical parameters are needed for risk asssesment. Some samples may be collected at depth with a hand auger.
BERA and HHRA Data Gap (Bank)	Full TCL scan required for Superfund. Exiting database for bank surface soil should be supplemented accordingly.		--	--	--	--	10	--	10	--	10	10	--	--	Additional analytical parameters are needed for risk asssesment.
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	One additional upgradient well to assess the potential for offsite source of VOCs and metals and sampling of 3 existing monitoring wells.		--	--	4	4	--	--		--	--	4		--	
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 carnivorous 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
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 = Target compound 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.

Eighteenmile Creek Superfund Site - White Transportation Property (DEC OU5)

Matrix and Data Gap	Note		Number of Samples												Remarks
			PCB Aroclors	PCB Congeners	Metals	Mercury	Cr(III) and Cr(IV)	PAH	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.***														
BERA and HHRA Data Gap	Full TCL scan required for Superfund. Exiting database for surface soil should be supplemented accordingly.		--	--	--	--	7	--	--	10	10	10	--	--	Additional analytical parameters are needed for risk asssesment. Some samples may be collected at depth with a hand auger.
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. Some parameters not listed here because they are included in above row.		3	3	3	3	3	3	--	--	--	--	--	--	
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
SLERA = Screening level ecological risk assessment
SVOCs = Semivolatile organic compounds
PAHs = Polycyclic aromatic hydrocarbons
PCBs = Polychlorinated biphenyls
TCL = Target compound 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.

Figures

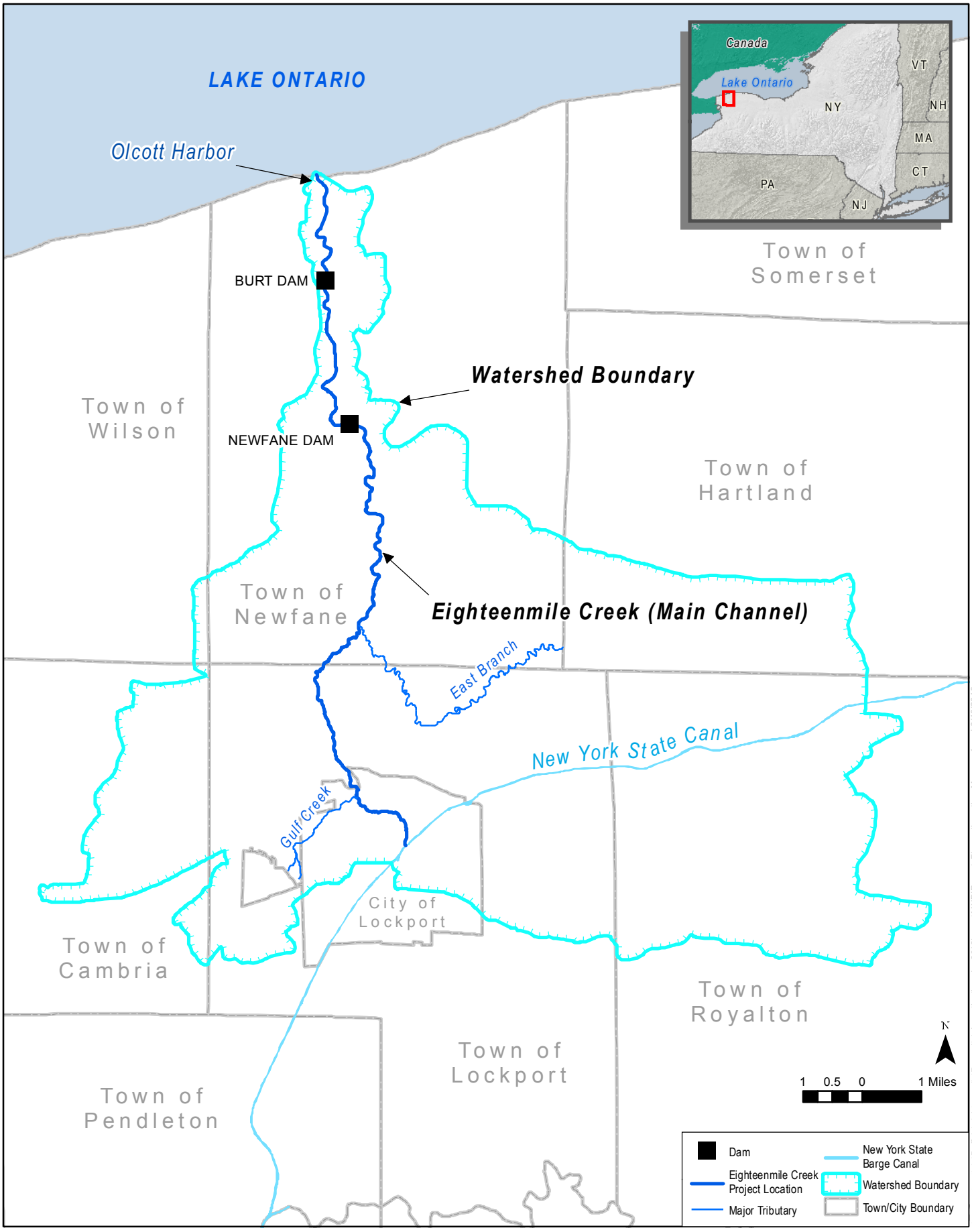


Figure 1 Eighteenmile Creek Site Location

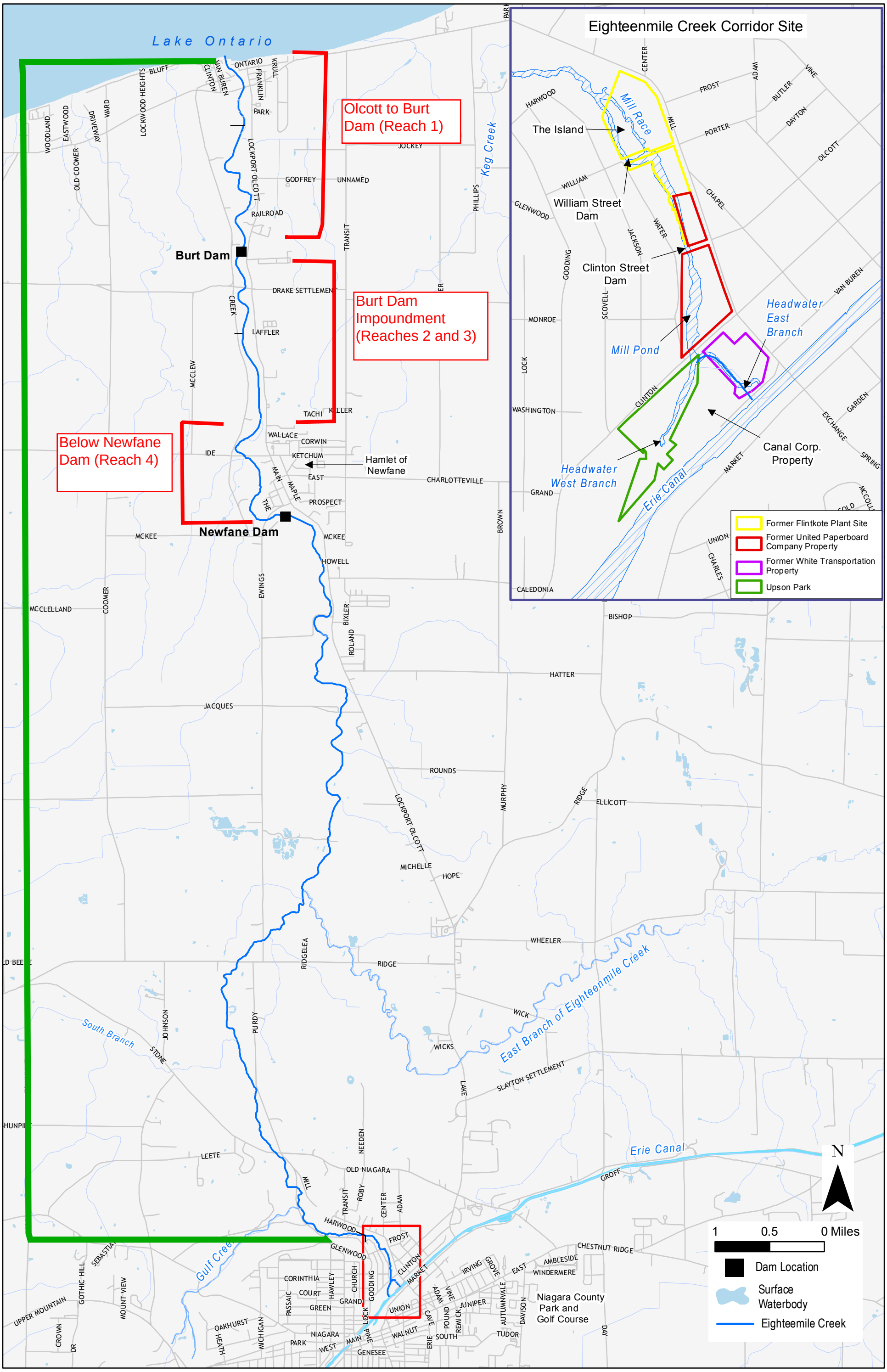


Figure 2 Eighteenmile Creek Site Areas

L:\Buffalo\eighteenmile\Remedial_Investigation_Jan2012\maps\MXD\Report_Figures\Reach_Overview.mxd 08/29/13

F:\18 Mile Creek\2014\Operable Unit Boundaries.dwg

N

MILLRACE

OU-2
FORMER
FLINTKOTE
PROPERTY

OU-2
EIGHTEENMILE
CREEK AND MILLRACE
(SEDIMENTS)

OU-1
WATER STREET
RESIDENTIAL
PROPERTIES

OU-2
FORMER
UNITED
PAPERBOARD
COMPANY
PROPERTY

OU-2
WHITE
TRANSPORTATION

OU-2
UPSON
PARK

NOTE:

1. SITE INFORMATION REFERENCED FROM POPLI CONSULTING ENGINEERS AND SURVEYOR'S SUPPLEMENTAL RI DATED SEPTEMBER 2007.
2. PROPERTY BOUNDARIES SHOWN ARE FROM NIAGARA COUNTY OFFICE OF REAL PROPERTY (2006).

Mill Street
Center St.
Frost Street
Porter Street
Harwood St.
Jackson Street
William Street
Scovell Street
Chapel Street
Water Street
Olcott Street
EIGHTEENMILE CREEK
Monroe Street
Water St.
Clinton Street
Van Buren Street
Jackson Street
Scovell St.
Gooding Street
Grand Street
Green Street
BARGE CANAL

SCALE IN FEET
0 250 500 750

ecology and environment

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

Figure 4 - State and National Registers of Historic Places, Lockport, New York

Document Path: L:\Buffalo\eighteenmile\Mxds\Groundwater_Contamination_Map.mxd Date: 1/24/2014

Former Flintkote Plant Site

Former United Paperboard Company Property

White Transportation Property

Upson Park

Canal Corp. Property

Olcott Street Bridge

Storm Sewer Pipe

Clinton Street Dam

Eighteenmile Creek

Eighteenmile Creek East Branch

Eighteenmile Creek West Branch

NYS Barge Canal

MW01 Overburden	Depth to Bedrock >22 ft	Screened Interval 12-22 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	7.6 J
Antimony Dissloved			3	7.7 J
Iron			300	1260 J
Iron Dissolved			300	919 J
Magnesium			35000 g	42800 J
Magnesium Dissolved			35000 g	39500 J
Sodium			20000	111000
Sodium Dissolved			20000	105000

MW02 Overburden	Depth to Bedrock >30 ft	Screened Interval 18-28 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	6.6 J
Antimony Dissloved			3	8.4 J
Iron			300	1070 J
Iron Dissolved			300	795 J
Magnesium			35000 g	40400 J
Magnesium Dissolved			35000 g	38100 J
Sodium			20000	173000
Sodium Dissolved			20000	168000

MW04 Overburden	Depth to Bedrock >26 ft	Screened Interval 16-26 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	5.6 J
Iron			300	868 J
Iron Dissolved			300	577 J
Sodium			20000	67200
Sodium Dissolved			20000	64300

MW05 Overburden	Depth to Bedrock >23 ft	Screened Interval 13-23 ft	Screening Criteria [1]	Round 1 Results above screening criteria	Round 2 Results above screening criteria
VOCs (µg/L)					
cis - 1,2-Dichloroethene			7	7.1	9.4
METALs (µg/L)					
Antimony			3	7 J	NA
Antimony Dissloved			3	7.6 J	NA
Iron			300	2260 J	NA
Iron Dissolved			300	1000 J	NA
Magnesium			35000 g	53400 J	NA
Magnesium Dissolved			35000 g	49500 J	NA
Manganese			300	444 J	NA
Manganese Dissolved			300	407 J	NA
Sodium			20000	113000	NA
Sodium Dissolved			20000	111000	NA

MW06 Overburden	Depth to Bedrock 26 ft	Screened Interval 15-25 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	5.3 J
Iron			300	888 J
Iron Dissolved			300	654 J
Magnesium			35000 g	37900 J
Magnesium Dissolved			35000 g	37600 J
Sodium			20000	155000
Sodium Dissolved			20000	162000

MW08 Overburden	Depth to Bedrock 16 ft	Screened Interval 6-16 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
VOCs (µg/L)				
Phenol			1	3.2 J
METALs (µg/L)				
Antimony			3	5.6 J
Iron			300	44900 J
Iron Dissolved			300	29700 J
Manganese			300	2030 J
Manganese Dissolved			300	1960 J
Sodium			20000	73100
Sodium Dissolved			20000	72800

MW09 Bedrock	Depth to Bedrock 9 ft	Screened Interval 9-14 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
Not Sampled - Dry				

MW11 Overburden	Depth to Bedrock 14 ft	Screened Interval 8.5-13.5 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	3.8 J
Iron			300	645 J
Iron Dissolved			300	325 J
Sodium			20000	88100
Sodium Dissolved			20000	87000

MW10 Overburden	Depth to Bedrock 18 ft	Screened Interval 7-17 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	3.1 J
Iron			300	662 J
Sodium			20000	21600
Sodium Dissolved			20000	20800

MW12 Overburden	Depth to Bedrock >14.5 ft	Screened Interval 9-14.5 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Antimony			3	5.4 J
Iron			300	793 J
Iron Dissolved			300	620 J
Magnesium			35000 g	5730 J
Magnesium Dissolved			35000 g	5490 J

MW14 Bedrock	Depth to Bedrock 20.5 ft	Screened Interval 20-25 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria	Round 2 2009 Results above screening criteria
VOCs (µg/L)					
cis - 1,2-Dichloroethene			7	33	29
TCE			5	20	19
METALs (µg/L)					
Antimony			3	5.5J	NA
Iron			300	1110 J	NA
Iron Dissolved			300	686 J	NA
Magnesium			35000 g	41100 J	NA
Magnesium Dissolved			35000 g	38800 J	NA
Sodium			20000	222000	NA
Sodium Dissolved			20000	210000	NA

MW15 Bedrock	Depth to Bedrock 16.7 ft	Screened Interval 16.7 ft - 21.7 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria	Round 2 2009 Results above screening criteria
METALs (µg/L)					
Antimony			3	7.2 J	NA
Iron			300	1220 J	NA
Iron Dissolved			300	682 J	NA
Magnesium			35000 g	41800 J	NA
Magnesium Dissolved			35000 g	39300 J	NA
Sodium			20000	585000	NA
Sodium Dissolved			20000	574000	NA

MW16 Bedrock	Depth to Bedrock 9.5 ft	Screened Interval 15-25 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria	Round 2 2009 Results above screening criteria
METALs (µg/L)					
Antimony			3	5.1 J	NA
Iron			300	928 J	NA
Iron Dissolved			300	540 J	NA
Magnesium			35000 g	37200 J	NA
Sodium			20000	529000	NA
Sodium Dissolved			20000	499000	NA

MW13 Overburden	Depth to Bedrock 10 ft	Screened Interval 4-9 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Iron			300	561 J
Iron Dissolved			300	406 J
Sodium			20000	24200
Sodium Dissolved			20000	22500

MW17 Overburden	Depth to Bedrock >26 ft	Screened Interval 16-26 ft	Screening Criteria [1]	Round 1 2007 Results above screening criteria
METALs (µg/L)				
Iron			300	1350

MW01 465.54
MW02 471.22
MW04 470.78
MW05 466.40
MW06 472.52
MW08 479.86
MW09 488.53
MW10 481.69
MW11 485.77
MW12 482.69
MW13 488.74
MW14 478.05
MW15 486.85
MW16 502.72
MW17 501.76

Historic DEC Micro-Well
Historic DEC Monitoring Well
Overburden SRI Groundwater Monitoring Well (water elevation in feet)
Bedrock SRI Groundwater Monitoring Well (water elevation in feet)
Creek Flow Direction
Direction of Groundwater Flow
July 2007 Groundwater Contours (10ft Interval)
July Inferred Goundwater Contours (10ft Interval)
Topographic Contours (10ft Interval)
Railroad
Bridge
Vegetation
Water

Key:
J = Estimated value
NA = Not Analyzed

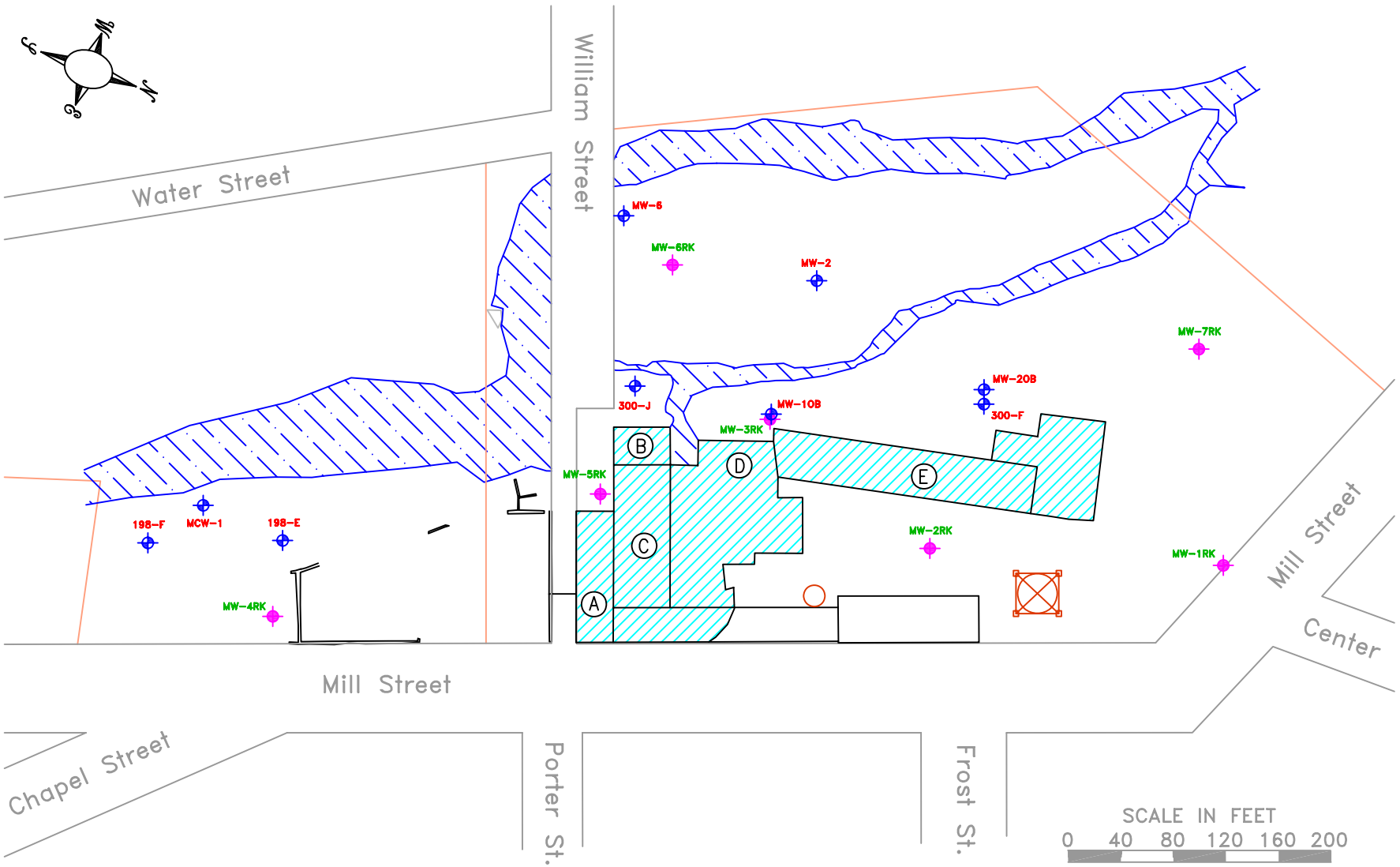
1 inch = 133.282941 feet
0 125 250 500 Feet
N

Figure 5 Groundwater Conamination Map, Eighteenmile Creek Corridor Site, Supplemental Remedial Investigation

Notes for Groundwater Standards and Guidance Values:

[1] New York State Department of Environmental Conservation, Technical and Operational Guidance #1.1.1: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, 1998 (and subsequent addenda).

g = Guidance Value



MONITORING WELL LOCATION MAP

DIVISION OF ENVIRONMENTAL REMEDIATION

DATE: 05/11/00 DRAWING: SITEMAP.DWG

SITE: FORMER FLINTKOTE PLANT SITE

FIGURE 6

EE-002964-0002-01-06TTO: Fig7.ai 1/24/2014

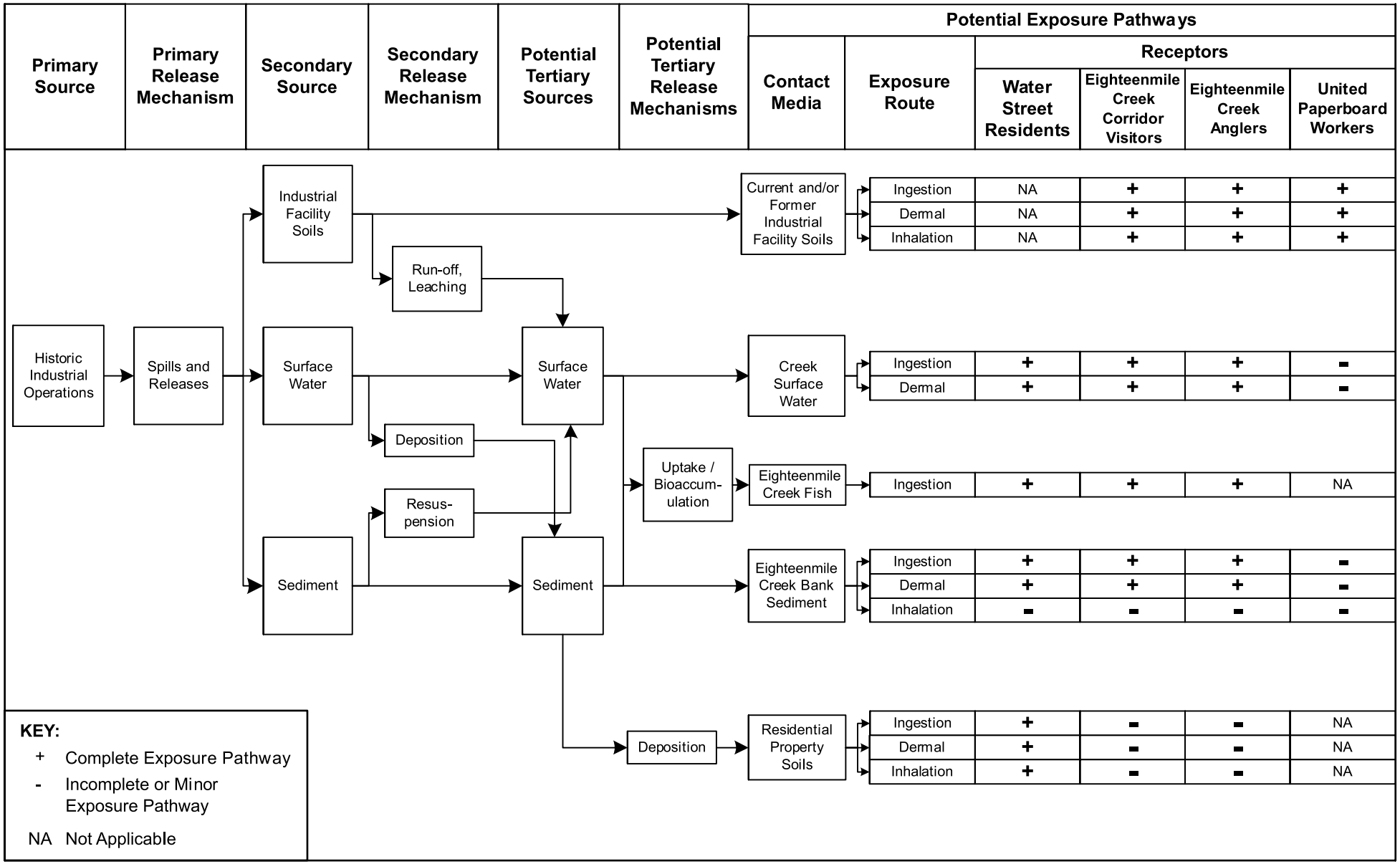
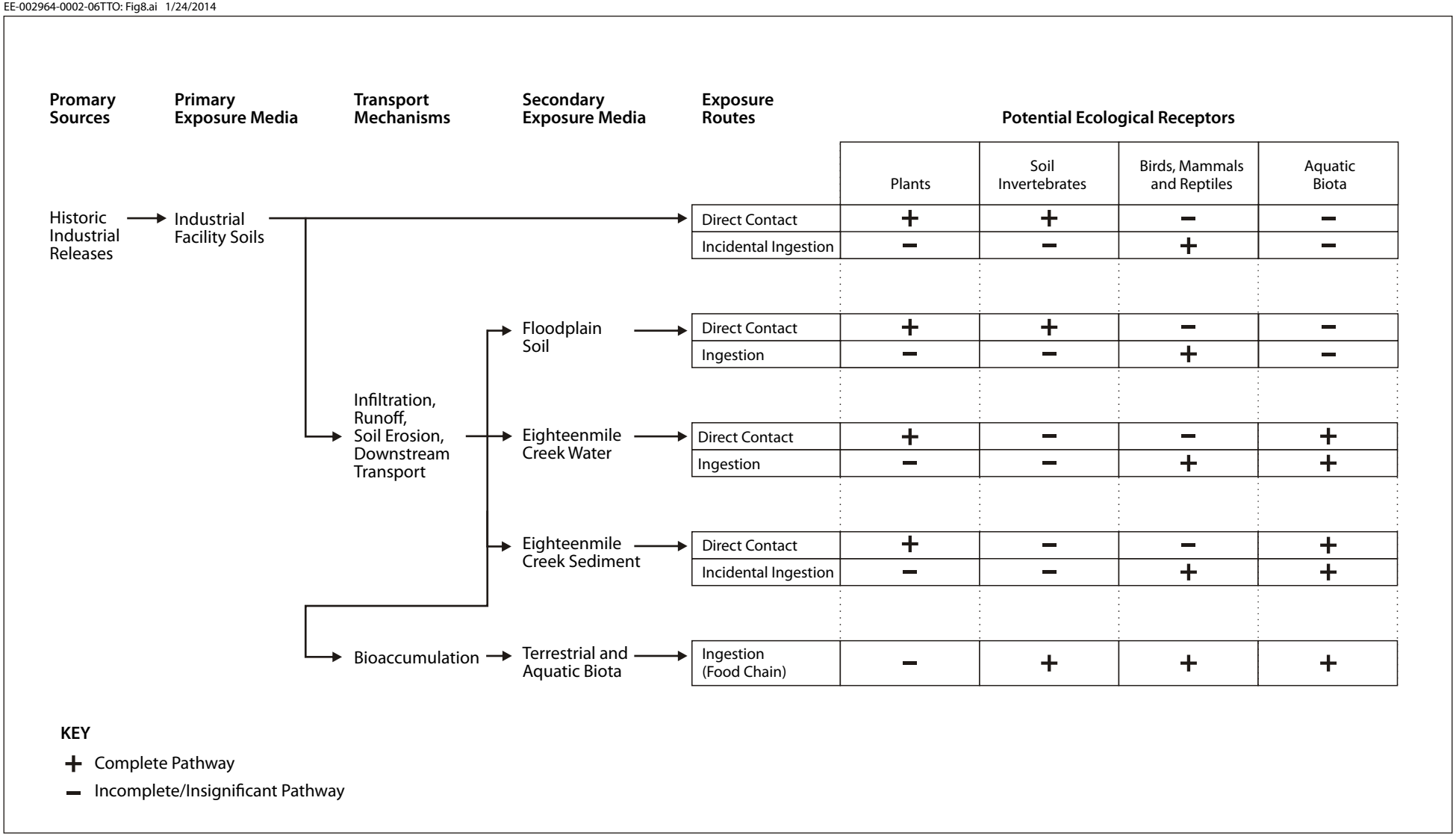


Figure 7 **Conceptual Model of Potential Human Exposures to Contaminants in the Eighteemile Creek Corridor Site, Supplemental Remediation Investigation**

EE-002964-0002-06TTO: Fig8.ai 1/24/2014



SOURCE: Ecology and Environment, Inc., 2014

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

A Reports Reviewed

Table A

List 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.
	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.
	OU2	2009	E & E. 2009. *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.
	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.

Table A

List 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.
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.
	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

List 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.
	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