FINAL
REMEDIAL ALTERNATIVES REPORT

SITE INVESTIGATION/REMEDIAL ALTERNATIVES REPORT (SI/RAR)

FORMER FLINTKOTE SITE
198 and 300 MILL STREET
CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

(NYSDEC SITE NO. B-00161-9)

Prepared for:

Niagara County Department of Planning, Development and Tourism
Vantage Center, Suite 1
6311 Inducon Corporate Drive
Sanborn, New York 14132

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FINAL REMEDIAL ALTERNATIVES REPORT

SI/RAR OF FORMER FLINTKOTE SITE

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1.0 INTRODUCTION

1.1 Purpose

The Niagara County Department of Planning, Development and Tourism (County) entered into a State Assistance Contract with the New York State Department of Environmental Conservation (NYSDEC) to complete a Site Investigation/Remedial Alternatives Report (SI/RAR) for the former Flintkote site located at 198 and 300 Mill Street in the City of Lockport, Niagara County, New York (Site). Figure 1 is included as a Site Location Map.

The SI/RAR is being completed pursuant to the Environmental Restoration, or Brownfield Program, component of Title 5 of the Clean Water/Clean Air Bond Act of 1996, which is administered by the NYSDEC. The purpose of the SI/RAR is to characterize the nature and extent of contamination occurring on and emanating from the project Site, and to develop and evaluate remedial alternatives.

TVGA Consultants (TVGA) has prepared this Draft Remedial Alternatives Report (RAR) on behalf of the County to describe the process used to develop and evaluate alternatives for addressing contaminated media at the Site. Contamination at the Site is detailed in the April 2004 Draft Site Investigation Report (SIR). In addition to presenting the Remedial Action Objectives (RAOs) for affected media at the Site, this RAR identifies and comparatively analyzes a range of remedial alternatives capable of satisfying these RAOs, and subsequently provides a recommendation for remedy selection. Upon confirmation of this recommendation by the NYSDEC, the proposed remedy will be summarized in a Proposed Remedial Action Plan (PRAP) for public review and comment.

1.2 Report Organization

This report has been structured to present the results of the remedial alternatives analysis in accordance with the report format suggested in NYSDEC TAGM 4058 and 6 NYCRR 375. The three (3) major sections of this report are as follows:

Section 1.0 – Presents background information, summarizes the results of the SI and develops the areas of concern.

Section 2.0 - Develops and identifies the RAOs for the areas of impacted media and develops general response actions for the affected media, which are assembled into site-wide remedial alternatives.

Section 3.0 - Presents detailed analyses of the remedial alternatives, both individually and comparatively, and identifies the recommended alternative.

1.3 Site Description

The Site is an abandoned industrial property that occupies an approximate six (6) acre area. The majority of the Site is situated along the eastern bank of Eighteen Mile Creek and is bordered by commercial property to the north, vacant land to the south, Mill Street to the east, and Eighteen Mile Creek to the west. However, a small portion of the Site occurs along the western bank of Eighteen Mile Creek, and is bounded to the south by residential properties that extend along Water Street. This portion of the Site, hereinafter referred to as the Water Street Section (WSS), is located directly to the south of William Street, which is currently closed to vehicular and pedestrian traffic. William Street also divides the eastern portion of the Site into north (300 Mill Street) and south sections (198 Mill Street). The section of 300 Mill Street between Eighteen Mile Creek and the millrace is referred to as the Island. The area to the west of Eighteen Mile Creek is occupied by residential properties. The area to the east of Mill Street is occupied by both residential and industrial properties. Figure 2 is included as a Site Plan.

The 198 and 300 Mill Street sections of the Site contain the remnants of a manufacturing complex that are now vacant and in long-term neglect. The different sections of the remaining buildings/structures have been identified using a lettering system or a former use designation. The building/structure identifications include Building “A” through “E”, Boiler Room, Machine Room, Water Tower, and Silo. These building/structures are shown on Figure 2 – Site Plan.

The former process equipment was removed from the Site years ago leaving residual volumes of assorted industrial debris inside the buildings. The external areas of the Site have become overgrown with weeds, brush and small trees. Exposed at the surface is a mixture of fill (typically ash), soil, miscellaneous piles of industrial debris, empty drums, and concrete, asphalt, or gravel surfaces. A small berm is visible along the western bank of Eighteen Mile Creek, on the WSS.

As shown on Figure 2, Eighteen Mile Creek and the former millrace constitute the two surface water bodies on the Site. The millrace and the Eighteen Mile Creek effectively form an island on the Site, which has been used for the disposal of various wastes, refuse and debris. Extensive filling has also been documented at the north end of 300 Mill Street and at the south end of 198 Mill Street.

1.4 Site History

The Site was initially developed for industrial use by the 1880s. Historic fire insurance maps from 1909 and 1914 depict the presence of an industrial complex occupied by the Lockport Paper Company. These maps also indicate that the facility contained machine rooms, engine rooms and boiler rooms. A structure identified as an oil house was located on the Island on the west bank of the millrace, at a point between the sluice gates on William Street and the facility’s tail race just to the north. A railroad line bounded the east side of the Site, from which track sidings extended to the northern part of the Site.

Historic street directories indicated that the Lockport Paper Company occupied the Site until the late 1920s when the Beckman Dawson Roofing Company used the Site. In 1928, the Flintkote Company purchased the property from the Beckman Dawson Roofing Company. Flintkote was noted to be a manufacturer of felt and felt products.

A historic fire insurance map from 1928 indicates that the Flintkote Company, Felt Division, occupied the Site and indicates the presence of machine rooms, boiler rooms, electrical transformers, coal piles, conveyors and a silo. A large industrial building was identified as a "saturating and coating plant" on the east side of Mill Street, northeast of the Site. The building was depicted containing a large fuel oil tank and overhead pipes for carrying asphalt.

From 1935 until 1973, Flintkote manufactured sound deadening and tufting felt for use in automobiles. Flintkote ceased its operations in 1971. Since 1971, the Site has been transferred and occupied by various companies (i.e. Frank Davis Company, River Salvage Company, Thomas E. Carter Trucking Company, etc.). The County acquired the parcels that comprise the Site via tax foreclosure in August 1999 and has been the sole owner since then.

1.5 Site Investigation Results

The objective of the Site Investigation (SI) phase of this program was to further characterize the Site and better define the nature and extent of contamination occurring in the on-site soil/fill; groundwater; surface water and sediment occurring in the vicinity of outfalls originating from the facility; and building surfaces, components and materials. The resulting data was used to qualitatively evaluate potential risks to human health and the environment associated with the current conditions and planned future use scenario, which involves the recreational use of the Site.

1.5.1 Scope of Site Investigation

The scope of the SI program was generally consistent with that outlined in the NYSDEC approved February 2003 Draft SI/RA Report Work Plan (Work Plan) and the subsequent June 20, 2003 Addendum which served to finalize the Work Plan. Minor modifications to the Work Plan were made during the completion of the SI in consultation with the NYSDEC and County to account for the Site conditions encountered. The primary tasks associated with the SI included:

- The collection of surface soil/fill samples;
- The advancement of 25 soil probes and the drilling of 10 test borings across the Site to collect, screen and classify overburden deposits and the bedrock geology;
- Installation of three overburden groundwater monitoring wells and seven bedrock groundwater monitoring wells to determine groundwater flow direction and facilitate the collection of representative groundwater

samples. Three existing wells that were previously installed by NYSDEC were also sampled;

- The sampling of concrete building surfaces that may have been exposed to PCBs;
- Inspection of sumps and low areas within the building and outfall pipes to Eighteen Mile Creek to identify and sample potential contaminated aqueous materials and sediments;
- The sampling of suspect material adhered to interior building surfaces;
- Chemical analysis of soil/fill, sediment, liquids, groundwater, concrete samples, and miscellaneous materials;
- Completion of a visual asbestos survey; and
- The survey of the Site's topography, monitoring well, and sample locations.

Field and laboratory procedures were performed in general accordance with the Field Sampling Plan and the Quality Assurance/Quality Control (QA/QC) Plan developed for the project. The environmental sample locations are included on Figure 3.

1.5.2 Physical Conditions of the Site

The subsurface stratigraphy is comprised of four major units including: topsoil; fill materials; glaciolacustrine deposits (native soil); and bedrock. The topsoil was usually less than 0.2 feet thick and was often encountered above the fill materials. The estimated 46,500 cubic yards of fill material identified at the Site varies in thickness across the Site from less than one foot thick to 24.9 feet thick. The most predominant fill material consists of an ash type material identified as a reddish brown colored ash or a black colored ash. Varying amounts of red brick, white brick, coal, slag, buttons, and metal fragments were identified in the ash layers. In general, the black ash was encountered in the northern most borings of the 300 Parcel, while the reddish brown ash was encountered on the southern part of the Island and in a berm on the WSS which appears to extend slightly onto the adjacent private property at 143 Water Street. The 198 Parcel exhibited a mixture of the reddish brown ash and the black ash. Other fill materials encountered included reworked cohesive and granular soils that were generally identified throughout the Site. A layer of glaciolacustrine soil consisting of fine-grained silty-clay and clayey-silt, was identified below the fill layer in most explorations, except at the northern portion of the 300 Parcel, where the fill materials generally occur directly above the bedrock.

The depth to the sandstone bedrock varies across the Site, with the shallowest occurrences along Mill Street, Eighteen Mile Creek and the northern portion of the Island. The bedrock has a fairly uniform slope from Mill Street (approximate elevation 90 feet) downward towards the millrace (approximate elevation 68 feet). Bedrock slopes in this area generally range from 10% to 15% with some

areas as steep as 40% at the south end of the Site. Bedrock elevations on the Island are highest in the middle section (approximate elevation 72 feet) and slope downward to the east and west towards the millrace and Eighteen Mile Creek, respectively.

Groundwater on the 198 and 300 Parcels occurs primarily in the fractured sandstone bedrock beneath this portion of the Site, and moves in a westerly direction toward the discharge area represented by the creek and millrace. Saturated conditions were not encountered in the surficial deposits occurring on the eastern-most portion of the Site. Instead precipitation that infiltrates the fill and/or overburden in this area of the Site migrates vertically downward and recharges the fractured bedrock water-bearing zone, which occurs between 15 to 20 feet below the ground surface and six to nine feet below the top of the bedrock. As groundwater migrates to the west in the fractured bedrock, it discharges from the bedrock into the overburden along the base of the sloped bedrock surface. Where the groundwater piezometric surface intersects the top of the bedrock surface along the base of this bedrock slope, the upper-most hydrostratigraphic unit on the Site transitions from one occurring exclusively within fractured bedrock to one that is comprised of both overburden and fractured bedrock zones.

Groundwater continues to migrate westward within this hydrostratigraphic unit toward the discharge zone represented by Eighteen Mile Creek and the millrace. Although recharge to the saturated overburden zone from precipitation infiltrating at the surface of these deposits is likely limited due to the steep surface slopes, some recharge is expected to occur in this manner. The depth to groundwater in the overburden monitoring wells installed along the western margins of the 198 and 300 Parcels ranged from 2.3 to 23.9 feet below ground surface.

A comparison of the groundwater elevations in the wells situated in close proximity to Eighteen Mile Creek on the 198 and 300 Parcels to the surface water elevation within the creek and millrace indicates that the groundwater is generally at equivalent or greater elevations than the surface water. This indicates that groundwater is likely discharging to these surface water bodies, although seasonal fluctuations in surface and groundwater elevations may result in periods where the creek is recharging groundwater.

Eighteen Mile Creek flows through the western portion of the Site in a north-northwesterly direction towards its eventual discharge into Lake Ontario. The creek has been diverted westward from its apparent natural course for approximately 300 feet by a dam along William Street, and resumes its northward course after passing through a pair of culverts beneath William Street. The Creek then rejoins its natural channel at an area approximately 460 feet north of William Street. A pair of sluice gates at the east end of the dam formerly allowed an unknown rate of flow from Eighteen Mile Creek to continue

downstream into a millrace along the west side of the buildings at 300 Mill Street where a water turbine was reportedly once located. Although the sluice gates are now closed and soil has been deposited behind them, leakage from the Creek through the gates and from the former turbine discharge portal supplies the millrace with a sluggish flow approximately six inches to one foot deep.

A review of the Flood Insurance Rate Map developed for the Site's vicinity by the Federal Emergency Management Agency, indicates that Eighteen Mile Creek and its lower banks are within a 100-year flood plain and the higher portions of the Site are within a Zone C, which is an area of minimal flooding. The surface elevations of 143 Water Street near the banks of Eighteen Mile Creek would likely fall within the 100 year flood zone. Flooding of 143 Water Street and other upstream properties along Water Street has been reported during storm events and is often believed to be a result of flow obstructions at the culverts beneath William Street.

The majority of the buildings on the 198 Parcel have been razed, with remaining portions consisting of former basement walls, concrete columns, and concrete floors. The buildings that remain on the 300 Parcel consist of stone, brick and concrete construction with wooden or concrete roof deck structures. The northern area of the Site includes a steel water tower and boiler stack, former coal bunkers and a coal silo. A number of debris and scrap steel piles are also located across the Site. The remaining buildings are generally in a deteriorated state, with the majority of the buildings having some structural deficiencies. There are numerous openings in the floors, roof systems are partially or completely collapsed and stairways and hand rails are in poor condition. Given the poor condition of the roof systems, and exposed window and door openings, the condition of the buildings will likely continue to deteriorate due to rain, snow and freeze/thaw cycles.

Several low areas were identified in the buildings, including the south end of Building E and the deep basement of Building D. These low points were identified as areas where contaminants from the building may have accumulated. One sump was identified at the southwest corner of the ground floor in Building C. The sump was about 2.5 feet wide and 3.5 feet long. The sediments within the sump were approximately 3 feet below the concrete floor. The bottom of the sump was not determined. A trench drain located along the interior of Building C discharges into this sump.

The results from the visual asbestos survey identified several areas of suspect ACM across the Site. Most of the suspect ACM would likely be classified as non-friable or non-friable organically bound including: roofing material, window glazing, materials within the debris piles, floor tile mastic, electrical wire, insulation/backer board, transite panels, gaskets, canvas cloth, and tar. The suspect ACM that would likely be identified as friable was generally found in

small quantities. However, if determined to contain asbestos, some of the larger quantities would include the prefabricated roofing blocks of Building D, the fire brick inside the furnace in the Boiler Room, and the brick mortar associated with the coal silo, chimney and building structures.

1.5.3 Contamination Assessment

Analytical data resulting from this investigation indicated the absence of wide-spread, facility-derived groundwater contamination, and the absence of surface water contamination within Eighteen Mile Creek. However, contamination was detected in the following media:

- Surface and subsurface soil/fill across the entire Site;
- Fill occurring within a berm that appears to extend from the WSS slightly onto the private property located at 143 Water Street;
- Overburden groundwater on the 198 Parcel in the vicinity of well 198-F;
- Bedrock groundwater on the 300 Parcel in the vicinity of up-gradient well MW-1RK;
- Standing water and sediments within building drains and sumps;
- Sediment in the outfall to Eighteen Mile Creek located to the south of William Street; and
- The viscous material adhered to surfaces in Buildings D and E.

Significant quantities of suspect asbestos containing materials were also observed throughout the building complex. Additionally, contamination was detected in the sediment samples that were collected from Eighteen Mile Creek at locations upstream, in the vicinity of and downstream of the Site by the NYSDEC during previous investigations.

1.5.3.1 Surface Soil/Fill

Contaminants of concern detected in the surface soil/fill consist of SVOCs, metals, and, to a lesser degree, PCBs. The presence of SVOCs and metals is wide-spread across the Site and appears to be reflective of the composition of the fill materials. The highest concentrations of SVOCs were detected in surface soil/fill on the 300 Parcel, while surface soil/fill on the 198 Parcel, Island, and the WSS contained the highest concentrations of metals. Furthermore, historical analytical results have indicated that some of the samples collected from material on the 198 Parcel, Island, and WSS contained leachable lead and cadmium levels that are considered hazardous.

The physical and chemical properties of these contaminants are such that they are not likely to migrate substantially in the subsurface or significantly impact groundwater quality. This is supported by the fact that SVOCs were generally not detected in groundwater at concentrations exceeding the WQS, and the concentrations of dissolved metals in the groundwater, including lead and cadmium, were below the WQS.

The mechanical transport of surface soil/fill contaminated with PAHs, metals and PCBs via wind and water erosion is the most likely means by which these contaminants will migrate. The presence of steep slopes on much of the Site and the fluvial processes occurring along the Eighteen Mile Creek corridor, and particularly within the floodplain, also increases the potential for the erosion of the contaminated surface soil/fill material and subsequent suspension and transport of contaminated soil/fill via the creek.

Under the current use scenario, persons living and working in the vicinity of the Site and/or persons trespassing on the Site could be exposed to SVOCs, metals and PCBs in the surface soil/fill via inhalation of airborne particles, incidental ingestion of, or dermal contact with the contaminated media. Furthermore, persons living in the vicinity of, or involved in recreational activities within Eighteen Mile Creek adjacent to and downstream of the Site could also become potential human receptors if contaminated surface soil/fill from the Site were to be discharged to the creek. Although the potential for human exposure during construction activities involving disturbance of contaminated fill has been identified, the use of appropriate personal protective equipment, dust suppression techniques, and the development and implementation of a Site Management Plan would likely minimize the risk of exposure during remediation and/or construction activities. No complete exposure pathways to contaminated surface soil/fill have been identified in connection with the post-redevelopment period, assuming that the contaminated surface soil/fill is removed or is not exposed at the ground surface.

In addition to household pets living in the vicinity of the Site, potential environmental receptors include wildlife occurring on the Site (e.g., rodents, birds, etc.) and terrestrial and aquatic organisms inhabiting Eighteen Mile Creek or the millrace, or using these surface waters as a source of drinking water and/or food. Under current conditions, these environmental receptors could be exposed to the contamination via inhalation or ingestion of, or contact with, impacted surface soil/fill. Exposure of these environmental receptors to contaminated sediment

and/or surface water originating from the erosion of the surface soil/fill could also result via similar exposure mechanisms. Assuming that the contaminated surface soil/fill is removed or is not exposed at the ground surface, no complete environmental exposure pathways would exist under the future use scenario.

1.5.3.2 Subsurface Soil/Fill

The chemistry of the subsurface fill material is similar to that of the surface soil/fill material and is also characterized by many of the same contaminants of concern, most notably PAHs and metals. PCBs were also detected sporadically across the Site in the subsurface fill at concentrations below their respective guidance values. The presence of SVOCs and metals identified in the subsurface is likely related to the presence of the ash and other waste materials identified throughout the Site. The type and concentration of SVOCs identified in the subsurface soil/fill is generally consistent throughout the on-site fill unit. The type of metals encountered within the various fill materials is similar, although typically higher concentrations of metals (particularly lead) are associated with the reddish brown ash that was primarily identified on the Island, WSS, and 198 Parcel. Lower concentrations of metals are associated with the black ash that was primarily identified on the 300 Parcel.

As discussed in the previous subsection, the physical and chemical properties of these contaminants are such that they are not likely to migrate substantially in the subsurface or significantly impact groundwater quality. This is supported by the significant reduction in contaminant concentrations that occurred between the fill material and the underlying native soil, as well as by the lack of significant groundwater contamination on the Site. Although historical data indicate that lead and cadmium could leach into groundwater as precipitation percolates downward through the reddish brown ash fill material on the 198 Parcel, the Island and the WSS, the concentrations of dissolved metals, including lead and cadmium, were below the WQS in all of the groundwater samples collected from the Site.

The detection of PCBs in the groundwater at one location within the 198 Parcel (Well 198-F) indicates the potential presence of a contaminant source area within the fill material in the vicinity of this micro-well. Although the origin and depth of the PCB contamination in the fill material is unknown, this source area could consist of PCB-

containing waste material or fill that was deposited in this area, or residual PCB-containing dielectric fluid that was discharged in this area as a result of past spills/releases and/or poor housekeeping practices.

Under current conditions, the potential for human exposure to contaminants in the subsurface soil/fill is limited to persons trespassing on the site for the purpose of excavating buttons or other artifacts. Potential routes of exposure under this scenario would include the inhalation of airborne particles, incidental ingestion of, or dermal contact with, the contaminated soil/fill. Although the potential for human exposure during construction activities involving disturbance of contaminated fill has been identified, the use of appropriate personal protective equipment, dust suppression techniques, and the development and implementation of a Site Management Plan would likely minimize the risk of exposure during remediation and/or construction activities. No complete human exposure pathways to subsurface soil/fill have been identified in connection with the post-redevelopment period, assuming that the contaminated subsurface soil/fill is removed or is not exposed at the ground surface.

Terrestrial wildlife that dens in the subsurface (e.g., rodents, foxes, etc.) could be exposed to the contamination in the subsurface soil/fill via ingestion or contact with the contaminated subsurface soil/fill. This exposure pathway would exist under the future use scenario as well, unless the contaminated subsurface soil/fill is removed from the Site or isolated by a physical barrier.

1.5.3.3 Groundwater

The only contraventions of the WQS were PCB Aroclor 1254 in one well (198-F) installed on the 198 Parcel and pentachlorophenol in one up-gradient bedrock well (MW-01 RK). Given the relatively low occurrence and concentrations of the contaminants detected in the groundwater and the relatively low mobility of these compounds, significant concentrations of these contaminants are not expected to migrate substantially in the groundwater. Moreover, the lack of local reliance on groundwater as a source of potable water minimizes the potential for direct human exposure to groundwater contaminants.

1.5.3.4 Building Materials and Components

Contaminants were identified in the standing water and sediments within the building, as well as in the felt/tar sample from the building column.

Sediments The contaminants of concern in the sediment samples from within the building's sumps/low areas include SVOCs (PAHs and some phthalates), PCBs, and metals. These types of contaminants have low solubilities and vapor pressures. While PAHs can be degraded over time by naturally occurring microbes, PCBs and metals are quite resistant to chemical or biological degradation and tend to persist in the environment.

The most likely pathway for migration would be via the suspension and transport of contaminated particles in liquids that enter and discharge from these sumps/low areas. However, it is not clear where the outfalls, if any, are located, but it is possible that the ultimate discharge location is to Eighteen Mile Creek or the millrace.

Felt/Tar from Building D Column The contaminants of concern in the tar/felt sample include SVOCs, PCBs and pesticides. Based on the observed viscous nature of this material and the low mobility of the contaminants, substantial contaminant migration within this media is not expected.

Standing Water Relatively low concentrations of PCB Aroclor 1242 and one pesticide compound, dieldrin, were detected in the standing water sample collected from the deep basement of Building D. Given the undefined nature of the facility's internal drainage system, there is the potential that water from the deep basement may discharge to Eighteen Mile Creek and/or the millrace during periods of heavy precipitation.

Surface Water/Sediment at Outfall to Eighteen Mile Creek No impacts to the surface water sample collected from within the outfall to Eighteen Mile Creek located near William Street were noted. However, contaminants of concern detected in the pipe sediment samples include SVOCs, and metals. The most likely pathway for contaminant migration in this situation would be via the suspension and transport of contaminated sediments in liquids that discharge from this pipe into the creek.

Under the current use scenario, site workers and/or persons trespassing on the Site could be exposed to SVOCs, metals and PCBs contained within the building sediments, felt/tar material, and standing water within the buildings via inhalation of airborne particles, incidental ingestion of, or dermal contact with the contaminated media.

Additionally, given the fact that the on-site drainage system has not been fully delineated, there is the potential for utility workers involved with the cleaning and/or maintenance of drainage structures that may still be tied into the on-site system to be exposed to the contaminated sediments present therein. The potential for the exposure of members of the public also exists should the sediment enter Eighteen Mile Creek or the millrace and be transported by stream currents, or dispersed by wind currents. Potential routes of exposure in such an instance would include the incidental ingestion of, or dermal contact with, the sediment or surface water containing suspended particulates of the contaminated material, as well as the inhalation of contaminated dust generated via the wind erosion of dried sediment.

Construction workers, Site visitors and persons, working and traveling through the Site could be exposed to the SVOCs, metals, and PCBs in the sediment during demolition and removal activities performed in connection with site redevelopment. However, the use of appropriate personal protective equipment and dust suppression techniques would limit the risk of exposure during site redevelopment. No complete exposure pathways for on-site sediment contamination have been identified in connection with the post redevelopment period, assuming that the sumps, drainage structures and their contents are removed or sealed in place.

Under current conditions, fish and wildlife inhabiting Eighteen Mile Creek and/or the millrace could be exposed to the contamination via ingestion of, or contact with, impacted sediments and/or surface water. These exposure pathways would be eliminated under the future use scenario assuming the removal or closure of the impacted structures and conduits.

1.5.3.5 Sediment from Eighteen Mile Creek

The contaminants of concern in the sediment samples included SVOCs and metals. Similar to the building sediment samples and the sediment sample collected from outfall to Eighteen Mile Creek, the SVOCs detected consisted mainly of PAHs. Six SVOCs and ten metals had concentrations that exceeded their respective regulatory

values in one or more of the sediment samples. The concentrations of the six SVOCs exceeding regulatory values, which consisted of PAHs, were generally uniform in the seven sediment samples collected by the NYSDEC. With the exception of SED-5, the concentrations of the metals were generally consistent with the metals results from the sediment sample collected at the outfall to Eighteen Mile Creek by TVGA. The concentrations of metals in SED-5 were generally an order of magnitude greater than the other six sediment samples.

While the presence of contaminated sediment within Eighteen Mile Creek has been identified, the extent of contaminated sediment with the creek is not well defined. Based upon the similarity between the types of contaminants detected in the creek sediment and those detected in on-site fill material, the Site may have contributed to the contamination within the creek. However, past industrial activities conducted upstream of the Site may also have contributed to the contamination within the creek sediments.

These types of contaminants have low solubilities and vapor pressures. While PAHs can be degraded over time by naturally occurring microbes, metals are quite resistant to chemical or biological degradation and tend to persist in the environment.

The most likely pathway for contaminant migration in this situation would be via the suspension and transport of contaminated sediments in the creek. Additionally, as the surface water elevation of Eighteen Mile Creek fluctuates, there is the potential for contaminated sediments to be exposed and be transported via the wind erosion of dried sediment.

Under the current use scenario, residents who live adjacent to the creek opposite the Site, site workers and/or persons trespassing on the Site could be exposed to SVOCs and metals in the creek sediments via incidental ingestion of, or dermal contact with the contaminated media.

There is also the potential for the exposure of members of the public located downstream of the Site should the sediments be agitated and be transported by stream currents, or dispersed by wind currents. Potential routes of exposure in such an instance would include the incidental ingestion of, or dermal contact with, the sediment or surface water containing suspended particulates of the contaminated material,

as well as the inhalation of contaminated dust generated via the wind erosion of dried sediment.

Fish and wildlife inhabiting Eighteen Mile Creek and/or the millrace could also be exposed to the contamination via ingestion of, or contact with, impacted sediments and/or surface water.

Construction workers, site visitors and persons working and traveling through the Site could be exposed to the SVOCs and metals in the sediment during remediation activities conducted along the stream bank of Eighteen Mile Creek and in the millrace. Potential exposure routes for these receptors include incidental ingestion of, or dermal contact with, the sediment or surface water containing suspended particulates of the contaminated material, as well as the inhalation of contaminated dust generated via the wind erosion of dried sediment. However, the use of appropriate personal protective equipment would limit the risk of exposure during site redevelopment.

1.5.3.6 Asbestos

Non-friable ACMs are relatively resistant to weathering and are not expected to migrate from the Site. However, asbestos fibers released as a result of the degradation of the suspect friable ACMs are susceptible to dispersion via wind currents and/or transport via storm water. Based upon the condition of the structures, some of the suspect friable ACMs, although minimal, are exposed directly to the environment and could be subject to wind and water erosion. Under the current conditions, persons living and working in the area immediately surrounding the Site have the potential to be exposed to asbestos via the inhalation of asbestos fibers released from damaged, suspect friable ACMs that are exposed to wind currents.

The risk of asbestos exposure during building demolition or renovation activities would be minimized through the implementation of proper abatement, control and monitoring procedures as required by applicable state and federal regulations. This risk would be eliminated with the removal and proper disposal of the asbestos-containing demolition debris, and, therefore, would not apply to the future use scenario.

1.5.4 Identification of Areas of Concern

Based on the results of the SI, seven areas of concern were identified based on the type of media and type of contaminants. These areas of concern (AOC) are included for evaluation as part of this RAR and include:

1. Non-Hazardous Fill Materials impacted with SVOCs and metals located on the 300 Parcel.

2. Hazardous Fill Materials impacted with SVOCs, metals, and PCBs located on the 198 Parcel and the Island. This material is classified as hazardous due to leachable concentrations of lead and cadmium.

3. Hazardous Fill Materials impacted with SVOCs, and metals located on the WSS. This material is classified as hazardous due to leachable concentration of lead.

4. Surface Water and Sediments located inside the buildings impacted with SVOCs, metals, and PCBs.

5. The dilapidated building structures, and construction and demolition debris located throughout the Site.

6. Sediments within the outfall to Eighteen Mile Creek impacted with SVOCs and metals.

7. Asbestos containing materials within the buildings

The contaminated sediments within Eighteen Mile Creek represent an additional AOC that will be further evaluated during a separate investigation of the creek by the NYSDEC. This investigation will focus on the creek sediments and will provide sufficient data to enable the development and evaluation of appropriate remedial alternatives for addressing this medium. In the absence of this detailed data concerning the creek sediments, this RAR focuses on the seven AOCs listed above. A separate report addressing the remediation of the creek sediments will be prepared by the NYSDEC to supplement this RAR.

2.0 IDENTIFICATION AND DEVELOPMENT OF ALTERNATIVES

2.1 Remedial Action Objectives

The following subsections summarize the Remedial Action Objectives (RAOs) identified for each of the contaminated-media encountered on the Site. These RAOs are based

upon the findings of the SI and the anticipated future use of the project site for recreational purposes.

2.1.1 AOC #1 - Non-Hazardous Fill Materials on the 300 Parcel

Contaminants of concern in this area consist of SVOCs and metals within the fill materials on the 300 Parcel. The RAO for protection of human health is to prevent the exposure of the public, trespassers and on-site construction workers to these contaminants via dermal contact, incidental ingestion or inhalation of particulates. The RAO for environmental protection is to prevent wildlife from exposure to this medium, and to prevent the discharge of contaminated storm water runoff and eroded fill to off-site locations or into Eighteen Mile Creek and the millrace. No significant risks to groundwater were identified in connection with the impacted fill materials.

2.1.2 AOC #2 - Hazardous Fill Materials on the 198 Parcel and Island

Contaminants of concern in these areas consist of SVOCs, metals, and PCBs within the fill materials of the 198 Parcel and the Island. The RAO for protection of human health is to prevent the exposure of the public, trespassers and on-site construction workers to these contaminants via dermal contact, incidental ingestion or inhalation of particulates.

The RAO for environmental protection is to prevent the PCB impacted subsurface soil/fill suspected to be present on the 198 Parcel from acting as a possible continuing source of groundwater contamination; to prevent the potential for the leaching of lead and cadmium into groundwater from the reddish brown ash fill; to prevent the discharge of contaminated storm water runoff and eroded fill to off-site locations or into Eighteen Mile Creek and the millrace; and to limit wildlife from contacting the contaminated subsurface soil/fill.

2.1.3 AOC #3 - Hazardous Fill Materials on the WSS

Contaminants of concern in the fill occurring within a berm that appears to extend from the WSS slightly onto the private property located at 143 Water Street include SVOCs and metals. The contamination discovered on this adjoining property will be addressed through the Eighteen Mile Creek Corridor (Site No. 932121) remedial work. The RAO for the protection of human health and the environment are the same as those for the hazardous fill materials on the 198 Parcel and Island (AOC #2) except that protecting the groundwater from PCBs is not included for this area of concern.

2.1.4 AOC #4 - Surface Water and Sediments Inside the Buildings

Contaminants of concern in the surface water and sediments inside the buildings consist of SVOCs, metals and PCBs. Based on the results from the SI, it is probable that similar contaminants are located throughout the remaining portions of the buildings. In particular, the floors of the buildings were generally covered with soil/sediments. The RAO for protection of human health is to prevent dermal contact with, incidental ingestion of, or inhalation of particulates originating from the contaminated sediments and/or standing water. The RAO for environmental protection is to prevent the release of contaminated storm water and/or sediments from the Site's drainage system that could result in the degradation of surface water.

2.1.5 AOC #5 - Dilapidated Buildings and C&D Debris

The remaining buildings are generally in a deteriorated state, with the majority of the buildings having some structural deficiencies. The buildings represent a physical hazard to persons trespassing and working on the Site. Physical hazards were also identified in exterior portions of the Site, which are littered with various piles of construction and demolition debris including concrete, railroad ties, scrap steel, scrap lumber, etc. Several empty drums are also located on the Site.

The RAO for protection of human health is to prevent the exposure of trespassers and on-site construction workers to the physical hazards associated with the dilapidated buildings and C&D debris located throughout the Site.

2.1.6 AOC #6 - Sediments within the Outfall to Eighteen Mile Creek

Contaminants of concern in this AOC consist of SVOCs and metals contained within the pipe that outfalls to Eighteen Mile Creek near William Street. The RAO for protection of human health is to prevent dermal contact with, incidental ingestion of, or inhalation of particulates originating from, the contaminated sediments. The RAO for environmental protection is to prevent the release of contaminated storm water and/or sediments from the Site's drainage system that could result in the degradation of surface water quality.

2.1.7 AOC #7 - Asbestos

Damaged, friable ACMs constitute a concern relative to the buildings. The RAO for protection of human health relative to ACMs is the prevention of the inhalation or incidental ingestion of asbestos fibers.

2.2 General Response Actions

General response actions for each of the seven areas of concern at the Site have been developed, summarized in Table 1, and described in the following subsections. Although these general response actions include no action as a means of source control, the no action response does not address the RAOs identified in the preceding section and is included for comparison purposes only.

2.2.1 AOC #1 - Non-Hazardous Fill Materials on the 300 Parcel

General response actions available to satisfy the RAOs identified for the non-hazardous fill materials on the 300 Parcel include:

- No action.
- Institutional and access controls.
- Cover or containment through the use of imported soils or pavement.
- Excavation and off-site disposal.

2.2.2 AOC #2 - Hazardous Fill Materials on the 198 Parcel and Island

General response actions available to satisfy the RAOs identified for the hazardous fill materials on the 198 Parcel and the Island include:

- No action.
- Institutional and access controls.
- Containment through the use of a low permeability cover system.
- Stabilization to reduce the leachable concentrations of lead and cadmium, followed by a soil cover.
- Excavation and off-site disposal.

2.2.3 AOC #3 - Hazardous Fill Materials on the WSS

General response actions available to satisfy the RAOs identified for the hazardous fill materials on the WSS include:

- No action.
- Institutional and access controls.
- Excavation and placement on the 198 Parcel or Island for stabilization and soil cover placement.
- Excavation and off-site disposal.

2.2.4 AOC #4 - Surface Water and Sediments Inside the Buildings

General response actions available to satisfy the RAOs identified for the surface water and sediments inside the buildings include:

- No action.
- Institutional and access controls.
- Removal after building demolition.
- Limited removal from accessible portions of the buildings (Building C sump and trench drain) and in-situ stabilization (Building D deep basement) prior to building demolition followed by soil cover after demolition.
- Limited removal from accessible portions of the buildings prior to building demolition (Building C sump and trench drain) and complete removal after building demolition (Building D deep basement). Clean basement floors and sumps after demolition.

2.2.5 AOC #5 - Dilapidated Buildings and C&D Debris

General response actions available to satisfy the RAOs identified for the dilapidated buildings and C&D debris include:

- No action.
- Institutional and access controls.
- Select building demolition, secure building openings and removal of site wide C&D debris.
- Demolition of building structures to four feet below grade and removal of site wide C&D debris.
- Demolition of entire building structures and removal of site wide C&D debris.

2.2.6 AOC #6 - Sediments within the Outfall to Eighteen Mile Creek

General response actions available to satisfy the RAOs identified for the sediments within the outfall to Eighteen Mile Creek include:

- No action.
- Institutional and access controls.
- In-place closure
- Partial or complete sediment removal and closure in-place.
- Complete removal and off-site disposal of the entire outfall (i.e. piping and the sediments contained therein).

2.2.7 AOC #7 - Asbestos

General response actions available to satisfy the RAOs identified for the asbestos include:

- No action.

- Institutional and access controls.
- Partial or complete removal and off-site disposal of friable and non-friable asbestos containing materials.

2.3 Remediation Areas

Remediation areas and volumes have been estimated based on the areas of concern identified within this RAR. The areal extent of the areas of concern are shown on Figures 4 and 5. The quantities developed from these areas and the assumptions used to develop the cost estimate for each site-wide remedial alternative are included in Appendix A.

2.4 Development of Alternatives

The general response actions identified in Section 2.2 have been assembled into a series of site-wide remedial alternatives. These alternatives are outlined in the following subsections.

2.4.1 Alternative A – "No Action"

Under this alternative, the Site would remain in its current state and maintenance of the current access controls would be performed until the time that the potential for human exposure to site-derived contamination is no longer present. No remedial activities, institutional or additional access controls would be implemented under this alternative.

This alternative does not satisfy the human health or environmental RAOs for the current use, nor is it supportive of the reuse of the Site for recreational purposes. However, it has been retained for detailed analysis to provide a point of comparison for the other alternatives.

2.4.2 Alternative B – "Exposure Pathway Removal"

This alternative combines institutional and access controls with the following general response actions to limit human and environmental exposure to the affected media.

- Non-Hazardous Fill Materials on the 300 Parcel (AOC#1): Installation of a soil cover over the non-hazardous fill materials on the 300 parcel.
- Hazardous Fill Materials on the 198 Parcel and Island (AOC#2) and Hazardous Fill Materials on the WSS (AOC#3): Excavation and stabilization of the hazardous fill materials from the Island, 198 Parcel, and WSS. Re-installation of the stabilized soils on the 198 Parcel and Island. Installation of a soil cover over the reinstalled stabilized soils.

- Surface Water and Sediments Inside the Buildings (AOC#4): Removal of sediments from the Building C sump and trench drain. The remaining interior sumps would be addressed through institutional and access controls.
- Dilapidated Buildings and C&D Debris (AOC#5): Removal of the existing C&D debris from portions of the Site outside the existing building footprint. Demolition of select portions of the buildings that are in danger of collapsing. Securing building openings.
- Sediments within the Outfall to Eighteen Mile Creek (AOC#6): Removal of a portion of the sediment from the outfall pipe to Eighteen Mile Creek and closure of the pipe in place.
- Asbestos (AOC#7): Abatement of the friable ACMs.

Institutional and access controls combined with the imported soil cover would focus on preventing human and environmental exposure to the impacted media until the time that the potential for human exposure to site-derived contamination within these media is no longer present. Long-term monitoring would focus on the soil cover. Additionally, a site management plan would be required since impacted surface and subsurface soil would remain in place.

While this alternative satisfies the human health and environmental RAOs for the current use, limits the potential for point discharges from the Site, and limits future leaching of contaminants from the hazardous fill, it represents the minimal approach to addressing contamination and is not supportive of the intended use of the Site for recreational purposes.

2.4.3 Alternative C – "Containment/Limited Removal"

This alternative combines institutional controls with the following general response actions to limit human and environmental exposure to the affected media while allowing for the Site to be utilized for future recreational purposes.

- Non-Hazardous Fill Materials on the 300 Parcel (AOC#1): Containment of the non-hazardous fill materials on the 300 Parcel with a soil cover.
- Hazardous Fill Materials on the 198 Parcel and Island (AOC#2): Containment of the hazardous fill materials on the 198 Parcel and Island with a low permeability cover system.
- Hazardous Fill Materials on the WSS (AOC#3): Excavation of the hazardous fill materials from the WSS and off-site disposal.
- Surface Water and Sediments Inside the Buildings (AOC#4): Removal of sediments from the Building C sump and trench drain and in-situ stabilization of sediments from Building D deep basement prior to building demolition. Installation of a soil cover over the demolished building footprint.

- Dilapidated Buildings and C&D Debris (AOC#5): Demolition of the buildings to four feet below grade, with reuse of the hard fill materials for backfill and off-site disposal of all non-hard fill materials associated with the building demolition. Removal of the existing C&D debris from portions of the Site outside the existing building footprint.
- Sediments within the Outfall to Eighteen Mile Creek (AOC#6): Removal of a portion of the sediment from the outfall pipe to Eighteen Mile Creek and closure of the pipe in place.
- Asbestos (AOC#7): Abatement of the friable and non-friable ACMs.

Under this alternative, the contaminated fill materials would remain, with the exception of the hazardous fill on the WSS, but the remaining fill would be contained in a manner that eliminates human and environmental exposure pathways. Long-term monitoring would focus on the soil cover and the low permeability cover system. Additionally, a site management plan would be required since impacted surface and subsurface soil would remain in place.

This alternative satisfies the human health and environmental RAOs for the current use scenario, limits the potential for point discharges from the project site, and reduces the mobility of contaminants in the soils through the containment system by effectively limiting the stormwater transport and wind transport mechanisms. At the completion of this remedial alternative, the Site would consist of an open grass area with maximum slopes of 4 horizontal to 1 vertical and would render the Site suitable for redevelopment for recreational purposes.

2.4.4 Alternative D – "Excavation and Containment"

This alternative combines institutional controls with the following general response actions to limit human and environmental exposure to the affected media while allowing for the Site to be utilized for future recreational purposes.

- Non-Hazardous Fill Materials on the 300 Parcel (AOC#1): Containment of the non-hazardous fill materials on the 300 Parcel with a soil cover.
- Hazardous Fill Materials on the 198 Parcel and Island (AOC#2) and Hazardous Fill Materials on the WSS (AOC#3): Excavation of the hazardous fill materials from the WSS, Island, and 198 Parcel and disposal off-site.
- Surface Water and Sediments Inside the Buildings (AOC#4): Removal of sediments from the Building C sump and trench drain and in-situ stabilization of sediments from Building D deep basement prior to building demolition. Installation of a soil cover over the demolished building footprint.
- Dilapidated Buildings and C&D Debris (AOC#5): Demolition of the buildings to four feet below grade, with reuse of the hard fill materials for

backfill and off-site disposal of all non-hard fill materials associated with the building demolition. Removal of the existing C&D debris from portions of the Site outside the existing building footprint.

- Sediments within the Outfall to Eighteen Mile Creek (AOC#6): Removal of a portion of the sediment from the outfall pipe to Eighteen Mile Creek and closure of the pipe in place.
- Asbestos (AOC#7): Abatement of the friable and non-friable ACMs.

Under this alternative, the hazardous fill would be removed from the Site but the non-hazardous contaminated fill materials would remain, however these materials would be contained under a soil cover eliminating human and environmental exposure pathways. Long-term monitoring would focus on the soil cover. Additionally, a site management plan would be required since impacted surface and subsurface soil would remain in place.

This alternative satisfies the human health and environmental RAOs for the current use scenario, limits the potential for point discharges from the project site, and reduces the volume, toxicity and mobility of contaminants in the fill material through excavation and off-site disposal of the hazardous fill material, Additionally, the soil cover would be installed over the remaining contaminated non-hazardous fill materials effectively limiting the stormwater transport and wind transport mechanisms. At the completion of this remedial alternative, the Site would consist of an open grass area with maximum slopes of 4 horizontal to 1 vertical and would be suitable for redevelopment for recreational purposes.

2.4.5 Alternative E – "Complete Excavation"

This alternative includes the following general response actions to remove a majority of the contaminants from the Site, and is the most comprehensive, involving the removal and off-site disposal of contaminated media from the Site.

- Non-Hazardous Fill Materials on the 300 Parcel (AOC#1): Excavation of the non-hazardous fill materials on the 300 Parcel and dispose off-site.
- Hazardous Fill Materials on the 198 Parcel and Island (AOC#2) and Hazardous Fill Materials on the WSS (AOC#3): Excavation of the hazardous fill materials from the WSS, Island, and 198 Parcel and disposal off-site.
- Surface Water and Sediments Inside the Buildings (AOC#4): Removal of sediments from the Building C sump and trench drain prior to building demolition and removal of sediments from Building D deep basement after building demolition. Cleaning of the basement floors, sumps, and low areas after building demolition.
- Dilapidated Buildings and C&D Debris (AOC#5): Demolition of the buildings to four feet below grade, with reuse of the hard fill materials for backfill and off-site disposal of all non-hard fill materials associated with

the building demolition. Removal of the existing C&D debris from portions of the Site outside the existing building footprint.

- Sediments within the Outfall to Eighteen Mile Creek (AOC#6): Complete removal of the outfall pipe from Eighteen Mile Creek to the building.
- Asbestos (AOC#7): Abatement of the friable and non-friable ACMs.

This alternative is the most comprehensive, and achieves the RAOs for the Site. Under this alternative, contaminated media would be largely removed from the Site. At the completion of this remedial alternative, the Site would consist of an open grass area. Due to the large quantities of materials that would be removed from the Site under this alternative, final Site grades would be significantly different from the current topography. Based on these factors this alternative is the most conducive to redevelopment for recreational purposes.

3.0 DETAILED ANALYSIS OF ALTERNATIVES

3.1 General Discussion

The remedial alternatives outlined in Section 2.4 were individually and comparatively evaluated with respect to the following six criteria as defined in 6 NYCRR 375:

- Overall protection of human health and the environment
- Compliance with SCGs
- Short-term effectiveness
- Long-term effectiveness
- Reduction of toxicity, mobility and volume
- Feasibility

A seventh criterion, community acceptance, will be evaluated by the NYSDEC at the conclusion of the public comment period.

The results of these evaluations are presented in the following subsections.

3.2 Individual Analysis of Alternatives

3.2.1 Alternative A – "No Action"

The No Action Alternative does not satisfy the RAOs because of its inability to eliminate the potential for the exposure of the public and future construction and site workers to on-site contaminants. In addition, this alternative is not protective of human health with respect to the surrounding community because contamination would remain on-site and would not be effectively contained.

This alternative would not reduce the toxicity, mobility or volume of the contamination. Additionally, potentially friable asbestos would remain, as would the threat of fiber release episodes from deteriorated sections of the building.

Under this alternative, the Site and existing structure would remain in their current states. Existing access controls (i.e. partial chain-link fencing, boarded-up windows and doors, and police patrols) have not been fully effective in the prevention of trespassing, resulting in the potential for chemical and/or asbestos exposure to vandals and/or neighborhood children. Moreover, the structure is severely deteriorated, and this condition will continue to worsen, further diminishing the effectiveness of access controls and increasing the potential for contaminant releases to the surrounding community. Therefore, the existing threats to public health and the environment are expected to increase over time as site conditions continue to erode.

Although no additional cost would be realized to implement the "No Action" alternative, it is not considered to be practical considering its inability to satisfy the RAOs or to support the ultimate goal of reusing the Site for recreational purposes.

3.2.2 Alternative B – "Exposure Pathway Removal"

This alternative would satisfy the RAOs for the current use, but would not be protective of human health with respect to construction workers or the proposed future use as a recreational area because most of the contamination, although stabilized and covered with soils, would remain on-site under a soil cover and would exceed the majority of the SCGs.

This alternative could be implemented during one construction season with minimal impacts to construction workers or the surrounding community assuming proper construction and health and safety techniques are utilized. Caution during excavation near the millrace and Eighteen Mile Creek would be required to prevent impacts to these surface water bodies. The soil cover is subject to weathering, erosion, and degradation from tree growth and vector intrusion. As such, the long-term effectiveness of the soil cover could be jeopardized if applicable long-term maintenance activities are not completed. In addition, access controls may not be fully effective in the prevention of trespassing, resulting in the potential for chemical and/or asbestos exposure to vandals and/or neighborhood children. Furthermore, said controls could deteriorate over time, and, thus, residual public health risks may persist in the long term.

The contaminated media located within with the sump and trench drain in Building C and the outfall to Eighteen Mile Creek as well as the friable asbestos within the existing building would be removed resulting in the reduced volume, toxicity and mobility of contaminated media in these areas of concern. However,

while the toxicity and mobility of contaminants within the hazardous fill would be reduced as a result of the stabilization process and the installation of a soil cover, the stabilization process would result in an increase of the total volume of contaminated media on Site after the implementation of this alternative. Additionally, the non-friable asbestos associated with the buildings would remain in place.

This alternative is feasible for implementation at the Site. However, given the ultimate goal of redeveloping the project site for recreational purposes this feasibility is questionable since access controls would be in place to prevent access to the Site and the institutional controls would restrict future use of the Site. Additionally, since the building would remain in place, development of the Site for recreational purposes would not be practical. Estimated costs for implementing this alternative are presented in Table 4.

3.2.3 Alternative C – "Containment/Limited Removal"

This alternative would satisfy the RAOs for the protection of human health and the environment for the current and the proposed future use. However, since the contaminants in the fill materials would remain after the implementation of this alternative, a future risk to construction and/or site workers would exist. Additionally, after implementation of this alternative, the contaminants in the fill materials located beneath the soil cover and the low permeability cover system would exceed the SCGs.

This alternative could be implemented during one construction season with minimal impacts to construction workers or the surrounding community assuming proper construction and health and safety techniques are utilized. Similar to Alternative B, short-term exposure risks to construction workers and the surrounding community resulting from construction activities could be effectively minimized through standard construction and health and safety precautions.

This alternative would also address exposure to contaminated soil/fill in the long-term, as long as the cover systems are maintained. The potential for the erosion of the cover systems will be reduced through the implementation of biannual monitoring program. Operation, maintenance, and monitoring (OM&M) of the cover systems would be conducted as needed. Maintaining a vegetative cover would reduce erosion of the cover systems. Additionally, exposure risks to construction workers and the surrounding community associated with future invasive activities at the Site could be effectively minimized through the use of a site management plan and standard construction and health and safety precautions.

The volume of contaminants will be reduced through the removal of contaminants associated with the sump and trench drain in Building C, outfall to

Eighteen Mile Creek and the friable and non-friable ACM within the existing building. However, the contaminated fill on the 300, 198, the Island parcels would remain on-site under cover systems. While it is anticipated that there will be a reduction in the toxicity of the remaining organic contaminants in the soil/fill over time via natural degradation, metals are quite resistant to chemical or biological degradation and tend to persist in the environment. The mobility of both organic and inorganic contaminants in the soil/fill would be reduced by the cover systems by effectively limiting the stormwater and wind transport mechanisms.

This remedial action alternative is appropriate for the proposed future use of the Site for recreational purposes. Materials and equipment for site clearing, grading, and placing and maintaining the cover system are readily available. However, the construction of the cover system may be complicated by existing site conditions including: site vegetation; site topography and access to the site. The estimated costs for implementing this alternative are presented in Table 5.

3.2.4 Alternative D – "Excavation and Containment"

This alternative would satisfy the RAOs for the protection of human health and the environment for the current and the proposed future use. The hazardous fill materials located on the 198 Parcel, Island and WSS would be removed from the Site, thereby eliminating the potential for future human health and/or environmental impacts from this material. However, since the contaminants in the non-hazardous fill materials would remain after the implementation of this alternative, a future risk to construction and/or site workers would exist. Additionally, after implementation of this alternative, the contaminants in the non-hazardous fill materials located beneath the soil cover would exceed the SCGs.

This alternative could be implemented during one construction season with minimal impacts to construction workers or the surrounding community assuming proper construction and health and safety techniques are utilized. Similar to Alternatives B and C, short-term exposure risks to construction workers and the surrounding community resulting from construction activities could be effectively minimized through standard construction and health and safety precautions.

This alternative would also address exposure to non-hazardous contaminated soil/fill in the long-term, as long as the soil cover is maintained. The potential for the erosion of the soil cover will be reduced through the implementation of biannual monitoring program. Operation, maintenance, and monitoring (OM&M) of the soil cover would be conducted as needed. Maintaining a vegetative cover would reduce erosion of the soil cover. Additionally, exposure risks to construction workers and the surrounding community associated with future invasive activities at the Site could be effectively minimized through the use of a

site management plan and standard construction and health and safety precautions.

The volume of contaminants will be reduced through the removal and off-site disposal of the hazardous fill material on the 198 Parcel, Island and WSS, as well as the contaminated materials associated with the sump and trench drain in Building C, outfall to Eighteen Mile Creek and the friable and non-friable ACM within the existing building. Additionally, the mobility and toxicity of the contaminants in these media would also be eliminated. However, the non-hazardous contaminated fill on the 300 Parcel would remain on-site under a soil cover. While it is anticipated that there will be a reduction in the toxicity of the remaining organic contaminants in the soil/fill over time via natural degradation, metals are quite resistant to chemical or biological degradation and tend to persist in the environment. The mobility of both organic and inorganic contaminants in the remaining non-hazardous fill would be reduced by the soil cover by effectively limiting the stormwater and wind transport mechanisms.

This remedial action alternative is appropriate for the proposed future use of the Site for recreational purposes. Materials and equipment for site clearing, grading, and placing and maintaining the cover system are readily available. However, the construction of the soil cover may be complicated by existing site conditions including: site vegetation; site topography and access to the Site. The estimated costs for implementing this alternative are presented in Table 6.

3.2.5 Alternative E – " Complete Excavation"

This alternative is fully protective of human health and the environment under current and the proposed future use. Temporary construction impacts to the surrounding community and the environment (e.g., dust generation, noise, etc.) would result during the implementation of this alternative. However, these impacts could be mitigated through standard construction practices. The application of common health and safety precautions would also minimize potential health risks to remedial contractors and the surrounding community during the implementation of this alternative.

This alternative represents an effective long-term approach to addressing on-site contamination and is fully supportive of the intended reuse of the Site for recreational purposes since a majority of the known contamination would be removed from the Site. The remaining media on-site after implementation of this alternative would meet the SCGs.

This alternative would effectively reduce the toxicity, mobility, and volume of the contaminants through excavation and proper off-site disposal of all contaminated media exceeding the SCGs. Following the excavation and off-site disposal of

contaminated soil/fill, clean fill will be brought to the Site and the Site will be re-graded during remediation to promote positive drainage.

This alternative could be effectively implemented within one to two construction seasons and would render the project site suitable for immediate use for recreational purposes. The estimated costs for implementing this alternative are presented in Table 7.

3.3 Comparative Analysis and Recommendation

A comparative evaluation of the remedial alternatives is presented in the form of a matrix, shown on the following page, which includes ratings for each of the criteria mandated by 6 NYCRR Part 375. The comparison of the alternatives is based upon a qualitative system that utilizes relative ratings of *high*, *medium* and *low* to define each alternative's performance with respect to the aforementioned criteria. These ratings are then equated to a numerical scale to produce a relative numerical score for final comparison purposes. The ratings equate to the following conditions and numerical scores:

RATING	DESCRIPTION	NUMERICAL RATING
HIGH	SATISFIES CRITERIA TO A HIGH DEGREE	3
MEDIUM	SATISFIES CRITERIA TO A MODERATE DEGREE	2
LOW	MINIMALLY SATISFIES CRITERIA	1

The aggregate numerical score for each of the alternatives evaluated is shown near the bottom of the matrix. Higher relative scores represent a higher level of effectiveness with respect to the evaluation criteria.

As reflected by Table 8, Alternatives C, D and E have been identified as the most effective alternatives. Each of these three Alternatives would fully satisfy the RAOs developed for the Site, would have a high degree of long-term effectiveness and would render the site suitable for recreational uses. Alternative E received a higher rating than Alternatives C and D for five of the criteria because all of the contaminated media would be removed under Alternative E, while contaminated soil/fill would remain on-site to varying degrees, but contained under Alternatives C and D. However, the reverse is true for the feasibility criterion because Alternative E has a significantly higher cost than both Alternatives C and D. Alternatives C and D are similar, with the primary difference being that hazardous fill would be contained on-site under Alternative C and removed from the site under Alternative D. As a result, Alternative D received higher ratings than Alternative C for five of the criteria, but a slightly lower rating for the feasibility criterion because of a relatively higher cost. Based upon the combination of the high degree of protection to human health and the environment afforded by this alternative and its relative cost effectiveness, Alternative D is recommended for implementation.

Under the recommended alternative, a site management plan should be developed for remediation activities as well as future invasive activities. In addition, air monitoring, appropriate personal protective equipment, and dust suppression measures should be employed during construction activities to prevent exposure of the public and construction workers to the contaminants in the soil/fill.

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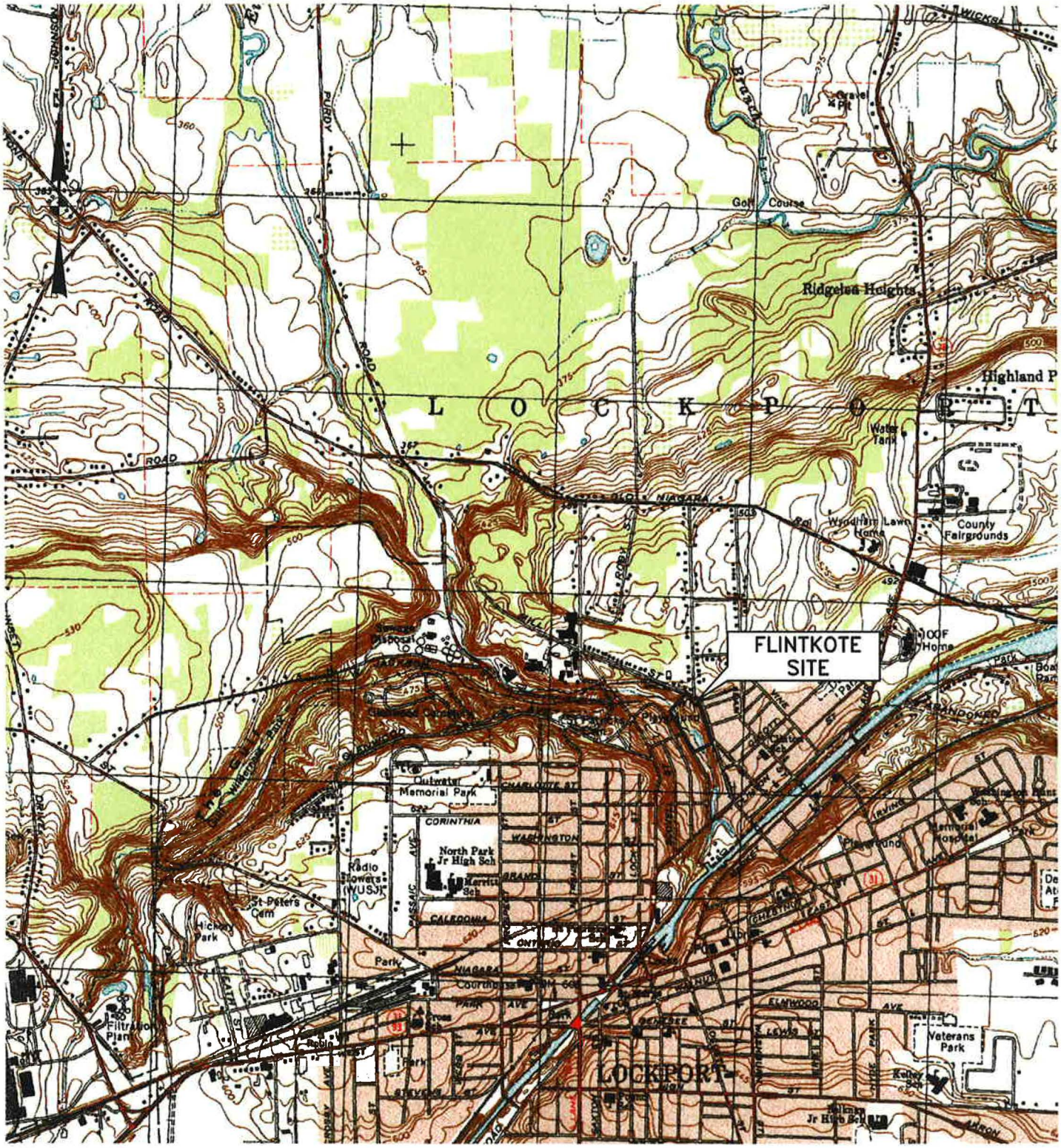
FIGURES



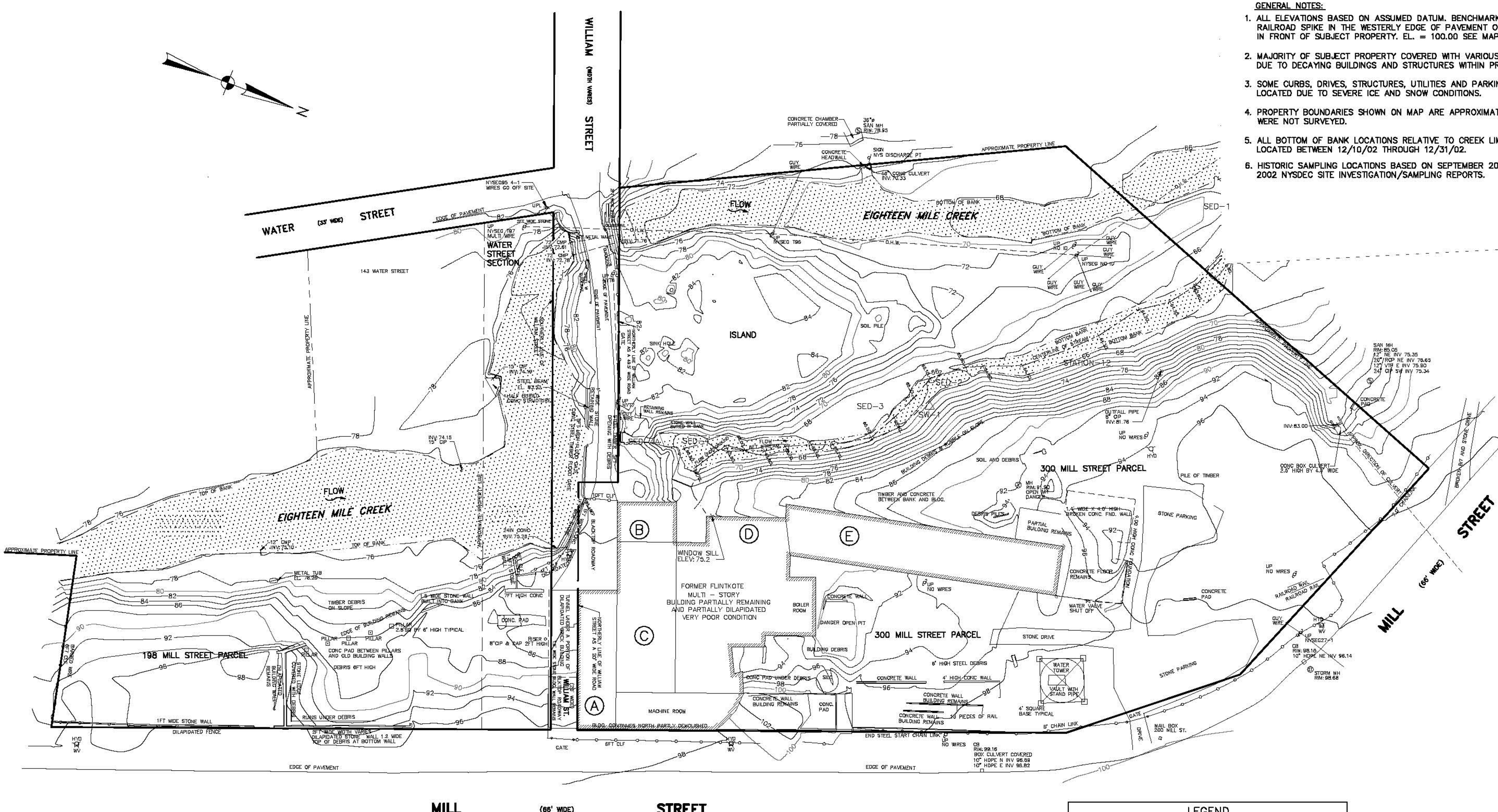
SITE LOCATION MAP

TVGA CONSULTANTS
1000 MAPLE ROAD
ELMA, NEW YORK 14059-9530
P. 716.655.8842
F. 716.655.0937
www.tvga.com

REMEDIAL ALTERNATIVES REPORT
SI/RAR
FORMER FLINTKOTE SITE
198 AND 300 MILL STREET, CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

PROJECT NO. 0020571	SCALE: 1" = 2000'	DATE: JUNE 2004	FIGURE NO. 1

S:\Engineering\0020571 - Flintkote\CADD\RAR PLANS\FIGURE_1.dwg 10/18/2005 11:14:02 AM EDT



GENERAL NOTES:

1. ALL ELEVATIONS BASED ON ASSUMED DATUM. BENCHMARK DESCRIPTION RAILROAD SPIKE IN THE WESTERLY EDGE OF PAVEMENT OF THE CURVE LOCATED IN FRONT OF SUBJECT PROPERTY. EL. = 100.00 SEE MAP FOR LOCATION.
2. MAJORITY OF SUBJECT PROPERTY COVERED WITH VARIOUS DEBRIS PILES DUE TO DECAYING BUILDINGS AND STRUCTURES WITHIN PROPERTY BOUNDS.
3. SOME CURBS, DRIVES, STRUCTURES, UTILITIES AND PARKING AREAS NOT LOCATED DUE TO SEVERE ICE AND SNOW CONDITIONS.
4. PROPERTY BOUNDARIES SHOWN ON MAP ARE APPROXIMATE ONLY, AND WERE NOT SURVEYED.
5. ALL BOTTOM OF BANK LOCATIONS RELATIVE TO CREEK LIMITS WERE LOCATED BETWEEN 12/10/02 THROUGH 12/31/02.
6. HISTORIC SAMPLING LOCATIONS BASED ON SEPTEMBER 2000 AND JUNE 2002 NYSDEC SITE INVESTIGATION/SAMPLING REPORTS.

LEGEND

UTILITY POLE	DR – DRIVE
EXISTING MICRO WELLS (4)	EP – EDGE PAVEMENT
HYDRANT	BB – BOTTOM BANK
WATER VALVE	CL – CENTERLINE
STORM MANHOLE	TB – TOP BANK
UTILITY POLE & LIGHT	TS – TOP SLOPE
SANITARY MANHOLE	BS – BOTTOM SLOPE
UNKNOWN MANHOLE	CLF – CHAIN LINK FENCE
CATCH BASIN	CB – CATCH BASIN
+ 64.8 SPOT ELEVATION	O.H.W. – OVERHEAD WIRES

GRAPHIC SCALE

(IN FEET)
1 inch = 40 ft.

SITE PLAN

TVGA CONSULTANTS
1000 MAPLE ROAD
ELMA, NEW YORK 14059-9530
P. 716.655.8842
F. 716.655.0937
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REMEDIAL ALTERNATIVES REPORT
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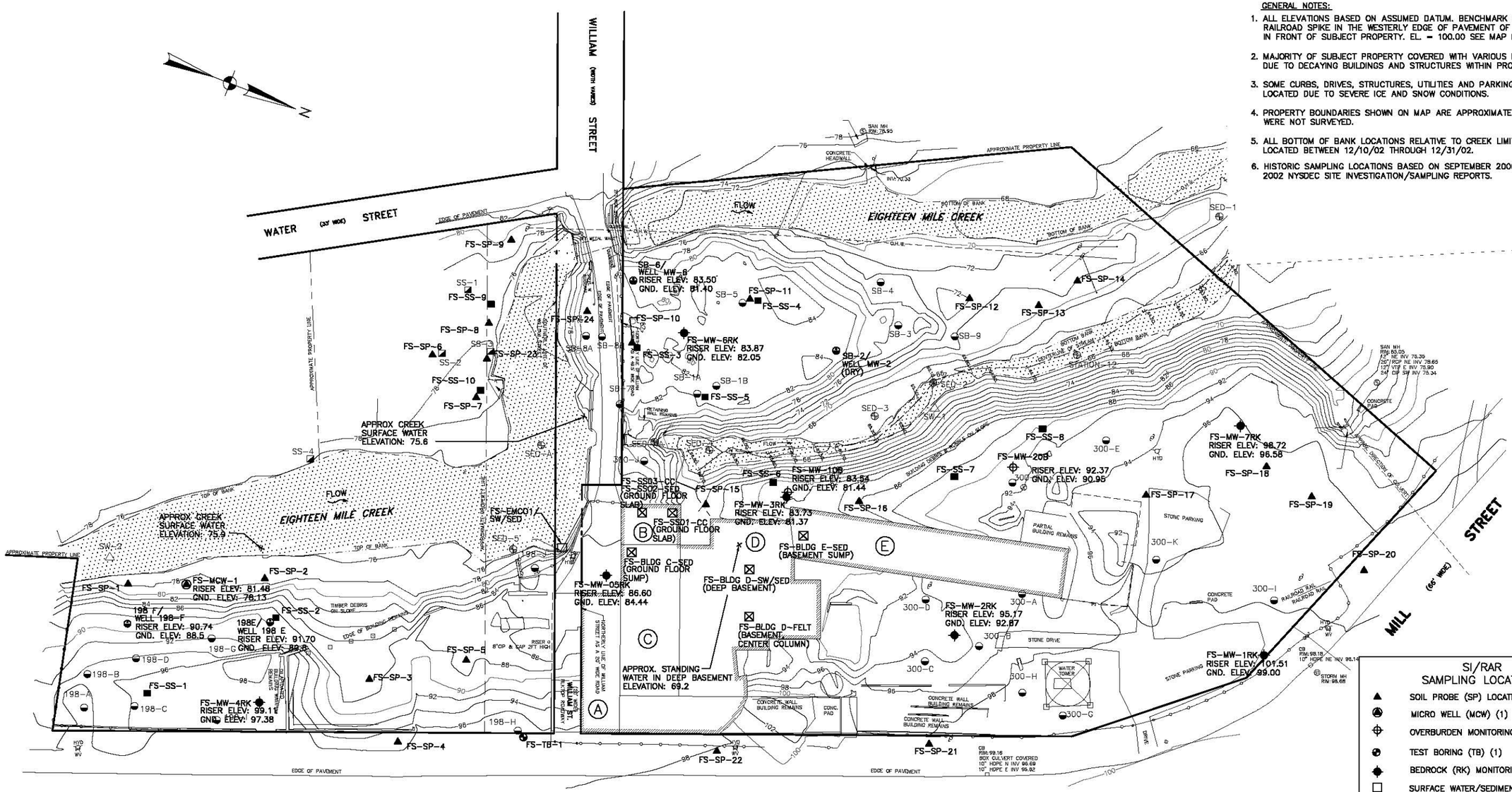
FORMER FLINTKOTE SITE
198 AND 300 MILL STREET
CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

PROJECT NO. 0020571	SCALE: 1" = 40'	DATE: JUNE 2004	FIGURE NO. 2

S:\Engineering\0020571 - Flintkote\CADD\RAR PLANS\FIG-2.dwg 6/7/2004 3:18:28 PM EDT

GENERAL NOTES:

1. ALL ELEVATIONS BASED ON ASSUMED DATUM. BENCHMARK DESCRIPTION RAILROAD SPIKE IN THE WESTERLY EDGE OF PAVEMENT OF THE CURVE LOCATED IN FRONT OF SUBJECT PROPERTY. EL. = 100.00 SEE MAP FOR LOCATION.
2. MAJORITY OF SUBJECT PROPERTY COVERED WITH VARIOUS DEBRIS PILES DUE TO DECAYING BUILDINGS AND STRUCTURES WITHIN PROPERTY BOUNDS.
3. SOME CURBS, DRIVES, STRUCTURES, UTILITIES AND PARKING AREAS NOT LOCATED DUE TO SEVERE ICE AND SNOW CONDITIONS.
4. PROPERTY BOUNDARIES SHOWN ON MAP ARE APPROXIMATE ONLY, AND WERE NOT SURVEYED.
5. ALL BOTTOM OF BANK LOCATIONS RELATIVE TO CREEK LIMITS WERE LOCATED BETWEEN 12/10/02 THROUGH 12/31/02.
6. HISTORIC SAMPLING LOCATIONS BASED ON SEPTEMBER 2000 AND JUNE 2002 NYSDEC SITE INVESTIGATION/SAMPLING REPORTS.



LEGEND

	UTILITY POLE	DR	– DRIVE
	EXISTING MICRO WELLS (4)	EP	– EDGE PAVEMENT
	HYDRANT	BB	– BOTTOM BANK
	WATER VALVE	CL	– CENTERLINE
ST	STORM MANHOLE	TB	– TOP BANK
	UTILITY POLE & LIGHT	TS	– TOP SLOPE
S	SANITARY MANHOLE	BS	– BOTTOM SLOPE
	UNKNOWN MANHOLE	CLF	– CHAIN LINK FENCE
	CATCH BASIN	CB	– CATCH BASIN
+ 64.8	SPOT ELEVATION	O.H.W.	– OVERHEAD WIRES

SI/RAR SAMPLING LOCATIONS

- SOIL PROBE (SP) LOCATION (24)
- MICRO WELL (MCW) (1)
- OVERBURDEN MONITORING (OB) WELL (2)
- TEST BORING (TB) (1)
- BEDROCK (RK) MONITORING WELL (7)
- SURFACE WATER/SEDIMENT (SW/SED) (1)
- SURFACE SOIL (SS) LOCATION (10)
- BUILDING COMPONENT SAMPLE LOCATION (6)
- HISTORIC SOIL BORING LOCATION (32)
- HISTORIC SOIL BORING COMPLETED WITH MICRO – WELL (4)
- HISTORIC SEDIMENT LOCATION (7)
- HISTORIC SURFACE WATER LOCATION (2)
- HISTORIC 143 WATER STREEET SURFACE SOIL LOCATION (4)

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

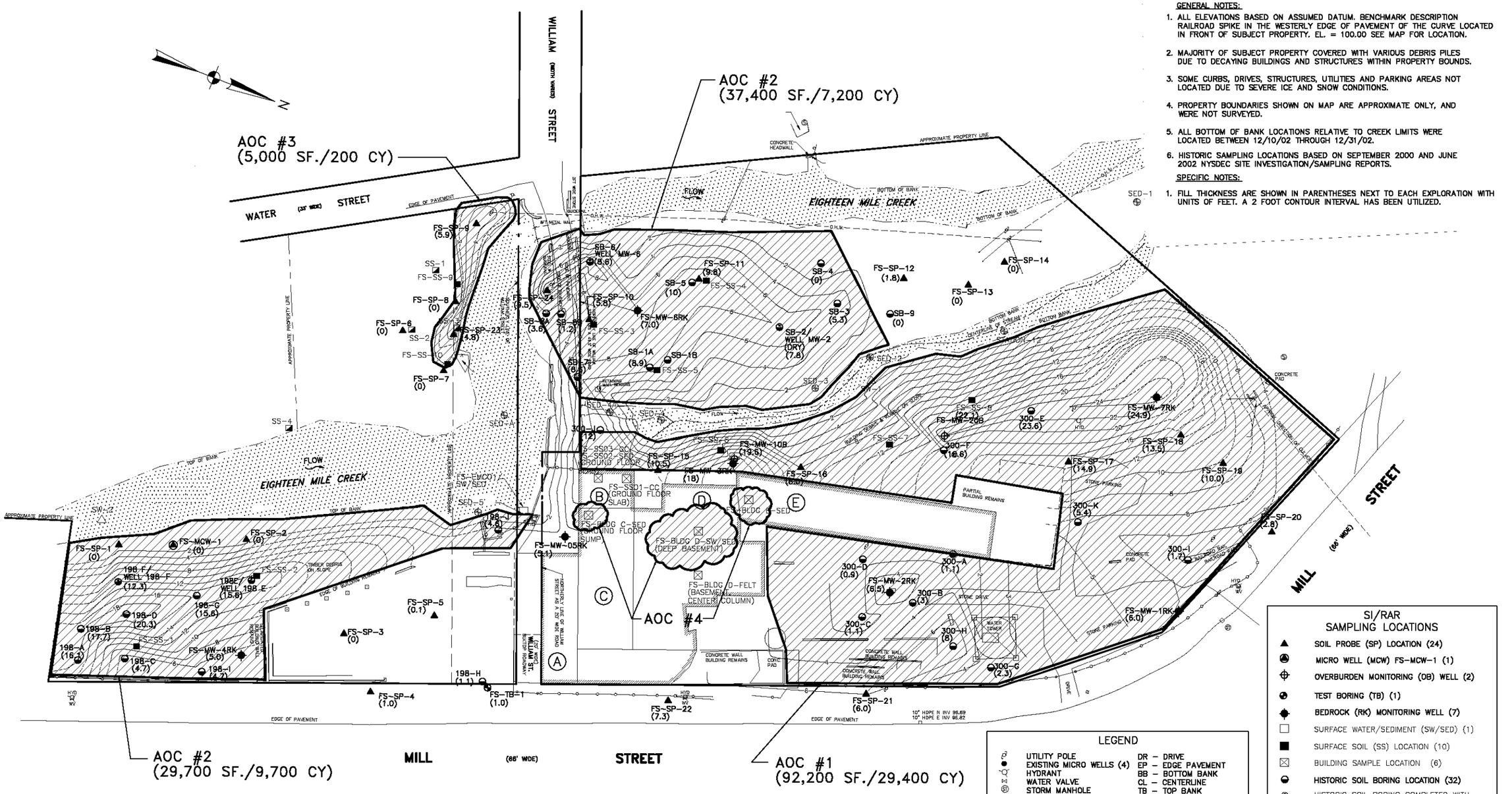
SAMPLE LOCATION PLAN

TVGA CONSULTANTS
1600 MAPLE ROAD
ELMA, NEW YORK 14059-9510
P. 716.652.5540
F. 716.655.0937
www.tvga.com

REMEDIAL ALTERNATIVES REPORT
SI/RAR
FORMER FLINTKOTE SITE
198 AND 300 MILL STREET
CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

PROJECT NO. 0020571 | SCALE: 1" = 40' | DATE: JUNE 2004 | FIGURE NO. 3

S:\Engineering\0020571 - Flintkote\CADD\RAR PLANS\FIG-3.dwg 6/7/2004 3:46:33 PM EDT



GENERAL NOTES:

1. ALL ELEVATIONS BASED ON ASSUMED DATUM. BENCHMARK DESCRIPTION RAILROAD SPIKE IN THE WESTERLY EDGE OF PAVEMENT OF THE CURVE LOCATED IN FRONT OF SUBJECT PROPERTY. EL. = 100.00 SEE MAP FOR LOCATION.
2. MAJORITY OF SUBJECT PROPERTY COVERED WITH VARIOUS DEBRIS PILES DUE TO DECAYING BUILDINGS AND STRUCTURES WITHIN PROPERTY BOUNDS.
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6. HISTORIC SAMPLING LOCATIONS BASED ON SEPTEMBER 2000 AND JUNE 2002 NYSDEC SITE INVESTIGATION/SAMPLING REPORTS.

SPECIFIC NOTES:

1. FILL THICKNESS ARE SHOWN IN PARENTHESES NEXT TO EACH EXPLORATION WITH UNITS OF FEET. A 2 FOOT CONTOUR INTERVAL HAS BEEN UTILIZED.

LEGEND

- UTILITY POLE
- EXISTING MICRO WELLS (4)
- HYDRANT
- WATER VALVE
- STORM MANHOLE
- UTILITY POLE & LIGHT
- SANITARY MANHOLE
- UNKNOWN MANHOLE
- CATCH BASIN
- –7– APPROXIMATE, FILL THICKNESS ISOPACH– (DASHED WHERE INFERRED)

DR – DRIVE
EP – EDGE PAVEMENT
BB – BOTTOM BANK
CL – CENTERLINE
TB – TOP BANK
TS – TOP SLOPE
BS – BOTTOM SLOPE
CLF – CHAIN LINK FENCE
CB – CATCH BASIN
O.H.W. – OVERHEAD WIRES

SI/RAR SAMPLING LOCATIONS

- SOIL PROBE (SP) LOCATION (24)
- MICRO WELL (MCW) FS–MCW–1 (1)
- OVERBURDEN MONITORING (OB) WELL (2)
- TEST BORING (TB) (1)
- BEDROCK (RK) MONITORING WELL (7)
- SURFACE WATER/SEDIMENT (SW/SED) (1)
- SURFACE SOIL (SS) LOCATION (10)
- BUILDING SAMPLE LOCATION (6)
- HISTORIC SOIL BORING LOCATION (32)
- HISTORIC SOIL BORING COMPLETED WITH MICRO – WELL (4)
- HISTORIC SEDIMENT LOCATION (7)
- HISTORIC SURFACE WATER LOCATION (2)
- HISTORIC 143 WATER STREEET SURFACE SOIL LOCATION (4)

GRAPHIC SCALE

40 0 20 40 80 120

(IN FEET)
1 inch = 40 ft.

AREA OF CONCERN 1 THROUGH 4 , AREAL EXTENT

TVGA CONSULTANTS
1030 MAPLE ROAD
ELMA, NEW YORK 14059-9509
P. 716.652.0842
F. 716.655.0637
www.tvga.com

REMEDIAL ALTERNATIVES REPORT
SI/RAR
FORMER FLINTKOTE SITE
198 AND 300 MILL STREET
CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

PROJECT NO. 0020571 | SCALE: 1" = 40' | DATE: JUNE 2004 | FIGURE NO. 4

S:\Engineering\0020571 - Flintkote\CADD\RAP PLANS\FIG-4.dwg, 6/8/2004 8:52:43 AM EDT

GENERAL NOTES:

1. ALL ELEVATIONS BASED ON ASSUMED DATUM. BENCHMARK DESCRIPTION RAILROAD SPIKE IN THE WESTERLY EDGE OF PAVEMENT OF THE CURVE LOCATED IN FRONT OF SUBJECT PROPERTY. EL. = 100.00 SEE MAP FOR LOCATION.
2. MAJORITY OF SUBJECT PROPERTY COVERED WITH VARIOUS DEBRIS PILES DUE TO DECAYING BUILDINGS AND STRUCTURES WITHIN PROPERTY BOUNDS.
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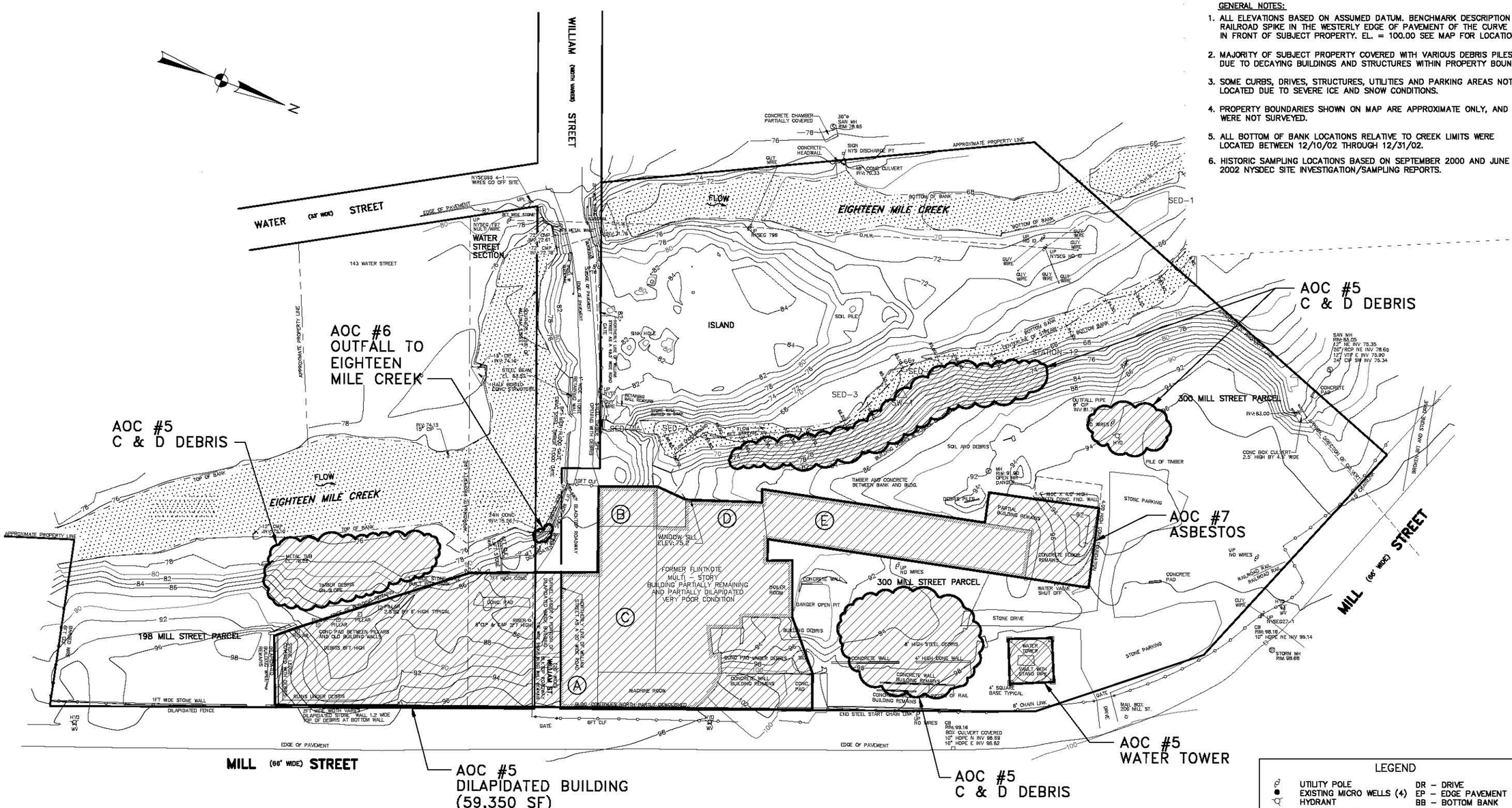
6. HISTORIC SAMPLING LOCATIONS BASED ON SEPTEMBER 2000 AND JUNE 2002 NYSDEC SITE INVESTIGATION/SAMPLING REPORTS.



LEGEND

	UTILITY POLE	DR	DRIVE
	EXISTING MICRO WELLS (4)	EP	EDGE PAVEMENT
	HYDRANT	BB	BOTTOM BANK
M	WATER VALVE	CL	CENTERLINE
ST	STORM MANHOLE	TB	TOP BANK
	UTILITY POLE & LIGHT	TS	TOP SLOPE
S	SANITARY MANHOLE	BS	BOTTOM SLOPE
	UNKNOWN MANHOLE	CLF	CHAIN LINK FENCE
	CATCH BASIN	CB	CATCH BASIN
+64.8	SPOT ELEVATION	O.H.W.	OVERHEAD WIRES

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

AREA OF CONCERN 5 THROUGH 7, AREAL EXTENT

TVGA CONSULTANTS
1020 MAPLE ROAD
ELMA, NEW YORK 14059-9520
P. 716.656.8943
F. 716.655.0937
www.tvga.com

REMEDIAL ALTERNATIVES REPORT
SI/RAR
FORMER FLINTKOTE SITE
198 AND 300 MILL STREET
CITY OF LOCKPORT
NIAGARA COUNTY, NEW YORK

PROJECT NO. 0020571 | SCALE: 1" = 40' | DATE: JUNE 2004 | FIGURE NO. 5

S:\Engineering\0020571 - Flintkote\CADD\RAP PLANS\FIG-5.dwg 6/8/2004 7:54:30 AM EDT

TABLES

Table 1
Areas of Concern and
General Response Actions

Former Flintkote Site

General Response Actions for each Area of Concern						
AOC #1 **Non-Hazardous Fill Materials (300 Parcel)**	**AOC #2** **Hazardous Fill Materials (198 Parcel & Island)**	**AOC #3** **Hazardous Fill Materials (WSS)**	**AOC #4** **Surface Water, Soil/Sediments Inside of Buildings**	**AOC #5** **Dilapidated Buildings and Site-Wide C&D Debris**	**AOC #6** **Sediments within the Outfall to Eighteen Mile Creek**	**AOC #7** **Asbestos**
No action.	No action.	No action.	No action.	No action.	No action.	No action.
Institutional and access controls.	Institutional and access controls.	Institutional and access controls.	Institutional and access controls.	Institutional and access controls.	Institutional and access controls.	Institutional and access controls.
Cover or containment with soil or pavement.	Containment with a low permeability cover system.	Excavation and placement on the Island or 198 Parcel Island for stabilization and soil cover placement.	Removal after building demolition.	Select building demolition, secure building openings and site wide C&D debris removal.	In-place closure.	Pre-demolition asbestos survey. Removal of friable asbestos.
Excavation and off-site disposal.	Stabilization and cover with soil or pavement.	Excavation and off-site disposal.	Limited removal (Bldg. C sump) and in-situ stabilization (Bldg. D deep basement) prior to demolition. Cover with soil after demolition.	Demolish Building to 4-feet bgs and site-wide C&D removal.	Sediment removal and closure in-place.	Pre-demolition asbestos survey. Removal of friable and non-friable asbestos.
	Excavation and off-site disposal.		Limited removal prior to building demolition (Bldg. C sump) and complete removal after building demolition (Bldg. D deep basement). Cleaning of all basement floors after building demolition.	Complete building demolition and site wide C&D removal.	Complete removal and off-site disposal of entire outfall.	

Table 2
Site-Wide Remedial Alternatives

Former Flintkote Site

Site Wide Remedial Alternatives								
Identification	**Name/ Description**	**AOC #1** **Non-Hazardous Fill Materials (300 Parcel)**	**AOC #2** **Hazardous Fill Materials (198 Parcel & Island)**	**AOC #3** **Hazardous Fill Materials (WSS)**	**AOC #4** **Surface Water, Soil/Sediments Inside of Buildings**	**AOC #5** **Dilapidated Buildings and Site-Wide C&D Debris**	**AOC #6** **Sediments within the Outfall to Eighteen Mile Creek**	**AOC #7** **Asbestos**
A	"No Action" Site remains as is.	No action.	No action.	No action.	No action.	No action.	No action.	No action.
B	"Exposure Pathway Removal" No Site reuse allowed after remediation.	Institutional and Access Controls Cover with 10-inch thick soil cover.	Institutional and Access Controls Stabilization and cover with 10-inch thick soil cover.	Institutional and Access Controls Excavation, stabilization and placement on the Island.	Institutional and Access Controls Limited removal (Bldg. C sump) prior to select building demolition.	Institutional and Access Controls Select building demolition and site-wide C&D removal.	Institutional and Access Controls Sediment removal at outfall and closure in-place.	Institutional and Access Controls Pre-demolition asbestos survey. Removal of friable asbestos.
C	"Containment/Limited Removal"	Institutional Controls Containment with an 24-inch thick soil cover.	Institutional Controls Containment with a low permeability cover system.	Institutional Controls Excavation and off-site disposal.	Institutional Controls Limited removal (Bldg. C sump) and in-situ stabilization (Bldg. D deep basement) prior to building demolition. Install a 10-inch thick soil cover after building demolition.	Institutional Controls Demolish Building to 4-feet bgs (slabs remain). Site-wide C&D removal.	Institutional Controls Sediment removal at outfall and closure in-place.	Institutional Controls Pre-demolition asbestos survey. Removal of friable and non-friable asbestos.
D	"Excavation and Containment"	Institutional Controls Containment with an 24-inch thick soil cover.	Institutional Controls Excavation and off-site disposal.	Institutional Controls Excavation and off-site disposal.	Institutional Controls Limited removal (Bldg. C sump) and in-situ stabilization (Bldg. D deep basement) prior to building demolition. Install a 10-inch thick soil cover after building demolition.	Institutional Controls Demolish Building to 4-feet bgs (slabs remain). Site-wide C&D removal.	Institutional Controls Sediment removal at outfall and closure in-place.	Institutional Controls Pre-demolition asbestos survey. Removal of friable and non-friable asbestos.
E	"Complete Excavation" Excavate and off-site disposal.	Excavation and off-site disposal.	Excavation and off-site disposal.	Excavation and off-site disposal.	Limited removal prior to building demolition (Bldg. C sump) and complete removal after building demolition (Bldg. D deep basement). Cleaning of all basement floors after building demolition.	Demolish Building to 4-feet bgs (slabs remain). Site-wide C&D removal.	Complete removal and off-site disposal of pipe from the outfall to the building.	Pre-demolition asbestos survey. Removal of friable and non-friable asbestos.

Notes:
1) Each alternative includes some varying degree of institutional controls depending on the state and volume of contamination that will remain on the Site after implementation of the particular remedial alternative.

Table 3
Former Flintkote Site
Cost Estimate - Alternative A
"No Action"

Item	Note	Unit	Quantity	Cost/Unit	Cost
No Action					
No Action	Implementation			$ -	
Total					**$0.00**

Notes:

Sources include:

2005 RS Means Environmental Remediation Cost Data-Assemblies and Unit Price 11th Edition (unit prices include a 30% markup for overhead and profit).

2005 RS Means Heavy Construction Cost Data 19th Edition.

Engineer's Estimate.

Table 4
Former Flintkote Site
RAR Cost Estimate
Alternative B
"Exposure Pathway Removal"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Institutional Controls (AOC Nos. 1 through 7)						
Deed Restrictions	Implementation	ls	1	$ 5,000.00	$5,000	$5,000
Access Controls (AOC Nos. 1 through 7)						
Site Fencing	Six foot high	lf	1,465	$ 33.06	$48,431	
Site Gates	Six foot high swing gate, 12' double	ea	2	$ 1,120.60	$2,241	
Secure Building	Fencing for building	csf	10	$ 140.00	$1,400	
Signage	Eight 2 ft x 2 ft reflective warning signs	sf	32	$ 18.00	$576	$52,649
Site Preparation (AOC Nos. 1 through 3)						
Clear and Grub	Clear, Grub and haul	acres	4	$ 9,289.80	$37,159	
Monitoring Well Decomistioning	Five Micro Wells	ft	95	$ 5.00	$475	
Monitoring Well Decomistioning	Two Overburden Wells	ft	55	$ 12.00	$660	
Monitoring Well Decomistioning	Seven Bedrock Wells	ft	220	$ 18.00	$3,960	
Grading	300-parcel	day	15	$ 1,710.80	$25,662	$67,916
Ex-Situ Stabilization (AOC Nos. 2 and 3)						
Complete Treatability Study	Bench/pilot study	ls	1	$ 10,000.00	$10,000	
Hazardous Fill Excavation	1.5 CY Track-Mounted Excavator	cy	17,100	$ 3.57	$61,047	
Hazardous Fill Transportation	On-site transportation to stabilization area	cy	17,100	$ 3.05	$52,155	
Loading Fill to Mixer	1.5 CY Track-Mounted Loader	cy	17,100	$ 3.12	$53,352	
Stabilization	Ex-situ w/ portland cement	cy	17,100	$ 20.80	$355,680	
Hazardous Fill Transportation	On-site transportation to place of origin	cy	18,800	$ 2.22	$41,736	
Re-install Stabilized Soils	Spreading w/ dozer	cy	18,800	$ 1.38	$25,944	$599,914
Soil Cover (AOC Nos. 1 through 3)						
Clean Fill	Unclassified fill, 6" lifts	cy	2,950	$ 13.00	$38,350	
Topsoil	Exterior portions of the site	cy	2,075	$ 37.88	$78,605	
Stream Bank Stabilization	Woven geotextile	sy	655	$ 1.74	$1,141	
Stream Bank Stabilization	One foot layer of medium stone	cy	220	$ 33.10	$7,282	
Seeding	Mechanical Seeding	acre	4	$ 4,947.80	$19,791	$145,169

Table 4
Former Flintkote Site
RAR Cost Estimate
Alternative B
"Exposure Pathway Removal"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Limited Sediment Removal (Building C Sump/Trench) (AOC No. 4)						
Drain/Sump Cleaning/Close in-place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,368.77	$1,369	
Non-Haz Soil Transportation/Disposal	Non-haz sediment	ton	2	$ 50.00	$100	
Plug Inlet/Outfall Pipes	Materials	ea	2	$ 200.00	$400	$1,869
Selective Building Demolition / C&D Removal (AOC No. 5)						
C&D Debris Loading	1.5 CY Track-Mounted Excavator	cy	1,000	$ 2.48	$2,480	
C&D Debris Transportation/Disposal	C&D debris	ton	1,600	$ 50.00	$80,000	
Selective Building Demolition	Building C walls, demolish and leave in place	sf	36	$ 2.69	$97	
Selective Building Demolition	Building C & Boiler Room roof, demolish and leave in place	sf	5,800	$ 1.43	$8,294	$90,871
Drainage Features (Eighteen Mile Creek) (AOC No. 6)						
Remove Sediments/ Grout In-Place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,368.77	$1,369	
Close In-Place	Materials	ea	1	$ 500.00	$500	
Non-Haz Sediment Transportation/Disposal	Non-haz sediment	ton	1	$ 50.00	$50	$1,919
Friable Asbestos Removal (AOC No. 7)						
Pre-Demolition Asbestos Survey	Survey/Sampling	ls	1	$ 5,000.00	$5,000	
Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 33,000.00	$33,000	
Project/Air Monitoring	Air monitoring and project oversight	ls	1	$ 500.00	$500	$38,500
Subtotal						$1,003,806

Table 4
Former Flintkote Site
RAR Cost Estimate
Alternative B
"Exposure Pathway Removal"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Additional Capital Costs						
Mob/Demob/Decon	5% of Subtotal				$50,190	
Contingencies	15% of Subtotal				$150,571	
Engineering/Oversight	10% of Subtotal				$100,381	$301,142
Capital Cost Subtotal						$1,304,948
Biannual Cover Monitoring (AOC Nos. 1 and 2)						
Cover Monitoring		event	2	$ 3,400.00	$6,800	$6,800
Capital Cost Subtotal						$1,304,948
Present Worth - Biannual Cover Monitoring (30 years)						$104,533
Total Project Cost						**$1,409,481**

Notes:

1. Sources include:
   2005 RS Means Environmental Remediation Cost Data-Assemblies and Unit Price 11th Edition
   (unit prices include a 30% markup for overhead and profit).
   2005 RS Means Heavy Construction Cost Data 19th Edition.
   Engineer's Estimate.

2. Present Worth Analysis assumes an interest rate of five percent.
3. As identified on page No. 1 of Appendix A there is the potential for larger quantities of friable asbestos to exist within the buildings. These larger quantities may exist within portions of the buildings that were inaccessible during the visual asbestos screening. If identified during a pre-demolition asbestos survey these larger quantities of friable asbestos have the potential to significantly increase the costs associated with friable asbestos abatement.

ea = each
cy = cubic yard
lf = linear foot
sf = square foot
csf = 100 square feet
ls = lump sum
ton = 2,000 pounds

Table 5
Former Flintkote Site
RAR Cost Estimate
Alternative C
"Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Institutional Controls (AOC Nos. 1 through 7)						
Deed Restrictions	Implementation	ls	1	$ 4,000.00	$4,000	$4,000
Site Preparation (AOC Nos. 1 and 2)						
Clear and Grub	Clear, Grub and haul	acre	3.7	$ 9,289.80	$34,372	
Monitoring Well Decomistioning	Five Micro Wells	ft	95	$ 5.00	$475	
Monitoring Well Decomistioning	Two Overburden Wells	ft	55	$ 12.00	$660	
Monitoring Well Decomistioning	Seven Bedrock Wells	ft	220	$ 18.00	$3,960	
Grading	300-parcel, 198-parcel and the Island.	day	30	$ 1,710.80	$51,324	$90,791
Soil Cover (300-Parcel) (AOC No. 1)						
Cushion Layer	12 oz Non-woven geotextile	sy	10,245	$ 2.82	$28,901	
Clean Fill	Unclassified fill, 6" lifts	cy	5,120	$ 13.00	$66,560	
Topsoil	6" lifts	cy	1,700	$ 37.88	$64,399	
Stream Bank Stabilization	Woven geotextile	sy	245	$ 1.74	$427	
Stream Bank Stabilization	One foot layer of medium stone	cy	85	$ 33.10	$2,813	
Seeding	Mechanical Seeding	acre	2.1	$ 4,948	$10,390	$173,491
Low Permeability Cover System (AOC No. 2)						
Subgrade	Unclassified fill, 6" lifts	cy	1,250	$ 15.00	$18,750	
Cushion Layer	12 oz Non-woven geotextile	sy	7,455	$ 2.82	$21,031	
Barrier Layer	80 mil textured LDPE	sf	67,100	$ 3.89	$260,818	
Cushion Layer	12 oz Non-woven geotextile	sy	7,455	$ 2.82	$21,031	
Barrier Protection Layer	Low permeability clay soil 10E-7	cy	5,000	$ 30.20	$150,995	
Topsoil	6" lifts	cy	1,250	$ 37.88	$47,353	
Stream Bank Stabilization	Woven geotextile	sy	410	$ 1.74	$714	
Stream Bank Stabilization	One foot layer of medium stone	cy	135	$ 33.10	$4,468	
Seeding	Mechanical Seeding	acre	1.5	$ 4,948	$7,422	$532,580
Excavation/Off-site Disposal of Hazardous Fill on the WSS (AOC No. 3)						
Clear and Grub	Clear, Grub and haul	acre	0.11	$ 9,289.80	$1,022	
Hazardous Fill Excavation (WSS)	1.5 CY Track-Mounted Excavator	cy	200	$ 3.57	$714	
Hazardous Soil Transportation/Disposal	Hazardous soil meeting disposal criteria	ton	320	$ 102.00	$32,640	
Topsoil	6" lifts	cy	100	$ 37.88	$3,788	
Seeding	Mechanical Seeding	acre	0.1	$ 4,948	$495	$38,659

Table 5
Former Flintkote Site
RAR Cost Estimate
Alternative C
"Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Limited Sediment Removal (Building C Sump/Trench) (AOC No. 4)						
Building C Drain/Sump Cleaning/Close-in-place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Non-Haz Soil Transportation/Disposal	Non-haz sediment	ton	2	$ 50.00	$100	
Plug Inlet/Outfall Pipes	Materials	ea	2	$ 200.00	$400	
Clean Fill	Unclassified fill, 6" lifts, following building demolition.	cy	1,100	$ 13.00	$14,300	
Topsoil	Following building demolition.	cy	730	$ 37.88	$27,654	
Seeding	Mechanical Seeding	acre	1.4	$ 4,948	$6,927	$50,750
Sediment Stabilization (Building D Deep Basement) (AOC No. 4)						
Collection of Water Building D deep basement	Vacuum truck	hr	10	$ 100.00	$1,000	
Non-Haz sediment/water Transportation	Transportation	mile	30	$ 15.94	$478	
Non-Haz Liquid Disposal	Non-haz water	gal	1,000	$ 1.00	$1,000	
Building D In-situ Stabilization	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Stabilization	Materials	ea	1	$ 500	$500	$4,347
Building Demolition / C&D Removal (AOC No. 5)						
Building Demolition	Demolish all buildings and remaining structures.	ls	1	$ 300,000	$300,000	
Sampling and Analysis of the Hard Fill	Collection and analysis of composite sample	ls	1	$ 600.00	$600.00	
Water Tower Demolition		ls	1	$ 3,799	$3,799	
Disposal of Wooden Roof	Transportation/Disposal	ton	540	$ 50.00	$27,000	
Electrical/Non-salvageable Equipment	Transportation/Disposal	ton	3,000	$ 50.00	$150,000	
C&D Debris Loading	1.5 CY Track-Mounted Excavator	cy	1,000	$ 2.48	$2,480	
C&D Debris Transportation/Disposal	C&D debris	ton	1,600	$ 50.00	$80,000	$563,879
Drainage Features (Eighteen Mile Creek) (AOC No. 6)						
Remove Sediments/ Grout In-Place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Close In-Place	Materials	ea	1	$ 500.00	$500	
Non-Haz Sediment Transportation/Disposal	Non-haz sediment	ton	1	$ 50.00	$50	$1,919

Table 5
Former Flintkote Site
RAR Cost Estimate
Alternative C
"Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Friable and Non-Friable Asbestos Removal (AOC No. 7)						
Pre-Demolition Asbestos Survey	Survey/Sampling	ls	1	$ 5,000	$5,000	
Non-Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 217,000	$217,000	
Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 33,000	$33,000	
Project/Air Monitoring	Air monitoring and project oversight	ls	1	$ 500.00	$500	$255,500
Subtotal						$1,715,916
Additional Capital Costs						
Mob/Demob/Decon	5% of Subtotal				$85,796	
Contingencies	15% of Subtotal				$257,387	
Engineering/Oversight	10% of Subtotal				$171,592	$514,775
Capital Cost Subtotal						$2,230,690
Biannual Cover Monitoring (AOC Nos. 1 and 2)						
Cover Monitoring		event	2	$ 3,400.00	$6,800	$6,800
Capital Cost Subtotal						$2,230,690
Present Worth - Biannual Cover Monitoring (30 years)						$104,533
Total Project Cost						**$2,335,223**

Notes:

1. Sources include:
   2005 RS Means Environmental Remediation Cost Data-Assemblies and Unit Price 11th Edition
   (unit prices include a 30% markup for overhead and profit).
   2005 RS Means Heavy Construction Cost Data 19th Edition.
   Engineer's Estimate.
2. Present Worth Analysis assumes an interest rate of five percent.
3. As identified on page No. 1 of Appendix A there is the potential for larger quantities of friable asbestos to exist within the buildings. These larger quantities may exist within portions of the buildings that were inaccessible during the visual asbestos screening. If identified during a pre-demolition asbestos survey these larger quantities of friable asbestos have the potential to significantly increase the costs associated with friable asbestos abatement.

ea = each
cy = cubic yard
sf = square foot
ls = lump sum
ton = 2,000 pounds

Table 6
Former Flintkote Site
RAR Cost Estimate
Alternative D
"Excavation and Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Institutional Controls (AOC Nos. 1 through 7)						
Deed Restrictions	Implementation	ls	1	$ 4,000.00	$4,000	$4,000
Site Preparation (AOC Nos. 1 and 2)						
Clear and Grub	Clear, Grub and haul	acre	3.7	$ 9,289.80	$34,372	
Monitoring Well Decomistioning	Five Micro Wells	ft	95	$ 5.00	$475	
Monitoring Well Decomistioning	Two Overburden Wells	ft	55	$ 12.00	$660	
Monitoring Well Decomistioning	Seven Bedrock Wells	ft	220	$ 18.00	$3,960	
Grading	300-parcel, 198-parcel and the Island.	day	30	$ 1,710.80	$51,324	$90,791
Soil Cover (300-Parcel) (AOC No. 1)						
Cushion Layer	12 oz Non-woven geotextile	sy	10,245	$ 2.82	$28,901	
Clean Fill	Unclassified fill, 6" lifts	cy	5,120	$ 13.00	$66,560	
Topsoil	6" lifts	cy	1,700	$ 37.88	$64,399	
Stream Bank Stabilization	Woven geotextile	sy	245	$ 1.74	$427	
Stream Bank Stabilization	One foot layer of medium stone	cy	85	$ 33.10	$2,813	
Seeding	Mechanical Seeding	acre	2.1	$ 4,948	$10,390	$173,491
Excavation/Off-site Disposal of Hazardous Fill (198-Parcel, the Island and the WSS) (AOC Nos. 2 and 3)						
Hazardous Soil Excavation/Loading	1.5 CY Track-Mounted Excavator	cy	17,100	$ 3.57	$61,047	
Hazardous Soil Transportation/Disposal	Hazardous soil meeting disposal criteria	ton	13,680	$ 102.00	$1,395,360	
Hazardous Soil Transportation/Disposal	Hazardous soil requireing stabilization	ton	13,680	$ 113.00	$1,545,840	
Clean Fill	Unclassified fill, 6" lifts	cy	5,000	$ 13.00	$65,000	
Topsoil	6" lifts	cy	1,250	$ 37.88	$47,353	
Seeding	Mechanical Seeding	acre	1.5	$ 4,948	$7,422	$3,122,021
Restoration (WSS) (AOC No. 3)						
Topsoil	6" lifts	cy	100	$ 37.88	$3,788	
Seeding	Mechanical Seeding	acre	0.1	$ 4,948	$495	$4,283

Table 6
Former Flintkote Site
RAR Cost Estimate
Alternative D
"Excavation and Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Limited Sediment Removal (Building C Sump/Trench) (AOC No. 4)						
Building C Drain/Sump Cleaning/Close-in-place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Non-Haz Soil Transportation/Disposal	Non-haz sediment	ton	2	$ 50.00	$100	
Plug Inlet/Outfall Pipes	Materials	ea	2	$ 200.00	$400	
Clean Fill	Unclassified fill, 6" lifts, following building demolition.	cy	1,100	$ 13.00	$14,300	
Topsoil	Following building demolition.	cy	730	$ 37.88	$27,654	
Seeding	Mechanical Seeding	acre	1.4	$ 4,948	$6,927	$50,750
Sediment Stabilization (Building D Deep Basement) (AOC No. 4)						
Collection of Water Building D deep basement	Vacuum truck	hr	10	$ 100.00	$1,000	
Non-Haz sediment/water Transportation	Transportation	mile	30	$ 15.94	$478	
Non-Haz Liquid Disposal	Non-haz water	gal	1,000	$ 1.00	$1,000	
Building D In-situ Stabilization	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Stabilization	Materials	ea	1	$ 500	$500	$4,347
Building Demolition / C&D Removal (AOC No. 5)						
Building Demolition	Demolish all buildings and remaining structures.	ls	1	$ 300,000	$300,000	
Sampling and Analysis of the Hard Fill	Collection and analysis of composite sample	ls	1	$ 600.00	$600.00	
Water Tower Demolition		ls	1	$ 3,799	$3,799	
Disposal of Wooden Roof	Transportation/Disposal	ton	540	$ 50.00	$27,000	
Electrical/Non-salvageable Equipment	Transportation/Disposal	ton	3,000	$ 50.00	$150,000	
C&D Debris Loading	1.5 CY Track-Mounted Excavator	cy	1,000	$ 2.48	$2,480	
C&D Debris Transportation/Disposal	C&D debris	ton	1,600	$ 50.00	$80,000	$563,879
Drainage Features (Eighteen Mile Creek) (AOC No. 6)						
Remove Sediments/ Grout In-Place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Close In-Place	Materials	ea	1	$ 500.00	$500	
Non-Haz Sediment Transportation/Disposal	Non-haz sediment	ton	1	$ 50.00	$50	$1,919

Table 6
Former Flintkote Site
RAR Cost Estimate
Alternative D
"Excavation and Containment"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Friable and Non-Friable Asbestos Removal (AOC No. 7)						
Pre-Demolition Asbestos Survey	Survey/Sampling	ls	1	$ 5,000	$5,000	
Non-Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 217,000	$217,000	
Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 33,000	$33,000	
Project/Air Monitoring	Air monitoring and project oversight	ls	1	$ 500.00	$500	$255,500
Subtotal						$4,270,980
Additional Capital Costs						
Mob/Demob/Decon	5% of Subtotal				$213,549	
Contingencies	15% of Subtotal				$640,647	
Engineering/Oversight	10% of Subtotal				$427,098	$1,281,294
Capital Cost Subtotal						$5,552,274
Biannual Cover Monitoring (AOC Nos. 1 and 2)						
Cover Monitoring		event	2	$ 2,000.00	$4,000	$4,000
Capital Cost Subtotal						$5,552,274
Present Worth - Biannual Cover Monitoring (30 years)						$61,490
Total Project Cost						**$5,613,764**

Notes:

1. Sources include:
   2005 RS Means Environmental Remediation Cost Data-Assemblies and Unit Price 11th Edition
   (unit prices include a 30% markup for overhead and profit).
   2005 RS Means Heavy Construction Cost Data 19th Edition.
   Engineer's Estimate.
2. Present Worth Analysis assumes an interest rate of five percent.
3. As identified on page No. 1 of Appendix A there is the potential for larger quantities of friable asbestos to exist within the buildings. These larger quantities may exist within portions of the buildings that were inaccessible during the visual asbestos screening. If identified during a pre-demolition asbestos survey these larger quantities of friable asbestos have the potential to significantly increase the costs associated with friable asbestos abatement.

ea = each
cy = cubic yard
sf = square foot
ls = lump sum
ton = 2,000 pounds

Table 7
Former Flintkote Site
RAR Cost Estimate
Alternative E
"Complete Excavation"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Site Preparation (AOC Nos. 1 through 3)						
Clear and Grub	Clear, Grub and haul	acre	4	$ 9,289.80	$37,159	
Monitoring Well Decomistioning	Five Micro Wells	ft	95	$ 5.00	$475	
Monitoring Well Decomistioning	Two Overburden Wells	ft	55	$ 12.00	$660	
Monitoring Well Decomistioning	Seven Bedrock Wells	ft	220	$ 18.00	$3,960	$42,254
Excavation/Off-site Disposal of Non-hazardous Fill (300-Parcel) (AOC No. 1)						
Non-Haz Soil Excavation/Loading	1.5 CY Track-Mounted Excavator	cy	29,400	$ 2.48	$72,912	
Non-Haz Soil Transportation/Disposal	Non-haz soil	ton	47,000	$ 50.00	$2,350,000	
Clean Fill	Unclassified fill, 6" lifts	cy	6,900	$ 13.00	$89,700	
Topsoil	6" lifts	cy	1,700	$ 37.88	$64,399	
Seeding	Mechanical Seeding	acre	2.1	$ 4,948	$10,390	$2,587,402
Excavation/Off-site Disposal of Hazardous Fill (198-Parcel, the Island and the WSS) (AOC Nos. 2 and 3)						
Hazardous Soil Excavation/Loading	1.5 CY Track-Mounted Excavator	cy	17,100	$ 3.57	$61,047	
Hazardous Soil Transportation/Disposal	Hazardous soil meeting disposal criteria	ton	13,680	$ 102.00	$1,395,360	
Hazardous Soil Transportation/Disposal	Hazardous soil requireing stabilization	ton	13,680	$ 113.00	$1,545,840	
Clean Fill	Unclassified fill, 6" lifts	cy	5,000	$ 13.00	$65,000	
Topsoil	6" lifts	cy	1,250	$ 37.88	$47,353	
Seeding	Mechanical Seeding	acre	1.5	$ 4,948	$7,422	$3,122,021
Restoration (WSS) (AOC No. 3)						
Topsoil	6" lifts	cy	100	$ 37.88	$3,788	
Seeding	Mechanical Seeding	acre	0.1	$ 4,948	$495	$4,283
Limited Sediment Removal (Building C Sump/Trench) (AOC No. 4)						
Building C Drain/Sump Cleaning/Close-in-place	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Plug Inlet/Outfall Pipes	Materials	ea	2	$ 200.00	$400	
Non-Haz Soil Transportation/Disposal	Non-haz sediment	ton	2	$ 50.00	$100	$1,869

Table 7
Former Flintkote Site
RAR Cost Estimate
Alternative E
"Complete Excavation"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Cleaning of Floors After Demolition (AOC No. 4)						
Collection of Water Building D deep basement	Vacuum truck	hr	10	$ 100.00	$1,000	
Building D Sump Cleaning	Three man crew (2 Laborers and a Forman)	day	1	$ 1,369	$1,369	
Power Wash Basement Floors	Building E and the Machine Room	ls	1	$ 5,000.00	$5,000	
Collection of Water/sediments	Vacuum truck	hr	40	$ 100.00	$4,000	
Hazardous Sediment Transportation/Disposal	Hazardous sediment (Building D deep basement)	ton	1	$ 113.00	$113	
Non-Haz sediment/water Transportation	Transportation	mile	20	$ 15.94	$319	
Non-Haz Liquid/Sludge Disposal	Non-haz sediment/water mix	gal	6,260	$ 1.00	$6,260	$18,061
Building Demolition / C&D Removal (AOC No. 5)						
Building Demolition	Demolish all buildings and remaining structures.	ls	1	$ 360,000	$360,000	
Water Tower Demolition		ls	1	$ 3,799	$3,799	
Disposal of Wooden Roof	Transportation/Disposal	ton	540	$ 50.00	$27,000	
Electrical/Non-salvageable Equipment	Transportation/Disposal	ton	3,000	$ 50.00	$150,000	
C&D Debris Loading	1.5 CY Track-Mounted Excavator	cy	1,000	$ 2.48	$2,480	
C&D Debris Transportation/Disposal	C&D debris	ton	1,600	$ 50.00	$80,000	$623,279
Drainage Features (Eighteen Mile Creek) (AOC No. 6)						
Soil Excavation/Deposition	1.5 CY Track-Mounted Excavator	cy	15	$ 2.59	$39	
Remove Piping		lf	30	$ 21.22	$636	
Plug Piping	Materials	ea	1	$ 500.00	$500	
Non-Haz Sediment Transportation/Disposal	Non-haz sediment within outfall pipe	ton	2	$ 50.00	$100	$1,275

Table 7
Former Flintkote Site
RAR Cost Estimate
Alternative E
"Complete Excavation"

Item	Note	Unit	Quantity	Cost/Unit	Cost	Subtotals
Friable and Non-Friable Asbestos Removal (AOC No. 7)						
Pre-Demolition Asbestos Survey	Survey/Sampling	ls	1	$ 5,000	$5,000	
Non-Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 217,000	$217,000	
Friable Asbestos	Abatement/Air Monitoring	ls	1	$ 33,000	$33,000	
Project/Air Monitoring	Air monitoring and project oversight	ls	1	$ 500.00	$500	$255,500
Subtotal						$6,655,943
Additional Capital Costs						
Mob/Demob/Decon	5% of Subtotal				$332,797	
Contingencies	15% of Subtotal				$998,392	
Engineering/Oversight	10% of Subtotal				$665,594	$1,996,783
Total						$8,652,726

Notes:

1. Sources include:
   2005 RS Means Environmental Remediation Cost Data-Assemblies and Unit Price 11th Edition
   (unit prices include a 30% markup for overhead and profit).
   2005 RS Means Heavy Construction Cost Data 19th Edition.
   Engineer's Estimate.

3. As identified on page No. 1 of Appendix A there is the potential for larger quantities of friable asbestos to exist within the buildings. These larger quantities may exist within portions of the buildings that were inaccessible during the visual asbestos screening. If identified during a pre-demolition asbestos survey these larger quantities of friable asbestos have the potential to significantly increase the costs associated with friable asbestos abatement.

ea = each
cy = cubic yard
gal = gallons
ls = lump sum
ton = 2,000 pounds

Table 8
Comparison of Site-Wide Alternatives

Former Flintkote Site

Criteria	Site Wide Remedial Alternatives									
	A "No Action"		B "Exposure Pathway Removal"		C "Containment/Limited Removal"		D "Excavation and Containment"		E "Complete Excavation"	
	Rating/Score									
Overall Protection Of Human Health And The Environment	Low	1	Medium	2	Medium-High	2.5	High	3	High	3
Compliance With SCG	Low	1	Medium	2	Low-Medium	1.5	Medium-High	2.5	High	3
Short-Term Effectiveness	Low	1	Medium	2	Medium	2	Medium-High	2.5	Medium-High	2.5
Long-Term Effectiveness	Low	1	Low-Medium	1.5	Medium	2	Medium-High	2.5	High	3
Reduction Of Toxicity, Mobility And Volume	Low	1	Medium	2	Medium-High	2.5	High	3	High	3
Feasibility	Low	1	Low	1	Medium-High	2.5	Medium	2	Low-Medium	1.5
Aggregate Score		6		10.5		13		15.5		16

Notes:

1) If the Site Wide Remedial Alternative satisfies the criteria to a high degree it is assigned a score of 3.

2) If the Site Wide Remedial Alternative satisfies the criteria to a moderate degree it is assigned a score of 2.

3) If the Site Wide Remedial Alternative minimally satisfies the criteria it is assigned a score of 1.

APPENDIX A

COST ESTIMATE ASSUMPTIONS FOR SITE-WIDE REMEDIAL ALTERNATIVES

APPENDIX A
Cost Estimate Assumptions
for
Site Wide Remedial Alternatives

Former Flintkote Site

This document provides a summary of the assumptions used to develop the cost estimates for each site-wide remedial alternative. Common to all the site-wide alternatives is the assumption that soil/fill material weighs 1.6 tons per cubic yard.

The results from the visual asbestos survey identified several areas of suspect ACM across the Site. Most of the suspect ACM would likely be classified as non-friable or non-friable organically bound, and a remedial cost has been included in the cost estimate tables where appropriate. The suspect ACM that would likely be identified as friable was generally found in small quantities and is included in the cost estimate tables. If determined to contain asbestos, some of the larger quantities of friable ACM would include the prefabricated roofing blocks of Building D, the fire brick inside the furnace in the Boiler Room, and the brick mortar associated with the coal silo, chimney and building structures. These larger quantities have not been included in the cost estimate. Following a pre-demolition asbestos survey all quantities and the associated costs will be determined.

Alternative A – "No Action"

No Action (AOC #1 through #7)

- Site remains in its current state.
- No environmental monitoring, remedial activities, or institutional controls would be implemented under this alternative.

Alternative B – "Exposure Pathway Removal"

Institutional Controls (AOC #1 through #7)

Implement the following institutional controls in the form of deed restrictions and access controls.

Deed Restrictions

- Prevent the future use of the Site and building.
- Require the development of a site management plan for any future excavation activities.
- Provide notice to potential owners, operators, or members of the public on the conditions of the Site and building.
- Prevent any change in the current zoning of the Site.

Access Controls

- Install a six-foot high chain link fence (approximately 1,465 linear feet) along the north, east, and south portions of the Site as well as across the west end of William Street.
- Install fencing and/or barricades to prevent access to the interior of the building (approximately 1,000 square feet).
- Install signage to warn potential trespassers of the site dangers every 200 feet along the fencing.

Stabilize Soils if Necessary, Install Soil Cover (AOC #1, #2, and #3)

Complete site preparation activities, ex-situ stabilization of hazardous fill materials, re-install stabilized fill materials, install a soil cover.

Site Preparation

- Monitoring well decommissioning (7 bedrock monitoring wells, 2 overburden monitoring wells, 5 micro wells).
- Clearing and grubbing of areas to be covered with soil and the WSS (approximately 165,000 square feet). Excavation and disposal of the site-wide C&D debris is included under AOC#5.
- Grade 300 Parcel to maximum 4H:1V slopes.

Ex-situ Stabilization

- Complete treatability study.
- Excavate and transport hazardous fill material from the WSS, Island and 198 Parcel to the ex-situ stabilization area. The hazardous fill from these areas includes approximately 9,700 cubic yards from the 198 Parcel, approximately 7,200 cubic yards from the Island and approximately 200 cubic yards from the WSS, totaling 17,100 cubic yards or 27,360 tons.
- Stabilize with Portland cement.
- Re-install stabilized soils onto the Island and 198 Parcel to a maximum 4H:1V slopes.

Alternative B – "Exposure Pathway Removal" (Continued)

Soil Cover

- Install a ten-inch thick soil cover (6-inches of unclassified fill and 4-inches of topsoil) over the 300 Parcel, the 198 Parcel and the Island portions of the Site. This is approximately 160,000 square feet resulting in approximately 2,950 cubic yards of unclassified fill and 1,975 cubic yards of topsoil.
- Install 6-inches of topsoil on the WSS. Approximately 5,000 square feet resulting in approximately 100 cubic yards.
- Seed and mulch soil cover areas and the WSS (approximately 165,000 square feet).
- Install stream bank protection along Eighteen Mile Creek and millrace consisting of a woven geotextile and a 12-inch thick layer of medium stone fill from the normal surface water elevation 5 feet up the embankment.

Long-term Cover System Monitoring

- Conduct bi-annual monitoring to document the effectiveness of the soil cover on the Site.
- Complete and submit to the NYSDEC an annual report that certifies that the institutional controls and access controls put in place are still in place, have not been altered, and are still effective.

Limited Sediment Removal (AOC #4)

Removal of sediments from Building C sump and trench drain.

- Remove and dispose sediments from the Building C sump and associated trench drain.
- This will include approximately 1.5 cubic yards (2 tons) of sediment.

Selective Building Demolition (AOC #5)

- Site-wide removal and off-site disposal of C&D debris (rebar, railroad ties, miscellaneous metal pieces, etc.). This is estimated to include approximately 1,000 cubic yards (1,600 tons).
- Demolish and portions of the building representing a safety hazard to trespassers including the second floor walls and remaining roof of Building C and the roof over the boiler room.

Sediment Removal and in-place closure of outfall to Eighteen Mile Creek (AOC #6)

24-inch diameter Eighteen Mile Creek Outfall

- Remove accessible sediment from the outfall pipe without entering the pipe (approximately one 55-gallon drum).
- Dispose of at a municipal solid waste facility.
- The end of the pipe will be closed in place, by plugging the pipe with concrete.

Alternative B – "Exposure Pathway Removal" (Continued)

Building Component Removal (AOC #7)

Pre-Demo Asbestos Survey & Friable Asbestos Removal

- Perform pre-demolition asbestos survey.
- Remove the friable asbestos from the building and dispose of off-site in accordance with State and Federal regulatory requirements.
- Complete air monitoring as required.

Alternative C – "Containment/Limited Removal"

Institutional Controls (AOC #1 through #7)

Implement the following institutional controls in the form of deed restrictions.

Deed Restrictions

- Restrict the future use of the Site for recreational purposes.
- Require the development of a site management plan for any future excavation activities.
- Provide notice to potential owners, operators, or members of the public about the conditions of the Site.

Containment with Soil Cover or Low Permeability Cover System (AOC #1 and #2)

Complete site preparation activities, install a soil cover or low permeability cover system.

Site Preparation

- Monitoring well decommissioning (7 bedrock monitoring wells, 2 overburden monitoring wells, 5 micro wells).
- Clearing and grubbing of areas to be covered with soil and low permeability cover system (approximately 160,000 square feet). Excavation and disposal of the site-wide C&D debris is included under AOC#5.
- Grade the 300 Parcel, 198 Parcel, and Island to maximum 4H:1V slopes (approximately 160,000 square feet).

Containment with Soil Cover (AOC #1)

- Install 24-inch thick soil cover over the 300 Parcel (approximately 92,200 square feet).
- The soil cover would consist of:
    - Cushion layer consisting of a 12 ounce per square yard non-woven geotextile (approximately 92,200 square feet).
    - 18-inches of unclassified fill (approximately 5,120 cubic yards).
    - 6-inches of topsoil (approximately 1,700 cubic yards).
    - Seeding and mulch soil cover areas (approximately 92,200 square feet).
    - Install stream bank protection along millrace consisting of a woven geotextile and a 12-inch thick layer of medium stone fill from the normal surface water elevation 5 feet up the embankment.

Alternative C – "Containment/Limited Removal" (Continued)

Containment with Low Permeability Cover System (AOC #2)

- Install a low permeability cover system over the 198 Parcel (29,700 square feet) and the Island (37,400 square feet) for a combined total of 67,100 square feet.
- The cover system would consist of:
    - Six inch subgrade layer (approximately 1,250 cubic yards).
    - Cushion layer consisting of a 12 ounce per square yard non-woven geotextile (67,100 square feet).
    - Barrier layer consisting of an 80-mil LDPE-textured geomembrane (67,100 square feet).
    - Cushion layer consisting of a 12 ounce per square yard non-woven geotextile (67,100 square feet).
    - Barrier protection layer consisting of 24-inches of low permeability soil (approximately 5,000 cubic yards).
    - 6-inches of topsoil (approximately 1,250 cubic yards).
    - Seeding and mulch (approximately 67,100 square feet).
    - Install stream bank protection along Eighteen Mile Creek and the mill race consisting of a woven geotextile and a 12 inch thick layer of medium stone fill from the normal surface water elevation 5 feet up the embankment

Long-term Cover System Monitoring (AOC #1 and #2)

- Conduct bi-annual monitoring to document the effectiveness of the cover system on the site.
- Complete and submit to the NYSDEC an annual report that certifies that the institutional controls and cover systems put in place are still in place, have not been altered, and are still effective.

Excavation and off-Site Disposal of Hazardous Fill Materials (AOC #3)

- Clearing and grubbing of area to be excavated (approximately 5,000 square feet).
- Excavate hazardous fill materials from the WSS (approximately 200 cubic yards).
- Transport and dispose of fill at a hazardous waste landfill facility (approximately 320 tons).
- Install 6-inches of topsoil over approximately 5,000 square feet (approximately 100 cubic yards).
- Seeding and mulch soil cover areas (approximately 5,000 square feet).

Limited Sediment Removal/In-situ Stabilization (AOC #4)

Removal of sediments from Building C sump and trench drain.

- Remove and dispose sediments from the Building C sump and associated trench drain.
- This will include approximately 1.5 cubic yards (2 tons) of sediment.

Alternative C – "Containment/Limited Removal" (Continued)

In-situ stabilization of sediments from Building D Deep Basement sump.

- Prior to building demolition remove accumulated water (approximately 1,000 gallons of water).
- In-situ stabilization of hazardous sediments from the sump in the Building D deep basement with Portland cement.
- This sump occupies approximately 15 cubic feet of space and it is estimated it will require approximately 1 cubic yard of cement for stabilization.

Containment with Soil Cover

- Install ten-inch soil cover over the demolished building areas (approximately 59,350 square feet).
    - Six inches of unclassified fill (approximately 1,100 cubic yards).
    - Four inches of topsoil (approximately 730 cubic yards).
    - Seeding and mulch (approximately 59,350 square feet).

Building Demolition (AOC #5)

- Site-wide removal and off-site disposal of C&D debris (rebar, railroad ties, miscellaneous metal pieces, etc.). This is estimated to include approximately 1,000 cubic yards (1,600 tons).
- Demolish buildings including remaining structures on the 198 Parcel to four feet below ground surface.
- Collection of one composite sample of the hard fill (brick, concrete, stone, etc) for SVOC, PCB and pesticide analysis to ensure that contaminated material is not present in the hard fill.
- Depending on the analytical results the hard fill would be left in-place for use as backfill.
- Remove and dispose off-site all non-hard fill materials associated with the building demolition from the Site (i.e. wood, steel, etc.).

Sediment Removal and in-place closure of outfall to Eighteen Mile Creek (AOC #6)

Same as Alternative B.

Building Component Removal (AOC #7)

Pre-Demo Asbestos Survey & Asbestos Removal

- Perform pre-demolition asbestos survey.
- Remove the friable and non-friable asbestos from the building and dispose of off-site in accordance with State and Federal regulatory requirements.
- Complete air monitoring as required.

Alternative D – "Excavation and Containment"

Institutional Controls (AOC #1 through #7)

Same as Alternative C.

Containment with Soil Cover (AOC #1)

Complete site preparation activities and install a soil cover.

Site Preparation

- Monitoring well decommissioning (7 bedrock monitoring wells, 2 overburden monitoring wells, 5 micro wells).
- Clearing and grubbing of the 300 Parcel (approximately 92,200 square feet). Excavation and disposal of the site-wide C&D debris is included under AOC#5.
- Grade the 300 Parcel to maximum 4H:1V slopes (approximately 92,200 square feet).

Soil Cover

Same as Alternative C.

Long-term Soil Cover Monitoring

- Conduct bi-annual monitoring to document the effectiveness of the soil cover on the site. Assume a 40% reduction in cost compared to Alternative C to account for the reduction in the size of the cover system.
- Complete and submit to the NYSDEC an annual report that certifies that the institutional controls and soil cover put in place are still in place, have not been altered, and are still effective.

Excavation and off-Site Disposal of Hazardous Fill Materials (AOC #2 and #3)

- Excavate hazardous fill material from the WSS, Island and 198 Parcel. The hazardous fill from these areas includes approximately 9,700 cubic yards from the 198 Parcel, approximately 7,200 cubic yards from the Island and approximately 200 cubic yards from the WSS, totaling 17,100 cubic yards.
- Transport and dispose of fill at a hazardous waste landfill facility (approximately 27,360 tons). It is assumed that half of this material will require stabilization at the landfill.
- Install 24-inches of unclassified fill over an approximate 67,100 square feet area (approximately 5,000 cubic yards).
- Install six-inch topsoil cover (approximately 1,250 cubic yards).
- Seeding and mulch (approximately 67,100 square feet).

Alternative D – "Excavation and Containment" (Continued)

Restoration (AOC #3)

- Install 6-inches of topsoil over approximately 5,000 square feet (approximately 100 cubic yards).
- Seeding and mulch soil cover areas (approximately 5,000 square feet).

Limited Sediment Removal/In-situ Stabilization (AOC #4)

Same as Alternative C.

Building Demolition (AOC #5)

Same as Alternative C.

Sediment Removal and in-place closure of outfall to Eighteen Mile Creek (AOC #6)

Same as Alternative B.

Building Component Removal (AOC #7)

Same as Alternative C.

Alternative E – "Complete Excavation"

Excavation and off-Site Disposal of fill materials. (AOC #1, #2, and #3)

Complete site preparation activities, excavate fill materials and dispose of off-site.

Site Preparation

- Monitoring well decommissioning (7 bedrock monitoring wells, 2 overburden monitoring wells, 5 micro wells).
- Clearing and grubbing of areas to be excavated and the WSS (approximately 165,000 square feet). Excavation and disposal of the site-wide C&D debris is included under AOC#5.

Excavation and off-Site Disposal of Non-Hazardous Fill Materials (AOC #1)

- Excavate non-hazardous fill material from the 300 Parcel (approximately 29,400 cubic yards or 47,000 tons).
- Transport and dispose of fill at a municipal solid waste facility.
- Install 24-inches of unclassified fill over an approximate 92,200 square feet area (approximately 6,900 cubic yards).
- Install six-inch topsoil cover (approximately 1,700 cubic yards).
- Seeding and mulch (approximately 92,200 square feet).

Excavation and off-Site Disposal of Hazardous Fill Materials (AOC #2 and #3)

Same as Alternative D.

Restoration (AOC #3)

Same as Alternative D.

Limited Sediment Removal and Cleaning of Floors after Demolition (AOC #4)

Removal of sediments from Building C sump and trench drain.

- Remove and dispose sediments from the Building C sump and associated trench drain.
- This will include approximately 1.5 cubic yards (2 tons) of sediment.

Removal of sediments from Building D Deep Basement.

- Prior to building demolition remove accumulated water (approximately 1,000 gallons of water).
- Remove and dispose sediments from the Building D deep basement.
- This will include approximately 0.5 cubic yards (1 ton) of sediment.
- Transport and dispose of sediment at a hazardous waste landfill facility.

Alternative E – "Complete Excavation" (Continued)

Post-Demolition Cleaning of Building Floors

- Following building demolition, clean all basement floors by power washing. Accumulated water and sediments will be collected and disposed of at an off-Site facility (approximately 5,000 gallons of water and 10 tons of sediments).

Building Demolition (AOC #5)

- Site-wide removal and off-site disposal of C&D debris (rebar, railroad ties, miscellaneous metal pieces, etc.). This is estimated to include approximately 1,000 cubic yards (1,600 tons).
- Demolish buildings including remaining structures on the 198 Parcel to four feet below ground surface and leave the hard fill (brick, concrete, stone, etc) in-place for use as backfill. Remove all non-hard fill materials from the Site (i.e. wood, steel, etc.). Assume a 20% increase in cost compared to Alternative C to allow for additional material handling required to allow for cleaning of the basement floors.

Sediment and Drainage Feature Removal (AOC #6)

Eighteen Mile Creek Outfall Removal

- Excavate the soil/fill from above and around the storm sewer pipe. Stage soils near excavation for later use as backfill.
- Remove 30 linear feet of the storm sewer pipe and sediments contained in the pipe.
- Load, transport and dispose of at a municipal solid waste facility.
- The end of the pipe will be closed in place, by plugging the pipe with concrete.
- The previously excavated soils will be used to backfill the excavation.

Building Component Removal (AOC #7)

Same as Alternative C.