SED-31

REGION 5 RAC2

REMEDIAL ACTION CONTRACT FOR

Remedial, Enforcement Oversight, and
Non-Time Critical Removal Activities at Sites of Release
or Threatened Release of Hazardous Substances in Region 5

QUALITY ASSURANCE PROJECT PLAN

Revision 3

Remedial Investigation/Feasibility Study

Eighteenmile Creek Area of Concern

Niagara County, New York

WA No. 051-RICO-1527/Contract No. EP-S5-06-01

November 2009

PREPARED FOR

U.S. Environmental Protection Agency

PREPARED BY

CH2M HILL
Ecology and Environment, Inc.
Environmental Design International, Inc.
Teska Associates, Inc.

FOR OFFICIAL USE ONLY

Quality Assurance Project Plan
Eighteenmile Creek Area of Concern
Niagara County, New York

Remedial Investigation/Feasibility Study

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November 2009
Revision 3

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Great Lakes National Program Office
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Quality Assurance Project Plan
Eighteenmile Creek Area of Concern
Niagara County, New York
Remedial Investigation/Feasibility Study
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Great Lakes National Program Office

Prepared by:

CH2M HILL, Inc.

Ecology and Environment Engineering, P.C.

The following personnel or their designees have reviewed the Quality Assurance Project Plan (QAPP) and concurred with the contents.

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Louis Blume — Date
USEPA Great Lakes National Program Office QA Manager

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Mary Beth Ross — Date
USEPA Great Lakes National Program Office Work Assignment Manager

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Jewelle Keiser — Date
CH2M HILL – Site Manager

____

Kris Erickson — Date
EEEPC – Assistant Site Manager

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List of Acronyms

AOC	–	Area of Concern
ASM	–	Aassistant Ssite Mmanager
AVS/SEM	–	acid volatile sulfides/simultaneously extracted metals
Bgs	–	Below ground surface
BUI	–	beneficial use impairment
CDF	–	confined disposal area
CLP	–	Contract Laboratory Program
cm	–	centimeter
COC	–	chain-of-custody
COR	–	contracting office representative
CPR	–	cardiopulmonary resuscitation
CRDLs	–	contract-required detection limits
CSO	–	combined sewer outflow
DOT	–	Department of Transportation
DQOs	–	data quality objectives
DUSRs	–	Data Usability Summary Reports
EDD	–	electronic data deliverable
EDP	–	electronic data processor
EEEPC	–	Ecology and Environment -Engineering, P.C.
ELAP	–	Environmental Laboratory Accreditation Program
FID	–	Flame Ionization Detector
FS	–	feasibility study
FSP	–	Field Sampling Plan
FSP SOW	–	Field Sampling Plan Scope of Work
FTL	–	Field Team Leader
GC/MS	–	gas chromatography/mass spectrometry
GIS	–	geographic information system
GLLA	–	Great Lakes Legacy Act
GLNPO	–	Great Lakes National Program Office
GPS	–	global positioning system
IATA	–	International Air Transport Association
ICP	–	inductively coupled plasma
ICV	–	initial calibration verification
IJC	–	International Joint Commission
in situ POM	–	in situ particulate organic matter
LCS	–	laboratory control samples

List of Abbreviations and Acronyms (cont.)

LEL	–	lowest effect level
LIMS	–	laboratory information management system
LWD	–	large woody debris
MDL	–	method detection limit
µg/kg	–	micrograms per kilogram
mg/kg	–	milligrams per kilogram
MS/MSD	–	matrix spike/matrix spike duplicate
NCR	–	Nonconformance Report
NCSWCD	–	Niagara County Soil and Water Conservation District
NYSDEC	–	New York State Department of Environmental Conservation
NYSDOH	–	New York State Department of Health
PAH	–	polycyclic aromatic hydrocarbons
PARCC	–	precision, accuracy, representativeness, completeness, and comparability
PCBs	–	polychlorinated biphenyls
PCDD/F	–	polychlorinated dibenzodioxins/furans
PCOC	–	potential contaminants of concern
PCT	–	Project Coordination Team
PDOP	–	position dilution of precision
PID	–	photoionization detector
ppb	–	parts per billion
ppm	–	parts per million
ppt	–	Part per trillion
QA/QC	–	quality assurance/quality control
QAPP	–	Quality Assurance Project Plan
RAP	–	Remedial Action Plan
RI	–	remedial investigation
ROD	–	Record of Decision
RPD	–	relative percent difference
RSD	–	relative standard deviation
SDG	–	sample delivery group
SM	–	Site Manager
SNR	–	Signal-to-noise ratio
SOPs	–	Standard Operating Procedures
SPDES	–	State Pollutant Discharge Elimination System
SRI	–	supplemental remedial investigation
TA	–	Test America
TAGM	–	Technical and Administrative Guidance Memorandum
TAL	–	Target Analyte List
TCL	–	Target Compound List
TCLP	–	toxicity characteristic leaching procedure
TEQ	–	toxic equivalent

List of Abbreviations and Acronyms (cont.)

TOC	–	total organic carbon
USACE	–	United States Army Corps of Engineers
USEPA	–	United States Environmental Protection Agency
WA	–	Work Assignment
WAM	–	Work Assignment Manager

Distribution List

Party	Affiliation and Title	Revision	Date Sent
Eighteenmile Creek QAPP Site Reconnaissance Survey Draft			
Jewelle Keiser	CH2M HILL Site Manager	1	November 2008
Kris Erickson	EEEPC Assistant Site Manager	1	November 2008
Diana Mally	USEPA Work Assignment Manager	1	November 2008
Louis Blume	USEPA QA Officer	1	November 2008
Julie Rupp	Field Team Leader	1	November 2008
Eighteenmile Creek QAPP Site Reconnaissance Survey Final Phase 1			
Jewelle Keiser	CH2M HILL Site Manager	2	December 2008
Kris Erickson	EEEPC Assistant Site Manager	2	December 2008
Victor DiGiacomo	NCSWCD Project Manager	2	December 2008
Diana Mally	USEPA Work Assignment Manager	2	December 2008
Louis Blume	USEPA QA Officer	2	December 2008
Julie Rupp	Field Team Leader	2	December 2008
Eighteenmile Creek QAPP Phase 2 Draft			
Jewelle Keiser	CH2M HILL Site Manager	3	November 2009
Kris Erickson	EEEPC Assistant Site Manager	3	November 2009
Victor DiGiacomo	NCSWCD Project Manager	3	November 2009
Mary Beth Ross	USEPA Work Assignment Manager	3	November 2009
Louis Blume	USEPA QA Officer	3	November 2009
To Be Determined	EEEPC Field Team Leader	3	November 2009

1 Project Management

This Quality Assurance Project Plan (QAPP) has been prepared pursuant to Work Assignment (WA) No. 051-RICO-1527 issued to CH2M HILL under United States Environmental Protection Agency (USEPA) Remedial Action Contract (RAC) 2, No. EP-S5-06-01. This QAPP has been prepared to explain the specific quality assurance/quality control (QA/QC) procedures that CH2M HILL's team subcontractor, Ecology and Environment Engineering, P.C. (EEEPC), will implement during the remedial investigation/feasibility study (RI/FS) of the Eighteenmile Creek Area of Concern (AOC), in Niagara County, New York. The Eighteenmile Creek AOC addressed under this QAPP is described in Section 1.2.

The RI is being conducted to evaluate the nature and extent of contamination in the sediments throughout the AOC, with the primary focus being on the unevaluated area between Lockport and the dam in Burt. The investigation involves two phases. The first phase consisted of a reconnaissance survey of the AOC to identify the physical characteristics of the creek and potential sediment depositional areas. The field work began in winter 2008 and was completed in spring 2009, and the site reconnaissance report was submitted in July 2009. A small section of the creek was re-surveyed in greater detail in October 2009, prior to completion of this Field Sampling Plan (FSP) and QAPP.

The observations and results of the preliminary phase of the investigation were used to develop the objectives and approach for sediment sampling and the analytical program to be implemented during the second phase of the investigation. The second phase of the investigation is scheduled to be implemented in fall 2009 and spring 2010. The estimated completion date for the entire WA is September 30, 2010.

This QAPP was used to implement the site reconnaissance survey and has been updated for the second phase of the investigation. In addition, an FSP has been prepared separately to describe the field sampling procedures and sample locations. This QAPP is provided as an appendix to the FSP.

The Eighteenmile Creek Great Lakes Legacy Act (GLLA) Project Coordination Team (PCT) includes the USEPA Great Lakes National Program Office (GLNPO), the Niagara County Soil and Water Conservation District (NCSWCD), the New York State Department of Environmental Conservation (NYSDEC), the United States Army Corps of Engineers (USACE), and USEPA Region 2. The PCT will be the end users of the site reconnaissance survey data and the sediment chemistry data. The reconnaissance data were used to develop this QAPP revision that details the sampling and analytical program for the second phase of the investigation.

This QAPP was developed in accordance with the four major sections provided in the USEPA QAPP guidance document (U.S. Environmental Protection Agency May 2006): Project Management, Data Generation and Acquisition, Assessment and Oversight, and Data Validation and Usability. In addition, the QAPP utilizes information that was included in the QAPPs approved by USEPA Region 2 for the *Eighteenmile Creek Beneficial Use Impairment Assessment* (Ecology and Environment Engineering, P.C. 2009a) and the *Eighteenmile Creek PCB Trackdown Study* (Ecology and Environment Engineering, P.C. 2009c).

1.1 Project Organization

The organizational chart for the CH2M HILL and EEEPC portion of this project is presented on Figure 1-1. The roles and specific QA responsibilities of key project personnel are described below.

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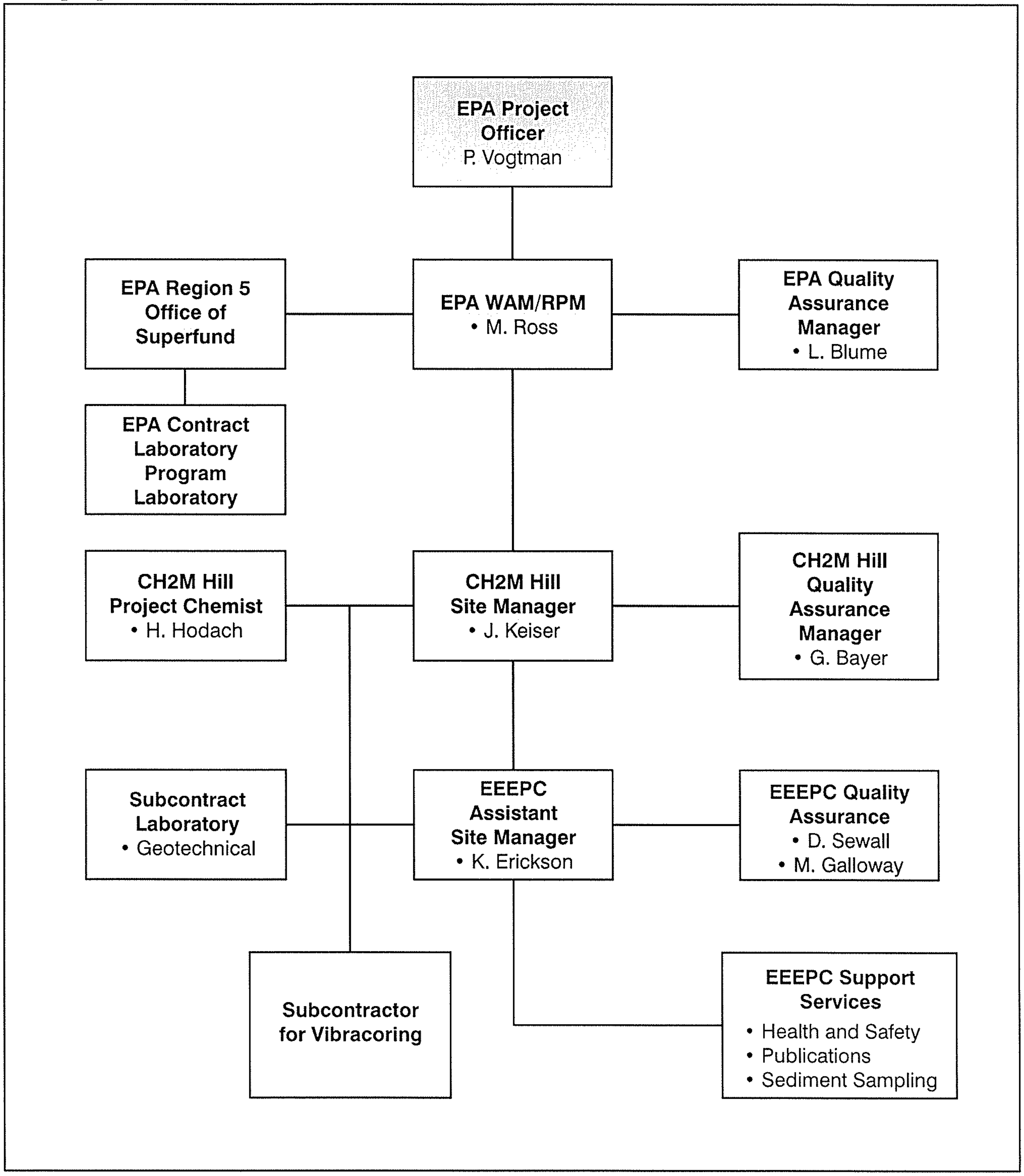

SOURCE: Ecology and Environment, Inc. 2009

Figure 1-1 Project Organization Chart
Eighteenmile Creek AOC RI/FS

Project Management Responsibilities

The USEPA GLNPO Work Assignment Manager (WAM) for this project is Mary Beth Ross. Ms. Ross will direct the work activities of the CH2M HILL and EEEPC project team, address potential deviations from planned activities, and approve corrective actions. In her absence, the USEPA GLNPO alternate contact is Marc Tuchman.

The CH2M HILL Site Manager (SM) for this project is Jewelle Keiser. Ms. Keiser will coordinate contract activities with the USEPA Project Officer and WAM; oversee day-to-day activities, including technical and administrative operations; and review and approve final reports and other work products.

The Assistant Site Manager (ASM) for this project is Kris Erickson of EEEPC. Mr. Erickson will coordinate with CH2M HILL to track schedules and budgets and manage subcontracted activities. He will also direct field activities, data review, and reporting activities associated with this project.

Quality Assurance (QA) Responsibilities

The USEPA GLNPO QA Manager for this project is Louis Blume. Mr. Blume will provide input to the planning process and review and approve this QAPP. Mr. Blume may elect to perform independent audits of any project activities and will assist the USEPA GLNPO WAM with addressing any QC nonconformance and associated corrective actions.

CH2M HILL and EEEPC have independent QA personnel assigned to this project (see Figure 1-1). They will remain independent of day-to-day, direct project involvement but will have the responsibility for ensuring that project QA/QC requirements are met. QA personnel will review and approve project deliverables and, as necessary, resolve any QA/QC problems, disputes, or deficiencies. The EEEPC QA leader assigned to this project is Marcia Meredith Galloway. She will be responsible for updating the QAPP when changes are necessary and distributing revisions to all personnel listed on the distribution list.

Project Chemist

EEEPC project chemists are responsible for laboratory coordination, review of data validation from the USEPA data validation contractor, data verification, and independent assessment of the hard copy and electronic analytical data. The Project Chemist will report nonconformance with the QC criteria to the appropriate managers and provide an assessment of the impact on data quality objectives (DQOs). EEEPC chemists will assess field QC samples and their impact on data usability. EEEPC's data validation will be reviewed by CH2M HILL's lead Project Chemist.

Field Personnel

The EEEPC Field Team Leader (FTL) for this project will be a senior-level geologist. The FTL will direct field operations and provide daily QC reports of field activities. The FTL will be responsible for identifying deviations from planned activities and obtaining approval of modifications to the field program.

GIS Personnel

Geographic information system (GIS) personnel for this project are responsible for coordinating with the FTL and site managers to set up a geodatabase prior to sampling. The GIS personnel will perform QC checks and maintain spatial layers and overall geodatabase integrity and accuracy in accordance with the QAPP. GIS personnel will provide the GIS-related outputs for reports.

Laboratories

Laboratories providing analytical services will be chosen as appropriate for the project and analytical requirements. The majority of analyses will be completed by USEPA Contract Laboratory Program (CLP) laboratories. The non-CLP laboratory analyses will be primarily geotechnical tests if these tests can be contracted via CLP. If laboratory support outside of the USEPA CLP is required, then the laboratory(ies) will be certified by the New York State

Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) for the analytical methods that they are contracted to perform. The NYSDOH ELAP certification does not apply to geotechnical testing. The laboratories will be selected based on qualifications and performance on previous USEPA RAC projects.

Other Subcontractors

An additional subcontractor will be hired to perform the proposed vibracore sampling in the areas behind Burt and Newfane dams. The subcontractor will be responsible for boat operation and collecting water depth, vibracoring, and water elevation readings. Subcontractors are responsible for rapid notification of CH2M HILL or EEEPC regarding nonconformance with the QAPP or QA/QC problems affecting implementation of the project.

1.2 Problem Definition/Background

The Eighteenmile Creek Remedial Action Plan (RAP) was jointly prepared by NYSDEC and the Eighteenmile Creek Remedial Action Contractor (RAC) in 1997. The RAP was prepared in response to a recommendation by the Water Quality Board of the International Joint Commission (IJC) that RAPs be prepared for the 43 areas of concern (AOCs) identified within the Great Lakes basin, including the Eighteenmile Creek AOC. The Niagara County soil and Water Conservation District (NCSWCD), with funding support from the USEPA's GLNPO, assumed management of the RAP as the Eighteenmile Creek RAP Coordinator in 2005. The NCSWCD has been historically involved in investigative and remedial activities and public education/outreach activities within communities affected by the Eighteenmile Creek AOC.

Eighteenmile Creek flows through central Niagara County, from its headwaters in the Town of Lockport to its discharge to Lake Ontario in Olcott, New York. The creek is surrounded by six residential townships, and many citizens own creek-front property. The investigation area is primarily in a rural/residential area. Sediment contamination in the area upstream of the AOC (in the Lockport area) has impacted residential properties adjacent to the creek. The portion of the creek within the AOC is used extensively for fishing, boating, and other forms of recreation.

Investigations completed in the 1980s and 1990s indicated that the sediments of Eighteenmile Creek within the AOC and in the Lockport area are contaminated with polychlorinated biphenyls (PCBs), metals, and dioxin. PCBs are factors in restrictions on fish and wildlife consumption, bird and animal deformities and reproductive problems, and degradation of benthos.

Surface sediment samples collected in 1994 from Olcott Harbor contained PCBs, metals, and the DDT pesticides metabolite DDE at concentrations indicating potential pollutions sources (Estabrooks et al. 1994). Ten of 15 fish flesh samples from the creek contained PCBs at levels above the U.S. Food and Drug Administration action level of 2.0 milligrams per kilogram (mg/kg). Sediment samples collected during NYSDEC investigations in an upstream portion of the creek (Flintkote site) contained PCBs at a concentration of 49 mg/kg (New York State Department of Environmental Conservation 1997).

NYSDEC conducted a limited sediment sampling program in1998 as a follow up to the 1994 and 1997 investigations (New York State Department of Environmental Conservation December 2001). Sediment cores and surficial sediment samples were collected at a total of 12 sites from Eighteenmile Creek, its tributaries, and the New York State Barge Canal. Additional water column sampling was completed to evaluate sediment transport from the Barge Canal into Eighteenmile Creek and, through Eighteenmile Creek, into Olcott Harbor. Sediment toxicity tests were performed on surficial sediment samples collected for chemical analyses. Ten-day solid-phase toxicity testing showed reduced growth in surficial sediments collected upstream of the Newfane Dam (Station No. 7ABC).

High concentrations of trace metals were found in sediment core samples collected upstream of Burt Dam (cadmium, 20.1 parts per million [ppm]; chromium, 1,490 ppm; copper, 2,450 ppm; lead, 4,490 ppm; nickel, 997 ppm; silver, 8 ppm; and zinc, 15,100 ppm). These concentrations were measured in sediment core subsections ranging from 0.9 feet to 3 feet (28 to 90 centimeters [cm]) deep. Similar trace metal concentrations were found in samples collected upstream of the

Newfane Dam. Radio-dating results suggest this contamination may be due to historic (middle 1950s to early 1960s) industrial practices, discharges, or spills.

The highest PCB concentration (25.8 ppm) was detected in Eighteenmile Creek sediments collected in the depositional pool created upstream of Burt Dam (Station No. 6F). The highest concentrations were detected in sediment cores at depths of found in at 1 to 2 feet (28 to 52 cm), and other cores collected in the dam impoundment also showed higher concentrations of PCBs at depth. PCBs were detected at lower concentrations at the bottom of the core. High PCB concentrations (24.93 ppm) were also detected in Eighteenmile Creek diversion channel sediments collected downstream of the abandoned Flintkote site (Station No. 12).

Dioxin and furan concentrations measured at several sampling locations were elevated (tetra through octa dioxin and furan homolog totals greater than 2,500 and 750 parts per thousand [ppt], respectively). Calculated 2,3,7,8- tetrachlorodibenzo-p-dioxin (TCDD) toxic equivalencies exceeded the NYSDEC human bioaccumulation guidance at Station Nos. 6E (Burt Dam) and 12 (Eighteenmile Creek at abandoned Flintkote site). In addition to dioxin, an elevated level of Mirex (380 parts per billion [ppb]) was detected in a sample collected from Eighteenmile Creek at a location (Station No. 9) upstream of the confluence with the New York State Barge Canal.

NYSDEC conducted a study to obtain estimates of loading of synthetic chemicals into Lake Ontario from several New York tributaries in 1997 and 1998 (New York State Department of Environmental Conservation March 26, 2009), with special emphasis on polychlorinated dibenzodioxins and furans (PCDD/F). PCB loading rates were particularly high in Eighteenmile Creek. Eighteenmile Creek also showed high concentrations of pesticides, particularly DDT and its metabolites. Eighteenmile Creek showed very high dioxin loads on an area basis, but less so on a per capita basis. The PCDD/F congener patterns in Lake Ontario sediments appear to be more like those of the Niagara River sites at Cayuga Island and Love Canal than of the lake's other principal tributaries. The New York State Barge Canal may move PCDD/Fs from the Tonawanda/Lockport area to the Genesee River.

A beneficial use impairment (BUI) investigation was conducted in 2007 by EEEPC under contract to NCSWCD to determine (1) whether Eighteenmile Creek is impaired with regard to fish tumors and other deformities; (2) the status of fish and wildlife populations; and (3) the status of bird or mammal deformities or reproductive impairment (Ecology and Environment Engineering, P.C. 2009a). A wide range of data were collected from Eighteenmile Creek and a similar background stream, Oak Orchard Creek, and the data from the two creeks were compared. The data collected for the BUI investigation suggest that bird and amphibian populations at Eighteenmile Creek are not impaired but that fish and mammal populations likely are. The high levels of PCBs in fish may be impairing fish and mammal populations. Whole-body concentrations of Aroclors 1248, 1254, and 1260 and total PCBs were an order of magnitude greater in brown bullheads from Eighteenmile Creek compared with the levels in brown bullheads from Oak Orchard Creek (Ecology and Environment Engineering, P.C. 2009a). Whole-body concentrations of dioxins/furans (expressed as 2TCDD toxic equivalent [TEQ]) in bullheads from Eighteenmile Creek were approximately five times greater than in bullheads from Oak Orchard Creek.

Sources and potential sources of PCBs in Eighteenmile Creek have been identified as industrial and municipal wastewater discharges, combined sewer overflows, inactive hazardous waste sites, the New York State Barge Canal discharge, contaminated sediments already present in the creek, and an unknown source between Olcott Street and North Transit Road. Extensive progress in reducing sources to the creek has been made by monitoring discharges and updating State Pollutant Discharge Elimination System (SPDES) permits for industrial and municipal wastewater dischargers and delisting inactive hazardous waste sites.

NYSDEC conducted a sediment study in the PCB-contaminated area between Olcott Street and North Transit Road in August 2005 (New York State Department of Environmental Conservation 2006a). A follow-up RI was performed in 2007 (Ecology and Environment Engineering, P.C. 2009a), and a supplemental RI (SRI) was performed in 2008 (Ecology and

Environment Engineering, P.C. 2009b). NYSDEC has divided this area into the Flintkote Site and the Eighteenmile Creek Corridor Site. NYSDEC has completed a remedial record of decision (ROD) for the Flintkote Site (New York State Department of Environmental Conservation 2006b) and anticipates a ROD to be issued for the Corridor Site in 2009.

During the RI and SRI, PCBs and metals were detected at concentrations exceeding screening criteria in sediment samples collected from the creek and the millrace as well as in soil samples collected on the properties next to the creek. PCBs were detected in most of the sediment samples, with concentrations up to 237 ppm noted in the SRI and 1,400 ppm noted in the RI. Seven samples collected at four locations during the RI and five samples collected at four locations during the SRI had PCB concentrations exceeding 50 ppm, thereby meeting the criteria for hazardous waste. The highest concentrations of PCBs in sediments tended to be from samples collected downstream of the Clinton Street Dam and in the creek and millrace adjacent to the Flintkote Site.

Arsenic, chromium, copper, lead, and zinc were also found in creek sediments, often at concentrations several times greater than the lowest effect levels (LEL) presented in the *Technical Guidance for Screening Contaminated Sediments* (New York State Department of Environmental Conservation 1999). Concentrations of these metals exceeding screening levels were found throughout the corridor site, with the highest concentrations occurring in samples collected downstream of the Clinton Street Dam. In addition, several sediment samples failed the toxicity characteristic leaching procedure (TCLP) test for lead, indicating the presence of hazardous sediments at the site. Polycyclic aromatic hydrocarbons (PAHs) were also prevalent in sediment samples collected throughout the site.

The SRI concluded that erosion and runoff appear to be the primary mechanisms for transporting PCBs and lead from contaminated fill material on the adjacent properties to the creek. In addition, subsurface utilities are another mechanism that could potentially allow the migration of contamination. The SRI also indicated that the New York State Barge Canal is potentially a chronic source of PCB contamination in the creek. PCB-contaminated sediment in the Barge Canal immediately upstream (to the west) of Eighteenmile Creek was identified by an investigation performed by URS Corporation in 2006, the RI, and to a lesser extent, during the SRI. An additional investigation (Ecology and Environmental Engineering, P.C. 2009b) was conducted to determine whether the Barge Canal is a significant source of contamination in creek sediments. This investigation concluded that the New York State Barge Canal is not a significant source of the PCBs and metals in Eighteenmile Creek sediments at the Corridor Site. Therefore, the likelihood of PCBs and metals from the Barge Canal recontaminating the creek sediments after the sediments have been remediated appears small. The investigation, however, did not evaluate one-time events such as allowing water to drain from the Barge Canal into the creek or significant discharges from combined sewer overflow (CSO) outfalls. Such events could cause a slug of potentially contaminated sediments to enter the creek.

Under contract to the NCSWD, EEEPC performed a PCB trackdown study (Ecology and Environment Engineering, P.C. 2009c). Grab samples were collected for PCB screening at 80 locations between Harwood Street and Stone Road (8,000 feet), including east of the confluence of Gulf Creek and Eighteenmile Creek and at an unmapped drainage on the west side of Eighteenmile Creek. Approximately 2,000 feet of creek within this area was not investigated because the gradient of the creek cascading down the Niagara Escarpment is too steep to ensure the safety of the field sampling crews. In addition, the amount of sediment in this area available for sampling is minimal due to high flow velocities and the steep gradient. A total of 80 samples and three duplicates were collected and analyzed for PCBs using a screening method. Total PCB concentrations ranged from 59 micrograms per kilogram (µg/kg) to 4,300 µg/kg; 29 samples did not contain detectable levels of PCBs. A total of 12 cores were collected in areas to confirm PCB screening levels. Three samples were collected at various depths. The concentrations in the core samples confirmed the screening results and ranged from 12 µg/kg to 69,000 µg/kg; only six samples were non-detect. A comparison of PCB screening results with PCB confirmation sample results indicates the screening results need to be increased by 40percent to be comparable to the confirmation results.

The results of the trackdown study indicate that PCBs are present in areas of Eighteenmile Creek outside of the AOC and downstream of the potential source area near Lockport. The core sample results show a general decrease in concentration with depth. The results indicate that the entire sediment column is impacted with PCBs and only the native material in the creek bed is free of PCB contamination. Most of the positive PCB results exceeded the PCB screening criteria. The results show a relatively uniform concentration of PCBs, except at areas close to the Flintkote property and in the area near the intersection of Old Niagara and Plank Road. The trackdown study results indicate the potential for an additional source of PCBs in an area north of Gulf Creek but before Plank Road.

In addition to PCBs, the surface samples from all 12 cores were analyzed for a selected list of metals, and the metals results were compared with NYSDEC Technical and Administrative Guidance Memorandum (TAGM) 4046 standards. All metal concentrations were near or exceeded TAGM criteria. The metals concentrations in the sediment cores were relatively uniform throughout the PCB trackdown study area.

The overall objective of the RI activities will be to determine the nature and extent of contamination throughout the Eighteenmile Creek AOC. Numerous sediment investigations have been conducted in the vicinity of the New York State Barge Canal, throughout Lockport, and downstream of Burt Dam. Additional data are needed to develop a conceptual model of the existing physical and chemical conditions throughout the Eighteenmile Creek AOC. The initial field investigation (Phase 1) was designed to collect data on the physical conditions of the creek between Burt Dam and Lockport. The results of the Phase 1 activities were used to develop a strategy and to implement a sampling and analytical program (Phase 2) for evaluating the nature and extent of contamination in the AOC.

1.3 Project Description

CH2M HILL and EEEPC will implement the RI activities for the Eighteenmile Creek AOC as described in the FSP. All work is to be performed consistent with NYSDEC and USEPA requirements, protocols, and guidance. These portions of the project will focus on the area between Burt Dam and Lockport. There is very little historical data for this portion of the creek. This project includes a site reconnaissance survey completed as Phase 1 followed by work planning and field activities for a sediment investigation. The RI scope currently includes activities for sampling, analysis, data analysis and validation, data evaluation, and preparation of the RI report. This QAPP includes the site reconnaissance activities from Phase 1 and has been updated to include Phase 2 activities. Additional RI tasks such as evaluation of the fate and transport and risk are not currently included in the scope.

Anticipated Project milestones include:

■ Project Start	September 19, 2008
■ Site Visit	October 2, 2008
■ QAPP Submittal Phase 1	November 5, 2008
■ Health and Safety Plan Submittal	November 7, 2008
■ Field Reconnaissance of Study Areas	December 2008 to May 2009
■ Preparation of Reconnaissance Report	May and June 2009
■ Submittal of Reconnaissance Report	July 2009
■ Work Plan Revision for Phase 2	September 2009
■ Draft Sampling and Analysis Plan	October 2009
■ Final Sampling and Analysis Plan	21 days after receipt of comments
■ Phase 2 Investigation	November 2009/March 2010
■ Data Evaluation Summary Report	45 days after receipt of validated data

■ Draft RI Report	30 days after approval of Data Evaluation Summary Report
■ Final RI Report	10 days after receipt of USEPA's comments
■ Project completion	September 2010

More detailed descriptions of the field tasks are presented in Sections 2.1 to 2.3. A map of the study area is provided as Figure 2-1. The reconnaissance activities included using a small boat to survey the Eighteenmile Creek AOC focusing on the 9.4-mile segment between Stone Road and the area just north of Ide Road and the 0.4-mile stretch up to Plank Road. The survey identified and mapped potential areas of sediment deposition, point discharges, ecologically significant areas, and other features that may affect sediment collection activities to be conducted in the Phase 2 RI. The following specific data were collected:

- Global positioning system (GPS) coordinates of the extent of depositional areas and ecologically significant habitats.
- Water depth, sediment thickness, and width of the creek.
- Locations of point discharges, utility crossings, bridges, logjams, and other features that may affect future actions.

The results of the Phase 1 investigation are presented in the Phase 1 Reconnaissance Survey report (CH2M HILL/Ecology and Environment Engineering, P.C. 2009). A small section of the creek was resurveyed with greater detail in October 2009, prior to completion of the FSP and this QAPP. The results have been incorporated into the FSP. Phase 2 of the RI will include field work to obtain sediment samples in locations along Eighteenmile Creek and behind Burt Dam. Samples will be obtained using multiple sampling methods, as described in the FSP, to further define the nature and extent of contamination within the creek boundaries. Measurement data for Phase 2 will include the following:

- PCB, total metals, and total organic carbon (TOC) concentrations in all sediment and soil samples.
- PAH, pesticide, and possibly dioxins concentrations and grain size distribution in approximately 40 percent of all the sediment and soil samples.
- Acid volatile sulfides/simultaneously extracted metals (AVS/SEM) and PCB congener concentrations in approximately 40 percent of surface sediment samples.
- GPS coordinates of all sediment locations.
- Water depth, sediment thickness, and width of the creek.
- Field observations on physical characteristics of the sediment.

1.4 Quality Objectives and Criteria

DQOs are qualitative and quantitative statements that clearly define the objectives of the project, define the most appropriate type of data, determine the appropriate procedures for data collection, and specify acceptable decision error limits that establish the quantity and quality of data needed for decision making. The analytical methods and QC limits have been developed for this revision of the QAPP and are documented in Section 2. The technical planning team has developed project-specific DQOs in accordance with USEPA's *Guidance for Data Quality Objectives Process* (EPA QA/G-4). Proposed additions or changes to the requirements in the approved QAPP will be documented in a QAPP addendum and submitted to the USEPA for review and approval.

1.4.1 GPS Data Objectives (from Phase 1 Revision)

GPS data collection activities should be consistent with the USEPA's *Interim Guidance for Developing Global Positioning System Data Collection Standard Operating Procedures and Quality Assurance Project Plans*, Revision 1.0, February 2008. GPS data for this project are equivalent to Category III: Validation, General Applications, and Feasibility Studies. Chain-of-custody (COC) documentation for Category III is not required for GPS data, but good recordkeeping practices always apply. Quality documentation for GPS is described in this QAPP. The measurement objectives and criteria for the GPS data are listed below:

a. **Data Quality Objectives.** The GPS survey will utilize the Trimble GeoXT, GeoXH, or equivalent hand-held GPS receivers in the GPS Code, Standard Position Mode to obtain facility latitude/longitude values within 10 meters of true locations at the 95percent confidence level. This level of accuracy is consistent with Tier 3 described inUSEPA's National Geospatial Data Policy.

b. **Receiver Performance Criteria.** The Trimble GeoXT, GeoXH, or equivalent hand-held GPS receivers will be set to capture data provided that at least four satellites are in view and the position dilution of precision (PDOP) value remains at 6 or below. The receiver will be set to provide audible or visual warnings when the quality settings are exceeded. Sample interval and time on-station will be consistent with the model recommendations. Generally, this will require 3 minutes on each station sampling at 2-second intervals.

c. **Statistical Quality Control Check.** Post-processing of the GPS data will be accomplished using the vendor's software package operating on a local workstation. Statistical analyses will be performed on the point data downloaded from the GPS receiver. For 10-meter data accuracy, any data points with a standard deviation of 3 meters or more will be a basis to exclude that data point from the collection. Ideally, the standard deviation for 10-meter accuracy data should be 1 meter or less at the 95percent confidence level.

1.4.2 Sampling and Analysis Objectives for Phase 2

The purpose of the RI activities relevant to the nature and extent of sampling is listed in the FSP prepared by CH2M HILL/Ecology and Environment Engineering, P.C.

The results of the seven-step DQO process for the Eighteenmile Creek AOC are presented in the following sections.

1.4.2.1 Step 1: State the Problem

The purpose of the RI is to determine the nature and extent of contamination in the sediments throughout the AOC, with the primary focus on the unevaluated area between Lockport and the Burt Dam.

Problem statement: A number of sediment investigations conducted in the vicinity of the Barge Canal, throughout Lockport and downstream of Burt Dam indicate high concentrations of potential contaminants of concern (PCOCs) in the sediment. Source investigations immediately downstream of the Lockport area show that PCBs and metals are present in the sediment of the creek between Burt Dam and Lockport. Additional data are needed to develop a conceptual model of the existing physical and chemical conditions throughout the Eighteenmile Creek AOC.

Specifically, field sampling activities have the following objectives:

- Evaluate the extent of contamination of selected PCOCs (PCBs and metals) in areas of the creek. Determine TOC of sediment to correlate PCB concentrations to percent organic carbon.
- Evaluate concentrations of PCOCs in upstream locations in major tributaries to the creek to identify other potential sources and establish background conditions.
- Evaluate the vertical extent of the concentration of PCOCs in areas with sediment thicknesses greater than 3 feet.
- Evaluate the concentration of PCOCs at bottom of sediment depth in areas with sediment thicknesses greater than 3 feet to verify that the bottom sample has low concentrations,
- Evaluate ecologically significant chemicals (e.g., PCB congeners and AVS/SEM) in the surface segments of the sediment to determine the bio-availability of PCOCs.
- Evaluate the potential for historic contamination to have migrated to wetlands or historic (e.g., relict) creek channels during past flooding events.
- Evaluate the potential sources of the PCOCs other than PCBs and metals (e.g., pesticides and PAHs) and establish the correlation of these other PCOCs with PCBs.
- Evaluate the geotechnical characteristics of the sediment materials.

1.4.2.2 Step 2: Identify the Decision

Data from Sediment Samples

- What is the extent of PCOCs in the sediment depositional areas in shallow water reaches of the creek and can the contamination be attributable to upstream sources in Lockport?
- What is the vertical profile of selected PCOCs in the sediment in areas of deeper water and significant sediment thickness?

- Could contaminated sediments have potentially impacted zones outside of the current channel?

- What is the nature of contamination by PCOCs other than PCBs or metals and is future evaluation of these other PCOCs warranted?

- What are the geotechnical characteristics of the sediment with regard to grain size and TOC?

- What are the concentrations of PCOCs in the surface sediments that are potentially bioavailable to fish and wildlife?

- Can sediments be left in place without posing an unacceptable ecological or human health risk?

1.4.2.3 Step 3: Identify the Inputs to the Decision

Project objectives will be met by collecting and analyzing the following types of samples:

- **Delineation:** Sediment cores from depositional areas throughout the creek will be collected and analyzed for contaminants identified as the main PCOCs. In shallower areas of the creek, sediment cores will be a composite of the entire core because, if the shallow sediment is remediated, it would be remediated as an entire mass. In tributaries, the surface sediment will be evaluated in addition to the composite core to assess background concentrations of current sediments. In deeper water areas, the sediments will be collected with vibracores and segmented to evaluate the vertical extent of contamination. Sediments from the surface interval (0 to1 foot) will be collected at locations in the deeper water areas to determine the surface sediment characteristics. Locations will be specified based on the water and sediment depth determined during the Phase 1 investigation. Intervals not selected for analysis will be archived pending data evaluation.

- **Geotechnical:** Grain size analysis will be performed on a portion of the sediment samples to determine the physical characteristics of the sediments. Historic data indicate very little variation in the physical character. All samples will be analyzed for TOCs and the data will be used to evaluate concentrations of PCBs in terms of organic carbon content for comparison with sediment screening criteria.

Historical Data

For shallow creek areas, the historical data indicate that PCBs and lead are present at all depths and in most samples. The primary concern is the extent of contamination in long areas of the creek not previously investigated. Historical data on deeper waters behind Burt Dam indicate

PCBs and metals are present at highest concentrations in the subsurface samples. However, investigations on the bioavailability of PCBs and concentration of PCBs in fish indicate that Eighteenmile Creek sediments are still a significant source of contamination to wildlife.

Historical data also indicate slightly elevated levels of PCDD/F in fish tissue and surface sediments, but the sources have not been attributed to the Eighteenmile Creek AOC or upstream areas. There is no historical data associated with the NYSDEC investigations at the Flintoke and Eighteenmile Creek corridor site because dioxins were not identified as sources. The decision of whether or not to include dioxin sampling is still under discussion.

Phase 1 survey data were used to determine the areas of sediment deposition.

New Data

New data will consist of the following:

- Validated PCB and metals concentrations in samples with an acceptable and verifiable reporting limit (RL) of less than 0.2 ppm. PCB congener data will be collected at a frequency of 40 percent of the surface sediment samples to establish potential correlation with Aroclor compounds. The congener data will aid in identifying PCBs in cases where Aroclor results are uncertain and will help correlate historical biological studies that rely on congener data. The proposed locations are presented in Table 2-3 of the FSP. The PCB congeners analysis will be selected from surface samples with the highest PCB concentrations. The project reporting limits for metals, PCB Aroclor, and PCB congener methods are summarized Appendix B.

- Validated concentrations of other PCOCs (e.g., pesticides and PAHs) in 40 percent of sediment samples at reporting limits established by the laboratory statement of work; validated concentrations of PCB congeners and AVS/SEM in 40 percent of the surface segments of the sediment to determine the bio-availability of PCOCs.

- Geotechnical data (including moisture content and grain size distribution) from 40 percent of the analytical core locations for evaluation of the physical characteristics. TOCs will be analyzed for all samples.

- The vessel utilized for sample collection will be equipped with real-time differential GPS receivers capable of sub-meter accuracy. Adequate shore-based control points to operate this system will be established. This positioning system will provide data to onboard GPS receivers that will guide the vessel to pre-programmed coordinates for each sediment core location. Once in position, the vessel will be held in position with anchors in accordance with the standard operating procedures (SOPs) provided in Appendix C of the FSP. Prior to attempting to collect a core, probing will be conducted in an area adjacent to the target sample location (i.e., 3 to 5 feet away) to avoid disturbing the sediment in the vicinity where the core will be taken. The probing will identify the general characteristics of the sediment (i.e., approximate depth and texture). This information will be used to evaluate whether a core can be obtained.

1.4.2.4 Step 4: Define the Study Boundaries

Eighteenmile Creek flows generally north through central Niagara County and discharges via Olcott Harbor into Lake Ontario, approximately 18 miles east of the mouth of the Niagara River (New York State Department of Environmental Conservation 1997). As originally identified, only a small portion of the Eighteenmile Creek basin was designated an AOC by the IJC. The AOC includes Olcott Harbor and extends upstream to the farthest point at which backwater conditions exist during Lake Ontario's highest monthly average lake level. This point is located just downstream of Burt Dam, approximately 2 miles south (upstream) of Olcott Harbor. The area under investigation includes the "source" area from upstream of Burt Dam to Lockport, extending south of Stone Road along Plank Road near the foot of the Niagara Escarpment.

1.4.2.5 Step 5: Develop a Decision Rule

Table 1-1 summarizes the samples and analyses and the purpose of the selected analyses.

Table 1-1 Sample Summary Eighteen Mile Creek AOC

Analysis	Method	Estimated Number of Samples	
		Analysis	Archive
Sediment Samples			
Polychlorinated biphenyls (PCBs)	SOM01.2	252	75
Target Compound List (TCL) PAHs only	SOM01.2	105	0
TCL pesticides	SOM01.2	105	0
PCB congeners	CBC01.0	50	0
Target Analyte List (TAL) metals	ILM05.4	252	75
Acid volatile sulfides (AVS)/ simultaneously extracted metals (SEM)	"Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment, December 1991"	50	0

Table 1-1 Sample Summary Eighteen Mile Creek AOC

Analysis	Method	Estimated Number of Samples	
		Analysis	Archive
TOCs	Lloyd Kahn Method	252	0
Particle size distribution (sieve only)	ASTM D422 or ASTM D4464	105	0
PCDD/F	DLM02.0	To Be Determined	

1.4.2.6 Step 6: Specify Limits on Decision Errors

The majority of the potential decision errors typically are associated with field sample variability and sample collection procedures. Analytical error is usually a much smaller portion of the total error associated with an environmental measurement; however, the analytical data must be reported by the laboratory at low enough levels that will allow comparison with the existing standards as presented in the tables in Appendix B, Summary of Reporting Limits. For PCBs, standard method reporting limits should be as low as possible but will be below risk-based screening levels.

Specified limits of decision errors need to be developed that are indicative of how much uncertainty will be tolerated in decision(s). Location information (x and y) must be determined to within 1 meter. Use of a digital GPS onboard the sampling vessel(s) will achieve the specified horizontal accuracy limits. The specific number of samples, sample locations, and rationale are presented in the FSP.

1.4.2.7 Step 7: Optimizing the Design

Sample location and analytical requirements for each sampling area have been established to cost-effectively collect data that are sufficient to fulfill the overall project objectives. Sediment cores will be collected from different areas to represent a reasonable range of conditions that will be encountered during the remedial action. The sample locations were selected to represent areas with the highest potential for sediment deposition. Areas outside of the creek channel have been selected based on review of aerial photographs and known flooding areas.

The maximum sediment core collected with the vibracore will be 12 feet. The core length is limited based on the size of the vessel that is accessible to the areas. In all cases samples will be collected at the surface 0 to1 foot and whatever the bottom sample interval is, as discussed in the FSP. The analysis of the bottom interval will be necessary to ensure contamination is not present at deeper areas. The historical data indicate concentrations of maximum concentrations at 1 to 4 feet and, therefore, samples in the first subsurface interval will be collected. The locations of each of the proposed sample cores are presented in the FSP.

The analytical parameter list was also developed to cost-effectively provide the data that can be used to evaluate the different remedial alternatives being considered. The parameters were selected based on historical data to identify contaminants that have the highest risk factors and represent chemicals that exhibit the same concentration profiles. In addition, the parameter list was developed in conjunction with the USACE to ensure that the data collected will be sufficient to use for future assessment of the bioavailability of PCBs and metals. If there is insufficient volume of the sediment for samples, the following priority list is established:

- PCBs, metals, PAHs, TOCs, and pesticides are high priority while PCB congeners, AVS/SEM, and grain size are low priority. PCB congeners samples will be archived for all samples and the highest concentrations of PCB samples will be selected for analysis with priority to the surface samples from the deep water areas. A container also will be archived for possible analysis of PCDD/F. If additional volume is required, Ponar samples will be collected from the surface sediment.

1.4.3 Characteristics of Data Quality

The PARCC (precision, accuracy, representativeness, completeness, and comparability) parameters are the characteristics of data quality. Table 1-2 lists the formulas used to calculate precision, accuracy, and completeness.

Table 1-2 Data Quality Characteristics Formulas

Characteristic	Formula	Symbols
Precision (as relative percent difference [RPD])	$RPD = \frac{\lvert X1 - X2 \rvert}{(X1 + X2)/2} \times 100$	X1, X2 = duplicate values
Precision (as relative standard deviation [%RSD])	$\%RSD = \frac{S}{A} \times 100$	S = standard deviation A = mean of the measurements
Accuracy (as percent recovery [%R] for samples without a background level of the analyte, such as reference materials, laboratory control samples, and performance evaluation samples)	$\%R = \frac{X}{T} \times 100$	X = found concentration T = true or assumed concentration
Accuracy (as percent recovery [%R] for measurements in which a known amount of analyte [a spike] is added to an environmental sample)	$\%R = \frac{X}{T} \times 100$	X = found concentration T = true or assumed concentration
Completeness	$C = \frac{N}{S} \times 100$	C = completeness (%) N = number of valid data S = number of samples collected

Precision can be defined as the relative uncertainty about a given measurement and is determined by replicate analyses. Due to the difficulty in obtaining true, duplicate sediment core samples, none are proposed. Two blind, field-homogenized, duplicate sediment sub-samples will be submitted for laboratory analysis. One will be collected for every 20 actual samples. Data resulting from these samples will be used to evaluate the sample compositing and analytical precision or variability. Acceptability of sample results will be based upon the precision criteria detailed in Section 2.

The precision of the laboratory analysis for a given matrix is also measured by analyzing laboratory replicates or laboratory matrix spike and matrix spike duplicate for the project specific analyses. Acceptable precision is defined as relative percent difference (RPD) between these replicates.

Accuracy is the degree of agreement between measured values and the true value. Accuracy is inversely proportional to measurement bias.

The accuracy or ability of the laboratory to determine the true values or concentrations of proposed analytes is evaluated as part of the laboratory's participation in the New York State Performance Evaluation sample program. A single laboratory MS/MSD sample will be analyzed to evaluate the accuracy of each batch of samples analyzed for this project. The expected accuracy in quantifying those analytes to be examined is specified in the laboratory statement of work.

Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. This is addressed in the FSP.

Completeness can be defined as the percentage of acceptable data necessary to accomplish the study objectives. For this project, the laboratory data completeness objective is 90 percent.

Ongoing precision and recovery is will be monitored and controlled through the use of laboratory control samples (LCS). Establishment and evaluation of control limits are specified in the laboratory statement of work.

In addition to the PARCC parameters, project objectives have been established for quantification limits, which are discussed in Section 2 of this QAPP.

Sensitivity

Sensitivity is expressed as the lowest concentration that can be distinguished from background with a given level of confidence. The contract-required detection limits (CRDLs) are established by the USEPA in the laboratory statement of work. The CRDLs achieved on individual samples will vary in accordance with percent moisture. CRDLs are elevated when dilutions are performed or reduced sample volume is analyzed. To the extent possible, field samplers will collect samples that have moisture contents greater than 50 percent.

1.4.4 Measurement Quality Objectives for Precision and Accuracy

The objectives for precision and accuracy for each chemical are based on the demonstrated capabilities of the laboratory with respect to laboratory performance and the required sensitivity; precision and recovery and are established by the laboratory statement of work.

1.5 Special Training/Certification

EEEPC is committed to providing vigorous training in health and safety procedures, the proper use of protective equipment, and overall policy objectives. General training requirements for project activities are as follows:

- EEEPC employees who participate in on-site activities must have completed the 40-hour health and safety training program and the cardiopulmonary resuscitation (CPR)/first aid certification course. To continue such participation, each employee must successfully complete a minimum of 8 hours of refresher training annually.
- Personnel shipping samples must complete the U.S. Department of Transportation (DOT) hazardous materials transportation training and certification, including training in specific International Air Transport Association (IATA) regulations (air shipments).
- EEEPC personnel responsible for GPS operation will complete E & E training.
- EEEPC personnel responsible for sample management will complete the Forms II Lite® tutorial training.

1.6 Documentation and Records

Project records will be maintained in a format that is secure and usable by the PCT. Project documents will be delivered as .pdf files and posted to the project website accessible to the PCT. Field records will be generated in hard copy field logs as specified in EEEPC's SOPs for field activities logbooks and geotechnical logbooks. Field logbooks will be scanned and included as an appendix to the final data report. Analytical data will be delivered in a .pdf version of the CLP-Level IV or equivalent analytical report. Preliminary results will be requested from the CLP laboratory to assess concentrations of PCBs present and selected samples for PCB congener analysis. Electronic data will be provided in accordance with the most recent version of Region 5's standardized electronic data deliverable (EDD) format.

The results of geotechnical reporting will be accompanied by an analytical report. An analytical report will be issued for each batch of samples processed through the laboratory. The analytical reports will consist of result summaries which, at a minimum, must include the following:

- Sample results with laboratory sample ID, client sample ID, and station ID, and
- Copies of raw data.

1.6.1 Field Documentation

Field records are described in Section 2.2. Field records include the following:

- The GPS coordinates where data are collected.
- The water depth (in inches) using a yard stick or weighted tape measure.
- Sediment thickness (in inches) using a hammer probe.
- Creek width will be measured by capturing GPS coordinates on opposite banks. The actual measurement will be determined once the information is downloaded into the (GIS for mapping.
- GPS location coordinates and photographs will be collected for cattail marshes, areas of discharge points, and utility crossings. If applicable, additional information regarding

significant habitats will be recorded by the biologist in a field notebook or in the GPS notes area.

Information will be recorded using a combination of the GPS unit, field notebooks, photographs, and GIS maps. The GPS will be coded to input water depth, sediment thickness, creek width, and field notations. GPS data and digital photographs will be electronically copied and archived each night. In addition to the GPS data collection, field maps with the most recent aerial image will be printed and used for tracking and recording field observations about potential access areas, geology, hydrology, and other items that may be important for planning the sampling effort but that are not conducive to a point measurement. These areas will be digitized later and included on GIS maps. A QC review of the field records will be performed to verify the locations after the information has been loaded to the GIS.

Additional field records are described in the FSP. Samples will be identified using the format described below. Each sample will be labeled, chemically preserved (if required), and sealed immediately after collection. To minimize handling of sample containers, labels will be completed prior to sample collection, as practicable. The sample label will be completed using waterproof ink and will be firmly affixed to sample containers and protected with clear tape. The sample label will give the following information: date of collection; unique sample number; analyses requested; and preservation (if applicable).

Sample identification will be made using the following schema:

RA-###-Y-ZX

where:

A = a number designating which reach the sample came from.

= a non-repeating sequential number for the sample location.

Y = letter designation as to what type of area the sample came from

C = Creek

W = Wetland

T = Tributary

H = Historic Creek/Drainage area

V = Vibracore

ZX = Depth interval for the sample

ex: Z1 = 0-1 ft below ground surface (bgs)

Z2 = 1-2 ft bgs

Z3 = 2-3 ft bgs

etc.

Each sample will be referenced by sample number in the logbook, entered into Forms II Lite®, and printed on the COC record. Field duplicates for QC samples will have an "R" appended to the end of the station location identifier. MS/MSDs will be identified on the tag and the COC form, not in the station location identifier.

Examples:

- R2-046-V-Z1 is a sediment vibracore sample at the 0- to 1-foot interval from Reach 2.
- R4-033-C-R is a field duplicate of the hand core sediment sample R4-033-C RR from Reach 4.

Photographs

Photographs will record field sampling activities and environmental conditions (channel structure, habitat types [cattail marsh], backwater areas, etc.) to support documentation and characterization process. The following information will be noted in the field notebook concerning photographs:

- Date, time, location, and direction photograph was taken;
- Description of the photograph taken;
- Sequential number of the digital photo; and
- Camera system used.

1.6.2 Record Retention

Project-related records will be stored in secure areas consistent with requirements of the contract. Records related to the analytical effort must be maintained at the laboratory or in the office (for field screening data) in lockable filing cabinets for at least one year, except those stored in the computer (i.e., cost information, scheduling, custody transfers, and management records). EEEPC will transfer project records to CH2M HILL for storage with the final project files.

Types of records to be maintained by the laboratory in addition to the analytical report are specified as part of the USEPA CLP contract. For non-CLP laboratories, records include the following:

- Sample-destruction records containing information on the manner of final disposal;
- Supporting documentation for any nonconformance or corrective action forms supplied in the analytical report or related to the analysis of project samples;
- Computer records on disk with magnetic tape backup of cost information, scheduling, laboratory COC transfers, and laboratory management records;
- Laboratory notebooks including raw data such as readings, calibration details, and QC results; and
- Hard copies of data system printouts.

1.6.3 Site Reconnaissance Report

The site reconnaissance report included a summary of the data collection activities, compilation of field data on detailed GIS maps and data tables, and a discussion of the findings relative to planning the Phase 2 sediment investigation. The report was submitted to the PCT for review in July 2009 and no comments have been received.

1.6.4 Data Evaluation Report

The physical and analytical data collected during the sampling events will be compiled in a data evaluation report after completion of the field sampling, receipt of laboratory data, and performance of the data evaluation. CH2M HILL/EEEPC will evaluate, compile, and tabulate data in an appropriate presentation format for final data tables in accordance with the schedule presented in Section 1.3. The data evaluation report will include the following:

- A figure for each reach, including sample locations,
- A field summary memorandum of the sampling activities,
- Data tables summarizing the results of the sampling, and
- Field logs and photographs documenting site conditions.

The laboratory results will be provided to the USEPA in the Region V EDD format.

1.6.5 Remedial Investigation Report

The RI report will refer to the data evaluation report and provide a discussion of the findings relative to further investigation and decision for the AOC. The report will be subject to peer review and review by the site managers.

In accordance with the schedule listed in Section 1.3, CH2M HILL/EEEPC will submit a draft RI report that includes the following:

- Site Background
  - General site description
  - Site history
  - Summary of data used to develop the investigation

- Site Characteristics
  - Demographics and land use
  - Features/challenges unique to project

- Sediment Sampling and Analysis Methods
  - Project objectives and technical approach

  - Sampling design
  - Sediment depth survey
  - Sample collection and analytical methods
    - Sample collection
    - Sample processing
    - Analytical methods
  - Summary of QA/QC, data validation, and evaluation

- Results and Discussions
  - Depth, thickness, volume of sediment
  - Sediment physical characteristics
  - Analytical results
    - Chemical – screening and laboratory
    - Physical/geotechnical parameters

- Correlation between Screening Data and Analytical Data

- Nature and Extent of Contamination
  - Vertical and horizontal extent of PCOCs
  - Correlation of PCOCs concentrations with screening levels
  - Comparison of contaminant concentration to established consensus-based sediment quality guidelines

- Conclusion and Recommendations
  - Summary
  - Data needs.

After the USEPA and the PCT review the draft RI report, CH2M HILL/Ecology and Environment Engineering, P.C. will incorporate comments as directed by the USEPA and submit the final RI report.

1.6.6 QAPP Revision and Distribution

As indicated in Section 1.1, the EEEPC QA leader will be responsible for updating the QAPP and reviewing the Phase 2 sampling plan. The results of the Phase 1 activities provided the basis for the Phase 2 sampling plan. The EEEPC QA leader will distribute the revised QAPP to the personnel listed in the distribution list prior to sampling activities subsequent to Phase 1.

2 Data Generation and Acquisition

The components of the Phase 1 site reconnaissance and Phase 2 sediment sampling and analysis are presented below.

2.1 Investigation Areas

Digital information from the 2005 aerial image of the creek and historic sampling areas were loaded into the GPS and used to divide Eighteenmile Creek into smaller investigation areas based on the geography of the creek and the existing data. As noted in the FSP, the creek was divided into five segments that require different levels of investigation (Figure 2-1). The Phase 1 reconnaissance survey was conducted in a 9.4-mile stretch of the creek just north of Ide Road upstream of Stone Road. This stretch of the creek is relatively isolated and little information has been developed on habitats, stream channel conditions, or sediment characteristics. A bathymetric survey was performed over the 1.5 miles of the impoundment area from behind Burt Dam upstream to the area just north of Ide Road (see Segment 2 as defined in the FSP). This portion of the creek is relatively wide and deep and there was little information on water depth and sediment thickness.

The results of the Phase 1 survey were used to define reaches of the creek based on the overall physical and channel substrate characteristics. These reaches are shown in Figure 2-1 and summarized on Table 2-1.

Table 2-1 Summary of Reaches, Eighteenmile Creek, Niagara County, New York

Reach	Reach Description	Section	Section Description	Starting Mile Marker	Ending Mile Marker	Total Length (miles)
Reach 1	Mouth of Creek to Burt Dam	NA		13.0	15.2	2.2
Reach 2	Burt Dam Impoundment	NA		11.5	13.0	1.5
Reach 3	Reach 3 – Confluence of Eighteenmile Creek with Upstream Extent of the Burt Dam Impoundment	NA		11.0	11.5	0.5
Reach 4	Bedrock/Gravel Channel Downstream of Newfane Dam	NA		10.0	11.0	1.0
Reach 5	Newfane Dam Impoundment	NA		9.2	10.0	0.8
Reach 6	Gravel Channel Upstream of the Newfane Dam Impoundment	1	Characterized April 2009	7.3	9.2	1.9
		2	Characterized October 2009	5.9	7.3	1.4
					Total Reach Length	**3.3**
Reach 7	Meandering Section with Large Woody Debris (LWD) Downstream of the Niagara Escarpment	1	Characterized October 2009	4.6	5.9	1.3
		2	Characterized April 2009	2.2	4.6	2.4
		3	PCB Trackdown Area*	1.2	2.2	1.0
					Total Reach Length	**4.7**
Reach 8	Steep Gradient Run of the Escarpment	NA		0.8	1.2	0.4
Reach 9	Short Run Downstream of Corridor Site	NA		0.6	0.8	0.2
Reach 10	Eighteenmile Creek Corridor Site	NA		0.0	0.6	0.6

* Under contract to the NCSWCD, EEEPC conducted sediment sampling in 2006 for the purposes of PCB-source trackdown.

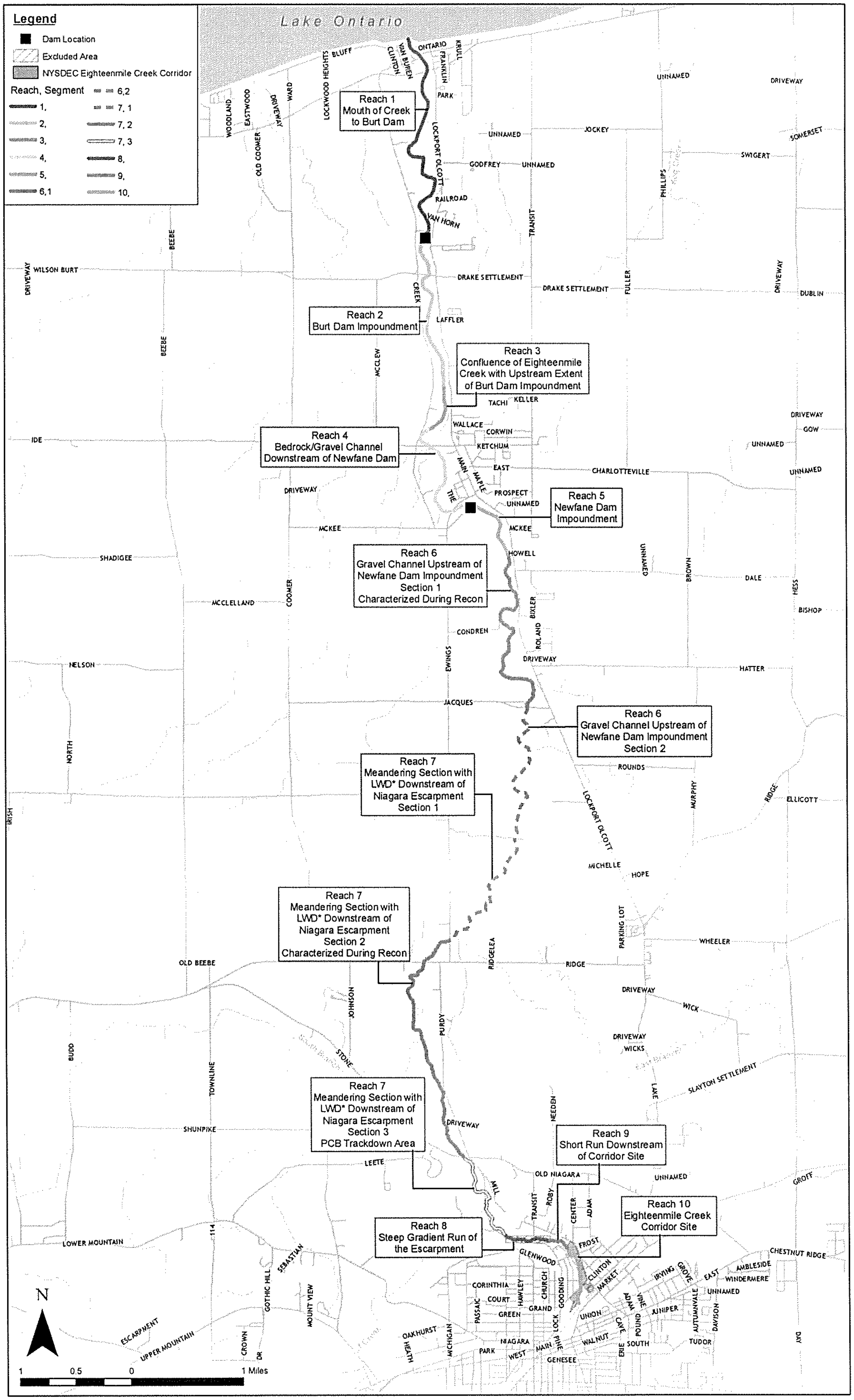

Figure 2-1 Eighteenmile Creek AOC and Investigation Areas

2.2 Field Activities

The overall objective of the Phase 1 investigation was to evaluate the physical conditions of the Eighteenmile Creek AOC to develop and determine the focus of the Phase 2 sediment investigation. The Phase 1 investigation consisted of a detailed reconnaissance survey to investigate site access, identify potential areas of sediment deposition, and make general observations on sediment thickness, sensitive habitats, and other areas of potential ecological concern.

The Phase 1 field effort comprised the following activities:

- Mobilization and planning
- Field reconnaissance surveys
- Bathymetric survey.

2.2.1 Mobilization and Planning Activities

The following mobilization and planning activities were conducted before initiating Phase 1 field reconnaissance surveys:

- Driving to locations where roads intersect the creek to identify areas along the creek that can accommodate launching or pulling out a small boat and parking a large truck.
- Working with the local non-federal sponsor (RAP Coordinator at the NCSWCD) to coordinate access with property owners, if needed, and to notify the public of activities, especially with the onset of the hunting season.
- Walking, when possible, between road crossings and access points to identify and note the types and locations of potential hazards, obstacles, or other issues that could impede or affect data collection methods.
- Visiting Burt and Newfane dams to identify any potential logistical issues.
- Procuring and transporting identified field equipment and supplies. It is assumed that a box truck and the boat can be stored at the NCSWCD Extension offices for the duration of the reconnaissance field work.

- Preparing detailed GIS field maps for use during the field survey and loading the GPS with field data forms and aerial images.

2.2.2 Field Reconnaissance Survey Activities

The specific objectives for the reconnaissance surveys are as follows:

- Identify areas of sediment deposition to support selection of future sampling locations.
- Collect data at potential sampling locations (such as GPS coordinates, water depth, sediment depth, width of creek, etc.).
- Identify areas of point-discharge (such as outfalls or discharge points, tributaries, etc.).
- Identify adjacent cattail marshes or other ecologically significant habitats.
- Identify utility crossings and other features that may affect future sediment sampling activities (such as bridges, logjams, channel widening, etc.).

2.2.3 Bathymetric Survey

A subcontractor will be hired to perform a single-beam hydrographic/bathymetric survey of the impoundment area behind Burt Dam up to just north of Ide Road. The bathymetric survey will be conducted using a real-time GPS system and a survey grade fathometer to collect data along regularly spaced transects across the impoundment area. The data will be processed and maps generated to depict the topography of the sediment surface. The detailed scope and measurement requirements for the bathymetric survey will be developed as part of the procurement process. In addition, a limited number of sediment probes will be conducted to estimate the sediment thickness. The actual number of locations probed will depend on the size of the boat that can be deployed and the depth of the water.

2.2.4 Field Data Collection

The specifics for field data collection are noted in Section 2.3 below. Collection and recording activity for each data collection effort is critical to the DQOs for this project. The observations and field measurement will be conducted at areas within the Eighteenmile Creek AOC (see Figure 2-1). Specific sampling locations will be determined as field locations by differential

GPS, as noted below. A pre-survey checklist will be completed prior to field data collection. A copy of the pre-survey checklist is provided in Appendix A, Field Forms.

2.2.5 Field Activities Phase 2

The Phase 2 field effort will comprise the following activities:

- Mobilization and planning
- Hand coring in creek and tributaries
- Surface soil sampling in the wetlands and historic creeks/drainage areas
- Vibracore sediment sampling in areas behind the dams.

Details of Phase 2 field activities are described in the FSP.

2.3 Sampling Process Design

Section 2 of the FSP provides a detailed discussion of the sampling process design.

2.4 Sampling Methods

2.4.1 Location Data Acquisition

At each point of interest, the following information will be collected:

- The GPS coordinates where data are collected
- The water depth (in inches) using a yardstick or weighted tape measure
- Sediment thickness (in inches) using a hammer probe. Steel alloy rods measuring 42 inches in length and half an inch in diameter will be hammered into the sediment until refusal. Based on expected site conditions and previous fieldwork at Eighteenmile Creek, four rods (a total length of 14 feet) and associated couplings will be on hand. Sediment thickness will be determined prior to coring if in an area that was not a previous sediment point from the Phase 1 survey.
- Creek width will be measured by capturing GPS coordinates on opposite banks. The actual measurement will be determined once the information is downloaded into the GIS.

- GPS location coordinates and photographs of cattail marshes, areas of discharge points, and utility crossings will be collected. If applicable, additional information regarding significant habitats will be recorded by the biologist in a field notebook or in the GPS notes area (Phase 1 only).

  All information will be recorded using the GPS unit, field notebooks, photographs, and GIS maps. The GPS will be coded to input water depth, creek width, and field notations. GPS data and digital photographs will be electronically copied and archived each night.

  The GeoXH, or equivalent hand-held GPS, which exceeds the requirements for a Category III project such as this, will be used to collect geo-referenced information during the field activities. The focus of the data collection activities will be on horizontal coordinates. Vertical data are not required for Phase 1 of the project except for the bathymetric survey; however, vertical data will be assessed for sample information by direct measurement from the sediment sampling equipment. Attributes are documented in the field through a customized script developed specifically for the Eighteenmile Creek RI project. A customized domain list is coded for all attributes collected in the field to minimize erroneous entries. In general, this list includes time, data, initials of field team member, and any comments that are relevant to or importance for data validation and transfer. Other project-specific fields may be included as well. The checklist provided in Appendix A, Field Forms, will be completed.

- The window of satellite availability is planned through the U.S. Coast Guard and the Department of Homeland Security.

- EEEPC has reviewed the benchmarks in the vicinity of the Eighteenmile Creek RI project area and none are close enough for use. To provide additional assurance of data accuracy and reproducibility, the field team will capture GPS data points at three known, fixed structures within the project area on each field day. At least one point will be captured before the collection of any other data. The other point(s) may be collected when encountered during normal daily field activities. If none are encountered, the field team will drive to the nearest acceptable location to capture the needed points. The locations used each day will be recorded in the field notebook. It is acceptable to use up to two areas (e.g., southwest corner and southeast corner) on one bridge or structure; this will be decided based on field conditions (e.g., traffic, obstructions, etc.) and will be recorded as part of the data identification and in the field notebook.

- Known, fixed locations in the Eighteenmile Creek AOC project area (see Figure 2-2):
  1. Ridge Road Bridge
  2. Jacques Road Bridge
  3. Ewings Road Bridge - South Crossing
  4. Ewings Road Bridge - North Crossing

5. Ide Road Bridge
6. Newfane Dam
7. Drake Settlement Road Bridge

- Field personnel will verify that the GPS is functioning properly before collecting data. This means that all of the following requirements will be met:
  1. A minimum of four visible satellites are available
  2. Position Dilution of Precision (PDOP) <= 6
  3. Satellite elevation >= 15° above the horizon
  4. Acceptable signal-to-noise ratio (SNR) Mask

- EEEPC will transfer datasets when the field crews return to the office. The data are usually collected in a local datum. Datasets will be differentially corrected using Trimble software and assessed for accuracy. This process involves both the field crew and the GIS analysts that are assigned to the project. Data points that may be erroneous or outliers will be checked and may be eliminated from the survey. To ensure spatial data validation, EEEPC uses high resolution 1-foot ground pixel orthophotography and the field crew notes to check GIS data after transferred to the computer. EEEPC has streamlined the GPS survey process, and transferring data from the field into an existing GIS database typically encounters minimal problems.

- Datasets collected for sampling will be mapped and analyzed for both spatial and non-spatial statistics. Generally, GIS will assess the lows and highs of various parameters and distances accompanying the data. Spatial analysis will be carried out using ArcGIS desktop software.

Data will be delivered with coordinates in the original WGS84 coordinate system. Example data collection forms such as the GPS check form are included in Appendix A. Additional sampling forms are included in Appendix D of the FSP.

2.4.2 Sediment and Surface Soil Sampling

Sampling methods are documented in the FSP. EEEPC's sampling SOPs and CLP's *Guidance for Field Samplers* serve as the basis for sampling procedures. The FSP describes the sampling methods, equipment decontamination, and field records.

Activities that deviate from the current planned approach as documented in the FSP will be documented by the FTL on a field adjustment form. The form will be sent to the site managers for CH2M HILL and EEEPC for review and approval. Corrective actions will be listed. Once approved by the site managers, the form will be sent to the USEPA GLNPO for review and approval. The FTL will be responsible for implementing the corrective actions.

2.5 Sample Handling and Custody

2.5.1 Sample Containers

The volumes and containers required for sampling activities are noted in Table 2-2. The laboratory must maintain a record of all sample bottle lot numbers shipped in order to track samples if a contamination problem should occur. All sample containers shall be the I-CHEM Series 200 type or equivalent. The laboratory shall follow the "Specifications and Guidance for Obtaining Contaminant-Free Sample Containers," OSWER Directive #9240.0-05 (rev. 06/90).

2.5.2 Samples Preservation and Holding Times

All samples requiring preservation will be collected in containers pre-preserved by the laboratory supplier. A list of preservatives and holding times for each type of analysis are indicated in Table 2-2. In addition to the samples for analysis, samples will be submitted to be archived. Sample for archiving will be maintained by the subcontracted laboratory in a -20 (+/-5) °C freezer until notified that the samples are to be analyzed or disposed. If storage space becomes low, the laboratory will consult with the EEEPC laboratory task manager to determine the need for analysis of the archived samples. Frozen samples will be held for up to six months prior to analysis without violation of holding time. Holding times will start once the sample is thawed to 4°C. Sample containers for PCB congener and PCDD/F analysis will be held under custody at a local laboratory at 4°C. Samples will be selected for analysis after the PCB Aroclor results are present and if it is determined that PCDD/F analysis is required.

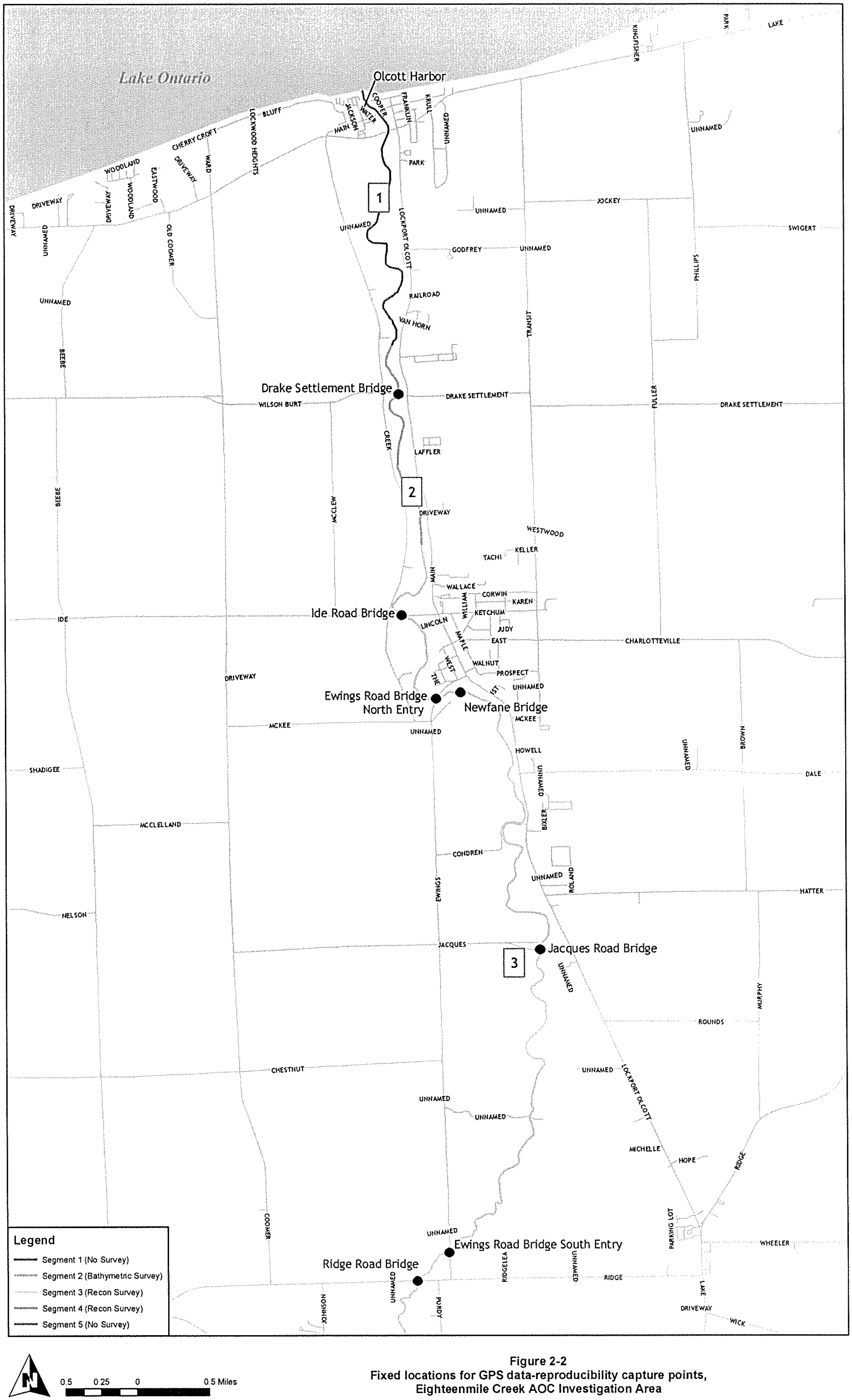

Figure 2-2
Fixed locations for GPS data-reproducibility capture points, Eighteenmile Creek AOC Investigation Area

Table 2-2 Sample Containers, Preservatives, and Holding Times — Eighteen Mile Creek AOC

Analysis	Method[a]	Container	Preservation/ Storage[(3)]	Maximum Hold Time
Sediment and Soil Samples				
PCBs, TCL PAHs only, and pesticides	SOM01.2	Amber 8-oz glass jar	4±2°C	14 days to extraction/40 days to analysis
PCB Congeners (additional container to hold for all surface sediments and hand core samples until PCB analysis is complete)	CBC01.0	Amber 4-oz glass jar	4±2°C	365 days to extraction/365 days to analysis
TAL Metals	ILM05.4	Amber 8-oz glass jar	4±2°C	180 days
AVS/SEM	"Draft Analytical Method for Determination of Acid Volatile Sulfide in Sediment" December 1991	2 oz jar filled completely, no head space	4°C	14 days for AVS
Total Organic Carbon[2]	Lloyd Kahn Method	Amber 4-oz glass jar	4±2°C	28 days
Particle Size Distribution[1]	ASTM D422 modified sieve only or ASTM D4464	Double bagged zip lock bags	4°C for Method ASTM D4464 only	NA
Moisture Content	ASTM D2216	4-oz glass jar	4±2°C	NA

Table 2-2 Sample Containers, Preservatives, and Holding Times — Eighteen Mile Creek AOC

Analysis	Method[a]	Container	Preservation/ Storage[(3)]	Maximum Hold Time
PCDD/F (optional container to hold if analysis is required)	DLM02.0	Amber 4-oz glass jar	4±2°C	Contract only - 10 days to extraction/30 days to analysis. Technical holding time up to one year.

Notes:
1. Particle size distribution analysis by modified sieve only shall also include sieve # 200. However, the limited sample size may indicate a need to use an alternate method (D4464). This method will not be used without approval by the USEPA.
2. There is no holding time for TOCs in the method. NYSDEC recommends applying the aqueous holding time to solid samples as a guideline.
3. Containers for archive should be filled 2/3 full and will be frozen at -20(+/-5)°C.

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Key:
PAH = Polycyclic aromatic hydrocarbon.
PCB = Polychlorinated biphenyl.
TAL = Target Analyte List.
TCL = Target Compound List.

2.5.3 Sample Handling

Transportation and handling of samples must be accomplished in a manner that not only protects the integrity of samples but also prevents any detrimental effects due to the possible hazardous nature of the samples. Regulations for packaging, marking, labeling, and shipping of hazardous materials are promulgated by the DOT in 49 CFR 171 through 177. EEEPC trains all staff responsible for the shipment of samples in these regulations. Procedures for sample packing and shipping are documented in the CLP *Guidance for Field Samplers* (EPA 540-R-07-06) and are summarized in Appendix E of the FSP.

2.5.4 Sample Shipment

Field personnel will make arrangements for transporting samples to the laboratory. In most cases, samples will be shipped using an overnight express carrier (e.g., Federal Express) or hand-delivered to a local laboratory for archive samples. If sample collection continues late in the day, samples will be shipped the following day. Because none of the samples are slated for volatile analysis or have short holding times, this will not impact data analysis. Field personnel will provide the Regional sample Control Coordinator (RSCC) or the designee or Sample Management Officer (SMO) with a shipment schedule and notify them of deviations from planned activities. The field personnel will notify the RSCC (or designee) or SMO of all of samples intended for Saturday delivery, no later than 3 p.m. (eastern standard time [EST]) on the Friday prior to delivery. If samplers are shipping samples after 5 p.m. (EST), they must notify the RSCC (or designee) or SMO by 8:00 a.m. EST on the following business day. Samples collected on Saturday will be shipped on Monday. Samples will be maintained on ice in a sealed cooler over the weekend at the EEEPC warehouse. Field personnel must also include cooler return instructions with each shipment, including shipping airbills bearing the samplers account number and a return address so that coolers can be returned.

2.5.5 Sample Custody

Formal sample custody procedures begin when the pre-cleaned sample containers leave the laboratory or upon receipt from the container vendor. Sample identification documents must be carefully prepared so that sample identification and COC can be maintained and sample disposition controlled. Sample identification documents include:

- Field notebooks;
- Sample labels;
- Custody seals; and
- COC records.

The primary objective of COC procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from sampling through completion of all required analyses. A sample is in custody if it is:

- In a team member's physical possession;
- In a team member's view;
- Locked up; or

- Kept in a secured area that is restricted to authorized personnel.

Field Custody Procedures

Pre-cleaned sample containers will be purchased by EEEPC, and the field data manager will record receipt of the sample containers in the project logbook. The following field custody procedure will be used during sample collection:

- As few persons as possible should handle samples.
- Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use.
- The sample collector is personally responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under COC rules.
- The sample collector will record sample data in the field logbook.
- The FTL will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

Chain-of-Custody Record

EEEPC will use the Forms II Lite® program for COC records and will follow the guidelines in the USEPA's Contract Laboratory Program *Guidance for Field Samplers* (EPA 540-R-07-06).

Custody Seals

Custody seals are preprinted, adhesive-backed seals with security slots designed to break if the seals are disturbed. DOT-approved sample shipping containers are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. Upon receipt at the laboratory, the custodian must check and document on a cooler receipt form that the seals on boxes are intact.

2.5.6 Laboratory Custody Procedures

Upon receipt at the laboratory, the SMO or designated custodian inspects the samples for integrity and checks the shipment against the COC. Cooler temperature is checked and documented on the laboratory's cooler receipt form.

Discrepancies and nonconforming conditions upon receipt are addressed at this point and documented on the cooler receipt form and must be resolved before samples are released to the laboratory for analysis. The laboratory project will contact the EEEPC ASM or designee to resolve discrepancies and report nonconforming conditions prior to releasing the samples for analysis. When the shipment and the COC are in agreement, the custodian enters the sample and analysis information into the laboratory computer system (laboratory information management system [LIMS]) and assigns each sample a unique laboratory number.

This number is affixed to each sample bottle. The original of the COC form is given to the data management group and the information it contains is copied to the appropriate laboratory operation areas. These log-in procedures are documented in each laboratory's sample management SOPs. The laboratory does not maintain internal COC records once the samples have been securely stored.

Sample Storage Security

While in the laboratory, the samples and aliquots that require storage at approximately 4°C are maintained in a secured refrigerator unless they are being used for analysis. All of the refrigerators in the laboratory used to store samples have restricted access, are numbered, and the actual storage location is traceable at all times. In addition, there are dedicated refrigerators designated for extracts and analytical standards. Samples (e.g., tissue) that are required to be frozen are stored in a freezer. The sample storage areas are in the laboratory to which access is limited to laboratory chemists and controlled by assigned passkeys.

For this project, all remaining sample volume and associated extracts will be held in storage for 30 days after submittal of the final analytical report, unless longer retention is specified by the USEPA.

2.6 Analytical Method Requirements

All inorganic and organic compounds for this project are determined using the methods listed in Table 1-1 and as described by the USEPA's CLP SOPs and selected laboratory methods/SOPs. The project reporting limits are provided in tables in Appendix B, Summary of Reporting Limits.

Once the samples have been properly collected and documented, the PCB Aroclor, TCL PAHs, pesticides, PCB congeners, and metals samples will be sent to a USEPA CLP laboratory for analysis. The samples for analyses that cannot be performed by CLP laboratories will be sent to an off-site laboratory subcontracted by CH2M HILL for analysis. Analytical method requirements and level of quantification will be forwarded to the chosen laboratory as part of the procurement process.

The laboratory will use analytical SOPs to ensure that the submitted samples are accurate and analyzed precisely. The analytical SOPs reflect the requirements of the stated methods while including internal QC criteria. The QC criteria used during the analyses will be those stated within the analytical SOPs obtained and included in Appendix C, once procurement of the laboratory services is completed.

2.6.1 CLP Methods

Laboratories will follow the current CLP statement of work for which they are under contract. For TCL PAH analysis, the statement of work will be modified to include only the 17 PAH compounds listed in Appendix B.

2.6.2 Total Organic Carbons (TOCs)

TOCs in sediments will be determined using the 1988 EPA Region II combustion oxidation procedure (i.e., the Lloyd Kahn procedure). In performing the Lloyd Kahn method, the laboratory analyzes each sample in duplicate and the results of the two individual determinations are averaged to derive a final result for a particular sample. In those instances when the two values yield an RPD that is more than 40percent, the laboratory does provide for additional determinations and applies the "Dixon" outlier test to the total population of determinations. The results of that assessment are provided for informational purposes within the supporting documentation.

2.6.3 Geotechnical Methods

Grain size tests are performed to determine the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D421 (dry preparation) or ASTM D2217 (wet preparation). The grain size distribution of soils coarser than a No.200 sieve (0.074 mm opening) is determined by passing the samples through a standard set of nested sieves. Materials passing the No. 200 sieve are suspended in water and the grain size distribution calculated from the measured settlement rate. These tests are conducted in accordance with ASTM D422 modified (sieve only).

2.7 Quality Control

QC data are necessary to determine precision and accuracy. The primary field data collection is latitude/longitude location and field measurements. These data will assist in developing field data collection maps to document locales, points, and areas of surveys. A GPS capable of ascertaining horizontal locations with less than 1 meter of accuracy will be used. To achieve this accuracy, it is important that the GPS be in good working order and receiving strong satellite signals. The field team will be responsible for checking the satellite signal strength for the GPS system prior to recording this data and for ensuring that the system records equivalent horizontal locations. Any problems with signal strength shall be recorded in the field boring log. If problems are noted, the field team should provide a qualitative description of the sampling location utilizing any available, permanent landmarks. QC data are also necessary to determine precision and accuracy of field sampling and to demonstrate the absence of interferences and/or contamination of glassware and reagents. Field QC will include duplicates samples. Field QC samples will be preserved, documented, and transported in the same manner as the samples they represent. Laboratory-based QC will consist of standards, replicates, spikes, and blanks.

2.7.1 Field Quality Control Samples

The collection of field QC samples and the conditions under which the samples were collected will be documented in the field logbook. The field QC samples listed below will be collected.

Duplicate Samples

Duplicate samples will be collected at the rate of one duplicate per 20 project samples of the same matrix. Duplicate sediment samples will be prepared by collecting equal aliquots from the same sample source and placing them in separate sample bottles. Duplicate water samples will be prepared by collecting successive volumes of water and placing them in separate bottles. Duplicate samples will be shipped with the samples they represent and will be analyzed in the same manner.

The RPD between the concentration in the original and duplicate sample measures the overall precision of the field sampling and analytical method. Field duplicates are evaluated by using two times the laboratory QC criteria for duplicates (i.e., RPDs of 40percent for water and air and 70percent for sediment). If all other laboratory QC criteria are met, RPD results outside control limits indicate potential matrix effects. Significant deviations in RPD results of field duplicates are assessed to evaluate whether the data met all quality objectives for the project.

Trip Blanks

Trip blanks are not required because no volatiles are being tested.

Field Equipment Blanks

Field equipment blanks are not required because the majority of the sampling equipment will be disposable. The only part of the equipment that will be decontaminated is the stainless steel bowl used for homogenizing the sample.

Matrix Spike/Matrix Spike Duplicate

MS/MSD samples will be used by the laboratories to assess the precision and accuracy of sample analysis. The MS/MSD samples will be fortified by the laboratories in accordance with the specifications of the analytical methods. Two extra volumes of sample are required for each combination of MS/MSD samples. Sample containers will be filled and stored in the same manner as field duplicate samples. The frequency of MS/MSD sample collection will be at least 5percent.

Temperature Blanks

A temperature blank will be included in each cooler to allow the laboratory receiving the shipment of samples to determine if the samples have been maintained at the proper temperature. Temperature blanks will consist of an unpreserved sample container filled with distilled water. One temperature blank will accompany each sample cooler being shipped to the laboratory.

2.7.2 Laboratory Quality Control Analyses

Quality control samples for each matrix will be analyzed at the frequency noted in Table 2-3.

Table 2-3 Laboratory Quality Control Samples

QC Sample	Frequency
Method Blanks	1 per analytical batch of 1 to 20 samples
Laboratory Control Sample	1 per analytical batch of 1 to 20 samples
Surrogates	Spiked into all field and QC samples (Organic Analyses)
Matrix Spike/Matrix Spike Duplicate or Analytical Duplicate	1 per analytical batch of 1 to20 samples

2.8 Instrument/Equipment Testing, Inspection, and Maintenance

2.8.1 Field Equipment Maintenance

Field instruments will be rented through approved suppliers that have manufacturer-approved maintenance programs. Field equipment will be checked upon receipt to verify that instruments are in good working condition and that the rental company provided appropriate calibration records or certifications. On-site operation will be performed in accordance with manufacturer manuals. If any problems occur, the instrument will be replaced immediately.

2.8.2 Laboratory Equipment Maintenance

Instruments in the laboratory will be maintained according to manufacturer specifications. Regular preventive maintenance should be performed by trained service personnel. Maintenance shall be documented and maintained in permanent records by the individual responsible for each instrument.

2.9 Instrument/Equipment Calibration and Frequency

All instruments and equipment used during the survey will be operated and calibrated according to the manufacturer's guidelines and recommendations. Personnel properly trained in these procedures will perform operation and calibration of all instruments. Documentation of all field maintenance and calibration information will be maintained in the field logbook. Table 2-4 lists monitoring equipment used during fieldwork. All field personnel receive annual refresher training on the field operation of all health and safety-related equipment, which includes calibration procedures. Brief descriptions of calibration procedures for major field instruments are included in Table 2-4.

Table 2-4 General Field Equipment and Calibration Procedures

Instrument or Equipment	Description[a]	Field Calibration Procedure	Acceptability/ Performance Criteria	Responsible Personnel
GPS Meter	Trimble GeoXT or GeoXH hand-held GPS units.	Trimble GeoXT/GeoXH handheld GPS units do not require field calibration. To verify accuracy, the field team will collect three divergent GPS location points at nearby, known, fixed structures such as bridges, road intersections, or large buildings.	Horizontal accuracy to less than 1 meter. Not applicable for vertical measurements.	FTL
Photoionization detector (PID)	The PID is a portable, non-destructive trace-gas analyzer. Units for site characterization must have a range of 0 to >2,000 ppm and a 10.6 or 11.7 eV lamp (e.g., MiniRAE 2000). Units for indoor air monitoring must have a range of 1 ppb to 2,000 ppm and a 10.6 eV lamp (e.g., ppb RAE Plus).Calibration check gas (e.g., isobutylene) must be provided with unit.	In the field, PIDs will be calibrated at the start of each field event by the manufacturer. Initial calibration must be verified by a certificate of calibration from the rental company or field calibration is required. There is no field calibration for a MiniRae 2000. If a significant change in weather occurs during the day (i.e., change in humidity or temperature) or if the unit is turned off for an extended period, then there is a field test, called a Bump Test. It consists of having the unit sniff 100ppm calibration check gas and determine the reading. If the unit is reading 100 ppm or close to it, then it is considered to be calibrated. If not, depending on how far off it is, either dry out the unit on a heater (due to potential fogging of the lamp), or send the unit back to the rental company for in-house calibration.	Meter must give consistent background readings.	Site Safety Officer, Project Geologist

Note:
[a] Description is for typical equipment; equivalent units may be used.

Key:
eV = Electronvolts.
ppm = Parts per million.

2.9.1 Field Calibration Procedures

Locations of data collection points will be measured using GPS or will be measured with reference to the location of a known feature. GPS coordinates will be recorded using a GeoXH or equivalent handheld GPS with integral personal computer (or equivalent) employed in the real-time differential correction mode, resulting in an approximate horizontal accuracy of ±3 feet. GPS collection points will be taken at known, fixed features (such as bridges and dams) as reference points.

2.9.2 Laboratory Calibration Procedures

Instruments and equipment used in CLP laboratories are controlled by a formal calibration program as described in the CLP statement of work. The program verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. All instruments and equipment that measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Written procedures are used by CLP laboratories for all instruments and equipment subject to calibration. Calibration is performed by CLP laboratories' personnel using reference standards or externally by calibration agencies or equipment manufacturers.

The designated laboratory personnel performing QC activities will maintain and file records of calibration, repairs, or replacement. These records will be filed where the work is performed and are subject to a QA audit.

All standards used in equipment will be traceable, directly or indirectly, to the National Institute of Standards and Technology. All standards received will be logged into standard receipt logs maintained by the individual analytical groups. Each group maintains a standards log that tracks the preparation of standards used for calibration and QC purposes.

Equipment that cannot be calibrated or becomes inoperable is removed from service. Such equipment must be repaired and satisfactorily recalibrated before reuse. For equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken and the analyst achieves an acceptable calibration.

2.10 Inspection/Acceptance of Supplies and Consumables

Procedures for the procurement, inspection, maintenance, and management of equipment and supplies for project activities are documented in EEEPC's Government Property Procurement SOP. All field supplies and equipment will be procured as part of the contract and maintained by the technical team. Supplies and equipment will be inspected on receipt at the site to verify that the correct materials were received. The FTL will be responsible for performing inspections.

2.11 Non-Direct Measurements

For data acquired from non-direct measurement, sources include the following:

- Physical information such as descriptions of sampling activities and geologic logs
- State and local environmental agency files
- Reference computer databases and literature files
- Historic reports on a site and subjective information gathered through interviews.

Data from non-direct measurements will be reviewed and summarized in the final report. Data from all non-direct measurement sources are stored as indicated in Section 1.6. Anticipated data for the site reconnaissance survey is summarized below in Table 2-5. Additional data from non-direct measurements will be reviewed and used as indicated in the FSP.

Table 2-5 Summary of Data from Non-Direct Measurements

Data Source	Description[a]	Intended Use	Acceptability/ Performance Criteria
New York State GIS Service	GIS Layers for Niagara County and aerial imagery	Present parcel data, permit locations, hazardous waste site locations, and aerial images for evaluation of future site sampling	New York State site will be checked prior to data use to verify most current copy.
Historic PCB results from USEPA project PCB Trackdown and NYSDEC supplemental RI	PCB data from historic investigations currently loaded into GIS	PCB data will be used to show concentrations of PCBs in sediments	As part of the PCB trackdown project, EEEPC performed extensive review of historic PCB and loaded the checked results into GIS. More recent data will be reviewed for consistency with existing data prior to use.
NYSDEC regulations and literature sources	Site screening values for sediment, surface water, and soil concentrations for PCBs and metals.	Screening values will be used as part of the planning process to establish appropriate DQOs.	Values will be reviewed against current source to verify the values are still acceptable.

Note:
[a] Description is for typical data type and not specific to each data layer.

2.12 Data Management

The field data include approved work planning tables, GPS data, field sampling forms, and logbooks, as appropriate (see Appendix D of the FSP for example forms). The FTL will review all field data for accuracy. Any field data not loaded into the GPS will be entered into a Forms II Lite®. Field data will downloaded from Forms II Lite®, checked by the FTL, and uploaded to Equis®, a central database on a secure area on EEEPC's network with access limited to data management specialists. The Equis® database will be electronically linked to EEEPC's GIS systems, ARCGIS ARCInfo Version 9.3. In order to link to Equis®, the software may include a geospatial database ARCSDE Version 9.3. Once verified or validated, the Equis® database will be accessible to other users via Equis® Enterprise, a web-based version data management system for project managers with read-only access. Any data from outside sources will include a description of the data, a reference to the source, and the date it was updated. Outside data will be checked prior to use to verify that current values are used. The Equis® database will be used to create tables for the final report.

The data for the report will be uploaded to an ARCIMS site that is accessible to all data users. The site is open only to project members that are given permission. The ARCIMS site includes all historical data that has been previously verified and validated under other Eighteenmile Creek projects. Data storage, access, and security will follow the procedures described in USEPA's National Geospatial Data Policy sections. A final report will be prepared in conjunction with the ARCIMS site. The report will include a description of the following:

- **Data Dictionary.** A list of all GIS layers and their sources.
- **Data Collection Process and Quality Checks.** See Section 2.3.
- **Data Processing.** Post-processing is described in Section 2.3 above.
- **Metadata Preparation.** Metadata preparation will be accomplished by the GIS analyst upon conclusion of the data processing phase using USEPA's *Geospatial Metadata Technical Specification v. 1.0* (November 2007).

Analytical Electronic Data Deliverables (EDDs)

Analytical EDDs will provided by USEPA's data validation contractor following completion of data review. The EDDs will be checked for completeness and compared with the field data entered into Equis® via Forms II Lite®. The EDDs will be processed via the Equis® electronic data processor (EDP) module by the Project Chemist. Analytical results will be verified against the hard copy reports for at least one sample for each type of analysis and EDD. If a data package is determined to be unusable, the Project Chemist will immediately notify the SM, who will then inform the Contracting Officer Representative (COR) and the analytical laboratory. Qualifiers assigned based on validation of field QC results will be entered into Equis® manually.

3 Assessment and Oversight

3.1 Assessment and Response Actions

Technical assessment activities include peer review, data quality reviews, and technical system audits (i.e., laboratory and field). Procedures for assessment and audit of data quality are described in Section 4 of this QAPP. Procedures for peer review and technical assessments are summarized briefly below.

Both overall and direct technical assessment activities may result in the need for corrective action. The project approach for implementing a corrective action response program for both field and laboratory situations is summarized briefly below. The project QA Officer has stop-work authority on any project activities that may have negative quality impacts prior to completion of corrective actions.

3.1.1 Peer Review

Peer review for all project deliverables, including work plans, QAPPs, draft and final reports, and technical memoranda will be implemented. The peer review process provides for a critical evaluation of the deliverable by an individual or team to determine if the deliverable will meet established criteria, quality objectives, technical standards, and contractual obligations. The SM and ASM will assign peer reviewers when the publications schedule is established. The SM and ASM will be responsible for ensuring all peer reviewers participate in the review process and approve all final deliverables.

3.1.2 Technical Systems Assessments

The entire project team is responsible for the ongoing assessment of the technical work performed by the team, identification of nonconformance with the project objectives, and initiation, implementation, and documentation of corrective action. Independent performance and systems audits are technical assessments that are a possible part of the QA/QC program. The following describes the types of audits conducted, frequency of these audits, and personnel responsible for conducting audits.

Field Audits

Field audits are performed under the direction of the QA Officer. Field audits will be typically performed during the early field programs. There are two days of planned field audits for this project. The USEPA GLNPO may perform independent field audits. Field audits will be performed for each hand coring and vibracoring activity.

Field Inspections

The FTL will be on-site for the day of sampling activities and be responsible for inspecting all field activities to verify compliance of activities with project plans. T EEEPC's ASM will be responsible for review of daily activities with the FTL.

Laboratory Audits

The USEPA must certify the laboratory and will perform external systems audits at a pre-award stage before the laboratory is certified as a CLP laboratory and will monitor CLP laboratory performance after the contracts are awarded. External audits include reviews of analytical capabilities and procedures, COC procedures, documentation, QA/QC, and laboratory organization. These audits also include analysis of blind PE samples.

3.1.3 Corrective Action

Corrective actions will be implemented, as needed. The FTL is responsible for initiating corrective action and implementing it in the field and office. Specific corrective actions will be clearly documented in the logbooks. The EEEPC ASM will be responsible for review of corrective actions based on field inspections.

3.2 Reports to Management

For reports to management, the following are included, as appropriate:

- **Audit Reports.** Audit reports are prepared by the audit team leader immediately after completion of the audit. The report will list findings and recommendations and will be provided to the SM and QA Officer.

- **Project Status Reports.** Project status reports are completed by the SM to document the overall assessment of the project on a monthly basis.

Upon completion of a project sampling effort, project data will be included in a comprehensive technical report that summarizes field activities and provides a data evaluation. A discussion of the validity of results in the context of QA/QC procedures will be made in the final report.

Serious problems will be reported immediately to USEPA personnel. Time and type of corrective action (if needed) will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting an audit, or modifying data review protocol. Table 3-1 summarizes the type and distribution of planned project assessments.

Table 3-1 Project Assessments and Reports

Assessment or Report Type	Frequency	Party(s) Performing Assessment	Party(s) Receiving Assessment Findings	Party(s) Responsible for Corrective Actions
Field Health and Safety Plan Review	Project startup	Tom Siener, CIH, RSC (EEEPC)	EEEPC ASM, FTL (EEEPC); USEPA GLNPO and CH2M HILL receive final version	EEEPC Assistant Site Manager, FTL (EEEPC)
Field Inspection	Project start-up and once in field program	Kris Erickson (EEEPC Assistant Site Manager)	GLNPO and CH2M HILL	FTL (EEEPC)
Field Audit	Beginning of each sampling mobilization	Marcia Galloway, QA leader (EEEPC)	GLNPO and CH2M HILL	FTL (EEEPC)
Deliverable Review	Prior to Each Report	Jewelle Keiser (CH2M HILL Site Manager); Kris Erickson (EEEPC Assistant Site Manager); Marcia Galloway, QA leader (EEEPC)	USEPA GLNPO	Kris Erickson (EEEPC Assistant Site Manager)

4 Data Validation and Usability

4.1 Data Review, Validation, and Verification Requirements

Data validation is the process of reviewing project data against the data QA/QC requirements. The data are evaluated for precision and accuracy against the analytical protocol requirements stated in the laboratory statement of work. Non-conformance issues or deficiencies that could affect the reported result's precision or accuracy are identified and considered when assessing whether the result is sufficient to achieve DQOs.

All data collected as part of this monitoring plan will be consistent with this QAPP. All CLP-equivalent data reports (Level 4 analyses) will be validated by the USEPA as described in Section 4.2. Criteria for assessment (for example, DQOs contained in these documents) are superseded by the laboratory statement of work.

The USEPA will conduct the validation of CLP-generated data. The EEEPC Project Chemist will validate the data generated by the subcontracted laboratory and assess the field QC sample results. Validation of laboratory data packages will include an assessment of compliance with method guidelines, specifically including an evaluation of the following:

- Holding times
- Blank contamination
- Calibration requirements (initial and continuing)
- Matrix spike and duplicate recoveries

- Surrogate spike recoveries
- Instrument performance
- Compound identification

The following steps are included as part of the data validation process:

- Evaluation of completeness of the data package.
- Verification that field COC forms were completed and that the samples were handled properly.
- Verification that holding times were met for each parameter. Holding time exceedences will be documented. Data for all samples exceeding holding time requirements will be flagged as having exceeded the holding time. The validator will decide which qualifiers are most appropriate on a case-by-case basis
- Verification that parameters were analyzed according to methods specified.
- Review of QA/QC data (assurance that duplicates, co-locates, blanks, spikes, and PE samples were analyzed on the required number of samples as specified in the method and/or this QAPP; verification that duplicate and matrix spike recoveries were acceptable).
- Investigation of anomalies identified during review, which will be discussed with the QA Manager and the Laboratory QA Manager.

The subcontracted non-CLP laboratory results will be reviewed and verified as described in Section 4.2.

Deficiencies discovered as a result of data validation, as well as corrective actions implemented in response to the deficiency, will be documented and submitted in the data evaluation report with supporting documentation supplied as check sheets. USEPA *Functional Guidelines* will be used as guidance on data validation procedures. QC requirements specified in the laboratory statement of work shall take precedence over the *Functional Guidelines* requirements when listed.

Field Data Validation and Verification

The following list of general QC procedures will be completed for field data.

- Verify that all data files are present and readable.
- Check that survey standards established in the planning phase were correctly followed, including verifying that horizontal and vertical controls were properly established.
- Verify that bathymetric data have been completely processed and appropriate data corrections have been applied.

All of the QC checks of bathymetric data will be performed by the survey subcontractor. Representatives of EEEPC will be present during the QC checks to ensure they are conducted. The EEEPC representative shall periodically view the data displays and independently record data, including RTK-DGPS accuracy and control point checks, and positioning tests.

Post-processing the bathymetric survey data will involve reviewing each of the records produced during field collection. The post-processing will also involve correcting any sounding data to the vertical datum specified (low-water data [LWD} for the Eighteenmile Creek) based on the RTK-DGPS elevations. The data will then be sorted and reduced to an X, Y, Z file. Combining the sediment thickness data with the bathymetric data to produces maps that will be presented in the report. The X, Y, Z file will also be generated and will show the water elevation, water depth, top of sediment elevation, and thickness of the sediment layer within the project area. Finally, the sorted data will be point-plotted, contoured, and annotated on geo-referenced GIS drawings.

4.2 Validation and Verification Methods

4.2.1 Analytical Data

All analytical data will be supported by a data package. The data package will contain the supporting QC data for the associated field samples (see Section 1.6 of this QAPP for the data package content requirements). Before the laboratory will release each data package, the Laboratory QA Manager (or the analytical section supervisor) must carefully review the sample and laboratory performance QC data to verify sample identity, the completeness and accuracy of the sample and QC data, and compliance with method specifications.

The USEPA will perform data validation for CLP-generated data in a manner consistent with the USEPA's *Contract Laboratory Program National Functional Guidelines for Organic Data Review,* the *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (2004), and the *Contract Laboratory Program National Functional Guidelines for Chlorinated Biphenyl Congeners (CBCs)* (2009). Sample results will then be assigned a degree of usability based upon overall data quality.

The subcontracted non-CLP laboratory results for waste characterization (if needed) and geotechnical testing will undergo a forms review (duplicates, lab notes, etc., as applicable) by the EEEPC Project Chemist.

The CH2M HILL/EEEPC project team will evaluate the data validation results. This evaluation will assess how the data, as qualified by the data validator, can be used for project decision-making once any discrepancies or anomalies have been resolved.

The data, after validation, will also be verified to assess if the correct samples were analyzed and the correct parameters reported. Data reporting limits will be verified against expected reporting limits listed in Appendix B. The data are also verified to assess if the EDDs and the hard copy data deliverables are consistent with one another to ensure an accurate database. Field QC results for duplicates will be compared with criteria listed in Section 2.&.1. The data will be looked at in such a way as to see if the results make sense if compared with what is anticipated. If the data are consistent with anticipated results, no corrective action will be deemed necessary. However, if the data obtained from the laboratory are not consistent with the anticipated results, an in-depth evaluation of the results may be necessary to interpret the deviation.

4.2.2 Field Data

The field data files, including raw survey data files and ancillary ASCII data files, processed survey data files, and edited data will be copied to a project drive on the EEEPC network and transferred to GIS. The GIS analyst will perform a QC check of the results to verify data are consistent with planned objectives. Final data will be included on a data compact disc (CD) in (X,Y,Z) spreadsheet form.

The data evaluation report will include the following information:

- Documentation of the equipment and methods used in the survey.
- Documentation of computer software programs, personnel, and analytical techniques used to store and process the spatial data.
- Electronic files of the mapping and profiling results shall be delivered in GIS format. ASCII files containing post-processed data in point number, X, Y, elevation, description format, and a listing of data used to generate maps will also be delivered.
- Survey data shall be in horizontal datum New York State Plane West NAD 83. The vertical datum shall be IGLD 1985. Units are in survey feet.

4.2.3 Data Review Reporting

The Project Chemist will perform the following reporting functions:

- Alert the SM to any QC problems, obvious anomalous values, or discrepancies between the field and laboratory data that may impact data usability.
- Discuss QC problems in a data evaluation report.
- Prepare analytical data summary tables of qualified data that summarize those samples and analytes for which detectable concentrations were exhibited, including field QC samples.
- At the completion of all field and laboratory efforts, summarize planned versus actual field and laboratory activities and data usability concerns in the data evaluation report.

Data will be stored as hard copies, as well as on CD, and backed up onto a computer system hard drive, or network drive. The drives will be large enough to accommodate this type of data. The data for the report will be uploaded to an ARCIMS site that is accessible to data users. The site is open only to project members that are given permission to access the site. The ARCIMS site includes all historical data that have been previously verified and validated under other Eighteenmile Creek projects.

4.3 Reconciliation with User Requirements

The QA Manager will be responsible for evaluating accuracy, representativeness, comparability, and completeness of field data observations based on consistency with past reports. Deviations from quality objectives for the project will be documented in the data evaluation report provided to the data users for the project.

Data that are determined to be incomplete or not usable for the project will be discussed with the project team. If critical data points are involved that impact the ability to complete project objectives, data users will report immediately to the project team, discuss resolution of the issue, and implement necessary corrective actions (for example, re-sampling).

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A Field Forms

GPS Pre-Survey Checklist

Pre-Survey Checklist

______ Obtain List of Facilities
______ Obtain Current GPS-Satellite Almanac
______ Call Coast Guard to Verify Satellite Availability
______ Obtain Control Points from NGS or Local Source
______ Obtain 7.5-min. Topographic Maps
______ Obtain Local Street Maps
______ Prepare Letter of Introduction
______ Collect and Pack Field Equipment

Field Equipment

______ GPS Equipment
______ Laptop or Other Field Computer
______ 7.5-min. Maps
______ Aerial Photo if Available
______ Camera [Digital cameras that can synchronize the images with the latitude / longitude field data are recommended]
______ Film [or Memory Stick]
______ Compass
______ Tape Measure
______ Binoculars
______ Field Forms
______ Clip Board
______ Calculator
______ GPS Hardware/Software Manuals
______ Mini Tape Recorder
______ Hard Copy of GPS-Satellite Almanac
______ Rain Gear
______ Two-way Radio Communication (i.e., CB, cellular phone, etc.)

Last Minute Checks

______ Charge Batteries
______ Verify GPS-Satellite Almanac
______ Target Travel Route

In the Field Checks

______ Find Base Stations
______ Initialize Equipment
______ Begin Collecting Data

Guidance for renting GPS Units

VENDOR: Geoplane Service – GIS group will order unit from account representative Armando Chavez

Steps for Technical staff to follow:

1. Provide someone in the GIS group with a **minimum of 48 hour*** notification prior to the date the Unit is required. The following information is required at time of notification•:

   - Name of Project and Project Manager
   - Project Job Charge
   - Name of User/GPS Handler(s)
   - Date(s) GPS unit is required
   - An email from PM indicating that all costs (i.e. Shipping, GIS time, etc.) associated with rental of unit will be covered at time of invoicing
   - Name of GIS point of contact

   *if you do not provide 48 hours notice to the GIS group there is a risk that the request cannot be accommodated. Prior notification is needed to ensure there is an understanding of what the unit will be used for, appropriate data is loaded on the unit, training and review by the end user is completed, and administrative procedures are followed.

2. Upon receipt of above information, Becky Schalk will coordinate with Geoplane to send the GPS unit to Buffalo for set-up. An internal tracking number (E & E job charge) will be provided to Geoplane for invoicing purposes.

3. Once the GPS unit arrives in Buffalo – the GIS point of contact will set-up the unit with appropriate data required for the field effort and handover (or send) to the appropriately trained GPS handler(s). The GIS POC will review the use of the GPS unit for data collection with the end user.

4. Post-field trip – the unit should be handed back (or sent) to the GIS point of contact ASAP. We are charged daily for the GPS rental. Data will be copied off the unit and QA'd by the GIS POC. One of the following scenarios will then occur:

   i. **IF** the Unit is required for a 2nd project within 2 to 5 days of receipt from the 1st project;

      THEN go to step 1 and collect pertinent information and inform Becky to contact Geoplane to effectively close the invoice on Project #1 and start an invoice for Project #2. Shipping costs will be charged to the last project that used the unit.

   ii. **IF** the Unit is not required for another project within 2 to 5 days;

      THEN the Unit is to be shipped back to Geoplane. All closing costs (which includes shipping) will be attributed to the last project that used the unit.

5. Invoices received from Geoplane will be promptly paid using information collected from step #1. Jenny Gnanendran to forward relevant invoice-related materials to Accounting Dept

6. GPS rental costs are as follows:

   -Daily rental – $50/day
   -Shipping costs – to and from Geoplane (located in Houston, TX)– $70 one way (FedEx priority overnight)

• *Information in Step 1 will be collected manually by GIS Point of Contact at this time. Future goals are to build a website that will automate the overall process.*

Clear Rotation	Clears the map rotation so that the map is "north up".

TOOLS DROPDOWN LIST

Options	Open the ArcPad Options dialog box.
Scale Bar	Display or hide the scale bar.
Panning Frame	Display or hide the map panning frame.
Status Bar	Display or hide the status bar.
North Arrow	Display or hide the north arrow in the map view.
Camera	Open the camera tool.
Toolbars	Display a sub-menu containing all the toolbars in ArcPad.
Utilities	Display a sub-menu containing utility tools.

UTILITIES DROPDOWN LIST

Pack Shapefile	Pack a shapefile by removing records flagged for deletion.
Reproject Shapefile	Reproject a shapefile to another projection and/or datum.
Export Projection Information	Export ArcPad's projection information into CSV and text files.
Run Script	Open the Script dialog box.

HELP DROPDOWN LIST

Quick Reference Help	Open the ArcPad Quick Reference.
User Guide	Open the User ArcPad guide (PC only).
Reference Guide	Open the ArcPad Reference Guide (PC only).
ESRI Support Center	Go to the support.esri.com website, using the default internet browser.
About ArcPad	Open the About ArcPad dialog box.
About Extension	Display a sub-menu listing all loaded ArcPad extensions.

BROWSE TOOLBAR

Zoom In	Zoom in on map using the pen.
Zoom to Full Extent	Zoom to the full extent of the map.
Go Back to Previous Extent	Zoom back to the previous extent you were using.
Identify	Activate the Identify tool.
Find	Open the Find tool.
Start/Stop Editing	Display a sub-menu containing all the editable layers in the ArcPad map. Tapping a layer toggles its editing state.
Refresh	Redraw the map.

ZOOM IN DROPDOWN LIST

Zoom In	Zoom in on map using the pen.
Zoom Out	Zoom out on map using the pen.
Pan	Pan the map using the pen.
Rotate Map	Set the map rotation angle.

ZOOM FULL EXTENT DROPDOWN LIST

Fixed Zoom In	Zoom in on the center of the map by 25%.
Fixed Zoom Out	Zoom out on the center of the map by 25%.
Zoom To Selected	Zoom to the extent of the selected feature.
Center on GPS	Center the map on the current GPS position.
Zoom to Full Extent	Zoom to the full extent of the map.
Zoom to Layer	Zoom to the extent of a particular layer in the map.

GO BACK TO PREVIOUS EXTENT DROPDOWN LIST

Go Back to Previous Extent	Zoom back to the previous extent you were using.
Go to Next Extent	Zoom forward to the next extent in the extent history.
Create Bookmark	Create a spatial bookmark
Zoom to Bookmark	Zoom to an existing spatial bookmark.

IDENTIFY DROPDOWN LIST

Identify	Activate the Identify tool.
Measure	Measure distances in the map view in "point mode".
Radial Measure	Measure radial distances in the map view using the pen.
Freehand Measure	Measure distances in the map view in "freehand mode".
Hyperlink	Activate the Hyperlink tool.
Go To	Activate the Go To tool.
Advanced Select	Activate the Advanced Select tool.

FIND DROPDOWN LIST

Find Features	Open the Find tool.
Clear Selected Feature	Unselect the selected feature.

START/STOP EDITING DROPDOWN LIST

Point Features Target Layers	Display the editable point feature layers.
Line Features Target Layers	Display the editable line feature layers.
Polygon Features Target Layers	Display the editable polygon feature layers.
Multi-Features Target Layers	Display the editable layers which support multiple feature types.

EDIT TOOLBAR

Select	Activate the Select tool.
Point	Activate the point feature type for data capture.
Capture Point using GPS	Capture a point feature in the editable point layer using the current GPS position.
Add GPS Vertex	Capture a single vertex in the current polyline or polygon feature using the current GPS position.
Add GPS Vertices Continuously	Continuously capture vertices in the current polyline or polygon feature using the current GPS position.
Feature Properties	Open the Feature Properties dialog box (or custom edit form) for the selected feature.
Offset Point	Activate offsets for point data capture.

SELECT DROPDOWN LIST

Select	Activate the Select tool.

GPS Collection Overview using ArcPad and GPS Correct

This pamphlet is designed to be a brief overview of ArcPad 7, GPS Correct and GPS collection methods. It is intended to be used after a formal training session and is therefore written to highlight the important aspects of using this technology. This document in no way undermines any literature published by Trimble or ESRI. For question or comment concerning this document, send inquiry to charvey@bcs-gis.com or cbradshaw@bcs-gis.com.

Previous Extent – Drop down menu for Previous/Next Extent, settings for map coordinates and scale, and Bookmarks

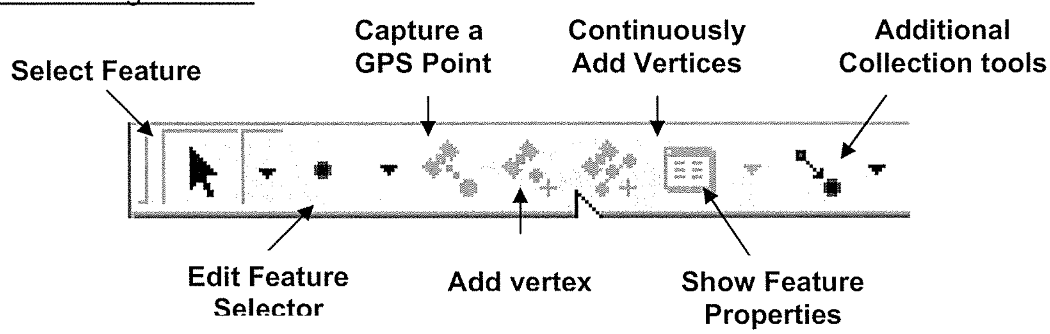
Identify – Drop down menu for identifying and selecting map features

Find – Search selected layers for specific features

Set Editable Layer – Quick access drop-down menu for selecting which layer to put in edit mode, allowing you to edit, add/delete or modify features from the selected layer

Refresh Map – Refreshes the current map, forcing it to redraw. This is also useful to remove the "Redraw Interrupted by User" message.

Edit/Drawing Toolbar



Select Feature – Select a feature to edit

Edit Vertices – Enables editing of vertices of a feature

Edit Feature Selector - Select the type of feature to collect from the drop down menu

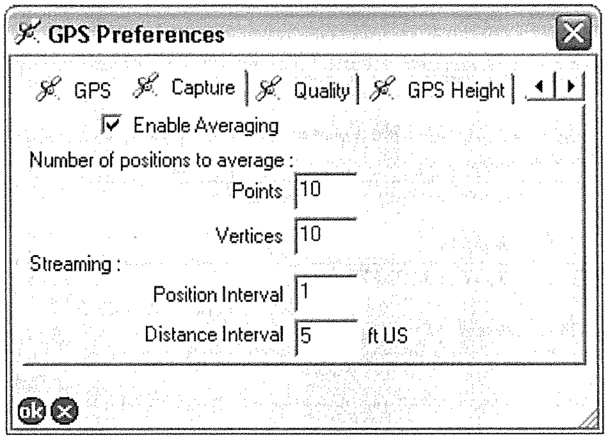
Capture a GPS Point – Collect a GPS point

Add Vertex – Collect a vertex for a polygon or line feature using the GPS

Continuously Add Vertices – Collect multiple vertices for polygon/line features using the GPS

Show Feature Properties – View properties and attributes of the selected feature

Capture



Enable Averaging – Select this option to enable the averaging of many points into one point for the collection of a feature with greater accuracy. Use discretion setting this; more points averaged = greater accuracy AND more time in the field

Points – The number of GPS positions to collect and average for a point feature

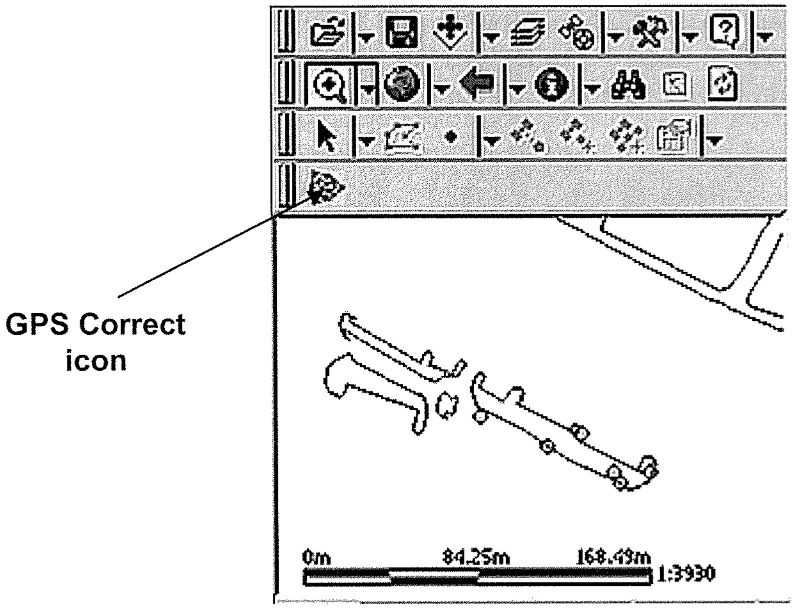
Vertices – The number of GPS positions to collect and average for a vertex

Streaming Vertices Interval – The interval at which to collect continuous vertices.
Example: 1 = plot every GPS position, 2 = every other, 3 = every third, etc.

Distance Interval – When collecting using the Streaming Vertices tool, set this value at the minimum travel distance between plotted points

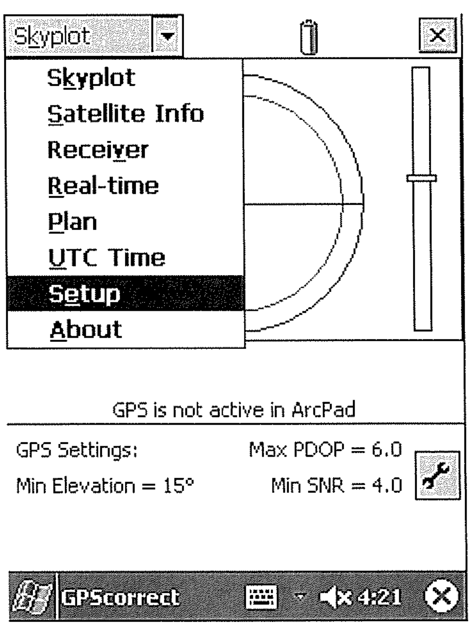
GPS Correct (if installed)

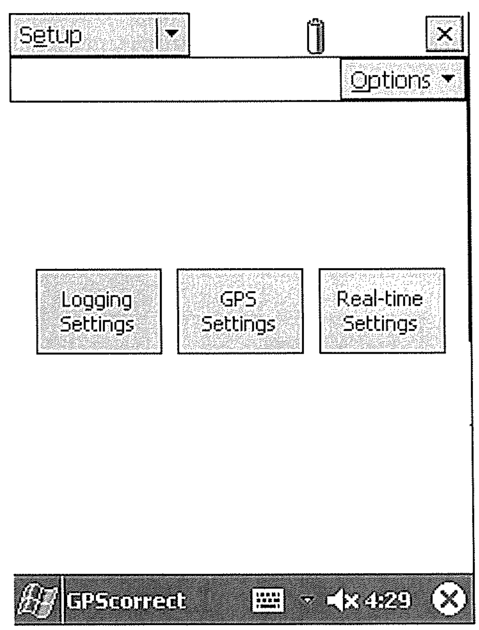
GPS Correct runs in the background of ArcPad. To access the GPS Correct interface, click the GPS Correct icon located on the toolbar with only one icon.



Setup

The first screen to appear is the Skyplot. This screen visualizes the satellite coverage. Tap the drop-down menu at the top. Select Setup. The proceeding screen has three buttons to adjust settings for GPS Correct.





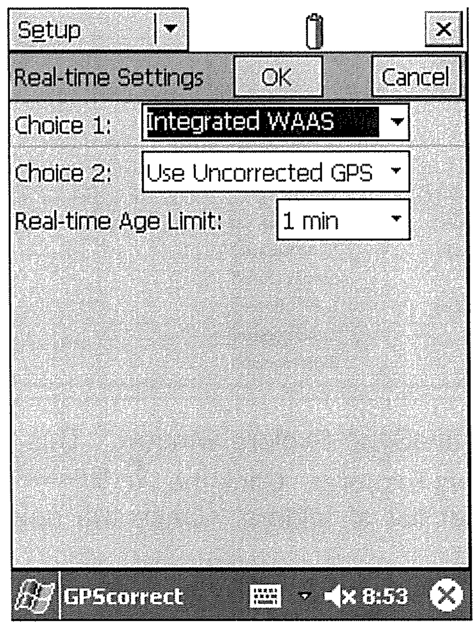
Real Time Settings

Tap Real Time Settings.

If you are using either the GeoXT or XM, set Choice 1 to "Integrated WAAS".

This will enable use of the integrated SBAS receiver (Satellite-Based Augmentation System) which should receive real-time corrections and theoretically increase your position accuracy.

Tap OK. Then tap the Close button on the top right corner to return to ArcPad.



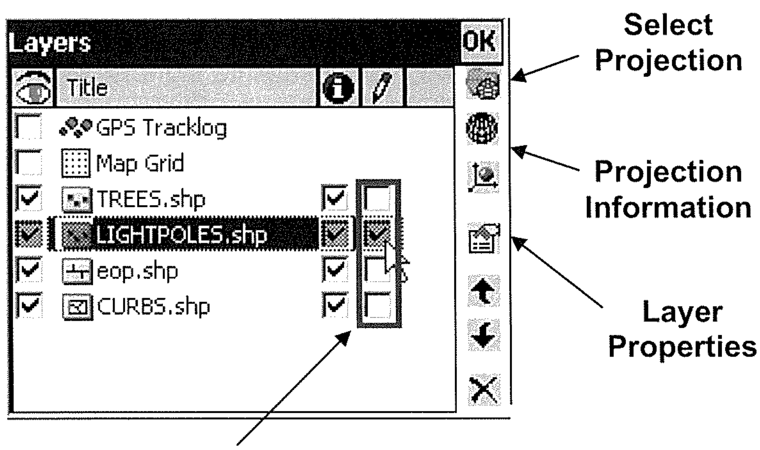
Create a new folder by right-clicking and selecting New Folder. Give it a descriptive name. Open the new folder. Next, drag and drop the data that you exported out of your GIS from your desktop PC into the new folder. It may take a moment for the transfer. When finished the data is now on the field collection device and ready for field work.

If you will not be creating a new layer for feature collection but continuing or updating collection for a data layer such as fire hydrants or light poles, be sure to transfer all needed layers to the CE device.

After collecting any information in the field, bring the unit back in, sync it, and do the above steps in reverse order, transferring the newly populated shapefiles back to your desktop PC. Now you can differentially correct the data or just proceed with merging it into your GIS.

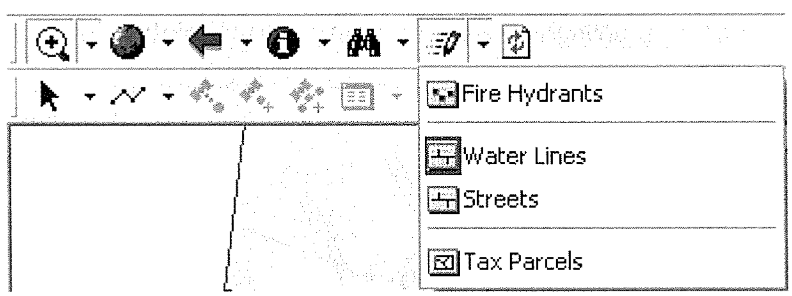
Set Layers for Editing

Now tap the Layers button. This dialogue box shows all active layers. Under the pencil icon, check the box next to the layer that you created for collecting GPS points. Checking this box enables the layer to be edited, or have information added to it. ArcPad will only allow 1 layer of each feature type (point, line, and polygon) to be set for editing at a time. The properties of each layer can be accessed from this screen, allowing for adjustment of symbol style and labels. Tap OK when finished. Once one or more layers have been set for editing, the buttons of the Edit/Drawing toolbar will be enabled.



Be sure that the projection of your data collection layer matches your other GIS layers so that the features collected will be oriented correctly.

An easier way to set or change editable layers is to use the "Set Editable Layer" drop-down on the Browse toolbar. This list is divided by layer types.



Activate GPS

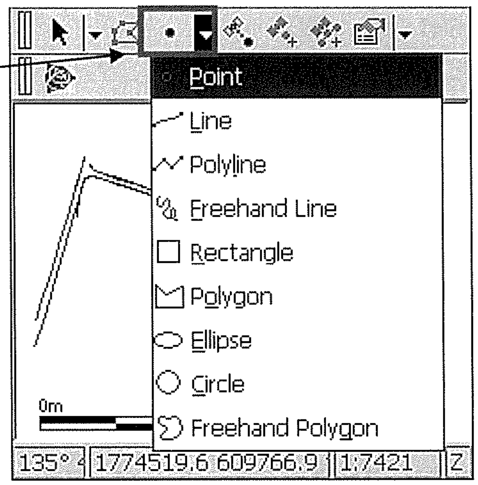
If the Edit/Drawing toolbar is not visible, tap the Tools drop-down menu and select Edit/Drawing from the Toolbars option. After layers have been set for editing, a few buttons should be enabled on the toolbar. With the GPS activated, the other buttons will be enabled as well. Activate the GPS, if not

Feature Collection

Select Feature Type

Select the feature type to collect from the drop-down menu found under the Select Feature button on the Edit/Drawing toolbar. Remember that you can only select from the layer types which are enabled for editing. Ex: If you are collecting fire hydrants, set the hydrants layer to be edited and then select "Point" from the Select Feature menu.

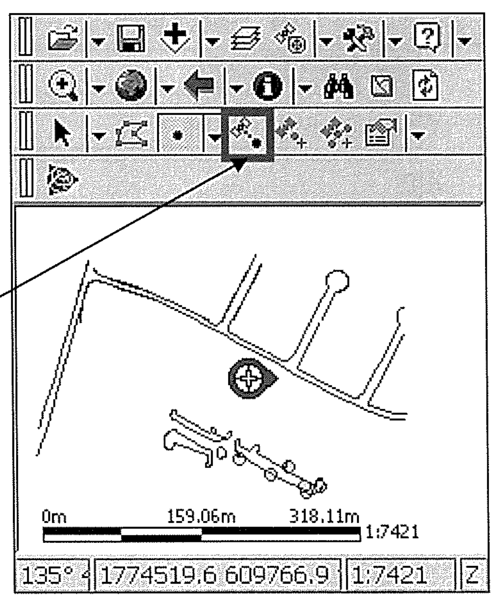
Select Feature menu



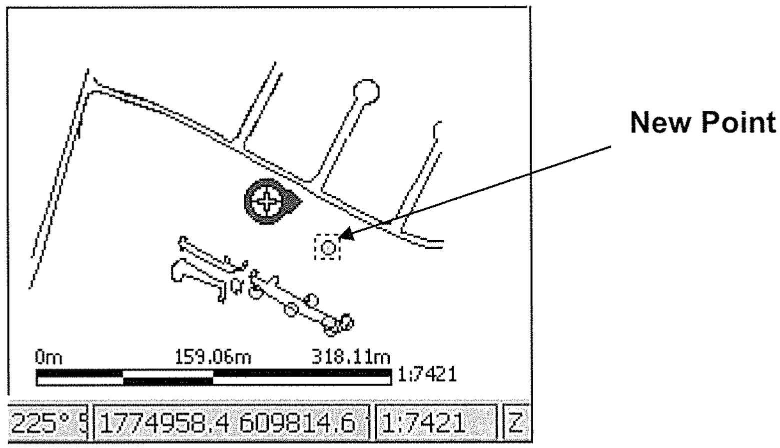
Collect Point Data

Stand over or next to the feature to collect. Be sure to hold out the GPS unit or antenna to prevent your body from blocking satellite signals, which only work by line-of-sight. Tap the "Capture a GPS Point" button on the Edit/Drawing toolbar.

Capture a GPS Point



Tap OK. The point feature you just collected will now be visible on the map. You may have to move away from the feature to see it since the GPS cursor could cover it on the map.



Repeat this process to collect more point features. There is no need to tap the "Save" button. Once a feature has been collected, it is already saved to the shapefile.

Line and Polygon Feature Collection

The collection of line and polygon features is very similar to the process of point collection except that you are gathering many points to create a feature instead of just one.

Check to be sure that a layer of either polyline or polygon type is selected for editing.

Activate the GPS, if not already activated.

Select the feature type to collect from the Select Feature menu.

Now instead of tapping the Capture GPS Point button on the Edit/Drawing toolbar, tap either the Add Vertex or Continuously Add Vertices button.

Add Vertex -- Tap this button to collect a vertex of a line or polygon feature. If Enable Averaging is selected, the Vertex dialogue box is displayed with a progress bar which counts down the GPS points to average for the vertex. When complete, ArcPad draws a straight line between each vertex of the feature.

Continuously Add Vertices – This will add a vertex every time a GPS point is received from the GPS unit. Vertices are not averaged in this function, but the interval of continuous points collected can be adjusted under the Enable

4. Troubleshooting the Device

This is a listing of potential issues and some suggestions for resolution. For help with items not presented here, contact your project leader. For additional support, contact your Trimble or ESRI representative for more options.

1. Stylus Recalibration

In the event the stylus loses calibration (ie screen not responding where the stylus is tapped) this can be recalibrated to ensure correct behavior. Follow these steps to recalibrate the device.

i. Click on the Start menu
ii. Click on Settings
iii. Scroll to the bottom of the Settings window and tap the "Stylus" item.
iv. Click on the "Recalibrate" button.
v. Tap on the screen where you see the crosshairs. As you tap it, the crosshairs will move from the center of the screen to the four corners for a total of 5 screen taps.
vi. Tap OK to accept these changes.

Your screen and stylus should now be calibrated and the point of contact of the stylus with the screen should interact together as intended.

2. Device Lockup

As with any computer hardware, there will be the occasion where the device will stop responding or "lockup", prohibiting any further interaction with the screen. This can occur while the device is running or when the device has been in suspend mode.

There are two different methods for remedying this situation: soft reset the device, which will normally fix this issue; hard reset the device, which should only be performed as a last resort option.

Soft Reset

A soft reset is the "safe" method for restarting a device. This will NOT delete any data from the device. It will merely stop all running processes and reboot the device.

i. Hold down the power button for ~5 seconds. You should see a message box appear that says something to the effect of "Warning: If you continue to hold the power button the device will reset"

3. Device won't connect to the Desktop PC

In the event that the device, when docked in the cradle, will not connect through Activesync to the PC here are a few steps to try.

i. Perform a SOFT reset on the device following the instructions on pg 19.
ii. Replace the unit in the cradle after the unit has restarted.
iii. The device should reconnect to the PC now.

In the event a soft reset does not work you can force Activesync to release the process and restart Activesync.

iv. Remove the unit from the docking cradle.
v. Perform a soft reset on the device.
vi. Right-click on the Windows task bar on the desktop PC and select Task Manager.
vii. Click on the Processes tab.
viii. Click on Image Name to sort the processes alphabetically.
ix. Locate the process called WCESCOMM.EXE.
x. Select this process and click the "End Process" button.
xi. Restart Activesync.
xii. Place the unit back in the docking cradle. The device should reconnect to the PC now.

4. "Error COM 55" Message when starting the GPS in ArcPad

This message generally occurs when another application has a lock on the communications port used by ArcPad to receive data from the GPS receiver. Steps to remedy this are as follows.

i. Close all other running applications to ensure nothing else is attempting to use the GPS COM port.
ii. If no other applications were running at the time the error occurred, please soft reset the device following the directions on pg 19.
iii. Shut down ArcPad.
iv. Restart ArcPad and attempt to start the GPS.
v. You should not receive the error message now.

5. "No data is being received from the GPS receiver…" Message when starting the GPS in ArcPad

This message generally occurs when the GPS settings are incorrect. Tap the drop-down next the "GPS Position Window" button on the top toolbar and select "GPS Preferences" to adjust settings.

Ecology and Environment			
GPS Request Form			
Items in red are Required			
Project Name:		*Start Date:*	
Project Manager:		***End Date:***	
Charge Number:			
Requestor Name:			
Field Team:			
Request Accepted by:			
Shipping Address:			
****Attention:***			
Comments:			

**if shippping to the Buffalo office, this will be either Mark Moore or Becky Schalk.*

All rentals include 1 day before and 1 days after field work for data transfer.

All rentals must be requested a minimum of 3 days before start of field work.

Additional Information:

Requested GPS software:	Terrasync?	
Please check the appropriate box(s)	ArcPad?	
Requested GIS Datalayers:		
Please list requested datasets:		

B Summary of Reporting Limits

Table B-2 Summary of Reporting Limits for Polychlorinated Biphenyls (PCB) Aroclors (SOM01.2)

COMPOUND	Soil (ug/kg)	Screening Criteria (ug/kg)[1]
Aroclor-1016	33	0.023
Aroclor-1221	33	0.023
Aroclor-1232	33	0.023
Aroclor-1242	33	0.023
Aroclor-1248	33	0.023
Aroclor-1254	33	0.023
Aroclor-1260	33	0.023
Aroclor-1262	33	0.023
Aroclor-1268	33	0.023

[1] **Screening Criteria**

A: 1999, Technical Guidance for Screening Contaminated Sediments, NYSDEC Division of Fish, Wildlife and Marine Resources, Albany, New York. The listed levels for organic compounds were calculated using the lower confidence limit of total organic carbon measured in the site sediments (28,834 mg/Kg). The most stringent (lowest) available value of Human Health, Benthic Acute Toxicity, Benthic Chronic Toxicity, and Wildlife Bioaccumulation criteria were used for screening organic compound data. The Lowest Effect Level was used for screening the metals data.

Table B-3 Summary of Reporting Limits for PCB Congeners (CBC01.0)

Compound	IUPAC Number	Other (ng/kg)	Extract (pg/µL)
3,3',4-TrCB	35	20	10
3,3',5-TrCB	36	20	10
3,4,4'-TrCB	37	50	25
3,4,5-TrCB	38	20	10
3,4',5-TrCB	39	20	10
Tetrachlorobiphenyls			
2,2',3,3'-TeCB	40	50	25
2,2',3,4-TeCB	41	50	25
2,2',3,4'-TeCB	42	20	10
2,2',3,5-TeCB	43	20	10
2,2',3,5'-TeCB	44	50	25
2,2',3,6-TeCB	45	20	10
2,2',3,6'-TeCB	46	20	10
2,2',4,4'-TeCB	47	50	25
2,2',4,5-TeCB	48	20	10
2,2',4,5'-TeCB	49	50	25
2,2',4,6-TeCB	50	20	10
2,2',4,6'-TeCB	51	20	10
2,2',5,5'-TeCB	52	50	25
2,2',5,6'-TeCB	53	20	10
2,2',6,6'-TeCB	54	50	25
2,3,3',4'-TeCB	55	50	25
2,3,3',4'-TeCB	56	20	10
2,3,3',5-TeCB	57	50	25
2,3,3',5'-TeCB	58	50	25
2,3,3',6-TeCB	59	20	10
2,3,4,4'-TeCB	60	50	25
2,3,4,5-TeCB	61	50	25
2,3,4,6-TeCB	62	20	10
2,3,4',5-TeCB	63	50	25
2,3,4',6-TeCB	64	20	10
2,3,5,6-TeCB	65	50	25
2,3',4,4'-TeCB	66	50	25
2,3',4,5-TeCB	67	50	25
2,3',4,5'-TeCB	68	50	25
2,3',4,6-TeCB	69	50	25
2,3',4',5-TeCB	70	50	25

Table B-3 Summary of Reporting Limits for PCB Congeners (CBC01.0)

Compound	IUPAC Number	Other (ng/kg)	Extract (pg/µL)
2,3,3',4',5-PeCB	107	100	50
2,3,3',4,5'-PeCB	108	50	25
2,3,3',4,6-PeCB	109	20	10
2,3,3',4',6-PeCB	110	100	50
2,3,3',5,5'-PeCB	111	100	50
2,3,3',5,6-PeCB	112	100	50
2,3,3',5',6-PeCB	113	100	50
2,3,4,4',5-PeCB	114	50	25
2,3,4,4',6-PeCB	115	100	50
2,3,4,5,6-PeCB	116	20	10
2,3,4',5,6-PeCB	117	20	10
2,3',4,4',5-PeCB	118	50	25
2,3',4,4',6-PeCB	119	50	25
2,3',4,5,5'-PeCB	120	50	25
2,3',4,5,'6-PeCB	121	50	25
2',3,3',4,5-PeCB	122	50	25
2',3,4,4',5-PeCB	123	50	25
2',3,4,5,5'-PeCB	124	100	50
2',3,4,5,6'-PeCB	125	50	25
3,3',4,4',5-PeCB	126	50	25
3,3',4,5,5'-PeCB	127	100	50
Hexachlorobiphenyls			
2,2',3,3',4,4'-HxCB	128	50	25
2,2',3,3',4,5-HxCB	129	50	25
2,2',3,3',4,5'-HxCB	130	50	25
2,2',3,3',4,6-HxCB	131	50	25
2,2',3,3',4,6'-HxCB	132	50	25
2,2',3,3',5,5'-HxCB	133	50	25
2,2',3,3',5,6-HxCB	134	50	25
2,2',3,3',5,6'-HxCB	135	50	25
2,2',3,3',6,6'-HxCB	136	20	10
2,2',3,4,4',5-HxCB	137	100	50
2,2',3,4,4',5'-HxCB	138	50	25
2,2',3,4,4',6-HxCB	139	50	25
2,2',3,4,4',6'-HxCB	140	50	25
2,2',3,4,5,5'-HxCB	141	20	10
2,2',3,4,5,6-HxCB	142	100	50

Table B-3 Summary of Reporting Limits for PCB Congeners (CBC01.0)

Compound	IUPAC Number	Other (ng/kg)	Extract (pg/µL)
2,2',3,3',5,6,6'-HpCB	179	50	25
2,2',3,4,4',5,5'-HpCB	180	50	25
2,2',3,4,4',5,6-HpCB	181	100	50
2,2',3,4,4',5,6'-HpCB	182	100	50
2,2',3,4,4',5',6-HpCB	183	100	50
2,2',3,4,4',6,6'-HpCB	184	100	50
2,2',3,4,5,5',6-HpCB	185	100	50
2,2',3,4,5,6,6'-HpCB	186	100	50
2,2',3,4',5,5',6-HpCB	187	50	25
2,2',3,4',5,6,6'-HpCB	188	50	25
2,3,3',4,4',5,5'-HpCB	189	50	25
2,3,3',4,4',5,6-HpCB	190	50	25
2,3,3',4,4',5',6-HpCB	191	100	50
2,3,3',4,5,5',6-HpCB	192	100	50
2,3,3',4',5,5',6-HpCB	193	50	25
Octachlorobiphenyls			
2,2',3,3',4,4',5,5'-OcCB	194	50	25
2,2',3,3',4,4',5,6-OcCB	195	100	50
2,2',3,3',4,4',5,6'-OcCB	196	100	50
2,2',3,3',4,4',6,6'-OcCB	197	100	50
2,2',3,3',4,5,5',6-OcCB	198	50	25
2,2',3,3',4,5,5',6'-OcCB	199	50	25
2,2',3,3',4,5,6,6'-OcCB	200	100	50
2,2',3,3',4,5',6,6'-OcCB	201	100	50
2,2',3,3',5,5',6,6'-OcCB	202	100	50
2,2',3,4,4',5,5',6-OcCB	203	100	50
2,2',3,4,4',5,6,6'-OcCB	204	100	50
2,3,3',4,4',5,5',6-OcCB	205	100	50
Nonachlorobiphenyls			
2,2',3,3',4,4',5,5',6-NoCB	206	100	50
2,2',3,3',4,4',5,6,6'-NoCB	207	100	50
2,2',3,3',4,5,5',6,6'-NoCB	208	100	50
Decachlorobiphenyls			
DeCB	209	50	25

Table B-5 Summary of Reporting Limits for Metals (ILM05.4)

ANALYTES	ICP-AES Soil (mg/kg)	Screening Criteria (mg/kg)[1]
Aluminum	20	NA
Antimony	6	2
Arsenic	1	6
Barium	20	NA
Beryllium	0.5	NA
Cadmium	0.5	0.6
Calcium	500	NA
Chromium	1	26
Cobalt	5	NA
Copper	2.5	16
Iron	10	2%
Lead	1	31
Magnesium	500	NA
Manganese	1.5	460
Mercury	0.1	0.15
Nickel	4	16
Potassium	500	NA
Selenium	3.5	NA
Silver	1	1
Sodium	500	NA
Thallium	2.5	NA
Vanadium	5	NA
Zinc	6	120
Cyanide	2.5	NA

[1] **Screening Criteria**

A: 1999, Technical Guidance for Screening Contaminated Sediments, NYSDEC Division of Fish, Wildlife and Marine Resources, Albany, New York. The listed levels for organic compounds were calculated using the lower confidence limit of total organic carbon measured in the site sediments (28,834 mg/Kg). The most stringent (lowest) available value of Human Health, Benthic Acute Toxicity, Benthic Chronic Toxicity, and Wildlife Bioaccumulation criteria were used for screening organic compound data. The Lowest Effect Level was used for screening the metals data.

Table B-7 Summary of Reporting Limits for Dioxins and Furans (DLM02.0)

PCDD/PCDF	Solids (ng/kg)
2378-TCDD	1
12378-PeCDD	5
123678-HxCDD	5
123478-HxCDD	5
123789-HxCDD	5
1234678-HpCDD	5
OCDD	10
2378-TCDF	1
12378-PeCDF	5
23478-PeCDF	5
123678-HxCDF	5
123789-HxCDF	5
123478-HxCDF	5
234678-HxCDF	5
1234678-HpCDF	5
1234789-HpCDF	5
OCDF	10