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May 31, 2012

Ms. Gail A. Dieter
New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau E, Section B
625 Broadway, 12th Floor
Albany, NY 12233-7017

Subject: RCRA Facility Investigation
Corrective Measures Study for AOC A – Seneca Cayuga Canal,
Former Hampshire Chemical Corp. Facility
Waterloo, New York

Dear Ms. Dieter:

Hampshire Chemical Corp. (HCC) is pleased to submit one hard copy and one electronic copy of the *Corrective Measures Study for AOC A – Seneca Cayuga Canal* for the Former Hampshire Chemical Corp. Facility in Waterloo, New York. This report identifies and evaluates potential corrective action alternatives for the sediment target area at AOC A, as identified by various phases of investigation, and selects a remedy for removing the defined target areas.

Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and remedial activities are being conducted pursuant to a Second Amended Order on Consent executed between Hampshire Chemical Corp. (HCC) and the New York State Department of Environmental Conservation (NYSDEC) under Index Number 8-20000218-3281, August 12, 2011. HCC is a wholly owned subsidiary of The Dow Chemical Company (Dow).

If you have any questions on this report, please contact me at 304-747-7788, or Dakon Brodmerkel at 610-280-0924.

Sincerely,

Jerome E. Cibrik, P.G.
Remediation Leader

cc: Mr. Pete Hoffmire, NYSDEC Region 8 (CD)
Mr. Scott Rodabaugh, NYSDEC Region 8 (CD)
Mr. Steve Brusso, Evans Chemetics (Hard copy)
Mr. Howard Goebel, New York State Canal Corporation (CD)
CH2M HILL Project File (Hard copy and CD)

Corrective Measures Study for AOC A – Seneca-Cayuga Canal

Former Hampshire Chemical Corp. Facility, Waterloo, New York

Prepared for

The Dow Chemical Company

May 2012

CH2MHILL®

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Acronyms and Abbreviations

AOC	area of concern
bgs	below ground surface
bss	below sediment surface
CFR	Code of Federal Regulations
cfs	cubic feet per second
CMS	corrective measures study
COC	constituent of concern
cy	cubic yard
DER	Division of Environmental Remediation
Dow	The Dow Chemical Company
facility	former Hampshire Chemical Corp. facility located at 228 East Main Street, Waterloo, New York
ft/ft	feet per foot
HASP	health and safety plan
HAZWOPER	hazardous waste operations
HCC	Hampshire Chemical Corp.
HSM	health and safety manager
IDW	investigation-derived waste
LEL	low effects level
mg/kg	milligrams per kilogram
MIBK	methyl isobutyl ketone
MMP	material management plan
MPA	mercaptopropionic acid
NYS	New York State
NYSCC	New York State Canal Corporation
NYSDEC	New York State Department of Environmental Conservation
OB&G	O'Brien and Gere Engineers, Inc.

OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
pH	hydrogen (ion) potential
PPE	personal protective equipment
QC	quality control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act facility investigation
RTA	remedial target area
RUSCO	Restricted Use Soil Cleanup Objectives
SAOC	Second Amended Order on Consent
SCG	standards, criteria, and guidance
SEL	severe effects level
SFPC	Seneca Falls Power Company
site	former Hampshire Chemical Corp. facility located at 228 East Main Street, Waterloo, New York
SPDES	State Pollutant Discharge Elimination System
SU	standard units
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&D	transport and disposal
T-acid	thioglycolic
TCL	target compound list
TMV	toxicity, mobility, or volume
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

SECTION 1

Introduction

This corrective measures study (CMS) for the former Hampshire Chemical Corp. (HCC) facility Area of Concern (AOC) A – Seneca-Cayuga Canal has been prepared pursuant to a Second Amended Order on Consent (SAOC) executed between HCC and the New York State Department of Environmental Conservation (NYSDEC), Index Number 8-20000218-3281, dated August 12, 2011 (NYSDEC 2011c) to conduct Resource Conservation and Recovery Act (RCRA) facility investigations (RFIs) and appropriate corrective measures at the site, which is located at 228 East Main Street, Waterloo, New York (hereafter referred to as facility or site; Figure 1). HCC is a wholly owned subsidiary of The Dow Chemical Company (Dow). HCC has retained environmental liabilities for the facility in accordance with the terms described in the purchase agreement between HCC and Bruno Bock, the current property owner.

Several AOCs, including AOC A, have been included in the RFIs (Figure 2). In a meeting on March 2, 2011, NYSDEC requested the development of a CMS to address impacted areas at AOC A.

This CMS generally follows the procedures outlined in the NYSDEC Division of Environmental Remediation (DER)-10/Technical Guidance for Site Investigation and Remediation (NYSDEC 2010a) in accordance with NYSDEC's e-mail request dated March 23, 2011 (NYSDEC 2011a), and letter dated April 19, 2012 (NYSDEC 2012b). DER-10 is an NYSDEC program policy that provides guidance for DER and regulated entities on how to conduct investigation and remediation at applicable sites.

1.1 Purpose and Objectives

This CMS identifies and evaluates potential corrective action alternatives for the sediment target area at AOC A, as identified by various phases of investigation, and selects a remedy for removing the defined target areas. The objective for corrective measures at AOC A is to remove the target areas of sediment agreed upon with the NYDSDEC to remove sediment that may pose risk to potential exposure pathways.

1.2 Site Description and Background

The site is located at 228 East Main Street, Waterloo, New York. Waterloo, which is located in the north-central portion of Seneca County, New York, historically has been a rural agricultural area. The site is bordered to the north by East Main Street, to the east by Gorham Street, to the west by East Water Street, and to the south by the Seneca-Cayuga Canal. The site is surrounded by residential properties (north, east, and southwest), commercial businesses (to the west), and the Seneca-Cayuga Canal (to the south). South of the canal are some residences, warehouses, and further downstream is the village wastewater treatment plant. Bruno Bock also owns a vacant lot on the northern side of East Main Street and a property on the eastern side of Gorham Street that is used as a parking lot.

The facility consists of 8.3 acres of industrially developed land, containing several interconnected buildings which house offices; a quality control (QC) laboratory; manufacturing, maintenance, and shipping/receiving operations; and a wastewater treatment plant. The site also includes outside drum storage areas and several aboveground storage tanks.

Adjacent to the site, the canal ranges from approximately 130 to 150 feet wide, and has water depths in the center channel between 14 and 16 feet deep (CH2M HILL 2010a). The canal consists primarily of a bedrock/cobble substrate, but near the facility, the shoreline has been modified with riprap and other fill material. The canal is used primarily for pleasure craft and has a series of locks that maintain pool elevations between each and maintain the water levels within Seneca and Cayuga Lake. The pool elevation at the site is approximately 429 feet above mean sea level (amsl).

1.2.1 Site History

The facility was first owned and operated by the Waterloo Woolen Manufacturing Company, which had operated a woolen textile mill from before 1839[1] until approximately 1936, when the mill was closed. The facility was later reopened in 1943 by Evans Chemetics and produces divalent organic sulfur chemical intermediates to this day. The facility was acquired by the W.R. Grace Company in 1979 and remained a part of Grace's Organic Chemical Division until 1992, when HCC completed a management buyout of the Organic Chemical Division. Evans Chemetics was part of the management buyout, and the facility became an operating unit of HCC.

In 1995, while HCC remained the owner of the facility, HCC was purchased by and became a wholly owned subsidiary of Sentrachem, Ltd., a South African chemical company. In 1997, Sentrachem was acquired as a wholly owned subsidiary of Dow. In 2005, Dow sold the facility (as well as other assets of Evans Chemetics) to Bruno Bock[2], a German manufacturing company. Evans Chemetics LP is now a wholly owned subsidiary of Bruno Bock and operates the site.

The facility has undergone significant changes over time. A number of onsite buildings were constructed in the 1800s, some of which are still standing, others of which were subsequently demolished. The canal and raceway system was much more extensive in the 1800s and early 1900s than it is today. Since 1943, many of the old canals and raceways were gradually filled, old buildings demolished, and new buildings constructed. Figure 2 depicts the current facility configuration.

1.2.2 Operations

No detailed information is available related to the operations, processes used, or waste management practices at the former woolen mill. However, the available information suggests that Building 4 was the main production building and contained a pit which was used for wool dyeing. Liquid waste from this process was discharged in the canal via historical pipes. Many of the compounds of interest in the canal are believed to be related to the woolen mill operational time, not the current operations.

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[1] The oldest standing onsite building dates from 1839; however, there are indications buildings were onsite prior to that time.

[2] The Evans Chemetics facility is no longer associated with HCC. Dow sold assets of the Evans Chemetics facility to Bruno Bock (CH2M HILL 2006).

The primary chemicals manufactured at the facility are thioglycolic acid (T-acid), thiodipropionate esters, and mercaptopropionic acid (MPA). Most of the chemicals are produced using batch operations. Chemical raw materials used in the processes include acids, acrylonitrile, alcohols, alkalis, ammonia, and metals (iron and zinc[3]).

Cooling water is obtained from the Seneca-Cayuga Canal raceway, which runs along the northern portion of the facility. As part of the manufacturing process, a considerable volume of contact (process) and noncontact (non-process) cooling water passes through the facility. The contact cooling water may contain small concentrations of the chemicals and byproducts used and produced at the facility.

From 1975 to 2000, hot wells received contact cooling water from the steam jet vacuum systems connected to the reactors and condensers, and this water drained to the canal through various outfalls.

In 2000, aboveground stainless steel tanks were installed to receive non-contact cooling water, prior to being discharged through the former hot well floor openings and underground piping to State Pollutant Discharge Elimination System (SPDES) permitted Outfalls 001, 004, 005, and 008 at the Seneca-Cayuga Canal in accordance with Permit Number NY0001406 (Figure 2). The facility SPDES permit has been effective since 1975. Other waste streams, including contact cooling water, are routed to the onsite biological treatment system before discharge at Outfall 013.

During the manufacturing processes and operation of the facility, several waste streams are generated, including acidic and alkaline wastes, wash water, spent solvents and paint thinners, and various nonhazardous wastes. Before installation of the Phase I waste treatment system in 1975, waste streams reportedly were discharged directly to the canal via the sewer system, Solid Waste Management Unit (SWMU) 29.

1.2.3 Uses of Canal

The Seneca-Cayuga Canal also is known as the Seneca River and is part of the New York State (NYS) canal system. It connects the Erie Canal to Cayuga Lake and Seneca Lake, and is approximately 20 miles long. The canal was created when three sets of locks and dams were installed to support navigation through a series of rapids.

Today, the New York State Canal Corporation (NYSCC), a subsidiary of the NYS Thruway Authority, operates the canal, which includes a 25- to 50 foot-wide right-of-way along both sides of the canal. The canal is important for water control and recreation. It provides water control for flood mitigation of the 5,100 square miles of the Oswego River watershed. The hydroelectric power plants at Waterloo and Seneca Falls, which are owned and operated by the Seneca Falls Power Company (SFPC), also are used to maintain water levels in Seneca Lake and for power generation. Recreational cruising is allowed from approximately May 1 to November 15.

1.2.4 Locks

AOC A is located between Lock CS4 in Waterloo, which is approximately 4 miles downstream from Seneca Lake and the city of Geneva, and 5 miles upstream of Lock CS2/3

[3] Zinc has not been used at the site since 1993 (CH2M HILL 2006)

in Seneca Falls (Figure 3). Lock CS4 raises and lowers boats 14.5 feet. Locks CS2 and 3 are combined without a pool of water between them. The two locks lift and lower boats a combined 49 feet, varying from 381.5 to 430.5 feet amsl.

1.2.5 Raceways

Canal raceways on the facility property historically connected to the Seneca-Cayuga Canal and have been present in the area since the 1800s. By 1948, most of the facility raceways were filled and covered, with the exception of one raceway that currently exists on the northwestern side of the facility along East Main Street (Figure 2). The source of the water is upgradient of Lock 4. This raceway provides contact and noncontact cooling water to the facility.

1.2.6 Historical and Current Discharges to Canal

Before 1975, liquids collected in facility floors, and stormwater drains were discharged directly to the canal through the wash water sewer system. The area of the canal, which is south of the facility, was identified as an AOC because of these former discharges to the canal. Currently, a network of pipes discharge noncontact cooling water from processes at the facility to the Seneca-Cayuga Canal through the SPDES permitted outfalls (Figure 2) under Permit Number NY0001406. Historically, discharges to the Seneca-Cayuga Canal were conveyed through as many as nine outfalls. Outfalls 001, 004, 005, and 008 discharge noncontact cooling water, and Outfalls 009, 010, and 012 discharge stormwater runoff to the canal. Process waste streams including contact cooling water are routed to the onsite biological treatment system before discharge at Outfall 013.

Piping from the abandoned outfalls 002, 006, and 007 was plugged and left in place. In 2010, the piping at abandoned Outfalls 002 and 007 was removed (CH2M HILL 2011a). Abandoned Outfall 006 was not removed because it is under existing facility structures.

Apart from the outfalls, water from the Village of Waterloo sewage treatment plant and from Silver Creek (Figure 3) also is discharged to the canal. It is estimated that approximately 84 cubic feet per second (cfs) of water is discharged from Silver Creek to the canal. Water discharge rates from the Village of Waterloo sewage treatment plant were not available at the time of this report.

The Bayard Street culvert is located approximately 3 miles downstream of the facility in Seneca Falls, Seneca County, New York. The culvert serves to discharge water from Benton Creek to the Seneca-Cayuga Canal. Benton Creek is a collection point for stormwater runoff from the surrounding residential area. The NYSCC reported having historical issues with the Bayard Street Culvert when the canal was previously drawn down for maintenance.

A diving inspection completed in 2004 indicated the presence of sediment up to 3.5 feet deep in the culvert, large debris (such as logs and branches) in the invert, and a 5-foot by 5-foot void in the culvert wall underneath Bayard Street. A follow-up sonar inspection conducted by CH2M HILL in 2011 confirmed the amount of debris and the location of the void, as well as other locations where masonry units were missing. The NYSCC plans to dewater the canal to conduct routine maintenance in late 2012 and will coordinate the dewatering to facilitate the sediment remediation activities upstream of the culvert.

The results of the previous culvert inspections indicate that measures to protect and/or rehabilitate portions of the culvert may be necessary prior to dewatering of the canal in order to prevent a potential collapse. For the mutual benefit of both the NYSCC and HCC, the NYSCC intends to assume ownership of the culvert and issue the work permit for the project, if HCC is required to perform measures to preserve the structural integrity of the culvert.

1.3 Report Organization

This CMS is organized into the following sections:

- **Introduction:** Briefly describes the regulatory framework, purpose and objectives, site description and background, and report organization.
- **Description of Current Conditions:** Summarizes the regional and site geology, hydrogeology, RFIs, and nature and extent of impacted areas for corrective measures.
- **Remedial Action Objective (RAO):** Defines the RAO and volume of sediment to be removed from each of the areas that require corrective measures.
- **Remedial Alternatives and Technologies:** Presents the general description of each technology, and its advantages and disadvantages.
- **Justification and Recommendation of the Corrective Measure:** Evaluates the corrective measures and recommends a final corrective measure alternative.
- **Performance and Operations Monitoring:** Summarizes the purpose and types of monitoring programs, and monitoring documents that will be developed.
- **Public Notice of CMS:** Describes the regulatory framework that will be used to develop a citizen participation plan.
- **Permits:** Lists and describes the purpose of permits that will be needed to implement the corrective action measure and the associated regulatory agencies that will receive and process the permit application.
- **Waste Management and Disposal:** Describes the waste streams that will be generated, and how each waste stream will be managed until disposal at an approved offsite disposal facilities.
- **Project Schedule:** Provides a schedule that shows milestones for the deliverables, submittal dates, and regulatory review timeframe.
- **References:** Provides the references cited in the report.

SECTION 2

Description of Current Conditions

2.1 Site Geology and Hydrogeology

Several environmental investigations have been performed at the site. The following presents a summary of the regional and local geology and hydrogeology.

2.1.1 Regional Geology

The city of Waterloo lies in an alluvial plain that is part of the Erie-Ontario Lowlands physiographic province. Glacial deposits consisting of lacustrine silts and clays from proglacial Lake Iroquois, a more extensive predecessor of Lake Ontario, overlie gray marls, shales, and egasite deposits of gypsum and salt, which are part of the Onondaga Limestone formation of Lower to Middle Devonian Age. Below the Onondaga Limestone lie Lower Devonian deposits consisting of the Manlium Limestone and the Rondout Dolomite, which overlie Silurian-age shales, dolomites, and sandstone. Below the Silurian sequence are the Ordovician-age shales, sandstones, and limestones, which cap the Upper Cambrian dolomites and sandstones, and the Precambrian basement comprised of gneiss, marble, and quartzite at depths of 5,000 feet below ground surface (bgs; Van Tyne 1974, as summarized in Saroff 1987).

2.1.2 Site Topography and Geology

The site topography slopes gently southward toward the canal with elevations ranging from 457 to 429 feet amsl at the canal bank, and to 415 feet amsl at the bottom of the canal. South of the facility, the canal consists of steep rocky sides, with a relatively flat bottom consisting largely of sand and rock. Riprap material also is present at some areas of the canal bank and bottom. The uplands portion of the site is underlain by historical anthropogenic fill. Beneath the historical anthropogenic fill, three distinct natural soil lithologic units are present: soft native deposits (silt and clay), glacial till (very hard silt and clay), and bedrock (Onondaga Limestone). Anthropogenic fill was placed over the native deposits across most of the site. The fill material generally consists of silt, sand, and gravel with varying amounts of brick fragments, cinder, ash, ceramic, glass and plastic bottles, wood, shoes, copper wires, and tires.

2.1.3 Hydrogeology

The facility is within the watershed of the Seneca River, which is an easterly flowing New York State Class “C” stream. A New York State Class “C” stream supports fisheries and is suitable for noncontact activities (NYSDEC 2009).

As part of the sitewide monitoring program at the facility, 42 groundwater monitoring wells, one stilling well (SG-2), and the Building 4 sump pit (BLDG-4-SSP-Pit) are sampled annually. Sitewide groundwater measurements indicate groundwater flow is generally to the south toward the Seneca-Cayuga Canal, which is consistent with historical conditions observed at the site (CH2M HILL 2011b).

The investigations performed at AOC A have identified sediment deposits in the canal, which have been grouped into four areas: North Shore, South Shore, Gorham Street, and Downstream deposits. Groundwater depths for onsite wells generally vary between 2 and 5 feet bgs upgradient of the North Shore Deposit, and between 5 and 8 feet bgs upgradient of the Gorham Street Deposit. Groundwater depths for the adjacent canal bank area at the South Shore and Downstream deposits are unknown because monitoring wells have not been required in these areas, based on groundwater conditions.

The horizontal hydraulic gradient in the western portion of the site was calculated to be 0.02 feet per foot (ft/ft). The horizontal hydraulic gradient in the eastern portion of the site was calculated to be 0.05 ft/ft. The vertical hydraulic gradient calculated at the MW-5S/5I couplet ranged from -0.16 ft/ft (April 2010) to -0.18 ft/ft (November 2010). The vertical hydraulic gradient calculated at the MW-11S/11I couplet was -0.2 ft/ft during the 2009 and 2010 monitoring events (CH2M HILL 2011b). The negative vertical hydraulic gradient indicates a downward flow of groundwater.

The NYSCC monitors canal water levels. Water depths in the center channel vary between 14 and 16 feet. Historically, the NYSCC has lowered these water levels for maintenance activities.

2.2 Summary of RCRA Facility Investigations

Several phases of RFIs have been performed at the site, and the detailed results of these investigations have been discussed in various reports that have been submitted to NYSDEC. This section summarizes the results of the RFI activities performed at AOC A and the upgradient AOCs that may have potentially impacted AOC A. It also presents a description of the constituents of concern (COCs) at each of the AOCs. The investigation results are described for the following AOCs:

- AOC A – Seneca-Cayuga Canal
- AOC B – Building 4 Pit
- AOC C – Gorham Street
- AOC D – MW-11S Area
- AOC F - Outfalls

2.2.1 AOC A - Seneca-Cayuga Canal

A series of four sediment characterization studies have been completed in the Seneca-Cayuga Canal in the area of the site. These investigations delineated the extent of depositional sediment in the canal near the facility and then characterized the nature and extent of chemical contamination in that sediment. Data from all phases of investigation were compared to NYSDEC sediment quality values (NYSDEC 1999), specifically the low effects level (LEL) and severe effects level (SEL). Also, an ecological impact assessment was performed in portions of two of the deposit areas. The overall study area (Figure 4), has been defined as four depositional areas:

- North Shore Deposit
- Gorham Street Deposit
- South Shore Deposit
- Downstream Deposit

Pre-RFI and Initial RFI

The initial sediment characterization activities conducted in 2001 (pre-RFI) and 2004 (initial RFI) consisted of collecting 38 sediment samples from shallow (less than 1 foot below sediment surface [bss]) and deeper (1 to 2 feet bss) intervals. The sediment samples were collected from 10 background locations, upgradient of the site and from the north shore of the canal, adjacent to the facility. The samples were analyzed for target compound list (TCL) volatile organic compounds (VOCs), TCL semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and target analyte list metals (O'Brien and Gere Engineers, Inc. [OB&G] 2003; CH2M HILL 2006). The data indicated sediment was impacted primarily with PCBs, polycyclic aromatic hydrocarbons (PAHs), and metals, including arsenic, cadmium, copper, lead, mercury, and zinc.

Phase I Sediment Investigation

Phase I of the canal sediment characterization was conducted in November 2007 and consisted of evaluating the distribution (vertical and horizontal extent) of soft sediment within the canal adjacent to the site. Sediment thickness was measured using a combination of manual probing methods and acoustic sub-bottom profiling. The acoustic sub-bottom profiling was performed along three overlapping transects running parallel to the shore and 24 transects located at approximately 60-foot intervals between the western end of the site and approximately 150 feet downstream of the Gorham Street Bridge. Manual probing consisted of using a push rod at a series of stations along transects running bank-to-bank and perpendicular to the north bank.

Sediment deposits were identified in the North Shore Deposit, South Shore Deposit and part of the Gorham Street Deposit, and represented a volume of 936 cubic yards based on comparison of top and bottom of sediment contours. The results indicated soft sediment was predominantly located along the southern side of the canal (across from the facility). Overall, measurable sediment thicknesses ranged from 0.1 to 3.7 feet (CH2M HILL 2009).

Phase II Sediment Investigation

Phase II of the canal characterization was conducted in October 2009 and consisted of additional sediment probing to delineate soft sediment deposits identified during Phase I. The probing conducted during the Phase II sediment investigation consisted of higher-density probing locations compared to Phase I to facilitate the delineation of the soft sediment deposits. In addition, Phase II sediment investigation activities included collecting surface sediment grab samples (0 to 6 inches bss), subsurface sediment (greater than 6 inches bss) via vibracoring, and surface water sampling. The surface sediment samples were collected from 48 locations within AOC A and 12 locations upstream of the site (background). In addition, sediment cores were collected at 43 locations to evaluate constituent concentrations at depth. In all cases, sediment was analyzed for metals, SVOCs, VOCs, and PCBs. Samples also were analyzed for total organic carbon, and a subset was analyzed for grain size.

Surface water samples were collected during Phase II from eight locations and analyzed for SVOCs, PCBs, total metals, dissolved metals, total suspended solids, and hardness. In addition, field measurements were performed on the samples for water temperature, hydrogen (ion) potential (pH), specific conductance, dissolved oxygen, and turbidity.

In addition to the sediment and chemical data collected, water flow velocity was measured at three points along four transects (adjacent to the surface water sampling locations) within the study area. Water velocity was measured at mid-depth at each location where a water sample was collected and in the thalweg.

The results of the Phase II sediment investigation were reported in the *Phase II Sediment Investigation Data Report* (CH2M HILL 2010a). Metals results along the North Shore, Gorham Street, and South Shore deposits indicated site-related constituents were present above background concentrations and respective LELs. As with the metals results, PAHs and PCBs were primarily encountered above background concentrations and respective LELs within the North Shore Deposit, in localized areas within the Gorham Street Deposit, and at a limited number of stations within the South Shore Deposit.

The only detected constituent to exceed the screening value in surface water was cadmium. None of the detected PAHs (2-methylnapthalene, acenaphthene, and naphthalene) in surface water were encountered at concentrations above their respective screening value.

Based on the data collected during the pre-RFI, initial RFI, and Phase I and II sampling, HCC concluded that corrective measures were required for the North Shore and Gorham Street deposits.

Phase III Sediment Investigation

The Phase III sediment investigation was conducted in November 2010 and focused on areas downstream from the easternmost extent of the Phase II investigation area (CH2M HILL 2010b). The investigation consisted of sediment probing along seven transects to delineate depositional sediment, and collecting surface and subsurface sediment samples at 18 stations. During the Phase III investigation, 88 samples were collected from the 18 stations for analysis of total metals, SVOCs, VOCs, PCBs, total organic carbon, and grain size.

The results of the Phase III investigation were reported in the *Phase III Sediment Investigation Data Report* (CH2M HILL 2011c). The results indicated concentrations of metals (including arsenic, cadmium, copper, lead, mercury, and zinc), PCBs, and PAHs in surface and subsurface sediment were above NYSDEC LELs within portions of the Downstream Deposit. At the eastern end of the study area, constituent concentrations were at or below concentrations detected in the background samples. Therefore, additional sediment characterization downstream from the eastern extent of the Downstream Deposit was not conducted during the Phase III sediment characterization.

Ecological Impact Assessment Investigation

The ecological impact assessment investigation was conducted in August 2011 and focused on an area within the South Shore and Downstream deposits (CH2M HILL 2011d). The investigation consisted of collecting sediment samples for chemical analyses and toxicity testing from stations in and around the areas in the South Shore and Downstream deposits identified as potential hot spot locations by NYSDEC's LEL approach. The NYSDEC also defined the area for investigation based on the LEL quotient (LEL-Q). The categorization criteria for the mean LEL-Q was provided by NYSDEC (NYSDEC 2011b) and is as follows:

- If LEL-Q equals 1 or less, categorize as non-impacted.
- If LEL-Q is greater than 1 and less than 1.5, categorize as undetermined.
- If LEL-Q equals 1.5 or greater, categorize as potentially impacted.

These categories were used to classify the sample stations. A sample station was classified as non-impacted, undetermined, or potentially impacted using the following decision criteria:

- Non-Impacted
  - All sample intervals non-impacted.
  - Less than three undetermined intervals and non-impacted within the surface sediment interval (or if undetermined within the surface sediment interval and adjacent stations are classified as non-impacted).
  - One potentially impacted interval and remainder are non-impacted, and the potentially impacted interval is below the 6- to 12-inch interval and not adjacent to stations with potentially impacted intervals within top 12 inches.
- Undetermined
  - All sample intervals undetermined.
  - One potentially impacted interval (not within top two intervals) and remainder undetermined.
- Potentially Impacted
  - Two or more potentially impacted intervals.
  - One potentially impacted and multiple undetermined intervals not meeting the above exception.

Five surface sediment and four subsurface sediment samples were collected from the South Shore Deposit, and 17 surface sediment and 16 subsurface sediment samples were collected from the Downstream Deposit.

To provide a measure of upgradient or background conditions, surface sediment samples were collected from seven additional locations upstream from the facility. The general locations were verbally agreed upon by NYSDEC on August 23 and 24, 2011 (NYSDEC 2011d).

The ecological impact assessment report presented a comprehensive review of existing sediment chemistry and toxicity data from AOC A (CH2M HILL 2012). The report presented a multiple-lines-of-evidence approach and site-specific data to evaluate potential biological effects associated with site-related constituents in the South Shore and

Downstream deposits. This approach included a comprehensive evaluation of upstream background conditions, and the results were used to guide recommendations for sediment management decisions regarding the portions of the South Shore and Downstream deposits that NYSDEC defined as requiring additional investigation.

Summary

The data from the overall sediment characterization for the North Shore and Gorham Street deposits indicate that these areas have increased potential for toxicity and could potentially adversely affect benthic invertebrates. HCC previously acknowledged this conclusion and committed to developing a corrective measures study for these two deposits.

The overall conclusion drawn from the impact assessment for the South Shore deposit is that the site-specific chemical and toxicity test data indicate that sediment in this deposit do not cause adverse biological effects compared to upstream reference conditions, and no corrective action is required. In a letter dated April 19, 2012, the NYSDEC concurred with this conclusion (NYSDEC 2012b), and discussion of corrective measures for the South Shore is not required as part of this CMS report.

HCC concluded in the Impact Assessment that no action was also needed for the downstream deposit area, which was also presented to the NYSDEC in a meeting dated April 24, 2012. The NYSDEC did not concur with the conclusion for the Downstream Deposit which recommended that no corrective actions were required (NYSDEC 2012b). HCC submitted a response to comment letter on April 27, 2012, which proposed a rationale for a one to two-foot removal of a limited area in the western portion of the Downstream Deposit (HCC 2012). The NYSDEC concurred with this limited removal approach in a letter dated May 1, 2012 (NYSDEC 2012c).

HCC does not agree that corrective measures are required in the western edge of the Downstream Deposit, for the reasons set forth in the multiple lines of evidence in its prior submissions. Nevertheless, HCC has agreed to perform certain work that it believes may not be warranted strictly based on ecological impacts from contaminants from the former HCC facility (both in the Downstream and in other deposits), in order to meet the deadlines and accomplish the synergies and mutual benefits of the project. HCC, NYSDEC and NYSCC have been working in a collaborative manner to coordinate a project that will meet several goals and provide benefits to the community. These benefits include coordinating with a NYSCC maintenance dewatering project to perform work “in the dry”, minimizing the complexity of dredging, minimizing the cost of the overall program and enhancing navigation and other benefits. (HCC 2012).

2.2.2 AOC B - Former Building 4 Pit

The former Building 4 pit has been identified as AOC B (Figure 2) and is located upgradient and north of the North Shore Deposit. When the pit was in use, barrels were placed in the pit and chemicals were transferred into the barrels. Process tanks also were located within the pit. The western portion of the pit contained a sump that served as the collection point for the floor drains in the building and for spills within the pit. Before 1975, the sump drained to the canal. COCs in soil include mercury and PCBs. COCs in groundwater include metals (antimony, arsenic, barium, beryllium, cadmium, chromium, copper, iron, lead, magnesium, manganese, mercury, nickel, selenium, sodium, thallium, and zinc), SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, and indeno(1,2,3-c,d)pyrene), and VOCs (1,1,2-trichloroethane, 1,2-dichloroethane, 1,2-dichloropropane, methyl ethyl ketone, methyl isobutyl ketone (MIBK), acetone, benzene, carbon disulfide, chlorobenzene, chloroform, cis-1,2-dichloroethene, methylene chloride, toluene, vinyl chloride, and total xylenes). Corrective measures are being evaluated for AOC B independently of those proposed for AOC A.

2.2.3 AOC C - Gorham Street

AOC C is located on the western side of Gorham Street. Several soil investigations have been performed from 2007 to 2011 as part of the RFI to determine the presence of the COCs (arsenic and cadmium) in soil on the eastern and western sides of Gorham Street, underneath the facility employee parking lot which is northeast of the Gorham Street Bridge, and on the offsite property located south of the employee parking lot. Corrective measures are being evaluated for AOC C independently of those proposed for AOC A.

2.2.4 AOC D – MW-11S Area

AOC D consists of monitoring wells MW-11S, MW-11I, MW-21, and MW-24, which are south of Building 3. MW-11S is screened at the water table and situated adjacent to MW-11I, which is screened in deeper overburden at the bedrock interface. Two additional shallow monitoring wells (MW-21 and MW-24) are within 50 feet of MW-11S to the west and east, respectively. RFIs have been performed to define the lateral and vertical extents of alkaline pH and elevated arsenic concentrations in soil and groundwater in the AOC D area. COCs in groundwater include metals (including arsenic), SVOCs (benzo(a)pyrene, benzo(b)fluoranthene, bis(2-ethylhexyl)phthalate, chrysene, di-n-octylphthalate, and phenol), and VOCs (ethylbenzene and xylenes). The COC in soil is arsenic. Corrective measures are being evaluated for AOC D independently of those proposed for AOC A.

2.2.5 AOC F - Outfalls

Because of the concern that various sewer lines, sumps, and trenches historically and/or current discharges to the Seneca-Cayuga Canal may have transported PCBs and other constituents to the canal, NYSDEC requested in a letter dated January 7, 2010 (NYSDEC 2010b), an investigation of the known and suspected sewer lines and outfalls.

An outfall evaluation was performed in August 2010 that consisted of smoke testing and closed circuit television of site outfalls. The results of the outfall evaluation concluded that no major defects were identified in the active outfalls. The locations of two inactive outfalls (002 and 006) also were identified. The location of inactive Outfall 007 could not be identified because of riprap material along the canal bank and the topography. Site personnel indicated that these three inactive outfalls had been abandoned by placing a concrete plug inside the piping

In December 2010, CH2M HILL performed a follow-up test pit investigation to identify the location of one of the inactive outfalls (007). Excavation activities were performed to remove inactive piping at Outfalls 002 and 007, and soil sampling was performed at the locations where the outfall piping was removed. No sources of PCBs or other COCs were identified. The results of this investigation were submitted to NYSDEC (CH2M HILL 2011a).

2.3 Nature and Extent of Impacted Areas for Corrective Measures

This section describes the nature and extent of the sediment target areas, as agreed on with NYSDEC, in AOC A. The remedial target areas are defined as the North Shore, Gorham Street and portions of the Downstream deposits as shown on Figure 5. The rationale for defining these target areas is discussed in the Impact Assessment Report (CH2M HILL 2012). As previously mentioned in Section 2.2.1, HCC concluded in the Impact Assessment that no action was needed for the downstream deposit area, which was also presented to NYSDEC in a meeting dated April 24, 2012. The NYSDEC did not concur with the conclusion for the Downstream Deposit which recommended that no corrective actions were required (NYSDEC 2012b). HCC submitted a response to comment letter on April 27, 2012, which proposed a rationale for a one to two-foot removal of a limited area in the western portion of the Downstream Deposit (HCC 2012). The NYSDEC concurred with this limited removal approach in a letter dated May 1, 2012 (NYSDEC 2012c).

The determination of the extent of target areas was based on chemical analyses, toxicity testing and comparison with background concentrations. A brief discussion is presented in Section 2.2.1.

A total volume of 7,210 cubic yards (cy) of soft sediment is anticipated to be removed from the three remedial target areas (RTAs), and is defined as follows:

- North Shore Deposit – 1,000 cy
- Gorham Street Deposit – 4,400 cy
- Downstream Deposit – 1,810 cy

Soft sediment is defined as loosely packed particles less than 2 millimeters (mm) in diameter (i.e., clay, silt, and sand). Particles less than 2 mm in diameter were selected for removal because larger diameter particles generally have insufficient surface area to allow for significant sorption and ion exchange of constituents. The impacted soft sediments will be excavated up to the till layer or bedrock, whichever is encountered first, thus removing the impacted soft sediment from the canal. However, for the Downstream Deposit, a portion of the sediment deposits will be removed up to 2 feet below the existing sediment surface and another portion will be removed to 1 foot below the existing sediment surface. To the extent practical, sediment intended for removal will be done only by large excavation equipment such as track-mounted hydraulic backhoe excavators or equivalent heavy machines; neither hand shovels, nor power washers or vacuum-trucks will be used to remove any de minimis amounts of sediment left behind by the excavator buckets.

2.3.1 North Shore Deposit

The North Shore Deposit extends approximately 650 feet toward the west from the Gorham Street Bridge and approximately 60 feet toward the south or center of the canal from the northern bank (Figure 5). Measurable soft sediment thicknesses ranged from less than 1 foot to approximately 5 feet bss.

Corrective measures will be completed to target all of the soft sediments at the North Shore Deposit (Figure 5).

2.3.2 Gorham Street Deposit

The Gorham Street Deposit is within the reach of the canal between the Gorham Street Bridge and extends up to approximately 830 feet downstream from the Gorham Street Bridge. The results indicate that soft sediment was predominantly localized along the northern bank with a lateral extent of 830 feet and along the southern bank with a lateral extent of approximately 380 feet. The soft sediment also extends approximately 40 feet toward the center channel on the eastern area of the deposit (Figure 5). The soft sediment thicknesses observed in the Gorham Street Deposit ranged from less than 1 foot to 5 feet bss.

Corrective measures will be completed to target all of the soft sediment at the Gorham Street Deposit (Figure 5).

2.3.3 Downstream Deposit

Sediment thickness in the portion of the Downstream Deposit where corrective measures will be completed extends approximately 620 feet west from the Silver Creek (Figure 5) and approximately 90 feet towards the center of the channel from the northern bank.

The corrective action is required to target a section of the soft sediment at the Downstream Deposit west of Silver Creek to a depth of up to 1-foot and 2 feet only in the areas shown on Figure 5.

As previously stated in Section 2.2.1, HCC does not agree that corrective measures are required in the western edge of the Downstream Deposit, for the reasons set forth in the multiple lines of evidence in its prior submissions. Nevertheless, HCC has agreed to perform certain work that it believes may not be warranted strictly based on ecological impacts from contaminants from the former HCC facility (both in the Downstream and in other deposits), in order to meet the deadlines and accomplish the synergies and mutual benefits of the project. HCC, NYSDEC and NYSCC have been working in a collaborative manner to coordinate a project that will meet several goals and provide benefits to the community. These benefits include coordinating with a NYSCC maintenance dewatering project to perform work “in the dry”, minimizing the complexity of dredging, minimizing the cost of the overall program and enhancing navigation and other benefits. (HCC 2012).

SECTION 3

Remedial Action Objective

RAOs are medium or operable-unit-specific objectives for the protection of public health and the environment and are developed based on contaminant-specific standards, criteria, and guidance (SCG) to address the contamination identified at a site (NYSDEC 2010a).

The RAO for AOC A is to remove all the soft sediment from the North Shore and Gorham Street deposits and a limited area west of Silver Creek in the Downstream Deposit as previously described in Section 2.3.

No additional areas require corrective measures at AOC A.

SECTION 4

Remedial Alternatives and Technologies

This section presents remedial technologies for sediment removal and evaluates the technologies against RAO that is presented in Section 3. The detailed analysis of alternatives presents the information needed to compare the sediment remedial alternatives assembled for AOC A. It follows the development and screening of alternatives, and precedes selection of the proposed corrective measure for AOC A. This analysis is based on available data and types of remedial technologies evaluated. The alternatives analysis consists of evaluating each alternative against the DER-10 evaluation criteria followed by a comparative evaluation.

Provisions of DER-10 require that each alternative be evaluated against nine criteria. These criteria were published to provide a basis for comparison of the relative performance of the alternatives and identify their advantages and disadvantages. This approach is intended to provide sufficient information to adequately compare the alternatives and select the most appropriate alternative for implementation at AOC A in the Statement of Basis. The evaluation criteria are as follows:

1. Overall protection of human health and the environment
2. Compliance with SCGs
3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility, or volume (TMV) through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. Land use
9. Community acceptance

The criteria are divided into three groups: threshold, balancing, and modifying criteria.

Threshold criteria must be met by a particular alternative for it to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria; they are met by a particular alternative or the alternative is not considered acceptable. The two threshold criteria are overall protection of human health and the environment and compliance with SCGs.

Unlike the threshold criteria, the six balancing criteria weigh the tradeoffs between alternatives. A low rating on one balancing criterion can be compensated by a high rating on another. The six balancing criteria include long-term effectiveness and permanence, reduction of TMV through treatment, short-term effectiveness, implementability, cost, and land use.

The modifying criterion is community acceptance. This is evaluated following public comment and used to modify selection of the recommended alternative.

4.1 Threshold Criteria

DER-10 indicates that to be eligible for selection, an alternative must meet the two threshold criteria described below.

Overall Protection of Human Health and the Environment (Criterion 1)

Protectiveness is the primary requirement that remedial actions must meet under DER-10 guidance. A remedy is protective if it adequately eliminates, reduces, or controls all current and potential risk posed by the site through each exposure pathway. The assessment against this criterion describes how the alternative achieves and maintains protection of human health and the environment.

Standards, Criteria, and Guidance (Criterion 2)

Compliance with SCGs is a DER-10 requirement of remedy selection. SCGs are cleanup standards, standards of control, and other substantive environmental statutes or regulations that are either "applicable" or "relevant and appropriate" to the cleanup action. The assessment against this criterion describes how the alternative complies with SCGs. The following are SCGs that are considered applicable for remedial action at the site.

Chemical-Specific SCGs

The chemical specific SGCs have been defined through the NYSDEC guidance levels for sediment (LEL and SEL), and as agreed on with the NYSDEC from the toxicity testing results (CH2M HILL 2012). However, because soft sediment will be removed from the RTAs to till or bedrock, post-excavation sampling will not be required, and it is anticipated that the chemical-specific SCGs will be met. It should be noted that the Downstream Deposit is an exception where depth-based removals will be performed. NYSDEC has agreed that no post-excavation confirmation sampling needs to be performed within any deposits where toxicity data adequately defines the horizontal and vertical extent of removal (NYSDEC 2012c). The chemical specific SCGs will be achieved as per our discussions with the NYSDEC.

Location-Specific SCGs

Location-specific SCGs will include a review of specific standards or guidance based on the location. The applicable agencies will be contacted to obtain a full understanding of the regulations for the adjacent areas such as the presence of habitats for threatened and endangered species, wetlands and flood plains mapping, and discharge to surface water requirements. Additional information on the agencies that will be contacted is presented in Appendix C.

Action-Specific SCGs

RCRA is the action-specific SCG for impacted sediment at the site during sediment handling and disposal and for worker protection during remediation activities.

Impacted sediment generated during remediation activities will be characterized, managed, and disposed of in accordance with the materials management plan (MMP; CH2M HILL 2010c) and any applicable RCRA regulations. It is anticipated that no hazardous waste will be generated during the removal action; however, any waste generated will be managed as if it is hazardous until it is characterized according to 40 Code of Federal Regulations (CFR) 261 (U.S. Environmental Protection Agency [USEPA] 1980a). The concentration of the components in the waste will be compared to the toxicity characteristic leaching procedure list in 40 CFR 261.24 (USEPA 1980a). Once characterized, nonhazardous waste will be managed and disposed of in accordance with the MMP (CH2M HILL 2010c). If hazardous waste is encountered, the MMP will be updated to address hazardous waste handling and disposal. In the event that excavated sediments cannot be appropriately dewatered to meet disposal facility requirements or are above TCLP limits located in 40 CFR 261.24, a drying/stabilization agent will be added to these sediments prior to offsite disposal at an approved landfill. Hazardous waste, if generated, will be managed and disposed of in accordance with 40 CFR 262 (USEPA 1980b).

A health and safety risk analysis will be performed for each task. The project health and safety manager (HSM) will consider various methods for mitigating the hazards (elimination, substitution, engineering controls, warnings, administrative controls and use of personal protective equipment [PPE]). Employees will be trained on this hierarchy of controls during their hazardous waste training and reminded of them throughout the execution of projects, daily safety topics, and routine audits.

A detailed project-specific health and safety plan (HASP) will be developed to detail comprehensive hazard controls and safe work practices such as general hazards, project-specific hazards, physical hazards, biological hazards, and COCs. Standard operating procedures will be included, as appropriate. In addition, the HASP may adopt procedures from the project work plan, and will incorporate governing regulations including applicable Occupational Safety and Health Administration (OSHA) regulations. If there is a contradiction between the HASP and any governing regulation, the more stringent and protective requirement will apply.

All site workers engaging in hazardous waste operations (HAZWOPER) or emergency response shall receive appropriate training as required by 29 CFR 1910.120 (USEPA 1974a) and 29 CFR 1926.65 (USEPA 1979). Personnel who have not met these training requirements will not be allowed to engage in HAZWOPER or emergency response activities. Additionally, all site workers will be required to possess training as applicable to their roles and responsibilities in the areas of PPE (29 CFR 1910 Subpart I) (USEPA 1974b), toxic and hazardous substances (29 CFR 1910 Subpart Z), and other regulations as determined (USEPA 1974c).

In compliance with 29 CFR 1910.132(d)(2), the project HSM will complete a hazard assessment for the project to determine if hazards are present, or are likely to be present, which necessitate the use of PPE (USEPA 1974a). Specifically, and in addition to other physical hazards associated with remediation tasks, PPE specifications for hand, feet, face, body protection, and respiratory protection will address dermal and airborne contact with sediment and soils potentially contaminated with arsenic, cadmium, chromium, lead, and mercury.

Action levels will be established based, at a minimum, on applicable OSHA permissible exposure limits. When available, action levels likely will be based on more conservative National Institute for Occupational Safety and Health-recommended exposure levels and/or American Conference of Governmental Industrial Hygienists threshold limit values.

Atmospheric monitoring will be performed at the source, in the employees breathing zone, and at the perimeter. Whenever possible, monitoring will be conducted before entering a potentially impacted area. All atmospheric monitoring and associated equipment calibration activities will be documented using standard forms, in project logbooks, and/or equipment data logging features. Air monitoring and calibration records will be archived consistent with CH2M HILL procedures and retained as required by applicable regulations.

4.2 Balancing Criteria

The six balancing criteria listed below are those upon which the detailed evaluation and comparative analysis of sediment treatment alternatives are based.

Long-Term Effectiveness and Permanence (Criterion 3)

Long-term effectiveness and permanence are measured by the overall effectiveness of the remedy after completion. Alternatives providing the highest degree of long-term effectiveness and permanence are those that maximize removal or treatment, make long-term maintenance and monitoring unnecessary, and minimize or eliminate the need for institutional controls.

Reduction of TMV through Treatment (Criterion 4)

The statutory preference is a remedial action that employs treatment to reduce the TMV of substances of concern. Criterion 4 addresses the anticipated performance of technologies to reduce TMV of COCs. Alternatives that do not include treatment technologies are not considered to reduce TMV. This criterion considers the following:

- Treatment process(es)
- Amount of COCs that would be treated or destroyed
- Degree of expected reduction in TMV through treatment, including how the treatment addresses the principal risk(s)
- Degree to which the treatment will be irreversible
- Type and quantity of residuals that will remain following treatment

Short-Term Effectiveness (Criterion 5)

This criterion considers the short-term effects of an alternative on human health and the environment. Short-term effectiveness is measured by the following factors:

- Short-term impacts that might be posed to the community during implementation of an alternative
- Potential adverse impacts on workers during implementation, and the effectiveness and reliability of protective measures
- Potential for adverse environmental impacts during implementation, and effectiveness and reliability of mitigation measures
- Estimated duration of implementation needed to achieve the remedial objectives

Implementability (Criterion 6)

Implementability deals with the difficulties of constructing and operating an alternative and the availability of materials and services required. The following facets are considered:

- Ability to construct and operate
- Ease of acting further, if needed
- Ability to monitor effectiveness
- Ability to obtain approvals and coordinate with other agencies
- Availability of services and capabilities
- Availability of necessary equipment, specialists, and materials
- Availability of technologies

Cost (Criterion 7)

This criterion is an evaluation of the overall cost effectiveness of an alternative remedy. According to DER-10, the overall cost effectiveness of a remedy will be determined by comparing factors set forth by Criteria 4, 5, and 6 to the cost of the alternative and effectiveness of the remedy. These cost estimates will be used to compare the alternatives, but not to bid the work. These estimates are based on available information (i.e., they have an expected accuracy of -30 percent to +50 percent) for the scope of action described for each alternative. The estimates of the capital costs will be based on information provided by vendors, regulators, and personnel with experience on similar projects.

Land Use (Criterion 8)

Land use scenarios evaluated for assessing risks and developing RAO and goals include land uses that may be appropriate (e.g., industrial, residential, and construction scenarios). The evaluation will consider future, current, and historical (cultural and heritage) use and/or recent development patterns; consistency with local, state, and federal laws; and burden on community.

4.3 Modifying Criteria

Community Acceptance (Criterion 9)

The community will be notified of the corrective measure to be implemented at AOC A. This criterion is weighed on an appropriate remedial alternative only after a public review of the remedy selection process.

4.4 Remedial Alternatives

Seven remedial alternatives were evaluated and compared to the criteria described above. These are as follows:

- Alternative 1: No Action
- Alternative 2: Diver-Assisted Hydraulic Dredging

- Alternative 3: Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions
- Alternative 4: Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
- Alternative 5: Canal Dewatering and Mechanical Excavation
- Alternative 6: Mechanical Excavation with Sheet Piles
- Alternative 7: Mechanical Excavation with Upstream and Downstream Dam and Bypass Pumping

Alternative 1 is a general corrective measure used to provide a baseline for comparison against other technologies. Alternatives 2, 3, 4, 5, 6, and 7 are all based on excavation and offsite disposal technology, which is a well-proven remedial technology for cleaning up sites with impacted sediment. These alternatives all involve removal of sediment, but the removal and water management methods are different over the alternatives. Alternative 2 involves hydraulic dredging under watered conditions, and the other alternatives involve the process of excavating the RTAs using backhoes, front loaders, continuous excavators, scrapers, and other equipment, and offsite disposal. This material may be staged temporarily in stockpiles and/or rolloff containers for waste characterization, dewatering, and/or pretreatment before transporting to an approved offsite landfill.

Appendix A presents a brief description of the seven alternatives in terms of the proposed technology, its advantages and disadvantages, and design component assumptions. Each technology also is screened against, threshold criteria, balancing criteria, modifying criteria, long-term risks, uncertainties, and its sustainability.

Note that all of the alternatives discussed below have been conceptually evaluated as part of this CMS. Certain assumptions were made for all alternatives based on the current knowledge of site conditions and the engineering involved for each; these assumptions are subject to change as additional design information is completed.

4.4.1 Alternative 1: No Action

This alternative is required by DER-10 to be evaluated as a baseline for other alternatives and does not involves any remedial actions or monitoring activities for the site. Natural processes, such as dilution, dispersion, and biodegradation would be expected to occur in the sediment with the potential to reduce constituent concentrations over time.

Table 4-1 contains a detailed evaluation of Alternative 1.

TABLE 4-1
Individual Analysis of Alternative 1 – No Action
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Not protective.
Environmental Protection	Not protective.

TABLE 4-1
Individual Analysis of Alternative 1 – No Action
CMS for AOC A – Seneca-Cayuga Canal

COMPLIANCE WITH SCGs	
Chemical-Specific	Not in compliance.
Location-Specific	None.
Action-Specific	None.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	Same as currently present.
Adequacy and Reliability of Controls	Not applicable.
Individual Technical Components	None.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	None.
Amount of Impacted Material Destroyed or Treated	None.
Expected Reduction in TMV	None.
Irreversibility of Treatment	Not applicable.
Type and Quantity of Treatment Residual	Not applicable.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	Not applicable.
Protection of Workers During Remedial Action	Not applicable.
Time Until Remedial Goals Achieved	Unknown and not monitored or evaluated.
Environmental Impacts	Same as currently present.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Not applicable.
Reliability of Technology	Not applicable.
Availability of Services and Material	Not applicable.
Administrative Feasibility	Not expected to be feasible based on regulatory and public opposition.
COSTS	
Cost	None
LAND USE	
Land Use	Not protective of future, current, and historical land use.

TABLE 4-1
Individual Analysis of Alternative 1 – No Action
CMS for AOC A – Seneca-Cayuga Canal

COMMUNITY ACCEPTANCE	
Community Acceptance	Probably not acceptable.

The no action alternative does not include any institutional controls, or active remedial activities to remove or treat the areas of impact to reduce the concentrations of COCs in sediment. The lack of institutional controls or an active remedy could potentially allow future migration of COCs to canal water or downstream sediment, and canal users and benthic wildlife may be exposed to the COCs. This alternative has no costs or actions to implement; however, a no action alternative is not expected to be acceptable to the community and regulators.

Alternative 1 is not retained for further evaluation because no action results in unfavorable conditions.

4.4.2 Alternative 2: Diver-Assisted Hydraulic Dredging

The diver-assisted hydraulic dredging remedial alternative involves a diver manually maneuvering a handheld hydraulic suction hose, which discharges sediment through a pipeline to sediment dewatering tubes. The sediment staging pad will be appropriately sized and designed by the subcontractor. It will likely include a flexible geomembrane or other impervious surface as part of the design for sediment dewatering. A water collection sump will be installed and maintained at a low area adjacent to the staging pad to collect waters for treatment of solids and discharge. Off-road haul trucks will be used to transport the sediment within the work area from the excavation zones to the sediment staging pad, where it will be mixed with drying/stabilization agents, as needed. The sediments will be loaded on a truck for offsite disposal at an approved landfill.

One of the main advantages of this method is that this method does not require coordination with the NYSCC dewatering schedule, and can be performed anytime during the non-navigation portion of the year. The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. An evaluation of existing conditions at the culvert would not be needed before implementing Alternative 2 because the water level conditions would be similar to existing conditions.

One of the main disadvantages of this method is that it produces large volumes of high percent water content dredged material slurry. This slurry will generate sediment waste and large volumes of water obtained from the dewatering of the sediment which would be challenging to manage. The water will require treatment for solids via a temporary onsite water treatment plant before discharge to the canal, and the treated sediment will be transported to an approved disposal facility. Another disadvantage is that an unknown volume of sediment may enter into suspension, and not be captured by the suction hose. This sediment may be transported downstream and redeposited at another location.

Working in cold water is another disadvantage because it is an added risk of cold exposure to divers.

Table 4-2 contains a detailed evaluation of Alternative 2.

TABLE 4-2
Individual Analysis of Alternative 2 – Diver-Assisted Hydraulic Dredging
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 2 will achieve RAO, which will be protective of human health.
Environmental Protection	Dredging of sediment will protect the environment by removing impacted sediment. Controls such as silt barriers will be needed to prevent migration of COCs to other environmental receptors.
COMPLIANCE WITH SCGs	
Chemical-Specific	Complies.
Location-Specific	Complies.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	Limited; some sediment may enter in resuspension during removal.
Adequacy and Reliability of Controls	Sediment dredging is expected to reliably decrease the concentrations COCs to adequate levels (below RAO, and will be protective of potential receptors).
Individual Technical Components	Handheld hydraulic suction hose, sediment pipeline and sediment dewatering tubes, water treatment system for solids, and disposal staging areas.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Diver manually maneuvering a handheld hydraulic suction hose, which discharges sediment through a pipeline to sediment dewatering tube. Liquids obtained from dewatering processes require treatment for solids by an onsite temporary water treatment system.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved landfill.
Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediment is not reversible.
Type and Quantity of Treatment Residual	Unknown.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	Sediment may become suspended and be transported downstream during remedial action.

TABLE 4-2
Individual Analysis of Alternative 2 – Diver-Assisted Hydraulic Dredging
CMS for AOC A – Seneca-Cayuga Canal

Protection of Workers During Remedial Action	High potential for exposure during remediation. Diving is a high risk activity and requires additional safety measures, and working in cold water conditions increases the risk for the divers.
Time Until Remedial Goals Achieved	Immediately after remedy implementation.
Environmental Impacts	Use of this active remedy may disturb or remove the natural benthic habitats in the enclosed area, and introduce minimal foreign matter to environment.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Challenging to perform safely with divers. Also, will be difficult to determine all sediment has been removed under watered conditions.
Reliability of Technology	Reliable, but susceptible to frequent maintenance of dredging equipment.
Availability of Services and Material	Available.
Administrative Feasibility	Expected to be feasible based on the availability of specialized diving staff and based on attainability of permits and agreements. Several regulatory agencies may desire to perform oversight.
COSTS	
Capital Cost	Very high because of the costs for diving teams because it is a high risk operation. Costs also will be increased because of the need to dewater sediment and also handle large quantities of water.
LAND USE	
Land Use	Protective of future, current, and historical land use.
COMMUNITY ACCEPTANCE	
Community Acceptance	Uncertain, but likely.

The diver-assisted hydraulic dredging is a proven, effective technology that would achieve the RAO; however, there are some disadvantages associated with using this method. Hydraulic dredging produces large quantities of water that must be treated and discharged. This alternative also would require adequate on-land space for staging, handling, and treatment of dredged materials. During the dredging process, resuspension of sediment may result in the release and transport of COCs in the water. Additionally, post-dredging sampling may be required to assure complete removal of the RTAs, or divers may be required to inspect the areas after removal to determine if any soft sediment was left in place. Subcontracting a diving company is very risky and associated construction worker exposure risks are high.

Alternative 2 is retained for further evaluation because it has the advantage of performing the corrective action under existing water conditions in the canal, and is not limited to the NYSCC schedule for canal dewatering.

4.4.3 Alternative 3: Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions

This alternative involves the installation of a Portadam along the length of the canal from the west end of the North Shore deposits up to the east end of the Gorham Street deposits, splitting the canal in the middle and enclosing the work areas up to the northern shoreline (Figure 6). It is HCC's understanding that the NYSCC can conduct a temporary dewatering of the canal for a short period to enable soft sediment in the south portion of the Gorham Street deposit to be pulled to the north prior to installation of the temporary water diversion system in that area.

The Portadam at the Downstream Deposit will either continue from the Gorham Street enclosure, or will be constructed as a separate enclosure (Figure 6). For the purposes of the CMS, it was assumed that the water diversion structure would begin at a point upstream of the work area, and end at a point downstream of the work area. The Portadam alignment would also need to be determined in consideration with property access agreements, utilities, etc. Based on the rocky and uneven topography of the canal bottom, rock and large debris will be removed to facilitate an adequate seal for the Portadam installation. Silt barriers may be installed to restrict transport of resuspended sediment during installation of the barrier.

The system will isolate the work area from the canal water and keep the work area dry or otherwise free from flowing canal waters from the SFPC and other sources. Natural dewatering will be encouraged for a period of time by creating a pit or trenches and placement of sumps in low spots to collect water. Any water that accumulates in the non-active excavation area from the other sources such as seepage or surface run off will be managed by a gravity flow temporary diversion system. For this CMS, we have assumed that water that enters and contacts the active excavation area will be pumped from the work area for treatment of solids before discharging into the bypass channel or to the canal downstream. The water treatment needs to maintain dewatered conditions in the work area; treatment will be further assessed during the next phase of design.

The mechanical excavation of the sediment will likely be performed with a large track-mounted hydraulic excavator or similar equipment. Appropriate methods will be used to move large rocks, boulders, and debris to expose soft sediment near and below them. It is expected that large rock, boulders, and debris will not be removed, but will be segregated during the excavation process and placed back near their original locations as sediment removal proceeds. Care will be taken to maintain boulders and rocks that may support the shoreline, banks, and other canal features. Soft sediment will be removed only by the excavators or equivalent heavy machines; no hand shovels, power washers or vacuum equipment will be used to remove any de minimis amounts of sediment remaining in the canal following excavation equipment removal.

Excavated materials will be direct-loaded into offsite transport vehicles, if possible, or loaded into off-road dump trucks and transported to the sediment staging area for stabilization (dewatering) and then loaded out for disposal to appropriate landfill.

The Portadam is a type of cofferdam based on a temporary, robust, watertight enclosure that would be installed in the canal allowing normal water level conditions on one side of the barrier, and would support dry conditions within the work area.

The Portadam technology uses a freestanding steel support system and impervious fabric membrane, which allows easy installation in any configuration and over uneven bottoms of water bodies. This technology eliminates the need for internal bracing which obstructs the work area. It has a flexible system framework with a pliable liner and sealing apron extensions, which produces a watertight seal on almost any surface and prevents saturation. Several enclosures would need to be constructed for each area for remedial action. It allows several types of in-water construction to be achieved in a relatively dry environment without the need for excavation or fill placement, costly pile driving equipment, or time-consuming sandbag dikes. This method partially restricts natural water flow in the canal and does not require the construction of a temporary diversion (bypass) channel to convey the entire flow around the area of excavation.

The Portadam would be constructed around the RTAs; however, it may be challenging to install with a canal water column of up to approximately 15 feet. This temporary water divertment structure would direct the canal water, which includes water from the SFPC facility located upstream of the canal, precipitation water, and other base flows from the canal, via gravity around the enclosed excavation areas. Canal water, surface runoff, and groundwater seepage that accumulate within the enclosure and do not enter in contact with the active excavation area would be allowed to flow via gravity, or be pumped, downstream of the work area.

Water from facility outfalls would be rerouted by installing a series of pipes to the existing outfalls to extend the discharge point and reroute the water to the canal at a point downstream of the work areas.

Access road(s) would be built to allow the machinery (excavators, trucks, etc.) to reach the work areas in the canal (Figure 7). Figure 7 also shows the approximate boundaries of the surrounding property boundaries, and the laydown and equipment storage areas.

The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. The actual water level that will be maintained in the canal under this alternative will be determined during the detailed design phase; this alternative assumes that the elevation of the canal will need to be such that the Bayard Street culvert remains full of water, to avoid performing repair/restoration of the culvert. This alternative would also minimize or eliminate operational impacts to the SFPC facilities. An evaluation of existing conditions at the culvert would not be needed before implementing Alternative 3 because the water level conditions would be similar to existing conditions.

Table 4-3 contains a detailed evaluation of Alternative 3.

TABLE 4-3
Individual Analysis of Alternative 3 – Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 3 will achieve RAO which will be protective of human health.
Environmental Protection	Mechanical excavation of impacted areas following isolation using Portadam technology will protect the environment by removing impacted sediment from the canal bottom and will prevent sediment migration to other environmental receptors.
COMPLIANCE WITH SCGs	
Chemical-Specific	Complies.
Location-Specific	May not meet the requirements for maintaining a benthic community over the dewatered area in the RTAs due to the lack of water.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	None. All of the impacted soft sediment in RTAs will be removed because the dewatered area will be easily accessible.
Adequacy and Reliability of Controls	Cofferdams will need to be constructed to ensure capture of most impacted sediment. The Portadam technology is more adequate and reliable for the uneven canal bottom conditions and limestone bedrock than the sheet pile cofferdam technology. This will ensure long-term success of remedial action in protecting environmental receptors.
Individual Technical Components	Impervious fabric sealing sheet, pumps, excavators, dewatering pad(s), water treatment system for solids, and disposal staging areas.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Portadam will be constructed on top of and around the area of impacted sediment, and entrapped water will be pumped out until area is dry. Soft sediment in the southern portion of the Gorham Street Deposit will be pulled to the north side before installation of the Portadam in that area. Sediment will then be mechanically excavated from that area. A water treatment system will be used for solids.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved waste disposal facility.
Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediment is not reversible.
Type and Quantity of Treatment Residual	None. Soft sediment will be removed.

TABLE 4-3
Individual Analysis of Alternative 3 – Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions
CMS for AOC A – Seneca-Cayuga Canal

SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	Sediment may become suspended and be transported downstream during installation of the Portadam. There is an increased potential for flooding near the area where the width of the canal is decreased by the installation of the Portadam.
Protection of Workers During Remedial Action	Potential for exposure during remediation, and overflow of Portadam due to high water levels.
Time Until Remedial Goals Achieved	Immediately after remedial action.
Environmental Impacts	Use of this active remedy may disturb or remove the natural benthic habitats in the enclosed area, introduce minimal foreign matter to environment, and there is the potential of resuspension during installation of the enclosure.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Challenging in high water levels. Need to determine the hydrostatic loading in both the horizontal and vertical directions. Would likely require significantly higher divertment structures than under watered conditions. May cause area-wide flooding if high rain or water levels are encountered during work.
Reliability of Technology	Will be susceptible to frequent monitoring and maintenance.
Availability of Services and Material	Available.
Administrative Feasibility	Expected to be feasible based the availability of workers specialized in the installation of Portadams, and on attainability of permits and agreements. Several regulatory agencies may desire to perform oversight.
COSTS	
Capital Cost	Medium to high. Less expensive than Alternative 2 – hydraulic dredging, but more expensive than Alternative 4- Aqua-Barrier.
LAND USE	
Land Use	Protective of future, current, and historical land use.
COMMUNITY ACCEPTANCE	
Community Acceptance	Uncertain, but likely. May have community concern over are-wide flooding.

One of the main advantages of Alternative 3 with using a Portadam is it provides better support against the pressures exerted by the high water column than Aqua-Barriers, and can be easier to install in the canal bottom than sheet piles, which can promote fractures in the limestone bedrock during installation and removal. Water would be pumped from the enclosure to create a dry canal bottom which would allow for excavation of the RTAs and visual confirmation of the removal of the soft sediment to glacial till or bedrock in the RTAs.

There would be less residual contamination and the release of waterborne COCs would be eliminated.

The main disadvantage is that it may be challenging to implement because of the high water column, especially in moving sediments from the south portion of the Gorham Street Deposit to the north, before installation of the Portadam. There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the sewage treatment plant, will gravity flow downstream and will not affect the work area.

There may be limited access points for mobilization of the excavation equipment to the RTAs, and access ramps would need to be to be constructed. There is the potential for increased air emissions, which may require air quality monitoring during the excavation and dewatering process.

Alternative 3 is retained for further evaluation because it allows for visual confirmation of the RAO.

4.4.4 Alternative 4: Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions

The NYSCC has expressed verbally in a meeting on April 19, 2011, that they will perform a partial dewatering of the canal by raising the dam at the upstream lock to perform maintenance of their locks within the canal during the time period covering December 2012 and April 2013. As a result of this decision, the water level in the canal will be lower than normal conditions which presents a unique opportunity to perform a dry removal using mechanical excavators in a dewatered cofferdam enclosure. The actual water level in the canal will be determined during future phases of design and based on negotiations with SFPC and NYSCC.

The Portadam structure type of cofferdam technology was described in Alternative 3.

The Aqua-Barrier technology is a water-filled barrier with an inner restraint baffle(s)/diaphragm(s) stabilizing system. It is constructed from industrial-grade, vinyl-coated polyester. This fabric is laminated with a base of woven polyester between two layers of flexible polyvinyl chloride. Each barrier section is straight, and an overlapping technique is used to join the sections. The units have the advantage that they can be repaired easily in the field in wet or dry conditions, can be installed in wet or dry conditions, can be installed relatively quickly in the field, are reusable, offer compact storage and transportation, and offer ease of handling.

It is HCC's understanding that the NYSCC can conduct a temporary dewatering of the canal for a short period to enable soft sediment in the south portion of the Gorham Street deposit to be pulled to the north prior to installation of the temporary water diversion system in that area. Once the canal has been dewatered to the extent feasible, a temporary, robust, water diversion structure similar to a Portadam, Aqua-Barrier, or equivalent would be constructed. Silt or turbidity screens would not be required to be placed around the work area because the relatively smaller water column would not enhance dispersal of sediment from the area. The difference between Alternatives 3 and 4 is the water level outside the temporary water divertment structure. For this CMS, we have assumed that the water level for Alternative 3 will be approximately 15 feet (normal conditions) whereas for Alternative 4 it is assumed the water level will be less than 2 feet. Accordingly, Alternative 4 would not require that the water divertment structure be as high as described in Alternative 3. The actual water level in the canal will be determined during future phases of design and based on negotiations with SFPC and NYSCC.

The potential locations of the water diversion structure and manner in which sediment is proposed to be removed are the same as described in Alternative 3. In addition, the facility outfalls would need to be rerouted downgradient of the work area. The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. An evaluation of existing conditions at the culvert, possibly including measures to protect and/or rehabilitate the culvert, would need to be performed before implementing Alternative 4 and an agreement with SFPC would be required to maintain the minimum of 50 to 200 cfs flow conditions required to meet their operating permit conditions. Table 4-4 contains a detailed evaluation of Alternative 4.

TABLE 4-4
Individual Analysis of Alternative 4 – Mechanical Excavation following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 4 will achieve RAO, which will be protective of human health.
Environmental Protection	Mechanical excavation of impacted areas following isolation using Portadam, Aqua-Barrier, or similar water divertment structure will protect the environment by removing impacted sediment from the canal bottom and will prevent sediment migration to other environmental receptors.
COMPLIANCE WITHSCGs	
Chemical-Specific	Complies.
Location-Specific	May not meet the requirements for maintaining a benthic community over the dewatered area in the RTAs due to a lack of water in the canal.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	None. All of the impacted sediment within the RTAs will be removed because the dewatered area will be easily accessible.
Adequacy and Reliability of Controls	Portadam, Aqua-Barrier, or similar water divertment structures will need to be constructed around the RTAs to ensure capture of most impacted sediment. The Portadam, Aqua-Barrier, or similar water divertment structure technologies are more adequate and reliable for the site conditions than the sheet pile cofferdam technology. This will ensure long-term success of remedial action in protecting environmental receptors.

TABLE 4-4
Individual Analysis of Alternative 4 – Mechanical Excavation following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
CMS for AOC A – Seneca-Cayuga Canal

Individual Technical Components	Impervious fabric sealing sheet, pumps, excavators, dewatering pad(s), water treatment system for solids, and disposal staging areas.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Portadam, Aqua-Barrier, or similar water divertment structure will be constructed around the area of impacted sediment, and entrapped water will be pumped out until area is dry. Soft sediment in the southern portion of the Gorham Street Deposit will be pulled to the north side before installation of the temporary water diversion structure in that area. Sediment will then be mechanically excavated from the enclosed area. A water treatment system will be used for solids.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved waste disposal facility.
Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediment is not reversible.
Type and Quantity of Treatment Residual	Unknown.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	A minimal quantity of sediment may become suspended and be transported downstream during installation of the Portadam, Aqua-Barrier, or similar water divertment structure.
Protection of Workers During Remedial Action	Potential for exposure during remediation.
Time Until Remedial Goals Achieved	Immediately after remedial action.
Environmental Impacts	Use of this active remedy may disturb or remove the natural benthic habitats in the enclosed area, introduce minimal foreign matter to environment, and there is the potential of resuspension during installation of the enclosure.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Highly applicable in low canal water levels. Need to determine the hydrostatic loading in both the horizontal and vertical directions.
Reliability of Technology	Divertment structure may be susceptible to monitoring and maintenance during the remedial activities.
Availability of Services and Material	Available.
Administrative Feasibility	Expected to be feasible based the availability of workers specialized in the installation of Portadams, Aqua-Barriers and similar water divertment structures, and on attainability of permits and agreements. Several regulatory agencies may desire to perform oversight.

TABLE 4-4
Individual Analysis of Alternative 4 – Mechanical Excavation following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
CMS for AOC A – Seneca-Cayuga Canal

COSTS	
Capital Cost	Medium. Less expensive than Alternatives 2 and 3.
LAND USE	
Land Use	Protective of future, current, and historical land use.
COMMUNITY ACCEPTANCE	
Community Acceptance	Uncertain, but likely.

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The Portadam and Aqua-Barrier technology have the advantage that they are easier to install in lower water levels and have the potential for reuse at another location proposed for corrective measures. Implementation of Alternative 4 would be easier than Alternative 3, and would minimally disturb impacted sediment and hence lower resuspension rates. Unlike Alternative 2, Alternatives 3 and 4 would protect against sediment leaving the enclosed area. Alternative 4 has the same advantage as Alternative 3 in that it allows for visual confirmation of the removal of soft sediment at the RTAs discussed in Section 2.3, including the south portion of Gorham Street because this CMS assumes water levels in the canal are less than 2 feet high which will allow for manual probing and visual inspection of the canal bottom.

Some disadvantages of the Aqua-Barrier are slow leaks, freezing if the structures were exposed to cold weather for an extended period of time, and rolling of the bladder if there is a significant flow or height of water on one side of the bladders while the other side is dry. However, it is anticipated that there will not be a significant flow of height of water on the south side of the Aqua-Barrier.

There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the sewage treatment plant, will gravity flow downstream and will not affect the work area. There may be limited access points for mobilization of the excavation equipment to the RTAs, and access ramps would need to be to be constructed. There is the potential for increased dust, which may require air quality monitoring during the excavation and dewatering process.

Alternative 4 is retained for further evaluation.

4.4.5 Alternative 5: Canal Dewatering and Mechanical Excavation

This alternative involves complete dewatering of the canal and mechanical excavation of the RTAs under dry conditions. The NYSCC will close its locks for maintenance activities from approximately December 2012 to April 2013, and this should allow for natural dewatering of the canal by gravity flow. However, complete dewatering of the canal is not possible because a minimum base flow of 50 to 200 cfs will need to be maintained to meet SFPC needs. As a result, a water divertment or isolation system would be required to protect the workers and work area.

The work area would be dewatered by gravity flow and sump pumps. Isolation cells would be required to keep the work area free from canal water and water from other sources such as runoff, precipitation, and groundwater seepage. Mechanical excavators would be used to enter the dewatered isolation cells and remove impacted sediment.

Table 4-5 contains a detailed evaluation of Alternative 5.

TABLE 4-5
Individual Analysis of Alternative 5 – Canal Dewatering and Mechanical Excavation
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 5 will achieve RAO, which will be protective of human health.
Environmental Protection	Mechanical excavation of impacted sediment will protect the environment by removing it from the bottom of the canal channel, which will prevent migration to other environmental receptors. However, a completely dewatered canal could impact the environment and may destabilize unprotected canal banks.
COMPLIANCE WITH SCGs	
Chemical-Specific	Complies.
Location-Specific	May not meet the requirements for maintaining a benthic community over the entire dewatered area due to a lack of water in the canal.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	None. Impacted sediment will be removed because the dewatered area will be easily accessible.
Adequacy and Reliability of Controls	Excavation of impacted sediment is expected to reliably reduce COC concentrations to adequate levels (below RAO), which will be protective of potential receptors.
Individual Technical Components	Sandbags, dewatering tubes, water treatment for solids, excavation, and disposal staging areas.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Canal dewatering and excavation will involve canal water being gravity drained from the canal. The work area will be dewatered by gravity flow and sump pumps. Isolation cells will be required to keep the work area free from canal water. Mechanical excavators will be used to enter the dewatered isolation cells and remove impacted sediment. A water treatment system will be used for solids.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved waste disposal facility.

TABLE 4-5
Individual Analysis of Alternative 5 – Canal Dewatering and Mechanical Excavation
CMS for AOC A – Seneca-Cayuga Canal

Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediments is not reversible.
Type and Quantity of Treatment Residual	None.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	There is the potential of increased risk of flooding of Seneca Lake because the canal will be completely dewatered.
Protection of Workers During Remedial Action	High potential for exposure during remediation.
Time Until Remedial Goals Achieved	Immediately after remedial action.
Environmental Impacts	Use of this active remedy may remove the natural benthic habitats in the enclosed area, and introduce minimal foreign matter to environment.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Complete canal dewatering is technically not feasible, and will not allow mechanical excavation unless an isolation system is installed.
Reliability of Technology	Not reliable unless isolation system is installed.
Availability of Services and Material	Available.
Administrative Feasibility	Not feasible unless the canal is completely dewatered, and based on attainability of permits and agreements. This alternative also will require minor site preparation. Several regulatory agencies may desire to perform oversight.
COSTS	
Capital Cost	Low. Less expensive than Alternative 4.
LAND USE	
Land Use	Protective of future, current, and historical land use
COMMUNITY ACCEPTANCE	
Community Acceptance	Unlikely due to fully dry conditions and potential for upstream flooding.

The facility outfalls would need to be rerouted downgradient of the work area. The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. Draining the canal may result in full or partial collapse of the culvert. An assessment of the culvert's condition and (if required) subsequent rehabilitation of the culvert may need to be performed before the canal is dewatered. A completely dry canal would likely cause flooding or water management issues in Seneca Lake if that water level cannot be maintained.

There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the sewage treatment plant, will gravity flow downstream and will not affect the work area. There may be limited access points for mobilization of the excavation equipment to the RTAs, and access ramps would need to be to be constructed. There is the potential for increased air emissions, which may require air quality monitoring during the excavation and dewatering process.

This technology is not retained for further evaluation because a complete dewatering of the canal is technically not feasible.

4.4.6 Alternative 6: Mechanical Excavation Following Isolation With Sheet Piles

The sheet pile cofferdam technology uses wood, steel, or concrete sheet piling to construct a reusable watertight enclosure. The sheet piles would need to be driven into bedrock because the sediment layer will not be able to hold up the structure. This may be challenging to install because of the hardness of the bedrock. Types of sheet piling include H-type, Z-type, arch-shaped/lightweight type, Larson type, and flat/straight type.

Alternative 6 consists of driving a series of interlocking prefabricated H-type sheet piles into bedrock to create a watertight retaining wall. The interlocks between sheets would form tight connections and allow minimum shift. The footing of the sheet piles would need to be sealed with sandbags to control seepage of water. Bracing would be required to control the hydrostatic head of approximately 15 feet. Silt or turbidity screens would be placed around the work area to minimize the upper water column dispersal of sediment from the area where the sheet piles would be driven into bedrock. Water within the enclosed area would then be pumped out to create a dry environment for mechanical excavation of sediment which will be performed similar to previously described in Section 4.4.3.

Table 4-6 contains a detailed evaluation of Alternative 6.

TABLE 4-6
Individual Analysis of Alternative 6 – Mechanical Excavation Following Isolation Using Sheet Pile
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 6 will achieve RAO which will be protective of human health.
Environmental Protection	Mechanical excavation of impacted areas following isolation using sheet piling will protect the environment because it is expected to target the COCs by removing the impacted sediment from the bottom of the canal channel. Removal of impacted sediment will prevent sediment migration to other environmental receptors.
COMPLIANCE WITH SCGs	
Chemical-Specific	Complies.

TABLE 4-6
Individual Analysis of Alternative 6 – Mechanical Excavation Following Isolation Using Sheet Pile
CMS for AOC A – Seneca-Cayuga Canal

Location-Specific	May not meet the requirements for maintaining a benthic community over the dewatered area in the RTA due to a lack of water in the canal.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	None. All of the impacted sediment will be removed because the dewatered area will be easily accessible.
Adequacy and Reliability of Controls	Sheet piles will have to be configured to ensure the enclosure captures impacted sediment. Sheet piles also will have to be driven into the canal bottom to accommodate varying water and wind pressures to prevent failure during remedial action. Ensures long-term success of remedial action protecting environmental receptors.
Individual Technical Components	Sheet pile, braces, whalers, pumps, excavators, dewatering pads, water treatment for solids, sandbags, and disposal staging areas.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Sheet pile will be driven into the canal bottom, and entrapped water will be pumped out until area proposed for remedial activity is dry. Soft sediment in the southern portion of the Gorham Street Deposit will be pulled to the north side before installation of the temporary water diversion structure in that area. Sediment will then be excavated from that area. A water treatment system will be used for solids.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved waste disposal facility.
Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediment is not reversible.
Type and Quantity of Treatment Residual	Unknown.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	Sediment may reenter the water column by resuspension and be transported downstream during installation of sheet piles.
Protection of Workers During Remedial Action	Potential for exposure during remediation.
Time Until Remedial Goals Achieved	Immediately after remedial action.
Environmental Impacts	Use of this active remedy may disturb or remove the natural benthic habitats in the enclosed area, introduce minimal foreign matter to environment, and there is the potential of sediment resuspension during sheet pile installation.
IMPLEMENTABILITY	

TABLE 4-6
Individual Analysis of Alternative 6 – Mechanical Excavation Following Isolation Using Sheet Pile
CMS for AOC A – Seneca-Cayuga Canal

Technical Feasibility of Operation and Construction	Challenging in high water levels and bedrock hardness. Need to determine bedrock depth required to install sheet piles to withstand varying water pressure and wind strength.
Reliability of Technology	Susceptible to frequent monitoring and maintenance.
Availability of Services and Material	Available.
Administrative Feasibility	Not expected to be feasible based the availability of workers specialized in the installation of sheet piles in uneven and rocky canal bottoms with a shallow limestone bedrock. Also not feasible based on the attainability of permits and agreements. Added requirement to obtain waiver on noise level during sheet pile installation. Several regulatory agencies may desire to perform oversight.
COSTS	
Capital Cost	High because of installation costs of the sheet piles and dewatering of the enclosed area(s). More expensive than Alternatives 3 and 4.
LAND USE	
Land Use	Protective of future, current, and historical land use.
COMMUNITY ACCEPTANCE	
Community Acceptance	Uncertain, especially because of noise levels.

Installation of the sheet piling may be difficult because there is not sufficient sediment thickness at the canal bottom to support the structure, and the bottom of the canal is uneven with the presence of gravel. Sheet piles are less adaptable to hard driving conditions, particularly where irregular rock surfaces occur, and log jams may occur. Cross braces and whalers would be needed to support the structure and prevent structure collapse. Several enclosures would need to be constructed for each RTA, and pumping of water from the enclosure would be required; leakage between sheets and from below would be a consideration.

Installation of sheet piles also would generate noise and may have a negative impact on the community. It is an expensive technology, and requires additional heavy machinery to maneuver, install, and remove the sheet piles. Alternative 6 has the largest carbon footprint because of the quantity of materials needed to construct the sheet pile cofferdams.

The difference between Alternatives 3 and 4, and Alternative 6 is that prefabricated sheet piles would be used in Alternative 6, while in Alternative 3, a Portadam enclosure would be used, and in Alternative 4 an Aqua-Barrier enclosure would be used. The Portadam and Aqua-Barrier technologies have the advantage that they require less storage space, and are faster to install and remove when compared the sheet pile technology. They also are easier to install on uneven surfaces. All three technologies have the potential for reuse at another RTA. Alternative 4 would be easier to implement than Alternatives 3 and 6 because of the partially dewatered conditions and type of technology. Alternative 4 would minimally disturb impacted sediment and produce lower resuspension rates. All three alternatives protect against sediment leaving the enclosed area, but Alternatives 3 and 4 would generate less noise than Alternative 6 because pile driving equipment would not be needed.

There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the Waterloo sewage treatment plant, will gravity flow downstream and will not affect the work area. There may be limited access points for mobilization of the excavation equipment to the RTAs, and access ramps would need to be to be constructed. There is the potential for increased air emissions, which may require air quality monitoring during the excavation and dewatering process.

The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. An evaluation of existing conditions at the culvert may need to be performed before implementing Alternative 6.

Alternative 6 is not retained for further evaluation based on these disadvantages.

4.4.7 Alternative 7: Mechanical Excavation with Upstream and Downstream Dam and Bypass Pumping

Implementation of this remedial alternative requires creating a dry canal by building an upstream and downstream dam with H-type sheet piles across the width of the canal, and then pumping water from the canal area enclosed by the dam structure south of the downstream dam. Sheet pile technology was discussed in Alternative 6; however, in this alternative, the technology would require more effort in the design calculations to determine the hydrostatic load of canal water and wind pressure since the structure would be installed across the entire width of the canal. A large number of high-capacity pumps would be still be needed to dewater the area enclosed by the upstream and downstream dams, and to pump water around the two dams even when the anticipated reduced flow would be a minimum of 50 to 200 cfs. This action would result in a dry canal bottom that would visually expose impacted sediment for removal by mechanical excavation.

Table 4-7 contains a detailed evaluation of Alternative 7.

TABLE 4-7
Individual Analysis of Alternative 7 – Upstream and Downstream Dam with Bypassing Pumping
CMS for AOC A – Seneca-Cayuga Canal

OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	
Protection of Human Health	Protective; implementation of Alternative 7 will achieve RAO, which will be protective of human health.
Environmental Protection	Mechanical excavation of impacted sediment will protect the environment and will prevent migration to other environmental receptors.
COMPLIANCE WITH SCGs	
Chemical-Specific	Complies.

TABLE 4-7
Individual Analysis of Alternative 7 – Upstream and Downstream Dam with Bypassing Pumping
CMS for AOC A – Seneca-Cayuga Canal

Location-Specific	Complies.
Action-Specific	Will meet action-specific SCGs.
LONG-TERM EFFECTIVENESS AND PERFORMANCE	
Magnitude of Residual Impact	None. Impacted sediment will be removed from the RTAs because the dewatered area will be easily accessible.
Adequacy and Reliability of Controls	Sediment excavation is expected to reliably decrease COC concentrations to achieve the RAO, and is protective of potential receptors.
Individual Technical Components	Sheet pile dam construction, cross braces, whalers, sandbags, pumps, piping, excavators, dewatering pad(s), and disposal staging areas. A water treatment system will be used for solids.
REDUCTION OF TMV THROUGH TREATMENT	
Treatment Processes Used and Materials Treated	Implementation of this alternative will involve canal water being lowered to a minimum and will impede water seepage into the dewatered area. Water will be pumped from the upstream side of the upstream dam to the downstream side of the downstream dam into dams constructed to isolate the work area. Mechanical excavators will be used to enter the dewatered section of the canal and remove impacted sediment. . A water treatment system will be used for solids.
Amount of Impacted Material Destroyed or Treated	Zero. The excavated sediment will be transported to an approved waste disposal facility.
Expected Reduction in TMV	Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Irreversibility of Treatment	Removal of sediment is not reversible.
Type and Quantity of Treatment Residual	None.
SHORT-TERM EFFECTIVENESS	
Protection of Community During Remedial Action	Minimal community exposure during remedial action.
Protection of Workers During Remedial Action	High potential for exposure during remediation. High potential for breaching of the dam during extreme weather conditions.
Time Until Remedial Goals Achieved	Immediately after remedial action.
Environmental Impacts	Use of this active remedy may disturb or remove the natural benthic habitats in the enclosed area, introduce minimal foreign matter to environment. Transfer of water from impacted zone may contain impacted suspended sediment and may introduce it into an unimpacted area.
IMPLEMENTABILITY	
Technical Feasibility of Operation and Construction	Dewatering by using dams across the entire width of the canal is challenging, but once completed, mechanical excavation will be technically feasible

TABLE 4-7
Individual Analysis of Alternative 7 – Upstream and Downstream Dam with Bypassing Pumping
CMS for AOC A – Seneca-Cayuga Canal

Reliability of Technology	Reliable, but will require intensive water management, and monitoring and maintenance of pumps.
Availability of Services and Material	Available.
Administrative Feasibility	Feasible, based the availability of workers specialized in the installation of dams, but several permits will have to be obtained to implement technology. Several regulatory agencies may desire to perform oversight.
COSTS	
Capital Cost	High because of the costs for installing the dams, pump equipment, and monitoring and maintenance during operation of the pumps.
LAND USE	
Land Use	Protective of future, current, and historical land use.
COMMUNITY ACCEPTANCE	
Community Acceptance	Uncertain; may be negative public perception, especially given noise generated by operation of pumps.

Dam construction and water pumping may involve transferring impacted suspended sediment to a clean zone, and the public perception may not be positive. There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the Village of Waterloo sewage treatment plant, will gravity flow downstream and will not affect the work area. There may be limited access points for mobilization of the excavation equipment to the RTAs, and access ramps would need to be to be constructed. There is the potential for increased air emissions, which may require air quality monitoring during the excavation and dewatering process.

The Bayard Street culvert is downstream of the site, and is suspected to have structural integrity issues if the canal is dewatered because it is thought to be held intact by the presence of water. An evaluation of existing conditions at the culvert may need to be performed before implementing Alternative 7.

This alternative is not retained because of the high risk, high costs, and long timeframe required for implementing the remedy.

SECTION 5

Justification and Recommendation of the Corrective Measure

Considering the key site characteristics described in Sections 1 and 2, as well as the site-specific RAO and remedial technologies appropriate for the canal conditions, Alternatives 2, 3, and 4 have been brought forward from Section 4 for a more detailed evaluation based on effectiveness, implementability, and cost. These three alternatives are as follows:

- Alternative 2: Diver-Assisted Hydraulic Dredging
- Alternative 3: Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions
- Alternative 4: Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions

Alternatives that were not compatible with site conditions or were determined not to clearly achieve the RAO were not considered for further evaluation. Appendix B presents a comparison of the different technologies that are proposed for Alternatives 2, 3, and 4.

5.1 Alternative 2: Diver-Assisted Hydraulic Dredging

Unlike the other two retained alternatives (Alternatives 3 and 4), Alternative 2 does not include dewatering of the work area, which would allow for a complete inspection of the canal bottom. A visual inspection of the removal cannot be completed using this alternative, and verification of the removal of soft sediment is difficult with this alternative, and less effective when compared to the other retained alternatives. Also, some sediment may enter into the water column via resuspension and may not be removed from the canal, which increases the potential for migration of sediment in surface water to be transported downstream.

This alternative has a high safety risk, high cost due to the use of divers, is less effective, and has increased water management and treatment challenges after sediment dewatering. Alternative 2 is the least cost-effective option of the three alternatives. The increased sediment and water treatment after removal also makes this alternative less sustainable than the other alternatives, due to increased treatment system monitoring and operations, and needing to not only transport sediment to the landfill, but also to handle the significant volume of water generated in this option.

The main advantages of this alternative over the other retained alternatives is that it can be performed throughout the non-navigational portion of the year, and the Bayard Street culvert will not be affected because the canal water levels will be similar to existing conditions and additional costs for culvert inspection and rehabilitation will not be required.

However, the limited effectiveness of this alternative, the increased treatment for solids requirements, and high costs do not outweigh this one advantage.

The capital cost for Alternative 2 is approximately $7,000,000. Appendix B presents a breakdown of this cost estimate, and includes the cost for design, permits, daily performance and operations monitoring, hydraulic dredging, sediment removal, water treatment for solids, sediment transportation and disposal, site preparation and restoration, and reporting.

Alternative 2 is not the preferred and recommended remedial alternative for the corrective measures because of it does not target removal of all soft sediment from the RTAs and it is not cost-effective.

5.2 Alternative 3: Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions

The principal advantage of this alternative is that a dewatered work zone in the RTAs will allow easy access to areas proposed for remedial action, permit visual confirmation of the soft sediment removed from the canal bottom, and direct mechanical excavation to glacial till or bedrock, and the depth previously indicated for the Downstream Deposit. This alternative is more cost-effective than Alternative 2, and is more effective in determining if soft sediment has been removed from the RTAs with no chance of suspension into surface water.

As discussed in Section 4.4.3, this technology may be challenging to implement with a high water column of up to 15 feet. In addition, groundwater infiltration may occur in the active work area, and this water will need to be pumped from the excavation area and treated before discharge back to the canal. Rainfall, snowmelt, and surface runoff may also contribute to water accumulating in the dewatered area and will add to water management costs. The restricted width of the canal which allows for flow of the canal water may not be able to handle the volume of water entering the canal, and there is the potential for flooding to occur.

Similar to Alternative 2, performing the remedy with normal water level conditions in the canal of up to 15 feet will not affect the Bayard Street culvert, and additional costs for inspection and potentially culvert rehabilitation will not be required. However, the cost and implementation issues with diverting a larger water flow does not outweigh the advantage of the Bayard Street culvert work.

The capital cost for Alternative 3 is approximately $6,500,000. Appendix B presents a breakdown of this cost estimate, and includes the cost for design, permits, outfall discharge relocation, daily performance and operations monitoring, Portadam installation and removal, sediment removal, water treatment for solids, sediment transportation and disposal, site preparation and restoration and reporting.

Alternative 3 is one of the two recommended dry removal alternatives and will be carried forward until negotiations with SFPC and NYSCC can be concluded and either Alternative 3 or Alternative 4 is selected.

5.3 Alternative 4: Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions

Alternative 4 is the most aggressive and comprehensive remedial approach and has the same advantages described in Section 5.2 for Alternative 3. The Portadam and Aqua-Barrier technologies are proven, more adequate, and more reliable for the uneven canal bottom conditions. The CMS has assumed dewatering to less than 2 feet so this technology will be adequate to manage the minimum required base flow rate of the SFPC facility, which is anticipated to be a minimum between 50 and 200 cfs to meet their permit conditions. Maintaining the canal channel open to water flow will reduce the ecological and socio-economical impact of the project. Additionally, there will be less water in the excavation area to manage because it will be easier to control seepage due to less head pressure (lowered water column) and manage water that accumulates in the smaller enclosed area.

This alternative is the most cost-effective retained technology because it is easier to implement the technology under partially dewatered conditions. It also is the most sustainable of the three alternatives because it requires the least amount of materials during construction, and the components of the barriers can be relocated, rather than needing one larger water divertment structure. One of the main advantages of Alternative 4 is that it provides the safest work environment of the three alternatives evaluated in Section 5. The alternative is safer than the high risks associated with diver assisted operations and working within divertment structures designed to withstand the hydrostatic forces of a water column of approximately 15 feet, as well as dynamic forces due to currents, waves and wind.

Alternative 4 presents similar difficulties as Alternative 3 in maintaining the active work area free from groundwater infiltration. Because of the length of the RTAs requiring sediment removal and the volume of water requiring diversion during the construction period, a gravity flow temporary water diversion system channel would be one of the most practical and cost-effective solutions for temporarily diverting canal water during excavation activities. There will be water management challenges from the effluent of the Village of Waterloo sewage treatment plant, which will need to bypass the Downstream Deposit. It is anticipated that flow from Silver Creek, which is adjacent to the sewage treatment plant, will gravity flow downstream and will not affect the work area.

An evaluation of existing conditions at the Bayard Street culvert, possibly including measures to protect and/or rehabilitate the culvert, would need to be performed before implementing Alternative 4 and an agreement with SFPC would be required to maintain the minimum 50 to 200 cfs flow conditions required to meet their operating permit conditions.

The capital cost for Alternative 4 is approximately $5,000,000. Appendix B presents a breakdown of this cost estimate, and includes the cost for design, permits, outfall discharge relocation, daily performance and operations monitoring, water divertment structure installation and removal, sediment removal, water treatment, sediment transportation and disposal, site preparation and restoration and reporting.

Alternative 4 is one of the two recommended dry removal alternatives and will be carried forward until negotiations with SFPC and NYSCC can be concluded and either Alternative 3 or Alternative 4 is selected.

5.4 Proposed Corrective Measure for AOC A

Mechanical excavation following isolation using Portadam, Aqua-Barrier, or similar water divertment structure is the preferred and proposed corrective measure because both Alternative 3 and Alternative 4 have the advantage of achieving the RAO, high implementability, lower costs, and are more sustainable than a diver assisted removal in watered conditions. The final selection of Alternative 3 or Alternative 4 will be determined during the upcoming design phase upon negotiations with SFPC and NYSCC regarding water flow management requirements and measures to protect and/or rehabilitate the Bayard Street culvert.

Appendix B presents a comparison of the criteria evaluated in Alternatives 2, 3 and 4, and includes a cost breakdown of the components for each technology.

SECTION 6

Performance and Operations Monitoring

This section provides a brief summary of the performance monitoring requirements for the corrective action. Additional details regarding field monitoring and data management will be described in the quality assurance project plan and field implementation plan.

6.1 Air Monitoring

Air monitoring for particulate matter will be performed because of the possibility of dust being released during the excavation procedures and during handling of the stabilization reagent (pelletized lime, fly ash, or similar). The reagents will be directly mixed with the sediment at a stockpiled area or in rolloff containers, and this activity could potentially create dust. The air monitoring procedure will be in accordance with a site-specific community air monitoring plan which will be developed prior to the field work. The prevailing wind direction will be monitored daily during site activities. In addition, a web site that records daily wind direction for Waterloo, New York, will be consulted, and the information will be recorded in the field logs.

6.2 Noise Monitoring

Noise monitoring will be performed during the duration of the field work. Because the mechanical excavation operations will be performed a maximum of 10 hours per shift during daylight hours (subject to change), the period that will be used to establish the background noise level will be daytime.

6.3 Sediment Monitoring Locations and Frequency

Sediment removal will be confirmed visually. Post-excavation sampling is not required because soft sediment removal will be bounded by the underlying glacial till or bedrock, and the depth defined in the Section 2.3.3 for the Downstream Deposit. The lateral extent of the North Shore and Gorham Street deposits have been defined as the extent of the soft (grain size less than less than 2 mm in diameter) sediment. Furthermore, NYSDEC has conferred that the Downstream Deposit removal will be horizontally bounded by past sampling stations (toxicity and chemistry data points) and vertically bounded by depth of removal rather than post-excavation sampling because of the abundance of chemical and toxicity testing data collected during the phases of sediment investigation.

6.4 Canal Water Monitoring

Because the mechanical excavation in Alternatives 3 and 4 will be performed in a dewatered environment, there is minimal potential for sediment to reenter in suspension and be transported downstream from the RTAs. As a result, canal water quality monitoring will not be required.

Silt or turbidity screens will not be required to minimize and control downstream migration of resuspended sediment because there is limited opportunity for sediment in suspension to travel long distances downstream of the work area. The water divertment structure also will be installed to include the entire area of impacted sediment. Water may accumulate in the excavation area by rainfall, snowmelt, surface runoff, and groundwater infiltration. For this CMS, we have assumed that water that enters and contacts the active excavation area will be pumped from the work area for treatment of solids before discharging into the bypass channel or to the canal downstream. The water treatment needs to maintain dewatered conditions in the work area; treatment will be further assessed during the next phase of design.

6.5 Reporting

Reporting parameters will include collecting, photodocumenting and presenting field data pertinent to the mechanical excavation activities. These will be maintained in field logbooks, photo logs and QC check forms. As project work begins and progresses through multiple phases, process changes and lessons learned may indicate the need for modifications to the reporting tools, and this will be managed through the change of conditions/management process.

Data which will be collected will include air and noise monitoring from the work area, if applicable, water treatment system effluent records, and transport and disposal records for sediment removed from the RTAs.

Data collected will be field verified daily for quantitative and qualitative accuracy as the data are generated. Data entry will be performed to digitize hard-copy information. A QC check will be performed on these data to ensure accuracy. A monthly progress report will be submitted to the NYSDEC.

Mobilization and operational measures including site security and fencing, runoff/run-on control (diversion or collection devices) for surface water and soil, noise, and dust suppressants will be evaluated in the design implementation plan. Inspection frequency of these project elements will be considered in the design and operations plan.

SECTION 7

Public Notice of CMS

HCC will comply with the citizen participation plan as outlined by NYSDEC in Title 6 of the New York Codes, Rules and Regulations Subpart 375-1.10 (NYSDEC 2006) before implementing the corrective measures at the site. A citizen participation plan will be developed and an accessible document repository will be established to provide the public with project information and updates. This plan will address the public involvement needs for all aspects of CMS and implementation.

A public notice and Statement of Basis on the CMS and proposed design implementation plan will be prepared by NYSDEC and published in a local newspaper. The Statement of Basis will include a description of the overall investigation/remedial process, a summary of possible impacts on the local community, and a brief description about the potential uses, available documents, and the location of the information repository.

The public will be allowed a 45-day comment period to review and comment in writing on the proposed CMS.

A public meeting will be held during the public comment period to explain the project, answer questions, and accept comments provided by the citizens. The responses to the citizens concerns will be incorporated in the revised citizen participation plan.

At a minimum, the citizen participation plan will include the following:

- A site contact list
- The name and address of a document repository and proof of acceptance of this designation by the repository
- Overview of the site's history and contamination issues
- Identification of major issues of public concern related to the site and a description of any mitigation planned to address the issue, if appropriate
- A description and schedule of the major elements of the site's remedial program
- A description and schedule of any additional citizen participation activities needed to address public concerns

The citizen participation plan will be submitted to NYSDEC for approval.

SECTION 8

Permits Plan

This section identifies the federal, state, and local permits that would typically be required for implementing the selected corrective measure. The process of obtaining the necessary permits and approvals for excavating sediment in the canal requires an understanding of the regulatory jurisdictions, the application requirements, and processing times of the permits. Several agencies have been identified and contacted to discuss the permit requirements for soil and wildlife disturbance, construction activities, sediment dredging, sediment removal via mechanical excavation, restoration of disturbed areas, and discharge of treated canal water. The purpose of these regulatory agencies and local authorities is to protect the physical and biological resources of the area and the public interests for use of the resources.

Permit considerations applicable to remedial action activities and the entities that have jurisdiction over these permits are listed in Appendix C. A final list of permits required for performing the fieldwork will be included in the design implementation plan and submitted to the regulatory agencies for review. Copies of the permit applications and approvals for each agency will be included in a technical memorandum that will be submitted to NYSDEC before implementation of fieldwork in December 2012.

SECTION 9

Waste Management and Disposal

This section identifies the waste management and disposal procedures for the waste that will be generated during remediation construction activities at the site. PPE, aqueous, solid, and general waste materials will be segregated, containerized, stockpiled, and managed in accordance with the revised MMP (CH2M HILL 2010c). All waste containers will be labeled appropriately to describe its contents and start date of waste generation. These containers will be inspected daily by the construction supervisor and tracked daily on the waste management tracking form.

Solid waste such as PPE and other disposable equipment will be placed in 55-gallon drums or a roll off container. The containerized waste will be stored in approved staging areas until disposal.

Solid waste will be generated by excavating the sediment deposits that have been identified for removal from the canal bottom. Previous sampling has provided sufficient analytical information to characterize this sediment for disposal. Therefore, waste profiles will be submitted to a Dow-approved landfill in NYS for approval before commencing excavation activities. This procedure will expedite the transport and disposal (T&D) process, and reduce the need for managing large quantities of sediment at the site.

Although excavation and disposal is the preferred option, additional time may be needed for dewatering of sediment or mixing with a drying agent to meet the landfill percent moisture requirement. In the event that excavated sediments cannot be appropriately dewatered to meet disposal facility requirements or are above TCLP limits located in 40 CFR 261.24, a drying/stabilization agent will be added to these sediments prior to offsite disposal at an approved landfill. Section 4.1 provides additional information on waste management based on action-specific SCGs. The excavated material will be transported in lined or watertight trucks and managed to avoid spills or leakage onto public roadways. Excavated sediment will be properly covered/ tarped over the top to prevent the spilling or air dispersal of fugitive material. Solid waste will be transported and disposed offsite by a Dow-approved contractor following submittal and approval of the waste profiles by the T&D facility.

Liquid waste may be generated by removing surface runoff, rainfall, snowmelt, or groundwater infiltration into the area proposed for excavation. This liquid will be pumped out of the excavation area into drums, a frac tank, or other approved storage container, and pumped to a temporary onsite water treatment system for treatment of solids. The treated water will be sampled before direct discharge into the canal. Other types of liquid wastes may be generated from decontamination of equipment, tools, sampling materials, etc. The liquid will be treated by the onsite temporary water treatment system and discharged into the canal.

The licenses and permits for T&D of solid waste streams generated during this project will comply with applicable federal, state, and local laws, codes, and regulations. The treatment, storage, and disposal facilities will be required under the contract to provide a certification of disposal indicating final disposition of the waste and will be signed by the authorized agent of the treatment, storage, and disposal facility. This certification will indicate the following:

- Material (by item and quantity) that was disposed
- Specific method of treatment
- Date of treatment
- Manifest number of waste

Copies of waste manifests and certification of disposal will be provided to NYSDEC in a construction completion report.

SECTION 10

Project Schedule

The field implementation schedule is dependent on the information provided by the NYSCC and controls the overall project schedule. In a conference meeting on April 19, 2011, HCC, NYSDEC, and CH2M HILL were informed that the NYSCC will perform a partial dewatering of the section of the Seneca-Cayuga Canal south of the facility between Lock CS 4 and Lock CS2/3 for maintenance activities starting in December 2012. The corrective measures proposed in this CMS will be completed during the time that the canal will remain partially dewatered. The estimated field completion date is April 2013.

10.1 Schedule of Preferred Alternative

One phase of construction will be necessary to implement this remedy. Based on feedback from the NYSDEC (NYSDEC 2012a) and to aid in the planning and design phases of the project, the following schedule is proposed:

- February to October 2012: Permit applications
- May 31, 2012: Submittal of CMS to NYSDEC
- June 4, 2012: Submittal of Basis of Design Report to NYSDEC
- June 1to August 14, 2012: NYSDEC Preparation and review of draft Statement of Basis
- August 15 to September 4, 2012: Preparation of Public Notice, fact sheet, etc.
- September 5 to October 19, 2012 (45 days): Public comment period
- September 15, 2012: Public meeting
- November 15, 2012: Submittal of final Statement of Basis
- December 3, 2012: Canal dewatering begins
- December 17, 2012: Sediment removal begins
- April 2013: Completion of sediment removal and restoration activities

Appendix D presents the project schedule and the major milestones that can be used to establish a schedule baseline to enable project progress tracking. This schedule may vary due to acceleration or delays of the various interlinked elements.

10.2 Deliverables

The following documents will be submitted to HCC and the agencies for review and comments:

- CMS for AOC A – Seneca-Cayuga Canal, Former HCC Facility, Waterloo, New York

- Design Implementation Plan (30 Percent Design)
- Final Design Implementation Plan (for information only)
- Technical Memorandum of Permit Approvals (for information only)
- Monthly Progress Reports
- Construction Completion Report

At least one copy of each deliverable will be submitted in print, as well as in an electronic format (CD or DVD) to NYSDEC. All other reviewers will receive an electronic copy of the deliverable, unless a hard copy is requested.

SECTION 11

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Figures

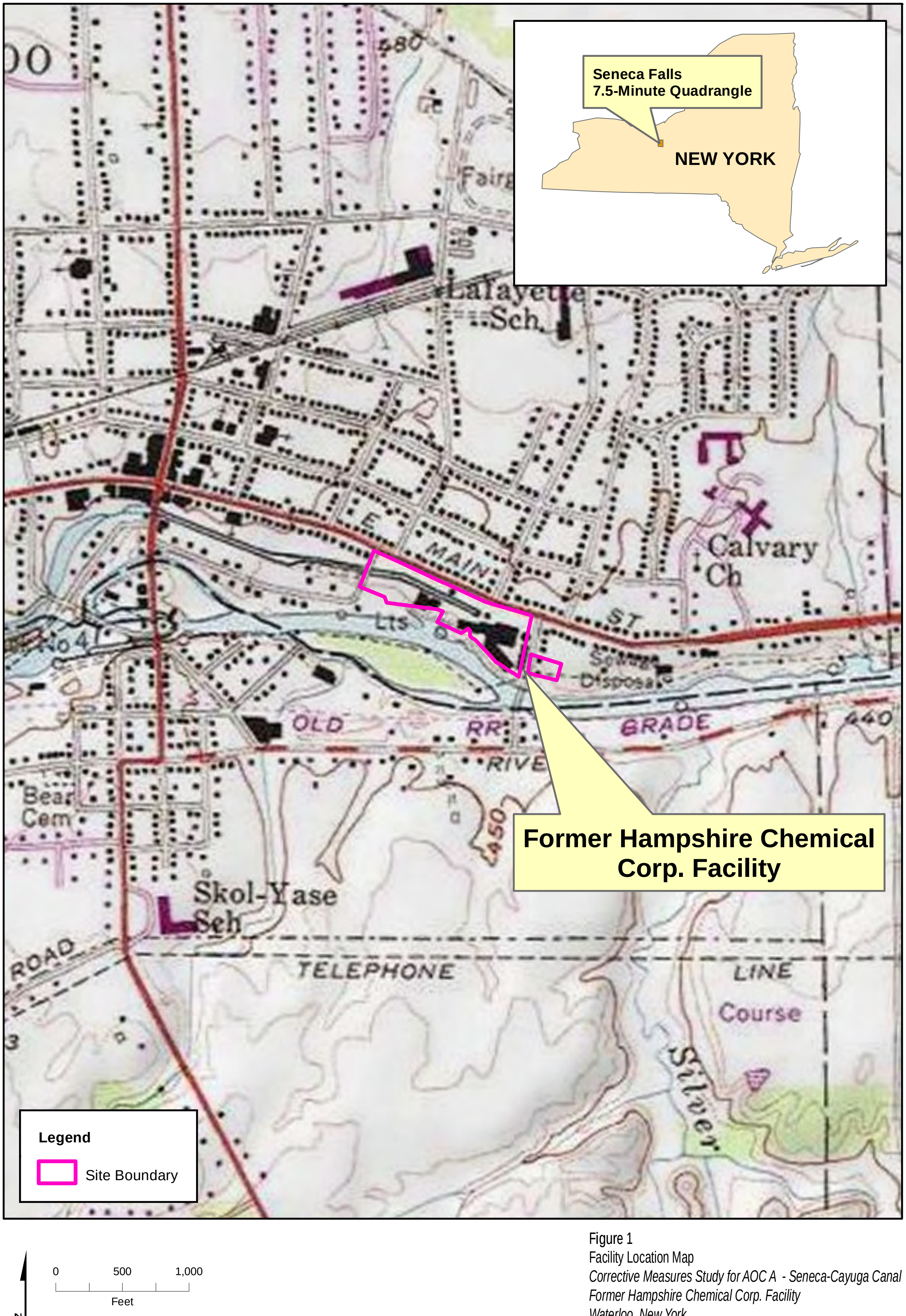

Figure 1
Facility Location Map
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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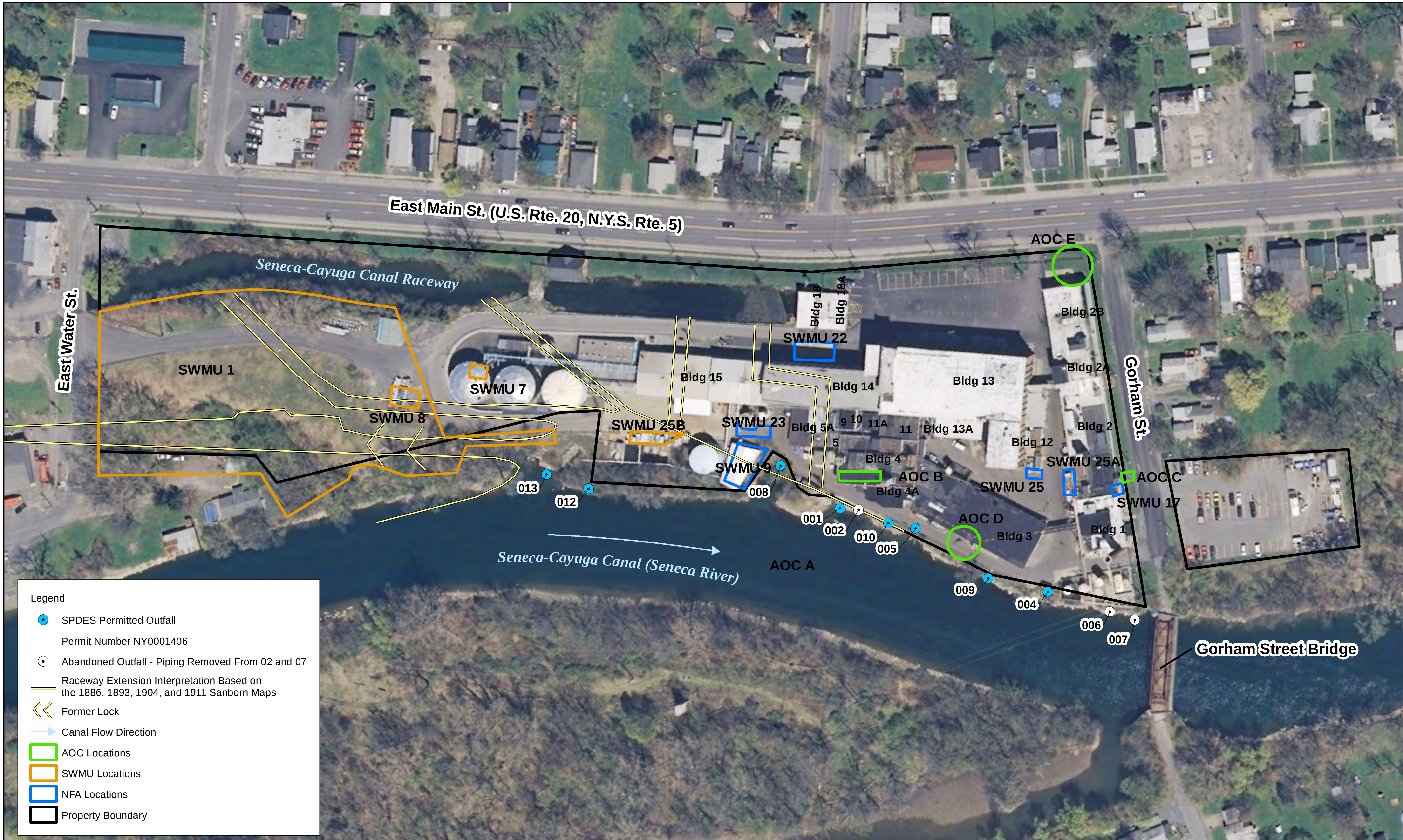
Originator: L. La Fortune Checked By: B. Carling Approved by SM: D. Brodmerkel



Notes:
NFA - No further action
NFA issued by NYSDEC on Dec. 2, 2003.
SWMU 28 (NFA) - Wash Water Sewer System (Buildings 2, 3, 4, 9, 13, 14 and 16)
SWMU 29 (NFA) - SPDES Sewer System (Buildings 1, 2, 2A, 2B, 3, 4, 5, 14 and Reactor)

Figure 2
SWMU and AOC Locations
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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Originator: L. La Fortune Checked By: B. Carling Approved by SM: D. Brodmerkel

Figure 3
Seneca-Cayuga Canal Locks
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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Originator: C. Ngoma Checked By: L. La Fortune Approved by SM: D. Brodmerkel

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Figure 4
North Shore, South Shore, Gorham Street, and Downstream Deposits
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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Originator: S. Maxwell Checked By: L. La Fortune Approved by SM: D. Brodmerkel

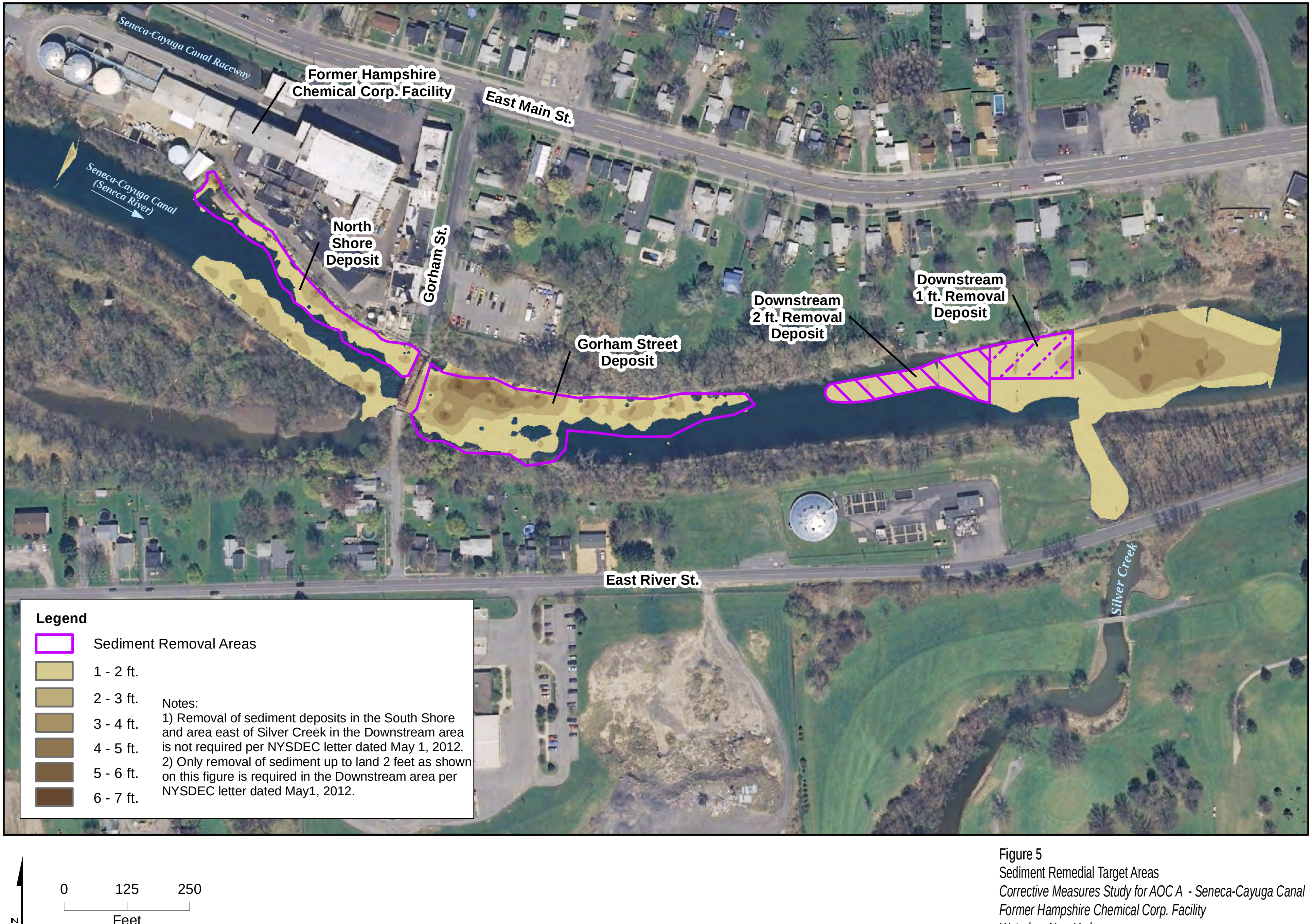

Figure 5
Sediment Remedial Target Areas
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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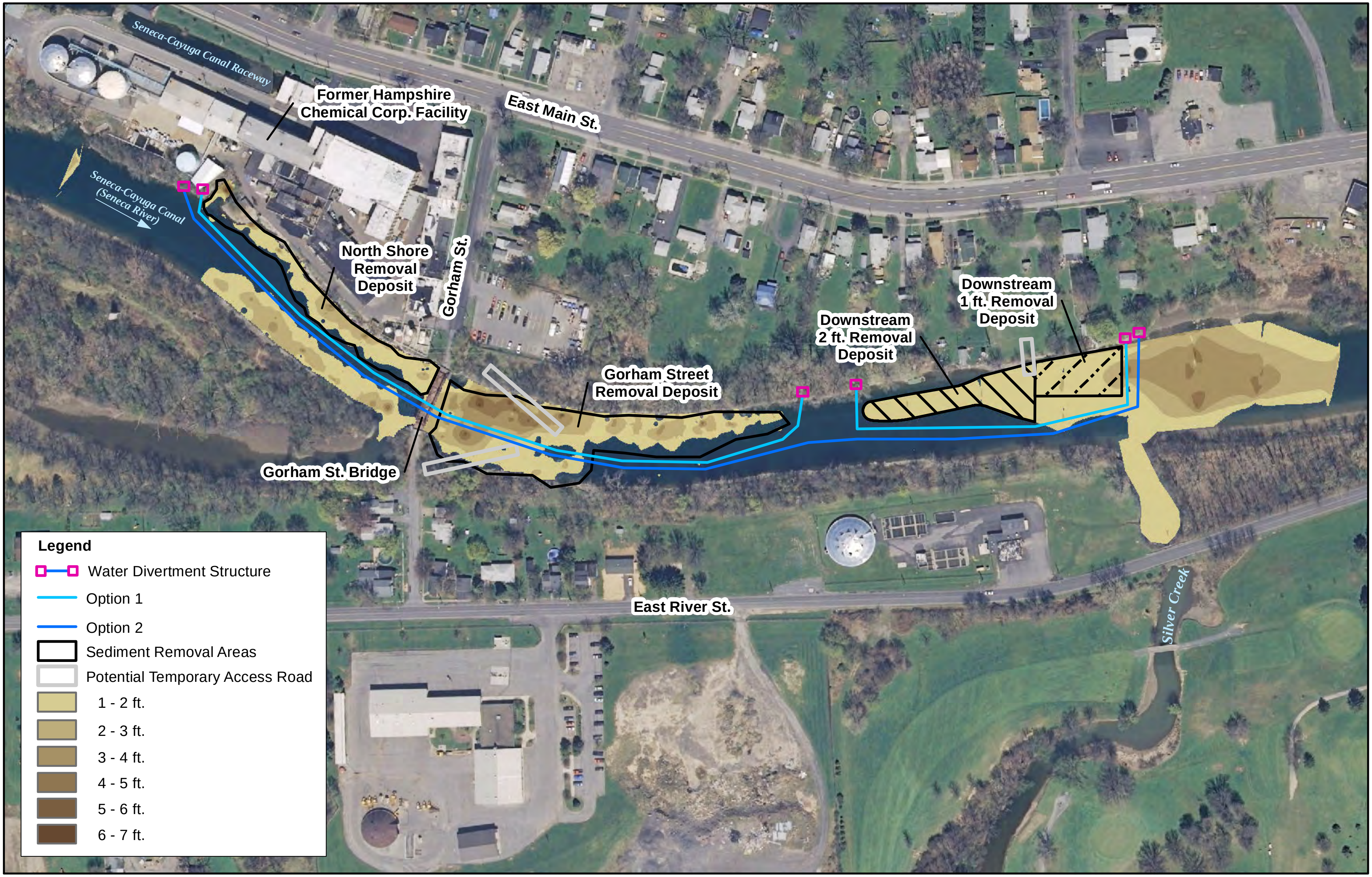

Note:
The water divertment structure option will be determined during the design phase. Options 1 and 2 are under consideration.

Figure 6
Proposed Locations of Water Divertment Structure and Access Roads
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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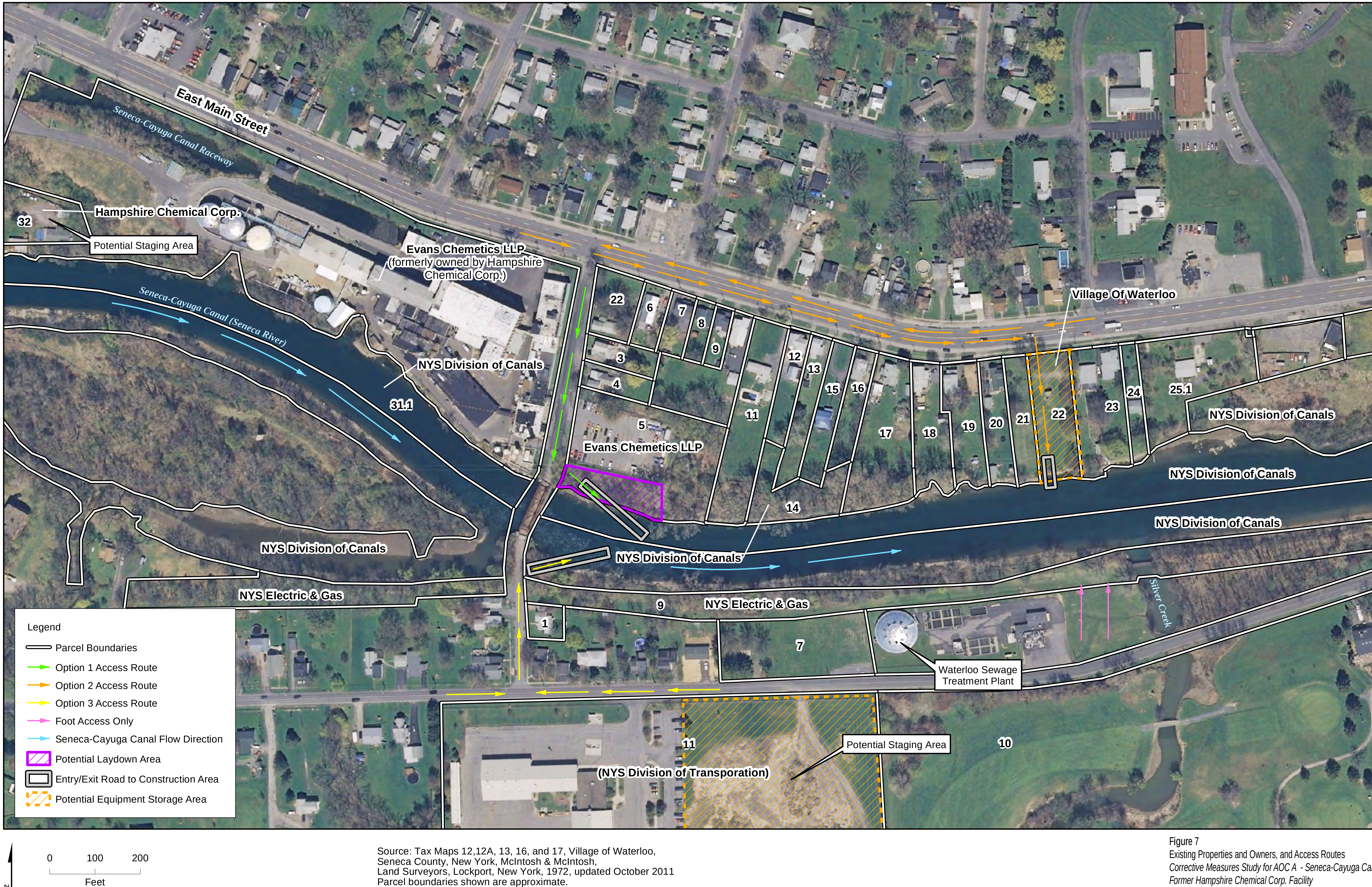
Originator: L. La Fortune Checked By: B. Carling Approved by SM: D. Brodmerkel



Source: Tax Maps 12,12A, 13, 16, and 17, Village of Waterloo,
Seneca County, New York, McIntosh & McIntosh,
Land Surveyors, Lockport, New York, 1972, updated October 2011
Parcel boundaries shown are approximate.

Figure 7
Existing Properties and Owners, and Access Routes
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility
Waterloo, New York

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Appendix A

Remedial Alternative Technologies

Option	Alternative 1 No Action	Alternative 2 Diver-Assisted Hydraulic Dredging	Alternative 3 Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions	Alternative 4 Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions	Alternative 5 Canal Dewatering and Mechanical Excavation	Alternative 6 Mechanical Excavation Following Isolation With Sheet Piles	Alternative 7 Mechanical Excavation With Upstream and Downstream Dam with Bypassing Pumping
Description	• Does not include any treatment, engineering controls, or institutional controls, but may include a monitoring program.	• Involves divers manually maneuvering a hand-held hydraulic suction hose, which discharges sediment through a pipeline to sediment dewatering tubes. It is most effective in small ponds and extremely tight situations. However in most cases it is inefficient and causes excessive turbidity in the water. Canal water will be pumped from the enclosure to create a dry environment.	• Installation of Aqua Barrier or Portadam, or similar water divertment structure around RTAs within the canal with potentially up to 15 ft of water column. Canal water will be pumped from the enclosure to create a dry environment. Requires removal of sediment from the RTAs by mechanical excavation.	• Installation of Aqua Barrier or Portadam, or similar water divertment structure around RTAs within the canal with potentially 2 ft or less water column. Canal water will be pumped from the enclosure to create a dry environment. Requires removal of sediment from the RTAs by mechanical excavation.	• Dewatering of canal by closing the upstream lock to create a dry canal bottom, followed by mechanical excavation of sediment deposits from the RTAs.	• Involves creation of a dry canal environment by driving prefabricated interlocking sheeting into the ground using standard installation techniques and equipment (i.e., hammer or vibratory equipment). The seams would be sealed using water-swelling sealant to create a water-tight barrier. Requires removal of sediment from the RTAs by mechanical excavation.	• Involves creation of a dry canal environment by building an upstream and downstream dam and pumping the water around the canal. Requires removal of sediment from the RTAs by mechanical excavation.
Advantages	• Ineffective because no technology is used. • No risk because impacted material will not require management by humans, and ecological habitat. • No short term disturbance of ecological habitat. • Does not require monitoring of air quality and noise levels. • Does not require total shut down of canal.	• Effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Long-term benefits achieved with deposition of cleaner upstream sediments. • Does not require total shut down of canal.	• Effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Minimal human exposure to during remediation. • Improves flexibility regarding future use of the water body. • Does not require total shut down of canal.	• Highly effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Improves flexibility regarding future use of the water body. • Requires shortest time to implement and achieve remedial action objective. • Does not require total shut down of canal.	• Highly effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Improves flexibility regarding future use of the water body. • Requires total shut down of canal. • Does not require additional time for installation of isolation barriers.	• Effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Minimal human exposure to during remediation. • Improves flexibility regarding future use of the water body.	• Effective technology. • Removal of impacted sediment will protect the environment and prevent downstream migration of COCs to environmental receptors. • Improves flexibility regarding future use of the water body.
Disadvantages	• Not regulatory acceptable. • Not effective in the long term.	• High safety risk due to working under water, and with hand held suction pump. • Long duration to achieve removal of impacted material and remedial action objectives. • Complex equipment (pump and dewater/filter dredged sediment). • Very high potential for human exposure to impacted sediment during remediation. • Treatment technologies for impacted sediment frequently offer implementation challenges. • Multiple diving teams are required due to short diving time of maximum 3 1/2 hours/day. • Sediment may enter in resuspension and be transported downstream.	• Intensive water management; enclosed area needs to be dewatered, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc. • This method only partially restricts natural flow of canal water and does not require construction of a temporary diversion (bypass) channel to convey entire flow around the area of excavation. • Site preparation for excavation can be more lengthy. • Base of water divertment structure needs to be water tight to avoid infiltration of canal water to the dewatered area. • Reducing the area of the canal may raise the upstream water level to unacceptable elevations.	• Some water management; enclosed area needs to be dewatered, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc. • Increased potential human exposure to impacted sediment during remediation.	• Limited water management; enclosed area needs to be dewatered, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc. • Increased potential human exposure to impacted sediment during remediation.	• Not easily implementable because of presence of uneven canal bottom and boulders. May encounter refusal during installation. • Potential safety risks associated with sheet pile enclosure. • This method only partially restricts natural flow of canal water and does not require construction of a temporary diversion (bypass) channel to convey entire flow around the RTA. • Site preparation for excavation can be more lengthy. • Requires silt curtain to be set up around area where sheet piles will be installed to control sediment resuspension and downstream migration.	• Potential safety risks associated with creation of temporary dams. • Requires intensive water management. • Increased potential human exposure to impacted material during remediation. • Negative public perception. • Short term increase in chemicals of concern bioavailability. • May require monitoring of air quality and noise levels.
Design Component Assumptions	• None	• Need to enclose work area with silt curtain to prevent transport of sediment that may enter in resuspension and be transported downstream. Vessel with divers and suction pump required. laydown and storage areas, and dewatering pads are needed. Rerouting of facility outfalls discharge points is not. required	• Need to enclose work area with Portadam, to perform excavation, and rerouting of facility outfalls discharge points is required. Excavators, access roads, laydown and storage areas, and dewatering pads are needed. Water treatment system for treatment of solids is required.	• Need to enclose work area with Portadam, Aqua-Barrier or similar water divertment structure to perform excavation, and rerouting of facility outfalls discharge points is required. Excavators, access roads, laydown and storage areas, and dewatering pads are needed. Water treatment system for treatment of solids is required.	• Dewatering of canal by closing the upstream lock to create a dry canal bottom, followed by mechanical excavation of sediment deposits. Excavators, access roads, laydown and storage areas, and dewatering pads are needed. Rerouting of facility outfalls discharge points is required. May require the construction of water divertment structure because complete dewatering of the canal is not possible. Water treatment system for treatment of solids is required.	• Need to determine how deep the sheet pile should be driven to withstand the water column pressure, wind, etc. Rerouting of facility outfalls discharge points is required. Excavators, access roads, laydown and storage areas, and dewatering pads are needed. Water treatment system for treatment of solids is required.	• Upstream and downstream dam sizing depend on theoretical volumes of water. Excavators, access roads, laydown and storage areas, and dewatering pads are needed. Rerouting of facility outfalls discharge points is required. Water treatment system for treatment of solids is required.
Overall protection of human health and the environment	• Not protective.	• Protective.	• Protective.	Protective.	• Protective.	• Protective.	• Protective.
Compliance with standards, criteria and guidance (SCGs)	• Does not comply with SCGs.	• Complies with SCGs.	• Complies with SCGs.	Complies with SCGs.	• Complies with SCGs.	• Complies with SCGs.	• Complies with SCGs.
Reduction of toxicity, mobility, or volume (TMV) through treatment	• Does not reduce toxicity, mobility or volume through no action.	• Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).	• Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).	Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).	• Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).	• Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).	• Does not reduces toxicity, or mobility, but reduces volume through active remediation (removal).

Option	Alternative 1 No Action	Alternative 2 Diver-Assisted Hydraulic Dredging	Alternative 3 Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions	Alternative 4 Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions	Alternative 5 Canal Dewatering and Mechanical Excavation	Alternative 6 Mechanical Excavation Following Isolation With Sheet Piles	Alternative 7 Mechanical Excavation With Upstream and Downstream Dam with Bypassing Pumping
Short-term effectiveness	• Not effective because it does not remove impacted media • Easy because no technology needs to be implemented.	• Effective because it removes the impacted media. • Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed through active removal. • Challenging to perform safely. • Permits and agreements are required.	• Very effective because it removes the impacted media. • Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed through active removal and verified by visual confirmation. • Challenging because of high water column and need for extensive site preparation. • Permits and agreements are required.	Very effective because it removes the impacted media. Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed through active removal and verified by visual confirmation. • Less challenging to implement due to low water column. • Permits and agreements are required	• Very effective because it removes the impacted media. • Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed through active removal and verified by visual confirmation. • Easily implemented because minor site preparation is required, if the canal can be completely dewatered. • Permits and agreements are required.	• Effective because it removes the impacted media. • Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed through active removal and verified by visual confirmation. • Challenging because extensive site preparation is required • Permits and agreements are required.	• Very effective because it removes the impacted media. • Risks associated with migration of contamination to the currently unaffected media would be reduced as the RTAs are removed by mechanical excavation and verified by visual confirmation. • Challenging because extensive site preparation is needed and required continuous management of natural volume of canal water by bypass pumping safely • Permits and agreements are required.
Long-Term Risks	• Same as currently present.	• Limited. Some sediment may enter in resuspension and may not be removed by the suction hose.	• None.	• None.	• None.	• Since this option in not easily implementable, it is likely a small volume of sediment will not be removed and may pose a long term risk.	• None.
Uncertainties	• Sediment migration will not be determined.	• Volume of unremoved impacted sediment is unknown.	• Removal of impacted sediment will reduce the uncertainty associated and the potential for future exposure and transport of impacted material.	• Removal of impacted sediment will reduce the uncertainty associated and the potential for future exposure and transport of impacted material. • It is unknown if there will be impacts to underground structures due to the lack of canal water.	• Removal of impacted sediment will reduce the uncertainty associated and the potential for future exposure and transport of impacted material. • It is unknown if there will be impacts to underground structures due to the lack of canal water.	• Removal of impacted sediment will reduce the uncertainty associated and the potential for future exposure and transport of impacted material.	• Removal of impacted sediment will reduce the uncertainty associated and the potential for future exposure and transport of impacted material.
Sustainability	• Not applicable.	• Is not sustainable since settling or dewatering system is required, and large volume of water generated from dewatering activities will need to be managed, and treated. The number of pumps required will be high.	• It is not sustainable because large volumes of water will need to be managed and treated, and the number of pumps will be high.	Sustainable because water divertment structure can be reused and a relatively small volume of water will need to be managed and treated.	• Sustainable because not much equipment is needed. A very small volume of water will require treatment.	• Sustainable because sheet piles can be reused, but requires intensive water management; enclosed area needs to be dewatered, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc	• It is not sustainable because amount of water to be managed and treated is uncertain.
Land use	• Not protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.
Community acceptance	• Probably not acceptable.	• Uncertain, but likely.	• Uncertain, but likely.	• Uncertain, but likely.	• Uncertain due to dry conditions.	• Uncertain due to noise from installation of sheet piles and pumps.	• Uncertain due to noise from pumps.
Costs	• None.	• High costs associated with high risk work.	• High costs associated with installation of water divertment structure and dewatering of excavation areas.	• Lower costs; costs may increase due to need for water management and evaluation and rehabilitation of structures that may be affected due to dewatered canal.	• Lowest costs; costs may increase due to need for water management and evaluation and rehabilitation of structures that may be affected due to dewatered canal.	• Very high costs associated with installation of sheet piles and dewatering of excavation areas.	• Very high costs associated with installaion of upstream and downstream dams, management of canal water by bypass pumping and dewatering of the dam area.

Appendix B

Evaluation of Proposed Remedial Alternatives

Option	Alternative 2 Diver-Assisted Hydraulic Dredging	Alternative 3 Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions	Alternative 4 Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
Advantages	• Removal of impacted sediment will protect the environment and prevent downstream migration to environmental receptors. • Avoids potential water management from the Waterloo Sewage Treatment Plant outfall near the Downstream Deposit. • Bayard Street Culvert investigation and restoration would not be required. • Improves flexibility regarding future use of the water body. • Does not require use of heavy machinery, construction of access roads and installation of water divertment structures.	• Removal of impacted sediment will protect the environment and prevent downstream migration to environmental receptors. • Highly effective technology. • Avoids potential water management from the Village of Waterloo Sewage Treatment Plant outfall near downgradient area. • Ecological impact limited to areas where the water divertment structure was installed. • Medium water treatment costs due to low water volume to be treated. • Bayard Street Culvert investigation and restoration would not be required. • Medium water treatment costs. • Improves flexibility regarding future use of the water body.	• Removal of impacted sediment will protect the environment and prevent downstream migration to environmental receptors. • Requires shortest time to achieve remedial action objectives. • Long-term benefits will be observed with deposition of cleaner upstream sediments. • Ecological impact limited to areas where the water divertment structure was installed. • Medium water treatment costs due to low water volume to be treated. • Does not require total shut down of canal. • Lower risk to personnel due to lowered water column.
Disadvantages	• High safety risk due to working under water, and with hand held suction pump. • Long duration to achieve removal of impacted material and remedial action objectives. • Complex equipment (pump and dewater/filter dredged sediment). • Very high potential for human exposure to impacted sediment during remediation. • Multiple diving teams are required due to short diving time of maximum 3½ hours per day. • Sediment may enter in resuspension and be transported downstream. • Settling or dewatering system is required, and large volume of water generated from dewatering activities will need to be managed. • Very high water treatment costs due to large quantity of water to be managed.	• Intensive water management necessary. Enclosed area requires dewatering, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc. • Installation of water divertment structure in high water column may not be technically feasible, at the least it will take a long time, be very disruptive to surrounding community, be very costly and has potential safety issues. The divertment structure may have slow leaks, suffer freezing if they are exposed to very cold weather for an extended period of time, and may roll from the location it was installed, if there is a significant flow or height of water on one side of the bladders while the other side is dry. • Some vegetation removal would be required at the canal bank for access to remediation areas. • Rerouting of facility outfall discharge piping will be needed.	• Intensive water management. Enclosed area requires dewatering, and additional water management may be required due to stormwater run off, snow melt, rain, groundwater infiltration, etc. • Increased potential human exposure to impacted sediment during remediation. • Some vegetation removal would be required at the canal bank for access to remediation areas. • Rerouting of facility outfall discharge piping will be needed. • May require potential water management of the Village of Waterloo Sewage Treatment Plant outfall near the Downstream Deposit.
Design Component Assumptions	• 7,210 cubic yards of impacted sediment to be removed (North Shore Deposit - 1,000 cubic yards, Gorham Street Deposit - 4,400 cubic yards and Downstream Deposit - 1,810 cubic yards). • Need to enclose work area with silt curtain to prevent transport of sediment that may enter in resuspension and be transported downstream. • A temporary onsite water treatment system will be needed for treatment of solids in water derived from the sediment dewatering and decontamination activities.	• 7,210 cubic yards of impacted sediment to be removed (North Shore Deposit - 1,000 cubic yards, Gorham Street Deposit - 4,400 cubic yards and Downstream Deposit - 1,810 cubic yards). • Portadam water divertment structure will be installed around the RTAs. • Construction of access roads is needed at areas to be remediated. • Approximately 2,000 ft of piping will be needed to reroute the facility outfalls discharge piping. • A temporary onsite water treatment system will be needed for treatment of solids in water derived from the sediment dewatering and decontamination activities.	• 7,210 cubic yards of impacted sediment to be removed (North Shore Deposit - 1,000 cubic yards, Gorham Street Deposit - 4,400 cubic yards and Downstream Deposit - 1,810 cubic yards). • Need to enclose work area with Portadam, Aqua-Barrier or similar water divertment structure. • Construction of access roads is needed at areas to be remediated. • Approximately 2,000 ft of piping will be needed to reroute the facility outfalls discharge piping. • The structural integrity of Bayard Street culvert will need to be evaluated to understand existing conditions and consider if rehabilitation is required prior to partial dewatering of the canal. • A temporary onsite water treatment system will be needed for treatment of solids in water derived from the sediment dewatering and decontamination activities.
Overall protection of human health and the environment	• Protective because remedial action objective (RAO) will be achieved by complete removal of reemdial target areas (RTAs).	• Protective because RAO will be achieved by complete removal of RTAs.	• Protective because RAO will be achieved by complete removal of RTAs.
Compliance with standards, criteria and guidance (SCGs)	• Complies with SCGs by removing impacted sediment from RTAs.	• Complies with SCGs by removing impacted sediment from RTAs.	• Complies with SCGs by removing impacted sediment from RTAs.
Effectiveness	• High because impacted sediment from RTAs will be removed.	• Very high because impacted sediment from RTAs will be removed.	• Very high because impacted sediment from RTAs will be removed.
Reduction of toxicity, mobility, or volume (TMV) through treatment	• Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.	• Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.	• Implementation of this remedy will not reduce its toxicity or volume, but will decrease mobility by being placed in a controlled landfill.
Short-term effectiveness	• Effective as it removes impacted sediment and does not have rebound potential.	• Effective as it removes impacted sediment and does not have rebound potential.	• Effective as it removes impacted sediment and does not have rebound potential.
Implementability	• Challenging to perform safely. • Permits and agreements are required.	• Medium, when compared to other options. Most technically difficult option, and largest footprint of all alternatives. • Permits and agreements are required.	• Less challenging when compared to other options because of the small water column, smaller quantity of water to be managed and treated, and small footprint. • Permits and agreements are required.
Long-Term Risks	• Divers may be exposed to impacted sediment. • Limited. All of the impacted sediment may not be removed due to resuspension and transport of sediment in the water column.	• None. All impacted media is immediately removed during remedy.	• None. All impacted media is immediately removed during remedy.
Uncertainties	• Volume of unremoved impacted sediment due to resuspension. • Amount of exposure to divers. • Extent of turbidity due to re-suspension of sediment.	• Groundwater infiltration in dewatered canal is unknown. • Impacts of dewatering to underground structures.	• Groundwater infiltration in dewatered canal is unknown. • Impacts of dewatering to underground structures.
Time frame	• Medium timeframe; to set up sediment dewatering and water treatment system.	• Longest timeframe because of the time required to install up the water divertment structure.	• Medium timeframe; to set up sediment dewatering and water treatment system.

Option	Alternative 2 Diver-Assisted Hydraulic Dredging	Alternative 3 Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions	Alternative 4 Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions
Schedule	• Implementation schedule depends on Weather Considerations and NYS Canal Corporation giving final approval to work on canal. • Short field schedule because construction of roads and water divertment structures is not needed. • Depends on permit approvals and regulatory approval of the CMS.	• Implementation schedule depends on weather considerations and NYS Canal Corporation giving final approval to work on canal. • Depends on permit approvals and regulatory approval of the CMS.	• Excavation schedule depends on NYS Canal Corporation (NYSCC) schedule to dewater the canal to allowable levels; NYSCC has committed to 12/1/12 dewatering of the canal. • Shorter field schedule than Alternative 3 because less time is required for the installation/removal of the water divertment structure. • Depends on permit approvals and regulatory approval of the CMS.
Sustainability	• Is not sustainable since water treatment system is required, and large volume of water generated from dewatering activities will need to be managed, treated for solids, and discharged to the canal.	• Although the barrier material is reusable, it is not sustainable because excessive costs due to installation of the water divertment structure, amount of water that will need to be managed, treated for solids, and the high number of pumps needed to dewater the work area.	• Is sustainable because lower costs for installation of the water divertment structure in a smaller water column, less amount of water that will need to be managed, treated for solids, and smaller number of pumps needed to dewater the work area. The barrier material is reusable. This technology has the minimal long term effect on the environment because it allows the RTAs to be addressed realtively quickly and effectively.
Land use	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.	• Protective of future, current and historical land use.
Community acceptance	• Uncertain, but probably acceptable because impacted sediment will be removed, and water levels in the canal for recreation will not be affected.	• Uncertain, but probably acceptable because it removes all of the impacted sediment, and does not affect water levels in the canal for recreation purposes. May have community concern over area flooding.	• Uncertain, but probably acceptable because the remedy removes all the impacted sediment and does not require total shutdown of navigational channel.
Cost **Costs are -30/+50** **(30 year net worth not applicable due to no O&M)**	High Design: $ 939,000 Outfall discharge relocation: $ 300,000 Daily performance and operations monitoring : $ 616,000 Water divertment structure installation and removal: $0MM Sediment removal: $ 1,891,000 Water treatment: $ 1,216,000 Sediment transport & disposal: $ 584,000 Site Preparation and Restoration: $ 1,408,000 Permits: $ 70,000 Reporting: $ 30,000 **Total: $ 7,098,000**	• High Design: $ 894,000 • Outfall discharge relocation: $ 190,000 • Daily performance and operations monitoring : $ 383,000 • Water divertment structure installation and removal: $ 1.587.000 • Sediment removal: $ 529,000 • Water treatment: $ 865,000 • Sediment transport & disposal: $ 584,000 Site Preparation and Restoration: $ 1,294,000 • Permits: $ 70,000 • Reporting: $ 30,000 • **Total: $ 6,426,000**	• Medium Design: $ 869,000 • Outfall discharge relocation: $ 155,000 • Daily performance and operations monitoring : $ 232,000 • Water divertment structure installation and removal: $ 1.046.000 • Sediment removal: $ 529,000 • Water treatment: $ 738,000 • Sediment transport & disposal: $ 584,000 Site Preparation and Restoration: $ 680,000 • Permits: $ 70,000 • Reporting: $ 25,000 • **Total: $ 4,928,000**

Appendix B. Evaluation of Proposed Remedial Alternatives
Corrective Measures Study for AOC A – Seneca-Cayuga Canal
Former Hampshire Chemical Corp. Facility, Waterloo, New York
Alternative 2 - Diver-Assisted Hydraulic Dredging

Assumptions

1 Assumptions are based on known conditions and may need to be slightly adjusted as details of sediment dewatering and removal are refined.
2 Fieldwork can be completed within a four to five month period if started in December 2012.
3 All applicable permits will be obtained prior to performing the fieldwork.
4 Only the sediment demarcated in the North Shore, Gorham Street and the western portion of the Downstream deposits will be removed and is estimated to be 7,210 cubic yards (10,815 tons). One cubic yard of sediment is assumed to weigh 1.5 tons.
5 The remedial action objective (RAO) for the North Shore and Gorham Street deposits is removal of all soft sediment deposits with a grain size of less than 2mm.
6 The RAO in the downstream deposit is two feet sediment removal on western edge of downstream deposit (SD-71 to SD-73), and removal of 1 foot of sediment along the northern bank of the Downstream Deposit from SD-73 to Silver Creek, in the portion of the deposit from SD-74 to the northern edge of soft sediment accumulation.
7 A barge based pump with cutter head system and crew will be used to perform the hydraulic dredging.
8 Lowering of the water level in the canal is not required.
9 Diver assisted hydraulic removal will be performed.
10 A rescue boat and pilot will be required during the hydraulic dredging activities.
11 No dewatering of remedial target areas (RTAs) is required.
12 Post-hydraulic dredging confirmation sampling is not required to be performed at RTAs.
13 Long-term monitoring of sediment deposits in AOC A of the Seneca-Cayuga Canal is not required.
14 All IDW water generated from sediment dewatering and decontamination activities will be treated for solids by a temporary onsite water treatment system.
15 Includes staging area, dewatering pad, and laydown area.
16 Biological sampling is not required.
17 In the event that excavated sediments cannot be appropriately dewatered to meet disposal facility requirements or are above TCLP limits located in 40 CFR 261.24, a drying/stabilization agent will be added to these sediments prior to offsite disposal at an approved landfill. Hazardous waste, if generated, will be managed and disposed of in accordance with 40 CFR 262 (USEPA 1980b).
18 A five person management team will be onsite and includes a project specific health and safety (H&S) coordinator who will perform daily H&S monitoring.
19 State and local taxes are not included and will be added where applicable.
20 No special insurances are included at this time and will be added where applicable.
21 Adequate access in the area east of the Gorham Street bridge will be granted to build the necessary equipment laydown and contractor staging area.
22 All sediment from the RTAs will be able to be dewatered out of the canal in sediment dewatering pads using Geotubes.
23 Rerouting of the facility outfalls discharge points is not required.
24 Field work will be performed during multiple 10 hour per day shifts, six days a week to meet the project schedule.
25 No staff will work greater than 10 hours a day for more than 10 days in row without a break of at least 4 days.
26 Prevention measures with be taken during the field work to not damage surface or side slopes, or utilities.
27 Access road(s) will not need to be constructed from the canal bank into the RTAs.
28 Canal bank and site restoration is included and equipment laydown areas will be restored to similar to original conditions.
29 The construction laydown area can be restored with a 4 inch top soil coating and one seeding with a native grass seed mix. No watering is assumed.
30 All work will be conducted in Modified Level D personal protective equipment.
31 There will be no delays caused by facility operations, the surrounding neighbors, or any outside party of interest.
32 No negotiations with Seneca Falls Power Corporation are required.
33 Full or near full canal conditions preclude assessment and structural integrity protection needs at Bayard Street culvert.

Alternative 3 - Mechanical Excavation Following Isolation Using Portadam Under Watered Conditions

Assumptions

1 Assumptions are currently based on known conditions and may need to be slightly adjusted as details of dewatering and removal are refined.
2 Fieldwork can be completed within a four to five month period if started in December 2012.
3 All applicable permits will be obtained prior to performing the fieldwork.
4 Only the sediment demarcated in the North Shore, Gorham Street and portions of the Downstream deposits will be removed and is estimated to be 7,210 cubic yards.
5 The remedial action objective (RAO) for the North Shore and Gorham Street deposits is removal of all soft sediment deposits with a grain size of less than 2mm.
6 The RAO in the downstream deposit is two feet sediment removal on western edge of downstream deposit (SD-71 to SD-73), and removal of 1 foot of sediment along the northern bank of the Downstream Deposit from SD-73 to Silver Creek, in the portion of the deposit from SD-74 to the northern edge of soft sediment accumulation.
7 Some lowering of the water level in the canal may be required.
8 Mechanical excavators will be used to perform the sediment removal.
9 Dewatering of the RTAs is required.
10 Sediment in the south portion of the Gorham Street deposit will be pulled back to the north prior to water divertment structure installation.
11 Post-excavation confirmation sediment sampling will not be performed at RTAs because either no sediment will left to sample, or toxicity data adequately defined the lateral and vertical extent of the removal.
12 Portadam technology will be used to create isolation areas at each RTA from the flow of canal water.
13 Biological sampling is not required
14 Air monitoring will be performed during the field activities
15 Long-term monitoring of sediment deposits in AOC A of the Seneca-Cayuga Canal is not required.
16 Water level outside the isolation barriers will be similar to original conditions. The volume of water that infiltrates in the isolation barriers can be managed with a 10" bypass pump.
17 Decontamination water, all water that enters in contact with the active excavation areas and water generated from sediment dewatering activities will be treated for solids via the temporary onsite water treatment plant.
18 Staging area, dewatering pad and laydown area will be set up in the vicinity of the canal.
19 Adequate access (east of the Gorham Street Bridge) will be granted to build the necessary equipment laydown/ contractor staging area.
20 Surrounding surface soil will be contained and managed as to not enter or impact the canal.
21 In the event that excavated sediments cannot be appropriately dewatered to meet disposal facility requirements or are above TCLP limits located in 40 CFR 261.24, a drying/stabilization agent will be added to these sediments prior to offsite disposal at an approved landfill. Hazardous waste, if generated, will be managed and disposed of in accordance with 40 CFR 262 (USEPA 1980b).
22 A three person management team will be onsite and includes a project specific H&S coordinator who will perform daily H&S monitoring.
23 State and local taxes are not included and must be added where applicable.
24 No special insurances are included at this time and will be added where applicable.
25 Community acceptance on remedy is obtained.
26 Rerouting of the facility outfalls discharge points is required.
27 Field work will be performed during multiple 10 hour per day shifts, six days a week to meet the project schedule.
28 No staff will work greater than 10 hours a day for more than 10 days in row without a break of at least 4 days.
29 Prevention measures with be taken during the field work to not damage surface or side slopes, or utilities.
30 Access road will need to be constructed from the canal bank into the RTAs.
31 Canal bank and site restoration is included and will be restored to similar to original conditions.
32 The construction lay down area can be restored with a 4 inch top soil coating and one seeding with a native grass seed mix. No watering is assumed.
33 All work will be conducted in Modified Level D personal protective equipment.
34 There will be no delays caused by facility operations, the surrounding neighbors, or any outside party of interest.
35 Negotiations with Seneca Falls Power Corporation may be required depending on canal water depth.
36 Full or near full canal conditions preclude assessment and/or structural integrity protection needs at Bayard Street culvert.

Appendix B. Evaluation of Proposed Remedial Alternatives

Corrective Measures Study for AOC A – Seneca-Cayuga Canal

Former Hampshire Chemical Corp. Facility, Waterloo, New York

Alternative 4 - Mechanical Excavation Following Isolation Using Portadam, Aqua-Barrier, or Similar Water Divertment Structure Under Partially Dewatered Conditions

Assumptions

1 Assumptions are currently based on known conditions and may need to be slightly adjusted as details of dewatering and removal are refined.
2 Fieldwork can be completed within a four to five month period if started in December 2012.
3 All applicable permits will be obtained prior to performing the fieldwork.
4 Only the sediment demarcated in the North Shore, Gorham Street and portions of the Downstream deposits will be removed and is estimated to be 7,210 cubic yards.
5 The remedial action objective (RAO) for the North Shore and Gorham Street deposits is removal of all soft sediment deposits with a grain size of less than 2mm.
6 The RAO in the downstream deposit is two feet sediment removal on western edge of downstream deposit (SD-71 to SD-73), and removal of 1 foot of sediment along the northern bank of the Downstream Deposit from SD-73 to Silver Creek, in the portion of the deposit from SD-74 to the northern edge of soft sediment accumulation.
7 Lowering of the water level in the canal is required.
8 Mechanical excavators will be used to perform the sediment removal.
9 Dewatering of the RTAs is required.
10 Sediment in the south portion of the Gorham Street deposit will be pulled back to the north prior to water divertment structure installation.
11 Post-excavation confirmation sediment sampling will not be performed at RTAs because either no sediment will left to sample, or toxicity data adequately defined the lateral and vertical extent of the removal.
12 Portadam or Aqua-Barrier technology will be used to create isolation areas at each RTA from the flow of canal water.
13 Biological sampling is not required.
14 Air monitoring will be performed during the field activities.
15 Long-term monitoring of sediment deposits in AOC A of the Seneca-Cayuga Canal is not required.
16 Water level outside the isolation barriers will not be similar to original conditions, and will be approximately less than 2 feet high. The volume of water that infiltrates in the isolation barriers can be managed with a 10" bypass pump.
17 Decontamination water, all water that enters in contact with the active excavation areas and water generated from sediment dewatering activities will be treated for solids via the temporary onsite water treatment plant.
18 Adequate access (east of the Gorham Street Bridge) will be granted to build the necessary equipment laydown/ contractor staging area.
19 Staging area, dewatering pad and laydown area will be set up in the vicinity of the canal.
20 Surrounding surface soil will be contained and managed as to not enter or impact the canal.
21 In the event that excavated sediments cannot be appropriately dewatered to meet disposal facility requirements or are above TCLP limits located in 40 CFR 261.24, a drying/stabilization agent will be added to these sediments prior to offsite disposal at an approved landfill. Hazardous waste, if generated, will be managed and disposed of in accordance with 40 CFR 262 (USEPA 1980b).
22 A three person management team will be onsite and includes a project specific H&S coordinator will perform daily H&S monitoring.
23 State and local taxes are not included and must be added where applicable.
24 No special insurances are included at this time and will be added where applicable.
25 Community acceptance on remedy is obtained.
26 Rerouting of the facility outfalls discharge points is required.
27 Field work will be performed during multiple 10 hour per day shifts, six days a week to meet the project schedule.
28 No staff will work greater than 10 hours a day for more than 10 days in row without a break of at least 4 days.
29 Prevention measures with be taken during the field work to not damage surface or side slopes, or utilities.
30 Access road(s) will need to be constructed from the canal bank into the RTAs.
31 Canal bank and site restoration is included and will be restored to similar to original conditions.
32 The construction lay down area can be restored with a 4 inch top soil coating and one seeding with a native grass seed mix. No watering is
33 All work will be conducted in Modified Level D personal protective equipment.
34 There will be no delays caused by facility operations, the surrounding neighbors, or any outside party of interest.
35 Negotiations with Seneca Falls Power Corporation are required to successfully manage canal flow.
36 Assessment and/or structural integrity protection needs will need to be addressed at Bayard Street culvert.

Appendix C

Permits Under Consideration

AGENCY	AUTHORITY	PERMITTING AGENCY and POINT OF CONTACT	ACTIVITY COVERED
1. JOINT PERMIT APPLICATION			
USACE	CWA Section 404, 10	Maggie Crawford, Auburn Field Office (315-704-0256), and Mark Scalabrino, Regulatory Chief, Buffalo District, New York Section (716-879-4327)	Mechanical excavation and restoration
NYSDEC	Article 15, 6NYCRR Part 608, Protection of Waters	Tom Haley, NYSDEC, (585-226-5393)	Mechanical excavation and restoration
NYSDEC	Article 24, 6NYCRR Part 663, Freshwater Wetlands	Tom Haley, NYSDEC (585-226-5393)	Mechanical excavation and restoration
NYSDEC	CWA Section 401	Tom Haley, NYSDEC (585-226-5393)	Mechanical excavation and restoration
USFWS	Federal T&E Species, Endangered Species Act	Robyn Niver or Sandy Duran, USFWS T&E Species Coordinator, New York Ecological Field Office (607-753-9334)	All activities
NYSDEC	State T&E Species Consultation, 6NYCRR Part 182	Jean Pietrusiak, NYSDEC, Natural Heritage Program (518-402-8935)	All activities
NYS Historic Preservation Office (SHPO)	Cultural Resources Section 106	Nancy Herter, NYS Historic Preservation Office, (518-237-8643 ext 3280)	On-shore activities
2. Canal Work Permit			
Canal Work Permit	Rules and Regulations of the NYS Canal Corporation	Neil Vellone, NYS Canal Corporation (315-438-2403)	Mechanical excavation and restoration
3. State Lands Permit/ Authorization			
NYS Education Department	NYS Education Department	Christina Rieth (518-402-5975)	State land activities
4. Floodplain Permit			
Floodplain Permit	Village of Waterloo per NYSDEC approval	Karis Manning, Environmental Engineer, NYSDEC, Region 8 (585-226-5445) and Dan Driscoll, Village of Waterloo (315-539-9131)	On-shore activities
5. Soil Erosion and Sediment Control Plan			
NYSDEC	Seneca County Soil and Water Conservation District	Seneca County Soil and Water Conservation District (315- 568-4366)	Soil disturbance
6. Stormwater Discharge due to Construction Activities Permit No. GP-O-IO-00 I			
NYSDEC	State Pollutant Discharge Elimination System (SPDES)	Division of Water 625 Broadway Albany, NY 12233-3505 518-402-8111	Construction activities that disturb one or more acre of soils. Requires the preparation of a Stormwater Pollution Prevention Plan.
7. Relocation of Facility Outfalls			
NYSDEC	State Pollutant Discharge Elimination System (SPDES)	Tom Haley NYSDEC (585-226-5393)	Creation of "Dry Zones" in the vicinity of the facility by relocating facilty outfall discharge points downgradient of the work area and across the canal.
8. Permission to Dredge/ Discharge Treated Canal Water Back into the Canal			
NYSDEC	Article 15, 6NYCRR Part 608, Protection of Waters	Tom Haley NYSDEC (585-226-5393)	Mechanical excavation activity. Discharge of treated canal water back into the canal; treatment for solids may be required.
8. Permission to Discharge to the local POTW - Not Applicable			
Waterloo Sewage Treatment Plant	*NYSDEC Division of Water Engineers and Waterloo Sewage Treatment Plant. No permit application to be submitted.*	*Dixon Rollins, NYSDEC Division of Water Engineers (585-226-5468)*	*Discharge of treated canal water.*
9. NYSDOT Permit to Run Trucks for Waste Disposal			
Local Department of Transportation	Local Department of Transportation	Chris Covert New York State Department of Transportation - Waterloo Division (315) 539-3112	Access routes around the work area, and for transport to the Seneca Meadows Landfill, Waterloo, NY.
10. Letter to the Village of Waterloo for permission to use their property. Amendment of existing access agreement for potential construction activities (e.g. access road construction).			
Village of Waterloo	Village of Waterloo	Steve Ward Village of Waterloo Public Works (315) 539-9393	General access for construction equipment.
11. Waste stabilization via mixing of drying or fixation agents.			
NYSDEC	Article 15, 6NYCRR Part 608, Protection of Waters	Article 15 Permit	Waste Disposal
12. Amendment to Revocable Permit No. C3W120008 Granting Access to NYS Canal Corporation property until December, 2012			
New York State Canal Corporation (NYSCC)	NYSCC	Neil Vellone New York State Canal Corporation P.O. Box 308 East Syracuse, NY 13057- 0308	Access to canal lands from Lock C/S 4 to Lock C/S 2/3 to complete a visual outfall survey. sediment sampling and site walks with potential subcontractors.

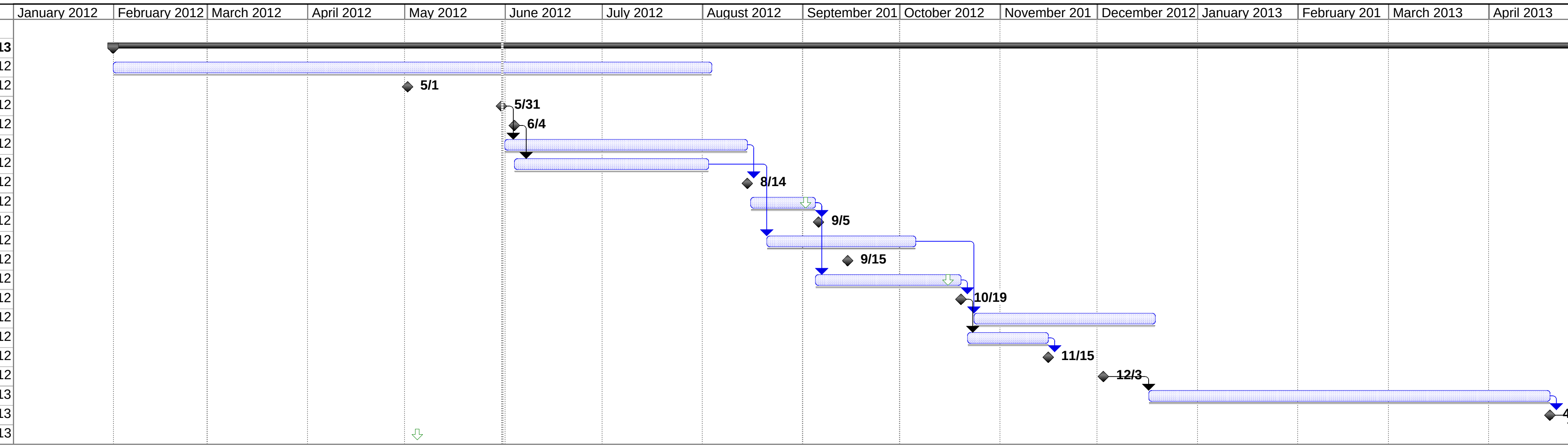
Notes:

A NYSDEC Division of Water Engineer representative (Mr. Dixon Rollins) and the POTW Plant Manager (Mr. Robert Loach "Bob") verbally indicated in December, 2011, that the POTW is currently operating at full capacity and is unable to accept additional volume per an order from the NYSDEC. Therefore, there it is not necessary to obtain permission to discharge to the POTW.

Appendix D
Project Schedule

Appendix D. Project Schedule and Major Milestones
Corrective Measures Study for AOC A - Seneca-Cayuga Canal
Former Hampshire Chemcical Corp. Facility, Waterloo, New York

ID	Task Name	Duration	Start	Finish
1				
2	**Project Schedule - Waterloo Sediment Removal Remedial Activities**	**454 days**	**Wed 2/1/12**	**Mon 4/29/13**
3	Permit Applications and Access Coordination	185 days	Wed 2/1/12	Fri 8/3/12
4	Receipt of NYSDEC Response on Impact Assessment Report	0 days	Tue 5/1/12	Tue 5/1/12
5	Submittal of CMS to NYSDEC	0 days	Thu 5/31/12	Thu 5/31/12
6	Submittal of 30% Basis of Design to NYSDEC	0 days	Mon 6/4/12	Mon 6/4/12
7	Preparation of Draft Statement of Basis (NYSDEC)	75 days	Fri 6/1/12	Tue 8/14/12
8	Final Design	60 days	Mon 6/4/12	Thu 8/2/12
9	Publish Draft Statement of Basis (NYSDEC	0 days	Tue 8/14/12	Tue 8/14/12
10	Preparation of Public Notice (NYSDEC)	20 days	Thu 8/16/12	Tue 9/4/12
11	Publish Public Notice (NYSDEC)	0 days	Wed 9/5/12	Wed 9/5/12
12	Contracting	46 days	Tue 8/21/12	Fri 10/5/12
13	Public Meeting	0 days	Sat 9/15/12	Sat 9/15/12
14	Public Comment Period (NYSDEC)	45 days	Wed 9/5/12	Fri 10/19/12
15	End of Public Comment Period (NYSDEC)	0 days	Fri 10/19/12	Fri 10/19/12
16	Contractor Mobilization	56 days	Wed 10/24/12	Tue 12/18/12
17	Develop Final Statement of Basis (NYSDEC)	25 days	Mon 10/22/12	Thu 11/15/12
18	Publish Final Statement of Basis (NYSDEC)	0 days	Thu 11/15/12	Thu 11/15/12
19	Water Shut Off in Canal (NYS Canal Corporation)	0 days	Mon 12/3/12	Mon 12/3/12
20	Sediment Removal Activities (2 weeks after partial dewatering)	124 days	Mon 12/17/12	Fri 4/19/13
21	End of Sediment Removal Activities and Site Restoration	0 days	Fri 4/19/13	Fri 4/19/13
22	Water Restart in Canal (NYS Canal Corporation)	1 day	Mon 4/29/13	Mon 4/29/13



Project: Waterloo, NY Sediment Removal Schedule Date: Thu 5/31/12	Task		Progress		Summary		External Tasks		Deadline	
	Split		Milestone		Project Summary		External Milestone			