Final Site Characterization Report

Assessment of Contaminated Sediments in the Crawford Creek/Nemadji River near Superior, Wisconsin, St. Louis River and Bay Area of Concern

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Acronyms and Abbreviations

Affiliated	Affiliated Researchers
amsl	above mean sea level
AVS	acid volatile sulfide
bss	below sediment surface
°F	degrees Fahrenheit
DO	dissolved oxygen
DUR	data usability report
Eco-SSL	ecological soil screening levels
EPA	U.S. Environmental Protection Agency
ESL	ecological screening levels
FOP	field operating procedure
FSP	field sampling plan
GPC	gel permeation chromatography
GPS	global positioning system
HMW	high molecular weight
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
ID	identification
IDW	investigation-derived waste
LIDAR	Light Detection and Ranging
LMW	low molecular weight
mg/kg	milligrams per kilogram
MS	matrix spike
MSD	matrix spike duplicate
µg/kg	microgram per kilogram
µmol/g	micromoles per gram
$\mu mol/g_{oc}$	micromoles per gram of organic carbon
ng/kg	nanograms per kilogram
NAPL	nonaqueous phase liquid
OPUS	Online Positioning User Service
PAH	polycyclic aromatic hydrocarbon
PCP	Pentachlorophenol
PEC	probable effect concentration

QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QHEI	Qualitative Habitat Evaluation Index
RBP	rapid bioassessment protocol
RTK	real-time kinematic
SEM	simultaneously extracted metals
SIM	Selected Ion Monitoring
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TEC	threshold effect concentration
TEF	toxicity equivalency factor
TEQ	toxicity equivalent quotient
TOC	total organic carbon
WDNR	Wisconsin Department of Natural Resources
work plan	*Work Plan for the Site Characterization of Crawford Creek/Nemadji River Sediments*
ww	wet weight
yd^3	cubic yard

1 Introduction

This site characterization report documents the field activities and findings of the investigation conducted within Crawford Creek, its floodplain area, and a portion of the Nemadji River (study area) near Superior, Wisconsin, in the St. Louis River and Bay Area of Concern. The investigation was conducted to gather information regarding the nature and extent of contaminated sediments, to evaluate sediment thickness, to conduct a preliminary evaluation of contaminant bioaccumulation in fish, and to perform habitat and biological surveys within the study area. The investigation was conducted for the U.S. Environmental Protection Agency's (EPA's) Great Lakes National Program Office under Task Order No. 0015, Contract No. EP-R5-11-09. Field investigation activities were conducted from June 18 through 27, 2014 (sediment thickness survey and sampling), and July 15 through 17, 2014 (habitat survey and fish sampling). The investigation activities were completed and documented in accordance with the *Work Plan for the Site Characterization of Crawford Creek/Nemadji River Sediments* (work plan; CH2M HILL 2013a). Minor modifications to the approved work plan based on field conditions were discussed with and approved by EPA prior to implementation and with Wisconsin Department of Natural Resources (WDNR) concurrence. The modifications are discussed in Section 2.10 and further documented in the data usability report (DUR; Appendix A). The following activities were conducted as part of the investigation:

- Probing at 165 locations in Crawford Creek, its floodplain, and Nemadji River to determine sediment thickness and sediment sampling locations. For purposes of this report, floodplain soils are generally referred to as sediment unless specified otherwise for screening criteria purposes.
- Collection of sediment samples from 61 locations for analysis of dioxins and furans (209 congeners), polycyclic aromatic hydrocarbons (PAHs; 17 PAHs), pentachlorophenol (PCP), and acid-volatile sulfide (AVS)/simultaneously extracted metals (SEM) to provide information regarding the nature and extent of analyte concentrations.
- Collection of sediment samples for analysis of total organic carbon (TOC) and grain size to assess the physical characteristics of the sediment and bioavailability of contaminants to receptors.
- Physical site characteristics (water depth, sediment thickness, and shoreline features) and the analytical results were evaluated to determine the nature and extent of chemical contamination in the creek and river.
- Characterization of the overall habitat quality within Crawford Creek.
- Characterization of concentrations of site-related chemicals of concern (that is, PCP and dioxins/furans) in targeted fish species from Crawford Creek and a portion of the Nemadji River.

The site characterization report is organized as follows:

- Section 1 presents the site setting, site history, and previous investigations.
- Section 2 presents objectives and description of the field investigation activities.
- Section 3 presents the investigation results.
- Section 4 provides conclusions, including a summary of the key findings and opportunities for addressing beneficial use impairments.
- Section 5 provides the references cited in this document.

1.1 Site History and Description

The study area is located in a rural, sparsely-populated setting in Douglas County, Wisconsin, approximately 5 miles southeast of the City of Superior. The study area is downstream from a former wood-treating facility called Koppers, Inc., and a railroad grade (Figure 1). The wood-treating facility commenced operations in 1928 and historically produced, pressure-treated railroad ties, bridge timbers, switch ties, and crossing panels.

The primary preservative used at the facility was creosote with a Number 6 fuel oil carrier. From 1955 to 1979, PCP with a petroleum oil carrier was also used. Wood-treating operations were discontinued, and the facility was decommissioned in 2006. The facility is presently used for storage and distribution of untreated wood.

The land surrounding the study area has remained relatively unchanged for the past 60 years and is predominantly undeveloped. Crawford Creek, a small tributary of the Nemadji River, is a meandering, intermittent stream that discharges to the Nemadji River. Parcels of land along the shores of Crawford Creek (that is, the floodplain areas) are privately owned and required access permission from the owners. In April and May 2014, CH2M HILL obtained signed access agreements from the private property owners, granting access to the study area and permission to temporarily stage equipment, supplies, and investigation-derived wastes (IDW).

1.2 Previous Investigations

Numerous investigations have been conducted upstream of the study area (next to the Koppers, Inc., facility) since 1981 to characterize the nature and extent of environmental impacts resulting from historical wood-treating operations. However, limited sampling has been conducted in Crawford Creek, with the most recent efforts conducted in 2005. Previous investigations (Blasland, Bouck and Lee 2006) indicated that the water depth in Crawford Creek ranged from 2 to 5 feet, and during spring flood conditions, can be well over 10 feet deep. Sediment thickness in the creek was reported to range from a few inches to 5 feet. No studies were previously conducted in the Nemadji River or in Crawford Creek's floodplain to estimate sediment thickness.

Based on previous investigations, sediments within portions of Crawford Creek have been documented to contain dioxins and furans, semivolatile organic compounds (SVOCs; primarily PAHs and PCP), and metals. According to background documents, sediments containing creosote-like product have been observed at intermittent locations downstream from a former Koppers, Inc., outfall and in Crawford Creek between the confluence of the outfall drainage ditch and the railroad embankment. There was minimal information concerning sediment conditions downstream of the railroad embankment. Therefore, information-gathering for the portion of Crawford Creek downstream of the railroad bridge (Figure 1) was the primary purpose of this study.

2 Field Investigation Activities

2.1 Objectives

The overall objective of the site characterization effort was to gather information regarding the nature and extent of contaminated sediments, and to evaluate sediment thickness in Crawford Creek, its floodplain area, and part of the Nemadji River. The study also included a preliminary evaluation of contaminant bioaccumulation in fish, and habitat and biological surveys in the Crawford Creek and Nemadji River areas. The investigation plan included the following tasks:

- Collect sediment thickness and associated elevation measurements to determine sediment distribution and volume in Crawford Creek and the Nemadji River.
- Record sediment thickness and associated elevation in the floodplain area.
- Collect survey data to document water level elevations, as well as creek and river top-of-bank elevations.
- Collect surface and subsurface sediment samples using vibracoring methods and manual coring methods for chemical analysis from a planned total of 55 sample locations in Crawford Creek, its associated floodplain, and the Nemadji River to provide information to support characterization. Upon discussions with EPA and WDNR during the field activities, six additional locations were sampled in the floodplain area.
- Characterize the overall habitat quality within Crawford Creek by calculating the Index of Biotic Integrity (IBI) through fish community collection, Invertebrate Community Index (ICI), and Qualitative Habitat Evaluation Index (QHEI).

- Characterize the concentrations of site-related chemicals of concern in fish collected from Crawford Creek and a part of the Nemadji River. This includes collecting fish samples using nets and filleting them for fish-tissue samples.

2.2 Field Investigation Background and Summary

Prior to mobilization for the field investigation, CH2M HILL and its subcontractor Affiliated Researchers (Affiliated) visited the site on April 3 and 4, 2014, to evaluate the general conditions along Crawford Creek and its floodplain areas, and plan for a late spring sampling event. CH2M HILL and Affiliated identified a public boat launch located near the mouth of the Nemadji River, which was subsequently used to deploy the pontoon boat during the field investigation. During the site visit, CH2M HILL met with the private property owners and obtained signed access agreements allowing CH2M HILL, Affiliated, and EPA to access the properties and to stage and store equipment.

Mobilization for the sediment probing and sampling activities was performed separate from the habitat assessment/fish surveys. Sediment probing and sampling activities were conducted between June 18 and 27, 2014. The habitat assessment survey and the bio-uptake fish sampling was conducted between July 14 and 18, 2014. Field investigation activities were conducted in accordance with the sediment thickness, sediment sampling and habitat assessment, and bio-uptake field sampling plans (FSP), Project Health and Safety plan and a project quality assurance project plan (QAPP) (CH2M HILL 2014a, 2014b, 2014c, 2013b and 2014d). Deviations from the FSPs and QAPP are described in Section 2.10 and in the DUR (Appendix A).

Weather conditions during the sediment probing and sampling field investigation period were foggy, rainy, and cool, with temperatures ranging from 45 degrees Fahrenheit [°F] to 70°F), with wind speeds between 0 and 15 miles per hour. Weather conditions during the habitat assessment and bio-uptake sampling period were sunny and cool with temperatures ranging from 60°F to 70°F, with wind speeds between 0 and 15 miles per hour.

A utility-clearance check was performed using Wisconsin's one-call utility-locating service to mark utility lines crossing the investigation area. No utilities were observed within the study area, and utility clearance tickets were valid throughout both field events. The private property owners also confirmed that there were no known underground utilities in the proposed sampling areas on their properties.

2.3 Surveying

Surveying activities were performed in accordance with the FSPs (CH2M HILL 2014a, 2014b, and 2014c) and QAPP (CH2M HILL 2014d). A real-time kinematic (RTK) global positioning system (GPS) was used for navigation to and collection of coordinates of core locations, sediment probe locations, shoreline topography survey locations, and collection of surface elevation data. Additionally, water depth and penetration depth were measured during coring and probing activities at each location and recorded on the core logs or transect probe data forms.

The sampling vessel and RTK GPS instrumentation for the investigation were provided by Affiliated. Horizontal coordinates were reported in latitude and longitude decimal degrees using the World Geodetic System of 1984. Elevation measurements were referenced to the North American Vertical Datum of 1988 and recorded in U.S. survey feet. RTK-GPS survey equipment and conventional RTK methods were used to collect survey data (*x* and *y* coordinate positions and elevations) at each core and probe location, as well as the top of the defined bank along each shore of Crawford Creek transects and at 35 locations along the shores of the Nemadji River. Elevation data at each probe and core location was used to convert water, probe, and core penetration depth measurements to elevation. The actual coordinates of each survey location were recorded at the time of sampling in the RTK-GPS data logger. Coordinates (*x*, *y*, and *z*) of the benchmark used for surveying activities were recorded in the same coordinate system and datum as the sample locations.
A daily GPS system check of the northing, easting, and elevation readings was performed against the established project site benchmarks both before and after sampling activities to verify horizontal and

vertical accuracies. Two benchmarks were established prior to sampling activities (during the site visit) using National Geodetic Survey–Online Positioning User Service (OPUS) methodology.

The average horizontal and vertical accuracy measurements collected during the field effort at the benchmark locations prior to and after daily surveying activities were within ±0.02 foot and ±0.01 foot as compared to the established coordinates of the referenced survey benchmark. Additionally, GPS data checklists and metadata forms were completed daily and are included in the summary of field activities report (Appendix B).

The OPUS benchmark was established with an 8-foot length of 0.5-inch-diameter rebar steel set into the ground. The OPUS benchmark was identified with a name or number, and marked with two guard stakes straddling the station or with painted identifying markings. To assure RTK-GPS accuracy and reliability, the benchmark was used to establish a local RTK-GPS base station. Affiliated's survey-grade Trimble R8 RTK global navigation satellite system was connected to a Trimble TDL450H data-radio transmitter to serve as a base station at the benchmark location. The base station transmitted RTK-GPS corrections to the survey grade Trimble R6/R8 RTK-GPS rover used to collect survey data. Additional survey control was also established at local National Geodetic Survey benchmark(s) prior to commencing surveying activities.

2.4 Sediment Thickness Assessment

The sediment thickness assessment was conducted to determine the thickness of unconsolidated sediments at the proposed probing locations and to develop a surface and subsurface sediment sampling strategy. Sediment thickness in Crawford Creek and the Nemadji River was measured using a push probe aboard Affiliated's 20-foot pontoon vessel, as described in the FSP (CH2M HILL 2014a). Chest-high, insulated waders were used to access the shallow waters and the flooded floodplains of Crawford Creek. The remaining locations in Crawford Creek's floodplain were conducted on foot. A 0.5-inch threaded steel probe pole was used for all probing activities thicknesses and was manually advanced by the technician to the point of refusal. Table 1 presents the probing data, including location identification number (ID), latitude, longitude, water depth, and probe refusal depths. Figures 2 and 3 present the probed locations in Crawford Creek, floodplain, and the Nemadji River. Probing results are further discussed by project area in the following subsections.

2.4.1 Crawford Creek

Ninety-one locations were probed within Crawford Creek along 30 transects roughly 100 feet apart (Figure 2). Each transect contained a minimum of three evenly spaced probe locations: two on the water's edges, and one in the middle of the creek. Within the Crawford Creek study area, manual probing techniques were used to measure sediment thickness. Water depth was measured using a surveyor's leveling rod outfitted with a 6-inch-diameter plate. The probe was manually advanced under the weight of the technician into the subsurface until refusal was reached, and the perceived change in the effort of progression was recorded. Refusal was defined as the depth when penetration into the sediment is less than 0.1 foot after continuous pushing of the manual probe. At refusal, the penetration depth was measured to the water surface to the nearest 0.1 foot. The water depth measurement was subtracted from the probe penetration depth to determine the sediment thickness.

2.4.2 Floodplain Area

Forty-one locations were probed in the Crawford Creek floodplain along 10 transects roughly 250 feet apart. Each transect included 3 to 5 probe locations, spaced approximately 50 to 100 feet apart. In the floodplain area of Crawford Creek, soil thickness (depositional sediments) was measured using the same manual probing techniques and equipment used in Crawford Creek, and in accordance with the FSP (CH2M HILL, 2014a). The soils in the floodplain were probed along transects with 4 points per transect. Floodplain probe locations were positioned to focus on the low-lying areas and floodplain drainage patterns where contamination have accumulated or areas used as a pathway to Crawford Creek. (Figure 2). The probing locations in the floodplain were modified from the FSP based on Light Detection and Ranging (LIDAR) data provided by WDNR shortly before the field event, field observations, and in consultation with EPA and WDNR by teleconference.

2.4.3 Nemadji River

The manual probing for sediment thickness was conducted within the first mile downstream of the confluence of Crawford Creek and the Nemadji River. Thirty probe locations were investigated in five depositional areas of the Nemadji River. Additional probe measurements were made at some locations based on the field conditions, to better characterize sediment thicknesses (Figure 3). If no suitable soft sediment material was identified for sampling at the probe location, the vessel conducted additional reconnaissance within the area in an attempt to find suitable soft sediment material for sampling. All probing locations were surveyed with a Trimble R6 RTK-GPS. One depositional area was surveyed and sampled upstream of the confluence of Crawford Creek and the Nemadji River (for background purposes), and the remaining four depositional areas were selected downstream of the confluence of Crawford Creek and the Nemadji River. Five sediment depositional areas were investigated, with approximately of five to seven sediment probing locations per area (Figure 3), using the same manual probing techniques (FSP, CH2M HILL 2014a) as used for Crawford Creek.

2.5 Sediment Sampling

Core samples were collected in Crawford Creek, its floodplain, and the Nemadji River based on the probing results, selected potential depositional areas, and field observations. The CH2M HILL field team reviewed the sediment thickness results (including visual observations, physical characteristics, spatial distribution, etc.) and recommended 55 locations for sample collection. CH2M HILL, EPA, and WDNR participated in a teleconference during the investigation to select additional sample locations in the floodplain area and to discuss limited sediment recovery encountered in Crawford Creek and its floodplain area, due to clay refusal. Based on the lower than expected core recoveries encountered in the floodplain area, EPA and WDNR recommended collecting samples from six additional locations to provide further delineation of the surficial sediments and greater data density within drainage pattern features observed within the western half of the Crawford Creek floodplain. The additional samples were collected at locations selected in consultation with EPA and WDNR. Samples from 61 core locations were collected for chemical analysis following the procedures outlined in the FSP and QAPP (CH2M HILL 2014b, c). EPA reviewed and approved the proposed sample locations, and WDNR concurred with the changes.

Of the 61 core locations sampled, 29 were collected from Crawford Creek and 10 from the Nemadji River using vibracore techniques. The remaining 22 core samples were collected in the Crawford Creek floodplain using manual coring methods. Vibracore coring methods were used exclusively in the Nemadji River sampling area, and all but the uppermost end of the Crawford Creek sampling area, where the water levels were too shallow for the pontoon vessel, Vibracoring equipment consisted of a 20-foot pontoon vessel outfitted with a Rossfelder VT-1 underwater vibracore system fitted with 8-foot lengths of 3-inch-diameter polycarbonate Lexan core-tubes. A polycarbonate core catcher capable of allowing sediments to enter the core tube and while retaining unconsolidated sediments was implemented at Nemadji River locations collected with vibracore equipment. Cores collected with vibracore equipment were considered acceptable if a minimum 70 percent recovery was achieved. Vibracore samples were considered acceptable if a minimum 70 percent recovery was achieved.

Manual coring methods were used exclusively in the Crawford Creek floodplain area and at the three most upstream transects of Crawford Creek (CC-001-A, CC-001-A1, and CC-002-A). Floodplain sediment cores were collected by manual techniques using a manually driven post hammer to advance the same type of 3-inch-diameter polycarbonate tubing, utilized with vibracore equipment Due to the manual coring locations consisting primarily of clay, a core catcher was not implemented. Cores collected using manual methods met a minimum recovery of 70 percent. Each vibracore and manual core was advanced until reaching the maximum penetrable depth. If recoveries were limited, up to three attempts were made to collect the core sample from the proposed location. Second and third attempts were made within a 5-foot-diameter area of the original core location, if the first attempt did not achieve acceptable recovery. Sediment cores were cut to manageable lengths capped, securely taped, and retained upright until being processed. Sampling locations were surveyed with a Trimble R6 RTK-GPS. Core locations in the floodplain were abandoned by filling with bentonite chips, and borehole abandonment documentation was provided to WDNR on July 10, 2014. Water depth and core penetration depth measurements were also collected to the nearest 0.1 foot to calculate respective elevations. CH2M HILL followed the written field operating procedure (FOPs) for manual coring methods (FSP, CH2M HILL 2014b) for collection of sediment samples. Coordinates were collected from each sampling location with a Trimble R6 RTK GPS to record the spatial position and sampling surface elevation. The sampled depth of each core sample is presented in Table 2. Sediment core locations are presented in Figures 2 and 3.

2.5.1 Sediment Core Processing and Characterization

Core samples were processed onshore at a staging area that was established behind the 3031 S. County Road A residence. The cores from each location were split lengthwise using an electric power shears. Sediment cores were logged and segmented into the appropriate sample intervals for analysis. Cores were photographed and described with respect to general stratigraphy, sediment type, apparent grain size, color, odor, plasticity, consistency, density, moisture, and any notable characteristics. Nonaqueous phase liquid (NAPL), staining, sheens and odors were observed in several cores. Appendix C contains the scanned copies of the field core logs with the descriptions. The laboratory analyses were recorded in the Scribe database. Table 2 summarizes the sediment sample locations, sample IDs, sample intervals, core penetration and refusal depths, water depths, latitude, longitude, and the observations noted during logging activities.

Core sample depths ranged from 0.6 foot to 4.7 feet long, below sediment surface (bss). Table 2 summarizes the depths at each core location. After the core characterization was completed, the core was divided into intervals for chemical analysis using the following scheme:

- 0.0 to 0.5 foot
- 0.5 foot to 2 feet
- 2 to 3 feet (if applicable)
- Thereafter in 1-foot intervals, collected up to a maximum penetrable depth (refusal) (if applicable)

The appropriate intervals for the selected cores were submitted for laboratory analysis. The material from each sample interval was transferred into disposable aluminum pans and homogenized until uniform texture and color were achieved. The homogenate was then transferred to analyte-specific bottleware, labeled, and bagged for laboratory pickup. Following collection, samples were held on ice until they were picked up by a courier for delivery to the laboratory. The samples were logged on chain-of-custody forms and stored in the Scribe database. A total of 142 samples was submitted to the laboratory for chemical analysis, including the quality assurance (QA)/quality control (QC) samples, as established by the QAPP (10 percent for duplicate samples, 5 percent for matrix spike [MS]/matrix spike duplicate [MSD] samples). The samples were analyzed for dioxins and furans, SVOCs (primarily PAHs and PCP), total metals, TOC, moisture content, and particle size. Sediment characterization and field documentation notes were recorded in the field book. Section 3 discusses the validated analytical results.

Sediment remaining after core processing and sample containerization was placed in drums. Waste characterization samples were shipped to PACE Analytical Services laboratories for analysis. Sediment core logs are included in Appendix C. Photographs were taken of each core collected and are included in Appendix D.

2.5.2 Field Equipment Decontamination

Equipment used for the project, including vehicles, boats, hoses, and pumps, was decontaminated for residual sediments as well as invasive and exotic vegetation prior to and after use in accordance with the FSP (CH2M HILL 2014b). Non-disposable sampling equipment, (such as Vibracore equipment, fence hammer, power shears) was decontaminated using the following protocol:

- Triple-rinse in the river and remove excess sediment with a stiff brush.

- Rinse with Liquinox.
- Rinse with distilled water.

Reusable equipment used during core processing or for the collection of the samples was decontaminated between samples. In accordance with Wisconsin state law, vegetation was removed from the boat's exterior after pulling the boat out and prior to launching the boat.

2.5.3 Quality Assurance/Quality Control Samples

QA/QC samples were collected at the frequency indicated in the FSP and QAPP (CH2M HILL 2014a,d). QA/QC samples collected included the following: field duplicate samples, MS/MSD samples, and equipment blanks. Field duplicate samples were collected at a 10 percent frequency, at least, and MS/MSD samples were collected at a 5 percent frequency, at least. In accordance with the FSP, MS/MSD samples were not collected for percent moisture, specific gravity, and particle-size samples. A summary of the field duplicate and MS/MSD sample results and discussions is presented in the DUR (Appendix A).

2.6 Defined-bank Survey

A topography shoreline survey was conducted at the top of the defined bank of each shore at Crawford Creek transects and at bank locations along the shores of the 1-mile segment of the Nemadji River. RTK-GPS survey equipment was used to collect 125 GPS positions and elevations at the water line and the top of bank along roughly 0.5 river mile of Crawford Creek, and 78 GPS positions and elevations along roughly 1 river mile of the Nemadji River. Figures 2 and 3 present the defined bank extents, and the survey data are presented in the *Summary of Sediment Probing, Sampling, and Surveying Activities* report (Appendix B). The top of bank was visually delineated as the first significant bank encountered above the water line by a CH2M HILL staff member. The defined bank survey will aid in estimating the sediment volumes present within Crawford Creek and the Nemadji River, as applicable, and also may be used to aid hydrodynamic flow models and drainage flow volumes for future studies.

2.7 Habitat Assessment Survey and Fish Tissue Sampling

CH2M HILL and Affiliated performed habitat assessment survey and fish tissue sampling between July 14 and 17, 2014. The habitat assessment was performed at four reaches within Crawford Creek and included the collection of field data in support of calculating the IBI, ICI, and QHEI. The study area includes a 0.5-mile segment of Crawford Creek from the Soo Line Railroad Bridge downstream to the confluence of Crawford Creek and the Nemadji River. The 0.5-mile segment of Crawford Creek was divided into four reaches equal in length, starting at the upstream end with Reach 1, and proceeding downstream to Reach 4, which ends at the confluence with the Nemadji River. Fish collection for the tissue analysis was performed in Crawford Creek and within a 1-mile segment of the Nemadji River starting from the Crawford Creek confluence and moving downstream. Figures 2 and 3 present the fish sampling locations within Crawford Creek and Nemadji River, respectively. Figure 2 presents the habitat assessment reaches within Crawford Creek. CH2M HILL provided fish scales and other relevant information (photographs) to WDNR for determining the ages of the fish collected in the Crawford Creek and Nemadji River portions. Based on the fish scale information, WDNR estimated the age for collected fish species and also provided identification of the silver red horse species. Table 3 presents the summary of fish collection, including Sample ID, weight, age, length, fish species, and sample type, in Crawford Creek and the Nemadji River. Section 3.6.2 presents the fish sampling results.

2.7.1 Physical Habitat Survey

The Crawford Creek study area is approximately 1,300 feet in long. The study area was divided into four 330-foot sampling reaches to account for the slight variations of the study area (Figure 2). The following Rapid Bioassessment Protocol (RBP) habitat-quality field data sheets were completed at each of the four reaches:

1. The Physical Characterization and Water Quality Field Data Sheet consisted of a basic description of the sampling reach, including observations and measurements of stream physical dimensions, substrate composition, water quality observations, vegetation, and others.

2. The Habitat Assessment Field Data Sheet for Low Gradient Streams consisted of rating 10 metrics of the physical habitat, including available cover, pool characteristics, sediment deposition, channel morphology, bank stability, and riparian zone characteristics.

The approximate center of each sampling reach was selected to represent conditions of that reach, and the appropriate data were recorded. Water temperatures and dissolved oxygen (DO) levels were also measured at each sampling reach using a YSI ProODO DO meter, and substrate samples were collected at each reach using a mini-Ponar grab.

The QHEI assessment was performed at four locations in the creek (Figure 2)—one location within each reach. The selected location, near the center of each reach, was considered to be representative of the habitat in that reach. Affiliated collected field data, including physical measurements and water quality information, took photographs, and noted observations in support of the QHEI. Section 3 discusses the qualitative characterization of the study area.

2.7.2 Macroinvertebrate Survey

Affiliated’s aquatic entomologist performed the macroinvertebrate sampling, the results of which were used for the ICI. The benthic macroinvertebrate community was sampled using a long-handled, 500-micron mesh, aquatic D-net in accordance with methods outlined in the RBP (Barbour et al. 1999). Twenty benthic macroinvertebrate samples were collected per each of the four Reaches. One composite macro-invertebrate sample was collected from each of the four reaches within Crawford Creek. RBP macro-invertebrate field data sheets were completed at each of the four reaches. A summary report on the field activities conducted for the habitat assessment and bio-uptake sampling is presented in Appendix B. The collected macroinvertebrate samples were preserved (using 70 percent ethanol) in the field with sorting and ID performed after the fieldwork, at Affiliated’s facility. Results are discussed in Section 3.

The benthic macroinvertebrates in the samples were identified to Family level using a *Meiji Techno* 7-45x power stereomicroscope and recognized taxonomic authority. The sample jars from different reaches were sorted into individual bottles by family for each reach. After the sorting and ID of the samples, the 45 invertebrate sample jars, along with the data sheets, were provided to WDNR at a WDNR Service Center and received a signed chain-of-custody-type receipt on August 13, 2014. The invertebrate samples may be used by WDNR for verification of the sample identification.

2.7.3 Fish Community Survey

Fish collection activities were conducted from July 15 to 17, 2014, using a combination of gill nets, a cast net, and a beach seine net. On July 15, 2014, four gill nets were set, one per reach in the Crawford Creek study area. The four gill nets were checked the next morning and pulled. On July 16, 2014, one gill net was placed in Crawford Creek in Reach 1, and three gill nets were placed in the Nemadji River below the confluence with Crawford Creek. The four gill nets were again checked the next morning and pulled. In addition, a 6-foot-diameter, clear monofilament cast net was used for the collection of forage fish (that is, minnows, fry, and young-of-the-year) in each reach. Finally, a 20-foot beach seine was used in Reach 1 in areas of the creek that were accessible for seine usage.

Fish from Crawford Creek were collected in support of calculating the IBI and for tissue analysis. The fish from the Nemadji River were collected for tissue analysis only. Affiliated obtained a Wisconsin Scientific Collectors Permit before collection. Fish collection was performed using gill nets with four mesh sizes to catch various sizes of fish. Cast netting was performed in the four reaches of Crawford Creek to supplement the gill nets. Seine netting was used in Reach 1 of Crawford Creek to target forage fish for bioaccumulation testing.

Four gill nets, one in each reach, were set in Crawford Creek on the first day and left overnight. The collected fish were logged, and a teleconference was held with EPA, WDNR, and CH2M HILL staff to determine how the fish would be processed and sampled for bioaccumulation testing. All four gill nets were reset during the second day and left overnight. Three nets were set in the Nemadji River and one in Reach 1 of Crawford Creek. The sampling approach for the second round of fish sampling was determined in consultation with EPA and WDNR.

Cast netting was performed as an alternative method to gill netting in all four reaches of Crawford Creek to support the IBI and bioaccumulation testing. Seine netting was performed in Reach 1 to target forage fish for bioaccumulation testing. Seine netting was not performed in the other three reaches of the creek because the steepness of the creek bank made it inaccessible. ICI, IBI, and QHEI results are discussed in Section 3.6, Habitat and Biological Surveys.

2.8 Investigation-derived Waste

Waste characterization samples were collected in accordance with the FSP's IDW and disposal plan. Analytical results of the waste characterization sampling were provided to EPA for review and waste profile verification. The IDW was removed from the site for disposal on September 11, 2014, by Capitol Environmental services and Badger Disposal Inc. Copies of the signed manifests were subsequently provided to EPA.

2.9 Deviation Summary

Although most of the field activities were conducted in accordance with the FSPs and QAPP, some deviations and modifications were undertaken to adjust to field conditions and to obtain the best outcome from the field investigation. Transect NR-04 located on the Nemadji River was relocated roughly 200 feet farther downstream than proposed. Floodplain transects and probing locations were relocated slightly based on the visual observations and topography of the floodplain. Sample locations were relocated to low-lying areas, expected to be sediment depositional areas during the flooding of Crawford Creek. Based on the recommendations from EPA and WDNR, six additional locations were sampled in the floodplain area to provide greater density of chemical results. The upstream sample (upstream of the confluence of the Nemadji River and Crawford Creek) was collected farther upstream than planned based on an observed sediment depositional area. One sample was collected between transects 2 and 3 of Nemadji River for better spatial coverage. No deviations were observed during the habitat assessment and bio-uptake sampling.

3 Investigation Results

The various investigations of sediment within Crawford Creek, its floodplain, and the Nemadji River have provided two types of characterization data for sediments: visual observations and laboratory analytical data. Each set of characterization data is summarized in the following subsections.

3.1 Physical Characteristics

Based on the field investigation data collected during the sediment probing and sampling activities, and from the defined bank survey activities, it is estimated that Crawford Creek is approximately 18 feet wide at most reaches, and it ranges from 12 feet (upstream portions) up to 25 feet (downstream near the river confluence) wide at certain sections of the creek. The recorded water depths in Crawford Creek ranged from 2.5 to 4 feet deep. The upstream reach of Crawford Creek (near the Railroad) was shallower, and the water depth gradually increased downstream towards the confluence with the Nemadji River. The Nemadji River is estimated to be approximately 75 to 100 feet wide at most locations and approximately 150 feet wide at meanders, with recorded water depths ranging between 2.3 and 8.9 feet. Water is deepest in the center of the main river channel. No known studies were previously conducted in the Nemadji River to estimate the sediment thicknesses prior to this study. Based on the LIDAR data provided by WDNR, the estimated floodplain extent of 23 acres (1,010,676 square feet) is defined by an elevation of 611 feet above mean sea level (amsl) (Figure 2). Several low-lying areas (below 611 feet amsl) and drainage pathways were identified within the defined floodplain boundary. As described in Sections 2.4 and 2.5, the areas were targeted for probing and additional sampling activities.

3.2 Visual Observations

Staining, sheens, and NAPL were observed during probing or sampling at Crawford Creek transects 1 through 11, 13 through 15, 18, 19, 23, 28, and also at the floodplain transect 2 (Figure 4). Visual observations were classified into the following three categories:

A. One or more of the following observations: staining, creosote like product (NAPL), chunks of coal-tar-like material, strong creosote-like odor, or NAPL-wetted fibers observed in the sediment matrix during probing or sampling

B. Lesser sheens, milder odor, or trace NAPL observed in the sediment matrix during probing or sampling

C. No signs of impacts

Most of the Category A sediments were observed at the upstream reaches of Crawford Creek, towards the railroad bridge. Sediments in transects 1 through 11 and 28 in Crawford Creek were classified as Category A. Transect 28, located at the confluence with the Nemadji River, contained sediment with Category A-like impacts. The remaining transects in Crawford Creek, where lesser visual impacts were observed (Category B), are also shown in Figure 4. No signs of creosote-like product (NAPL) or sheens were observed during probing and sampling activities in Nemadji River. Sediment thickness results, water depths, *x*, *y*, and *z* coordinates, and the visual observations at each probed and sampled location are included in Tables 1 and 2.

3.3 Sediment Type and Distribution

Lithological conditions in Crawford Creek and its floodplain consist largely of a saturated clay/silt, and a defined soft sediment layer largely was not observed in that part of the study area. In general, for Crawford Creek and floodplain areas, the probe refusal depths tend to show deeper deposits of clay/silt sediment compared to the vibracore refusal depths. Thus, the refusal depths presented in Table 1 for Crawford Creek and its floodplain do not represent an accumulation of soft sediments over a typical dense underlying layer, but are predominantly a measure of the probe's ability to be pushed through the native saturated clay. For the purposes of this report, the native saturated clay is referred to as "sediment" in the following subsections. Conditions in the Nemadji River exhibited characteristics more definable as unconsolidated sediments, composed predominantly of well sorted sand.

The sediment thickness, as measured by the vibracore refusal depths in Crawford Creek, ranged between 0.7 and 5.2 feet bss, with an average sediment thickness of 2.2 feet. Thicker sediment deposits were observed in the downstream reaches of Crawford Creek, towards the confluence with the Nemadji River, with the thickest deposit observed at Transect 28, located at the confluence of the Nemadji River and Crawford Creek. The upstream reaches of the creek generally exhibited less sediments. Sediment thickness in the floodplain areas ranged from 0.7 foot to 5.5 feet bss, with an average sediment thickness of 2.9 feet based on the sediment core refusal depths. Although no clear pattern of sediment thickness was observed within the floodplain areas, most of the thicker deposits were observed in the low-lying areas of the floodplain. This observation can be explained by the tendency of the creek and river sediments to accumulate in the low-lying areas during the annual flooding of Crawford Creek and the Nemadji River.

The Nemadji River sediments consisted predominantly of coarse to medium-coarse sand, with clay-like consolidated soft material towards the banks of the river. Since the river sediments predominantly contain sand, the sediment thickness measured by the probe is expected to provide better correlation and representation of an accumulation of unconsolidated sediments over a typical dense underlying layer. The sediment thickness measured by the probe refusal depths in the Nemadji River ranged from 2.9 up to 11.5 feet bss, with an average sediment thickness of 6.4 feet. During probing activities, native clay-like material was encountered at the bottom of the river sediments.

3.3.1 Physical Parameters

Grain Size

One-hundred and forty-two discrete samples were collected and analyzed for grain size using ASTM International Method D-442. The grain-size results are generally consistent with the visual observations made during sample collection activities. Grain size sample results are presented in Table 4 and summarized in Exhibit 1.

EXHIBIT 1
Grain Size Sample Results

	Average Grain Size Distribution		
Grain Size	**Crawford Creek**	**Floodplain**	**Nemadji River**
Sand and Gravel	14%	4%	93%
Silt	44%	30%	4%
Clay	42%	66%	3%

Crawford Creek sediment samples, on average, contained an evenly distributed amount of silt and clay, comprising approximately 85 percent of the matrix. Floodplain soils were predominantly clay (66 percent), followed by silt (30 percent). Composition of the Nemadji River sediments was distinctly different from the Crawford Creek sediment and floodplain soils, with sand and gravel composing over 90 percent of the samples.

Total Organic Carbon

The 129 samples submitted for chemical analysis were also analyzed for TOC using the Lloyd Kahn Method. TOC concentrations ranged from 0.3 to 5.2 percent in Crawford Creek sediments, 0.7 to 4.6 percent in floodplain soils, and 0.04 to 0.9 percent in Nemadji River sediments. TOC sample results are presented in Table 5.

3.4 Analytical Results Summary

In accordance with the QAPP, analytical results were screened against applicable EPA Region 5 ecological screening levels (ESLs) (EPA 2003), EPA ecological soil screening levels (Eco-SSLs) (EPA 2007), Wisconsin consensus-based sediment quality guidelines (probably effect concentrations [PECs] and threshold effect concentrations [TECs]) (WDNR 2003). For dioxins and furans, toxicity equivalency quotients (TEQs) were calculated and compared to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) screening criteria (EPA 2003). AVS/SEM was screened using Equilibrium Sediment Benchmarks Guidelines (EPA 2005).

The analytical results are presented together with their respective screening criteria, including ID of samples with exceedances, in Tables 5 and 7 for Crawford Creek and Nemadji River sediments, and Table 6 for floodplain soils. Tables 8 and 9 present mammalian and avian TEQs (calculated from dioxins and furans) for sediments and floodplain soils, respectively. Analytical results for AVS/SEM and physical parameters are presented in Table 10.

3.4.1 Polycyclic Aromatic Hydrocarbons

One-hundred and twenty-nine samples collected throughout the project area were analyzed for PAH compounds as specified in the QAPP by Method SW-846 8270D. Crawford Creek and Nemadji River samples were screened against Wisconsin TECs and PECs, as well as EPA Region 5 ESLs. In terms of evaluating floodplain soil impacts, floodplain samples were screened against EPA Eco-SSLs for low molecular weight (LMW) and high molecular weight (HMW) PAHs, rather than the Wisconsin TEC and PEC that are more applicable to sediment. To compare Crawford Creek and Nemadji River sediments to the Wisconsin TEC and PEC for total PAHs, total PAH values were calculated by normalizing each PAH to 1 percent organic carbon, then summing all 17 PAHs, with nondetect values set at one-half the detection limit. For floodplain samples, the following two types of total PAH sums (LMW and HMW) were calculated with nondetect values set at one-half the reported detection limit: (1) total LMW PAHs, which includes 7 two- and three-ring PAHs, and (2) total HMW PAHs, which includes 10 four- and higher-ring PAHs. Note that the total HMW PAH and total LMW PAH values for floodplain soils are not normalized to organic carbon; therefore, direct comparison to total PAH values calculated for creek and river sediments is not appropriate.

PAHs were detected in the majority of the surface and subsurface sample locations sampled throughout the project area. Total PAH concentrations in sediment ranged from nondetect to 159 milligrams per kilogram (mg/kg), with the maximum concentration found in Crawford Creek subsurface sample CC-028-B-0.5/2.0. The maximum total PAH concentration found in Nemadji River was on the same order as Crawford Creek, at 116 mg/kg. Approximately half of the Crawford Creek sediment samples exceeded the Wisconsin TEC of 1.61 mg/kg, while approximately 25 percent of the Nemadji River samples exceeded this screening value. The Wisconsin PEC of 22.8 mg/kg was exceeded in less than 20 percent of the Crawford Creek sediment samples and two Nemadji River samples.

By contrast, there were few screening-level exceedances for PAHs in floodplain soils. Only 1 of the 35 floodplain samples exceeded the LMW PAH screening values of 29 mg/kg, while four floodplain samples exceeded the HMW screening value of 18 mg/kg.

In general, Crawford Creek had higher PAH concentrations, with values typically an order of magnitude greater than floodplain samples and Nemadji River sediments. Moreover, the screening-level exceedances were generally located in the upstream segment of Crawford Creek, the segment closest to the former Koppers, Inc., outfall and drainage ditches. PAH analytical results screened against the various screening values are presented in Tables 6 and 7 and shown in Figures 4 and 5. Screening value exceedance frequency by area is summarized in Exhibit 2.

EXHIBIT 2
Screening Value Exceedance Frequency by Area

	Concentration Ranges and Exceedances of Screening Criteria		
Total PAHs	**Crawford Creek (Sum of 17 PAHs)**	**Nemadji River (Sum of 17 PAHs)**	**Floodplain (LMW and HMW PAHs)**
Wisconsin TEC (1.61 mg/kg)	31/64 (48%)	7/30 (23%)	
Wisconsin PEC (22.8 mg/kg)	11/64 (17%)	2/30 (7%)	
EPA Eco-SSL – LMW (29 mg/kg)			1/35 (3%)
EPA Eco-SSL – HMW (18 mg/kg)			4/35 (11%)

Shading implies Screening Criteria not applicable.

PAH concentration as a function of sediment depth was evaluated throughout the project area; however, no consistent trends were observed in any of the study areas. At some locations, the highest PAH concentrations were observed at the surface and generally decreased with increasing depth. While at other locations, the highest PAH concentrations were detected in a subsurface interval. The variability in PAH distribution with depth may be attributed to differing depositional trends within the project area.

3.4.2 Metals

One-hundred and twenty-nine samples collected throughout the project area were analyzed for total metals (including mercury) by Methods SW-6010C and SW-7471. Crawford Creek and Nemadji River samples were screened against EPA Region 5 ESLs for sediment and Wisconsin TECs and PECs. Floodplain samples were screened against the EPA Region 5 ESL for soil.

All Crawford Creek and Nemadji River sediment samples were below the Wisconsin PEC screening criteria. One-hundred percent of the floodplain samples exceeded the Region 5 ESL screening values for barium, cadmium, chromium, copper, lead, nickel, and zinc. The metals either were below or found at concentrations with significantly fewer exceedances of the Region 5 ESLs in Crawford Creek and Nemadji River sediments.

Total metals results screened against the various screening criteria are presented in Tables 6 and 7, respectively, and results of select metals (chromium, copper, and nickel) are presented in Figure 6. The Region 5 ESL and Wisconsin TEC screening value exceedance frequencies by sample area are summarized in the following table for total metals. Since there were no exceedances of the Wisconsin PEC screening values, this criterion is not presented in Exhibit 3.

EXHIBIT 3
Region 5 ESL and Wisconsin TEC Screening Value Exceedance Frequencies by Sample Area

	Floodplain Soil	Crawford Creek	Nemadji River
Total Metals	**Exceedance of EPA Region 5 ESL**	**Exceedance of Wisconsin TEC**	
Arsenic	2/35 (6%)	0/64 (0%)	0/30 (0%)
Barium	35/35 (100%)	NA	NA
Cadmium	35/35 (100%)	0/64 (0%)	0/30 (0%)
Chromium	35/35 (100%)	10 (16%)	0/30 (0%)
Copper	35/35 (100%)	29/64 (45%)	0/30 (0%)
Lead	35/35 (100%)	0/64 (0%)	0/30 (0%)
Mercury	0/35 (0%)	0/64 (0%)	0/30 (0%)
Nickel	35/35 (100%)	54/64 (84%)	0/30 (0%)
Selenium	0/35 (0%)	0/64 (0%)	0/30 (0%)
Silver	0/35 (0%)	0/64 (0%)	0/30 (0%)
Zinc	35/35 (100%)	0/64 (0%)	0/30 (0%)

NA = no screening criterion available for given analyte

3.4.3 Pentachlorophenol

PCP analysis was performed on 129 samples collected throughout the project area as specified in the QAPP by Method SW-846 8270C Selected Ion Monitoring (SIM). Crawford Creek and Nemadji River sediment samples were screened against the EPA Region 5 ESL for sediment (23 mg/kg), the Wisconsin TEC (0.150 mg/kg), and the Wisconsin PECs (0.200 mg/kg) (Figures 7 and 8). Floodplain samples were screened against the EPA Region 5 ESL for soil (0.119 mg/kg) (Figure 7). All surface and subsurface sediment and floodplain soil samples were reported as nondetect; however, some sample detection limits were elevated above the screening levels. Because of the number of samples with detection limits above the screening criteria, the sample detection limit was used as a surrogate to evaluate the potential presence of PCP in study area.

As shown in the following exhibit, none of the Nemadji River sediment samples had detection limits exceeding the Region 5 ESL; therefore, 100 percent of the samples were below this screening criterion. However, for the remaining samples, reported detection limits for PCP exceeded their respective screening criteria between 14 percent and 73 percent, confounding evaluation of this analyte for numerous samples. Despite the potential confounding nature of some of the results exhibiting elevated detection limits, there are still 27 to 86 percent of samples that meet the Wisconsin TEC, PEC, and/or ESL floodplain soil screening criteria for PCP. There were no detections of PCP in the 27 percent to 86 percent of samples that met the respective screening limits, thus providing a degree of confidence that there is not a trend of widespread PCP impacts at the site exceeding the screening criteria, as presented in Exhibit 4.

EXHIBIT 4
Detection Limit Exceedances of Pentachlorophenol

	Detection Limit Exceedances of Screening Criteria		
Pentachlorophenol	**Crawford Creek**	**Floodplain**	**Nemadji River**
EPA Region 5 ESL (23,000 µg/kg sediment, 119 µg/kg soil)	9/64 (14%)	12/35 (34%)	0/30 (0%)
Wisconsin TEC (150 µg/kg)	41/64 (64%)		22/30 (73%)
Wisconsin PEC (200 µg/kg)	36/64 (56%)		21/30 (70%)

µg/kg = microgram per kilogram; Shading implies screening criteria not applicable.

Since some of the PCP and PAH sample results were reported with high MDLs and dilutions, CH2M HILL evaluated the results and discussed the issue with laboratory personnel to identify possible solutions, including cleaning up the gel permeation chromatography (GPC) and re-analyzing the samples. This alternative was evaluated, and it was determined that a GPC cleanup and re-analysis would not provide a substantive improvement in the results because PCP is expected to be masked by high concentrations of PAH compounds that have the same elution time, and it is difficult to separate the PCP from those PAHs. The same conclusion was also reached by EPA's third-party analytical data consultant.

3.4.4 Dioxins and Furans

One-hundred and twenty-nine samples collected from Crawford Creek, its floodplain area, and a portion of the Nemadji River were analyzed for dioxin and furan congeners and homologs as specified in the QAPP by Method SW-846 1613B. Dioxin and furans were evaluated by calculating TEQs associated with each of the samples. The basis for the TEQ calculations is presented in the following paragraphs, followed by a discussion of the results.

The polychlorinated dibenzo-p-dioxins (dioxins) include 75 individual congeners, and the polychlorinated dibenzofurans (furans) include 135 individual congeners. Seven of the dioxin congeners and 10 of the furan congeners have been identified as having significant toxicity with respect to the other congener configurations due to the presence of chlorine substitution in the 2, 3, 7, and 8 positions of the molecule. The toxicity of each congener, indicated by a toxicity equivalency factors (TEFs), is measured with respect to the most toxic congener 2,3,7,8-TCDD. 2,3,7,8-TCDD is assigned a TEF of 1, and the remaining congeners are assigned values of 1 or less based on their relative toxicity to 2,3,7,8-TCDD. TEQs were calculated for both mammals and birds. Mammalian TEFs were obtained from the World Health Organization (van den Berg et al. 2006), and TEFs for birds were obtained from van den Berg et al. (1998). Fish TEQs were calculated per WDNR guidance (WDNR 2003).

To calculate TEQ, congener concentrations (7 dioxin congeners and 10 furan congeners) were multiplied by their corresponding TEF to produce a congener-specific TEQ concentration. The TEQ concentrations for each of the detected congeners were then summed to determine the total TEQ concentration in the sample. The total TEQ for mammals and birds for Crawford Creek and Nemadji River sediments were compared to EPA Region 5 ESLs for 2,3,7,8-TCDD in sediment (0.12 nanogram per kilogram [ng/kg]), and floodplain samples were compared to the analogous screening level for soil (0.19 ng/kg), total fish TEQ for Crawford Creek and Nemadji River sediments were compared to the Wisconsin TEC (0.85 ng/kg at 1 percent TOC), and the Wisconsin PECs (21.5 ng/kg at 1 percent TOC) (see Tables 8 and 9, respectively). The exceedances are presented in Figures 9 and 10. The laboratory data for the dioxins and furan congeners, TEF data for mammals and birds, and the calculations to estimate the TEQ values are presented in Appendix E.

The majority of the mammalian TEQs exceeded their respective screening levels, including 100 percent of the floodplain samples, approximately 61 percent of the Crawford Creek samples, and approximately 3 percent of the Nemadji River samples. Similar results were found for the bird TEQs (100% of Floodplain

Samples, 56% of Crawford Creek Samples), with the exception of the Nemadji River samples where 43 percent of the samples exceeded the sediment screening level. Significantly higher TEQ concentrations, on the order of two to three orders of magnitude, were found in Crawford Creek sediments and floodplain samples than in Nemadji River sediment. Fish TEQs exceeded the TEC in 21 samples and the PEC in one sample in Crawford Creek. One sample in the Nemadji River had a fish TEQ that exceeded the PEC.

The highest TEQ concentrations were detected in the floodplain at 325 (225) [mammal (bird)] ng/kg and 161 (95) ng/kg in surface and subsurface samples, respectively. Maximum TEQ concentrations in the Nemadji River samples ranged from 0.18 ng/kg to 4.65 ng/kg, with the highest concentrations generally located in the subsurface. In Crawford Creek, TEQ concentrations were generally higher in the surface samples, except at locations CC-027 and CC-028, located just upstream of the confluence with the Nemadji River.

3.4.5 AVS/SEM

One-hundred and twenty-nine samples were collected throughout the study area for analysis of AVS/SEM by EPA Method 821 R-91-100. The samples included surface and subsurface samples from Crawford Creek, its floodplain area, and a portion of the Nemadji River. For the purposes of the analysis, it was assumed that the floodplain soils were saturated; therefore, AVS/SEM would behave similar in submerged sediment. AVS/SEM sample results are discussed herein and presented against sediment benchmark screening values in Table 10.

Equilibrium partitioning theory predicts that the divalent metals partition in sediment between AVS, interstitial (pore) water, benthic organisms, and other sediment phases such as organic carbon (EPA 2005). Biological responses of benthic organisms to these metals in sediments are different across sediments when the sediment concentrations are expressed on a dry-weight basis, but similar when sediments are normalized to ΣSEM-AVS. The difference between the sum of the molar concentrations of SEM (ΣSEM, the metal extracted in the AVS extraction procedure) minus the molar concentration of AVS tends to be a better predictor of potential toxicity (EPA 2005). The potential for toxicity can be further refined by normalizing to the organic carbon content of the sediment as follows:

$$(\Sigma SEM\text{-}AVS)/f_{oc}$$

Where

- ΣSEM is the molar sum of the concentrations of cadmium, copper, lead, nickel, and zinc in micromoles per gram (µmol/g)
- AVS in µmol/g
- f_{oc} is the fraction of organic carbon

The results provide benchmarks for potential toxicity to benthic organisms (EPA 2005), as follows:

- If $(\Sigma SEM\text{-}AVS)/f_{oc}$ is less than 130 micromoles per gram of organic carbon ($\mu mol/g_{oc}$), sediment should pose low risk of adverse biological effects due to cadmium, copper, lead, nickel, or zinc.
- If $130\ \mu mol/g_{oc} < (\Sigma SEM\text{-}AVS)/f_{oc} < 3000\ \mu mol/g_{oc}$, sediment may have adverse biological effects due to cadmium, copper, lead, nickel, or zinc.
- If $(\Sigma SEM\text{-}AVS)/f_{oc} > 3000\ \mu mol/g_{oc}$, adverse biological effects due to cadmium, copper, lead, nickel, or zinc is expected.

The ΣSEM and AVS results presented in Table 10 were compared against two sediment benchmark criteria: (1) ΣSEM/AVS, and (2) $(\Sigma SEM\text{-}AVS)/f_{oc}$. Under the first screening criterion, ΣSEM/AVS ratio, if equal molar concentrations of ΣSEM and AVS are present, then there are no excess metals (ΣSEM) available to cause toxicity. For ΣSEM/AVS ratios greater than 1, the potential for metal toxicity exists from the excess metals (ΣSEM). Over 90 percent of the study area samples (119 of 129 samples) had ΣSEM/AVS ratios greater than 1, indicating a potential for metal toxicity. Given the inherent limitations of this screening criterion (for example, the ratio overestimates metal availability under some environmental conditions), further evaluation was performed using the carbon normalized factor Σ(SEM – AVS)/f_{oc}. Since metal complexation with organic matter (carbon) reduces bioavailability, this factor improves the prediction of toxicity.

Marked differences were observed between the Σ(SEM – AVS)/f_{oc} results for the Nemadji River and Crawford Creek (including the floodplain areas). Of the 99 samples collected within Crawford Creek and its floodplain area, only two samples (creek sample CC-021-C-0.0/0.5 [178 µmol/g_{oc}] and floodplain sample CF-01-A-0.5/1.0 [180 µmol/g_{oc}]) exceeded the 130 µmol/g_{oc} criterion, indicating that the vast majority of Crawford Creek sediment and floodplain soils pose low risk of adverse biological effects due to cadmium, copper, lead, nickel, or zinc. Conversely, over 60 percent of the Nemadji River sediment samples (19 of 30 samples) exceeded the 130 µmol/g_{oc} criterion with a maximum value of 286 µmol/g_{oc} observed at surface location NR-02-B1-0.0/0.5. Of these exceedances, 6 were associated with surface sediments, and the remaining 13 were measured in subsurface sediments.

The Σ(SEM – AVS)/f_{oc} results indicate that a portion of the Nemadji River sediments may have adverse biological effects due to cadmium, copper, lead, nickel, or zinc. However, the bulk sediment concentration of metals was below the TEC, suggesting that no adverse effects are likely. Further examination of the AVS/SEM data for the Nemadji River samples shows low concentrations of the SEM metals. However the samples also have low AVS and TOC. The somewhat higher Σ(SEM – AVS)/f_{oc} results seen in the Nemadji River samples are an artifact of the low measurements and are likely not predictive of effects.

3.4.6 Data Quality Summary

The DUR (Appendix A) summarizes the quality evaluation conducted for this field investigation. The report provides a general data quality assessment designed to summarize data issues, if present. As detailed in the DUR, the samples were analyzed within the EPA-recommended holding times, and required chain-of-custody procedures were followed. The data were considered valid, with the exception of two mercury results (CC-001-A-0.0/0.8 and CC-010-A-0.8/1.9) that were rejected for project use due to MS recoveries below the required limit (for additional details, see the discussion in the MS section of the DUR). Overall, 10,373 of 10,375 results (99.98 percent) were considered valid data, meeting project completeness goals.

3.5 Sediment Volumes

Various sediment volumes were calculated for the project area using the probe and analytical data. A total sediment volume was calculated for Crawford Creek and the Nemadji River, as well as an overall soil volume of the Crawford Creek floodplain. Volume calculations used a series of averaged sediment or soil thickness measurements representative of probing locations and transects multiplied by the area determined to be representative of the thickness data. Volume estimates associated with analytical data used the bottom-most sample interval depth value at which a screening criteria exceedance occurred and was then multiplied by the lateral extent representative of the analytical data location. The volume estimates were performed using the above-stated 2-dimensional methodology and are reported in cubic yards (yd^3). It is noted that the estimated volumes of potentially impacted sediment material exceeding the total PAH PEC and dioxin/furan TEQ criteria are considered preliminary and are subject to verification and enhancement by additional studies prior to any contemplated remedial efforts. A summary of impacted volume distribution within the study area is presented in Exhibit 5.

3.5.1 Crawford Creek

The total sediment volume of Crawford Creek was calculated to be 7,500 yd^3. The total sediment volume within Crawford Creek was calculated by summing the products of each sample location polygon area by the average probe transect thickness value. Average probe transect thickness values ranged from 2.3 to 5.6 feet.

An estimated quantity of sediment exceeding the total PAH PEC value of 22.8 mg/kg was calculated to be 900 yd^3. In addition, the calculations indicate that about 2,500 yd^3 of sediment contains concentrations greater than 10 times the mammalian or bird ESL values of 0.12 ng/kg for dioxin and furan TEQ.
An exceedance of 10 times the screening values was selected to represent the volume with a high potential

for causing impacts to wildlife given the uncertainties of the screening process. A total of 9 sediment core locations (CC-002 through CC-005, CC-008, CC-010, CC-020, CC-023, and CC-028) within Crawford Creek exhibited total PAH concentrations greater than the PEC value (22.8 mg/kg). The lateral extent represented by each sample location exceeding the PAH PEC value within Crawford Creek is shown in Figure 11. A total of 20 sediment core locations (CC-002 through CC-005, CC-007, CC-008, CC-010, CC-011, CC-013 to CC-015, CC-017 though CC-021, CC-023, CC-024, CC-027, and CC-028) exceeded 10 times the mammalian or bird ESL values of 0.12 ng/kg for dioxin and furan TEQ. Lateral extent boundaries were established as polygons between sample location midpoints bounded by the creek channel as delineated from the aerial photograph. Sediment thickness values used within each polygon represent the deepest sample interval value with an exceedance or, in the instances where locations exhibit an exceedance, at the deepest sample interval (CC-003, CC-004, and CC-005), the average transect probe thickness value was implemented. In each instance, the average probe depth value is greater than the sediment core penetration depth, which results in the most conservative sediment thickness value.

3.5.2 Crawford Creek Floodplain

An estimated 265,000 yd^3 of total soil lies within the floodplain extent of 23 acres (1,010,676 square feet) defined by elevation 611 feet amsl (Figure 11). The volume calculation used an average soil thickness to represent the depth of clay soil penetrable by the manual probing technique as discussed in Section 2.4. The volume representing the PAH PEC value exceedance at core location CF-01-B located within the upper extent of the floodplain was not calculated due to the lack of analytical data available to define lateral extents. The PAH concentration exceeded its respective PEC value at depth (0.9 foot); therefore, the core penetration depth of 2.7 feet is assumed to be the most conservative value for delineating the vertical extent at this time. A volume representing dioxins, furans, and metals data against respective TEQs and ESL exceedance criteria was not conducted due to the spatial distribution of sample locations and the analytical results of dioxins, furans, and metals. Review of the analytical results revealed each floodplain sample location as having exceedances of respective TEQ and ESL criteria at depth, which would result in an approximate volume representing TEQ and ESL exceedance criteria to essentially be the same as the total volume calculated using floodplain soil probe data.

3.5.3 Nemadji River

A total sediment volume of 71,500 yd^3 was calculated for the portion of the Nemadji River in the study area, with approximately 10,100 yd^3 representing the volume of sediment estimated to exceed the total PAH PEC value at locations NR-02-C and NR-03-B (Figure 12). In addition, an estimated 7,400 yd^3 was calculated to represent the sediments exceeding 10 times the mammalian or bird ESL values of 0.12 ng/kg for dioxin and furan TEQ at location NR-05-C. The total volume associated with the Nemadji River was calculated using an average channel width of 75 feet as derived from aerial imagery multiplied by the total Nemadji River length (4,200 feet) from the confluence of Crawford Creek to the furthest downstream probe transect (NR-05). An average sediment thickness for the Nemadji River segment of 6.13 feet was calculated by averaging the sediment probe thickness data collected at each depositional river transect/area.

The volume associated with Nemadji River location NR-02-C assumes an area represented by the average channel width of 75 feet by 300 feet, resulting in 22,500 square feet. The distance of 300 feet is representative of the linear river distance to the upstream and downstream locations (NR-02-B1 and NR-02-B2), with results less than the PAH PEC value. The same square footage was assumed to represent the area of PAH impact greater than the PEC value at location NR-03-B, as well as the area exceeding 10 times the mammalian or Bird ESL values of 0.12 ng/kg for dioxin and furan TEQs at location NR-05-C. At this time, further refinement of the PAH PEC and dioxin and furan TEQ exceedance area is not feasible due to the current spatial distribution of sediment cores collected with the Nemadji River. Each location's total PAH or dioxin and furan TEQs value exceeds the PAH PEC or mammalian or bird ESLs value at depth, respectively; therefore, the average transect sediment thickness at each location was used for volume-estimate purposes.

EXHIBIT 5
Summary of Impacted Volume Distribution within the Study Area*

Study Area	Estimated Volume Exceeding PAH PEC (yd^3)	Estimated Volume Exceeding TEQ ESL (yd^3)	Total Estimated Volume (yd^3)
Crawford Creek	900	2,500	7,500
Floodplain	--	--	265,000
Nemadji River	10,100	7,400	71,500

*Volumes are considered preliminary and are subject to verification and enhancement by additional studies.

3.6 Habitat and Biological Surveys

Qualitative habitat and biological assessments were completed to support calculating IBI, ICI, and QHEI. The assessments were conducted in accordance with the EPA *Rapid Bioassessment Protocols for Use in Streams and Wadable Rivers* (Barbour et al. 1999), and WDNR *Guidelines for Evaluating Habitat of Wadable Streams* (WDNR 2002). A summary of the assessments and results is presented in the following subsections. A detailed description, including all data and data sheets, is included in Appendix B.

3.6.1 Physical Habitat Survey

The habitat in the study area of Crawford Creek is of relatively low quality for supporting aquatic life. There was little or no current during the time of the field investigation. Water levels and velocities in Crawford Creek are significantly affected by Lake Superior water levels and seiches. DO ranged from 6.0 to 6.4 milligrams per liter during the time of the investigation. The low water velocity likely contributes to the relatively low DO. In general, Crawford Creek is more characteristic of a linear-shaped pool, versus a “typical” stream habitat that has flow and habitat diversity respective of interspersed pools and riffles.

In the study area of Crawford Creek, aquatic plant life was very limited, and the bottom substrate consisted of a soft mixture of silt and clay, with occasional organic debris (that is, leaves and twigs). A creosote-like odor was notable in the sediments of Reach 1, somewhat notable in Reach 2, but not notable in Reaches 3 or 4. During the site investigation, the stream was very turbid with suspended clay, restricting water visibility to approximately 6 inches.

The QHEI results for the four reaches investigated at Crawford Creek are presented in Table 11. The results show the conditions to be fairly homogenous with respect to habitat type and quality, with a score of 153 out of a maximum of 200 for Reach 1, and 161 out of a maximum of 200 for Reaches 2 through 4. In-stream structure was generally lacking, with only pools providing some cover in the form of depth. Only limited amounts of erosion were noted, and vegetation was found growing down to the water line. A relatively wide, native riparian zone was noted throughout much of the study area. Nonnative invasive species were not noted in the stream or the adjacent floodplain. Bank stability was excellent, and the channel was moderately sinuous. Lack of in-stream cover and diversity in the substrates were noted.

3.6.2 Fish Community Survey

The initial four gill nets placed in Crawford Creek yielded the following results.

- Reach 1: two northern pike (*Esox* lucius) and one black bullhead (*Ameiurus melas*)
- Reach 2: no fish were captured
- Reach 3: one northern pike and one trout-perch (*Percopsis omiscomaycus*)
- Reach 4: one northern pike (*Esox lucius*; 14-inch total length)

The second gill net set produced the following results:

- Nets #1 and #3 in the Nemadji River did not capture any fish.
- Net #2 in the Nemadji River captured one channel catfish (*Ictalurus punctatus*) and one Silver Redhorse (*Moxostoma anisurum*).

- Net #4 at Reach 1 of Crawford Creek captured two northern pike.

The cast net was thrown three times into each reach of Crawford Creek. No fish were captured at Reaches 2 and 3, one northern pike was captured at Reach 1, and one minnow (Family Cyprinidae, 3 inches) was caught at Reach 4. Seine netting was only used at Reach 1 of Crawford Creek, due to the difficulty of seining other sections of the creek attributed to water depth, steep banks, or slick clay substrates. The seine netting captured numerous minnows (species unknown) and several brook sticklebacks (*Culaea inconstans*).

Due to the low number of individual fish collected and the opportunistic sample methods deployed to assure adequate fish numbers and type for tissue analysis, a meaningful IBI could not be calculated.

Even though a meaningful IBI could not be calculated due to the low number of fish captured, the results can be assessed relative to the individual metrics to provide some overview of the conditions in Crawford Creek.

The total number of native fish species collected was 6 in Crawford Creek and 2 in the Nemadji River; in addition, several unidentified minnow species were collected in Crawford Creek as part of the forage fish sample for tissue analysis. The RBP states: "The number of species is strongly affected by stream size…." (Barbour et al, 1999). The RBP also states that the number of native fish species generally declines with increasing degradation of a stream environment.

No darters, sculpins, or madtoms were collected in either Crawford Creek or the Nemadji River, perhaps due to the lack of suitable habitat for these species (gravel or vegetative substrates) throughout the study area.

No sunfish species were collected in either Crawford Creek or the Nemadji River, although suitable habitat seemed to be present for at least some sunfish species (*Lepomis cyanellus*) and other members of the family Centrarchidae *(Micropterus salmoides*). The RBP states that the pool-dwelling species decrease in abundance with pool and in-stream cover degradation. However, pool habitat degradation was not observed within the study area.

Only one sucker was captured during this study, a silver redhorse captured in the Nemadji River. Redhorse suckers (*Moxostoma* spp.) are generally considered "intolerant" of environmental perturbations as are many other species of suckers. All of the other species collected (87.5 percent) are considered "tolerant." Two of the species collected (25 percent) are listed as omnivores—the golden shiner and the black bullhead. The small minnows (less than or equal to 1 inch) collected were not identified to species.

Approximately 37.5 percent of the species collected are considered to be insectivores, including silver redhorse, brook stickleback, and trout-perch. Many minnow species are also considered of insectivorous species and would significantly increase the respective percentage of the catch. The RBP states that as the fish community is impacted and becomes less abundant and diverse, the percentage of insectivores will decrease as the percentage of omnivores increases (Barbour et al, 1999). Due to the lack of species-level ID of the unknown minnows, the interpretation of this metric is limited. The only top carnivore species collected during this study was northern pike, and seven individuals were collected in Crawford Creek, including a large adult 31.5 inches long. Other individuals ranged from 9 to 14 inches long (juveniles). The size and biomass of this species is significant. According to the RBP, the presence of northern pike can be an indicator of moderate quality …." (Barbour et al, 1999). If all tolerant species are excluded, the number of individuals collected is only 1, the silver redhorse, and it was collected from the Nemadji River, not Crawford Creek itself. This metric indicates substantial impairment of the stream environment.

Finally, no diseased or malformed individuals were collected. All collected individuals appeared to be relatively healthy, with fully formed fins and no signs of any external lesions, tumors, or other noted anatomical/physiological problems.

3.6.3 Benthic Macroinvertebrate Assessment

The results indicate that the benthic macroinvertebrate community in Crawford Creek has low abundance and taxa richness (Table 12). Total abundance ranged from 577 individuals in Reach 1 to 80 individuals in

Reach 4. Taxa richness ranged from 19 taxa in Reach 1 to 9 taxa in Reach 4. The majority of organisms collected were midge larvae and pupae of the family Chironomidae (Diptera), with the second-most common group of organisms being segmented worms (Annelida: Oligochaeta). Third most common were snails (Gastropoda) in the families Lymnaeidae, Physidae, and Planorbidae.

For purposes of a qualitative comparison between reaches, the macroinvertebrate data were categorized by the ICI metrics (Table 13). Because of the level of taxonomic ID, two metrics, percent Tribe Tanytarsini Midge composition and percent other Dipteran and Non-Insect composition, were not included. The results show that the benthic macroinvertebrate community in Crawford Creek is limited. The most robust community composition is in Reach 1. Reach 1 had the greatest total abundance, taxa richness, and mayfly taxa. Appendix B presents the results of the benthic macroinvertebrate survey.

3.6.4 Fish Tissue Sampling Results Summary

PCP and dioxin/furan analysis was performed on 11 tissue samples (2 fillet, 2 offal, and 7 whole) obtained from fish collected from Crawford Creek and 4 tissue samples (2 fillet and 2 offal) obtained from fish collected from the Nemadji River. PCP was analyzed in accordance with the QAPP by Method SW-846 8270C SIM. Dioxin and furan congeners and homologs were analyzed as specified in the QAPP by Method SW-846 1613B. As with the sediment and floodplain soils, TEQ was calculated for each sample. TEQs were calculated as described in Section 3.3.4., using the mammalian TEFs (World Health Organization 2005). Results from the fillet samples were evaluated with respect to EPA Region 3 Fish Tissue Screening Levels (May 2014) at the 1.0 E-06 excess cancer risk level and are presented in Table 14.

Pentachlorophenol

PCP was detected in 13 of the 15 fish tissue samples analyzed. Detected concentrations ranged from 6.7 to 13.5 µg/kg wet weight (ww). For the 4 fillet samples, PCP were 8 µg/kg ww in the black bullhead, 6.6 µg/kg ww in the channel catfish, and below detection limits in the northern pike and silver redhorse. All fillet samples were below the PCP screening value.

Dioxins and Furans

At least one dioxin/furan congener was detected in all fish tissue samples. TEQs ranged from 0.01 ng/kg ww to 3.10 ng/kg ww. For the four fillet samples, TEQs were 0.16 ng/kg ww in the northern pike, 0.01 ng/kg ww in the black bullhead, 2.6 g/kg ww in the channel catfish, and 0.05 ng/kg ww in the silver redhorse. All the fillet samples, with the exception of the black bullhead, exceeded the TEQ screening value.

4 Conclusions

4.1 Assessment of Sediment and Floodplain Soil Contamination

Sampling was conducted in Crawford Creek, its floodplain area, and a portion of the Nemadji River, targeting areas of potential sediment and soil contamination. Visual indications of NAPL were noted during sampling. The selection of sample locations was facilitated by reviewing the results of the sediment thickness survey, focusing on areas of potential and actual soft sediment deposition, taking into account field conditions, and obtaining recommendations for sample locations from EPA and WDNR. Collectively, the information was used to place samples to develop a preliminary delineation of surface and subsurface contaminant concentrations within the designated study area. The samples were analyzed for the site-specific COCs, including PAHs, dioxins and furans, PCP, and select metals. The results were compared to ecological screening values to provide a preliminary assessment of sediment and floodplain quality. In addition, the presence of NAPL was noted as another indication of contamination. The findings are summarized in the following subsections.

4.1.1 NAPL Observations

Most of the more highly impacted sediments (based on field observations) were observed between transects 1 through 11, at the upstream reaches of the Crawford Creek study area, towards the railroad bridge. Transects 1 through 11 and 28 in the Crawford Creek represented Category A-type conditions as described in Section 3.2. Lesser NAPL impacts were observed downstream of transect station CC-11, with the exception of transect sampling location CC-028 located near the confluence of Crawford Creek and the Nemadji River. Location CC-028 presented Category A-like impacts. There were no NAPL observations in the Nemadji River samples. In the floodplain area, only one location CF-01-B, exhibited NAPL impacts. Location CF-01-B was located next to Crawford Creek transect station CC-01 and presented Category B-like impacts (see CF-01B on Figure 4).

Therefore, visual and odor observations suggest that the greatest creosote/NAPL impacts are located within the approximate upper half of the Crawford Creek study area, closest to the railroad bridge, as indicated in Figures 4 and 11. No signs of creosote-like product/NAPL or sheens were observed during probing and sampling activities in the Nemadji River (Figures 5 and 12).

4.1.2 Polycyclic Aromatic Hydrocarbons

For PAHs, detected Crawford Creek sediment concentrations were typically an order of magnitude greater than the detected PAH concentrations in the floodplain samples and Nemadji River sediments.
The Wisconsin PEC for total PAHs was exceeded in 9 surface and subsurface sediment samples from 7 of the 11 core locations within the upper stretches of the Crawford Creek study area nearest to the railroad bridge. Exceedances shaded in green in Figure 4 represent the PAH concentrations exceeding the PEC screening criteria, which is the higher of the two screening criteria. Only three sporadic surface and subsurface sediment samples exceeded the PEC for total PAHs in the portion of Crawford Creek downstream of transect core location 11. Therefore, the bulk of the total PAH PEC exceedances within the upper half of the Crawford Creek study area (nearest to the railroad bridge) roughly correspond to the area of greatest visual/odor evidence of NAPL/creosote (Figures 11 and 12). It is also noted that the area roughly corresponds to an anecdotal report from the landowner (Mr. Reuille) that black creosote-like staining occurred across much of his floodplain land (nearest to the railroad bridge) in the 1970s.

Floodplain soil samples screened against EPA Eco-SSLs for total LMW and HMW PAHs revealed that the total LMW PAH ECO SSL was exceeded in one floodplain sample (CF-01B), while four floodplain samples (CF-01B, CF-01C, CF-03-C, and CF-05-B) exceeded the total HMW PAH Eco-SSL (See Figure 11). Therefore, the floodplain results also indicate that total PAH impacts exceeding screening criteria are predominantly located within the upper half of the Crawford Creek study area nearest to the railroad bridge, and generally occurred within floodplain cores that were closest to Crawford Creek. By contrast, approximately half of the Crawford Creek and 25 percent of the Nemadji River sediment samples exceeded the Wisconsin TEC for total PAHs.

4.1.3 Pentachlorophenol

PCP was reported as nondetect in all surface and subsurface samples for both sediment and floodplain soil, although a large number of samples (maximum 73 percent as described in Section 3.3.3) had elevated PCP detection limits above the screening levels due to high concentrations of PAHs in the samples. However, despite the potential confounding nature of some of the results exhibiting elevated detection limits, there are still 27 to 86 percent of samples that meet the Wisconsin TEC, PEC, and/or ESL floodplain soil screening criteria for PCP, as described in Section 3.4.3. There were no detections of PCP in the 27 to 86 percent of samples that met the respective screening limits, thus providing a degree of confidence that there is not a trend of widespread PCP impacts exceeding the screening criteria at the site.

4.1.4 Dioxins and Furans

For dioxins and furans, the majority of the samples exceeded the TEQ screening levels, including 100 percent of the floodplain samples (Figure 9), approximately 60 and 56 percent (mammalian and bird TEQ respectively) of the Crawford Creek samples, and approximately 3 and 43 percent (mammalian and bird TEQ respectively) of the Nemadji River samples (Figures 9 and 10). Significantly higher TEQs, on the order of two to three orders of magnitude, were found in Crawford Creek sediments and floodplain samples as opposed to the Nemadji River sediments. Figures 11 and 12 show the highest TEQ values that exceed the mammalian

ESL screening criteria (0.199 ng/kg for Floodplain soils and 0.12 ng/kg for Sediments) by a factor of 10, for comparison purposes in the Crawford Creek, its floodplains, and the Nemadji River.

4.1.5 Metals

All total metals sample concentrations in sediment were below the Wisconsin PEC screening criteria. However, 100 percent of the floodplain samples exceeded the Region 5 ESL screening values for barium, cadmium, chromium, copper, lead, nickel, and zinc. None of the Nemadji River sediments exceeded its respective Wisconsin TECs for metals. The Wisconsin TEC, however, was exceeded in Crawford Creek sediments for chromium, copper, and nickel. Marked differences were observed between the AVS/SEM results for the Nemadji River and Crawford Creek (including the floodplain areas). Of the 99 samples collected within Crawford Creek and its floodplain area, only 3 samples exceeded the criterion, indicating that the vast majority of the samples pose low risk of adverse biological effects due to cadmium, copper, lead, nickel, or zinc. Conversely, over 60 percent of the Nemadji River sediment samples exceeded the criterion, indicating that a portion of the Nemadji River sediments may have adverse biological effects. However, the Nemadji River samples also have low AVS and TOC, and the exceedances seen in the Nemadji River samples are an artifact of the low measurements and are likely not predictive of effects.

4.1.6 Chemical Concentration Trends

The spatial distribution of screening exceedances and NAPL observations generally shows greater contamination in Crawford Creek than in its respective floodplain and the Nemadji River. Furthermore, higher levels of contamination are generally found in the upper half of the Crawford Creek study area, as shown by the density of red-colored circles shown in Figures 11 and 12. This is true for both sediment and floodplain soil. No distinct hot spots or source areas were evident for any given constituent.

However, an analysis of the Crawford Creek sediment and floodplain data appears to show some trends between chemicals of concern. Figure 13 shows that there is a possible relationship between total PAHs and TEQs. Figures 14 and 15 show a strong relationship between chromium and copper, and chromium and nickel, respectively. However, there does not appear to be a relationship between total PAHs and metals such as chromium (Figure 16). Additional studies would be necessary to determine if detected metals concentrations are potentially associated with the silty clay matrix background concentrations, or anthropogenic sources.

Chemical concentration as a function of sediment depth was evaluated throughout the project area; however, no consistent trends were observed. At some locations, the highest concentrations were observed at the surface and generally decreased with increasing depth, while at other locations, the highest concentrations were detected in a subsurface interval. The variability with depth may be attributed to differing depositional trends within the project area.

4.1.7 Fish Tissue Contaminant Assessment

Fish were collected in Crawford Creek and within a 1-mile segment of the Nemadji River, and tissues were analyzed for PCP and dioxins/furans. Fifteen fish tissue samples were collected and analyzed. Edible portions were collected from four fish (northern pike and black bullhead caught in Crawford Creek and a channel catfish and silver redhorse caught in the Nemadji River). The edible portions, fillets, were compared to EPA Region 3 Fish Tissue Screening Levels at the 1.0 E-06 excess lifetime cancer risk level.

PCP was detected in 13 of the 15 fish tissue samples analyzed. Detected concentrations ranged from 6.7 to 13.5 µg/kg ww. For the 4 fillet samples, PCP results were 8 µg/kg ww in the black bullhead and 6.6 µg/kg ww in the channel catfish, and below detection limits in the northern pike and silver redhorse. All the fillet samples were below the PCP screening value.

At least one dioxin/furan congener was detected in all fish tissue samples. TEQs ranged from 0.01 ng/kg ww to 3.10 ng/kg ww. For the four fillet samples, TEQs were 0.16 ng/kg ww in the northern pike, 0.01 ng/kg ww in the black bullhead, 2.6 g/kg ww in the channel catfish, and 0.05 ng/kg ww in the silver redhorse. All the fillet samples exceeded the TEQ screening value. The results of the tissue fish tissue analysis show that a diversity of fish are bioaccumulating site-related contaminants. Fish in Crawford Creek and the Nemadji River are accumulating levels of dioxins and furans that may limit their consumption by area anglers. However, the sampling was limited (four edible tissue samples), and a more systematic study may be needed to determine full nature and extent of the potential issue.

4.1.8 Habitat Assessment

The habitat survey showed that in-stream habitat of Crawford Creek is limited for supporting a diversity of aquatic life. There was little or no current during the time of the field investigation, which would generally be the case since water levels and velocities in Crawford Creek are significantly affected by Lake Superior water levels and seiches. Crawford Creek is more characteristic of a linear-shaped pool, versus “typical” stream habitat, which has flow and habitat diversity respective of interspersed pools and riffles.

In the Crawford Creek study area, aquatic plant life was very limited and the bottom substrate consisted of a soft mixture of silt and clay, with occasional organic debris (that is, leaves and twigs). The QHEI results show the conditions to be fairly homogenous with respect to habitat type and quality. There is a relatively wide, native riparian zone was noted throughout much of the study area. Nonnative invasive species were not noted in the stream or the adjacent floodplain. Bank stability was excellent and the channel was moderately sinuous. Lack of in-stream cover and diversity in the substrates was noted.

4.1.9 Fish Community Assessment

The fish community sampling captured few fish (fewer than 20), indicating that if fewer than 50 fish are captured when using the IBI to measure environmental quality in Wisconsin warm water streams, an IBI should not be calculated, and the quality should be considered “Very Poor.” Individual metrics that make up the IBI are consistent with that determination. For example, the following indicate impairment:

- The total number of native fish species was low.
- No darters, sculpins, or madtoms were captured.
- No sunfish species were captured. Only one sucker was captured during this study.

4.1.10 Benthic Macro-invertebrate Community Assessment

The results of the benthic macroinvertebrate community assessment in Crawford Creek indicates that the creek has low abundance and taxa richness, which are the two most robust measures of the diversity of a macroinvertebrate community. The low diversity and abundance is consistent with the physical habitat assessment that showed limited habitat. The community was dominated by midge larvae, annelid worms, and snails. The ICI results show that the benthic macroinvertebrate community in Crawford Creek is limited. The most robust community composition is in Reach 1. Reach 1 showed the greatest total abundance, taxa richness, and mayfly taxa.

4.2 Opportunities to Address Beneficial Use Impairments

The following are key findings and elements that will support and define opportunities to address beneficial use impairments in the study area and overall area of concern:

- The results of the Crawford Creek and Nemadji River characterization provide a preliminary assessment of the nature and extent of contamination in Crawford Creek, its floodplain, and the Nemadji River. The occurrence of obvious NAPL and creosote-like odors, combined with elevated total PAH and TEQ values (Figures 11 and 12) provides initial focus areas where further studies and actions may be warranted.

- Sporadic total PAH impacts exceeding the PEC were identified in the Nemadji River sediments downstream of the confluence with Crawford Creek (Figure 12). While the potential connection of Crawford Creek to the sporadic PAH impacts in the Nemadji River may not be fully established, the presence of elevated PAHs in the creek and the absence of PAH PEC exceedances in the three sediment sample locations upstream of confluence (NR-01-A1, NR-01-E, and NR-01-B) suggests a potential PAH source in Crawford Creek. Additional studies in Crawford Creek and the Nemadji River would be necessary to further evaluate this potential connection.

- The estimated volume of potentially impacted sediment material exceeding the total PAH PEC criteria is considered preliminary and is subject to verification and enhancement by additional studies prior to any contemplated remedial efforts.
- In order to further delineate the vertical extent of sediment/soil impacts in the saturated clay of Crawford Creek and its floodplain, an evaluation of other sampling methodologies that will allow deeper core penetration is warranted. Potential sampling options for Crawford Creek might include direct-push techniques, or drilling using hollow stem auger or rotosonic rig mounted on a small barge/vessel or from a constructed bridge/platform. The drilling options could also be used in the floodplain on a track-mounted or amphibious vehicle. In addition, soil test pit excavations with a small excavator, may also be considered for sampling in the floodplain.
- Fish tissue sampling was limited, and a more systematic study, or desktop study of existing fish tissue databases, may be needed to determine full nature and extent of site-related contaminants in fish in the area.
- If additional studies are contemplated, alternative sampling and/or analytical methods for PCP analysis may be warranted to minimize matrix effects in samples with high PAH concentrations.
- There is potential for habitat improvement in Crawford Creek. Habitat quality could be improved after any remedial efforts by addition of in-stream cover, such as woody debris. Placement of more diverse substrate types, such as cobbles and gravels would increase habitat quality and diversity for macroinvertebrates, which would attract a more diverse fish community. However, it should be noted that the lack of flow may limit the long-term effectiveness of habitat restoration.
- Integration is warranted of the findings of this study with the findings and conclusions of prior studies from portions of Crawford Creek that are upstream of the railroad bridge.

5 References

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Tables

TABLE 1

Summary of Sediment and Soil Probing Data

Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Sediment/Soil Surface Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Probe Refusal Depth (ft-bss)	Visual and other Observations
Crawford Creek	CC01-A	46.65426	-92.07636	603.68	2.7	4.6	
Crawford Creek	CC01-B	46.65427	-92.07636	603.68	3.7	2.8	Sheen/ Blobs of NAPL observed; Strong Creosote like Odor
Crawford Creek	CC01-C	46.6543	-92.07637	603.68	3.0	2.0	
Crawford Creek	CC02-A	46.65433	-92.07618	603.76	2.7	2.2	
Crawford Creek	CC02-B	46.65434	-92.07619	603.76	3.1	5.1	Sheen/ Blobs of NAPL observed
Crawford Creek	CC02-C	46.65435	-92.0762	603.76	2.3	2.9	
Crawford Creek	CC03-A	46.65457	-92.07592	603.51	2.0	3.1	
Crawford Creek	CC03-B	46.65458	-92.07594	603.51	2.8	3.4	Sheen/ Blobs of NAPL observed
Crawford Creek	CC03-C	46.65459	-92.07594	603.51	2.6	4.4	
Crawford Creek	CC04-A	46.65482	-92.07569	603.49	3.0	5.0	No sheen observed
Crawford Creek	CC04-B	46.65482	-92.07572	603.49	3.3	2.8	Sheen Observed. Blobs of sheen observed in water
Crawford Creek	CC04-C	46.65482	-92.07574	603.49	2.9	4.1	Sheen/ Blobs of NAPL observed
Crawford Creek	CC05-A	46.65505	-92.07575	603.58	2.3	3.1	No sheen observed
Crawford Creek	CC05-B	46.65504	-92.07577	603.58	3.4	3.3	Sheen/ Blobs of NAPL observed
Crawford Creek	CC05-C	46.65504	-92.07579	603.58	3.2	2.6	Sheen/blobs of NAPL observed
Crawford Creek	CC06-A	46.65529	-92.07582	604.30	3.0	5.5	
Crawford Creek	CC06-B	46.6553	-92.07583	604.30	4.1	3.3	No sheen/no blobs of NAPL
Crawford Creek	CC06-C	46.65531	-92.07583	604.30	3.5	3.0	
Crawford Creek	CC07-A	46.6555	-92.07571	603.56	2.8	3.2	
Crawford Creek	CC07-B	46.65549	-92.07572	603.56	3.5	4.2	No sheen/No NAPL stain. Clay at bottom
Crawford Creek	CC07-C	46.65548	-92.07573	603.56	2.7	5.1	
Crawford Creek	CC08-A	46.65562	-92.07611	603.61	3.4	2.8	Sheen observed - blobs of NAPL
Crawford Creek	CC08-B	46.65563	-92.07613	603.61	4.1	1.9	Mild sheen observed when probed
Crawford Creek	CC08-C	46.65563	-92.07615	603.61	3.2	3.7	No sheen observed
Crawford Creek	CC09-A	46.65582	-92.07595	603.54	3.1	4.4	Sheen/blob of NAPL observed when probed
Crawford Creek	CC09-B	46.65583	-92.07597	603.54	3.1	4.9	No sheen observed
Crawford Creek	CC09-C	46.65584	-92.07598	603.54	2.0	6.5	No sheen observed
Crawford Creek	CC10-A	46.65602	-92.07577	603.62	3.3	3.9	
Crawford Creek	CC10-B	46.65604	-92.07578	603.62	3.8	2.9	No sheen observed
Crawford Creek	CC10-C	46.65604	-92.07579	603.62	3.2	3.0	
Crawford Creek	CC11-A	46.65599	-92.0754	604.09	3.2	3.3	
Crawford Creek	CC11-B	46.656	-92.07539	604.09	3.7	3.1	No sheen observed
Crawford Creek	CC11-C	46.65601	-92.07538	604.09	3.4	2.5	
Crawford Creek	CC12-A	46.65604	-92.075	604.08	3.7	2.2	
Crawford Creek	CC12-B	46.65604	-92.07502	604.08	4.0	2.1	No sheen observed
Crawford Creek	CC12-C	46.65604	-92.07504	604.08	3.2	2.6	
Crawford Creek	CC13-A	46.65625	-92.07512	603.74	3.6	2.8	
Crawford Creek	CC13-B	46.65624	-92.07514	603.74	3.8	2.3	No sheen observed
Crawford Creek	CC13-C	46.65623	-92.07515	603.74	2.8	3.3	

TABLE 1

Summary of Sediment and Soil Probing Data

Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Sediment/Soil Surface Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Probe Refusal Depth (ft-bss)	Visual and other Observations
Crawford Creek	CC14-A	46.65632	-92.07547	603.91	4.0	2.8	
Crawford Creek	CC14-B	46.6563	-92.0755	603.91	4.0	6.0	No sheen observed
Crawford Creek	CC14-C	46.6563	-92.0755	603.91	2.4	2.0	
Crawford Creek	CC15-A	46.65663	-92.07566	603.82	3.3	3.2	
Crawford Creek	CC15-B	46.65664	-92.07567	603.82	4.2	2.3	No sheen observed
Crawford Creek	CC15-C	46.65665	-92.07569	603.82	3.2	1.4	
Crawford Creek	CC16-A	46.65672	-92.07541	604.00	3.9	4.05	
Crawford Creek	CC16-B	46.65674	-92.07545	604.00	4.4	4.8	No sheen observed
Crawford Creek	CC16-C	46.65677	-92.07545	604.00	3.2	5.95	
Crawford Creek	CC17-A	46.65682	-92.07514	603.24	3.2	4.8	
Crawford Creek	CC17-B	46.65684	-92.07514	603.24	3.9	3.1	No sheen observed
Crawford Creek	CC17-C	46.65685	-92.07515	603.24	3.5	2.9	
Crawford Creek	CC18-A	46.65697	-92.07485	603.30	4.1	2.2	
Crawford Creek	CC18-B	46.65699	-92.07487	603.30	3.8	2.5	No sheen observed
Crawford Creek	CC18-C	46.65699	-92.07489	603.30	2.7	5.3	
Crawford Creek	CC19-A	46.65723	-92.07488	603.77	3.7	3.5	
Crawford Creek	CC19-B	46.65722	-92.07489	603.77	4.0	3.7	No sheen observed
Crawford Creek	CC19-C	46.65721	-92.0749	603.77	2.9	4.8	
Crawford Creek	CC20-A	46.65741	-92.07516	603.46	3.2	4.4	
Crawford Creek	CC20-B	46.6574	-92.07518	603.46	3.5	1.7	No sheen observed
Crawford Creek	CC20-C	46.65739	-92.0752	603.46	3.1	3.0	
Crawford Creek	CC21-A	46.65761	-92.0754	603.82	2.6	3.3	
Crawford Creek	CC21-B	46.6576	-92.07542	603.82	3.9	1.4	Wood debris and vegetation througout the transect at river bottom
Crawford Creek	CC21-C	46.65759	-92.07544	603.82	3.9	3.6	
Crawford Creek	CC22-A	46.65792	-92.07553	603.18	3.8	3.5	
Crawford Creek	CC22-B	46.65791	-92.07555	603.18	4.2	2.8	No sheen observed
Crawford Creek	CC22-C	46.65792	-92.07557	603.18	3.9	3.0	
Crawford Creek	CC23-A	46.6581	-92.07546	603.66	3.2	4.7	
Crawford Creek	CC23-B	46.6581	-92.07548	603.66	4.2	3.8	No sheen observed
Crawford Creek	CC23-C	46.65811	-92.0755	603.66	4.0	3.0	
Crawford Creek	CC24-A	46.65814	-92.07511	603.59	2.9	7.1	
Crawford Creek	CC24-B	46.65815	-92.07511	603.59	4.2	4.8	No sheen observed
Crawford Creek	CC24-C	46.65817	-92.07509	603.59	3.9	4.4	
Crawford Creek	CC25-A	46.65813	-92.07475	603.68	3.75	4.45	
Crawford Creek	CC25-B	46.65814	-92.07477	603.68	4.9	2.0	No sheen observed
Crawford Creek	CC25-C	46.65816	-92.07478	603.68	3.6	4.2	
Crawford Creek	CC26-A	46.65833	-92.07457	603.81	3.3	2.7	
Crawford Creek	CC26-B	46.65834	-92.07459	603.81	4.2	3.3	No sheen observed
Crawford Creek	CC26-C	46.65834	-92.07461	603.81	4.0	5.0	
Crawford Creek	CC27-A	46.6586	-92.07438	603.98	3.0	6.5	
Crawford Creek	CC27-B	46.6586	-92.0744	603.98	4.1	5.7	No sheen observed

TABLE 1

Summary of Sediment and Soil Probing Data

Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Sediment/Soil Surface Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Probe Refusal Depth (ft-bss)	Visual and other Observations
Crawford Creek	CC27-C	46.65861	-92.07441	603.98	4.0	4.6	
Crawford Creek	CC28-A	46.65885	-92.0742	603.84	3.1	5.8	
Crawford Creek	CC28-B	46.65885	-92.07421	603.84	3.5	5.4	Very soft sandy silt with clay sediment at confluence
Crawford Creek	CC28-C	46.65886	-92.07424	603.84	3.8	4.8	
Crawford Creek	CC28-D	46.65886	-92.07427	603.84	3.0	4.6	
Floodplain	CF01-A	46.65392	-92.07632	604.74	0.0	8.6	No creosote or staining. Mostly clay/soft clay
Floodplain	CF01-B	46.6541	-92.07634	605.00	0.0	2.2	Coarse sand. Felt the friction of sand
Floodplain	CF01-C	46.65441	-92.07638	604.94	0.0	9.1	No stains
Floodplain	CF01-D	46.65467	-92.07641	604.73	0.0	8.1	No stains
Floodplain	CF02-A	46.65394	-92.07592	605.15	0.0	8.3	No stains/sheen. Soft clay
Floodplain	CF02-B	46.6541	-92.07606	604.73	0.0	11.5	No stains/sheen. Soft clay
Floodplain	CF02-C	46.65468	-92.07609	605.70	0.0	8.0	No stains/sheen. Soft clay
Floodplain	CF03-A	46.65413	-92.07547	605.01	0.0	5.65	No stains/no sheen. Brown, clay
Floodplain	CF03-B	46.65426	-92.07569	605.16	0.0	6.2	No stains
Floodplain	CF03-C	46.65436	-92.07578	605.07	0.0	7.35	No stains. Brown clay
Floodplain	CF03-D	46.65489	-92.07627	605.25	0.0	7.6	No stains. Brown clay
Floodplain	CF03-E	46.65503	-92.07649	605.22	0.0	7.5	No stains. Brown clay
Floodplain	CF04-A	46.65458	-92.07515	604.82	0.0	6.2	No stain. Brown clay
Floodplain	CF04-B	46.65473	-92.07543	603.99	0.0	4.7	No stains/clay
Floodplain	CF05-A	46.6549	-92.07514	605.18	0.0	12.3	No stains/clay/brown
Floodplain	CF05-B	46.65502	-92.07562	604.75	0.0	8.1	No stains/clay
Floodplain	CF05-C	46.65507	-92.0759	604.99	0.0	8.5	No stains/clay
Floodplain	CF05-D	46.65515	-92.07616	605.26	0.0	8.8	No stains/clay
Floodplain	CF05-E	46.6552	-92.07627	606.85	0.0	6.4	No stains/clay
Floodplain	CF06-A	46.65532	-92.07499	605.34	0.0	10.5	No stains
Floodplain	CF06-B	46.65556	-92.0752	605.28	0.0	4.45	No stains
Floodplain	CF06-C	46.65568	-92.07575	605.78	0.0	8.0	Stiff, hard clay
Floodplain	CF06-D	46.65591	-92.07625	605.71	0.0	4.7	Stiff, hard clay
Floodplain	CF07-A	46.65643	-92.07475	605.74	0.0	7.15	Stiff, hard clay
Floodplain	CF07-B	46.6565	-92.07507	605.83	0.0	7.9	Stiff, hard clay
Floodplain	CF07-C	46.65653	-92.07538	606.93	0.0	5.6	Stiff, hard clay
Floodplain	CF07-D	46.65658	-92.07592	607.64	0.0	7.3	Stiff, hard clay
Floodplain	CF08-A	46.65682	-92.07458	606.72	0.0	4.7	Dry clay, hard
Floodplain	CF08-B	46.65676	-92.07489	607.52	0.0	5.5	Dry clay, hard
Floodplain	CF08-C	46.65693	-92.07534	607.75	0.0	3.4	Stiff, hard clay
Floodplain	CF08-D	46.65702	-92.07563	622.68	0.0	7.2	Stiff, hard, dry clay
Floodplain	CF09-A	46.65771	-92.07482	608.20	0.0	9.25	Dry clay, hard
Floodplain	CF09-B	46.65783	-92.0751	608.90	0.0	5.1	Dry clay, hard
Floodplain	CF09-C	46.65793	-92.07533	610.30	0.0	5.7	No NAPL. Brown clay. Wet/moist
Floodplain	CF09-D	46.65805	-92.07577	610.77	0.0	10.5	Clay. No stains
Floodplain	CF10-A	46.65778	-92.07408	607.87	0.0	3.8	No creosote. Brown clay. Wet/moist

TABLE 1

Summary of Sediment and Soil Probing Data

Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Sediment/Soil Surface Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Probe Refusal Depth (ft-bss)	Visual and other Observations
Floodplain	CF10-B	46.65801	-92.07434	608.37	0.0	6.5	No creosote. Brown clay. Wet/moist
Floodplain	CF10-C	46.65841	-92.07491	610.81	0.0	9.7	Clay. No stains
Floodplain	FP-1	46.65438	-92.07553	604.95	0.0	8.0	Creosote like product observed oozing out of surface
Nemadji River	NR01-A	46.65897	-92.075	603.61	1.0	9.0	Background location A - sedimentation layers B, C, D - silt/sand, etc.
Nemadji River	NR01-B	46.659	-92.075	603.61	2.1	8.9	
Nemadji River	NR01-C	46.65908	-92.07501	603.61	4.3	8.2	
Nemadji River	NR01-D	46.65915	-92.07497	603.61	9.1	3.9	
Nemadji River	NR01-E	46.65919	-92.07496	603.61	10.0	3.3	Clayey at bottom
Nemadji River	NR02-A	46.65983	-92.07459	603.51	5.5	3.8	Relocated to inner edge of the Nemadji. Mostly sand/silt-coarse sand.
Nemadji River	NR02-A1	46.65984	-92.07494	603.51	4.6	3.7	Hard clay at bottom. Several layers of sedimentation
Nemadji River	NR02-A2	46.65932	-92.0741	603.51	4.2	6.2	Sand/silt layers - several sedimentation layers
Nemadji River	NR02-B	46.65979	-92.07461	603.51	5.0	2.9	Relocated to inner edge of the Nemadji. Mostly sand/silt-coarse sand.
Nemadji River	NR02-B1	46.6598	-92.07492	603.51	3.2	4.3	Hard clay at bottom. Several layers of sedimentation
Nemadji River	NR02-B2	46.65933	-92.07414	603.51	2.7	6.3	Next to sand flat
Nemadji River	NR02-C	46.65975	-92.07459	603.51	3.7	5.6	Relocated to inner edge of the Nemadji. Mostly sand/silt-coarse sand.
Nemadji River	NR03-A	46.66114	-92.07857	603.55	7.1	11.0	
Nemadji River	NR03-B	46.66112	-92.07861	603.55	7.8	11.5	
Nemadji River	NR03-C	46.66108	-92.07862	603.55	7.0	6.5	Sandy clay with clay at bottom.
Nemadji River	NR03-D	46.66104	-92.07867	603.55	6.4	3.4	
Nemadji River	NR03-E	46.661	-92.07869	603.55	4.2	4.4	
Nemadji River	NR04-A	46.66245	-92.07744	603.56	3.2	4.0	
Nemadji River	NR04-B	46.66245	-92.07736	603.56	4.0	6.9	
Nemadji River	NR04-C	46.66245	-92.07727	603.56	4.2	4.2	Sand throughout transect. Located ~200 ft further downstream than proposed
Nemadji River	NR04-D	46.66247	-92.07717	603.56	4.5	5.4	
Nemadji River	NR04-E	46.66246	-92.07707	603.56	5.3	5.6	
Nemadji River	NR05-A	46.6616	-92.07312	603.47	5.5	6.6	
Nemadji River	NR05-B	46.66155	-92.0731	603.47	6.5	9.8	
Nemadji River	NR05-C	46.66147	-92.07313	603.47	4.5	11.2	Sand throughout transect
Nemadji River	NR05-D	46.66139	-92.07316	603.47	4.3	10.4	
Nemadji River	NR05-E	46.66132	-92.0732	603.47	4.3	6.4	

Notes:

[a]All horizontal coordinates are in latitude/longitude (decimal degrees) World Geodetic System of 1984 (WGS 84) Coordinate System.

[b]Elevation is referenced to North American Vertical Datum 1988 (NAVD 88), US survey feet.

0.5-inch outer-diameter steel probe rod used to measure sediment thickness

bss - below sediment/soil surface; ft - feet

TABLE 2

Summary of Sediment and Soil Sampling Activities

Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Sample ID	Start Depth (ft)	End Depth (ft)	Sample Date	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Water-Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Sediment/Soil Surface -Elevation (ft)	Core Penetration Depth-BSS (ft)	Core Recovery (ft)	Visual and other Observations
Crawford Creek	CC-001-A	CC-001-A-0.0/0.8	0	0.8	6/25/2014	46.654262	-92.076358	603.678	2.4	601.3	2.4	0.8	Probing indicated sheen and NAPL. However, no sheen nor NAPL observed in the sample core.
Crawford Creek	CC-001-A1	CC-001-A1-0.0/0.5	0	0.5	6/26/2014	46.654238	-92.076544	604.771	2.6	602.2	0.9	0.5	Trace sheen observed at top 0.1 foot
Crawford Creek	CC-002-A	CC-002-A-0.0/0.5	0	0.5	6/25/2014	46.65433	-92.076181	605.15	2.4	602.8	1.5	1.4	Sheens/Staining/NAPL present in the top 0.3 foot. Strong creosote like odor.
		CC-002-A-0.5/1.4	0.5	1.4									
Crawford Creek	CC-003-C	CC-003-C-0.0/0.5	0	0.5	6/22/2014	46.654593	-92.075937	603.51	3.1	600.4	1.8	1.3	Sheen and NAPL wetted fibers present. Mild creosote-like odor.
		CC-003-C-0.5/1.3	0.5	1.3									
Crawford Creek	CC-004-A	CC-004-A-0.0/0.5	0	0.5	6/22/2014	46.654818	-92.075691	603.486	3.0	600.5	2.3	1.8	Sheens/staining/NAPL-wetted fibers present in the top 3 inches. Strong creosote-like odor.
		CC-004-A-0.5/1.8	0.5	1.8									
		CC-004-A-0.5/1.8R	0.5	1.8									
Crawford Creek	CC-005-B	CC-005-B-0.0/0.5	0	0.5	6/22/2014	46.655042	-92.075773	603.581	3.4	600.2	2.0	1.3	Sheens/staining/NAPL wetted fibers present throughout. Mild creosote-like odor.
		CC-005-B-0.5/1.3	0.5	1.3									
Crawford Creek	CC-006-A	CC-006-A-0.0/0.5	0	0.5	6/22/2014	46.655288	-92.075822	604.295	3.3	601.0	1.6	1.3	Black staining/sheen/NAPL present throughout. Moderate to strong creosote-like odor.
		CC-006-A-0.5/1.3	0.5	1.3									
Crawford Creek	CC-007-C	CC-007-C-0.0/0.5	0	0.5	6/23/2014	46.655476	-92.075725	603.558	2.9	600.7	1.9	1.6	Black staining/sheen/NAPL present throughout. Moderate to strong creosote-like odor.
		CC-007-C-0.5/1.6	0.5	1.6									
Crawford Creek	CC-008-C	CC-008-C-0.0/0.5	0	0.5	6/23/2014	46.655633	-92.076145	603.611	2.8	600.8	2.5	2.3	NAPL-wetted fibers; Mild creosote-like odor.
		CC-008-C-0.5/2.3	0.5	2.3									
Crawford Creek	CC-009-C	CC-009-C-0.0/0.5	0	0.5	6/23/2014	46.655842	-92.075983	603.543	2.9	600.6	1.4	1.3	NAPL observed in top 5 inches; Mild creosote-like odor.
		CC-009-C-0.5/1.3	0.5	1.3									
Crawford Creek	CC-010-A	CC-010-A-0.0/0.8	0	0.8	6/23/2014	46.656023	-92.075767	603.619	2.7	600.9	2.2	1.9	Coal tar present. Black staining/sheen/NAPL present throughout. Moderate to strong creosote-like odor.
		CC-010-A-0.8/1.9	0.8	1.9									
		CC-010-A-0.8/1.9R	0.8	1.9									
Crawford Creek	CC-011-A	CC-011-A-0.0/0.5	0	0.5	6/23/2014	46.655988	-92.075402	604.085	3.8	600.3	1.2	1.2	Coal tar present. Black staining/sheen/NAPL present throughout. Strong creosote-like odor.
		CC-011-A-0.5/1.2	0.5	1.2									
Crawford Creek	CC-012-C	CC-012-C-0.0/0.6	0	0.6	6/23/2014	46.656035	-92.074999	604.081	3.5	600.6	0.7	0.6	No visuals of NAPL impact observed.
Crawford Creek	CC-013-C	CC-013-C-0.0/0.5	0	0.5	6/23/2014	46.656231	-92.075149	603.742	3.0	600.7	1.4	1.2	Coal tar/sheen/NAPL present up to 0.7 foot. Moderate to strong creosote-like odor.
		CC-013-C-0.5/1.2	0.5	1.2									
Crawford Creek	CC-014-B	CC-014-B-0.0/0.5	0	0.5	6/23/2014	46.656303	-92.0755	603.911	4.0	599.9	1.3	1.3	Coal tar/sheen/NAPL present up to 0.5 foot. Moderate to strong creosote-like odor.
		CC-014-B-0.5/1.3	0.5	1.3									
Crawford Creek	CC-015-A	CC-015-A-0.0/0.5	0	0.5	6/23/2014	46.656627	-92.075659	603.817	3.3	600.5	2.5	1.7	Coal tar/sheen/NAPL present up to 0.5 foot. Moderate to strong creosote-like odor.
		CC-015-A-0.5/1.7	0.5	1.7									
		CC-015-A-0.5/1.7R	0.5	1.7									
Crawford Creek	CC-016-C	CC-016-C-0.0/0.5	0	0.5	6/24/2014	46.656771	-92.075453	604.001	3.8	600.2	1.6	1.3	No visuals of NAPL impact.
		CC-016-C-0.5/1.3	0.5	1.3									
Crawford Creek	CC-017-A	CC-017-A-0.0/0.5	0	0.5	6/24/2014	46.656822	-92.075139	603.24	3.2	600.0	1.6	1.3	No visuals of NAPL impact.
		CC-017-A-0.5/1.3	0.5	1.3									
Crawford Creek	CC-018-C	CC-018-C-0.0/0.5	0	0.5	6/24/2014	46.656994	-92.074885	603.299	2.8	600.5	2.1	2.0	Sheen/NAPL present up to 0.5 foot. Strong creosote-like odor. Lots of decayed vegetation and wood debris.
		CC-018-C-0.5/2.0	0.5	2									

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Project Area	Location ID	Sample ID	Start Depth (ft)	End Depth (ft)	Sample Date	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Water-Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Sediment/Soil Surface -Elevation (ft)	Core Penetration Depth-BSS (ft)	Core Recovery (ft)	Visual and other Observations
Crawford Creek	CC-019-C	CC-019-C-0.0/0.5	0	0.5	6/24/2014	46.657207	-92.074904	603.773	3.0	600.8	2.4	1.9	Coal tar/Sheen/NAPL present up to 0.6 foot. Moderate creosote-like odor.
		CC-019-C-0.5/1.9	0.5	1.9									
		CC-019-C-0.5/1.9R	0.5	1.9									
Crawford Creek	CC-020-A	CC-020-A-0.0/0.5	0	0.5	6/24/2014	46.657409	-92.075164	603.459	3.3	600.2	2.2	1.8	No visuals of NAPL impact.
		CC-020-A-0.5/1.8	0.5	1.8									
Crawford Creek	CC-021-C1	CC-021-C1-0.0/0.5	0	0.5	6/25/2014	46.657726	-92.07551	603.815	3.8	600.0	4.2	3.6	No visuals of NAPL impact.
		CC-021-C1-0.5/2.0	0.5	2									
		CC-021-C1-0.5/2.0R	0.5	2									
		CC-021-C1-2.0/3.0	2	3									
		CC-021-C1-3.0/3.6	3	3.6									
Crawford Creek	CC-022-A	CC-022-A-0.0/0.8	0	0.8	6/25/2014	46.657916	-92.075531	603.178	3.8	599.4	1.1	0.8	No visuals of NAPL impact.
Crawford Creek	CC-023-A	CC-023-A-0.0/0.5	0	0.5	6/25/2014	46.658096	-92.075463	603.662	3.8	599.9	2.4	2.1	Chunks of Coal tar/Sheen/NAPL present up to 0.8 foot. Moderate creosote-like odor.
		CC-023-A-0.5/2.1	0.5	2.1									
		CC-023-A-0.5/2.1R	0.5	2.1									
Crawford Creek	CC-024-A	CC-024-A-0.0/0.5	0	0.5	6/25/2014	46.658137	-92.075111	603.586	3.5	600.1	3.6	3.6	No visuals of NAPL impact.
		CC-024-A-0.5/2.0	0.5	2									
		CC-024-A-2.0/3.0	2	3									
		CC-024-A-2.0/3.0R	2	3									
		CC-024-A-3.0/3.6	3	3.6									
Crawford Creek	CC-025-C	CC-025-C-0.0/0.5	0	0.5	6/26/2014	46.658162	-92.074782	603.681	4.0	599.7	4.4	4.0	No visuals of NAPL impact.
		CC-025-C-0.5/2.0	0.5	2									
		CC-025-C-2.0/3.0	2	3									
		CC-025-C-3.0/4.0	3	4									
Crawford Creek	CC-026-C	CC-026-C-0.0/0.5	0	0.5	6/24/2014	46.658338	-92.074606	603.814	3.0	600.8	3.9	3.3	No visuals of NAPL impact.
		CC-026-C-0.5/2.0	0.5	2									
		CC-026-C-2.0/3.3	2	3.3									
Crawford Creek	CC-027-A	CC-027-A-0.0/0.5	0	0.5	6/25/2014	46.658596	-92.074375	603.98	3.2	600.8	1.9	1.9	No visuals of NAPL impact.
		CC-027-A-0.5/1.9	0.5	1.9									
Crawford Creek	CC-028-B	CC-028-B-0.0/0.5	0	0.5	6/25/2014	46.658854	-92.074213	603.839	3.2	600.6	5.2	4.7	Staining/sheen/ NAPL (free product) observed at interval 1.2 to 1.3 feet. Also observed NAPL (free product) pooling at 3.3- to 3.5-foot interval. Strong creosote-like odors observed up to 3.5 feet.
		CC-028-B-0.5/2.0	0.5	2									
		CC-028-B-2.0/3.0	2	3									
		CC-028-B-3.0/4.0	3	4									
		CC-028-B-4.0/4.7	4	4.7									
Floodplain	CF-01-A	CF-01-A-0.0/0.5	0	0.5	6/24/2014	46.653919	-92.076319	604.737	0.0	604.7	4.0	1.0	No visuals of NAPL impact.
		CF-01-A-0.5/1.0	0.5	1							4.0	1.0	
Floodplain	CF-01-B1	CF-01-B1-0.0/0.5	0	0.5	6/26/2014	46.654096	-92.076341	605.001	0.0	605.0	2.7	0.9	Sheen observed in the top 4 inches of the core. moderate creosote-like odors.
		CF-01-B1-0.5/0.9	0.5	0.9									
Floodplain	CF-01-C	CF-01-C-0.0/0.7	0	0.7	6/26/2014	46.654405	-92.076379	604.938	0.0	604.9	2.2	0.7	No visuals of NAPL impact.
Floodplain	CF-01-D	CF-01-D-0.0/0.5	0	0.5	6/25/2014	46.654666	-92.076413	604.732	0.0	604.7	1.5	1.1	No visuals of NAPL impact.
		CF-01-D-0.5/1.1	0.5	1.1									

TABLE 2
Summary of Sediment and Soil Sampling Activities
Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Sample ID	Start Depth (ft)	End Depth (ft)	Sample Date	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Water-Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Sediment/Soil Surface -Elevation (ft)	Core Penetration Depth-BSS (ft)	Core Recovery (ft)	Visual and other Observations
Floodplain	CF-02-B	CF-02-B-0.0/0.5	0	0.5	6/24/2014	46.654104	-92.076058	604.728	0.0	604.7	3.5	1.6	No visuals of NAPL impact.
		CF-02-B-0.5/1.6	0.5	1.6									
Floodplain	CF-02-C	CF-02-C-0.0/0.8	0	0.8	6/25/2014	46.654678	-92.076093	605.701	0.0	605.7	2.0	0.8	No visuals of NAPL impact.
Floodplain	CF-03-A	CF-03-A-0.0/0.5	0	0.5	6/24/2014	46.654125	-92.075473	605.01	0.0	605.0	4.5	1.3	No visuals of NAPL impact.
		CF-03-A-0.5/1.3	0.5	1.3									
		CF-03-A-0.5/1.3R	0.5	1.3									
Floodplain	CF-03-C	CF-03-C-0.0/0.5	0	0.5	6/24/2014	46.654363	-92.075777	605.065	0.0	605.1	5.0	1.3	No visuals of NAPL impact.
		CF-03-C-0.5/1.3	0.5	1.3									
Floodplain	CF-03-E	CF-03-E-0.0/0.5	0	0.5	6/26/2014	46.655027	-92.076485	605.223	0.0	605.2	2.3	1.2	No visuals of NAPL impact.
		CF-03-E-0.5/1.2	0.5	1.2									
Floodplain	CF-04-B	CF-04-B-0.0/0.5	0	0.5	6/24/2014	46.654734	-92.075434	603.993	0.0	604.0	5.5	1.3	No visuals of NAPL impact.
		CF-04-B-0.5/1.3	0.5	1.3									
Floodplain	CF-05-B	CF-05-B-0.0/0.5	0	0.5	6/24/2014	46.655015	-92.075616	604.748	0.0	604.7	5.5	0.9	No visuals of NAPL impact.
		CF-05-B-0.5/0.9	0.5	0.9									
Floodplain	CF-05-C	CF-05-C-0.0/0.6	0	0.6	6/26/2014	46.655072	-92.075904	604.992	0.0	605.0	1.5	0.6	No visuals of NAPL impact.
Floodplain	CF-05-D	CF-05-D-0.0/0.5	0	0.5	6/25/2014	46.655153	-92.076161	605.258	0.0	605.3	2.0	0.9	No visuals of NAPL impact.
		CF-05-D-0.5/0.9	0.5	0.9									
Floodplain	CF-06-A	CF-06-A-0.0/0.5	0	0.5	6/25/2014	46.655318	-92.074989	605.342	0.0	605.3	5.0	1.8	No visuals of NAPL impact.
		CF-06-A-0.5/1.8	0.5	1.8									
Floodplain	CF-06-B	CF-06-B-0.0/0.6	0	0.6	6/26/2014	46.655561	-92.075203	605.28	0.0	605.3	2.3	0.6	No visuals of NAPL impact.
		CF-06-B-0.0/0.6R	0	0.6									
Floodplain	CF-06-D	CF-06-D-0.0/0.8	0	0.8	6/25/2014	46.655907	-92.076251	605.706	0.0	605.7	1.2	0.8	No visuals of NAPL impact.
Floodplain	CF-07-A	CF-07-A-0.0/0.8	0	0.8	6/26/2014	46.65643	-92.07475	605.742	0.0	605.7	2.0	0.8	No visuals of NAPL impact.
Floodplain	CF-07-B	CF-07-B-0.0/0.7	0	0.7	6/23/2014	46.656498	-92.075074	605.828	0.0	605.8	0.7	0.7	No visuals of NAPL impact.
Floodplain	CF-08-D	CF-08-D-0.0/0.7	0	0.7	6/26/2014	46.656576	-92.075917	622.684	0.0	622.7	2.0	0.7	No visuals of NAPL impact.
Floodplain	CF-09-A	CF-09-A-0.0/0.8	0	0.8	6/25/2014	46.656824	-92.074584	608.2	0.0	608.2	3.0	0.8	No visuals of NAPL impact.
		CF-09-A-0.0/0.8R	0	0.8									
Floodplain	CF-10-B	CF-10-B-0.0/0.5	0	0.5	6/25/2014	46.656763	-92.074888	608.369	0.0	608.4	2.6	1.3	No visuals of NAPL impact.
		CF-10-B-0.5/1.3	0.5	1.3									
Floodplain	FP-01	FP-01-0.0/0.5	0	0.5	6/26/2014	46.654378	-92.075526	604.946	0.0	604.9	2.5	1.2	No visuals of NAPL impact.
		FP-01-0.5/1.2	0.5	1.2									
		FP-01-0.5/1.2R	0.5	1.2									
Nemadji River	NR-01-A1	NR-01-A1-0.0/0.5	0	0.5	6/25/2014	46.658965	-92.074996	603.61	4.2	599.4	4.8	2.6	No visuals of NAPL impact.
		NR-01-A1-0.5/2.0	0.5	2									
		NR-01-A1-0.5/2.0R	0.5	2									
		NR-01-A1-2.0/2.5	2	2.5									
Nemadji River	NR-01-B	NR-01-B-0.0/0.5	0	0.5	6/25/2014	46.658139	-92.077127	603.61	2.3	601.3	3.6	3.5	No visuals of NAPL impact.
		NR-01-B-0.5/2.0	0.5	2									
		NR-01-B-2.0/3.0	2	3									
		NR-01-B-3.0/3.5	3	3.5									

TABLE 2
Summary of Sediment and Soil Sampling Activities
Crawford Creek and Nemadji River Site Characterization, June 2014

Project Area	Location ID	Sample ID	Start Depth (ft)	End Depth (ft)	Sample Date	Latitude (WGS 84)[a]	Longitude (WGS 84)[a]	Water-Elevation (ft) (NAVD 88)[b]	Water Depth (ft)	Sediment/Soil Surface -Elevation (ft)	Core Penetration Depth-BSS (ft)	Core Recovery (ft)	Visual and other Observations
Nemadji River	NR-01-E	NR-01-E-0.0/0.5	0	0.5	6/25/2014	46.659185	-92.074956	603.61	8.9	594.7	4.6	4.6	No visuals of NAPL impact.
		NR-01-E-0.5/2.0	0.5	2									
		NR-01-E-2.0/3.0	2	3									
		NR-01-E-3.0/4.0	3	4									
		NR-01-E-4.0/4.6	4	4.6									
Nemadji River	NR-02-B1	NR-02-B1-0.0/0.5	0	0.5	6/26/2014	46.659799	-92.074919	603.51	3.0	600.5	3.5	2.6	No visuals of NAPL impact.
		NR-02-B1-0.5/2.0	0.5	2									
		NR-02-B1-2.0/2.5	2	2.5									
Nemadji River	NR-02-B2	NR-02-B2-0.0/0.5	0	0.5	6/26/2014	46.659333	-92.074141	603.51	2.8	600.7	4.2	2.9	No visuals of NAPL impact.
		NR-02-B2-0.5/2.0	0.5	2									
		NR-02-B2-2.0/2.9	2	2.9									
Nemadji River	NR-02-C	NR-02-C-0.0/0.5	0	0.5	6/26/2014	46.659751	-92.074586	603.51	2.8	600.7	4.6	3.0	No visuals of NAPL impact.
		NR-02-C-0.5/2.0	0.5	2									
		NR-02-C-2.0/3.0	2	3									
		NR-02-C-2.0/3.0R	2	3									
Nemadji River	NR-03-A1	NR-03-A1-0.0/0.5	0	0.5	6/25/2014	46.660096	-92.07665	603.55	6.5	597.1	2.5	1.5	No visuals of NAPL impact.
		NR-03-A1-0.5/1.5	0.5	1.5									
Nemadji River	NR-03-B	NR-03-B-0.0/0.5	0	0.5	6/24/2014	46.66112	-92.07861	603.55	7.7	595.9	2.8	1.5	No visuals of NAPL impact.
		NR-03-B-0.5/1.3	0.5	1.3									
Nemadji River	NR-04-B	NR-04-B-0.0/0.5	0	0.5	6/25/2014	46.662447	-92.077355	603.56	3.7	599.9	3.2	2.6	No visuals of NAPL impact.
		NR-04-B-0.5/2.0	0.5	2									
		NR-04-B-2.0/2.6	2	2.6									
Nemadji River	NR-05-C	NR-05-C-0.0/0.5	0	0.5	6/24/2014	46.661473	-92.073128	603.47	4.3	599.2	2.0	1.6	No visuals of NAPL impact.
		NR-05-C-0.5/1.6	0.5	1.6									

Notes:
[a]All horizontal coordinates are in latitude/longitude (decimal degrees) World Geodetic System of 1984 (WGS 84) Coordinate System.
[b]Elevation is referenced to North American Vertical Datum 1988 (NAVD 88), US survey feet.
Vibracoring techniques were used to collect sediment samples in Crawford Creek and Nemadji River. A 3-inch-diameter polycarbonate tube was used to collect samples.
Manual coring techniques used to collect sediment samples from the floodplain area. A 3-inch-diameter polycarbonate tube was used to collect samples.
Field duplicates identified with a "R" appended to the end of the Sample ID.
bss = below sediment/soil surface; ft = feet

TABLE 3
Summary of Fish Collection
Crawford Creek and Nemadji River Site Characterization, July 2014

Location	Collection	Species	Whole Fish Weight (grams)	Length (in.)	Age[a]	Sample Type	Sample ID
July 16, 2014							
Crawford Creek Reach 1	Gill net	Northern pike	3200	31.5	7+	Fillet and offal	CC-FT-001
Crawford Creek Reach 1	Gill net	Northern pike	150	11.5	1+	Whole fish	CC-FT-004
Crawford Creek Reach 1	Gill net	Black bullhead	115	7	3+	Fillet and offal	CC-FT-005
Crawford Creek Reach 2	Gill net	No fish	—	—	—	—	—
Crawford Creek Reach 3	Gill net	Northern pike	190	12	1+	Whole fish	CC-FT-003
Crawford Creek Reach 3	Gill net	Trout perch	15	4.5	—	*Incl. In composite*	*Incl. In composite*
Crawford Creek Reach 4	Gill net	Northern pike	245	14	1+	Whole fish	CC-FT-002
July 17, 2014							
Nemadji River Gill Net 1	Gill net	No fish	—	—	—	—	—
Nemadji River Gill Net 2	Gill net	Channel catfish	800	17.25	7+	Fillet and offal	NR-FT-008
Nemadji River Gill Net 2	Gill net	Silver redhorse	800	17	7+	Fillet and offal	NR-FT-009
Nemadji River Gill Net 3	Gill net	No fish	—	—	—	—	—
Crawford Creek Reach 1	Gill net	Northern pike	230	13.5	1+	Whole fish	CC-FT-007
Crawford Creek Reach 1	Gill net	Northern pike	170	12	1+	Whole fish	CC-FT-006
Crawford Creek Reach 1	Cast net	Northern pike	120	10.75	1+	Whole fish	CC-FT-010
Crawford Creek Reach 2	Cast net	No fish	—	—	—	—	—
Crawford Creek Reach 3	Cast net	No fish	—	—	—	—	—
Crawford Creek Reach 4	Cast net	No fish	—	—	—	—	—
Crawford Creek Composite	Combination[b]	Forage fish	46.5[c]	< 4.5	—	Whole fish composite	CC-FT-011

Notes:
[a] Age determinations provided by WDNR; + indicates a partial years growth since specimens were collected in July.
[b] Most of the forage fish were collected by seine net in Reach 1 of Crawford Creek. One fish collected by gill net and one minnow collected by cast net were included in the composite sample.
[c] Weight of composite sample includes the 15-gram trout perch.
in = inches

TABLE 4
Summary of Grain Size Data
Crawford Creek and Nemadji River Site Characterization, June 2014

		% Gravel		% Sand			% Fines	
Sample ID	**Sample Date**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**
CC-001-A-0.0/0.8	6/25/2014	0	0	0	0	1	33	66
CC-001-A1-0.0/0.5	6/26/2014	0	0	0	0	0	25.6	74.4
CC-002-A-0.0/0.5	6/25/2014	0	0	0	5.8	3.2	31.6	59.4
CC-002-A-0.5/1.4	6/25/2014	0	0	0	0.2	1	39.5	59.3
CC-003-C-0.0/0.5	6/22/2014	6.5	18.1	7.1	17.6	4.2	13.8	32.7
CC-003-C-0.5/1.3	6/22/2014	0	0	0	0	1.8	35.8	62.4
CC-004-A-0.0/0.5	6/22/2014	0	0.7	2.2	18.1	8.8	37.9	32.3
CC-004-A-0.5/1.8	6/22/2014	0	0	0	0	0	44.3	55.7
CC-005-B-0.0/0.5	6/22/2014	0	0	1	6.6	1.9	37.3	53.2
CC-005-B-0.5/1.3	6/22/2014	0	0	0	1.4	3.3	35.5	59.8
CC-006-A-0.0/0.5	6/22/2014	0	0	0	0.2	1.1	41.1	57.6
CC-006-A-0.5/1.3	6/22/2014	0	0	0	0.6	1.6	32	65.8
CC-007-C-0.0/0.5	6/23/2014	0	0.1	1.6	15.1	5.5	26	51.7
CC-007-C-0.5/1.6	6/23/2014	0	0	0	0.4	0.2	30.6	68.8
CC-008-C-0.0/0.5	6/23/2014	0	0.2	0.3	3	1.2	40.1	55.2
CC-008-C-0.5/2.3	6/23/2014	0	0	0.5	16	7.8	24.3	51.4
CC-009-C-0.0/0.5	6/23/2014	0	0	0	1.4	1.8	48.4	48.4
CC-009-C-0.5/1.3	6/23/2014	0	0	0	0	0	53.3	46.7
CC-010-A-0.0/0.8	6/23/2014	0	0	1.4	9.6	4.4	32.3	52.3
CC-010-A-0.8/1.9	6/23/2014	0	0	0	1.5	1	50.7	46.8
CC-011-A-0.0/0.5	6/23/2014	0	1.1	0.2	2.9	4.3	39.2	52.3
CC-011-A-0.5/1.2	6/23/2014	0	0	0	1	5	35.4	58.6
CC-012-C-0.0/0.6	6/23/2014	0	0	0	6.2	6.5	31.5	55.8
CC-013-C-0.0/0.5	6/23/2014	0	0	0	0.8	0.4	20.7	78.1
CC-013-C-0.5/1.2	6/23/2014	0	0	0	0.8	3.3	35.4	60.5
CC-014-B-0.0/0.5	6/23/2014	0	0	0	3	4.2	40.1	52.7
CC-014-B-0.5/1.3	6/23/2014	0	0	0	0.4	2.9	41.2	55.5
CC-015-A-0.0/0.5	6/23/2014	0	0	0	3.8	2.9	44.4	48.9
CC-015-A-0.5/1.7	6/23/2014	0	0	0	0	1.2	64.4	34.4
CC-016-C-0.0/0.5	6/24/2014	0	0	0	0	0.8	67	32.2
CC-016-C-0.5/1.3	6/24/2014	0	0	0	0.2	1.5	49.8	48.5
CC-017-A-0.0/0.5	6/24/2014	0	0	0	1.2	8.8	41.2	48.8
CC-017-A-0.5/1.3	6/24/2014	0	0	0	0.4	1.7	55.5	42.4
CC-018-C-0.0/0.5	6/24/2014	0	0	0	0	2.9	66.8	30.3
CC-018-C-0.5/2.0	6/24/2014	0	0	0	2.9	3.6	45	48.5
CC-019-C-0.0/0.5	6/24/2014	0	0	0	3.7	7.5	40	48.8
CC-019-C-0.5/1.9	6/24/2014	0	0	0	0.2	3.6	60	36.2
CC-020-A-0.0/0.5	6/24/2014	0	0.2	1.3	5.5	5.1	42	45.9
CC-020-A-0.5/1.8	6/24/2014	0	0	0	0	2.7	59	38.3
CC-021-C1-0.0/0.5	6/25/2014	0	0	0	0	37.6	38.5	23.9
CC-021-C1-0.5/2.0	6/25/2014	0	0	0	0	40.8	39.3	19.9
CC-021-C1-2.0/3.0	6/25/2014	0	0	0	0	44	36.1	19.9
CC-021-C1-3.0/3.6	6/25/2014	0	0	0	0.2	44.6	35.3	19.9
CC-022-A-0.0/0.8	6/25/2014	0	0	0	0	2.6	57.6	39.8
CC-023-A-0.0/0.5	6/25/2014	0	0	0.6	4.9	6	51	37.5
CC-023-A-0.5/2.1	6/25/2014	0	0	0	0	3.6	62.9	33.5
CC-024-A-0.0/0.5	6/25/2014	0	0	0	0.6	10.2	53.5	35.7
CC-024-A-0.5/2.0	6/25/2014	0	0	0	0.2	4.4	57.6	37.8
CC-024-A-2.0/3.0	6/25/2014	0	0	0	0.2	7.2	56.9	35.7
CC-024-A-3.0/3.6	6/25/2014	0	0	0	0	2.8	59.4	37.8
CC-025-C-0.0/0.5	6/26/2014	0	0	0	0.4	4.4	59.6	35.6
CC-025-C-0.5/2.0	6/26/2014	0	0	0	0	4	60.4	35.6

TABLE 4
Summary of Grain Size Data
Crawford Creek and Nemadji River Site Characterization, June 2014

		% Gravel		% Sand			% Fines	
Sample ID	**Sample Date**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**
CC-025-C-2.0/3.0	6/26/2014	0	0	0	0	3.8	60.6	35.6
CC-025-C-3.0/4.0	6/26/2014	0	0	0	0	6	60.4	33.6
CC-026-C-0.0/0.5	6/24/2014	0	0	0	1	3.2	59.7	36.1
CC-026-C-0.5/2.0	6/24/2014	0	0	0	0.4	12.7	60.8	26.1
CC-026-C-2.0/3.3	6/24/2014	0	0	0	0.8	13.8	56.6	28.8
CC-027-A-0.0/0.5	6/25/2014	0	0	0	0	7.4	65.4	27.2
CC-027-A-0.5/1.9	6/25/2014	0	0	0	0	18.2	52.4	29.4
CC-028-B-0.0/0.5	6/25/2014	0	0	0	4.2	44	33.9	17.9
CC-028-B-0.5/2.0	6/25/2014	0	0	0.7	9.5	56.4	18.7	14.7
CC-028-B-2.0/3.0	6/25/2014	0	0	0	1.2	54.8	27.3	16.7
CC-028-B-3.0/4.0	6/25/2014	0	0	0	0.2	67.4	18.5	13.9
CC-028-B-4.0/4.7	6/25/2014	0	0	0	0	75.8	14.3	9.9
CF-01-A-0.0/0.5	6/24/2014	0	0	0	2.9	3.3	20.2	73.6
CF-01-A-0.5/1.0	6/24/2014	0	0	0	0.4	2.3	19.5	77.8
CF-01-B1-0.0/0.5	6/26/2014	0	0	0	1.2	2	25.2	71.6
CF-01-B1-0.5/0.9	6/26/2014	0	0	0.6	26.3	19	22.7	31.4
CF-01-C-0.0/0.7	6/26/2014	0	0.1	0.7	7.7	5.2	27.4	58.9
CF-01-D-0.0/0.5	6/25/2014	0	0	0	1.6	2.4	27.9	68.1
CF-01-D-0.5/1.1	6/25/2014	0	0	0	0	1.8	31.4	66.8
CF-02-B-0.0/0.5	6/24/2014	0	0	0	0.8	2.6	27.3	69.3
CF-02-B-0.5/1.6	6/24/2014	0	0	0	0.2	2.6	24.7	72.5
CF-02-C-0.0/0.8	6/25/2014	0	0	0	0.4	2.3	28.7	68.6
CF-03-A-0.0/0.5	6/24/2014	0	0	0	1.4	2	16.5	80.1
CF-03-A-0.5/1.3	6/24/2014	0	0	0	0.8	2.9	18.9	77.4
CF-03-C-0.0/0.5	6/24/2014	0	0	0	1.9	5.2	29	63.9
CF-03-C-0.5/1.3	6/24/2014	0	0	0	0	4.4	30.1	65.5
CF-03-E-0.0/0.5	6/26/2014	0	0	0	0.2	0.6	26.8	72.4
CF-03-E-0.5/1.2	6/26/2014	0	0	0	0	0.4	32.8	66.8
CF-04-B-0.0/0.5	6/24/2014	0	0.2	0.1	6.5	4.6	25.2	63.4
CF-04-B-0.5/1.3	6/24/2014	0	0	0	1.7	2	27.6	68.7
CF-05-B-0.0/0.5	6/24/2014	0	0	0	1	1.7	29.3	68
CF-05-B-0.5/0.9	6/24/2014	0	0.3	0.3	1.5	5.8	30.2	61.9
CF-05-C-0.0/0.6	6/26/2014	0	0	0	1.2	1.8	33.3	63.7
CF-05-D-0.0/0.5	6/25/2014	0	0	0	0.2	0	36.3	63.5
CF-05-D-0.5/0.9	6/25/2014	0	0	0	0.2	1	36.7	62.1
CF-06-A-0.0/0.5	6/25/2014	0	0	0	1.2	4.2	23.4	71.2
CF-06-A-0.5/1.8	6/25/2014	0	0	0	0	1.2	33.4	65.4
CF-06-B-0.0/0.6	6/26/2014	0	0	0	0	0	25.7	73.5
CF-06-D-0.0/0.8	6/25/2014	0	0	0	0	0.2	34.4	65.4
CF-07-A-0.0/0.8	6/26/2014	0	0	0	0.4	0.2	32.7	66.7
CF-07-B-0.0/0.7	6/23/2014	0	0	0	1.2	0	37.2	61.6
CF-08-D-0.0/0.7	6/26/2014	0	0	0	0	0.8	42.1	57.1
CF-09-A-0.0/0.8	6/25/2014	0	0	0	0	1	50.1	48.9
CF-10-B-0.0/0.5	6/25/2014	0	0	0	0	1	43.9	55.1
CF-10-B-0.5/1.3	6/25/2014	0	0	0	0	0.4	54.9	44.7
FP-01-0.0/0.5	6/26/2014	0	0	0	2.4	2.2	25.1	70.3
FP-01-0.5/1.2	6/26/2014	0	0	0	1	1.6	29.4	68
NR-01-A1-0.0/0.5	6/25/2014	0	0	0	3.8	76.6	13.9	5.7
NR-01-A1-0.5/2.0	6/25/2014	0	0	0	15	81.7	1.9	1.4
NR-01-A1-2.0/2.5	6/25/2014	0	0	0	24.3	73.8	0.6	1.3
NR-01-B-0.0/0.5	6/25/2014	0	0	0	17.1	79.6	0.7	2.6
NR-01-B-0.5/2.0	6/25/2014	0	0	0	26.9	70.5	1.4	1.2

TABLE 4

Summary of Grain Size Data

Crawford Creek and Nemadji River Site Characterization, June 2014

		% Gravel		% Sand			% Fines	
Sample ID	**Sample Date**	**Coarse**	**Fine**	**Coarse**	**Medium**	**Fine**	**Silt**	**Clay**
NR-01-B-2.0/3.0	6/25/2014	0	0	0	32	65.4	2.6	
NR-01-B-3.0/3.5	6/25/2014	0	0	0	34.5	62.7	0.3	2.5
NR-01-E-0.0/0.5	6/25/2014	0	0	0	0	56	29.4	14.6
NR-01-E-0.5/2.0	6/25/2014	0	0	0	0.6	75.5	16.2	7.7
NR-01-E-2.0/3.0	6/25/2014	0	0	0	0	82.9	11.4	5.7
NR-01-E-3.0/4.0	6/25/2014	0	0	0	0.1	78.9	13.2	7.8
NR-01-E-4.0/4.6	6/25/2014	0	0	0	1.4	78.7	10.6	9.3
NR-02-B1-0.0/0.5	6/26/2014	0	0	0	7	88.2	2.3	2.5
NR-02-B1-0.5/2.0	6/26/2014	0	0	0	10	87.5	1.2	1.3
NR-02-B1-2.0/2.5	6/26/2014	0	0	0	8	82.1	6.8	3.1
NR-02-B2-0.0/0.5	6/26/2014	0	0	0	25.8	70.8	2.2	1.2
NR-02-B2-0.5/2.0	6/26/2014	0	0	0	27.6	68.7	2.5	1.2
NR-02-B2-2.0/2.9	6/26/2014	0	0	0	14.2	80.3	4	1.5
NR-02-C-0.0/0.5	6/26/2014	0	0	0	5.9	90.7	2.2	1.2
NR-02-C-0.5/2.0	6/26/2014	0	0	0	22.5	75	1.3	1.2
NR-02-C-2.0/3.0	6/26/2014	0	0	0	45.1	53	0.7	1.2
NR-03-A1-0.0/0.5	6/25/2014	0	0.1	0.5	31.3	65.8	1	1.3
NR-03-A1-0.5/1.5	6/25/2014	0	0.5	2	39.6	55.8	0.9	1.2
NR-03-B-0.0/0.5	6/24/2014	0	2.1	1.9	54.5	39.5	0.8	1.2
NR-03-B-0.5/1.3	6/24/2014	0	0.9	2.4	48.6	46.9	1.2	
NR-04-B-0.0/0.5	6/25/2014	0	0	0	15.2	81.7	0.6	2.5
NR-04-B-0.5/2.0	6/25/2014	0	0	0.1	20.4	77.5	0.7	1.3
NR-04-B-2.0/2.6	6/25/2014	2.6	4.5	0.5	7.5	80.8	1.7	2.4
NR-05-C-0.0/0.5	6/24/2014	0	0.1	1.1	49.7	45.9	2	1.2
NR-05-C-0.5/1.6	6/24/2014	0	0.2	1.6	55.5	40.3	1.2	1.2

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-001-A-0.0/0.8 6/25/2014	CC-001-A1-0.0/0.5 6/26/2014	CC-002-A-0.0/0.5 6/25/2014	CC-002-A-0.5/1.4 6/25/2014	CC-003-C-0.0/0.5 6/22/2014	CC-003-C-0.5/1.3 6/22/2014	CC-004-A-0.0/0.5 6/22/2014	CC-004-A-0.5/1.8 6/22/2014	CC-005-B-0.0/0.5 6/22/2014	CC-005-B-0.5/1.3 6/22/2014	CC-006-A-0.0/0.5 6/22/2014
Metals													
ARSENIC	7440-38-2	mg/kg	3.5	2.8 J	3.6	5	2.8	3.2	3.6	4.2	3.8	3.4	4.4
BARIUM	7440-39-3	mg/kg	176	193	162	143	89.9	178	126	139	155	170	159
CADMIUM	7440-43-9	mg/kg	0.13 J	0.2 J	0.096 U	0.14 J	0.083 U	0.1 J	0.094 U	0.095 J	0.092 U	0.088 U	0.13 J
CHROMIUM	7440-47-3	mg/kg	50.3	53.7	45.4	39.9	29.3	49.7	36.9	36.7	41.9	44.9	41.9
COPPER	7440-50-8	mg/kg	37.6	41.5	35.5	34	24.4	35.6	37.1	32.8	33.5	33.8	33.5
LEAD	7439-92-1	mg/kg	10.9	12.1	10.5	9.5	8.5	11.4	10.4	9.1	10.2	10.5	10.1
MERCURY	7439-97-6	mg/kg	0.036	0.032	0.031	0.034	0.031	0.038	0.074	0.032	0.037	0.034	0.041
NICKEL	7440-02-0	mg/kg	39.3	40.7	35.2	33.1	26.8	39.7	29.3	31.1	34.8	36	34.6
SELENIUM	7782-49-2	mg/kg	0.97 U	1.1 U	1.1 U	1 U	0.97 U	0.99 U	1.1 U	0.96 U	1.1 U	1 U	1.1 U
SILVER	7440-22-4	mg/kg	0.35 U	0.4 U	0.4 U	0.37 U	0.35 U	0.36 U	0.39 U	0.35 U	0.45 J	0.37 U	0.38 U
ZINC	7440-66-6	mg/kg	80.2	88.1	90.2	71.3	59	81.3	91.7	65.4	80.1	75.1	75.2
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	6.1 UJ	8.2 J	3,130 U	31 U	4,050 J	9,260 J	643 U	6,490 J	3,100 U	7,070 J	161 U
ACENAPHTHENE	83-32-9	µg/kg	33.5 J	16.3	4,850 J	74.8	6,160	14,000	875 J	9,820	13,200	19,300	313
ACENAPHTHYLENE	208-96-8	µg/kg	5.1 J	3.1 U	1,640 U	16.2 U	1,590 U	3,140 U	641 J	1,560 U	1,620 U	3,120 U	84.5 U
ANTHRACENE	120-12-7	µg/kg	9.5 J	8.6 J	3,960 J	32.2 J	2,660 J	3,710 J	1,560	2,520 J	7,650	6,740 J	87.2 J
Benzo[a]anthracene	56-55-3	µg/kg	6.2 J	11.7	3,670 J	52	1,300 U	2,560 U	639 J	1,330 J	5,310	3,110 J	69 U
BENZO(A)PYRENE	50-32-8	µg/kg	15.3 J	5.4 J	2,010 U	24 J	1,960 U	3,860 U	3,470	1,910 U	2,730 J	3,830 U	104 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	16.1 J	4.3 J	2,130 J	28.7 J	1,690 U	3,340 U	3,170	1,650 U	3,050 J	3,320 U	89.9 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	13.1 J	5.7 J	1,530 U	15.2 U	1,490 U	2,940 U	3,350	1,460 U	1,520 U	2,920 U	79.1 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	9.7 J	6.1 J	2,030 U	23.1 J	1,970 U	3,890 U	2,270	1,930 U	2,870 J	3,860 U	105 U
CHRYSENE	218-01-9	µg/kg	10.8 J	32.9 J	3,170 J	37.4 J	1,340 U	2,650 U	1,800	1,310 U	6,250	3,340 J	71.3 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	3.8 J	2.3 U	1,200 U	11.9 U	1,170 U	2,300 U	792 J	1,140 U	1,190 U	2,290 U	62 U
FLUORANTHENE	206-44-0	µg/kg	25.6 J	10.3	15,800	203	6,370	17,100	1,640	10,600	30,500	22,700	218 J
FLUORENE	86-73-7	µg/kg	15.8 J	8.7 J	3,590 J	51.2	4,660 J	10,600	629 J	7,020	10,800	14,700	199 J
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	11.9 J	5 J	1,080 U	10.7 U	1,050 U	2,070 U	2,810	1,030 U	1,070 U	2,060 U	55.8 U
NAPHTHALENE	91-20-3	µg/kg	52.5 J	16.8 J	4,210 U	297	17,200	37,400	3,800	42,800	20,800	42,400	217 U
PHENANTHRENE	85-01-8	µg/kg	18.1 J	10.4	13,500	174	13,600	32,800	1,510	22,800	36,900	46,500	567
PYRENE	129-00-0	µg/kg	10.6 J	7.4 J	11,200	146	3,900 J	9,590	1,010 J	6,320	17,400	13,800	140 J
TOTAL PAH[a]	-	µg/kg	261	161	70,285	1,186	65,380	147,835	30,288	115,695	161,710	190,360	2,074
PENTACHLOROPHENOL	87-86-5	µg/kg	57.4 U	56.5 UJ	29,500 U	292 U	28,600 U	56,500 U	6,060 U	28,000 U	29,200 U	56,100 U	1,520 U
Wet Chemistry													
Moisture	-	%	31.7	30.6	33.5	32.8	31.5	30.6	35.3	29.9	32.8	30.1	35.5
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	20,200	8,760	11,700 J	14,800	10,400	14,400	51,800	9,590	23,500	23,300	13,900
TOTAL ORGANIC CARBON (TOC)	-	%	2.02	0.876	1.17	1.48	1.04	1.44	5.18	0.959	2.35	2.33	1.39

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-006-A-0.5/1.3 6/22/2014	CC-007-C-0.0/0.5 6/23/2014	CC-007-C-0.5/1.6 6/23/2014	CC-008-C-0.0/0.5 6/23/2014	CC-008-C-0.5/2.3 6/23/2014	CC-009-C-0.0/0.5 6/23/2014	CC-009-C-0.5/1.3 6/23/2014	CC-010-A-0.0/0.8 6/23/2014	CC-010-A-0.8/1.9 6/23/2014	CC-011-A-0.0/0.5 6/23/2014	CC-011-A-0.5/1.2 6/23/2014
Metals													
ARSENIC	7440-38-2	mg/kg	3.8	4.1	4	3.7	4.2	4.3	3.5	5	3.8	3.9	3.8
BARIUM	7440-39-3	mg/kg	154	168	147	138	138	123	133	132	162	153	162
CADMIUM	7440-43-9	mg/kg	0.12 J	0.096 U	0.083 U	0.087 U	0.11 J	0.1 J	0.14 J	0.087 U	0.086 U	0.11 J	0.11 J
CHROMIUM	7440-47-3	mg/kg	42.5	45.6	41.9	37.9	36.9	34.5	36.9	37.3	44.6	41.6	43.6
COPPER	7440-50-8	mg/kg	31.5	37	35	32.7	33.1	30.8	34.1	35.6	32.3	34.5	34.8
LEAD	7439-92-1	mg/kg	9.9	12.6	11.1	10.4	9.5	9.1	9.3	8.8	10.6	10.3	10.6
MERCURY	7439-97-6	mg/kg	0.034	0.057	0.045	0.04	0.036	0.031	0.029	0.039	0.038	0.041	0.037
NICKEL	7440-02-0	mg/kg	34.6	36.9	33.8	32.3	31.7	30	30.8	30.9	35.3	33.3	35.8
SELENIUM	7782-49-2	mg/kg	0.92 U	1.1 U	0.97 U	1 U	1.1 U	0.96 U	0.95 U	1 U	1 U	1.1 U	1 U
SILVER	7440-22-4	mg/kg	0.33 U	0.4 U	0.35 U	0.36 U	0.4 U	0.35 U	0.34 U	0.36 U	0.36 U	0.39 U	0.37 U
ZINC	7440-66-6	mg/kg	74.2	90.4	83.9	78.3	70.9	64	64.6	67.3	74.9	75	75
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	148 U	316 U	117 U	1,540 U	3 U	60.2 U	2.8 U	2,500 U	37.2 J	1,650 U	29.7 U
ACENAPHTHENE	83-32-9	µg/kg	285	580	230	2,380 J	5.7	35.6 U	2.1 J	3,930 J	131 J	2,550 J	26.7 J
ACENAPHTHYLENE	208-96-8	µg/kg	77.6 U	166 U	61.3 U	806 U	1.6 U	31.5 U	1.5 U	1,310 U	15.4 U	867 U	15.6 U
ANTHRACENE	120-12-7	µg/kg	66.2 U	302 J	74.3 J	6,380	1.4 U	45.5 J	1.2 U	10,000	27.8 J	4,060	19.8 J
Benzo[a]anthracene	56-55-3	µg/kg	63.3 U	241 J	86.5 J	2,040 J	1.3 U	45.7 J	1.2 U	3,090 J	41.5 J	2,480 J	30.9 J
BENZO(A)PYRENE	50-32-8	µg/kg	95.4 U	204 U	75.4 U	1,290 J	2 U	38.8 U	1.8 U	1,740 J	19 U	1,190 J	20.6 J
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	82.6 U	176 U	65.2 U	1,460 J	1.7 U	33.6 U	1.5 U	1,900 J	19.6 J	1,290 J	27 J
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	72.6 U	155 U	57.4 U	754 U	1.5 U	29.5 U	1.4 U	1,230 U	14.4 U	811 U	14.6 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	96.1 U	205 U	75.9 U	1,270 J	2 U	39 U	1.8 U	1,740 J	19.1 U	1,370 J	23.3 J
CHRYSENE	218-01-9	µg/kg	65.5 U	237 J	62.5 J	1,940 J	1.3 U	37.5 J	1.2 U	4,380	34.3 J	3,750	26.9 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	56.9 U	122 U	45 U	591 U	1.2 U	23.1 U	1.1 U	962 U	11.3 U	636 U	11.4 U
FLUORANTHENE	206-44-0	µg/kg	222 J	1,260	446	9,390	3.3 J	262	1.4 U	15,600	161	11,000	139
FLUORENE	86-73-7	µg/kg	212 J	435 J	158 J	2,530	4.1 J	39.6 U	1.8 U	4,070	72.2	2,210 J	19.6 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	51.2 U	109 U	40.5 U	532 U	1.1 U	20.8 U	0.96 U	866 U	10.2 U	573 U	10.3 U
NAPHTHALENE	91-20-3	µg/kg	199 U	426 U	157 U	2,070 U	4.1 U	81 U	3.7 U	3,370 U	39.6 U	2,230 U	40.6 J
PHENANTHRENE	85-01-8	µg/kg	555	1,170	418	6,550	6.2	194	2.4 J	13,400	105	8,360	79.2
PYRENE	129-00-0	µg/kg	137 J	777	282	6,080	2.4 J	160	1.8 U	9,310	109	7,530	95.9
TOTAL PAH[a]	-	µg/kg	1,948	5,942	2,105	44,457	33	961	17	74,279	803	49,174	581
PENTACHLOROPHENOL	87-86-5	µg/kg	1,400 U	2,980 U	1,100 U	14,500 U	28.6 U	567 U	26.1 U	23,600 U	278 U	15,600 U	280 U
Wet Chemistry													
Moisture	-	%	29.8	34.2	28.9	32.4	31.5	30.9	25	33.5	29.3	37.2	30.1
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	15,200	19,300	10,100	16,600	8,220	10,600	8,110	28,600	7,550	26,200	17,600
TOTAL ORGANIC CARBON (TOC)	-	%	1.52	1.93	1.01	1.66	0.822	1.06	0.811	2.86	0.755	2.62	1.76

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5
Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-012-C-0.0/0.6 6/23/2014	CC-013-C-0.0/0.5 6/23/2014	CC-013-C-0.5/1.2 6/23/2014	CC-014-B-0.0/0.5 6/23/2014	CC-014-B-0.5/1.3 6/23/2014	CC-015-A-0.0/0.5 6/23/2014	CC-015-A-0.5/1.7 6/23/2014	CC-016-C-0.0/0.5 6/24/2014	CC-016-C-0.5/1.3 6/24/2014	CC-017-A-0.0/0.5 6/24/2014	CC-017-A-0.5/1.3 6/24/2014
Metals													
ARSENIC	7440-38-2	mg/kg	3.5	4.4	3.7	4.2	4.1	4.5	4	3.8	4.1	4	3.9
BARIUM	7440-39-3	mg/kg	170	150	154	153	153	133	107	101	125	125	125
CADMIUM	7440-43-9	mg/kg	0.098 U	0.086 U	0.13 J	0.089 U	0.17 J	0.13 J	0.1 J	0.15 J	0.16 J	0.11 J	0.13 J
CHROMIUM	7440-47-3	mg/kg	50.5	40.8	43.1	40.5	41.3	33.4	26.4	26.8	33.4	34.1	32.5
COPPER	7440-50-8	mg/kg	34.3	35.1	37.7	33.9	32.4	30.7	26.6	25.8	28.3	29.9	27.6
LEAD	7439-92-1	mg/kg	11.8	11.7	10.6	10.6	10.3	8.7	7.6	7.2	8.6	9.6	8.4
MERCURY	7439-97-6	mg/kg	0.035	0.078	0.038	0.042	0.037	0.033	0.028	0.026	0.034	0.036	0.077
NICKEL	7440-02-0	mg/kg	40.8	34.8	36.3	34.9	34.3	30.9	23.3	23.5	29.3	30	27
SELENIUM	7782-49-2	mg/kg	1.1 U	1 U	0.93 U	1 U	0.95 U	1.1 U	0.92 U	0.98 U	0.96 U	1 U	1 U
SILVER	7440-22-4	mg/kg	0.41 U	0.36 U	0.34 U	0.38 U	0.4 J	0.4 J	0.33 U	0.35 U	0.35 U	0.38 U	0.36 U
ZINC	7440-66-6	mg/kg	84.4	83.5	77.3	80.1	73.4	65.4	50.9	49.3	61.3	68.5	60.8
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	31.9 U	1,560 U	582 U	790 U	30.2 U	611 U	2.9 U	2.9 U	2.9 U	645 U	95
ACENAPHTHENE	83-32-9	µg/kg	41.1 J	2,270 J	1,410	1,460	42.3 J	662 J	3.2 J	1.7 U	1.7 U	659 J	253
ACENAPHTHYLENE	208-96-8	µg/kg	16.7 U	819 U	305 U	414 U	15.8 U	320 U	1.5 U	1.5 U	1.5 U	338 U	15.2 U
ANTHRACENE	120-12-7	µg/kg	38 J	3,590	2,440	1,280	29.6 J	934 J	5.7	1.3 U	1.3 U	633 J	13 U
Benzo[a]anthracene	56-55-3	µg/kg	80.7	2,200 J	1,470	1,490	40 J	721 J	1.3 U	1.2 U	1.3 U	701 J	12.4 U
BENZO(A)PYRENE	50-32-8	µg/kg	81.4	1,440 J	934	879 J	25.1 J	394 U	1.9 U	1.9 U	1.9 U	582 J	18.7 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	70.8	1,480 J	1,090	976 J	27.1 J	415 J	1.6 U	1.6 U	1.6 U	613 J	16.2 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	56.2	767 U	415 J	404 J	14.9 J	300 U	1.4 U	1.4 U	1.4 U	384 J	14.2 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	66.9	1,410 J	899 J	951 J	24.6 J	424 J	1.9 U	1.9 U	1.9 U	509 J	18.8 U
CHRYSENE	218-01-9	µg/kg	86.7	3,850	2,420	1,550	32.2 J	1,010	1.3 J	1.3 J	1.3 U	834 J	12.8 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	16 J	601 U	224 U	304 U	11.6 U	235 U	1.1 U	1.1 U	1.1 U	248 U	11.2 U
FLUORANTHENE	206-44-0	µg/kg	331	9,760	6,340	5,850	186	3,010	8.7	2 J	1.4 U	2,830	17.5 J
FLUORENE	86-73-7	µg/kg	28.9 J	2,190 J	1,230	1,130 J	34.8 J	591 J	3.3 J	1.9 U	1.9 U	458 J	128
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	49 J	549 J	396 J	392 J	13.5 J	212 U	1 U	1 U	1 U	337 J	10 U
NAPHTHALENE	91-20-3	µg/kg	43 U	2,100 U	784 U	1,060 U	40.7 U	823 U	3.9 U	3.9 U	13.4	868 U	49.3 J
PHENANTHRENE	85-01-8	µg/kg	115	7,800	4,610	4,120	134	2,280	8.8	1.8 U	3 J	1,890	90.1
PYRENE	129-00-0	µg/kg	247	6,880	3,940	4,150	131	2,120	5.7	1.9 U	2 U	2,010	19.3 U
TOTAL PAH[a]	-	µg/kg	1,355	46,343	28,542	25,916	784	13,615	46	17	29	13,490	714
PENTACHLOROPHENOL	87-86-5	µg/kg	301 U	14,700 U	5,490 UJ	7,450 U	285 U	5,770 U	27.6 U	27.1 U	27.8 U	6,080 U	274 U
Wet Chemistry													
Moisture	-	%	34.9	33.5	28.6	34.2	31.2	31.9	28.8	27.7	29.4	35.5	28.4
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	10,100	22,000	19,100	16,900	21,300	12,100	10,400	10,600	13,900	18,200	15,600
TOTAL ORGANIC CARBON (TOC)	-	%	1.01	2.2	1.91	1.69	2.13	1.21	1.04	1.06	1.39	1.82	1.56

Notes:
Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.
[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-018-C-0.0/0.5 6/24/2014	CC-018-C-0.5/2.0 6/24/2014	CC-019-C-0.0/0.5 6/24/2014	CC-019-C-0.5/1.9 6/24/2014	CC-020-A-0.0/0.5 6/24/2014	CC-020-A-0.5/1.8 6/24/2014	CC-021-C-0.0/0.5 6/25/2014	CC-021-C-0.5/2.0 6/25/2014	CC-021-C-2.0/3.0 6/25/2014	CC-021-C-3.0/3.6 6/25/2014	CC-022-A-0.0/0.8 6/25/2014
Metals													
ARSENIC	7440-38-2	mg/kg	4.7	3.8	5.1	4	4.4	4.2	2.6 J	3	3.3	3.3	4
BARIUM	7440-39-3	mg/kg	143	126	140	105	135	111	74.7	71.3	71.1	70.1	125
CADMIUM	7440-43-9	mg/kg	0.091 U	0.12 J	0.12 J	0.1 J	0.11 J	0.15 J	0.12 J	0.12 J	0.1 J	0.077 U	0.18 J
CHROMIUM	7440-47-3	mg/kg	38.1	33.4	37.7	28.4	36	27.9	18.8	17.8	18.7	18.4	33.2
COPPER	7440-50-8	mg/kg	34.2	28.7	35.4	26.6	33.6	26.9	18.5	18.5	18.6	17.8	28.4
LEAD	7439-92-1	mg/kg	10.3	8.3	11.1	7.6	9.9	7.3	5.7	5.5	5.7	5.7	7.9
MERCURY	7439-97-6	mg/kg	0.091	0.028	0.047	0.029	0.035	0.026	0.016	0.013	0.014	0.013	0.033
NICKEL	7440-02-0	mg/kg	33.4	28	32.4	24.6	31.8	24	17.6	16.8	17.8	16.5	27.2
SELENIUM	7782-49-2	mg/kg	1.1 U	1.1 U	1.2 U	0.93 U	1.1 U	1.1 U	1 U	0.83 U	0.88 U	0.9 U	1.1 U
SILVER	7440-22-4	mg/kg	0.38 U	0.38 U	0.42 U	0.33 U	0.39 U	0.39 U	0.37 U	0.3 U	0.32 U	0.32 U	0.38 U
ZINC	7440-66-6	mg/kg	76.9	60.4	78.6	51.8	70.3	49.9	34.1	31.2	32.5	32.5	61.9
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	806 U	573 U	1,670 U	85.2	1,610 U	291 U	6.4 U	2.6 U	2.6 U	2.6 U	15.3 J
ACENAPHTHENE	83-32-9	µg/kg	880 J	1,070	1,720 J	111	1,660 J	181 U	4.9 J	1.5 U	1.5 U	1.5 U	12.7
ACENAPHTHYLENE	208-96-8	µg/kg	422 U	300 U	875 U	7.7 U	846 U	152 U	3.3 U	1.3 U	1.4 U	1.4 U	3.3 U
ANTHRACENE	120-12-7	µg/kg	1,120 J	1,530	8,980	6.6 U	2,440 J	1,100	21.7	1.1 U	1.2 U	1.2 U	12.1
Benzo[a]anthracene	56-55-3	µg/kg	715 J	503 J	2,840	6.3 U	2,900	337 J	12.1	1.1 U	1.1 U	1.1 U	2.7 U
BENZO(A)PYRENE	50-32-8	µg/kg	519 U	369 U	1,280 J	9.5 U	1,490 J	187 U	18.3	1.7 U	1.7 U	1.7 U	4.1 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	510 J	349 J	1,460 J	8.2 U	1,810 J	172 J	17.9	1.4 U	1.5 U	1.4 U	3.5 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	395 U	281 U	819 U	7.2 U	791 U	143 U	16.8	1.3 U	1.3 U	1.3 U	3.1 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	523 U	372 U	1,450 J	9.5 U	1,770 J	189 U	13.7	1.7 U	1.7 U	1.7 U	4.1 U
CHRYSENE	218-01-9	µg/kg	1,260 J	545 J	8,890	6.5 U	2,860	1,290	27.9	1.1 U	1.2 U	1.1 U	16.2
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	310 U	220 U	642 U	5.6 U	621 U	112 U	4.5 J	0.99 U	1 U	1 U	2.4 U
FLUORANTHENE	206-44-0	µg/kg	3,040	2,330	10,600	13.6 J	12,200	781	35.4	1.3 U	1.3 U	1.3 U	11
FLUORENE	86-73-7	µg/kg	688 J	1,020	1,730 J	39.6	1,560 J	191 U	5.5 J	1.7 U	1.7 U	1.7 U	4.1 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	279 U	198 U	578 U	5.1 U	559 U	101 U	14.5	0.89 U	0.9 U	0.9 U	2.2 U
NAPHTHALENE	91-20-3	µg/kg	1,090 U	772 U	2,250 U	32.7 J	2,170 U	391 U	8.6 U	3.5 U	3.5 U	3.5 U	12.9 J
PHENANTHRENE	85-01-8	µg/kg	2,450	2,960	6,640	19.8 J	6,420	525	18.1	1.6 U	1.7 U	1.6 U	6.1 J
PYRENE	129-00-0	µg/kg	2,100	1,540	7,320	9.7 U	8,300	557	24.5	1.7 U	1.7 U	1.7 U	7.2 J
TOTAL PAH[a]	-	µg/kg	14,935	13,390	56,327	343	46,709	5,731	245	13 U	14 U	13 U	108
PENTACHLOROPHENOL	87-86-5	µg/kg	7,600 U	5,410 U	15,800 U	139 U	15,200 U	2,740 UJ	60.2 U	24.3 U	24.6 UJ	24.5 UJ	59.3 U
Wet Chemistry													
Moisture	-	%	35.5	27.4	37.7	29.2	35.6	28.4	34.8	19.1	20.2	19.9	33.8
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	20,400	11,000 J	31,300	15,100	17,000	12,500	3,170	3,230	4,490	5,220	15,000
TOTAL ORGANIC CARBON (TOC)	-	%	2.04	1.1	3.13	1.51	1.7	1.25	0.317	0.323	0.449	0.522	1.5

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-023-A-0.0/0.5 6/25/2014	CC-023-A-0.5/2.1 6/25/2014	CC-024-A-0.0/0.5 6/25/2014	CC-024-A-0.5/2.0 6/25/2014	CC-024-A-2.0/3.0 6/25/2014	CC-024-A-3.0/3.6 6/25/2014	CC-025-C-0.0/0.5 6/26/2014	CC-025-C-0.5/2.0 6/26/2014	CC-025-C-2.0/3.0 6/26/2014	CC-025-C-3.0/4.0 6/26/2014	CC-026-C-0.0/0.5 6/24/2014
Metals													
ARSENIC	7440-38-2	mg/kg	3.9	4.1	4.3	4.5	4.2	4.1	5.1	4.2	3.5	3.4	5.1
BARIUM	7440-39-3	mg/kg	112	120	110	115	109	132	136	118	115	109	139
CADMIUM	7440-43-9	mg/kg	0.19 J	0.15 J	0.13 J	0.12 J	0.095 J	0.17 J	0.15 J	0.12 J	0.13 J	0.14 J	0.19 J
CHROMIUM	7440-47-3	mg/kg	30.2	31.6	28	28.4	27.4	34	32.7	29.6	28.4	26.2	31.2
COPPER	7440-50-8	mg/kg	27.8	28.4	26.9	28.3	25.9	29.5	32.2	26.9	25.5	26.1	31.4
LEAD	7439-92-1	mg/kg	8.2	7.5	8	7.9	7.3	8.6	8.5	7.4	7	7.2	8.9
MERCURY	7439-97-6	mg/kg	0.037	0.028	0.04	0.032	0.028	0.032	0.034	0.031	0.028	0.027	0.037
NICKEL	7440-02-0	mg/kg	26.6	26.5	24.2	24.1	24	28.8	28.2	26.4	24.3	24.1	27.9
SELENIUM	7782-49-2	mg/kg	1 U	0.85 U	1.1 U	1 U	0.99 U	1 U	1.3 U	1 U	0.97 U	0.88 U	1.1 U
SILVER	7440-22-4	mg/kg	0.37 U	0.31 U	0.38 U	0.37 U	0.36 U	0.38 U	0.47 U	0.37 U	0.35 U	0.32 U	0.41 J
ZINC	7440-66-6	mg/kg	57	52.9	54.1	54	51.6	61.9	63	54.6	51.9	47.1	62.6
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	5,750 U	152 J	63.9 U	152 U	2.9 U	3 U	7.1 U	5.8 U	3 U	2.8 U	11.6 J
ACENAPHTHENE	83-32-9	µg/kg	9,780	248	92.2 J	228 J	2.6 J	1.8 U	8.5 J	44.7	1.7 U	1.7 U	53.6
ACENAPHTHYLENE	208-96-8	µg/kg	3,010 U	28.4 U	33.5 U	79.7 U	1.5 U	1.6 U	3.7 U	3.1 U	1.5 U	1.5 U	3.8 U
ANTHRACENE	120-12-7	µg/kg	10,300	48.7 J	272	176 J	1.3 U	1.3 U	3.4 J	3 J	1.3 U	1.3 U	28.3
Benzo[a]anthracene	56-55-3	µg/kg	8,180 J	27 J	154	126 J	1.3 U	1.3 U	8.1 J	2.5 U	1.3 U	1.2 U	16.6
BENZO(A)PYRENE	50-32-8	µg/kg	3,700 U	34.9 U	149	98 U	1.9 U	1.9 U	4.6 J	3.7 U	1.9 U	1.8 U	14.4
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	3,830 U	30.2 U	163	84.8 U	1.6 U	1.7 U	5.5 J	3.2 U	1.6 U	1.6 U	18
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	2,820 U	26.6 U	88.4 J	74.6 U	1.4 U	1.5 U	3.5 U	2.9 U	1.4 U	1.4 U	7.2 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	3,730 U	35.2 U	125	98.7 U	1.9 U	1.9 U	4.7 J	3.8 U	1.9 U	1.8 U	13.9
CHRYSENE	218-01-9	µg/kg	8,490 J	24 U	333	127 J	1.3 U	1.3 U	8.4 J	2.6 U	1.3 U	1.2 U	16.7
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	2,210 U	20.8 U	28.2 J	58.5 U	1.1 U	1.1 U	2.7 U	2.2 U	1.1 U	1.1 U	2.8 U
FLUORANTHENE	206-44-0	µg/kg	42,500	208	494	633	1.4 U	1.5 U	17	3.5 J	1.4 U	1.4 U	49.7
FLUORENE	86-73-7	µg/kg	9,110 J	149	66 J	187 J	1.9 U	2 U	4.7 U	22.8	1.9 U	1.8 U	29.3
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	1,990 U	18.8 U	79.3 J	52.6 U	1 U	1 U	2.5 U	2 U	1 U	0.97 U	6.7 J
NAPHTHALENE	91-20-3	µg/kg	7,740 U	73 U	86.1 U	205 U	4 U	4 U	9.6 U	7.8 U	4 U	3.8 U	14.4 J
PHENANTHRENE	85-01-8	µg/kg	39,600	378 J	227	518	2.1 J	1.9 U	10.1 J	18.7	2.2 J	1.8 U	47.7
PYRENE	129-00-0	µg/kg	29,100	146	361	435	2 U	2 U	12.4	3.9 U	2 U	1.9 U	33.1
TOTAL PAH[a]	-	µg/kg	176,365	1,503	2,724	2,882	18	15 U	100	114	16	15 U	365
PENTACHLOROPHENOL	87-86-5	µg/kg	54,200 U	511 U	603 UJ	1,430 UJ	27.8 UJ	28 UJ	67.4 UJ	54.9 UJ	27.9 UJ	26.4 UJ	67.8 UJ
Wet Chemistry													
Moisture	-	%	27.6	23.3	34.9	31.6	29.5	29.9	41.8	28.5	29.6	25.8	42.1
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	30,100	6,960 J	12,800	13,000	11,900	12,600	19,700	7,220	10,700	6,000	16,200
TOTAL ORGANIC CARBON (TOC)	-	%	3.01	0.696	1.28	1.3	1.19	1.26	1.97	0.722	1.07	0.6	1.62

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5
Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	CC-026-C-0.5/2.0 6/24/2014	CC-026-C-2.0/3.3 6/24/2014	CC-027-A-0.0/0.5 6/25/2014	CC-027-A-0.5/1.9 6/25/2014	CC-028-B-0.0/0.5 6/25/2014	CC-028-B-0.5/2.0 6/25/2014	CC-028-B-2.0/3.0 6/25/2014	CC-028-B-3.0/4.0 6/25/2014	CC-028-B-4.0/4.7 6/25/2014	NR-01-A1-0.0/0.5 6/25/2014	NR-01-A1-0.5/2.0 6/25/2014
Metals													
ARSENIC	7440-38-2	mg/kg	4	4.6	4.4	3.9	2.7	5.4	3.5	3.1	3.7	2.4 J	2.3 J
BARIUM	7440-39-3	mg/kg	104	116	111	115	58.3	131	62.2	48.4	66.6	39.2	15.5
CADMIUM	7440-43-9	mg/kg	0.16 J	0.23 J	0.17 J	0.13 J	0.11 J	0.12 J	0.084 J	0.1 J	0.19 J	0.086 U	0.082 U
CHROMIUM	7440-47-3	mg/kg	24.3	28.1	26.7	30.2	15	34.4	17.2	13.4	17.9	9.6	5.1
COPPER	7440-50-8	mg/kg	27.1	26	26	26.2	13.2	32.8	14.7	12.1	15.7	8.4	3.5
LEAD	7439-92-1	mg/kg	6.7	7.3	7.4	7.5	4	9.8	5.4	4.1	5.3	3.4	1.9
MERCURY	7439-97-6	mg/kg	0.029	0.031	0.029	0.023	0.017	0.029	0.013	0.013	0.018	0.0073 J	0.0039 U
NICKEL	7440-02-0	mg/kg	22.7	24.8	22.7	25.3	12.4	30.3	14.2	11.4	14.9	8.4	4.2
SELENIUM	7782-49-2	mg/kg	0.94 U	0.95 U	1.2 U	0.9 U	0.98 U	0.89 U	0.89 U	0.87 U	0.88 U	1 U	0.96 U
SILVER	7440-22-4	mg/kg	0.34 U	0.34 U	0.42 U	0.32 U	0.35 U	0.32 U	0.32 U	0.31 U	0.32 U	0.36 U	0.35 U
ZINC	7440-66-6	mg/kg	45.2	53.4	48.6	48.9	26.3	79.3	33.6	26.7	44.2	19.6	10.6
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	96	3 U	6.9 U	2.7 U	293 U	5,480 U	273 U	108 U	135 U	2.7 U	2.7 U
ACENAPHTHENE	83-32-9	µg/kg	251	1.8 U	4.3 J	1.6 U	277 J	15,300	771	381	235	1.6 U	1.6 U
ACENAPHTHYLENE	208-96-8	µg/kg	15.7 U	1.6 U	3.6 U	1.4 U	153 U	2,870 U	143 U	56.5 U	70.8 U	1.4 U	1.4 U
ANTHRACENE	120-12-7	µg/kg	29.5 U	1.3 U	3.1 U	1.2 U	218 J	13,500	445	223	165 J	1.2 U	1.2 U
Benzo[a]anthracene	56-55-3	µg/kg	12.8 U	1.3 U	3 U	1.1 U	421 J	12,000	379 J	145 J	105 J	1.2 U	1.1 U
BENZO(A)PYRENE	50-32-8	µg/kg	19.3 U	1.9 U	4.4 U	1.7 U	247 J	5,160 J	176 U	69.4 U	87.1 U	1.8 U	1.7 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	16.7 U	1.7 U	3.8 U	1.5 U	326 J	5,950 J	175 J	65.3 J	75.4 U	1.5 U	1.5 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	14.7 U	1.5 U	3.4 U	1.3 U	144 U	2,690 U	134 U	52.9 U	66.3 U	1.3 U	1.3 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	19.4 U	1.9 U	4.5 U	1.7 U	267 J	5,550 J	177 U	70 U	87.7 U	1.8 U	1.7 U
CHRYSENE	218-01-9	µg/kg	13.2 U	1.3 U	3.5 J	1.2 U	376 J	10,800	372 J	142 J	118 J	1.2 U	1.2 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	11.5 U	1.1 U	2.7 U	1 U	113 U	2,110 U	105 U	41.5 U	52 U	1.1 U	1 U
FLUORANTHENE	206-44-0	µg/kg	67.8	1.5 U	10.2 J	1.3 U	1,530	60,200	2,140	861	645	1.3 U	1.3 U
FLUORENE	86-73-7	µg/kg	137	2 U	4.5 U	1.8 U	228 J	14,000	632	308	197 J	1.8 U	1.7 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	10.4 U	1 U	2.4 U	0.93 U	101 U	1,900 U	94.6 U	37.3 U	46.8 U	0.95 U	0.92 U
NAPHTHALENE	91-20-3	µg/kg	40.3 U	4 U	9.3 U	3.6 U	394 U	7,370 U	368 U	145 U	182 U	3.7 U	3.6 U
PHENANTHRENE	85-01-8	µg/kg	274	1.9 U	9.8 J	1.7 U	962	58,700	2,380	1,030	754	1.7 U	1.7 U
PYRENE	129-00-0	µg/kg	42.3 J	2 U	7.1 J	1.8 U	1,120	43,100	1,540	619	463	1.8 U	1.8 U
TOTAL PAH[a]	-	µg/kg	970	15 U	61	14 U	6,571	255,470	9,569	4,065	3,084	14 U	14 U
PENTACHLOROPHENOL	87-86-5	µg/kg	282 UJ	28.2 UJ	65.1 U	25.3 U	2,760 U	51,700 U	2,580 U	1,020 U	1,270 U	25.9 U	25 U
Wet Chemistry													
Moisture	-	%	30.5	30.4	39.7	22.4	28.9	24	23.9	22.8	23	24.3	21.6
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	17,200	17,500	14,600	5,240	10,600	16,100	7,820	10,600	9,790	4,450	3,960 J
TOTAL ORGANIC CARBON (TOC)	-	%	1.72	1.75	1.46	0.524	1.06	1.61	0.782	1.06	0.979	0.445	0.396

Notes:
Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.
[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	NR-01-A1-2.0/2.5 6/25/2014	NR-01-B-0.0./0.5 6/25/2014	NR-01-B-0.5/2.0 6/25/2014	NR-01-B-2.0/3.0 6/25/2014	NR-01-B-3.0/3.5 6/25/2014	NR-01-E-0.0/0.5 6/25/2014	NR-01-E-0.5/2.0 6/25/2014	NR-01-E-2.0/3.0 6/25/2014	NR-01-E-3.0/4.0 6/25/2014	NR-01-E-4.0/4.6 6/25/2014	NR-02-B1-0.0/0.5 6/26/2014
Metals													
ARSENIC	7440-38-2	mg/kg	2.3 J	2.2 J	2 J	1.8 J	2.8	2.8	2.4	2 J	1.9 J	2.1 J	1.6 J
BARIUM	7440-39-3	mg/kg	14.5	17.8	15.3	13.4	15.6	57.7	38.2	36.1	33.3	24.7	16.2
CADMIUM	7440-43-9	mg/kg	0.079 U	0.076 U	0.081 U	0.076 U	0.068 U	0.077 U	0.078 U	0.078 U	0.079 U	0.074 U	0.07 U
CHROMIUM	7440-47-3	mg/kg	4.3	5.9	4.8	4.8	4.9	16.4	11.2	10.5	10.7	8.1	5.3
COPPER	7440-50-8	mg/kg	2.9	3.4	4.1	2.7	4.6	15.7	10.4	8.4	8.1	6.1	3.5
LEAD	7439-92-1	mg/kg	1.8	2.3	1.9	1.8	1.7	4.4	3.4	3	3.2	2.4	1.7
MERCURY	7439-97-6	mg/kg	0.0035 U	0.0033 U	0.0041 U	0.0033 U	0.0033 U	0.011	0.0061 J	0.0036 J	0.0043 J	0.0036 U	0.0037 U
NICKEL	7440-02-0	mg/kg	4.2	4.9	4.2	4.4	5	14.4	9.7	9.2	8.8	7	4.4
SELENIUM	7782-49-2	mg/kg	0.92 U	0.88 U	0.94 U	0.89 U	0.79 U	0.89 U	0.9 U	0.9 U	0.92 U	0.87 U	0.82 U
SILVER	7440-22-4	mg/kg	0.33 U	0.32 U	0.34 U	0.32 U	0.28 U	0.32 U	0.33 U	0.33 U	0.33 U	0.31 U	0.3 U
ZINC	7440-66-6	mg/kg	9.1	12.1	10.8	11.6	11.4	29.1	20.3	19.1	17.2	14.8	10.9
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	2.5 U	2.4 U	2.6 U	2.4 U	2.4 U	2.6 U	2.5 U	2.5 U	2.6 U	2.5 U	2.5 U
ACENAPHTHENE	83-32-9	µg/kg	1.5 U	1.4 U	1.5 U	1.4 U	1.4 U	1.6 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
ACENAPHTHYLENE	208-96-8	µg/kg	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.4 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
ANTHRACENE	120-12-7	µg/kg	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Benzo[a]anthracene	56-55-3	µg/kg	1.1 U	1 U	1.1 U	1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	3.3 J
BENZO(A)PYRENE	50-32-8	µg/kg	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U	1.7 U	1.6 U	2.4 J
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	1.4 U	1.4 U	1.4 U	1.4 U	1.4 U	1.5 U	1.4 U	1.4 U	1.4 U	1.4 U	2.9 J
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	1.7 U	1.6 U	1.7 U	1.6 U	1.6 U	1.7 U	1.6 U	1.7 U	1.7 U	1.6 U	2.3 J
CHRYSENE	218-01-9	µg/kg	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U	1.1 U	1.1 U	1.1 U	3.6 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	0.98 U	0.94 U	0.98 U	0.94 U	0.94 U	1 U	0.97 U	0.98 U	0.99 U	0.97 U	0.97 U
FLUORANTHENE	206-44-0	µg/kg	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.3 U	1.2 U	9.3
FLUORENE	86-73-7	µg/kg	1.7 U	1.6 U	1.7 U	1.6 U	1.6 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	0.88 U	0.84 U	0.89 U	0.85 U	0.85 U	0.92 U	0.87 U	0.88 U	0.89 U	0.87 U	1.1 J
NAPHTHALENE	91-20-3	µg/kg	3.4 U	3.3 U	3.4 U	3.3 U	3.3 U	3.6 U	3.4 U	3.4 U	3.5 U	3.4 U	3.4 U
PHENANTHRENE	85-01-8	µg/kg	1.6 U	1.5 U	1.6 U	1.6 U	1.6 U	1.7 U	1.6 U	1.6 U	1.6 U	1.6 U	2.6 J
PYRENE	129-00-0	µg/kg	1.7 U	1.6 U	1.7 U	1.6 U	1.6 U	1.8 U	1.7 U	1.7 U	1.7 U	1.7 U	7.4
TOTAL PAH[a]	-	µg/kg	13 U	13 U	13 U	13 U	13 U	14 U	13 U	13 U	13 U	13 U	42
PENTACHLOROPHENOL	87-86-5	µg/kg	24 U	23 U	24.1 UJ	23.1 U	23.1 U	25 U	23.8 U	24 U	24.2 U	23.8 U	23.8 U
Wet Chemistry													
Moisture	-	%	18.3	14.7	18.7	14.9	14.9	21.4	17.4	18.3	18.9	17.7	17.6
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	399	834	564	769	503	8,490	4,360	1,310	2,080	3,400	1,750
TOTAL ORGANIC CARBON (TOC)	-	%	0.0399	0.0834	0.0564	0.0769	0.0503	0.849	0.436	0.131	0.208	0.34	0.175

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5
Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	NR-02-B1-0.5/2.0 6/26/2014	NR-02-B1-2.0/2.5 6/26/2014	NR-02-B2-0.0/0.5 6/26/2014	NR-02-B2-0.5/2.0 6/26/2014	NR-02-B2-2.0/2.9 6/26/2014	NR-02-C-0.0/0.5 6/26/2014	NR-02-C-0.5/2.0 6/26/2014	NR-02-C-2.0/3.0 6/26/2014	NR-03-A1-0.0/0.5 6/25/2014	NR-03-A1-0.5/1.5 6/25/2014	NR-03-B-0.0/0.5 6/24/2014
Metals													
ARSENIC	7440-38-2	mg/kg	2 J	2 J	1.7 J	1.8 J	1.6 J	1 J	1.3 J	1.9 J	2.1 J	2.8	2.7
BARIUM	7440-39-3	mg/kg	15	25.2	16.2	16.6	21.5	14.3	15	14.6	14.5	14.4	16.7
CADMIUM	7440-43-9	mg/kg	0.08 U	0.086 U	0.066 U	0.064 U	0.08 U	0.079 U	0.075 U	0.077 U	0.076 U	0.072 U	0.069 U
CHROMIUM	7440-47-3	mg/kg	5.5	8.7	4.7	4.7	5.4	3.7	4.6	4.9	6.1	5.3	4.7
COPPER	7440-50-8	mg/kg	3.2	7.8	3.1	3.1	3.9	2.7	2.4	2.5	2.7	3.2	3.4
LEAD	7439-92-1	mg/kg	2.6	2.7	1.5	1.9	2.2	1.7	1.6	2	2	2	1.7
MERCURY	7439-97-6	mg/kg	0.0035 U	0.0043 U	0.004 J	0.0041 J	0.0046 J	0.0036 J	0.0032 J	0.0036 U	0.0036 U	0.0033 U	0.0032 U
NICKEL	7440-02-0	mg/kg	4.3	6.3	4.8	4.5	5.2	4	4.2	5.1	4.3	5	4.5
SELENIUM	7782-49-2	mg/kg	0.93 U	1 U	0.76 U	0.75 U	0.93 U	0.92 U	0.87 U	0.89 U	0.89 U	0.84 U	0.81 U
SILVER	7440-22-4	mg/kg	0.33 U	0.36 U	0.28 U	0.27 U	0.34 U	0.33 U	0.31 U	0.32 U	0.32 U	0.3 U	0.29 U
ZINC	7440-66-6	mg/kg	10.9	15.7	11.2	10.5	12.5	9.6	10	10.9	10.6	13.1	11.9
SVOC SIM													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	2.6 U	116 U	2.2 U	2.3 U	2.5 U	2.6 U	5.2 U	123 U	2.5 U	2.5 U	2.4 U
ACENAPHTHENE	83-32-9	µg/kg	1.5 U	68.3 U	1.3 U	1.4 U	1.5 U	1.5 U	3 U	92.3 J	1.5 U	1.5 U	1.4 U
ACENAPHTHYLENE	208-96-8	µg/kg	1.3 U	60.5 U	1.1 U	1.2 U	1.3 U	1.3 U	2.7 U	64.6 U	1.3 U	1.3 U	1.2 U
ANTHRACENE	120-12-7	µg/kg	1.1 U	79.2 J	0.97 U	1 U	1.1 U	1.1 U	2.3 U	191 J	1.1 U	1.1 U	1.4 U
Benzo[a]anthracene	56-55-3	µg/kg	2.1 J	263	0.93 U	1 U	2 J	1.1 U	10.3	403	1.1 U	1.1 U	1 U
BENZO(A)PYRENE	50-32-8	µg/kg	1.6 U	111 J	1.4 U	1.5 U	1.6 U	1.6 U	6.5 J	172 J	1.6 U	1.6 U	1.5 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	1.8 J	134 J	1.2 U	1.3 U	1.4 U	1.4 U	7.6 J	198	1.4 U	1.4 U	1.3 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	1.3 U	56.6 U	1.1 U	1.1 U	1.2 U	1.3 U	2.5 U	60.4 U	1.2 U	1.2 U	1.2 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	1.7 U	122 J	1.4 U	1.5 U	1.6 U	1.7 U	6.9 J	185 J	1.6 U	1.6 U	1.5 U
CHRYSENE	218-01-9	µg/kg	1.9 J	186	0.96 U	1 U	1.6 J	1.1 U	7.6 J	382	1.1 U	1.1 U	1 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	0.98 U	44.4 U	0.84 U	0.9 U	0.97 U	0.98 U	2 U	47.4 U	0.95 U	0.97 U	0.91 U
FLUORANTHENE	206-44-0	µg/kg	8.6	912	1.1 U	1.1 U	4.7	3.4 J	36.1	1,460 J	1.9 J	1.9 J	3.8 U
FLUORENE	86-73-7	µg/kg	1.7 U	76.1 U	1.4 U	1.5 U	1.7 U	1.7 U	3.4 U	115 J	1.6 U	1.7 U	1.6 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	0.89 U	40 U	0.75 U	0.81 U	0.87 U	0.88 U	2.6 J	55.2 J	0.85 U	0.88 U	0.82 U
NAPHTHALENE	91-20-3	µg/kg	3.4 U	155 U	2.9 U	3.2 U	3.4 U	3.4 U	6.9 J	166 U	3.3 U	3.4 U	3.2 U
PHENANTHRENE	85-01-8	µg/kg	2.3 J	347	1.4 U	1.5 U	1.6 U	1.6 U	4.9 J	866 J	1.6 U	1.6 U	2.6 U
PYRENE	129-00-0	µg/kg	6.8	677	1.4 U	1.6 U	3.8 J	2.4 J	27.4	1,080 J	1.6 U	1.7 U	2.6 J
TOTAL PAH[a]	-	µg/kg	33	3,140	11 U	12 U	22	17	124	5,430	14	14	16
PENTACHLOROPHENOL	87-86-5	µg/kg	24.1 U	1,090 U	20.6 U	22.1 U	23.8 UJ	24.1 U	48.6 UJ	1,160 UJ	23.2 U	23.9 U	22.4 UJ
Wet Chemistry													
Moisture	-	%	18.7	28	4.6	11.2	17.5	18.6	19.3	15.6	15.4	17.9	12.4
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	661	9,320	981	735	2,200	598	565	467	563	439	553
TOTAL ORGANIC CARBON (TOC)	-	%	0.0661	0.932	0.0981	0.0735	0.22	0.0598	0.0565	0.0467	0.0563	0.0439	0.0553

Notes:
Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.
[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 5

Analytical Results for Metals, PAHs, and PCP in the Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	NR-03-B-0.5/1.3 6/24/2014	NR-04-B-0.0/0.5 6/25/2014	NR-04-B-0.5/2.0 6/25/2014	NR-04-B-2.0/2.6 6/25/2014	NR-05-C-0.0/0.5 6/24/2014	NR-05-C-0.5/1.6 6/24/2014
Metals								
ARSENIC	7440-38-2	mg/kg	2.3	1.8 J	2.1 J	1.5 J	2.4	2.5
BARIUM	7440-39-3	mg/kg	13.6	13	11.9	15.5	15.8	16.7
CADMIUM	7440-43-9	mg/kg	0.066 U	0.071 U	0.071 U	0.096 J	0.073 U	0.075 U
CHROMIUM	7440-47-3	mg/kg	5.6	4.5	4.5	5.6	4.3	6
COPPER	7440-50-8	mg/kg	3.4	2.6	2.7	3.8	3.1	3.8
LEAD	7439-92-1	mg/kg	1.7	1.9	1.6	2	1.7	1.6
MERCURY	7439-97-6	mg/kg	0.0034 U	0.0037 U	0.0037 U	0.004 U	0.004 U	0.0038 U
NICKEL	7440-02-0	mg/kg	4.9	3.9	3.7	4.9	4.5	5.9
SELENIUM	7782-49-2	mg/kg	0.77 U	0.83 U	0.82 U	0.91 U	0.86 U	0.87 U
SILVER	7440-22-4	mg/kg	0.28 U	0.3 U	0.3 U	0.33 U	0.31 U	0.31 U
ZINC	7440-66-6	mg/kg	10.8	9.2	9.2	11	12.1	13.5
SVOC SIM								
2-METHYLNAPHTHALENE	91-57-6	µg/kg	247 U	2.5 U	2.5 U	13 U	2.6 U	12.2 U
ACENAPHTHENE	83-32-9	µg/kg	146 U	1.5 U	1.5 U	7.7 U	1.5 U	7.2 U
ACENAPHTHYLENE	208-96-8	µg/kg	130 U	1.3 U	1.3 U	6.8 U	2.3 J	6.4 U
ANTHRACENE	120-12-7	µg/kg	110 U	1.1 U	1.1 U	60.7	3.5 U	5.5 U
Benzo[a]anthracene	56-55-3	µg/kg	107 J	11.3	1.3 J	5.5 U	15.3	36.9
BENZO(A)PYRENE	50-32-8	µg/kg	159 U	7.5	1.6 U	8.4 U	21.5	23.8
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	138 U	9	1.4 U	7.2 U	25.9	29.3
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	121 U	2.4 J	1.2 U	6.4 U	9	8.3 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	160 U	7.4	1.6 U	8.4 U	19.8	22.7
CHRYSENE	218-01-9	µg/kg	109 U	7.6	1.3 J	87.7	16.5	27.4
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	95 U	0.96 J	0.97 U	5 U	3.7 J	4.7 U
FLUORANTHENE	206-44-0	µg/kg	846	9.2	3.2 J	6.4 U	20.4	56.4
FLUORENE	86-73-7	µg/kg	163 U	1.6 U	1.7 U	8.5 U	1.7 U	8.1 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	90 J	2.4 J	0.87 U	4.5 U	9.6	8.3 J
NAPHTHALENE	91-20-3	µg/kg	333 U	3.3 U	3.4 U	17.5 U	3.5 U	16.5 U
PHENANTHRENE	85-01-8	µg/kg	157 U	1.7 J	1.6 U	8.2 U	1.9 U	7.8 U
PYRENE	129-00-0	µg/kg	590	8.3	2.4 J	8.6 U	16.5	45.8
TOTAL PAH[a]	-	µg/kg	2,667	73	19	209	168	293
PENTACHLOROPHENOL	87-86-5	µg/kg	2,330 UJ	23.2 U	23.7 U	122 U	24.3 UJ	116 UJ
Wet Chemistry								
Moisture	-	%	15.8	15.4	17.2	19.8	19.4	15.1
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	447	472	428	535	603	621
TOTAL ORGANIC CARBON (TOC)	-	%	0.0447	0.0472	0.0428	0.0535	0.0603	0.0621

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 6

Analytical Results and Exceedance of Metals, PAHs, and PCP in Floodplain Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Region 5 Soil ESL[a]	CF-01-A-0.0/0.5 6/24/2014	CF-01-A-0.5/1.0 6/24/2014	CF-01-B-0.0/0.5 6/26/2014	CF-01-B-0.5/0.9 6/26/2014	CF-01-C-0.0/0.7 6/26/2014	CF-01-D-0.0/0.5 6/25/2014	CF-01-D-0.5/1.1 6/25/2014	CF-02-B-0.0/0.5 6/24/2014	CF-02-B-0.5/1.6 6/24/2014	CF-02-C-0.0/0.8 6/25/2014	CF-03-A-0.0/0.5 6/24/2014	CF-03-A-0.5/1.3 6/24/2014
Metals															
ARSENIC	7440-38-2	mg/kg	5.7	3.7	5.6	4.7	3.5	5.9	4.1	5.2	5.3	5.3	4.2	3.8	5.6
BARIUM	7440-39-3	mg/kg	1.04	184	180	188	165	176	194	158	200	147	164	184	193
CADMIUM	7440-43-9	mg/kg	0.00222	0.19 J	0.21 J	0.17 J	0.13 J	0.18 J	0.37 J	0.29 J	0.21 J	0.23 J	0.24 J	0.2 J	0.15 J
CHROMIUM	7440-47-3	mg/kg	0.4	51.1	49.5	53.9	47.4	51.1	53	45.1	57.1	45.1	46.6	50.7	50
COPPER	7440-50-8	mg/kg	5.4	46.6	45.5	45.8	40	59.4	45.4	38.4	45.7	40	38.3	42.8	36.6
LEAD	7439-92-1	mg/kg	0.0537	16.1	13.3	14.7	13.4	14.5	13.9	10.7	15.2	10.9	12.3	13.4	12 J
MERCURY	7439-97-6	mg/kg	0.1	0.045	0.037	0.051	0.052	0.09	0.055	0.04	0.054	0.039	0.054	0.05	0.035
NICKEL	7440-02-0	mg/kg	13.6	41.3	40.9	44.4	38.7	42.9	41.6	37.6	42.9	36.9	36.4	40.4	42
SELENIUM	7782-49-2	mg/kg	0.0276	1.1 U	1.1 U	1 U	0.97 U	1.1 U	1.1 U	1 U	1.2 U	1.1 U	0.98 U	1.1 U	1.1 U
SILVER	7440-22-4	mg/kg	4.04	0.41 U	0.39 U	0.37 U	0.35 U	0.39 U	0.41 U	0.37 U	0.43 U	0.41 U	0.36 U	0.41 U	0.4 U
ZINC	7440-66-6	mg/kg	6.62	107	101	111	98.2	99.7	110	79.9	114	77.3	113	104	80.5
SVOC SIM															
PENTACHLOROPHENOL	87-86-5	µg/kg	119	64.3 UJ	295 UJ	284 UJ	57,800 UJ	5,730 UJ	34.1 U	2,900 U	33.5 U	117 U	116 U	33.5 UJ	28.8 UJ
PAH SIM															
2-METHYLNAPHTHALENE	91-57-6	µg/kg	-	6.8 U	31.2 U	30.2 U	6,130 U	608 U	3.6 U	308 U	3.6 U	12.4 U	12.3 U	3.6 U	3.3 J
ACENAPHTHENE	83-32-9	µg/kg	-	4 U	18.5 U	17.8 U	3,620 U	359 U	2.1 U	182 U	2.1 U	7.3 U	7.3 U	2.1 U	1.8 U
ACENAPHTHYLENE	208-96-8	µg/kg	-	11.1	52.1	40.1 J	6,950 J	978	3.8 J	266 J	3.7 J	10 J	25.3	2.5 J	4.7 J
ANTHRACENE	120-12-7	µg/kg	-	30.8	113	56.2	22,500	1,400	6.3	299 J	6.1	16.6 J	45.3	9.9	9.8 J
FLUORENE	86-73-7	µg/kg	-	4.5 U	20.6 U	19.9 U	4,040 U	400 U	2.4 U	203 U	2.3 U	8.2 U	8.1 U	2.3 U	2 U
NAPHTHALENE	91-20-3	µg/kg	-	12.5 J	120	40.6 U	8,250 U	818 U	9.9 J	415 U	6.3 J	17.6 J	31.4 J	5.7 J	9.7 J
PHENANTHRENE	85-01-8	µg/kg	-	8 U	57.3	19.1 U	3,890 U	386 U	3.9 J	195 U	2.9 J	7.9 U	15.7 J	4 U	5.3
Total Low Molecular Weight PAHs [b]		µg/kg	29,000[c]	66.1	378	160	42,415	3,664	28.0	1,217	23.0	62.1	132	24.1	34.7
Benzo[a]anthracene	56-55-3	µg/kg	-	7.7 J	36 J	24.5 J	5,080 J	509 J	3.3 J	132 U	2.7 J	10.7 J	16.7 J	4.6 J	3.1 J
BENZO(A)PYRENE	50-32-8	µg/kg	-	23.6	278	142	62,900	4,810	7.3	901	5.9	65.4	47.8	5.1 J	5.4
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	-	23.4	274	129	50,700	4,000	10.2	414 J	8.9	77.3	49.9	8.5	9.5 J
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	-	54	321	211	37,200	5,810	14.9	1,630	13.4	48.5	116	6	17.4 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	-	11.7	136	81.2	35,400	2,580	4.9 J	288 J	4 J	46.9	31.8	5 J	4.4 J
CHRYSENE	218-01-9	µg/kg	-	11.2	84	93.3	27,500	1,180	13.6	136 U	11.9	37.3	72.2	16.6	5.4
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	-	10.2 J	88.4	51.8	12,700	1,490	3.5 J	395 J	2.9 J	13.6 J	24.9	1.7 J	3.7 J
FLUORANTHENE	206-44-0	µg/kg	-	10.1 U	56.5	33.3 J	7,220 J	743 J	5.6 J	151 U	4.5 J	8.7 J	23.8	9.4	6
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	-	46.1	294	170	34,400	4,540	11.1	1,380	10.7	42.8	85.1	5.1 J	14.4 J
PYRENE	129-00-0	µg/kg	-	8.1 J	40.5 J	27.3 J	5,340 J	957 J	4.4 J	204 U	3.7 J	8.2 U	20.8	7.4	5
Total High Molecular Weight PAHs [b]		µg/kg	18,000[c]	201	1,608	963	278,440	26,619	78.8	5,320	68.6	355	489	69.4	74.3
TOTAL PAH[b]	-	ug/Kg	-	267	1,929	1,124	320,855	30,283	107	6,536	92	417	621	94	109
Wet Chemistry															
Moisture	-	%	-	39	33.4	31	32.1	31.6	42.5	32.5	41.5	32.8	32.5	41.4	31.9
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	-	39,500	10,800	38,000	27,000	21,800	36,300	29,200	34,700	19,700	22,900	29,700	21,400

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] EPA Region 5, Resource Conservation Recovery Act Ecological Screening Levels (ESL), August 2003

[b] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

[c] EPA Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs), June 2007, for the protection of soil invertebrates.

Shading represents cases where the sample result is greater than the screening level.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CF = Floodplain; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 6

Analytical Results and Exceedance of Metals, PAHs, and PCP in Floodplain Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Region 5 Soil ESL[a]	CF-03-C-0.0/0.5 6/24/2014	CF-03-C-0.5/1.3 6/24/2014	CF-03-E-0.0/0.5 6/26/2014	CF-03-E-0.5/1.2 6/26/2014	CF-04-B-0.0/0.5 6/24/2014	CF-04-B-0.5/1.3 6/24/2014	CF-05-B-0.0/0.5 6/24/2014	CF-05-B-0.5/0.9 6/24/2014	CF-05-C-0.0/0.6 6/26/2014	CF-05-D-0.0/0.5 6/25/2014	CF-05-D-0.5/0.9 6/25/2014	CF-06-A-0.0/0.5 6/25/2014
Metals															
ARSENIC	7440-38-2	mg/kg	5.7	3.6	3.7	4.9	3.9	3.7	4.1	5.2	4.9	4.4	5.1	5.8	4.3
BARIUM	7440-39-3	mg/kg	1.04	161	168	163	156	161	154	201	198	146	155	155	174
CADMIUM	7440-43-9	mg/kg	0.00222	0.17 J	0.17 J	0.16 J	0.18 J	0.095 U	0.11 J	0.22 J	0.27 J	0.27 J	0.2 J	0.23 J	0.24 J
CHROMIUM	7440-47-3	mg/kg	0.4	44.1	49.2	45.7	43.1	45.6	41.6	51.8	47.1	42.1	45.9	44.1	50.1
COPPER	7440-50-8	mg/kg	5.4	40.3	56.1	40.3	39.5	38.8	39.8	45.3	45.9	40.1	38.8	63.7	42.1
LEAD	7439-92-1	mg/kg	0.0537	11.9	17.2	12.3	11.6	12.7	11.1	13.9	15.6	11.8	13.1	12.4	13.5
MERCURY	7439-97-6	mg/kg	0.1	0.047	0.048	0.046	0.046	0.043	0.037	0.052	0.068	0.077	0.05	0.042	0.035
NICKEL	7440-02-0	mg/kg	13.6	36.8	38.3	38.6	36.7	37.4	36.2	44.3	39.9	35.5	36.4	34.5	39.1
SELENIUM	7782-49-2	mg/kg	0.0276	1.1 U	0.97 U	1 U	1 U	1.1 U	0.94 U	1.3 U	1 U	1 U	1.2 U	0.99 U	1.2 U
SILVER	7440-22-4	mg/kg	4.04	0.4 U	0.35 U	0.38 U	0.36 U	0.4 J	0.34 U	0.46 U	0.36 U	0.37 U	0.42 U	0.36 U	0.45 U
ZINC	7440-66-6	mg/kg	6.62	93	108	92	95.4	86.9	77.5	105	98.6	90.2	87.5	91.5	91
SVOC SIM															
PENTACHLOROPHENOL	87-86-5	µg/kg	119	320 UJ	5,650 UJ	30.2 UJ	56.2 U	153 UJ	140 UJ	33.5 UJ	5,640 UJ	1,070 UJ	30.4 U	54.9 U	34.1 U
PAH SIM															
2-METHYLNAPHTHALENE	91-57-6	µg/kg	-	33.9 U	599 U	3.2 U	6 U	16.2 U	15.4 J	3.7 J	598 U	114 U	3.2 U	5.8 U	3.6 U
ACENAPHTHENE	83-32-9	µg/kg	-	20.1 U	354 U	1.9 U	3.6 J	9.6 U	8.8 U	2.1 U	354 U	67.4 U	1.9 U	3.4 U	2.1 U
ACENAPHTHYLENE	208-96-8	µg/kg	-	57.8	1,160	1.7 U	10.2	22.5 J	28.6	2.9 J	1,350	250	5.3	6.7 J	1.9 U
ANTHRACENE	120-12-7	µg/kg	-	156	1,450	2.5 J	17.1	38.8	42.9	12.3	2,020	528	8.2	10	2.9 J
FLUORENE	86-73-7	µg/kg	-	22.3 U	394 U	2.1 U	6.2 J	10.7 U	10 U	2.4 U	394 U	75 U	2.1 U	3.8 U	2.4 U
NAPHTHALENE	91-20-3	µg/kg	-	45.7 U	806 U	4.3 U	13.8 J	25.3 J	87.1	11.2 J	805 U	153 U	6.6 J	13.5 J	4.9 U
PHENANTHRENE	85-01-8	µg/kg	-	24.9 U	380 U	2.1 J	14.6	12.2 U	20.8 U	6.1 U	380 U	72.3 U	4.1 J	4.5 J	2.6 J
Total Low Molecular Weight PAHs [b]		µg/kg	29,000[c]	287	3,877	11.2	68.5	111	194	35.4	4,636	1,019	27.8	41.2	13.0
Benzo[a]anthracene	56-55-3	µg/kg	-	33.3 J	359 J	1.4 U	5.1 J	11.4 J	15.3 J	3.6 J	562 J	149 J	3.8 J	3.6 J	1.6 J
BENZO(A)PYRENE	50-32-8	µg/kg	-	172	4,050	2.1 U	8.1 J	61	98.3	7	8,240	893	7.4	7.5 J	2.3 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	-	139	3,150	2.6 J	12.7	45	87.5	10.2	4,950	595	12.1	9.2 J	3.3 J
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	-	254	7,120	4.2 J	30.2	109	176	10.3	7,730	1,560	19.8	26	4.9 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	-	91.9	1,770	2.1 U	5.9 J	25.2 J	39.1	5.6 J	2,610	431	7.3	5.5 J	2.3 U
CHRYSENE	218-01-9	µg/kg	-	227	794 J	2.8 J	7 J	25.2 J	29.3	19.8	2,380	348	9.9	5.7 J	3.4 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	-	63.3	1,680	1.2 U	6 J	26.3	46.2	2.5 J	2,320	328	4.4 J	4.4 J	1.4 U
FLUORANTHENE	206-44-0	µg/kg	-	32.2 U	533 U	2.7 J	10.8	18.5 U	25	8.3	669 U	187	5.9	5.7 J	3.8 J
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	-	202	5,700	3.1 J	25.9	92.3	153	7.6	6,950	1,140	16.1	19.7	3.8 J
PYRENE	129-00-0	µg/kg	-	27 J	416 J	2.1 U	7.4 J	13.6 J	16.2 J	5.5 J	1,200	211	4.6 J	4.4 J	2.9 J
Total High Molecular Weight PAHs [b]		µg/kg	18,000[c]	1,226	25,306	19.9	119	418	686	80.4	37,277	5,842	91.3	91.7	26.7
TOTAL PAH[b]	-	ug/Kg	-	1,513	28,457	31	188	510	867	116	41,912	6,861	119	133	40
Wet Chemistry															
Moisture	-	%	-	38.7	30.5	35.1	30.2	35.9	29.7	41.4	30.5	27	35.5	28.5	42.5
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	-	45,700	19,000	30,100	12,200	15,100	14,500	29,700	34,500	24,800	18,400	11,000	37,500

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] EPA Region 5, Resource Conservation Recovery Act Ecological Screening Levels (ESL), August 2003

[b] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

[c] EPA Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs), June 2007, for the protection of soil invertebrates.

Shading represents cases where the sample result is greater than the screening level.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CF = Floodplain; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 6

Analytical Results and Exceedance of Metals, PAHs, and PCP in Floodplain Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Region 5 Soil ESL[a]	CF-06-A-0.5/1.8 6/25/2014	CF-06-B-0.0/0.6 6/26/2014	CF-06-D-0.0/0.8 6/25/2014	CF-07-A-0.0/0.8 6/26/2014	CF-07-B-0.0/0.7 6/23/2014	CF-08-D-0.0/0.7 6/26/2014	CF-09-A-0.0/0.8 6/25/2014	CF-10-B-0.0/0.5 6/25/2014	CF-10-B-0.5/1.3 6/25/2014	FP-01-0.0/0.5 6/26/2014	FP-01-0.5/1.2 6/26/2014
Metals														
ARSENIC	7440-38-2	mg/kg	5.7	3.5	3.2	5.3	4.5	4.8	3.6	4.6	4.7	5.6	3.3 J	4
BARIUM	7440-39-3	mg/kg	1.04	163	174	163 J	141	165	126	126	137	139	191	157
CADMIUM	7440-43-9	mg/kg	0.00222	0.25 J	0.14 J	0.23 J	0.25 J	0.25 J	0.23 J	0.2 J	0.25 J	0.25 J	0.21 J	0.2 J
CHROMIUM	7440-47-3	mg/kg	0.4	47.9	48.4	43.9	38.1	43.4	35.1	35.5	38.6	37.5	51.9	44
COPPER	7440-50-8	mg/kg	5.4	38.4	42.9	37.4	37.8	39.3	33.4	31.2	34.1	33.6	46.3	41.1
LEAD	7439-92-1	mg/kg	0.0537	10.3	13.6	12.2	9.6	14.4	9.8	10.3	12.6	12.4	12.1	11.2
MERCURY	7439-97-6	mg/kg	0.1	0.038	0.046	0.047	0.04	0.047	0.044	0.037	0.045	0.038	0.055	0.059
NICKEL	7440-02-0	mg/kg	13.6	37.9	39	35.6	32.1	36.3	29.3	29.1	31.6	30.7	42.3	36.7
SELENIUM	7782-49-2	mg/kg	0.0276	0.97 U	1.1 U	1.1 U	0.99 U	1 U	1 U	0.95 U	0.92 U	0.87 U	1.3 U	1 U
SILVER	7440-22-4	mg/kg	4.04	0.35 U	0.4 U	0.4 U	0.36 U	0.37 U	0.36 U	0.34 U	0.33 U	0.32 U	0.48 U	0.37 U
ZINC	7440-66-6	mg/kg	6.62	78.4	94.5	86.2	77.5	87	72.7	66.5	76.4	78.2	110	90.9
SVOC SIM														
PENTACHLOROPHENOL	87-86-5	µg/kg	119	29 U	29 UJ	28.2 UJ	27.4 U	28 UJ	26.7 U	27 U	27.9 U	25.8 U	34.9 U	1,200 U
PAH SIM														
2-METHYLNAPHTHALENE	91-57-6	µg/kg	-	3.1 U	3.1 U	3 U	2.9 U	3 U	3.1 J	2.9 U	3 U	7.8 J	3.7 U	128 U
ACENAPHTHENE	83-32-9	µg/kg	-	1.8 U	1.8 U	1.8 U	1.7 U	1.8 U	1.7 U	2.5 J	1.7 U	1.6 U	2.2 U	75.4 U
ACENAPHTHYLENE	208-96-8	µg/kg	-	3.3 J	2.4 J	5.8	4 J	1.6 U	3.5 J	1.5 U	1.5 U	2.8 J	3.6 J	216
ANTHRACENE	120-12-7	µg/kg	-	5.1	5.4	7.5	6.3	2.3 U	4.9	3.8 J	2.3 J	3.9 J	5.3 J	345
FLUORENE	86-73-7	µg/kg	-	2 U	2 U	2 U	1.9 U	2 U	1.9 U	2.6 J	1.9 U	1.8 U	2.4 U	84 U
NAPHTHALENE	91-20-3	µg/kg	-	5.8 J	8 J	7 J	8 J	4 U	8.5 J	5.2 J	5.2 J	12.4	8 J	172 U
PHENANTHRENE	85-01-8	µg/kg	-	2.8 J	4.4 J	5.4	6	3.6 U	4.8	8.3	5.3	9.3	3.9 J	81 U
Total Low Molecular Weight PAHs [b]		µg/kg	29,000[c]	20.5	23.7	29.1	27.6	9.2	26.6	24.6	16.9	37.9	25.0	831
Benzo[a]anthracene	56-55-3	µg/kg	-	1.8 J	2.3 J	2.7 J	2.7 J	1.9 J	3.2 J	1.3 J	1.6 J	4.1 J	2.4 J	61 J
BENZO(A)PYRENE	50-32-8	µg/kg	-	6	2.9 J	5.2	3.5 J	2.3 J	4.1 J	1.8 U	1.9 U	4.6	5.1 J	1,040
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	-	5.5	3.8 J	6.9	6.4	3.8 J	6	2 J	3 J	9.6	7.9	624
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	-	16.4	9.8 J	15.7	11.4	2.7 J	10.7	2 J	2.4 J	6.6	11.1	1,430
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	-	2.9 J	2.3 J	3.6 J	2.9 J	2.2 J	3.2 J	1.9 U	1.9 U	4.2 J	3.4 J	237
CHRYSENE	218-01-9	µg/kg	-	2.8 J	6.7	4.4 J	6.5	4.3 J	6.7	2.5 J	3.9 J	8.9	8.1	113 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	-	3.4 J	1.4 J	3.1 J	1.9 J	1.1 U	2.2 J	1.1 U	1.1 U	1.9 J	2.4 J	380
FLUORANTHENE	206-44-0	µg/kg	-	3.3 J	4.2 J	6	6.6	5.7 U	6.7	6.9	5.4	9.2	5.4 J	73.1 J
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	-	13.3	6.1 J	12.6	8.5	2.1 J	8.3	1.6 J	1.9 J	5.3	8.5	1,330
PYRENE	129-00-0	µg/kg	-	2.6 J	3.4 J	4.3 J	4.7	3.9 J	5.2	4.4 J	3.7 J	6.4	4.2 J	84.6 U
Total High Molecular Weight PAHs [b]		µg/kg	18,000[c]	58.0	42.9	64.5	55.1	26.6	56.3	23.1	24.4	60.8	58.5	5,330
TOTAL PAH[b]	-	ug/Kg	-	78	67	94	83	36	83	48	41	99	83	6,162
Wet Chemistry														
Moisture	-	%	-	32.2	32.3	30.5	28.5	29.9	26.5	27.4	29.6	23.9	43.7	34.8
TOTAL ORGANIC CARBON (TOC)	-	mg/kg	-	16,000	22,200 J	21,400	23,600	18,100	15,000	17,900	24,200	6,620	38,100	26,900

Notes:

Analytical results are reported on a dry-weight basis; Results presented are not TOC-Normalized.

[a] EPA Region 5, Resource Conservation Recovery Act Ecological Screening Levels (ESL), August 2003

[b] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs.

[c] EPA Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs), June 2007, for the protection of soil invertebrates.

Shading represents cases where the sample result is greater than the screening level.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CF = Floodplain; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-001-A-0.0/0.8 6/25/2014	CC-001-A1-0.0/0.5 6/26/2014	CC-002-A-0.0/0.5 6/25/2014	CC-002-A-0.5/1.4 6/25/2014	CC-003-C-0.0/0.5 6/22/2014	CC-003-C-0.5/1.3 6/22/2014	CC-004-A-0.0/0.5 6/22/2014	CC-004-A-0.5/1.8 6/22/2014	CC-005-B-0.0/0.5 6/22/2014	CC-005-B-0.5/1.3 6/22/2014	CC-006-A-0.0/0.5 6/22/2014	CC-006-A-0.5/1.3 6/22/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	3.5	2.8 J	3.6	5	2.8	3.2	3.6	4.2	3.8	3.4	4.4	3.8
BARIUM	7440-39-3	mg/Kg	-	-	176	193	162	143	89.9	178	126	139	155	170	159	154
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.13 J	0.2 J	0.096 U	0.14 J	0.083 U	0.1 J	0.094 U	0.095 J	0.092 U	0.088 U	0.13 J	0.12 J
CHROMIUM	7440-47-3	mg/Kg	43	110	**50.3**	**53.7**	**45.4**	39.9	29.3	**49.7**	36.9	36.7	41.9	**44.9**	41.9	42.5
COPPER	7440-50-8	mg/Kg	32	150	**37.6**	**41.5**	**35.5**	**34**	24.4	**35.6**	**37.1**	**32.8**	**33.5**	**33.8**	**33.5**	31.5
LEAD	7439-92-1	mg/Kg	36	130	10.9	12.1	10.5	9.5	8.5	11.4	10.4	9.1	10.2	10.5	10.1	9.9
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.036	0.032	0.031	0.034	0.031	0.038	0.074	0.032	0.037	0.034	0.041	0.034
NICKEL	7440-02-0	mg/Kg	23	49	**39.3**	**40.7**	**35.2**	**33.1**	**26.8**	**39.7**	**29.3**	**31.1**	**34.8**	**36**	**34.6**	**34.6**
SELENIUM	7782-49-2	mg/Kg	-	-	0.97 U	1.1 U	1.1 U	1 U	0.97 U	0.99 U	1.1 U	0.96 U	1.1 U	1 U	1.1 U	0.92 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.35 U	0.4 U	0.4 U	0.37 U	0.35 U	0.36 U	0.39 U	0.35 U	0.45 J	0.37 U	0.38 U	0.33 U
ZINC	7440-66-6	mg/Kg	120	460	80.2	88.1	90.2	71.3	59	81.3	91.7	65.4	80.1	75.1	75.2	74.2
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	3.0 UJ	9.4 J	**2,675 U**	**20.9 U**	**3,894 J**	**6,431 J**	**124 U**	**6,767 J**	**1,319 U**	**3,034 J**	**116 U**	**97.4 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**16.6 J**	**18.6**	**4,145 J**	**50.5**	**5,923**	**9,722**	**169 J**	**10,240**	**5,617**	**8,283**	**225**	**188**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	2.5 J	3.5 U	**1,402 U**	**10.9 U**	**1,529 U**	**2,181 U**	**124 J**	**1,627 U**	**689 U**	**1,339 U**	**60.8 U**	**51.1 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	4.7 J	9.8 J	**3,385 J**	21.8 J	**2,558 J**	**2,576 J**	**301**	**2,628 J**	**3,255**	**2,893 J**	**62.7 J**	43.6 U
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	3.1 J	13.4	**3,137 J**	35.1	**1,250 U**	**1,778 U**	**123 J**	**1,387 J**	**2,260**	**1,335 J**	49.6 U	41.6 U
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	7.6 J	6.2 J	**1,718 U**	16.2 J	**1,885 U**	**2,681 U**	**670**	**1,992 U**	**1,162 J**	**1,644 U**	74.8 U	62.8 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	8.0 J	4.9 J	**1,821 J**	19.4 J	**1,625 U**	**2,319 U**	**612**	**1,721 U**	**1,298 J**	**1,425 U**	64.7 U	54.3 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	6.5 J	6.5 J	**1,308 U**	10.3 U	**1,433 U**	**2,042 U**	**647**	**1,522 U**	**647 U**	**1,253 U**	56.9 U	47.8 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	4.8 J	7.0 J	**1,735 U**	15.6 J	**1,894 U**	**2,701 U**	**438**	**2,013 U**	**1,221 J**	**1,657 U**	75.5 U	63.2 U
CHRYSENE	218-01-9	µg/kg	166	1,290	5.3 J	37.6 J	**2,709 J**	25.3 J	**1,288 U**	**1,840 U**	**347**	**1,366 U**	**2,660**	**1,433 J**	51.3 U	43.1 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	1.9 J	2.6 U	**1,026 U**	8.0 U	**1,125 U**	**1,597 U**	**153 J**	**1,189 U**	**506 U**	**983 U**	**44.6 U**	**37.4 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	12.7 J	11.8	**13,504**	137	**6,125**	**11,875**	317	**11,053**	**12,979**	**9,742**	157 J	146 J
FLUORENE	86-73-7	µg/kg	77.4	536	7.8 J	9.9 J	**3,068 J**	34.6	**4,481 J**	**7,361**	**121 J**	**7,320**	**4,596**	**6,309**	**143 J**	**139 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	5.9 J	5.7 J	**923 U**	7.2 U	**1,010 U**	**1,438 U**	**542**	**1,074 U**	**455 U**	**884 U**	40.1 U	33.7 U
NAPHTHALENE	91-20-3	µg/kg	176	561	26.0 J	19.2 J	**3,598 U**	**201**	**16,538**	**25,972**	**734**	**44,630**	**8,851**	**18,197**	156 U	131 U
PHENANTHRENE	85-01-8	µg/kg	204	1,170	9.0 J	11.9	**11,538**	118	**13,077**	**22,778**	**292**	**23,775**	**15,702**	**19,957**	**408**	**365**
PYRENE	129-00-0	µg/kg	195	1,520	5.2 J	8.4 J	**9,573**	98.6	**3,750 J**	**6,660**	195 J	**6,590**	**7,404**	**5,923**	101 J	90.1 J
TOTAL PAH[c]	-	µg/kg	1,610	22,800	129	183	**60,073**	801	**62,865**	**102,663**	**5,847**	**120,641**	**68,813**	**81,700**	1,492	1,282
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	28.4 U	64.5 UJ	**25,214 U**	**197 U**	**27,500 U**	**39,236 U**	**1,170 U**	**29,197 U**	**12,426 U**	**24,077 U**	**1,094 U**	**921 U**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-007-C-0.0/0.5 6/23/2014	CC-007-C-0.5/1.6 6/23/2014	CC-008-C-0.0/0.5 6/23/2014	CC-008-C-0.5/2.3 6/23/2014	CC-009-C-0.0/0.5 6/23/2014	CC-009-C-0.5/1.3 6/23/2014	CC-010-A-0.0/0.8 6/23/2014	CC-010-A-0.8/1.9 6/23/2014	CC-011-A-0.0/0.5 6/23/2014	CC-011-A-0.5/1.2 6/23/2014	CC-012-C-0.0/0.6 6/23/2014	CC-013-C-0.0/0.5 6/23/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	4.1	4	3.7	4.2	4.3	3.5	5	3.8	3.9	3.8	3.5	4.4
BARIUM	7440-39-3	mg/Kg	-	-	168	147	138	138	123	133	132	162	153	162	170	150
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.096 U	0.083 U	0.087 U	0.11 J	0.1 J	0.14 J	0.087 U	0.086 U	0.11 J	0.11 J	0.098 U	0.086 U
CHROMIUM	7440-47-3	mg/Kg	43	110	**45.6**	41.9	37.9	36.9	34.5	36.9	37.3	**44.6**	41.6	**43.6**	**50.5**	40.8
COPPER	7440-50-8	mg/Kg	32	150	**37**	**35**	**32.7**	**33.1**	30.8	**34.1**	**35.6**	**32.3**	**34.5**	**34.8**	**34.3**	**35.1**
LEAD	7439-92-1	mg/Kg	36	130	12.6	11.1	10.4	9.5	9.1	9.3	8.8	10.6	10.3	10.6	11.8	11.7
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.057	0.045	0.04	0.036	0.031	0.029	0.039	0.038	0.041	0.037	0.035	0.078
NICKEL	7440-02-0	mg/Kg	23	49	**36.9**	**33.8**	**32.3**	**31.7**	**30**	**30.8**	**30.9**	**35.3**	**33.3**	**35.8**	**40.8**	**34.8**
SELENIUM	7782-49-2	mg/Kg	-	-	1.1 U	0.97 U	1 U	1.1 U	0.96 U	0.95 U	1 U	1 U	1.1 U	1 U	1.1 U	1 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.4 U	0.35 U	0.36 U	0.4 U	0.35 U	0.34 U	0.36 U	0.36 U	0.39 U	0.37 U	0.41 U	0.36 U
ZINC	7440-66-6	mg/Kg	120	460	90.4	83.9	78.3	70.9	64	64.6	67.3	74.9	75	75	84.4	83.5
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**164 U**	**116 U**	**928 U**	3.6 U	**56.8 U**	3.5 U	**874 U**	**49.3 J**	**630 U**	16.9 U	**31.6 U**	**709 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**301**	**228**	**1,434 J**	**6.9**	**33.6 U**	2.6 J	**1,374 J**	**174 J**	**973 J**	**15.2 J**	**40.7 J**	**1,032 J**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**86.0 U**	**60.7 U**	**486 U**	1.9 U	**29.7 U**	1.8 U	**458 U**	**20.4 U**	**331 U**	**8.9 U**	**16.5 U**	**372 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	**156 J**	**73.6 J**	**3,843**	1.7 U	42.9 J	1.5 U	**3,497**	36.8 J	**1,550**	11.3 J	37.6 J	**1,632**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	**125 J**	85.6 J	**1,229 J**	1.6 U	43.1 J	1.5 U	**1,080 J**	55.0 J	**947 J**	17.6 J	79.9	**1,000 J**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	106 U	74.7 U	**777 J**	2.4 U	36.6 U	2.2 U	**608 J**	25.2 U	**454 J**	11.7 J	80.6	**655 J**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	91.2 U	64.6 U	**880 J**	2.1 U	31.7 U	1.8 U	**664 J**	26.0 J	**492 J**	15.3 J	70.1	**673 J**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	80.3 U	56.8 U	**454 U**	1.8 U	27.8 U	1.7 U	**430 U**	19.1 U	**310 U**	8.3 U	55.6	**349 U**
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	106 U	75.1 U	**765 J**	2.4 U	36.8 U	2.2 U	**608 J**	25.3 U	**523 J**	13.2 J	66.2	**641 J**
CHRYSENE	218-01-9	µg/kg	166	1,290	123 J	61.9 J	**1,169 J**	1.6 U	35.4 J	1.5 U	**1,531**	45.4 J	**1,431**	15.3 J	85.8	**1,750**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	**63.2 U**	**44.6 U**	**356 U**	1.5 U	21.8 U	1.4 U	**336 U**	15.0 U	**243 U**	6.5 U	15.8 J	**273 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	**653**	**442**	**5,657**	4.0 J	247	1.7 U	**5,455**	213	**4,198**	79.0	328	**4,436**
FLUORENE	86-73-7	µg/kg	77.4	536	**225 J**	**156 J**	**1,524**	5.0 J	37.4 U	2.2 U	**1,423**	**95.6**	**844 J**	11.1 U	28.6 J	**995 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	56.5 U	40.1 U	**320 U**	1.3 U	19.6 U	1.2 U	**303 U**	13.5 U	**219 U**	5.9 U	48.5 J	**250 J**
NAPHTHALENE	91-20-3	µg/kg	176	561	**221 U**	155 U	**1,247 U**	5.0 U	76.4 U	4.6 U	**1,178 U**	52.5 U	**851 U**	23.1 J	42.6 U	**955 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	**606**	**414**	**3,946**	7.5	183	3.0 J	**4,685**	139	**3,191**	45.0	114	**3,545**
PYRENE	129-00-0	µg/kg	195	1,520	**403**	**279**	**3,663**	2.9 J	151	2.2 U	**3,255**	144	**2,874**	54.5	**245**	**3,127**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	**3,078**	**2,084**	**26,781**	40	907	21	**25,972**	1,064	**18,769**	330	1,341	**21,065**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**1,544 U**	**1,089 U**	**8,735 U**	34.8 U	**535 U**	32.2 U	**8,252 U**	**368 U**	**5,954 U**	**159 U**	**298 U**	**6,682 U**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-013-C-0.5/1.2 6/23/2014	CC-014-B-0.0/0.5 6/23/2014	CC-014-B-0.5/1.3 6/23/2014	CC-015-A-0.0/0.5 6/23/2014	CC-015-A-0.5/1.7 6/23/2014	CC-016-C-0.0/0.5 6/24/2014	CC-016-C-0.5/1.3 6/24/2014	CC-017-A-0.0/0.5 6/24/2014	CC-017-A-0.5/1.3 6/24/2014	CC-018-C-0.0/0.5 6/24/2014	CC-018-C-0.5/2.0 6/24/2014	CC-019-C-0.0/0.5 6/24/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	3.7	4.2	4.1	4.5	4	3.8	4.1	4	3.9	4.7	3.8	5.1
BARIUM	7440-39-3	mg/Kg	-	-	154	153	153	133	107	101	125	125	125	143	126	140
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.13 J	0.089 U	0.17 J	0.13 J	0.1 J	0.15 J	0.16 J	0.11 J	0.13 J	0.091 U	0.12 J	0.12 J
CHROMIUM	7440-47-3	mg/Kg	43	110	**43.1**	40.5	41.3	33.4	26.4	26.8	33.4	34.1	32.5	38.1	33.4	37.7
COPPER	7440-50-8	mg/Kg	32	150	**37.7**	**33.9**	**32.4**	30.7	26.6	25.8	28.3	29.9	27.6	**34.2**	28.7	**35.4**
LEAD	7439-92-1	mg/Kg	36	130	10.6	10.6	10.3	8.7	7.6	7.2	8.6	9.6	8.4	10.3	8.3	11.1
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.038	0.042	0.037	0.033	0.028	0.026	0.034	0.036	0.077	0.091	0.028	0.047
NICKEL	7440-02-0	mg/Kg	23	49	**36.3**	**34.9**	**34.3**	**30.9**	**23.3**	**23.5**	**29.3**	**30**	**27**	**33.4**	**28**	**32.4**
SELENIUM	7782-49-2	mg/Kg	-	-	0.93 U	1 U	0.95 U	1.1 U	0.92 U	0.98 U	0.96 U	1 U	1 U	1.1 U	1.1 U	1.2 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.34 U	0.38 U	0.4 J	0.4 J	0.33 U	0.35 U	0.35 U	0.38 U	0.36 U	0.38 U	0.38 U	0.42 U
ZINC	7440-66-6	mg/Kg	120	460	77.3	80.1	73.4	65.4	50.9	49.3	61.3	68.5	60.8	76.9	60.4	78.6
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**305 U**	**467 U**	14.2 U	**505 U**	2.8 U	2.7 U	2.1 U	**354 U**	**60.9**	**395 U**	**521 U**	**534 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**738**	**864**	**19.9 J**	**547 J**	3.1 J	1.6 U	1.2 U	**362 J**	**162**	**431 J**	**973**	**550 J**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**160 U**	**245 U**	**7.4 U**	**264 U**	1.4 U	1.4 U	1.1 U	**186 U**	**9.7 U**	**207 U**	**273 U**	**280 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	**1,277**	**757**	13.9 J	**772 J**	5.5	1.2 U	0.9 U	**348 J**	8.3 U	**549 J**	**1,391**	**2,869**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	**770**	**882**	18.8 J	**596 J**	1.3 U	1.1 U	0.9 U	**385 J**	7.9 U	**350 J**	**457 J**	**907**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	**489**	**520 J**	11.8 J	**326 U**	1.8 U	1.8 U	1.4 U	**320 J**	12.0 U	**254 U**	**335 U**	**409 J**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	**571**	**578 J**	12.7 J	**343 J**	1.5 U	1.5 U	1.2 U	**337 J**	10.4 U	**250 J**	**317 J**	**466 J**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	**217 J**	**239 J**	7.0 J	**248 U**	1.3 U	1.3 U	1.0 U	**211 J**	9.1 U	**194 U**	**255 U**	**262 U**
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	**471 J**	**563 J**	11.5 J	**350 J**	1.8 U	1.8 U	1.4 U	**280 J**	12.1 U	**256 U**	**338 U**	**463 J**
CHRYSENE	218-01-9	µg/kg	166	1,290	**1,267**	**917**	15.1 J	**835**	1.3 J	1.2 J	0.9 U	**458 J**	8.2 U	**618 J**	**495 J**	**2,840**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	**117 U**	**180 U**	5.4 U	**194 U**	1.1 U	1.0 U	0.8 U	**136 U**	7.2 U	**152 U**	**200 U**	**205 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	**3,319**	**3,462**	87.3	**2,488**	8.4	1.9 J	1.0 U	**1,555**	11.2 J	**1,490**	**2,118**	**3,387**
FLUORENE	86-73-7	µg/kg	77.4	536	**644**	**669 J**	16.3 J	**488 J**	3.2 J	1.8 U	1.4 U	**252 J**	**82.1**	**337 J**	**927**	**553 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	**207 J**	**232 J**	6.3 J	175 U	1.0 U	0.9 U	0.7 U	185 J	6.4 U	137 U	180 U	185 U
NAPHTHALENE	91-20-3	µg/kg	176	561	**410 U**	**627 U**	19.1 U	**680 U**	3.8 U	3.7 U	9.6	**477 U**	31.6 J	**534 U**	**702 U**	**719 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	**2,414**	**2,438**	62.9	**1,884**	8.5	1.7 U	2.2 J	**1,038**	57.8	**1,201**	**2,691**	**2,121**
PYRENE	129-00-0	µg/kg	195	1,520	**2,063**	**2,456**	61.5	**1,752**	5.5	1.8 U	1.4 U	**1,104**	12.4 U	**1,029**	**1,400**	**2,339**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	**14,943**	**15,335**	368	**11,252**	44	16	21	**7,412**	458	**7,321**	**12,172**	**17,996**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**2,874 UJ**	**4,408 U**	134 U	**4,769 U**	26.5 U	25.6 U	20.0 U	**3,341 U**	**176 U**	**3,725 U**	**4,918 U**	**5,048 U**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7
Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-019-C-0.5/1.9 6/24/2014	CC-020-A-0.0/0.5 6/24/2014	CC-020-A-0.5/1.8 6/24/2014	CC-021-C-0.0/0.5 6/25/2014	CC-021-C-0.5/2.0 6/25/2014	CC-021-C-2.0/3.0 6/25/2014	CC-021-C-3.0/3.6 6/25/2014	CC-022-A-0.0/0.8 6/25/2014	CC-023-A-0.0/0.5 6/25/2014	CC-023-A-0.5/2.1 6/25/2014	CC-024-A-0.0/0.5 6/25/2014	CC-024-A-0.5/2.0 6/25/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	4	4.4	4.2	2.6 J	3	3.3	3.3	4	3.9	4.1	4.3	4.5
BARIUM	7440-39-3	mg/Kg	-	-	105	135	111	74.7	71.3	71.1	70.1	125	112	120	110	115
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.1 J	0.11 J	0.15 J	0.12 J	0.12 J	0.1 J	0.077 U	0.18 J	0.19 J	0.15 J	0.13 J	0.12 J
CHROMIUM	7440-47-3	mg/Kg	43	110	28.4	36	27.9	18.8	17.8	18.7	18.4	33.2	30.2	31.6	28	28.4
COPPER	7440-50-8	mg/Kg	32	150	26.6	**33.6**	26.9	18.5	18.5	18.6	17.8	28.4	27.8	28.4	26.9	28.3
LEAD	7439-92-1	mg/Kg	36	130	7.6	9.9	7.3	5.7	5.5	5.7	5.7	7.9	8.2	7.5	8	7.9
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.029	0.035	0.026	0.016	0.013	0.014	0.013	0.033	0.037	0.028	0.04	0.032
NICKEL	7440-02-0	mg/Kg	23	49	**24.6**	**31.8**	**24**	17.6	16.8	17.8	16.5	**27.2**	**26.6**	**26.5**	**24.2**	**24.1**
SELENIUM	7782-49-2	mg/Kg	-	-	0.93 U	1.1 U	1.1 U	1 U	0.83 U	0.88 U	0.9 U	1.1 U	1 U	0.85 U	1.1 U	1 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.33 U	0.39 U	0.39 U	0.37 U	0.3 U	0.32 U	0.32 U	0.38 U	0.37 U	0.31 U	0.38 U	0.37 U
ZINC	7440-66-6	mg/Kg	120	460	51.8	70.3	49.9	34.1	31.2	32.5	32.5	61.9	57	52.9	54.1	54
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**56.4**	**947 U**	**233 U**	20.2 U	8.0 U	5.8 U	5.0 U	10.2 J	**1,910 U**	**218 J**	**49.9 U**	**117 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**73.5**	**976 J**	**145 U**	**15.5 J**	4.6 U	3.3 U	2.9 U	**8.5**	**3,249**	**356**	**72.0 J**	**175 J**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	5.1 U	**498 U**	**122 U**	**10.4 U**	4.0 U	3.1 U	2.7 U	2.2 U	**1,000 U**	**40.8 U**	**26.2 U**	**61.3 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	4.4 U	**1,435 J**	**880**	**68.5**	3.4 U	2.7 U	2.3 U	8.1	**3,422**	**70.0 J**	**213**	**135 J**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	4.2 U	**1,706**	**270 J**	38.2	3.4 U	2.4 U	2.1 U	1.8 U	**2,718 J**	38.8 J	**120**	96.9 J
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	6.3 U	**876 J**	150 U	57.7	5.3 U	3.8 U	3.3 U	2.7 U	**1,229 U**	50.1 U	116	75.4 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	5.4 U	**1,065 J**	138 J	56.5	4.3 U	3.3 U	2.7 U	2.3 U	**1,272 J**	43.4 U	127	65.2 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	4.8 U	**465 U**	114 U	53.0	4.0 U	2.9 U	2.5 U	2.1 U	**937 U**	38.2 U	69.1 J	57.4 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	6.3 U	**1,041 J**	151 U	43.2	5.3 U	3.8 U	3.3 U	2.7 U	**1,239 U**	50.6 U	97.7	75.9 U
CHRYSENE	218-01-9	µg/kg	166	1,290	4.3 U	**1,682**	**1,032**	88.0	3.4 U	2.7 U	2.1 U	10.8	**2,821 J**	34.5 U	**260**	97.7 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	3.7 U	**365 U**	**89.6 U**	14.2 J	3.1 U	2.2 U	1.9 U	1.6 U	**734 U**	29.9 U	22.0 J	**45.0 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	9.0 J	**7,176**	**625**	112	4.0 U	2.9 U	2.5 U	7.3	**14,120**	299	386	**487**
FLUORENE	86-73-7	µg/kg	77.4	536	26.2	**918 J**	**153 U**	17.4 J	5.3 U	3.8 U	3.3 U	2.7 U	**3,027 J**	**214**	51.6 J	**144 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	3.4 U	**329 U**	80.8 U	45.7	2.8 U	2.0 U	1.7 U	1.5 U	**661 U**	27.0 U	62.0 J	40.5 U
NAPHTHALENE	91-20-3	µg/kg	176	561	21.7 J	**1,276 U**	**313 U**	27.1 U	10.8 U	7.8 U	6.7 U	8.6 J	**2,571 U**	105 U	67.3 U	158 U
PHENANTHRENE	85-01-8	µg/kg	204	1,170	13.1 J	**3,776**	**420**	57.1	5.0 U	3.8 U	3.1 U	4.1 J	**13,156**	**543 J**	177	**398**
PYRENE	129-00-0	µg/kg	195	1,520	6.4 U	**4,882**	**446**	77.3	5.3 U	3.8 U	3.3 U	4.8 J	**9,668**	**210**	**282**	**335**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	227	**27,476**	**4,585**	773	41 U	30 U	26 U	72	**58,593**	**2,159**	**2,128**	**2,217**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	92.1 U	**8,941 U**	**2,192 UJ**	**190 U**	75.2 U	54.8 UJ	46.9 UJ	39.5 U	**18,007 U**	**734 U**	**471 UJ**	**1,100 UJ**

Notes:
[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.
[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.
[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.
Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.
Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7
Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-024-A-2.0/3.0 6/25/2014	CC-024-A-3.0/3.6 6/25/2014	CC-025-C-0.0/0.5 6/26/2014	CC-025-C-0.5/2.0 6/26/2014	CC-025-C-2.0/3.0 6/26/2014	CC-025-C-3.0/4.0 6/26/2014	CC-026-C-0.0/0.5 6/24/2014	CC-026-C-0.5/2.0 6/24/2014	CC-026-C-2.0/3.3 6/24/2014	CC-027-A-0.0/0.5 6/25/2014	CC-027-A-0.5/1.9 6/25/2014	CC-028-B-0.0/0.5 6/25/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	4.2	4.1	5.1	4.2	3.5	3.4	5.1	4	4.6	4.4	3.9	2.7
BARIUM	7440-39-3	mg/Kg	-	-	109	132	136	118	115	109	139	104	116	111	115	58.3
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.095 J	0.17 J	0.15 J	0.12 J	0.13 J	0.14 J	0.19 J	0.16 J	0.23 J	0.17 J	0.13 J	0.11 J
CHROMIUM	7440-47-3	mg/Kg	43	110	27.4	34	32.7	29.6	28.4	26.2	31.2	24.3	28.1	26.7	30.2	15
COPPER	7440-50-8	mg/Kg	32	150	25.9	29.5	**32.2**	26.9	25.5	26.1	31.4	27.1	26	26	26.2	13.2
LEAD	7439-92-1	mg/Kg	36	130	7.3	8.6	8.5	7.4	7	7.2	8.9	6.7	7.3	7.4	7.5	4
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.028	0.032	0.034	0.031	0.028	0.027	0.037	0.029	0.031	0.029	0.023	0.017
NICKEL	7440-02-0	mg/Kg	23	49	**24**	**28.8**	**28.2**	**26.4**	**24.3**	**24.1**	**27.9**	22.7	**24.8**	22.7	**25.3**	12.4
SELENIUM	7782-49-2	mg/Kg	-	-	0.99 U	1 U	1.3 U	1 U	0.97 U	0.88 U	1.1 U	0.94 U	0.95 U	1.2 U	0.9 U	0.98 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.36 U	0.38 U	0.47 U	0.37 U	0.35 U	0.32 U	0.41 J	0.34 U	0.34 U	0.42 U	0.32 U	0.35 U
ZINC	7440-66-6	mg/Kg	120	460	51.6	61.9	63	54.6	51.9	47.1	62.6	45.2	53.4	48.6	48.9	26.3
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	2.4 U	2.4 U	3.6 U	8.0 U	2.8 U	4.7 U	7.2 J	**55.8**	1.7 U	4.7 U	5.2 U	**276 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	2.2 J	1.4 U	4.3 J	**61.9**	1.6 U	2.8 U	**33.1**	**146**	1.0 U	2.9 J	3.1 U	**261 J**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	1.3 U	1.3 U	1.9 U	4.3 U	1.4 U	2.5 U	2.3 U	**9.1 U**	0.9 U	2.5 U	2.7 U	**144 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	1.1 U	1.0 U	1.7 J	4.2 J	1.2 U	2.2 U	17.5	17.2 U	0.7 U	2.1 U	2.3 U	**206 J**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	1.1 U	1.0 U	4.1 J	3.5 U	1.2 U	2.0 U	10.2	7.4 U	0.7 U	2.1 U	2.1 U	**397 J**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	1.6 U	1.5 U	2.3 J	5.1 U	1.8 U	3.0 U	8.9	11.2 U	1.1 U	3.0 U	3.2 U	**233 J**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	1.3 U	1.3 U	2.8 J	4.4 U	1.5 U	2.7 U	11.1	9.7 U	1.0 U	2.6 U	2.9 U	**308 J**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	1.2 U	1.2 U	1.8 U	4.0 U	1.3 U	2.3 U	4.4 J	8.5 U	0.9 U	2.3 U	2.5 U	136 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	1.6 U	1.5 U	2.4 J	5.3 U	1.8 U	3.0 U	8.6	11.3 U	1.1 U	3.1 U	3.2 U	**252 J**
CHRYSENE	218-01-9	µg/kg	166	1,290	1.1 U	1.0 U	4.3 J	3.6 U	1.2 U	2.0 U	10.3	7.7 U	0.7 U	2.4 J	2.3 U	**355 J**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	0.9 U	0.9 U	1.4 U	3.0 U	1.0 U	1.8 U	1.7 U	6.7 U	0.6 U	1.8 U	1.9 U	**107 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	1.2 U	1.2 U	8.6	4.8 J	1.3 U	2.3 U	30.7	39.4	0.9 U	7.0 J	2.5 U	**1,443**
FLUORENE	86-73-7	µg/kg	77.4	536	1.6 U	1.6 U	2.4 U	31.6	1.8 U	3.0 U	18.1	**79.7**	1.1 U	3.1 U	3.4 U	**215 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	0.8 U	0.8 U	1.3 U	2.8 U	0.9 U	1.6 U	4.1 J	6.0 U	0.6 U	1.6 U	1.8 U	95.3 U
NAPHTHALENE	91-20-3	µg/kg	176	561	3.4 U	3.2 U	4.9 U	10.8 U	3.7 U	6.3 U	8.9 J	23.4 U	2.3 U	6.4 U	6.9 U	**372 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	1.8 J	1.5 U	5.1 J	25.9	2.1 J	3.0 U	29.4	159	1.1 U	6.7 J	3.2 U	**908**
PYRENE	129-00-0	µg/kg	195	1,520	1.7 U	1.6 U	6.3	5.4 U	1.9 U	3.2 U	20.4	24.6 J	1.1 U	4.9 J	3.4 U	**1,057**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	15	12 U	51	159	15	24 U	225	564	9 U	42	26 U	**6,199**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	23.4 UJ	22.2 UJ	34.2 UJ	76.0 UJ	26.1 UJ	44.0 UJ	41.9 UJ	**164 UJ**	16.1 UJ	44.6 U	48.3 U	**2,604 U**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7
Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CC-028-B-0.5/2.0 6/25/2014	CC-028-B-2.0/3.0 6/25/2014	CC-028-B-3.0/4.0 6/25/2014	CC-028-B-4.0/4.7 6/25/2014	CF-01-A-0.0/0.5 6/24/2014	CF-01-A-0.5/1.0 6/24/2014	CF-01-B-0.0/0.5 6/26/2014	CF-01-B-0.5/0.9 6/26/2014	CF-01-C-0.0/0.7 6/26/2014	CF-01-D-0.0/0.5 6/25/2014	CF-01-D-0.5/1.1 6/25/2014	CF-02-B-0.0/0.5 6/24/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	5.4	3.5	3.1	3.7	3.7	5.6	4.7	3.5	5.9	4.1	5.2	5.3
BARIUM	7440-39-3	mg/Kg	-	-	131	62.2	48.4	66.6	184	180	188	165	176	194	158	200
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.12 J	0.084 J	0.1 J	0.19 J	0.19 J	0.21 J	0.17 J	0.13 J	0.18 J	0.37 J	0.29 J	0.21 J
CHROMIUM	7440-47-3	mg/Kg	43	110	34.4	17.2	13.4	17.9	**51.1**	**49.5**	**53.9**	**47.4**	**51.1**	**53**	**45.1**	**57.1**
COPPER	7440-50-8	mg/Kg	32	150	**32.8**	14.7	12.1	15.7	**46.6**	**45.5**	**45.8**	**40**	**59.4**	**45.4**	**38.4**	**45.7**
LEAD	7439-92-1	mg/Kg	36	130	9.8	5.4	4.1	5.3	16.1	13.3	14.7	13.4	14.5	13.9	10.7	15.2
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.029	0.013	0.013	0.018	0.045	0.037	0.051	0.052	0.09	0.055	0.04	0.054
NICKEL	7440-02-0	mg/Kg	23	49	**30.3**	14.2	11.4	14.9	**41.3**	**40.9**	**44.4**	**38.7**	**42.9**	**41.6**	**37.6**	**42.9**
SELENIUM	7782-49-2	mg/Kg	-	-	0.89 U	0.89 U	0.87 U	0.88 U	1.1 U	1.1 U	1 U	0.97 U	1.1 U	1.1 U	1 U	1.2 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.32 U	0.32 U	0.31 U	0.32 U	0.41 U	0.39 U	0.37 U	0.35 U	0.39 U	0.41 U	0.37 U	0.43 U
ZINC	7440-66-6	mg/Kg	120	460	79.3	33.6	26.7	44.2	107	101	111	98.2	99.7	110	79.9	114
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**3,404 U**	**349 U**	**102 U**	**138 U**	1.7 U	**28.9 U**	7.9 U	**2,270 U**	**279 U**	1.0 U	**105 U**	1.0 U
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**9,503**	**986**	**359**	**240**	1.0 U	**17.1 U**	4.7 U	**1,341 U**	**165 U**	0.6 U	**62.3 U**	0.6 U
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**1,783 U**	**183 U**	**53.3 U**	**72.3 U**	2.8	**48.2**	**10.6 J**	**2,574 J**	**449**	1.0 J	**91.1 J**	1.1 J
ANTHRACENE	120-12-7	µg/kg	57.2	845	**8,385**	**569**	**210**	**169 J**	7.8	**105**	14.8	**8,333**	**642**	1.7	**102 J**	1.8
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	**7,453**	**485 J**	**137 J**	107 J	1.9 J	33.3 J	6.4 J	**1,881 J**	**233 J**	0.9 J	45.2 U	0.8 J
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	**3,205 J**	**225 U**	65.5 U	89.0 U	6.0	**257**	37.4	**23,296**	**2,206**	2.0	**309**	1.7
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	**3,696 J**	224 J	61.6 J	77.0 U	5.9	**254**	33.9	**18,778**	**1,835**	2.8	142 J	2.6
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	**1,671 U**	**171 U**	49.9 U	67.7 U	13.7	**297**	55.5	**13,778**	**2,665**	4.1	**558**	3.9
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	**3,447 J**	226 U	66.0 U	89.6 U	3.0	126	21.4	**13,111**	**1,183**	1.3 J	98.6 J	1.2 J
CHRYSENE	218-01-9	µg/kg	166	1,290	**6,708**	**476 J**	134 J	121 J	2.8	77.8	24.6	**10,185**	**541**	3.7	46.6 U	3.4
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	**1,311 U**	**134 U**	**39.2 U**	**53.1 U**	2.6 J	**81.9**	13.6	**4,704**	**683**	1.0 J	**135 J**	0.8 J
FLUORANTHENE	206-44-0	µg/kg	423	2,230	**37,391**	**2,737**	**812**	**659**	2.6 U	52.3 U	8.8 J	**2,674 J**	341 J	1.5 J	51.7 U	1.3 J
FLUORENE	86-73-7	µg/kg	77.4	536	**8,696**	**808**	**291**	**201 J**	1.1 U	19.1 U	5.2 U	**1,496 U**	**183 U**	0.7 U	69.5 U	0.7 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	**1,180 U**	121 U	35.2 U	47.8 U	11.7	**272**	44.7	**12,741**	**2,083**	3.1	**473**	3.1
NAPHTHALENE	91-20-3	µg/kg	176	561	**4,578 U**	**471 U**	137 U	**186 U**	3.2 J	111	10.7 U	**3,056 U**	**375 U**	2.7 J	142 U	1.8 J
PHENANTHRENE	85-01-8	µg/kg	204	1,170	**36,460**	**3,043**	**972**	**770**	2.0 U	53.1 U	5.0 U	**1,441 U**	177 U	1.1 J	66.8 U	0.8 J
PYRENE	129-00-0	µg/kg	195	1,520	**26,770**	**1,969**	**584**	**473**	2.1 J	37.5 J	7.2 J	**1,978 J**	**439 J**	1.2 J	69.9 U	1.1 J
TOTAL PAH[c]	-	µg/kg	1,610	22,800	**158,677**	**12,237**	**3,835**	**3,150**	68	**1,786**	296	**118,835**	**13,891**	29	**2,238**	26
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**32,112 U**	**3,299 U**	**962 U**	**1,297 U**	16.3 UJ	**273 UJ**	74.7 UJ	**21,407 UJ**	**2,628 UJ**	9.4 U	**993 U**	9.7 U

Notes:
[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.
[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.
[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.
Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.
Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CF-02-B-0.5/1.6 6/24/2014	CF-02-C-0.0/0.8 6/25/2014	CF-03-A-0.0/0.5 6/24/2014	CF-03-A-0.5/1.3 6/24/2014	CF-03-C-0.0/0.5 6/24/2014	CF-03-C-0.5/1.3 6/24/2014	CF-03-E-0.0/0.5 6/26/2014	CF-03-E-0.5/1.2 6/26/2014	CF-04-B-0.0/0.5 6/24/2014	CF-04-B-0.5/1.3 6/24/2014	CF-05-B-0.0/0.5 6/24/2014	CF-05-B-0.5/0.9 6/24/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	5.3	4.2	3.8	5.6	3.6	3.7	4.9	3.9	3.7	4.1	5.2	4.9
BARIUM	7440-39-3	mg/Kg	-	-	147	164	184	193	161	168	163	156	161	154	201	198
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.23 J	0.24 J	0.2 J	0.15 J	0.17 J	0.17 J	0.16 J	0.18 J	0.095 U	0.11 J	0.22 J	0.27 J
CHROMIUM	7440-47-3	mg/Kg	43	110	**45.1**	**46.6**	**50.7**	**50**	**44.1**	**49.2**	**45.7**	**43.1**	**45.6**	41.6	**51.8**	**47.1**
COPPER	7440-50-8	mg/Kg	32	150	**40**	**38.3**	**42.8**	**36.6**	**40.3**	**56.1**	**40.3**	**39.5**	**38.8**	**39.8**	**45.3**	**45.9**
LEAD	7439-92-1	mg/Kg	36	130	10.9	12.3	13.4	12 J	11.9	17.2	12.3	11.6	12.7	11.1	13.9	15.6
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.039	0.054	0.05	0.035	0.047	0.048	0.046	0.046	0.043	0.037	0.052	0.068
NICKEL	7440-02-0	mg/Kg	23	49	**36.9**	**36.4**	**40.4**	**42**	**36.8**	**38.3**	**38.6**	**36.7**	**37.4**	**36.2**	**44.3**	**39.9**
SELENIUM	7782-49-2	mg/Kg	-	-	1.1 U	0.98 U	1.1 U	1.1 U	1.1 U	0.97 U	1 U	1 U	1.1 U	0.94 U	1.3 U	1 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.41 U	0.36 U	0.41 U	0.4 U	0.4 U	0.35 U	0.38 U	0.36 U	0.4 J	0.34 U	0.46 U	0.36 U
ZINC	7440-66-6	mg/Kg	120	460	77.3	113	104	80.5	93	108	92	95.4	86.9	77.5	105	98.6
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	6.3 U	5.4 U	1.2 U	1.5 J	7.4 U	**315 U**	1.1 U	4.9 U	10.7 U	10.6 J	1.2 J	**173 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	3.7 U	3.2 U	0.7 U	0.8 U	4.4 U	**186 U**	0.6 U	3.0 J	6.4 U	6.1 U	0.7 U	**103 U**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	5.1 J	**11.0**	0.8 J	2.2 J	**12.6**	**611**	0.6 U	**8.4**	**14.9 J**	**19.7**	1.0 J	**391**
ANTHRACENE	120-12-7	µg/kg	57.2	845	8.4 J	19.8	3.3	4.6 J	34.1	**763 U**	0.8 J	14.0	25.7 U	29.6	4.1	**586**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	5.4 J	7.3 J	1.5 J	1.4 J	7.3 J	**189 J**	0.5 U	4.2 J	7.5 J	10.6 J	1.2 J	**163 J**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	33.2	20.9	1.7 J	2.5	37.6	**2,132**	0.7 U	6.6 J	40.4	67.8	2.4	**2,388**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	39.2	21.8	2.9	4.4 J	30.4	**1,658**	0.9 J	10.4	29.8	60.3	3.4	**1,435**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	24.6	50.7	2.0	8.1 J	55.6	**3,747**	1.4 J	24.8	72.2	121	3.5	**2,241**
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	23.8	13.9	1.7 J	2.1 J	20.1	**932**	0.7 U	4.8 J	16.7 J	27.0	1.9 J	**757**
CHRYSENE	218-01-9	µg/kg	166	1,290	18.9	31.5	5.6	2.5	49.7	**418 J**	0.9 J	5.7 J	16.7 J	20.2	6.7	**690**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	6.9 J	10.9	0.6 J	1.7 J	13.9	**884**	0.4 U	4.9 J	17.4	31.9	0.8 J	**672**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	4.4 J	10.4	3.2	2.8	7.0 U	281 U	0.9 J	8.9	12.3 U	17.2 U	2.8	194 U
FLUORENE	86-73-7	µg/kg	77.4	536	4.2 U	3.5 U	0.8 U	0.9 U	4.9 U	**207 U**	0.7 U	5.1 J	7.1 U	6.9 U	0.8 U	**114 U**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	21.7	37.2	1.7 J	6.7 J	44.2	**3,000**	1.0 J	21.2	61.1	106	2.6	**2,014**
NAPHTHALENE	91-20-3	µg/kg	176	561	8.9 J	13.7 J	1.9 J	4.5 J	10.0 U	**424 U**	1.4 U	11.3 J	16.8 J	60.1	3.8 J	**233 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	4.0 U	6.9 J	1.3 U	2.5	5.4 U	200 U	0.7 J	12.0	8.1 U	14.3 U	2.1 U	110 U
PYRENE	129-00-0	µg/kg	195	1,520	4.2 U	9.1	2.5	2.3	5.9 J	**219 J**	0.7 U	6.1 J	9.0 J	11.2 J	1.9 J	**348**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	212	271	31	51	331	**14,977**	10	154	338	598	39	**12,148**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	59.4 U	50.7 U	11.3 UJ	13.5 UJ	70.0 UJ	**2,974 UJ**	10.0 UJ	46.1 U	101 UJ	96.6 UJ	11.3 UJ	**1,635 UJ**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7
Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CF-05-C-0.0/0.6 6/26/2014	CF-05-D-0.0/0.5 6/25/2014	CF-05-D-0.5/0.9 6/25/2014	CF-06-A-0.0/0.5 6/25/2014	CF-06-A-0.5/1.8 6/25/2014	CF-06-B-0.0/0.6 6/26/2014	CF-06-D-0.0/0.8 6/25/2014	CF-07-A-0.0/0.8 6/26/2014	CF-07-B-0.0/0.7 6/23/2014	CF-08-D-0.0/0.7 6/26/2014	CF-09-A-0.0/0.8 6/25/2014	CF-10-B-0.0/0.5 6/25/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	4.4	5.1	5.8	4.3	3.5	3.2	5.3	4.5	4.8	3.6	4.6	4.7
BARIUM	7440-39-3	mg/Kg	-	-	146	155	155	174	163	174	163 J	141	165	126	126	137
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.27 J	0.2 J	0.23 J	0.24 J	0.25 J	0.14 J	0.23 J	0.25 J	0.25 J	0.23 J	0.2 J	0.25 J
CHROMIUM	7440-47-3	mg/Kg	43	110	42.1	**45.9**	**44.1**	**50.1**	**47.9**	**48.4**	**43.9**	38.1	**43.4**	35.1	35.5	38.6
COPPER	7440-50-8	mg/Kg	32	150	**40.1**	**38.8**	**63.7**	**42.1**	**38.4**	**42.9**	**37.4**	**37.8**	**39.3**	**33.4**	31.2	**34.1**
LEAD	7439-92-1	mg/Kg	36	130	11.8	13.1	12.4	13.5	10.3	13.6	12.2	9.6	14.4	9.8	10.3	12.6
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.077	0.05	0.042	0.035	0.038	0.046	0.047	0.04	0.047	0.044	0.037	0.045
NICKEL	7440-02-0	mg/Kg	23	49	**35.5**	**36.4**	**34.5**	**39.1**	**37.9**	**39**	**35.6**	**32.1**	**36.3**	**29.3**	**29.1**	**31.6**
SELENIUM	7782-49-2	mg/Kg	-	-	1 U	1.2 U	0.99 U	1.2 U	0.97 U	1.1 U	1.1 U	0.99 U	1 U	1 U	0.95 U	0.92 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.37 U	0.42 U	0.36 U	0.45 U	0.35 U	0.4 U	0.4 U	0.36 U	0.37 U	0.36 U	0.34 U	0.33 U
ZINC	7440-66-6	mg/Kg	120	460	90.2	87.5	91.5	91	78.4	94.5	86.2	77.5	87	72.7	66.5	76.4
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**46.0 U**	1.7 U	5.3 U	1.0 U	1.9 U	1.4 U	1.4 U	1.2 U	1.7 U	2.1 J	1.6 U	1.2 U
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**27.2 U**	1.0 U	3.1 U	0.6 U	1.1 U	0.8 U	0.8 U	0.7 U	1.0 U	1.1 U	1.4 J	0.7 U
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**101**	2.9	**6.1 J**	0.5 U	2.1 J	1.1 J	2.7	1.7 J	0.9 U	2.3 J	0.8 U	0.6 U
ANTHRACENE	120-12-7	µg/kg	57.2	845	**213**	4.5	9.1	0.8 J	3.2	2.4	3.5	2.7	1.3 U	3.3	2.1 J	1.0 J
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	60.1 J	2.1 J	3.3 J	0.4 J	1.1 J	1.0 J	1.3 J	1.1 J	1.0 J	2.1 J	0.7 J	0.7 J
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	**360**	4.0	6.8 J	0.6 U	3.8	1.3 J	2.4	1.5 J	1.3 J	2.7 J	1.0 U	0.8 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	240	6.6	8.4 J	0.9 J	3.4	1.7 J	3.2	2.7	2.1 J	4.0	1.1 J	1.2 J
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	**629**	10.8	23.6	1.3 J	10.3	4.4 J	7.3	4.8	1.5 J	7.1	1.1 J	1.0 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	174	4.0	5.0 J	0.6 U	1.8 J	1.0 J	1.7 J	1.2 J	1.2 J	2.1 J	1.1 U	0.8 U
CHRYSENE	218-01-9	µg/kg	166	1,290	140	5.4	5.2 J	0.9 J	1.8 J	3.0	2.1 J	2.8	2.4 J	4.5	1.4 J	1.6 J
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	**132**	2.4 J	4.0 J	0.4 U	2.1 J	0.6 J	1.4 J	0.8 J	0.6 U	1.5 J	0.6 U	0.5 U
FLUORANTHENE	206-44-0	µg/kg	423	2,230	75.4	3.2	5.2 J	1.0 J	2.1 J	1.9 J	2.8	2.8	3.1 U	4.5	3.9	2.2
FLUORENE	86-73-7	µg/kg	77.4	536	30.2 U	1.1 U	3.5 U	0.6 U	1.3 U	0.9 U	0.9 U	0.8 U	1.1 U	1.3 U	1.5 J	0.8 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	**460**	8.8	17.9	1.0 J	8.3	2.7 J	5.9	3.6	1.2 J	5.5	0.9 J	0.8 J
NAPHTHALENE	91-20-3	µg/kg	176	561	61.7 U	3.6 J	12.3 J	1.3 U	3.6 J	3.6 J	3.3 J	3.4 J	2.2 U	5.7 J	2.9 J	2.1 J
PHENANTHRENE	85-01-8	µg/kg	204	1,170	29.2 U	2.2 J	4.1 J	0.7 J	1.8 J	2.0 J	2.5	2.5	2.0 U	3.2	4.6	2.2
PYRENE	129-00-0	µg/kg	195	1,520	85.1	2.5 J	4.0 J	0.8 J	1.6 J	1.5 J	2.0 J	2.0	2.2 J	3.5	2.5 J	1.5 J
TOTAL PAH[c]	-	µg/kg	1,610	22,800	**2,766**	65	121	11	49	30	44	35	20	55	27	17
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**431 UJ**	16.5 U	49.9 U	9.1 U	18.1 U	13.1 UJ	13.2 UJ	11.6 U	15.5 UJ	17.8 U	15.1 U	11.5 U

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	CF-10-B-0.5/1.3 6/25/2014	FP-01-0.0/0.5 6/26/2014	FP-01-0.5/1.2 6/26/2014	NR-01-A1-0.0/0.5 6/25/2014	NR-01-A1-0.5/2.0 6/25/2014	NR-01-A1-2.0/2.5 6/25/2014	NR-01-B-0.0./0.5 6/25/2014	NR-01-B-0.5/2.0 6/25/2014	NR-01-B-2.0/3.0 6/25/2014	NR-01-B-3.0/3.5 6/25/2014	NR-01-E-0.0/0.5 6/25/2014	NR-01-E-0.5/2.0 6/25/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	5.6	3.3 J	4	2.4 J	2.3 J	2.3 J	2.2 J	2 J	1.8 J	2.8	2.8	2.4
BARIUM	7440-39-3	mg/Kg	-	-	139	191	157	39.2	15.5	14.5	17.8	15.3	13.4	15.6	57.7	38.2
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.25 J	0.21 J	0.2 J	0.086 U	0.082 U	0.079 U	0.076 U	0.081 U	0.076 U	0.068 U	0.077 U	0.078 U
CHROMIUM	7440-47-3	mg/Kg	43	110	37.5	**51.9**	**44**	9.6	5.1	4.3	5.9	4.8	4.8	4.9	16.4	11.2
COPPER	7440-50-8	mg/Kg	32	150	**33.6**	**46.3**	**41.1**	8.4	3.5	2.9	3.4	4.1	2.7	4.6	15.7	10.4
LEAD	7439-92-1	mg/Kg	36	130	12.4	12.1	11.2	3.4	1.9	1.8	2.3	1.9	1.8	1.7	4.4	3.4
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.038	0.055	0.059	0.0073 J	0.0039 U	0.0035 U	0.0033 U	0.0041 U	0.0033 U	0.0033 U	0.011	0.0061 J
NICKEL	7440-02-0	mg/Kg	23	49	**30.7**	**42.3**	**36.7**	8.4	4.2	4.2	4.9	4.2	4.4	5	14.4	9.7
SELENIUM	7782-49-2	mg/Kg	-	-	0.87 U	1.3 U	1 U	1 U	0.96 U	0.92 U	0.88 U	0.94 U	0.89 U	0.79 U	0.89 U	0.9 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.32 U	0.48 U	0.37 U	0.36 U	0.35 U	0.33 U	0.32 U	0.34 U	0.32 U	0.28 U	0.32 U	0.33 U
ZINC	7440-66-6	mg/Kg	120	460	78.2	110	90.9	19.6	10.6	9.1	12.1	10.8	11.6	11.4	29.1	20.3
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	11.8 J	1.0 U	**47.6 U**	6.1 U	6.8 U	**62.7 U**	**28.8 U**	**46.1 U**	**31.2 U**	**47.7 U**	3.1 U	5.7 U
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	2.4 U	0.6 U	**28.0 U**	3.6 U	4.0 U	**37.6 U**	**16.8 U**	**26.6 U**	**18.2 U**	**27.8 U**	1.9 U	3.4 U
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	4.2 J	0.9 J	**80.3**	3.1 U	3.5 U	**32.6 U**	**15.6 U**	**23.0 U**	**16.9 U**	**25.8 U**	1.6 U	3.0 U
ANTHRACENE	120-12-7	µg/kg	57.2	845	5.9 J	1.4 J	**128**	2.7 U	3.0 U	27.6 U	13.2 U	19.5 U	14.3 U	21.9 U	1.4 U	2.5 U
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	6.2 J	0.6 J	22.7 J	2.7 U	2.8 U	27.6 U	12.0 U	19.5 U	13.0 U	19.9 U	1.3 U	2.5 U
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	6.9	1.3 J	**387**	4.0 U	4.3 U	40.1 U	19.2 U	28.4 U	20.8 U	31.8 U	2.0 U	3.7 U
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	14.5	2.1	232	3.4 U	3.8 U	35.1 U	16.8 U	24.8 U	18.2 U	27.8 U	1.8 U	3.2 U
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	10.0	2.9	**532**	2.9 U	3.3 U	30.1 U	14.4 U	23.0 U	15.6 U	23.9 U	1.5 U	2.8 U
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	6.3 J	0.9 J	88.1	4.0 U	4.3 U	42.6 U	19.2 U	30.1 U	20.8 U	31.8 U	2.0 U	3.7 U
CHRYSENE	218-01-9	µg/kg	166	1,290	13.4	2.1	42.0 J	2.7 U	3.0 U	27.6 U	13.2 U	19.5 U	14.3 U	21.9 U	1.4 U	2.5 U
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	2.9 J	0.6 J	**141**	2.5 U	2.5 U	24.6 U	11.3 U	17.4 U	12.2 U	18.7 U	1.2 U	2.2 U
FLUORANTHENE	206-44-0	µg/kg	423	2,230	13.9	1.4 J	27.2 J	2.9 U	3.3 U	30.1 U	14.4 U	23.0 U	15.6 U	23.9 U	1.5 U	2.8 U
FLUORENE	86-73-7	µg/kg	77.4	536	2.7 U	0.6 U	31.2 U	4.0 U	4.3 U	42.6 U	19.2 U	30.1 U	20.8 U	31.8 U	2.0 U	3.9 U
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	8.0	2.2	**494**	2.1 U	2.3 U	22.1 U	10.1 U	15.8 U	11.1 U	16.9 U	1.1 U	2.0 U
NAPHTHALENE	91-20-3	µg/kg	176	561	18.7	2.1 J	63.9 U	8.3 U	9.1 U	85.2 U	39.6 U	60.3 U	42.9 U	65.6 U	4.2 U	7.8 U
PHENANTHRENE	85-01-8	µg/kg	204	1,170	14.0	1.0 J	30.1 U	3.8 U	4.3 U	40.1 U	18.0 U	28.4 U	20.8 U	31.8 U	2.0 U	3.7 U
PYRENE	129-00-0	µg/kg	195	1,520	9.7	1.1 J	31.4 U	4.0 U	4.5 U	42.6 U	19.2 U	30.1 U	20.8 U	31.8 U	2.1 U	3.9 U
TOTAL PAH[c]	-	µg/kg	1,610	22,800	149	22	**2,291**	32 U	35 U	325 U	150 U	233 U	164 U	250 U	16 U	30 U
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	39.0 U	9.2 U	**446 U**	58.2 U	63.1 U	**602 U**	**276 U**	**427 UJ**	**300 U**	**459 U**	29.4 U	54.6 U

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7
Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples
Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	NR-01-E-2.0/3.0 6/25/2014	NR-01-E-3.0/4.0 6/25/2014	NR-01-E-4.0/4.6 6/25/2014	NR-02-B1-0.0/0.5 6/26/2014	NR-02-B1-0.5/2.0 6/26/2014	NR-02-B1-2.0/2.5 6/26/2014	NR-02-B2-0.0/0.5 6/26/2014	NR-02-B2-0.5/2.0 6/26/2014	NR-02-B2-2.0/2.9 6/26/2014	NR-02-C-0.0/0.5 6/26/2014	NR-02-C-0.5/2.0 6/26/2014	NR-02-C-2.0/3.0 6/26/2014
Metals																
ARSENIC	7440-38-2	mg/Kg	9.8	33	2 J	1.9 J	2.1 J	1.6 J	2 J	2 J	1.7 J	1.8 J	1.6 J	1 J	1.3 J	1.9 J
BARIUM	7440-39-3	mg/Kg	-	-	36.1	33.3	24.7	16.2	15	25.2	16.2	16.6	21.5	14.3	15	14.6
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.078 U	0.079 U	0.074 U	0.07 U	0.08 U	0.086 U	0.066 U	0.064 U	0.08 U	0.079 U	0.075 U	0.077 U
CHROMIUM	7440-47-3	mg/Kg	43	110	10.5	10.7	8.1	5.3	5.5	8.7	4.7	4.7	5.4	3.7	4.6	4.9
COPPER	7440-50-8	mg/Kg	32	150	8.4	8.1	6.1	3.5	3.2	7.8	3.1	3.1	3.9	2.7	2.4	2.5
LEAD	7439-92-1	mg/Kg	36	130	3	3.2	2.4	1.7	2.6	2.7	1.5	1.9	2.2	1.7	1.6	2
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.0036 J	0.0043 J	0.0036 U	0.0037 U	0.0035 U	0.0043 U	0.004 J	0.0041 J	0.0046 J	0.0036 J	0.0032 J	0.0036 U
NICKEL	7440-02-0	mg/Kg	23	49	9.2	8.8	7	4.4	4.3	6.3	4.8	4.5	5.2	4	4.2	5.1
SELENIUM	7782-49-2	mg/Kg	-	-	0.9 U	0.92 U	0.87 U	0.82 U	0.93 U	1 U	0.76 U	0.75 U	0.93 U	0.92 U	0.87 U	0.89 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.33 U	0.33 U	0.31 U	0.3 U	0.33 U	0.36 U	0.28 U	0.27 U	0.34 U	0.33 U	0.31 U	0.32 U
ZINC	7440-66-6	mg/Kg	120	460	19.1	17.2	14.8	10.9	10.9	15.7	11.2	10.5	12.5	9.6	10	10.9
SVOC SIM [b]																
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	19.1 U	12.5 U	7.4 U	14.3 U	**39.3 U**	**124 U**	**22.4 U**	**31.3 U**	11.4 U	**43.5 U**	**92.0 U**	**2,634 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**11.5 U**	**7.2 U**	4.4 U	**8.6 U**	**22.7 U**	**73.3 U**	**13.3 U**	**19.0 U**	**6.8 U**	**25.1 U**	**53.1 U**	**1,976 J**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**9.9 U**	**6.3 U**	3.8 U	**7.4 U**	**19.7 U**	**64.9 U**	**11.2 U**	**16.3 U**	**5.9 U**	**21.7 U**	**47.8 U**	**1,383 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	8.4 U	5.3 U	3.2 U	6.3 U	16.6 U	**85.0 J**	9.9 U	13.6 U	5.0 U	18.4 U	40.7 U	**4,090 J**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	8.4 U	5.3 U	3.2 U	18.9 J	31.8 J	**282**	9.5 U	13.6 U	9.1 J	18.4 U	**182**	**8,630**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	12.2 U	8.2 U	4.7 U	13.7 J	24.2 U	119 J	14.3 U	20.4 U	7.3 U	26.8 U	115 J	**3,683 J**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	10.7 U	6.7 U	4.1 U	16.6 J	27.2 J	144 J	12.2 U	17.7 U	6.4 U	23.4 U	135 J	**4,240**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	9.2 U	6.3 U	3.5 U	6.9 U	19.7 U	60.7 U	11.2 U	15.0 U	5.5 U	21.7 U	44.2 U	**1,293 U**
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	13.0 U	8.2 U	4.7 U	13.1 J	25.7 U	131 J	14.3 U	20.4 U	7.3 U	28.4 U	122 J	**3,961 J**
CHRYSENE	218-01-9	µg/kg	166	1,290	8.4 U	5.3 U	3.2 U	20.6 J	28.7 J	**200**	9.8 U	13.6 U	7.3 J	18.4 U	135 J	**8,180**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	7.5 U	4.8 U	2.9 U	5.5 U	14.8 U	**47.6 U**	8.6 U	12.2 U	4.4 U	16.4 U	**35.4 U**	**1,015 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	9.2 U	6.3 U	3.5 U	53.1	130	**979**	11.2 U	15.0 U	21.4	56.9 J	**639**	**31,263 J**
FLUORENE	86-73-7	µg/kg	77.4	536	13.0 U	8.2 U	5.0 U	9.7 U	25.7 U	**81.7 U**	14.3 U	20.4 U	7.7 U	28.4 U	60.2 U	**2,463 J**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	6.7 U	4.3 U	2.6 U	6.3 J	13.5 U	42.9 U	7.6 U	11.0 U	4.0 U	14.7 U	46.0 J	**1,182 J**
NAPHTHALENE	91-20-3	µg/kg	176	561	26.0 U	16.8 U	10.0 U	19.4 U	51.4 U	166 U	29.6 U	43.5 U	15.5 U	56.9 U	122 U	**3,555 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	12.2 U	7.7 U	4.7 U	14.9 J	34.8 J	**372**	14.3 U	20.4 U	7.3 U	26.8 U	86.7 J	**18,544 J**
PYRENE	129-00-0	µg/kg	195	1,520	13.0 U	8.2 U	5.0 U	42.3	103	**726**	14.3 U	21.8 U	17.3 J	40.1 J	**485**	**23,126 J**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	99 U	64 U	38 U	238	492	**3,369**	114 U	163 U	102	291	**2,193**	**116,278**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**183 U**	116 U	70.0 U	136 U	**365 U**	**1,170 U**	**210 U**	**301 U**	108 UJ	**403 U**	**860 UJ**	**24,839 UJ**

Notes:
[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.
[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.
[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.
Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.
Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.
"0.0/0.5" represents sample intervals below sediment/soil surface (bss)
CC = Crawford Creek; NR = Nemadji River
J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 7

Analytical Results, TEC and PEC Exceedances for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

	CAS No.	Unit	Wisconsin TEC[a]	Wisconsin PEC[a]	NR-03-A1-0.0/0.5 6/25/2014	NR-03-A1-0.5/1.5 6/25/2014	NR-03-B-0.0/0.5 6/24/2014	NR-03-B-0.5/1.3 6/24/2014	NR-04-B-0.0/0.5 6/25/2014	NR-04-B-0.5/2.0 6/25/2014	NR-04-B-2.0/2.6 6/25/2014	NR-05-C-0.0/0.5 6/24/2014	NR-05-C-0.5/1.6 6/24/2014
Metals													
ARSENIC	7440-38-2	mg/Kg	9.8	33	2.1 J	2.8	2.7	2.3	1.8 J	2.1 J	1.5 J	2.4	2.5
BARIUM	7440-39-3	mg/Kg	-	-	14.5	14.4	16.7	13.6	13	11.9	15.5	15.8	16.7
CADMIUM	7440-43-9	mg/Kg	0.99	5	0.076 U	0.072 U	0.069 U	0.066 U	0.071 U	0.071 U	0.096 J	0.073 U	0.075 U
CHROMIUM	7440-47-3	mg/Kg	43	110	6.1	5.3	4.7	5.6	4.5	4.5	5.6	4.3	6
COPPER	7440-50-8	mg/Kg	32	150	2.7	3.2	3.4	3.4	2.6	2.7	3.8	3.1	3.8
LEAD	7439-92-1	mg/Kg	36	130	2	2	1.7	1.7	1.9	1.6	2	1.7	1.6
MERCURY	7439-97-6	mg/Kg	0.18	1.1	0.0036 U	0.0033 U	0.0032 U	0.0034 U	0.0037 U	0.0037 U	0.004 U	0.004 U	0.0038 U
NICKEL	7440-02-0	mg/Kg	23	49	4.3	5	4.5	4.9	3.9	3.7	4.9	4.5	5.9
SELENIUM	7782-49-2	mg/Kg	-	-	0.89 U	0.84 U	0.81 U	0.77 U	0.83 U	0.82 U	0.91 U	0.86 U	0.87 U
SILVER	7440-22-4	mg/Kg	1.6	2.2	0.32 U	0.3 U	0.29 U	0.28 U	0.3 U	0.3 U	0.33 U	0.31 U	0.31 U
ZINC	7440-66-6	mg/Kg	120	460	10.6	13.1	11.9	10.8	9.2	9.2	11	12.1	13.5
SVOC SIM [b]													
2-METHYLNAPHTHALENE	91-57-6	µg/kg	20.2	201	**44.4 U**	**56.9 U**	**43.4 U**	**5,526 U**	**53.0 U**	**58.4 U**	**243 U**	**43.1 U**	**196 U**
ACENAPHTHENE	83-32-9	µg/kg	6.7	89	**26.6 U**	**34.2 U**	**25.3 U**	**3,266 U**	**31.8 U**	**35.0 U**	**144 U**	**24.9 U**	**116 U**
ACENAPHTHYLENE	208-96-8	µg/kg	5.9	128	**23.1 U**	**29.6 U**	**21.7 U**	**2,908 U**	**27.5 U**	**30.4 U**	**127 U**	**38.1 J**	**103 U**
ANTHRACENE	120-12-7	µg/kg	57.2	845	19.5 U	25.1 U	25.3 U	**2,461 U**	23.3 U	25.7 U	**1,135**	**58.0 U**	**88.6 U**
Benz[a]anthracene	56-55-3	µg/kg	108	1,050	19.5 U	25.1 U	18.1 U	**2,394 J**	**239**	30.4 J	103 U	**254**	**594**
BENZO(A)PYRENE	50-32-8	µg/kg	150	1,450	28.4 U	36.4 U	27.1 U	**3,557 U**	**159**	37.4 U	**157 U**	**357**	**383**
BENZO(B)FLUORANTHENE	205-99-2	µg/kg	240	13,400	24.9 U	31.9 U	23.5 U	**3,087 U**	191	32.7 U	135 U	**430**	**472**
BENZO(G,H,I)PERYLENE	191-24-2	µg/kg	170	3,200	21.3 U	27.3 U	21.7 U	**2,707 U**	50.8 J	28.0 U	120 U	149	134 J
BENZO(K)FLUORANTHENE	207-08-9	µg/kg	240	13,400	28.4 U	36.4 U	27.1 U	**3,579 U**	157	37.4 U	157 U	**328**	**366**
CHRYSENE	218-01-9	µg/kg	166	1,290	19.5 U	25.1 U	18.1 U	**2,438 U**	161	30.4 J	**1,639**	**274**	**441**
DIBENZ(A,H)ANTHRACENE	53-70-3	µg/kg	33	135	16.9 U	22.1 U	16.5 U	**2,125 U**	20.3 J	22.7 U	**93.5 U**	**61.4 J**	**75.7 U**
FLUORANTHENE	206-44-0	µg/kg	423	2,230	33.7 J	43.3 J	68.7 U	**18,926**	195	74.8 J	120 U	338	**908**
FLUORENE	86-73-7	µg/kg	77.4	536	28.4 U	38.7 U	28.9 U	**3,647 U**	33.9 U	39.7 U	**159 U**	28.2 U	**130 U**
INDENO(1,2,3-CD)PYRENE	193-39-5	µg/kg	200	3,200	15.1 U	20.0 U	14.8 U	**2,013 J**	50.8 J	20.3 U	84.1 U	159	134 J
NAPHTHALENE	91-20-3	µg/kg	176	561	58.6 U	77.4 U	57.9 U	**7,450 U**	69.9 U	79.4 U	**327 U**	58.0 U	**266 U**
PHENANTHRENE	85-01-8	µg/kg	204	1,170	28.4 U	36.4 U	47.0 U	**3,512 U**	36.0 J	37.4 U	153 U	31.5 U	126 U
PYRENE	129-00-0	µg/kg	195	1,520	28.4 U	38.7 U	47.0 J	**13,199**	176	56.1 J	161 U	**274**	**738**
TOTAL PAH[c]	-	µg/kg	1,610	22,800	250	324	290	**59,664**	1,555	434	**3,915**	**2,784**	**4,720**
PENTACHLOROPHENOL	87-86-5	µg/kg	150	200	**412 U**	**544 U**	**405 UJ**	**52,125 UJ**	**492 U**	**554 U**	**2,280 U**	**403 UJ**	**1,868 UJ**

Notes:

[a] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

[b] SVOC results are reported as dry-weight normalized to 1% organic carbon by sample.

[c] Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.

Bold values represent cases where the TOC-normalized result is greater than the Wisconsin TEC.

Shading represents cases where the TOC-normalized result is greater than the Wisconsin PEC.

"0.0/0.5" represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; NR = Nemadji River

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 8

Toxicity Equivalence Summary Statistics for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

		(ng/kg)		(ng/kg at 1% TOC based on site-specific TOC[a])
Sample ID	**Sample Date**	**Mammal TEQs[b,c]**	**Bird TEQs[b,d]**	**Fish TEQs[b,d]**
		Sediment ESL[e]: 0.12	**Sediment ESL[e]: 0.12**	**TEC[f]: 0.85 PEC[f]: 21.5**
CC-001-A-0.0/0.8	6/25/2014	0.0704	0.0221	0.0110
CC-001-A1-0.0/0.5	6/26/2014	0.548	0.573	0.274
CC-002-A-0.0/0.5	6/25/2014	16.1	5.14	**4.08**
CC-002-A-0.5/1.4	6/25/2014	0.256	0.102	0.0691
CC-003-C-0.0/0.5	6/22/2014	1.44	0.734	0.694
CC-003-C-0.5/1.3	6/22/2014	0.313	0.0550	0.0382
CC-004-A-0.0/0.5	6/22/2014	49.6	15.7	**2.88**
CC-004-A-0.5/1.8	6/22/2014	0.161	0.0550	0.0574
CC-005-B-0.0/0.5	6/22/2014	42.9	18.5	**6.85**
CC-005-B-0.5/1.3	6/22/2014	0.0250	0.0170	0.0073
CC-006-A-0.0/0.5	6/22/2014	0.970	0.284	0.204
CC-006-A-0.5/1.3	6/22/2014	0.111	0.107	0.0706
CC-007-C-0.0/0.5	6/23/2014	222	89.7	**47.3**
CC-007-C-0.5/1.6	6/23/2014	3.36	1.24	**1.23**
CC-008-C-0.0/0.5	6/23/2014	66.5	18.1	**11.1**
CC-008-C-0.5/2.3	6/23/2014	3.86	1.25	**1.52**
CC-009-C-0.0/0.5	6/23/2014	0.370	0.0687	0.0648
CC-009-C-0.5/1.3	6/23/2014	0.0108	0.0036	0.0044
CC-010-A-0.0/0.8	6/23/2014	93.0	34.7	**12.9**
CC-010-A-0.8/1.9	6/23/2014	0.932	0.286	0.379
CC-011-A-0.0/0.5	6/23/2014	11.0	3.14	**1.20**
CC-011-A-0.5/1.2	6/23/2014	ND	ND	ND
CC-012-C-0.0/0.6	6/23/2014	0.0955	0.0418	0.0414
CC-013-C-0.0/0.5	6/23/2014	42.2	19.8	**8.33**
CC-013-C-0.5/1.2	6/23/2014	6.71	3.18	**1.38**
CC-014-B-0.0/0.5	6/23/2014	12.2	6.06	**3.31**
CC-014-B-0.5/1.3	6/23/2014	0.783	0.707	0.149
CC-015-A-0.0/0.5	6/23/2014	16.6	11.1	**7.13**
CC-015-A-0.5/1.7	6/23/2014	0.0297	0.252	0.0137
CC-016-C-0.0/0.5	6/24/2014	0.0067	0.0044	0.0042
CC-016-C-0.5/1.3	6/24/2014	ND	ND	ND
CC-017-A-0.0/0.5	6/24/2014	6.13	1.85	**0.940**
CC-017-A-0.5/1.3	6/24/2014	0.130	0.0221	0.0142
CC-018-C-0.0/0.5	6/24/2014	75.2	41.8	**17.4**
CC-018-C-0.5/2.0	6/24/2014	3.45	1.09	**0.987**
CC-019-C-0.0/0.5	6/24/2014	31.0	10.4	**3.33**
CC-019-C-0.5/1.9	6/24/2014	0.106	0.0173	0.0115
CC-020-A-0.0/0.5	6/24/2014	6.96	1.98	**1.17**
CC-020-A-0.5/1.8	6/24/2014	0.0192	0.0064	0.0051
CC-021-C-0.0/0.5	6/25/2014	1.37	0.642	**2.00**
CC-021-C-0.5/2.0	6/25/2014	ND	ND	ND
CC-021-C-2.0/3.0	6/25/2014	ND	ND	ND
CC-021-C-3.0/3.6	6/25/2014	ND	ND	ND
CC-022-A-0.0/0.8	6/25/2014	0.0296	0.0099	0.0066
CC-023-A-0.0/0.5	6/25/2014	2.85	1.50	0.395
CC-023-A-0.5/2.1	6/25/2014	0.295	0.108	0.156

TABLE 8

Toxicity Equivalence Summary Statistics for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

		(ng/kg)		(ng/kg at 1% TOC based on site-specific TOC[a])
Sample ID	**Sample Date**	**Mammal TEQs[b,c]**	**Bird TEQs[b,d]**	**Fish TEQs[b,d]**
		Sediment ESL[e]: 0.12	**Sediment ESL[e]: 0.12**	**TEC[f]: 0.85 PEC[f]: 21.5**
CC-024-A-0.0/0.5	6/25/2014	2.13	0.959	0.605
CC-024-A-0.5/2.0	6/25/2014	1.63	0.688	0.529
CC-024-A-2.0/3.0	6/25/2014	ND	ND	ND
CC-024-A-3.0/3.6	6/25/2014	ND	ND	ND
CC-025-C-0.0/0.5	6/26/2014	0.719	0.457	0.132
CC-025-C-0.5/2.0	6/26/2014	ND	ND	ND
CC-025-C-2.0/3.0	6/26/2014	ND	ND	ND
CC-025-C-3.0/4.0	6/26/2014	ND	ND	ND
CC-026-C-0.0/0.5	6/24/2014	0.0585	0.0195	0.0120
CC-026-C-0.5/2.0	6/24/2014	0.0575	0.0094	0.0055
CC-026-C-2.0/3.3	6/24/2014	0.0009	0.0003	0.0002
CC-027-A-0.0/0.5	6/25/2014	0.114	0.0593	0.0406
CC-027-A-0.5/1.9	6/25/2014	3.53	1.49	**2.03**
CC-028-B-0.0/0.5	6/25/2014	ND	ND	ND
CC-028-B-0.5/2.0	6/25/2014	13.8	4.55	**2.83**
CC-028-B-2.0/3.0	6/25/2014	1.94	0.664	0.781
CC-028-B-3.0/4.0	6/25/2014	1.52	0.502	0.433
CC-028-B-4.0/4.7	6/25/2014	1.06	0.344	0.351
	Maximum:	222	89.7	**47.3**
NR-01-A1-0.0/0.5	6/25/2014	0.0280	0.280	0.0315
NR-01-A1-0.5/2.0	6/25/2014	0.0008	0.0003	0.0007
NR-01-A1-2.0/2.5	6/25/2014	ND	ND	ND
NR-01-B-0.0./0.5	6/25/2014	ND	ND	ND
NR-01-B-0.5/2.0	6/25/2014	0.0068	0.0068	0.121
NR-01-B-2.0/3.0	6/25/2014	ND	ND	ND
NR-01-B-3.0/3.5	6/25/2014	ND	ND	ND
NR-01-E-0.0/0.5	6/25/2014	ND	ND	ND
NR-01-E-0.5/2.0	6/25/2014	ND	ND	ND
NR-01-E-2.0/3.0	6/25/2014	0.0033	0.0003	0.0025
NR-01-E-3.0/4.0	6/25/2014	0.0210	0.210	0.0505
NR-01-E-4.0/4.6	6/25/2014	ND	ND	ND
NR-02-B1-0.0/0.5	6/26/2014	0.0466	0.267	0.116
NR-02-B1-0.5/2.0	6/26/2014	0.0472	0.248	0.298
NR-02-B1-2.0/2.5	6/26/2014	0.0763	0.275	0.0397
NR-02-B2-0.0/0.5	6/26/2014	0.0183	0.180	0.0927
NR-02-B2-0.5/2.0	6/26/2014	0.0394	0.370	0.255
NR-02-B2-2.0/2.9	6/26/2014	0.0180	0.180	0.0409
NR-02-C-0.0/0.5	6/26/2014	0.0023	0.0002	0.0038
NR-02-C-0.5/2.0	6/26/2014	0.0190	0.190	0.168
NR-02-C-2.0/3.0	6/26/2014	0.0222	0.191	0.226
NR-03-A1-0.0/0.5	6/25/2014	ND	ND	ND
NR-03-A1-0.5/1.5	6/25/2014	ND	ND	ND
NR-03-B-0.0/0.5	6/24/2014	0.0269	0.231	0.231
NR-03-B-0.5/1.3	6/24/2014	ND	ND	ND
NR-04-B-0.0/0.5	6/25/2014	0.0250	0.0250	0.530
NR-04-B-0.5/2.0	6/25/2014	0.0027	0.0027	0.0631

TABLE 8

Toxicity Equivalence Summary Statistics for Crawford Creek and Nemadji River Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

Sample ID	Sample Date	Mammal TEQs[b,c] (ng/kg)	Bird TEQs[b,d] (ng/kg)	Fish TEQs[b,d] (ng/kg at 1% TOC based on site-specific TOC[a])
		Sediment ESL[e]: 0.12	**Sediment ESL[e]: 0.12**	**TEC[f]: 0.85 PEC[f]: 21.5**
NR-04-B-2.0/2.6	6/25/2014	ND	ND	ND
NR-05-C-0.0/0.5	6/24/2014	0.117	0.0349	0.579
NR-05-C-0.5/1.6	6/24/2014	4.66	1.84	**28.7**
	Maximum:	4.66	1.84	**28.7**

Notes:

Bold values represent cases where the TOC-normalized Fish TEQ is greater than the Wisconsin TEC.

Shading indicates the Mammal or Bird TEQ is greater than the Region 5 Sediment ESL;
or the TOC-normalized Fish TEQ is greater than the Wisconsin PEC for 2,3,7,8-TCDD.

[a] Fish TEQs are normalized to 1% organic carbon by sample.

[b] TEQs calculated by summing the individual TEQs for 17 congeners; nondetects were not included in the sum.

[c] Mammal TEQs were derived from the human and mammal toxic equivalency factors for dioxins and dioxlin-like compounds (Van den Berg, M; Birnbaum, LS; Denison, M, DeVito, M, Farland, W, Feeley, M; Fiedler, H; Hakansson, H; Hanberg, A; Haws, L; Rose, M; Safe, S; Schrenk, D; Tohyama, C; Tritscher, A; Tuomisto, J; Tysklind, M; Walker, N; Peterson, RE. (2006) The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicol Sci 93:223-241).

[d] Bird and Fish TEQs were derived from the avian and fish toxic equivalency factors for dioxins and dioxin-like compounds (Van den Berg, M; Birnbaum, L; Bosveld, ATC; Brunstrom, B; Cook, P; Feeley, M; Giesy, JP; Hanberg, A; Hasegawa, R; Kennedy, SW; Kubiak, T; Larsen, JC; van Leeuwen, FX; Liem,

[e] EPA Region 5, Resource Conservation Recovery Act Ecological Screening Level (ESL), August 2003

[f] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

ND = nondetect; ng/kg = nanograms per kilogram; TEQ = toxicity equivalence; TOC = total organic carbon

TABLE 9

Toxicity Equivalence Summary Statistics for Floodplain Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

Sample ID	Sample Date	(ng/kg)		(ng/kg at 1% TOC based on site-specific TOC[a])
		Mammal TEQs[b,c]	Bird TEQs[b,d]	Fish TEQs[b,d]
		Soil ESL[e]: 0.199	Soil ESL[e]: 0.199	TEC[f]: 0.85 PEC[f]: 21.5
CF-01-A-0.0/0.5	6/24/2014	8.59	4.90	**1.19**
CF-01-A-0.5/1.0	6/24/2014	2.05	0.813	0.686
CF-01-B-0.0/0.5	6/26/2014	18.9	10.7	**2.44**
CF-01-B-0.5/0.9	6/26/2014	161	70.8	**28.3**
CF-01-C-0.0/0.7	6/26/2014	325	221	**96.3**
CF-01-D-0.0/0.5	6/25/2014	2.01	1.21	0.336
CF-01-D-0.5/1.1	6/25/2014	158	93.9	**31.9**
CF-02-B-0.0/0.5	6/24/2014	7.17	4.23	**1.14**
CF-02-B-0.5/1.6	6/24/2014	26.6	12.8	**6.27**
CF-02-C-0.0/0.8	6/25/2014	5.81	2.61	**1.19**
CF-03-A-0.0/0.5	6/24/2014	2.00	1.47	0.328
CF-03-A-0.5/1.3	6/24/2014	21.9	9.15	**4.87**
CF-03-C-0.0/0.5	6/24/2014	13.4	6.72	**1.27**
CF-03-C-0.5/1.3	6/24/2014	9.68	5.89	**2.62**
CF-03-E-0.0/0.5	6/26/2014	0.493	0.590	0.0696
CF-03-E-0.5/1.2	6/26/2014	4.49	1.99	**1.73**
CF-04-B-0.0/0.5	6/24/2014	2.25	1.15	0.710
CF-04-B-0.5/1.3	6/24/2014	9.44	5.88	**3.82**
CF-05-B-0.0/0.5	6/24/2014	3.10	1.97	0.685
CF-05-B-0.5/0.9	6/24/2014	40.1	19.3	**5.49**
CF-05-C-0.0/0.6	6/26/2014	31.2	15.6	**5.98**
CF-05-D-0.0/0.5	6/25/2014	22.3	13.7	**6.48**
CF-05-D-0.5/0.9	6/25/2014	2.31	0.854	0.776
CF-06-A-0.0/0.5	6/25/2014	7.60	5.38	**1.27**
CF-06-A-0.5/1.8	6/25/2014	6.33	2.16	**1.63**
CF-06-B-0.0/0.6	6/26/2014	19.1	10.5	**4.41**
CF-06-D-0.0/0.8	6/25/2014	7.02	4.03	**1.54**
CF-07-A-0.0/0.8	6/26/2014	18.7	11.7	**4.38**
CF-07-B-0.0/0.7	6/23/2014	14.8	9.79	**4.22**
CF-08-D-0.0/0.7	6/26/2014	5.17	3.17	**2.00**
CF-09-A-0.0/0.8	6/25/2014	0.357	0.218	0.122
CF-10-B-0.0/0.5	6/25/2014	3.67	2.54	0.838
CF-10-B-0.5/1.3	6/25/2014	1.32	1.13	**0.879**
FP-01-0.0/0.5	6/26/2014	12.2	7.06	**1.51**
FP-01-0.5/1.2	6/26/2014	59.9	31.9	**11.3**
	Maximum:	325	221	**96.3**

TABLE 9

Toxicity Equivalence Summary Statistics for Floodplain Samples

Crawford Creek and Nemadji River Site Characterization, June 2014

		(ng/kg)		(ng/kg at 1% TOC based on site-specific TOC[a])
Sample ID	**Sample Date**	**Mammal TEQs[b,c]**	**Bird TEQs[b,d]**	**Fish TEQs[b,d]**
		Soil ESL[e]: 0.199	**Soil ESL[e]: 0.199**	**TEC[f]: 0.85 PEC[f]: 21.5**

Notes:

Bold values represent cases where the TOC-normalized Fish TEQ is greater than the Wisconsin TEC.

Shading indicates the Mammal or Bird TEQ is greater than the Region 5 Soil ESL;
or the TOC-normalized Fish TEQ is greater than the Wisconsin PEC for 2,3,7,8-TCDD.

[a] Fish TEQs are normalized to 1% organic carbon by sample.

[b] TEQs calculated by summing the individual TEQs for 17 congeners; nondetects were not included in the sum.

[c] Mammal TEQs were derived from the human and mammal toxic equivalency factors for dioxins and dioxin-like compounds (Van den Berg, M; Birnbaum, LS; Denison, M, DeVito, M, Farland, W, Feeley, M; Fiedler, H; Hakansson, H; Hanberg, A; Haws, L; Rose, M; Safe, S; Schrenk, D; Tohyama, C; Tritscher, A; Tuomisto, J; Tysklind, M; Walker, N; Peterson, RE. (2006) The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicol Sci 93:223-241).

[d] Bird and Fish TEQs were derived from the avian and fish toxic equivalency factors for dioxins and dioxin-like compounds (Van den Berg, M; Birnbaum, L; Bosveld, ATC; Brunstrom, B; Cook, P; Feeley, M; Giesy, JP; Hanberg, A; Hasegawa, R; Kennedy, SW; Kubiak, T; Larsen, JC; van Leeuwen, FX; Liem, AK; Nolt, C; Peterson, RE; Poellinger, L; Safe, S; Schrenk, D; Tillitt, D; Tysklind, M; Younes, M; Waern, F; Zacharewski, T. (1998) Toxic equivalency factors for PCBs, PCDDs, PCDFs for humans and wildlife. Environ Health Perspect 106(12):775-792).

[e] EPA Region 5, Resource Conservation Recovery Act Ecological Screening Level (ESL), August 2003

[f] Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC), Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.

ng/kg = nanograms per kilogram; TEQ = toxicity equivalence; TOC = total organic carbon

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CC-001-A-0.0/0.8 6/25/2014	CC-001-A1-0.0/0.5 6/26/2014	CC-002-A-0.0/0.5 6/25/2014	CC-002-A-0.5/1.4 6/25/2014	CC-003-C-0.0/0.5 6/22/2014	CC-003-C-0.5/1.3 6/22/2014	CC-004-A-0.0/0.5 6/22/2014	CC-004-A-0.5/1.8 6/22/2014	CC-005-B-0.0/0.5 6/22/2014	CC-005-B-0.5/1.3 6/22/2014	CC-006-A-0.0/0.5 6/22/2014	CC-006-A-0.5/1.3 6/22/2014	CC-007-C-0.0/0.5 6/23/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.26 J	0.95	0.19	0.53	0.25	0.088	0.026 J	0.26	0.18	0.25	1	0.34	0.2
ARSENIC	µmoles/g	-	-	0.007 J	0.014 J	0.0083 J	0.0098 J	0.007 J	0.0087 J	0.022	0.017 J	0.012 J	0.012 J	0.014 J	0.014 J	0.019
CADMIUM	µmoles/g	-	-	0.001 U	0.0011 U	0.0013 J	0.001 U	0.001 U	0.0011 J	0.0017 J	0.0017 J	0.00097 U	0.0019 J	0.0018 J	0.0016 J	0.0014 J
CHROMIUM	µmoles/g	-	-	0.12	0.18	0.13	0.1	0.1	0.14	0.12	0.14	0.14	0.16	0.16	0.17	0.13
COPPER	µmoles/g	-	-	0.16	0.28	0.23	0.16	0.19	0.22	0.38	0.32	0.26	0.28	0.35	0.31	0.32
LEAD	µmoles/g	-	-	0.02	0.028	0.029	0.022	0.17	0.021	0.032	0.026	0.028	0.03	0.031	0.03	0.036
MERCURY	µmoles/g	-	-	0.0000065 R	0.000016 J	0.000007 U	0.0000067 U	0.000015	0.0000071 J	0.000045	0.0000063 U	0.000032	0.00001 J	0.0000075 U	0.000013 J	0.000033
NICKEL	µmoles/g	-	-	0.3	0.21	0.23	0.24	0.12	0.16	0.15	0.19	0.18	0.19	0.21	0.21	0.18
SILVER	µmoles/g	-	-	0.001 U	0.00099 U	0.00096 U	0.00093 U	0.00092 U	0.00097 U	0.00094 U	0.00089 U	0.00087 U	0.0026 U	0.001 U	0.00093 U	0.00096 U
ZINC	µmoles/g	-	-	0.4	0.48	0.44	0.44	0.36	0.37	0.78	0.42	0.54	0.45	0.48	0.5	0.62
Wet Chemistry																
Moisture	%	-	-	31.7	30.6	33.5	32.8	31.5	30.6	35.3	29.9	32.8	30.1	35.5	29.8	34.2
Total Organic Carbon	mg/kg	-	-	20,200	8,760	11,700 J	14,800	10,400	14,400	51,800	9,590	23,500	23,300	13,900	15,200	19,300
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**3.39**	**1.05**	**4.90**	**1.63**	**3.37**	**8.78**	**51.70**	**3.69**	**5.61**	**3.81**	**1.07**	**3.09**	**5.79**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	30.8	5.7	63.3	22.5	56.9	47.5	25.4	72.8	35.3	30.2	5.3	46.8	49.6

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

a EPA Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc), EPA-600-R-02-011, January 2005.

b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CC-007-C-0.5/1.6 6/23/2014	CC-008-C-0.0/0.5 6/23/2014	CC-008-C-0.5/2.3 6/23/2014	CC-009-C-0.0/0.5 6/23/2014	CC-009-C-0.5/1.3 6/23/2014	CC-010-A-0.0/0.8 6/23/2014	CC-010-A-0.8/1.9 6/23/2014	CC-011-A-0.0/0.5 6/23/2014	CC-011-A-0.5/1.2 6/23/2014	CC-012-C-0.0/0.6 6/23/2014	CC-013-C-0.0/0.5 6/23/2014	CC-013-C-0.5/1.2 6/23/2014	CC-014-B-0.0/0.5 6/23/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.031 J	0.53	0.41 J	0.34	0.72	0.57	1.4 J	0.72	0.75	1.4	1.9	0.33	0.43
ARSENIC	µmoles/g	-	-	0.015 J	0.014 J	0.021	0.021	0.019	0.017	0.016 J	0.018 J	0.014 J	0.0098 J	0.015 J	0.016 J	0.018 J
CADMIUM	µmoles/g	-	-	0.0016 J	0.0011 U	0.0018 J	0.0015 J	0.0017 J	0.0015 J	0.0017 J	0.0015 J	0.0015 J	0.0012 U	0.0013 J	0.0016 J	0.0012 J
CHROMIUM	µmoles/g	-	-	0.13	0.11	0.082	0.095	0.094	0.12	0.11	0.12	0.17	0.15	0.12	0.13	0.12
COPPER	µmoles/g	-	-	0.31	0.25	0.28	0.28	0.25	0.31	0.26	0.38	0.27	0.2	0.27	0.26	0.3
LEAD	µmoles/g	-	-	0.029	0.029	0.025	0.028	0.024	0.033	0.026	0.033	0.033	0.027	0.031	0.027	0.034
MERCURY	µmoles/g	-	-	0.000011 J	0.000018	0.000007 UJ	0.000026	0.0000064 U	0.000019	0.000007 U	0.000011 J	0.0000066 U	0.0000096 J	0.000013 J	0.000015	0.000017
NICKEL	µmoles/g	-	-	0.18	0.16	0.14	0.15	0.14	0.17	0.16	0.17	0.21	0.16	0.17	0.16	0.18
SILVER	µmoles/g	-	-	0.0009 U	0.00095 U	0.00097 U	0.00086 U	0.00088 U	0.00088 U	0.00096 U	0.00097 U	0.0009 U	0.0011 U	0.00088 U	0.00093 U	0.00093 U
ZINC	µmoles/g	-	-	0.4	0.48	0.32	0.4	0.36	0.56	0.37	0.59	0.5	0.4	0.45	0.39	0.51
Wet Chemistry																
Moisture	%	-	-	28.9	32.4	31.5	30.9	25	33.5	29.3	37.2	30.1	34.9	33.5	28.6	34.2
Total Organic Carbon	mg/kg	-	-	10,100	16,600	8,220	10,600	8,110	28,600	7,550	26,200	17,600	10,100	22,000	19,100	16,900
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**29.71**	**1.74**	**1.87**	**2.53**	**1.08**	**1.89**	**0.58**	**1.63**	**1.35**	**0.56**	**0.49**	**2.54**	**2.39**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	88.1	23.5	43.5	49.1	6.9	17.7	-77.1	17.4	15.1	-60.5	-44.4	26.7	35.2

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CC-014-B-0.5/1.3 6/23/2014	CC-015-A-0.0/0.5 6/23/2014	CC-015-A-0.5/1.7 6/23/2014	CC-016-C-0.0/0.5 6/24/2014	CC-016-C-0.5/1.3 6/24/2014	CC-017-A-0.0/0.5 6/24/2014	CC-017-A-0.5/1.3 6/24/2014	CC-018-C-0.0/0.5 6/24/2014	CC-018-C-0.5/2.0 6/24/2014	CC-019-C-0.0/0.5 6/24/2014	CC-019-C-0.5/1.9 6/24/2014	CC-020-A-0.0/0.5 6/24/2014	CC-020-A-0.5/1.8 6/24/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.68	1.1	0.14	0.27	0.23	1.8	0.6	0.33	0.18 J	0.81	0.24	0.3	0.13
ARSENIC	µmoles/g	-	-	0.011 J	0.016 J	0.016 J	0.018	0.015 J	0.012 J	0.011 J	0.013 J	0.018 J	0.012 J	0.0096 J	0.017 J	0.01 J
CADMIUM	µmoles/g	-	-	0.0017 J	0.0014 J	0.0016 J	0.0015 J	0.0015 J	0.0012 J	0.0014 J	0.001 U	0.0011 J	0.0016 J	0.00097 U	0.0014 J	0.0014 J
CHROMIUM	µmoles/g	-	-	0.13	0.1	0.073	0.081	0.12	0.1	0.1	0.1	0.077	0.097	0.056	0.095	0.11
COPPER	µmoles/g	-	-	0.25	0.26	0.25	0.24	0.25	0.25	0.24	0.25	0.21	0.3	0.14	0.28	0.26
LEAD	µmoles/g	-	-	0.029	0.03	0.022	0.023	0.028	0.025	0.022	0.026	0.02	0.03	0.018	0.027	0.025
MERCURY	µmoles/g	-	-	0.0000061 U	0.000024	0.0000069 U	0.0000065 U	0.0000069 U	0.000012 J	0.0000059 U	0.000015	0.0000069 UJ	0.000012 J	0.0000063 U	0.000016	0.000006 U
NICKEL	µmoles/g	-	-	0.18	0.17	0.12	0.12	0.16	0.15	0.15	0.16	0.12	0.17	0.099	0.16	0.15
SILVER	µmoles/g	-	-	0.00084 U	0.0009 U	0.00094 U	0.00089 U	0.00095 U	0.001 U	0.00081 U	0.00091 U	0.00094 U	0.0011 U	0.00087 U	0.00092 U	0.00082 U
ZINC	µmoles/g	-	-	0.45	0.38	0.28	0.29	0.42	0.41	0.36	0.41	0.29	0.49	0.24	0.4	0.37
Wet Chemistry																
Moisture	%	-	-	31.2	31.9	28.8	27.7	29.4	35.5	28.4	35.5	27.4	37.7	29.2	35.6	28.4
Total Organic Carbon	mg/kg	-	-	21,300	12,100	10,400	10,600	13,900	18,200	15,600	20,400	11,000 J	31,300	15,100	17,000	12,500
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**1.34**	**0.77**	**4.81**	**2.50**	**3.74**	**0.46**	**1.29**	**2.57**	**3.56**	**1.22**	**2.08**	**2.90**	**6.21**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	10.9	-21.3	51.4	38.2	45.3	-52.9	11.1	25.4	42.0	5.8	17.1	33.5	54.1

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

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Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CC-021-C-0.0/0.5 6/25/2014	CC-021-C-0.5/2.0 6/25/2014	CC-021-C-2.0/3.0 6/25/2014	CC-021-C-3.0/3.6 6/25/2014	CC-022-A-0.0/0.8 6/25/2014	CC-023-A-0.0/0.5 6/25/2014	CC-023-A-0.5/2.1 6/25/2014	CC-024-A-0.0/0.5 6/25/2014	CC-024-A-0.5/2.0 6/25/2014	CC-024-A-2.0/3.0 6/25/2014	CC-024-A-3.0/3.6 6/25/2014	CC-025-C-0.0/0.5 6/26/2014	CC-025-C-0.5/2.0 6/26/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.016 U	1.3 J	0.72	0.38 J	0.66	0.28	0.02 J	0.096	1	0.55	0.24	0.24	0.044
ARSENIC	µmoles/g	-	-	0.015 J	0.012 J	0.011 J	0.012 J	0.012 J	0.016 J	0.013 J	0.023	0.017 J	0.014 J	0.016 J	0.018 J	0.015 J
CADMIUM	µmoles/g	-	-	0.0012 J	0.0012 J	0.001 J	0.0014 J	0.0018 J	0.0014 J	0.0015 J	0.002 J	0.0019 J	0.0019 J	0.0015 J	0.0018 J	0.0017 J
CHROMIUM	µmoles/g	-	-	0.068	0.053	0.048	0.049	0.088	0.083	0.08	0.085	0.077	0.093	0.097	0.074	0.11
COPPER	µmoles/g	-	-	0.2	0.16	0.18	0.17	0.23	0.27	0.23	0.3	0.27	0.22	0.24	0.27	0.31
LEAD	µmoles/g	-	-	0.019	0.014	0.015	0.016	0.024	0.024	0.022	0.028	0.026	0.026	0.024	0.025	0.026
MERCURY	µmoles/g	-	-	0.000015	0.000014	0.0000058 U	0.0000059 UJ	0.0000064 U	0.0000064 U	0.0000056 U	0.0000068 U	0.000007 U	0.000007 U	0.0000062 U	0.000011 J	0.0000065 J
NICKEL	µmoles/g	-	-	0.18	0.12	0.11	0.11	0.18	0.18	0.18	0.15	0.14	0.15	0.14	0.15	0.19
SILVER	µmoles/g	-	-	0.00089 U	0.00081 U	0.0008 U	0.00082 U	0.00088 U	0.00088 U	0.00077 U	0.00094 U	0.00096 U	0.00096 U	0.00085 U	0.0011 U	0.00083 U
ZINC	µmoles/g	-	-	0.18	0.14	0.16	0.19	0.38	0.33	0.27	0.34	0.35	0.39	0.33	0.31	0.33
Wet Chemistry																
Moisture	%	-	-	34.8	19.1	20.2	19.9	33.8	27.6	23.3	34.9	31.6	29.5	29.9	41.8	28.5
Total Organic Carbon	mg/kg	-	-	3,170	3,230	4,490	5,220	15,000	30,100	6,960 J	12,800	13,000	11,900	12,600	19,700	7,220
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**36.29**	**0.34**	**0.65**	**1.28**	**1.24**	**2.88**	**35.19**	**8.55**	**0.79**	**1.43**	**3.07**	**3.16**	**19.50**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	**178.1**	-267.6	-56.5	20.7	10.4	17.5	98.3	56.6	-16.3	20.0	39.4	26.3	112.8

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

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Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CC-025-C-2.0/3.0 6/26/2014	CC-025-C-3.0/4.0 6/26/2014	CC-026-C-0.0/0.5 6/24/2014	CC-026-C-0.5/2.0 6/24/2014	CC-026-C-2.0/3.3 6/24/2014	CC-027-A-0.0/0.5 6/25/2014	CC-027-A-0.5/1.9 6/25/2014	CC-028-B-0.0/0.5 6/25/2014	CC-028-B-0.5/2.0 6/25/2014	CC-028-B-2.0/3.0 6/25/2014	CC-028-B-3.0/4.0 6/25/2014	CC-028-B-4.0/4.7 6/25/2014	CF-01-A-0.0/0.5 6/24/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.16	0.015 U	0.61 J	0.032 J	0.22	0.52	0.06	0.22	0.24 J	0.11	0.051	1	0.35
ARSENIC	µmoles/g	-	-	0.018	0.014 J	0.02 J	0.017 J	0.016 J	0.018 J	0.012 J	0.012 J	0.015 J	0.017 J	0.015 J	0.012 J	0.0099 J
CADMIUM	µmoles/g	-	-	0.0018 J	0.0014 J	0.002 J	0.0014 J	0.0018 J	0.0018 J	0.00089 U	0.001 U	0.00095 U	0.0086	0.0009 U	0.0014 J	0.0025 J
CHROMIUM	µmoles/g	-	-	0.089	0.079	0.16	0.11	0.11	0.098	0.066	0.041	0.035	0.053	0.028	0.04	0.16
COPPER	µmoles/g	-	-	0.28	0.27	0.36	0.29	0.3	0.3	0.19	0.15	0.12	0.16	0.1	0.14	0.37
LEAD	µmoles/g	-	-	0.025	0.023	0.033	0.021	0.023	0.027	0.018	0.016	0.014	0.021	0.011	0.016	0.031
MERCURY	µmoles/g	-	-	0.0000063 U	0.0000062 U	0.0000093 J	0.000011 J	0.0000086 J	0.000011 J	0.0000058 U	0.0000068 U	0.0000062 UJ	0.0000063 U	0.0000059 U	0.0000063 U	0.000012 J
NICKEL	µmoles/g	-	-	0.14	0.14	0.22	0.16	0.17	0.17	0.11	0.088	0.069	0.087	0.049	0.073	0.21
SILVER	µmoles/g	-	-	0.00087 U	0.00086 U	0.0011 U	0.0009 U	0.0015 J	0.00096 U	0.0008 U	0.00095 U	0.00085 U	0.0029 J	0.0027 J	0.0022 J	0.0011 U
ZINC	µmoles/g	-	-	0.33	0.29	0.49	0.32	0.39	0.4	0.22	0.22	0.2	0.25	0.12	0.29	0.7
Wet Chemistry																
Moisture	%	-	-	29.6	25.8	42.1	30.5	30.4	39.7	22.4	28.9	24	23.9	22.8	23	39
Total Organic Carbon	mg/kg	-	-	10,700	6,000	16,200	17,200	17,500	14,600	5,240	10,600	16,100	7,820	10,600	9,790	39,500
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**4.86**	**48.32**	**1.81**	**24.78**	**4.03**	**1.73**	**8.99**	**2.16**	**1.68**	**4.80**	**5.53**	**0.52**	**3.75**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	57.7	118.3	30.6	44.2	38.0	26.0	91.5	24.1	10.2	53.5	21.8	-48.9	24.4

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CF-01-A-0.5/1.0 6/24/2014	CF-01-B-0.0/0.5 6/26/2014	CF-01-B-0.5/0.9 6/26/2014	CF-01-C-0.0/0.7 6/26/2014	CF-01-D-0.0/0.5 6/25/2014	CF-01-D-0.5/1.1 6/25/2014	CF-02-B-0.0/0.5 6/24/2014	CF-02-B-0.5/1.6 6/24/2014	CF-02-C-0.0/0.8 6/25/2014	CF-03-A-0.0/0.5 6/24/2014	CF-03-A-0.5/1.3 6/24/2014	CF-03-C-0.0/0.5 6/24/2014	CF-03-C-0.5/1.3 6/24/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.037 J	0.017 U	0.018 U	0.015 U	0.02 U	0.018 U	0.018 U	0.017 UJ	0.016 U	0.019 U	0.016 U	0.02 J	0.017 U
ARSENIC	µmoles/g	-	-	0.025	0.016 J	0.019 J	0.014 J	0.021 J	0.022	0.024	0.023 J	0.023	0.014 J	0.017 J	0.017 J	0.018 J
CADMIUM	µmoles/g	-	-	0.0027 J	0.0021 J	0.002 J	0.0017 J	0.0031 J	0.0026 J	0.0016 J	0.0016 J	0.0021 J	0.0018 J	0.002 J	0.0012 U	0.0015 J
CHROMIUM	µmoles/g	-	-	0.22	0.06	0.081	0.062	0.085	0.088	0.15	0.16	0.11	0.21	0.18	0.13	0.21
COPPER	µmoles/g	-	-	0.46	0.26	0.32	0.26	0.37	0.34	0.37	0.42	0.36	0.39	0.43	0.31	0.42
LEAD	µmoles/g	-	-	0.048	0.031	0.043	0.03	0.038	0.046	0.044	0.034	0.052	0.047	0.052	0.034	0.05
MERCURY	µmoles/g	-	-	0.000038	0.000029	0.000041	0.000019	0.000031	0.000027	0.000032	0.000035 J	0.000082	0.000042	0.000036	0.000021	0.000066
NICKEL	µmoles/g	-	-	0.27	0.1	0.12	0.11	0.15	0.13	0.21	0.23	0.15	0.25	0.21	0.17	0.25
SILVER	µmoles/g	-	-	0.0009 U	0.00099 U	0.001 U	0.00085 U	0.0012 U	0.001 U	0.001 U	0.00094 U	0.00091 U	0.0011 U	0.00093 U	0.0011 U	0.00098 U
ZINC	µmoles/g	-	-	1.2	0.48	0.53	0.46	0.67	0.84	0.67	0.53	0.6	0.75	0.95	0.56	0.71
Wet Chemistry																
Moisture	%	-	-	33.4	31	32.1	31.6	42.5	32.5	41.5	32.8	32.5	41.4	31.9	38.7	30.5
Total Organic Carbon	mg/kg	-	-	10,800	38,000	27,000	21,800	36,300	29,200	34,700	19,700	22,900	29,700	21,400	45,700	19,000
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**53.54**	**51.39**	**56.42**	**57.48**	**61.59**	**75.51**	**72.01**	**71.53**	**72.78**	**75.76**	**102.78**	**53.79**	**84.23**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	**180.0**	22.5	36.9	38.9	33.4	45.9	36.8	60.9	50.2	47.8	76.1	23.1	74.5

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CF-03-E- 0.0/0.5 6/26/2014	CF-03-E- 0.5/1.2 6/26/2014	CF-04-B- 0.0/0.5 6/24/2014	CF-04-B- 0.5/1.3 6/24/2014	CF-05-B- 0.0/0.5 6/24/2014	CF-05-B- 0.5/0.9 6/24/2014	CF-05-C- 0.0/0.6 6/26/2014	CF-05-D- 0.0/0.5 6/25/2014	CF-05-D- 0.5/0.9 6/25/2014	CF-06-A- 0.0/0.5 6/25/2014	CF-06-A- 0.5/1.8 6/25/2014	CF-06-B- 0.0/0.6 6/26/2014	CF-06-D- 0.0/0.8 6/25/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.018 U	0.015 U	0.018 U	0.016 J	0.02 U	0.016 U	0.016 U	0.018 U	0.014 U	0.044 J	0.018 J	0.017 U	0.015 UJ
ARSENIC	µmoles/g	-	-	0.016 J	0.024	0.018 J	0.02	0.018 J	0.017 J	0.019	0.027	0.031	0.016 J	0.029	0.021	0.02 J
CADMIUM	µmoles/g	-	-	0.0024 J	0.0018 J	0.002 J	0.0016 J	0.002 J	0.0027 J	0.0022 J	0.0022 J	0.0024 J	0.0022 J	0.0023 J	0.002 J	0.0017 J
CHROMIUM	µmoles/g	-	-	0.08	0.078	0.2	0.16	0.13	0.15	0.057	0.076	0.091	0.11	0.11	0.088	0.058
COPPER	µmoles/g	-	-	0.31	0.3	0.38	0.33	0.37	0.44	0.29	0.33	0.32	0.41	0.37	0.33	0.28
LEAD	µmoles/g	-	-	0.032	0.03	0.036	0.034	0.034	0.048	0.03	0.035	0.038	0.039	0.041	0.043	0.027
MERCURY	µmoles/g	-	-	0.000022	0.000043	0.000054	0.000041	0.000027	0.00011	0.000029	0.000029	0.000053	0.00001 J	0.00002	0.000042	0.000026 J
NICKEL	µmoles/g	-	-	0.14	0.12	0.26	0.21	0.2	0.21	0.12	0.15	0.15	0.17	0.15	0.13	0.11
SILVER	µmoles/g	-	-	0.001 U	0.00087 U	0.001 U	0.0009 U	0.003 J	0.00093 U	0.00092 U	0.001 U	0.00082 U	0.0011 U	0.001 U	0.00097 U	0.00087 U
ZINC	µmoles/g	-	-	0.53	0.37	0.64	0.55	0.6	0.68	0.39	0.45	0.54	0.56	0.55	0.45	0.36
Wet Chemistry																
Moisture	%	-	-	35.1	30.2	35.9	29.7	41.4	30.5	27	35.5	28.5	42.5	32.2	32.3	30.5
Total Organic Carbon	mg/kg	-	-	30,100	12,200	15,100	14,500	29,700	34,500	24,800	18,400	11,000	37,500	16,000	22,200 J	21,400
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**56.38**	**54.82**	**73.25**	**70.38**	**60.38**	**86.32**	**52.04**	**53.76**	**75.06**	**26.86**	**61.88**	**56.21**	**51.94**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	33.1	66.2	86.1	76.6	40.0	39.6	32.9	51.6	94.3	30.3	68.5	42.3	35.7

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		CF-07-A- 0.0/0.8 6/26/2014	CF-07-B- 0.0/0.7 6/23/2014	CF-08-D- 0.0/0.7 6/26/2014	CF-09-A- 0.0/0.8 6/25/2014	CF-10-B- 0.0/0.5 6/25/2014	CF-10-B- 0.5/1.3 6/25/2014	FP-01- 0.0/0.5 6/26/2014	FP-01- 0.5/1.2 6/26/2014	NR-01-A1- 0.0/0.5 6/25/2014	NR-01-A1- 0.5/2.0 6/25/2014	NR-01-A1- 2.0/2.5 6/25/2014	NR-01-B- 0.0./0.5 6/25/2014	NR-01-B- 0.5/2.0 6/25/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.015 U	0.015 U	0.014 U	0.016 U	0.015 U	0.014 U	0.098	0.063	0.015 U	0.015 U	0.014 U	0.014 U	0.013 U
ARSENIC	µmoles/g	-	-	0.026	0.02	0.018	0.028	0.02	0.028	0.012 J	0.025	0.018	0.009 J	0.011 J	0.013 J	0.011 J
CADMIUM	µmoles/g	-	-	0.0024 J	0.0016 J	0.0017 J	0.0023 J	0.0033	0.002 J	0.0014 J	0.0024 J	0.0013 J	0.00093 U	0.00087 U	0.00087 U	0.00084 U
CHROMIUM	µmoles/g	-	-	0.065	0.047	0.053	0.065	0.054	0.071	0.12	0.13	0.037	0.01	0.006	0.0085	0.0079
COPPER	µmoles/g	-	-	0.31	0.22	0.26	0.28	0.25	0.28	0.36	0.42	0.19	0.024	0.011	0.016	0.017
LEAD	µmoles/g	-	-	0.035	0.032	0.03	0.046	0.033	0.034	0.031	0.036	0.016	0.0054	0.0045	0.0055	0.0055
MERCURY	µmoles/g	-	-	0.000035	0.000042	0.000027	0.000058	0.000027	0.00009	0.000019	0.000048	0.000026	0.0000069 J	0.0000057 U	0.0000057 U	0.0000055 U
NICKEL	µmoles/g	-	-	0.12	0.084	0.11	0.13	0.11	0.13	0.19	0.21	0.085	0.022	0.014	0.018	0.018
SILVER	µmoles/g	-	-	0.00083 U	0.00082 U	0.00081 U	0.00091 U	0.00084 U	0.00077 U	0.0013 J	0.0012 J	0.00085 U	0.00084 U	0.00078 U	0.00078 U	0.00076 U
ZINC	µmoles/g	-	-	0.39	0.28	0.34	0.38	0.35	0.35	0.63	0.6	0.2	0.066	0.055	0.069	0.063
Wet Chemistry																
Moisture	%	-	-	28.5	29.9	26.5	27.4	29.6	23.9	43.7	34.8	24.3	21.6	18.3	14.7	18.7
Total Organic Carbon	mg/kg	-	-	23,600	18,100	15,000	17,900	24,200	6,620	38,100	26,900	4,450	3,960 J	399	834	564
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**57.19**	**41.20**	**53.01**	**52.42**	**49.78**	**56.88**	**12.38**	**20.14**	**32.85**	**7.92**	**6.13**	**7.84**	**8.06**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	35.7	33.3	48.5	46.0	30.2	118.2	29.3	44.8	107.4	26.2	**179.8**	114.8	**162.6**

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		NR-01-B-2.0/3.0 6/25/2014	NR-01-B-3.0/3.5 6/25/2014	NR-01-E-0.0/0.5 6/25/2014	NR-01-E-0.5/2.0 6/25/2014	NR-01-E-2.0/3.0 6/25/2014	NR-01-E-3.0/4.0 6/25/2014	NR-01-E-4.0/4.6 6/25/2014	NR-02-B1-0.0/0.5 6/26/2014	NR-02-B1-0.5/2.0 6/26/2014	NR-02-B1-2.0/2.5 6/26/2014	NR-02-B2-0.0/0.5 6/26/2014	NR-02-B2-0.5/2.0 6/26/2014	NR-02-B2-2.0/2.9 6/26/2014
AVS/SEM																
Acid Volatile Sulfide	µmoles/g	-	-	0.013 U	0.012 U	0.79	0.15	0.059	0.24	0.13	0.013 U	0.015 U	0.016 U	0.012 U	0.013 U	0.013 U
ARSENIC	µmoles/g	-	-	0.014 J	0.016	0.013 J	0.011 J	0.0077 J	0.013 J	0.011 J	0.02	0.0092 J	0.011 J	0.012 J	0.012 J	0.011 J
CADMIUM	µmoles/g	-	-	0.00085 U	0.00077 U	0.0013 J	0.0011 J	0.00089 U	0.00092 U	0.00097 J	0.0016 J	0.00092 U	0.00099 U	0.00076 U	0.00083 U	0.00081 U
CHROMIUM	µmoles/g	-	-	0.0081	0.01	0.051	0.038	0.027	0.03	0.035	0.035	0.011	0.016	0.013	0.012	0.014
COPPER	µmoles/g	-	-	0.015	0.017	0.17	0.15	0.087	0.094	0.14	0.22	0.017	0.044	0.019	0.017	0.025
LEAD	µmoles/g	-	-	0.0057	0.0063	0.017	0.014	0.011	0.011	0.013	0.016	0.0047	0.007	0.0061	0.0056	0.0063
MERCURY	µmoles/g	-	-	0.0000055 U	0.0000069 J	0.0000061 U	0.0000069 J	0.0000064 J	0.000006 U	0.0000052 U	0.00003	0.0000068 J	0.000011 J	0.0000072 J	0.0000068 J	0.0000084 J
NICKEL	µmoles/g	-	-	0.018	0.021	0.12	0.08	0.059	0.065	0.077	0.095	0.02	0.032	0.025	0.024	0.028
SILVER	µmoles/g	-	-	0.00076 U	0.0007 U	0.00084 U	0.00072 U	0.0008 U	0.00083 U	0.002 U	0.00075 U	0.00083 U	0.0014 J	0.00068 U	0.00074 U	0.00073 U
ZINC	µmoles/g	-	-	0.069	0.079	0.21	0.15	0.11	0.12	0.15	0.18	0.062	0.1	0.07	0.068	0.071
Wet Chemistry																
Moisture	%	-	-	14.9	14.9	21.4	17.4	18.3	18.9	17.7	17.6	18.7	28	4.6	11.2	17.5
Total Organic Carbon	mg/kg	-	-	769	503	8,490	4,360	1,310	2,080	3,400	1,750	661	9,320	981	735	2,200
Bioavailability of Metals																
∑SEM/AVS Ratio	-	1.0[b]	-	**8.38**	**10.37**	**0.66**	**2.64**	**4.55**	**1.21**	**2.94**	**39.46**	**7.00**	**11.54**	**10.10**	**8.91**	**10.11**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	124.7	**223.5**	-32.0	56.3	**159.8**	24.7	74.1	**285.7**	**136.2**	18.1	111.3	**139.9**	53.9

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

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Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 10

Analytical Results for Acid Volatile Sulfide and Simultaneously Extracted Metals (AVS/SEM)

Crawford Creek and Nemadji River Site Characterization, June 2014

	Units	Sediment Benchmarks[a]		NR-02-C-0.0/0.5 6/26/2014	NR-02-C-0.5/2.0 6/26/2014	NR-02-C-2.0/3.0 6/26/2014	NR-03-A1-0.0/0.5 6/25/2014	NR-03-A1-0.5/1.5 6/25/2014	NR-03-B-0.0/0.5 6/24/2014	NR-03-B-0.5/1.3 6/24/2014	NR-04-B-0.0/0.5 6/25/2014	NR-04-B-0.5/2.0 6/25/2014	NR-04-B-2.0/2.6 6/25/2014	NR-05-C-0.0/0.5 6/24/2014	NR-05-C-0.5/1.6 6/24/2014
AVS/SEM															
Acid Volatile Sulfide	µmoles/g	-	-	0.014 U	0.014 U	0.014 U	0.014 U	0.014 U	0.013 U	0.013 U	0.013 U	0.014 U	0.014 U	0.013 U	0.013 U
ARSENIC	µmoles/g	-	-	0.0095 J	0.01 J	0.015 J	0.0073 J	0.011 J	0.012 J	0.014	0.0094 J	0.01 J	0.0045 U	0.014 J	0.017
CADMIUM	µmoles/g	-	-	0.00087 U	0.0009 U	0.00087 U	0.00088 U	0.0009 U	0.00081 U	0.0008 U	0.00083 U	0.00087 U	0.00086 U	0.00081 U	0.00082 U
CHROMIUM	µmoles/g	-	-	0.012	0.011	0.01	0.0093	0.0082	0.012	0.013	0.0077	0.0082	0.0092	0.02	0.018
COPPER	µmoles/g	-	-	0.017	0.016	0.016	0.017	0.014	0.015	0.019	0.014	0.014	0.015	0.029	0.028
LEAD	µmoles/g	-	-	0.0053	0.0057	0.0059	0.0046	0.0052	0.0052	0.0048	0.0041	0.0046	0.0051	0.0075	0.007
MERCURY	µmoles/g	-	-	0.0000064 J	0.0000064 J	0.0000082 J	0.0000075 J	0.0000088 J	0.0000053 U	0.0000052 U	0.0000099 J	0.0000074 J	0.0000073 J	0.0000053 U	0.0000054 U
NICKEL	µmoles/g	-	-	0.023	0.02	0.023	0.02	0.021	0.023	0.024	0.017	0.017	0.017	0.036	0.037
SILVER	µmoles/g	-	-	0.0016 J	0.00081 U	0.0018 U	0.00079 U	0.0014 J	0.00073 U	0.00072 U	0.0014 J	0.00078 U	0.00077 U	0.00073 U	0.00074 U
ZINC	µmoles/g	-	-	0.059	0.063	0.074	0.064	0.063	0.045 U	0.046 U	0.054	0.046	0.055	0.064 U	0.053 U
Wet Chemistry															
Moisture	%	-	-	18.6	19.3	15.6	15.4	17.9	12.4	15.8	15.4	17.2	19.8	19.4	15.1
Total Organic Carbon	mg/kg	-	-	598	565	467	563	439	553	447	472	428	535	603	621
Bioavailability of Metals															
∑SEM/AVS Ratio	-	1.0[b]	-	**7.57**	**7.57**	**8.62**	**7.63**	**7.49**	**6.88**	**7.30**	**6.97**	**5.92**	**6.67**	**10.59**	**9.71**
(∑SEM-AVS)/f_{OC}	µmole/g_{oc}	130[c]	3,000[d]	**153.8**	**162.8**	**228.4**	**165.0**	**206.8**	**138.1**	**183.4**	**164.5**	**160.9**	**148.3**	**206.8**	**182.3**

Notes:

∑SEM was calculated by summing the molar concentrations of silver divided by 2, cadmium, copper, lead, nickel, and zinc.

a EPA Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: Metal Mixtures (Cadmium, Copper, Lead, Nickel, Silver, and Zinc), EPA-600-R-02-011, January 2005.

b An SEM/AVS ratio of ≤1.0 indicates an excess of sulfide and probable nontoxic sediments. An SEM/AVS ratio of >1.0 indicates an excess of metal and potentially toxic sediments.

c Sediment in which the organic carbon-normalized excess SEM is between 130 and 3,000 µmoles/goc may have adverse biological effects.

d Sediment in which the organic carbon-normalized excess SEM is greater than 3,000 µmoles/goc, adverse biological effects may be expected.

Shading indicates an SEM/AVS ratio greater than 1.0.

0.0/0.5 represents sample intervals below sediment/soil surface (bss)

CC = Crawford Creek; CF = Floodplain; NR = Nemadji River; J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 11

Summary of Habitat Assessment – QHEI Results

Crawford Creek and Nemadji River Site Characterization, July 2014

QHEI Characteristics	Reach 1	Reach 2	Reach 3	Reach 4
Epifaunal Substrate/Available Cover	6	6	6	6
Pool Substrate Characterization	6	6	6	6
Pool Variability	13	13	13	13
Sediment Deposition	20	20	20	20
Channel Flow Status	20	20	20	20
Channel Alteration	20	20	20	20
Channel Sinuosity	16	16	16	16
Bank Stability L/R	L:8, R:8	L:10, R:10	L:10, R:10	L:10, R:10
Vegetation Protection L/R	L:10, R:10	L:10, R:10	L:10, R:10	L:10, R:10
Riparian Vegetation Zone Width L/R	L:8, R:8	L:10, R:10	L:10, R:10	L:10, R:10
Total Score	**153**	**161**	**161**	**161**

Notes:

Maximum possible total score is 200

Scored metrics for RBP Habitat Assessment Crawford Creek Study Area (each individual metric has a maximum possible score of 20).

QHEI = Qualitative Habitat Evaluation Index; L = Left; R = Right

TABLE 12

Summary of Habitat Assessment – IBI Results

Crawford Creek and Nemadji River Site Characterization, July 2014

Order	Family	Reach 1	Reach 2	Reach 3	Reach 4	Total
Pelecypoda	Sphaeriidae			9	2	11
Gastropoda	Lymnaeidae	5		1		6
	Physidae	31	2	8	2	43
	Planorbidae	13	1	2		16
Oligochaeta		141	32	14	12	199
Hirudinea	Erpobdellidae	5	3			8
	Glossiphoniidae	3	3			6
Decapoda	Cambaridae	3				3
Amphipoda	Hyalellidae	14		8	4	26
Ephemeroptera	Caenidae	7	2			9
	Baetidae	6	1			7
	Heptageniidae	1			1	2
Trichoptera	Hydroptilidae			1		1
	Psychomyiidae	1				1
	Limnephilidae	1				1
Coleoptera	Haliplidae	2				2
Odonata	Corduliidae	5				5
	Libelullidae	1				1
	Coenagrionidae				1	1
Diptera	Ceratopogonidae	4	2	1		7
	Chironomidae	333	44	59	58	494
	Tabanidae	1				1
Abundance		577	90	103	80	850
Taxa Richness		19	9	9	7	

Notes:

Benthic Macroinvertebrates Collected from Crawford Creek by Stream Reach

IBI = Index of Biotic Integrity

TABLE 13

Summary of Habitat Assessment – ICI Results

Crawford Creek and Nemadji River Site Characterization, July 2014

Metric	Reach 1		Reach 2		Reach 3		Reach 4	
	No.	Score	No.	Score	No.	Score	No.	Score
Number of Taxa	19	2	9	0	9	0	7	0
Number of Mayfly Taxa	4	2	2	0	0	0	1	0
Number of Caddisfly Taxa	2	2	0	0	1	2	0	0
Number of Dipteran Taxa	3	0	2	0	2	0	1	0
Percent Mayfly Composition	2.00%	0	3.00%	0	0.00%	0	2.00%	0
Percent Caddisfly Composition	<1%	2	0.00%	0	1.00%	0	0.00%	0
Percent Tribe Tanytarsini Midge Composition								
Percent other Dipteran and Non-Insect Composition								
Percent Tolerant Organisms	82.00%	0	84.00%	0	71.00%	0	92.00%	0
Number of Qualitative EPT taxa	6	2	2	0	1	0	1	0
TOTAL SCORE	**10**		**0**		**2**		**0**	

Notes:

Modified Invertebrate Community Index (ICI) Summary

TABLE 14

Summary of Fish Sampling Results – Dioxins/Furans and PCPs

Crawford Creek and Nemadji River Site Characterization, July 2014

	CAS No.	Unit	Cancer 1.0E-6 Potential Risk Criterion (ww)[a]	CC-FT-001-F (Northern Pike 7+ Years) 7/16/2014	CC-FT-001-O (Northern Pike 7+ Years) 7/16/2014	CC-FT-002-W (Northern Pike 1+ Years) 7/16/2014	CC-FT-003-W (Northern Pike 1+ Years) 7/16/2014	CC-FT-004-W (Northern Pike 1+ Years) 7/16/2014	CC-FT-005-F (Black Bullhead 3+ Years) 7/16/2014	CC-FT-005-O (Black Bullhead 3+ Years) 7/16/2014	CC-FT-006-W (Northern Pike 1+ Years) 7/17/2014	CC-FT-007-W (Northern Pike 1+ Years) 7/17/2014	CC-FT-010-W (Northern Pike 1+ Years) 7/17/2014
DIOXIN													
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	ng/Kg	-	0.37 U	0.26 U	0.33 U	0.6 J	0.58 J	0.32 U	1.4 UJ	0.47 UJ	0.41 UJ	0.43 J
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-46-9	ng/Kg	-	0.35 U	1.8	1.1 UJ	1.7 UJ	1.3	0.58 J	8.8	1.4	1.1 UJ	1 UJ
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	ng/Kg	-	0.5 U	0.67 U	0.54 U	0.82 U	0.42 U	0.37 U	1.5 U	0.38 U	0.74 U	0.51 U
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	ng/Kg	-	0.22 U	0.24 U	0.24 UJ	0.47 UJ	0.39 J	0.2 U	0.46 U	0.45 UJ	0.24 UJ	0.27 U
1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	ng/Kg	-	0.23 U	0.45 UJ	0.29 U	0.25 U	0.13 J	0.23 U	0.51 U	0.28 U	0.23 U	0.24 U
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	ng/Kg	-	0.22 U	3.8 UJ	0.53 UJ	1.1 UJ	3.1 UJ	0.24 U	0.44 U	1.5 UJ	0.77 UJ	0.79 UJ
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	ng/Kg	-	0.28 U	1.6	0.54 J	0.89 UJ	0.54 J	0.34 U	0.69 UJ	0.66 J	0.64 J	0.53 J
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	ng/Kg	-	0.2 U	0.33 U	0.31 U	0.36 U	0.12 U	0.32 U	0.51 U	0.21 U	0.22 U	0.35 U
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	ng/Kg	-	0.35 U	0.22 U	0.32 U	0.32 U	0.13 U	0.3 U	0.49 U	0.25 U	0.27 U	0.27 U
1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	ng/Kg	-	0.22 U	0.48 J	0.17 U	0.24 J	0.2 J	0.18 U	0.42 U	0.23 U	0.21 U	0.16 U
1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	40321-76-4	ng/Kg	-	0.26 U	0.66 J	0.32 U	0.25 U	0.16 J	0.21 U	0.58 U	0.38 U	0.34 U	0.22 U
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	ng/Kg	-	0.25 U	0.2 U	0.23 U	0.24 U	0.17 J	0.25 U	0.5 U	0.15 U	0.14 U	0.13 U
2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	ng/Kg	-	0.19 U	0.6 J	0.16 UJ	0.25 J	0.2 J	0.15 U	0.27 U	0.21 U	0.28 U	0.18 UJ
2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	ng/Kg	-	0.45 UJ	1.8	0.32	0.26 UJ	0.25 U	0.12 UJ	0.32 UJ	0.37 UJ	0.21 UJ	0.31 UJ
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	ng/Kg	-	0.16 J	0.56 UJ	0.095 U	0.15 U	0.11 UJ	0.1 U	0.31 U	0.13 U	0.13 U	0.16 U
OCTACHLORODIBENZOFURAN	39001-02-0	ng/Kg	-	1.2 U	1.1 U	1.3 U	1.6 U	0.54 U	1.5 U	4.5 UJ	1.5 U	2 U	1.8 U
OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	ng/Kg	-	1.4 U	4.9	8.7	15	4.9 U	2.9 J	130	7.3	5.1	4.1
TOTAL HEPTACHLORODIBENZOFURANS (HPCDF)	HPCDF	ng/Kg	-	0.44 U	0.47 U	0.44 U	1.6 J	0.58 J	0.34 U	6.3	0.31 U	0.49 U	0.43 J
TOTAL HEPTACHLORODIBENZO-P-DIOXINS (HPCDD)	HPCDD	ng/Kg	-	0.35 U	1.8	0.29 U	0.86 J	1.3	0.58 J	20	1.4	0.26 U	0.29 U
TOTAL HEXACHLORODIBENZOFURANS (HXCDF)	HXCDF	ng/Kg	-	0.22 U	5.3	0.25 U	3.3	2.3 J	2.3 J	6.6 J	3.2	1.3	0.25 U
TOTAL HEXACHLORODIBENZO-P-DIOXINS (HXCDD)	HXCDD	ng/Kg	-	0.28 U	1.6	0.54 J	0.3 U	0.67 J	0.29 U	0.51 U	0.66 J	0.64 J	0.53 J
TOTAL PENTACHLORINATEDIBENZO-P-DIOXIN	PECDD	ng/Kg	-	0.26 U	0.66 J	0.32 U	0.25 U	0.16 J	0.21 U	0.58 U	0.38 U	0.34 U	1.1 J
TOTAL PENTACHLORODIBENZOFURANS (PECDF)	PECDF	ng/Kg	-	0.2 U	1.1 J	0.22 J	0.97 J	0.58 J	0.17 U	0.34 U	0.53 J	0.43 J	0.36 J
TOTAL TETRACHLORODIBENZOFURANS (TCDF)	TCDF	ng/Kg	-	0.072 U	3.2	0.7	0.42 J	0.41 U	0.24 U	0.34 J	0.5	0.29	0.14 U
TOTAL TETRACHLORODIBENZO-P-DIOXINS (TCDD)	TCDD	ng/Kg	-	0.16 J	0.17 U	0.095 U	0.15 U	0.086 U	0.1 U	0.33 J	0.13 U	0.13 U	0.16 U
TEQ													
Mammals - Sum of TEQs (individuals) [b,c]			0.032	0.16	1.21	0.09	0.09	0.37	0.01	0.13	0.08	0.07	0.06
SVOC SIM													
PENTACHLOROPHENOL	87-86-5	ug/Kg	10	4.7 UJ	7.9 J	7.6 J	13.5 J	10 J	8 J	6.7 J	8.6 J	7.4 J	8.9 J
Wet Chemistry													
Lipid	Lipid	%	-	1.2	5.4	1.5	2.1	1.9	1.1	2.6	2.9	1.9	1.4

Notes:

Analytical results are reported on a wet-weight (ww) basis.

Shading indicates the result value is greater than the screening level

[a] The potential risk criterion are based on the EPA Region 3 Fish Tissue Screening Levels, May 2014 for pentachlorophenol and 2,3,7,8-TCDD with an assumed target risk range of 1x10-6 for carcinogens.

[b] TEQs calculated by summing the individual TEQs for 17 congeners; nondetects were not included in the sum

[c] Mammal TEQs were derived from the human and mammal toxic equivalency factors for dioxins and dioxin-like compounds (Van den Berg, M; Birnbaum, LS; Denison, M, DeVito, M, Farland, W, Feeley, M; Fiedler, H; Hakansson, H; Hanberg, A; Haws, L; Rose, M; Safe, S; Schrenk, D; Tohyama, C; Tritscher, A; Tuomisto, J; Tysklind, M; Walker, N; Peterson, RE. (2006) The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicol Sci 93:223-241).

F = Fillet; O = Offal; W = Whole Fish

ng/kg = nanograms per kilogram; µg/kg = microgram per kilogram; TEQ = toxicity equivalence

J = Estimated; U = Nondetect; UJ = Estimated nondetect

TABLE 14
Summary of Fish Sampling Results – Dioxins/Furans and PCPs
Crawford Creek and Nemadji River Site Characterization, July 2014

	CAS No.	Unit	Cancer 1.0E-6 Potential Risk Criterion (ww)[a]	CC-FT-011-W (Forage Fish NA) 7/17/2014	NR-FT-008-F (Channel Catfish 7+ Years) 7/17/2014	NR-FT-008-O (Channel Catfish 7+ Years) 7/17/2014	NR-FT-009-F (Silver Redhorse 7+ Years) 7/17/2014	NR-FT-009-O (Silver Redhorse 7+ Years) 7/17/2014
DIOXIN								
1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	ng/Kg	-	0.84 J	6.2	8.6	0.31 U	0.47 J
1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-46-9	ng/Kg	-	4.6	6.7	8.3	0.21 U	0.4 UJ
1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	ng/Kg	-	0.71 U	0.56 U	0.41 U	0.64 U	0.42 U
1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	ng/Kg	-	0.36 U	0.57 J	0.64 J	0.13 U	0.26 U
1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	ng/Kg	-	0.28 U	0.34 UJ	0.57 UJ	0.22 U	0.3 J
1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	ng/Kg	-	1.5 UJ	1.5	1.9	0.35 UJ	1.8 UJ
1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	ng/Kg	-	0.54 J	2.7	3.6	0.27 U	0.69 J
1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	ng/Kg	-	0.44 U	0.3 U	0.34 U	0.28 U	0.22 U
1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	ng/Kg	-	0.37 U	0.72 J	1.1 J	0.26 U	0.24 U
1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	ng/Kg	-	0.19 U	0.19 U	0.12 U	0.14 U	0.71 J
1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	40321-76-4	ng/Kg	-	0.52 U	0.85 J	1 J	0.15 U	0.48 J
2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	ng/Kg	-	0.38 U	0.52 J	0.46 J	0.11 U	0.27 J
2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	ng/Kg	-	0.36 U	0.81 J	1 J	0.12 U	0.6 J
2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	ng/Kg	-	0.19 J	0.68	0.52	0.5	1.8
2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	ng/Kg	-	0.26 U	0.71	0.81	0.12 UJ	0.51
OCTACHLORODIBENZOFURAN	39001-02-0	ng/Kg	-	3.1 UJ	1.3 U	1.2 U	0.75 U	0.77 U
OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	ng/Kg	-	29	6 UJ	11	1.2 U	1.3 U
TOTAL HEPTACHLORODIBENZOFURANS (HPCDF)	HPCDF	ng/Kg	-	2.9	6.2	8.6	0.47 U	0.47 J
TOTAL HEPTACHLORODIBENZO-P-DIOXINS (HPCDD)	HPCDD	ng/Kg	-	8.5	7.3	8.8	0.21 U	0.24 U
TOTAL HEXACHLORODIBENZOFURANS (HXCDF)	HXCDF	ng/Kg	-	0.39 U	4.5	5.2	0.17 U	0.27 J
TOTAL HEXACHLORODIBENZO-P-DIOXINS (HXCDD)	HXCDD	ng/Kg	-	1.1 J	3.4	4.7	0.25 U	0.99 J
TOTAL PENTACHLORINATEDIBENZO-P-DIOXIN	PECDD	ng/Kg	-	0.52 U	0.85 J	1 J	0.15 U	0.48 J
TOTAL PENTACHLORODIBENZOFURANS (PECDF)	PECDF	ng/Kg	-	0.53 J	1 J	1.3 J	0.19 J	2.5 J
TOTAL TETRACHLORODIBENZOFURANS (TCDF)	TCDF	ng/Kg	-	0.78 J	0.68	2.7	0.96	1.8
TOTAL TETRACHLORODIBENZO-P-DIOXINS (TCDD)	TCDD	ng/Kg	-	0.26 U	0.71	0.81	0.094 U	0.51
TEQ								
Mammals - Sum of TEQs (individuals) [b,c]			0.032	0.14	2.60	3.10	0.05	1.50
SVOC SIM								
PENTACHLOROPHENOL	87-86-5	ug/Kg	10	7.9 J	6.6 J	6.7 J	4.7 UJ	6.9 J
Wet Chemistry								
Lipid	Lipid	%	-	1.6	12.3	14.4	1.1	5.3

Notes:
Analytical results are reported on a wet-weight (ww) basis.
Shading indicates the result value is greater than the screening level
[a] The potential risk criterion are based on the EPA Region 3 Fish Tissue Screening Levels, May 2014 for pentachlorophenol and 2,3,7,8-TCDD with an assumed target risk range of 1x10-6 for carcinogens.
[b] TEQs calculated by summing the individual TEQs for 17 congeners; nondetects were not included in the sum
[c] Mammal TEQs were derived from the human and mammal toxic equivalency factors for dioxins and dioxin-like compounds (Van den Berg, M; Birnbaum, LS; Denison, M, DeVito, M, Farland, W, Feeley, M; Fiedler, H; Hakansson, H; Hanberg, A; Haws, L; Rose, M; Safe, S; Schrenk, D; Tohyama, C; Tritscher, A; Tuomisto, J; Tysklind, M; Walker, N; Peterson, RE. (2006) The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. Toxicol Sci 93:223-241).
F = Fillet; O = Offal; W = Whole Fish
ng/kg = nanograms per kilogram; µg/kg = microgram per kilogram; TEQ = toxicity equivalence
J = Estimated; U = Nondetect; UJ = Estimated nondetect

Figures

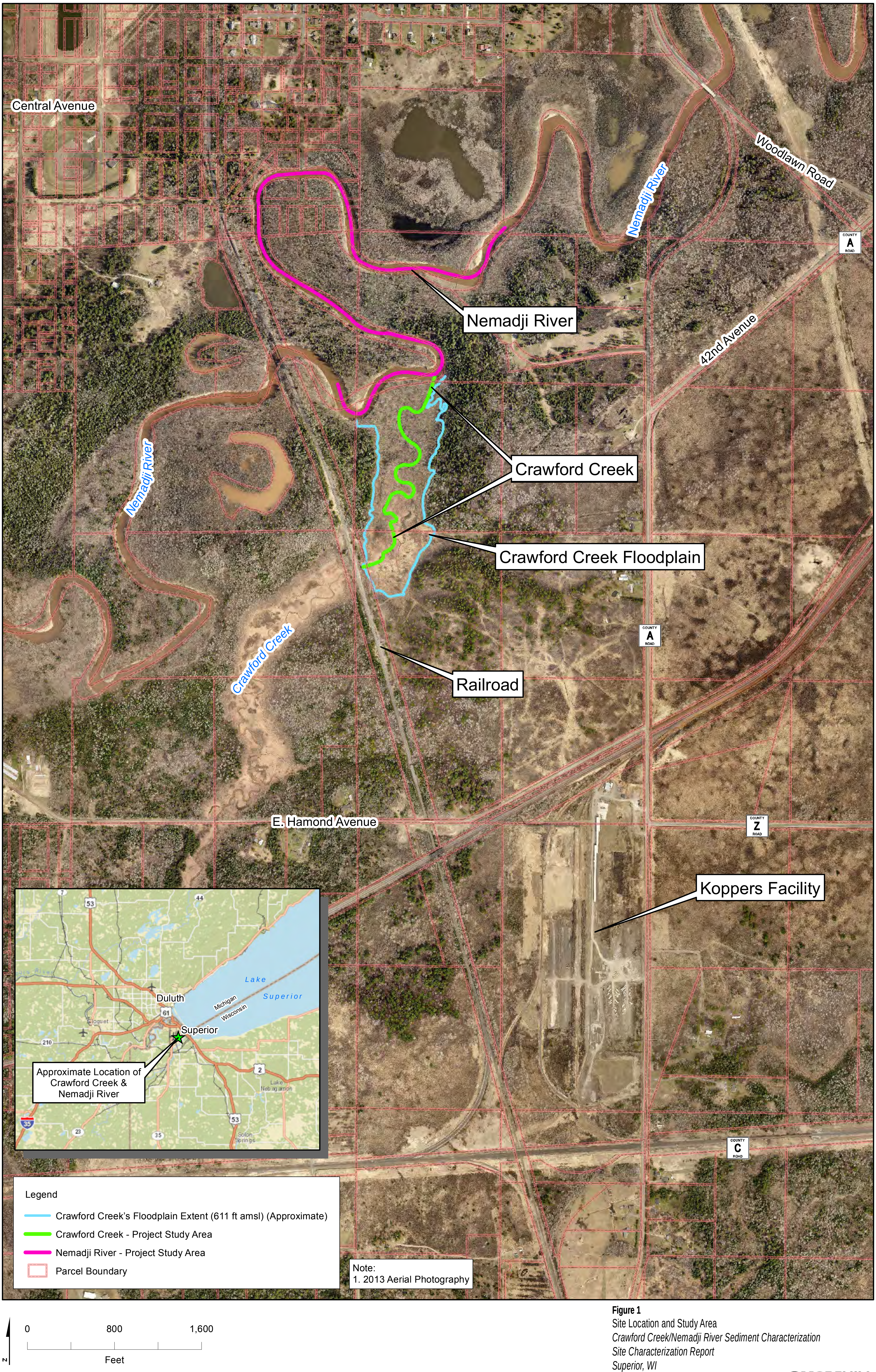

Figure 1
Site Location and Study Area
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 01 - SITE LOCATION AND STUDY AREA MAP.MXD JHANSEN1 12/2/2014 12:02:14 PM

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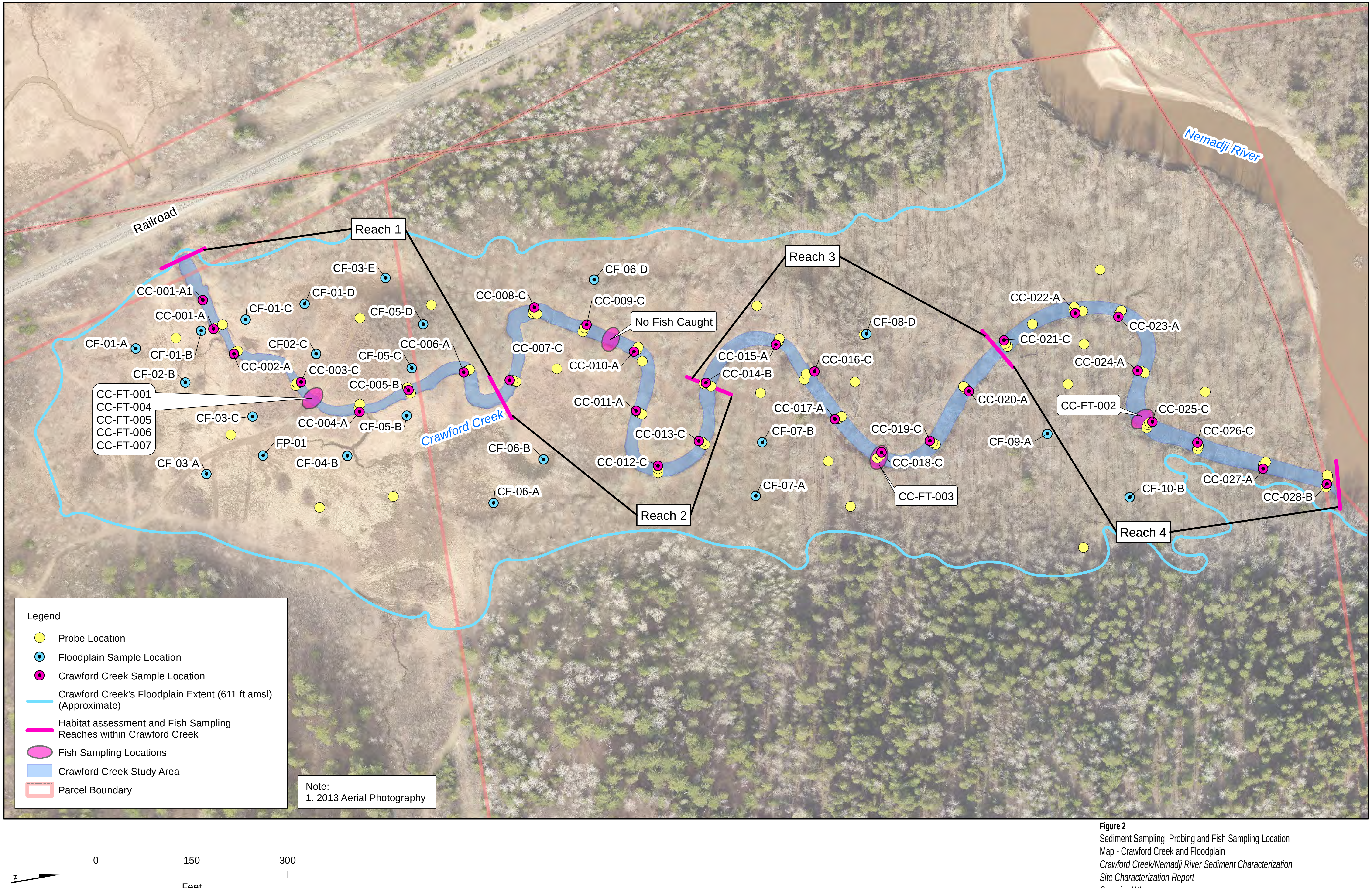

Figure 2
Sediment Sampling, Probing and Fish Sampling Location Map - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization Site Characterization Report
Superior, WI

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MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 02 - SED SAMPLING, PROBING AND FISH SAMPLING LOCATION MAP - CC AND FP.MXD JHANSEN1 12/2/2014 12:16:47 PM

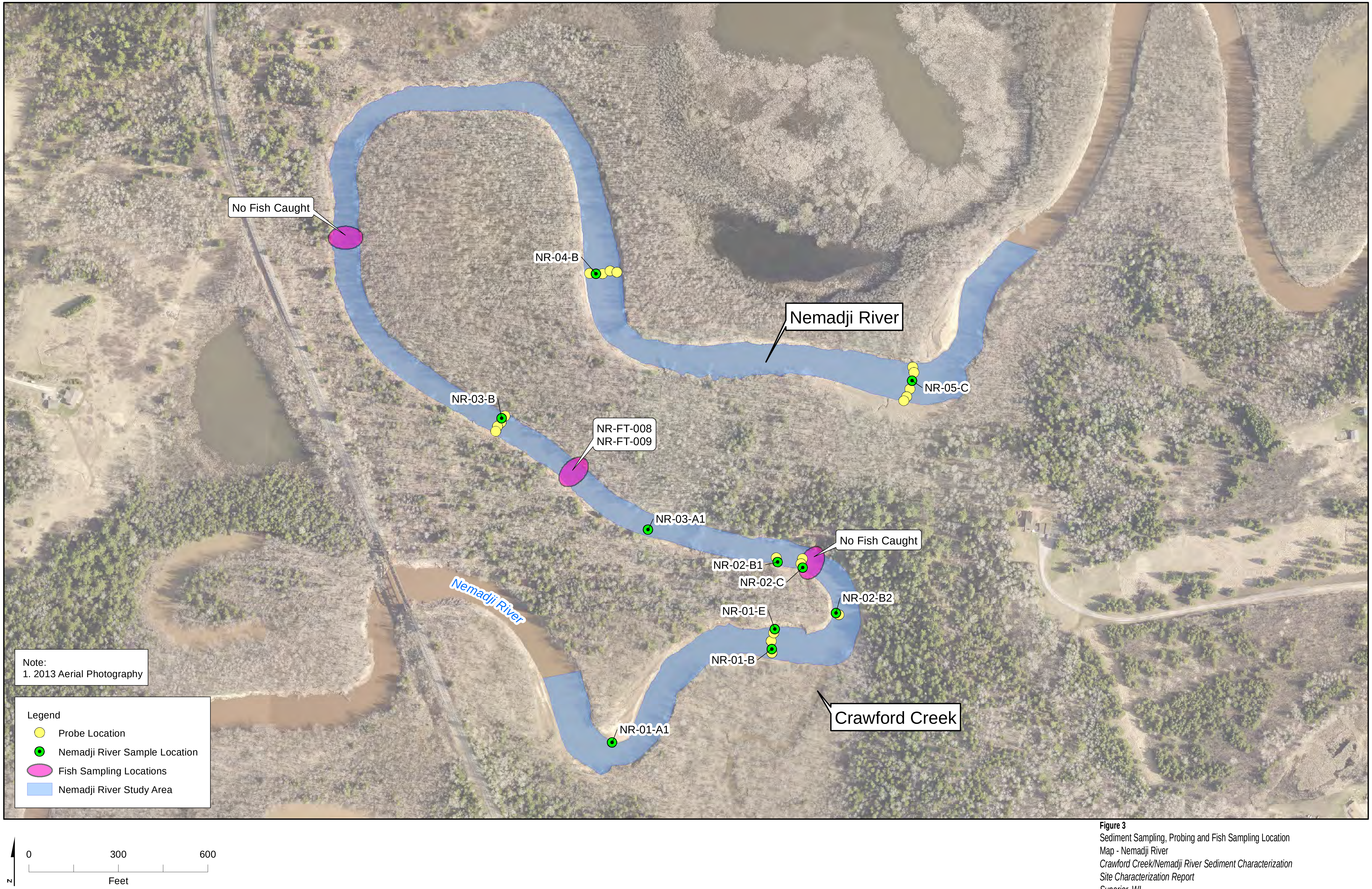

Figure 3
Sediment Sampling, Probing and Fish Sampling Location Map - Nemadji River
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 03 - SED SAMPLING, PROBING AND FISH SAMPLING LOCATION MAP - NEMADJI RIVER.MXD JHANSEN1 10/15/2014 2:39:21 PM

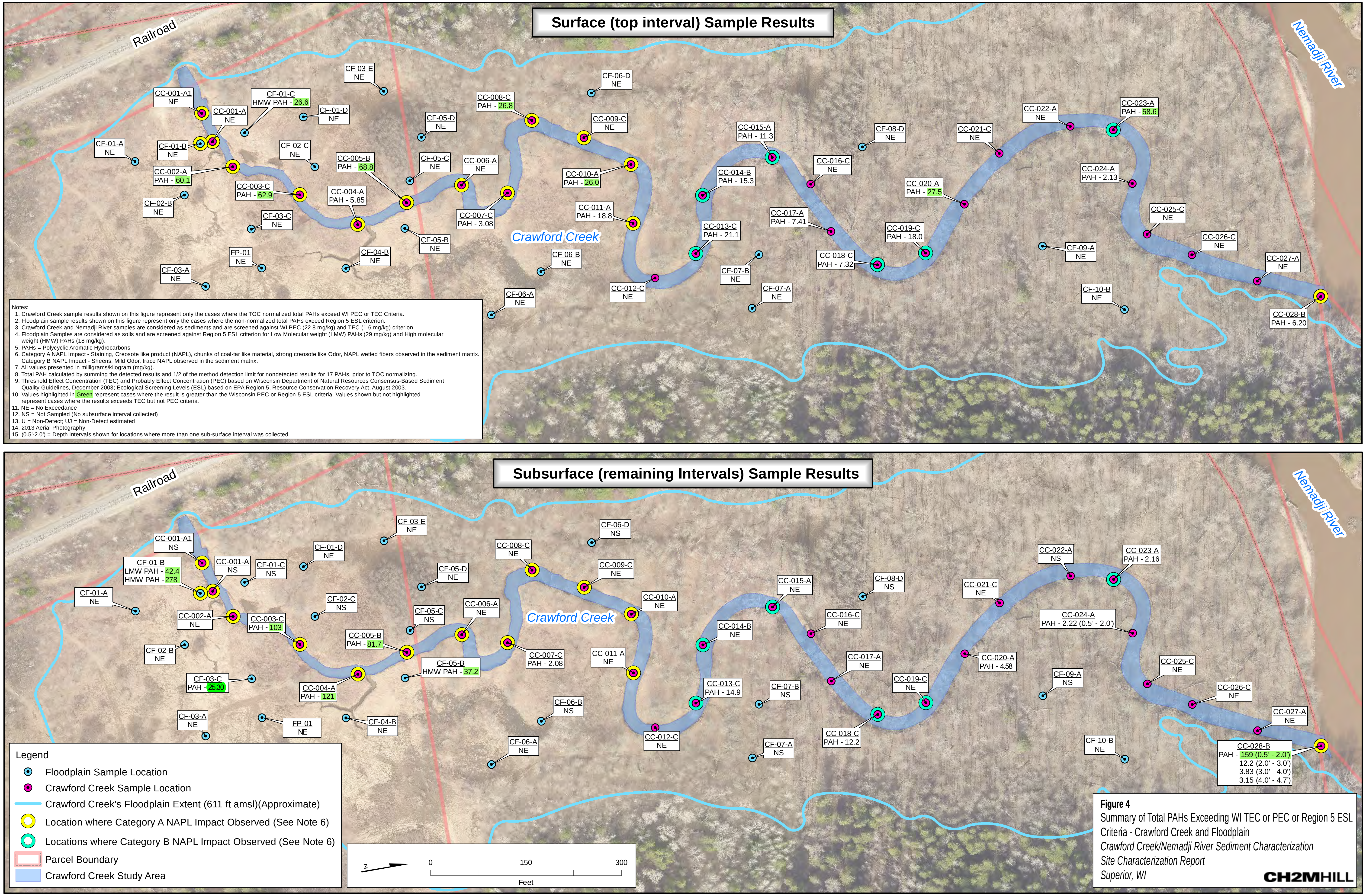
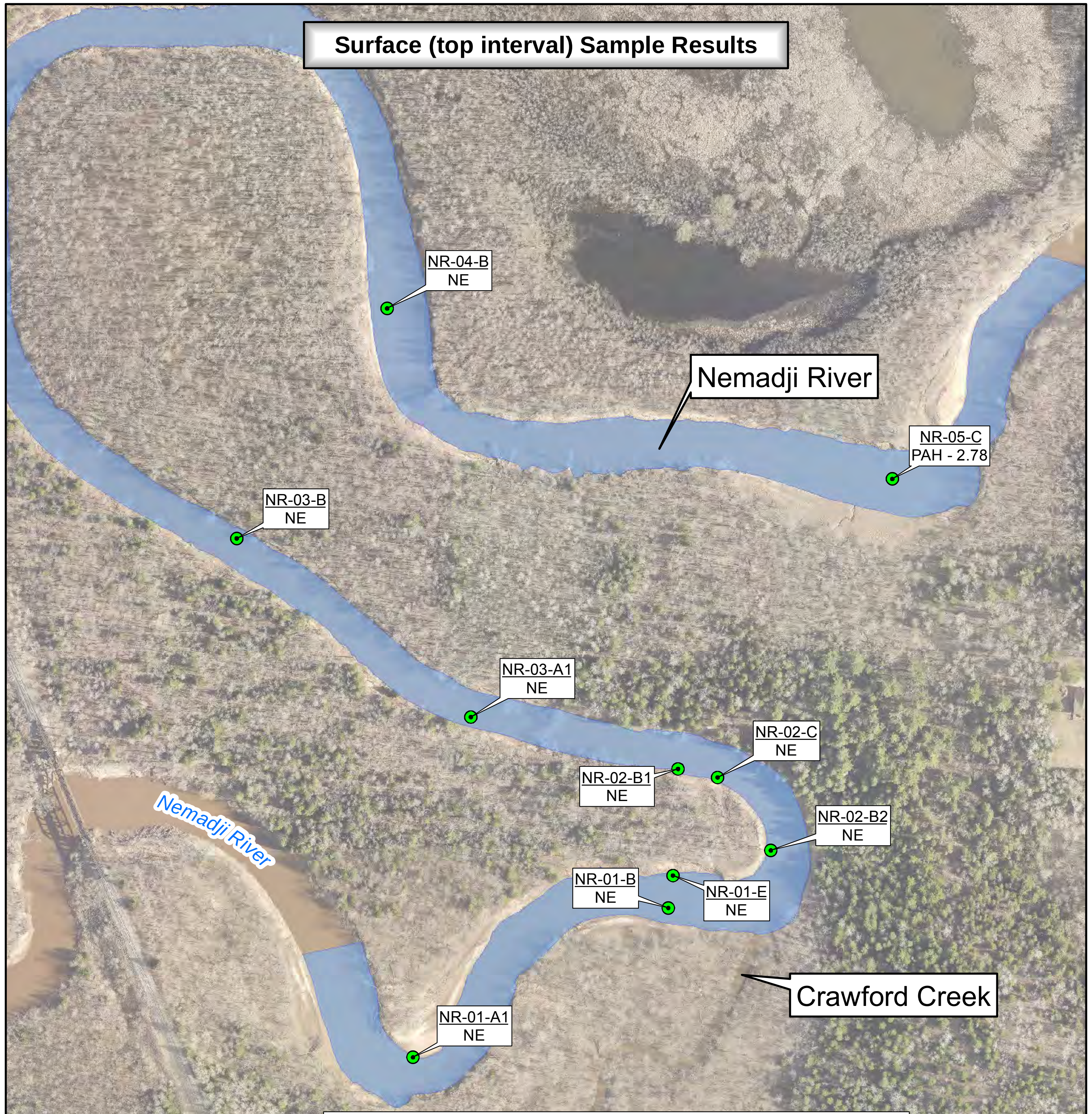
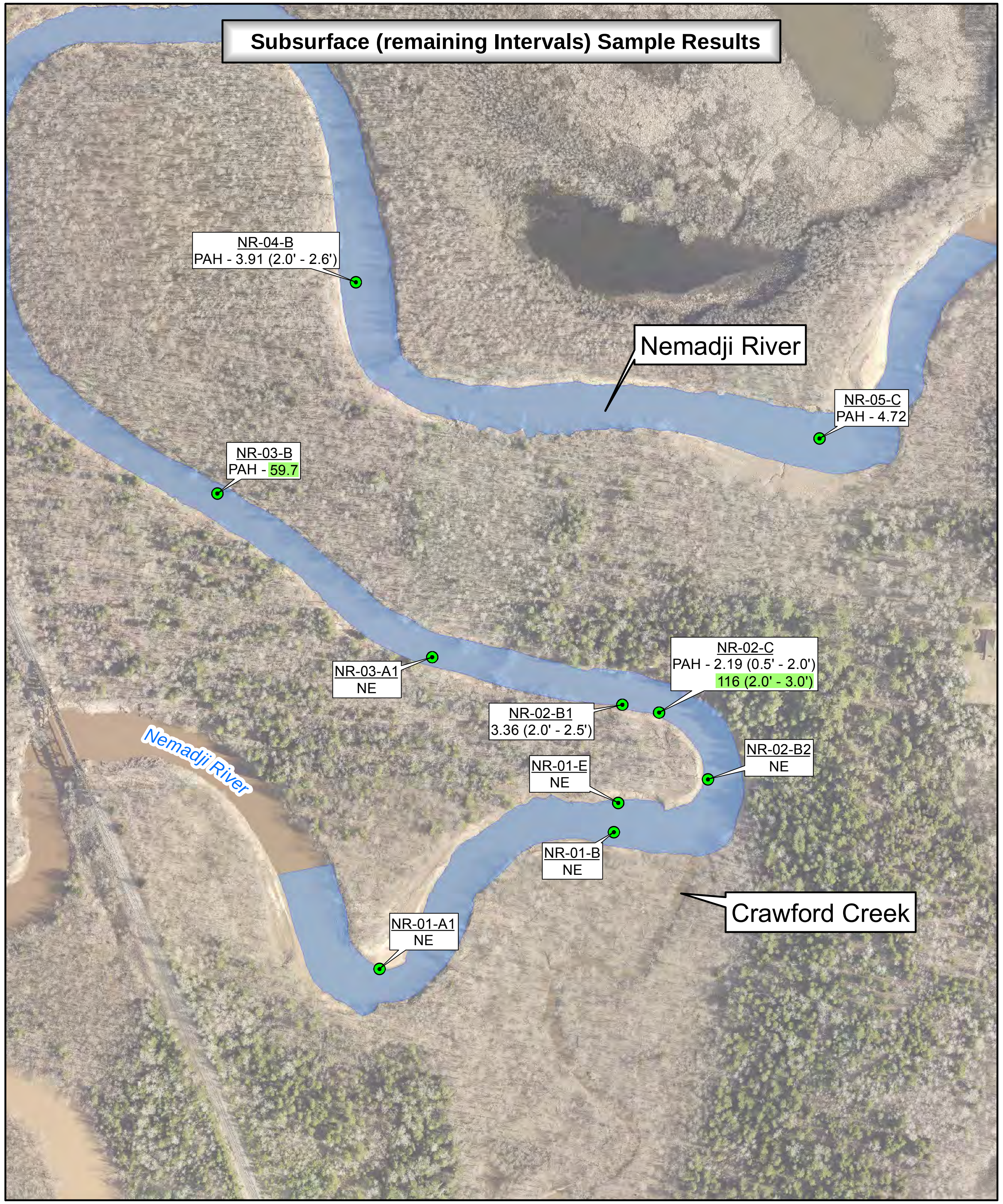


Figure 4
Summary of Total PAHs Exceeding WI TEC or PEC or Region 5 ESL Criteria - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI





Notes:
1. All values presented in milligrams/kilogram (mg/kg).
2. Total PAH values represent only the cases where the TOC-normalized result are greater than the Wisconsin TEC or PEC.
3. Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC) based on Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003
4. Results are not shown when TEC or PEC criterion are not exceeded.
5. Values highlighted in Green represent cases where the TOC-normalized result is greater than the Wisconsin PEC (22.8 mg/kg). Values shown but not highlighted represent cases where the results exceeds TEC (1.6 mg/kg) but not PEC criteria
6. Total PAH calculated by summing the detected results and 1/2 of the method detection limit for nondetected results for 17 PAHs, prior to TOC normalizing.
7. PAHs = Polycyclic Aromatic Hydrocarbons
8. NE = No Exceedance
9. NS = Not Sampled (No subsurface interval collected)
10. U = Non-Detect; UJ = Non-Detect estimated
11. 2013 Aerial Photography
12. (0.5'-2.0') = Depth intervals shown for locations where more than one sub-surface interval was collected.

N
0 300 600
Feet

Figure 5
Summary of Total PAHs Exceeding WI TEC or PEC Criteria - Nemadji River
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
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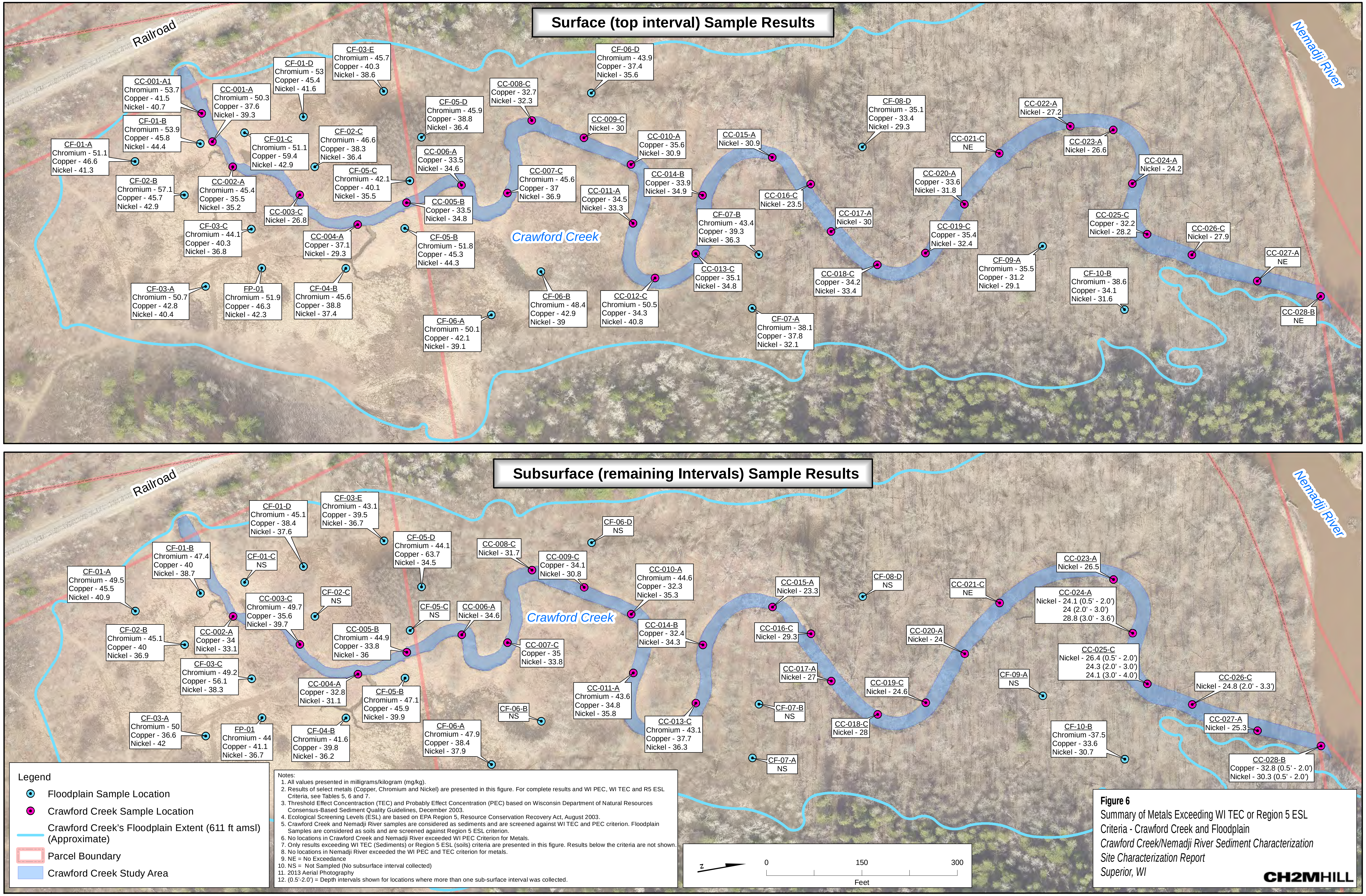
MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 05 - SUM OF TOTAL PAHS EXCEED WI TEC AND PEC CRITERIA - NEMADJI RIVER.MXD JHANSEN1 12/2/2014 12:33:49 PM



Legend
- Floodplain Sample Location
- Crawford Creek Sample Location
- Crawford Creek's Floodplain Extent (611 ft amsl) (Approximate)
- Parcel Boundary
- Crawford Creek Study Area

Notes:
1. All values presented in milligrams/kilogram (mg/kg).
2. Results of select metals (Copper, Chromium and Nickel) are presented in this figure. For complete results and WI PEC, WI TEC and R5 ESL Criteria, see Tables 5, 6 and 7.
3. Threshold Effect Concentraction (TEC) and Probably Effect Concentration (PEC) based on Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.
4. Ecological Screening Levels (ESL) are based on EPA Region 5, Resource Conservation Recovery Act, August 2003.
5. Crawford Creek and Nemadji River samples are considered as sediments and are screened against WI TEC and PEC criterion. Floodplain Samples are considered as soils and are screened against Region 5 ESL criterion.
6. No locations in Crawford Creek and Nemadji River exceeded WI PEC Criterion for Metals.
7. Only results exceeding WI TEC (Sediments) or Region 5 ESL (soils) criteria are presented in this figure. Results below the criteria are not shown.
8. No locations in Nemadji River exceeded the WI PEC and TEC criterion for metals.
9. NE = No Exceedance
10. NS = Not Sampled (No subsurface interval collected)
11. 2013 Aerial Photography
12. (0.5'-2.0') = Depth intervals shown for locations where more than one sub-surface interval was collected.

Figure 6
Summary of Metals Exceeding WI TEC or Region 5 ESL Criteria - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 06 - SUM OF METALS EXCEED WI TEC OR REGION 5 ESL CRITERIA - CC AND FP.MXD JHANSEN1 12/2/2014 9:51:03 AM

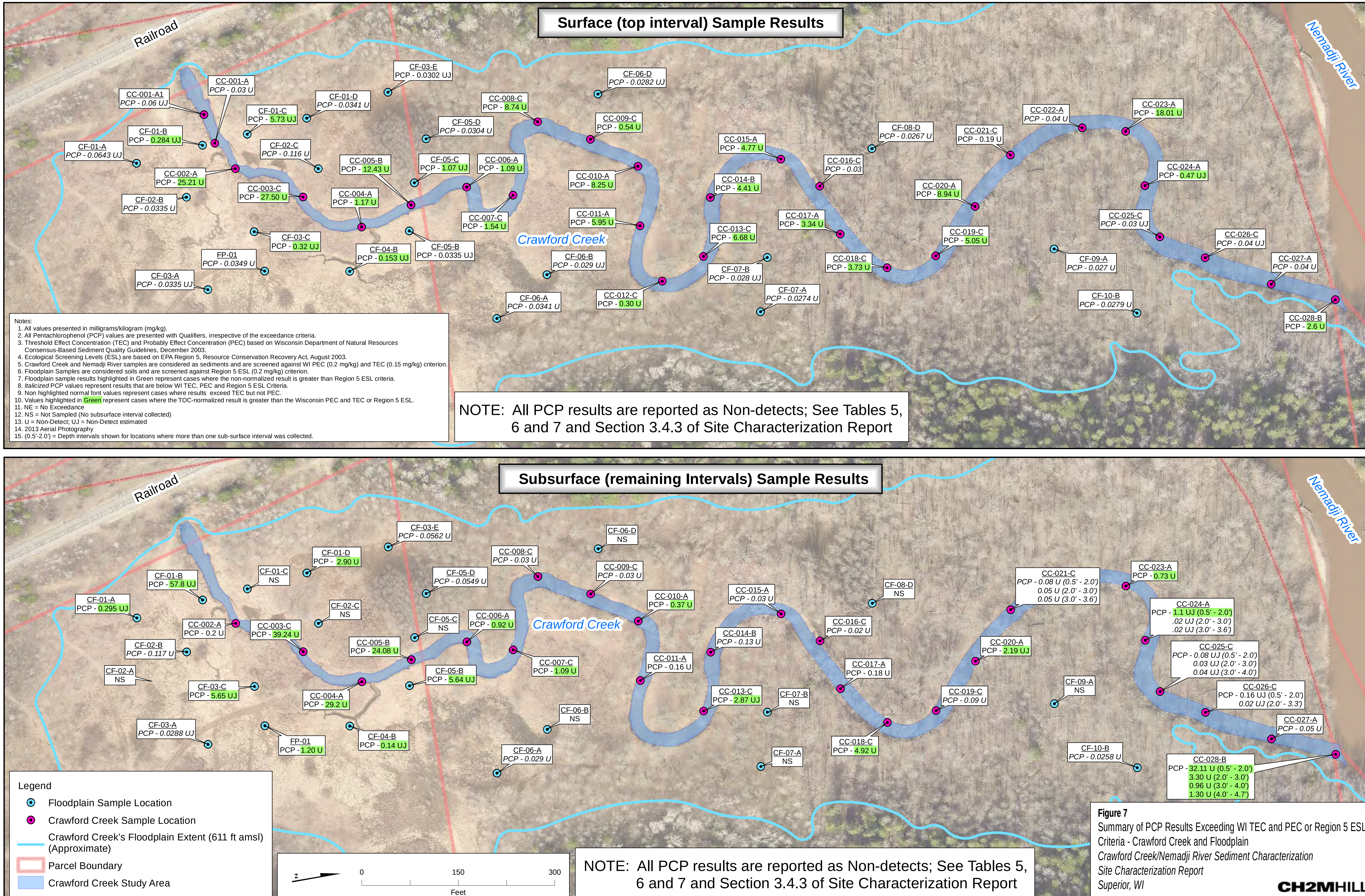

Figure 7
Summary of PCP Results Exceeding WI TEC and PEC or Region 5 ESL Criteria - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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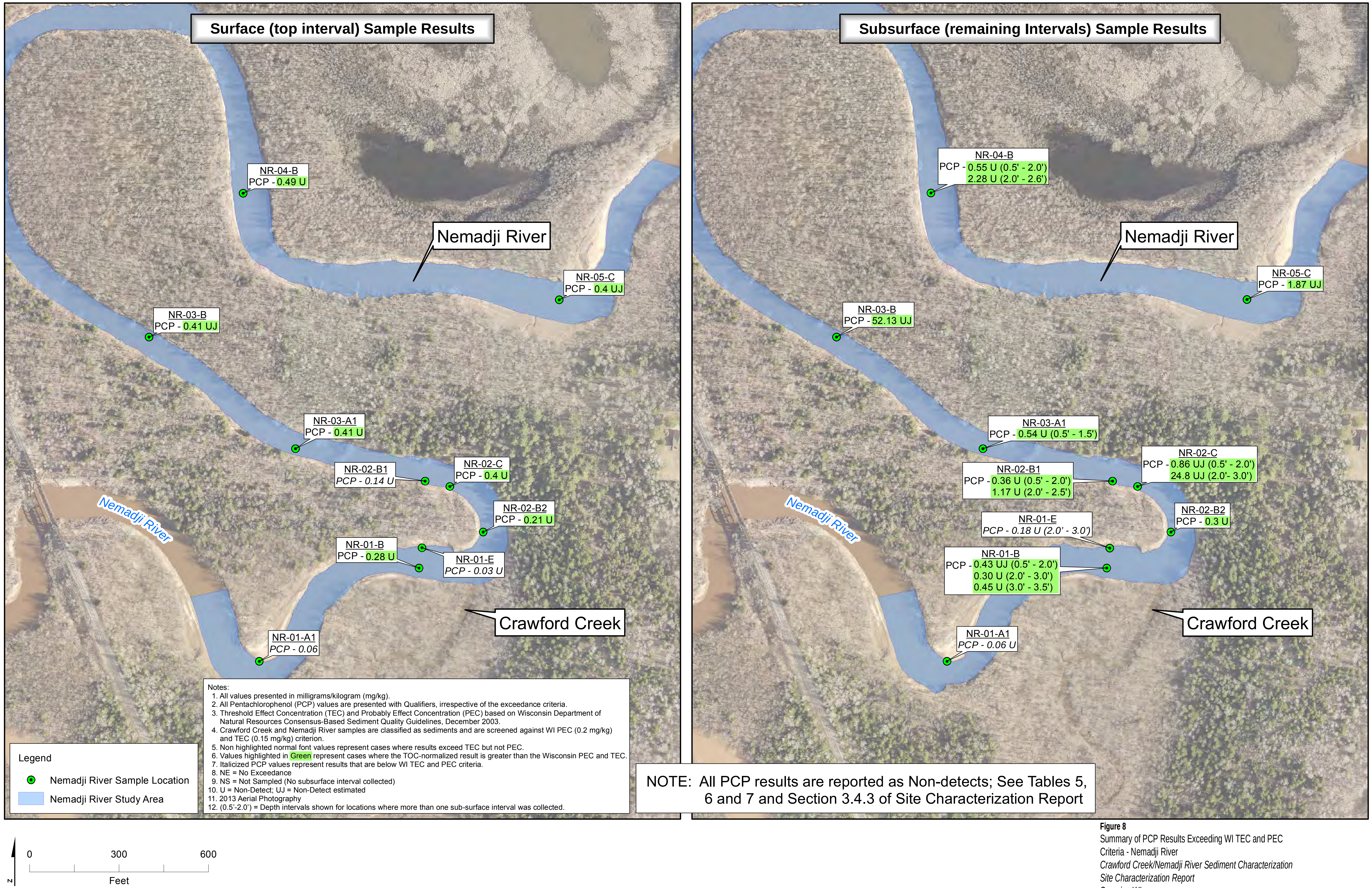
MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 07 - SUM OF PCP RESULTS EXCEED WI TEC AND PEC OR REGION 5 ESL CRITERIA - CC AND FP.MXD JHANSEN1 12/2/2014 12:54:08 PM



Notes:
1. All values presented in milligrams/kilogram (mg/kg).
2. All Pentachlorophenol (PCP) values are presented with Qualifiers, irrespective of the exceedance criteria.
3. Threshold Effect Concentration (TEC) and Probably Effect Concentration (PEC) based on Wisconsin Department of Natural Resources Consensus-Based Sediment Quality Guidelines, December 2003.
4. Crawford Creek and Nemadji River samples are classified as sediments and are screened against WI PEC (0.2 mg/kg) and TEC (0.15 mg/kg) criterion.
5. Non highlighted normal font values represent cases where results exceed TEC but not PEC.
6. Values highlighted in Green represent cases where the TOC-normalized result is greater than the Wisconsin PEC and TEC.
7. Italicized PCP values represent results that are below WI TEC and PEC criteria.
8. NE = No Exceedance
9. NS = Not Sampled (No subsurface interval collected)
10. U = Non-Detect; UJ = Non-Detect estimated
11. 2013 Aerial Photography
12. (0.5'-2.0') = Depth intervals shown for locations where more than one sub-surface interval was collected.

NOTE: All PCP results are reported as Non-detects; See Tables 5, 6 and 7 and Section 3.4.3 of Site Characterization Report

Figure 8
Summary of PCP Results Exceeding WI TEC and PEC Criteria - Nemadji River
Crawford Creek/Nemadji River Sediment Characterization Site Characterization Report
Superior, WI

MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 08 - SUM OF PCP RESULTS EXCEED WI TEC AND PEC OR REGION 5 ESL CRITERIA - NEMADJI RIVER.MXD JHANSEN1 12/2/2014 12:49:28 PM

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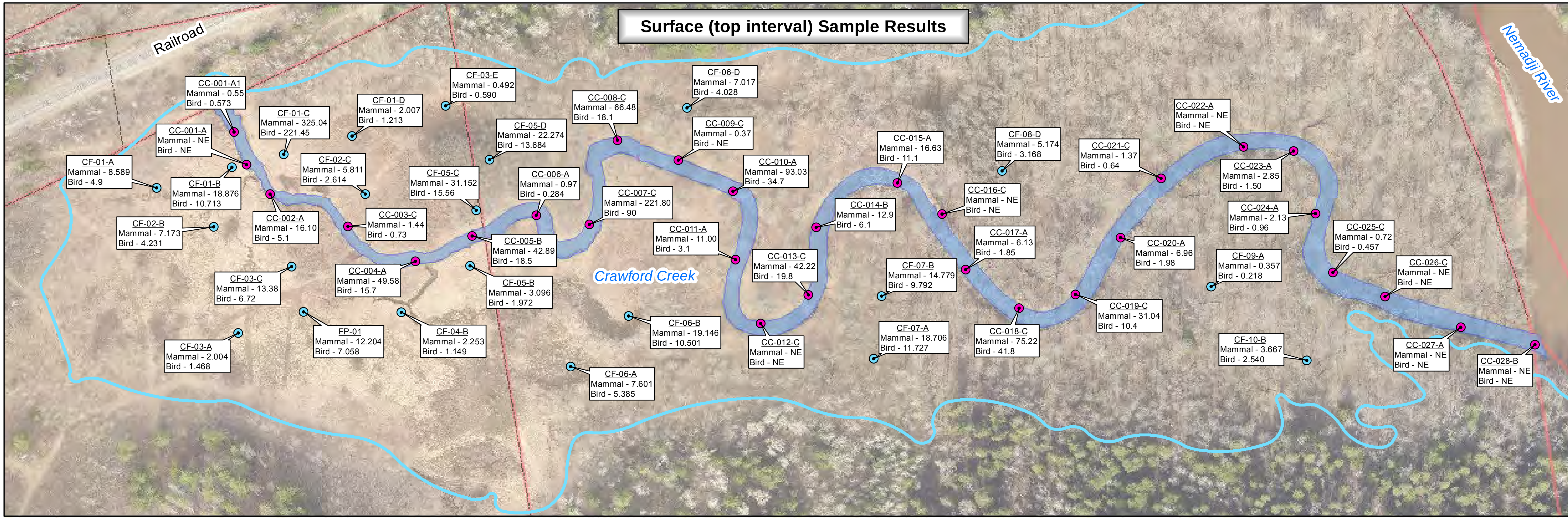

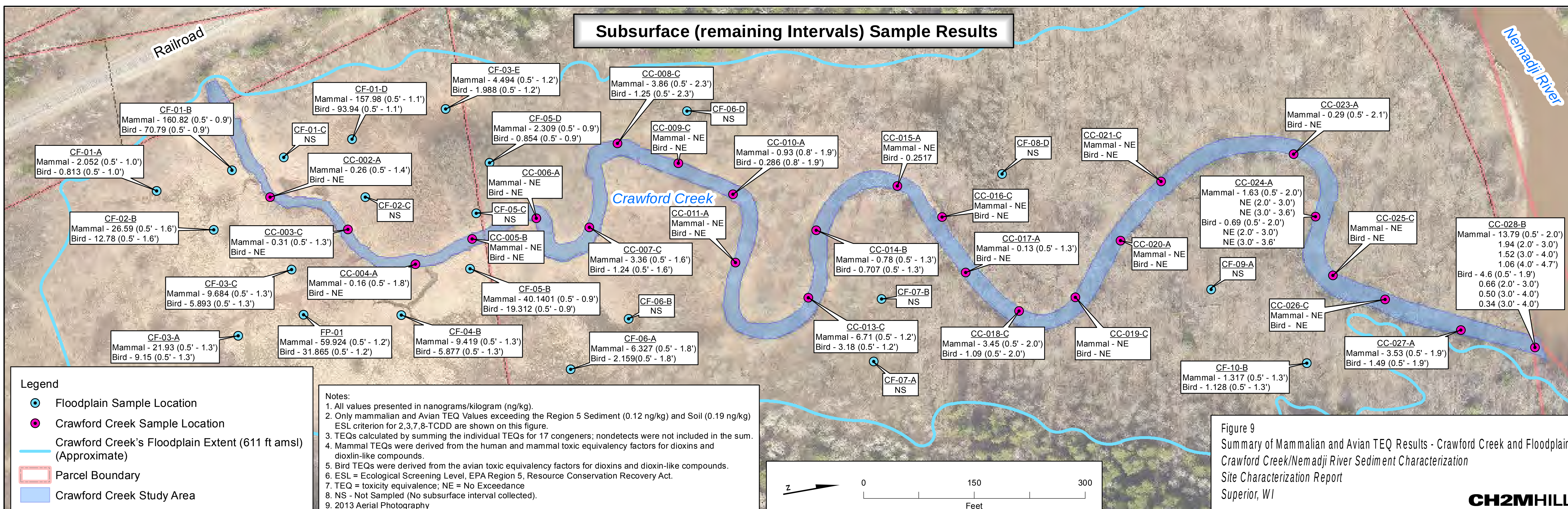

Legend
- Floodplain Sample Location
- Crawford Creek Sample Location
- Crawford Creek's Floodplain Extent (611 ft amsl) (Approximate)
- Parcel Boundary
- Crawford Creek Study Area

Notes:
1. All values presented in nanograms/kilogram (ng/kg).
2. Only mammalian and Avian TEQ Values exceeding the Region 5 Sediment (0.12 ng/kg) and Soil (0.19 ng/kg) ESL criterion for 2,3,7,8-TCDD are shown on this figure.
3. TEQs calculated by summing the individual TEQs for 17 congeners; nondetects were not included in the sum.
4. Mammal TEQs were derived from the human and mammal toxic equivalency factors for dioxins and dioxin-like compounds.
5. Bird TEQs were derived from the avian toxic equivalency factors for dioxins and dioxin-like compounds.
6. ESL = Ecological Screening Level, EPA Region 5, Resource Conservation Recovery Act.
7. TEQ = toxicity equivalence; NE = No Exceedance
8. NS - Not Sampled (No subsurface interval collected).
9. 2013 Aerial Photography

Figure 9
Summary of Mammalian and Avian TEQ Results - Crawford Creek and Floodplain
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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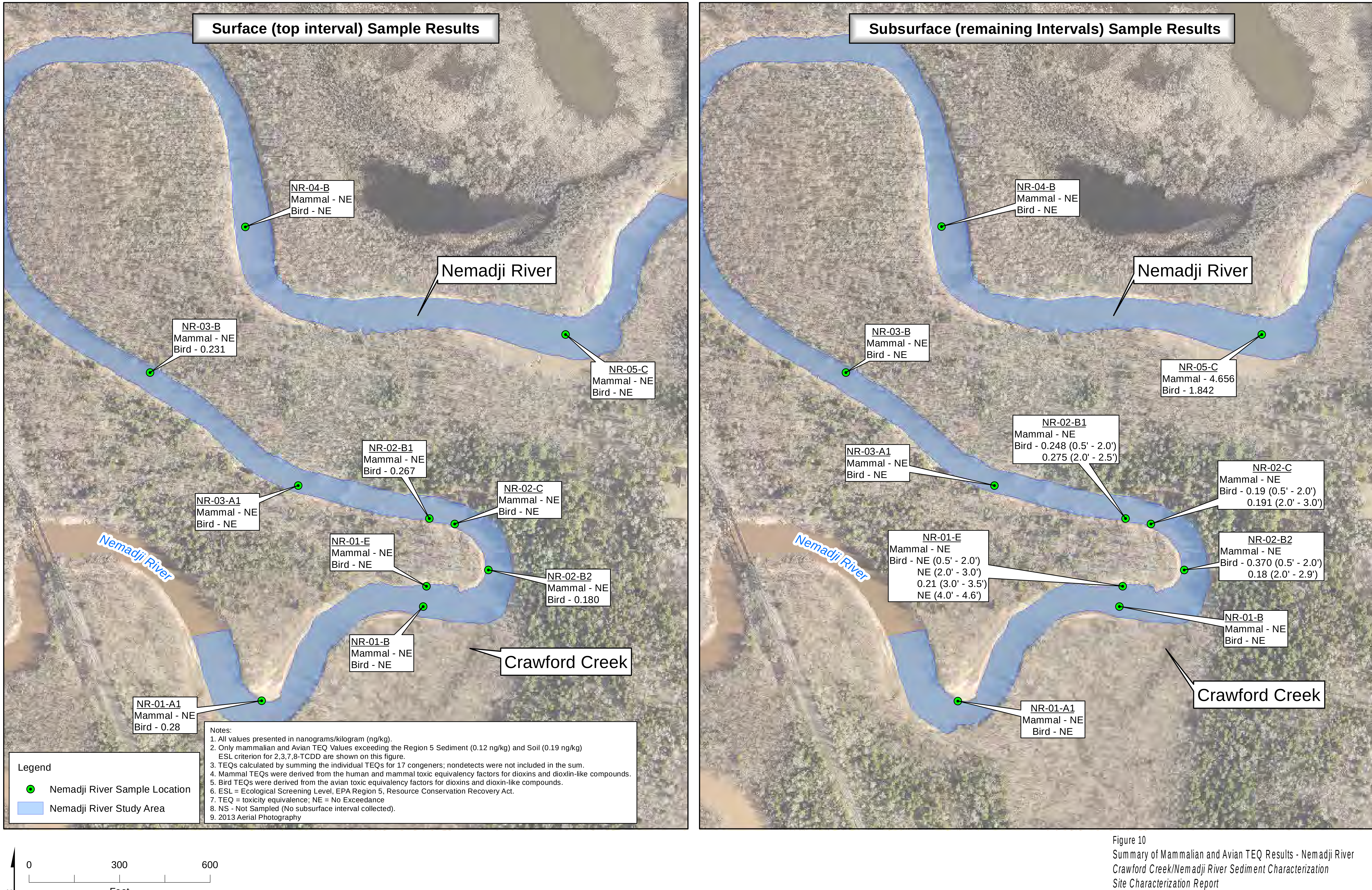

Figure 10
Summary of Mammalian and Avian TEQ Results - Nemadji River
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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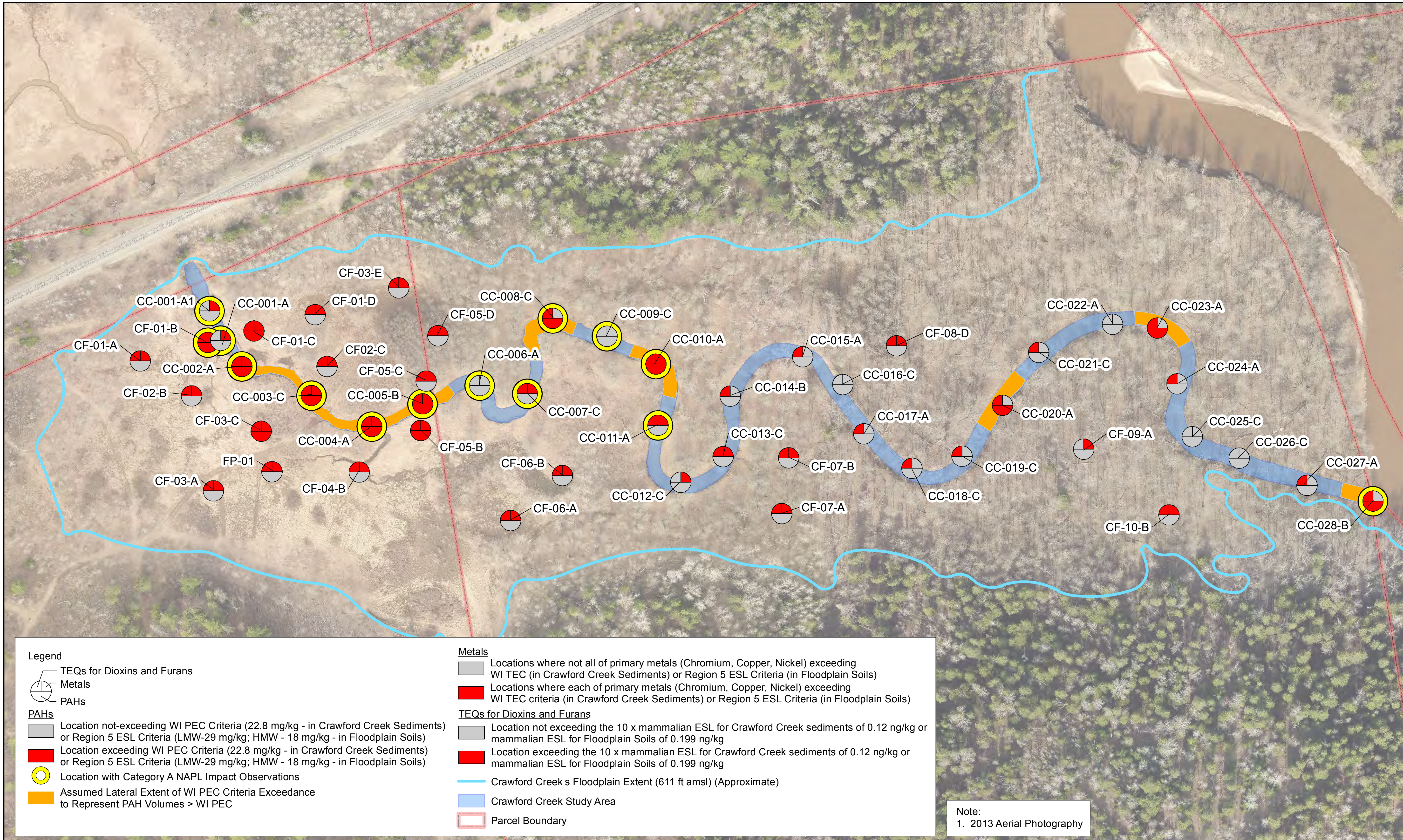

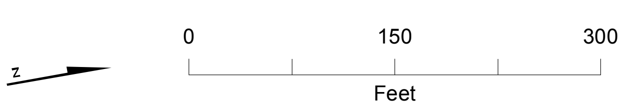

Figure 11
Summary of Contamination in Crawford Creek and its Floodplain
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 11 - SUMMARY OF CONTAMINATION IN CRAWFORD CREEK AND ITS FLOODPLAIN.MXD JHANSEN 12/3/2014 10:33:35 AM

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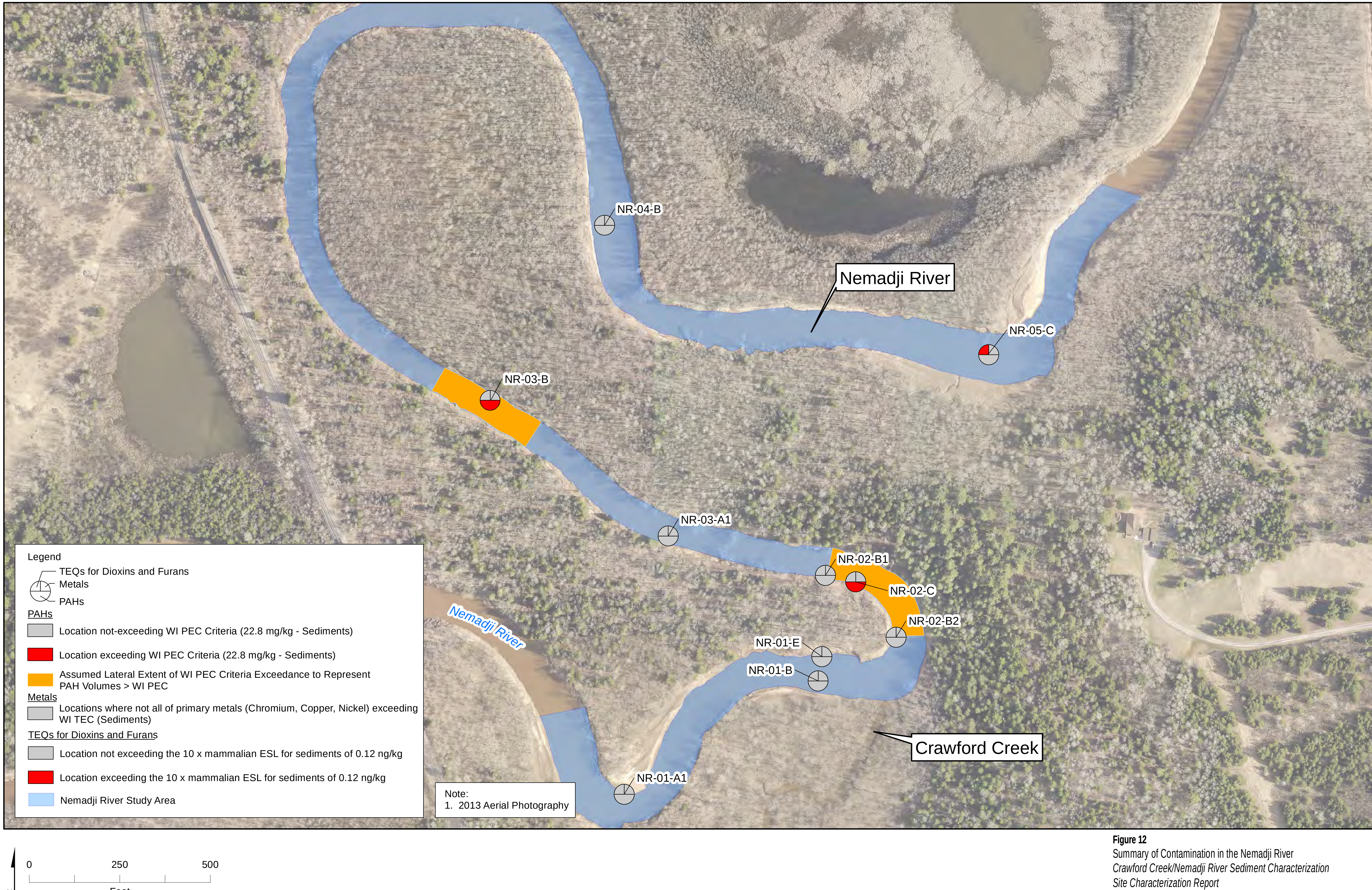

Figure 12
Summary of Contamination in the Nemadji River
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

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MKE \\LAKEFRONT\PROJ\GLAES\CRAWFORDCREEKSUPERIORWI\MAPFILES\SITECHARACTERIZATIONREPORT2014\FIGURE 12 - SUMMARY OF CONTAMINATION IN NEMADI RIVER.MXD JHANSEN1 10/15/2014 3:56:01 PM

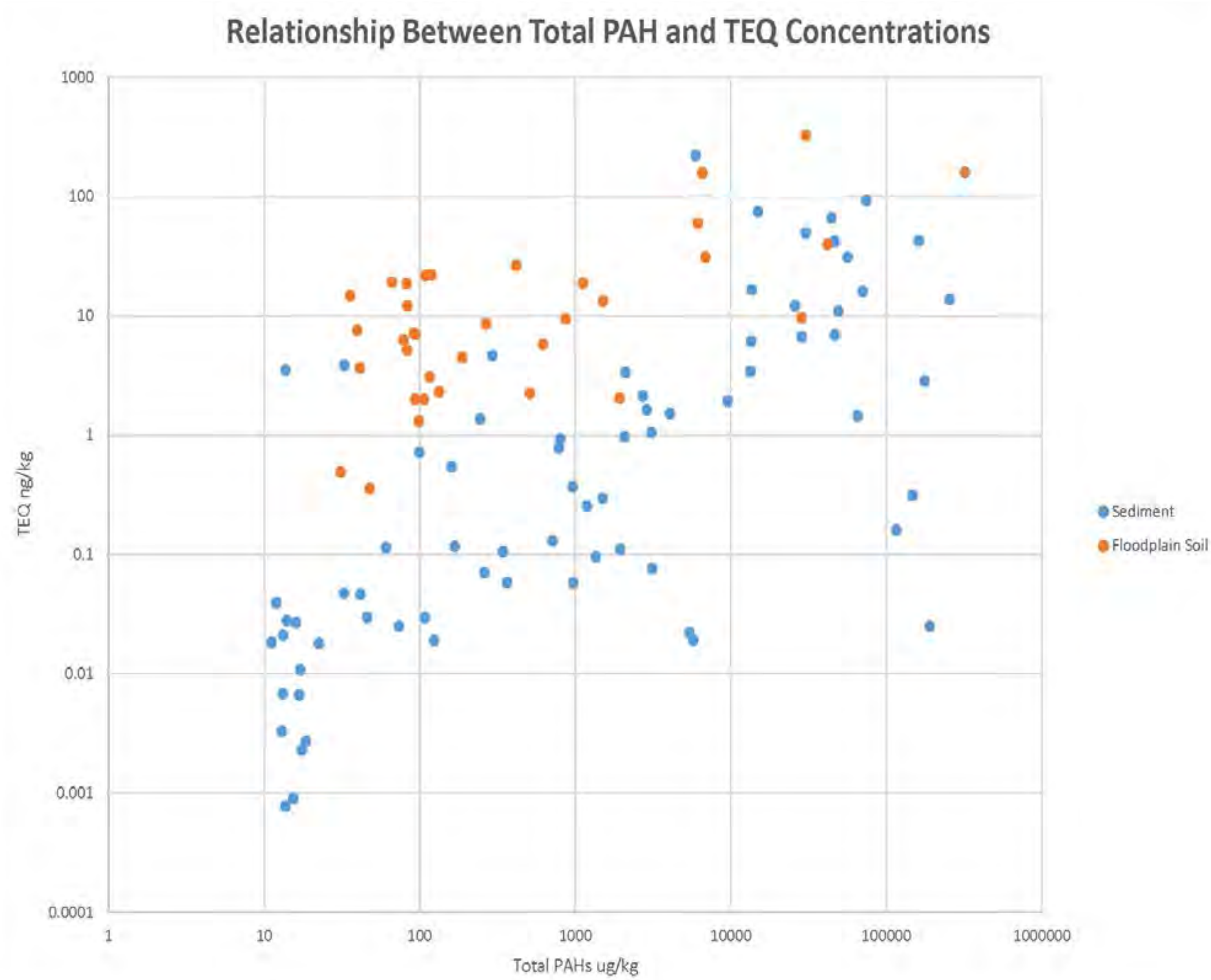

Figure 13
Relationship between Total PAHs and TEQ Concentrations
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

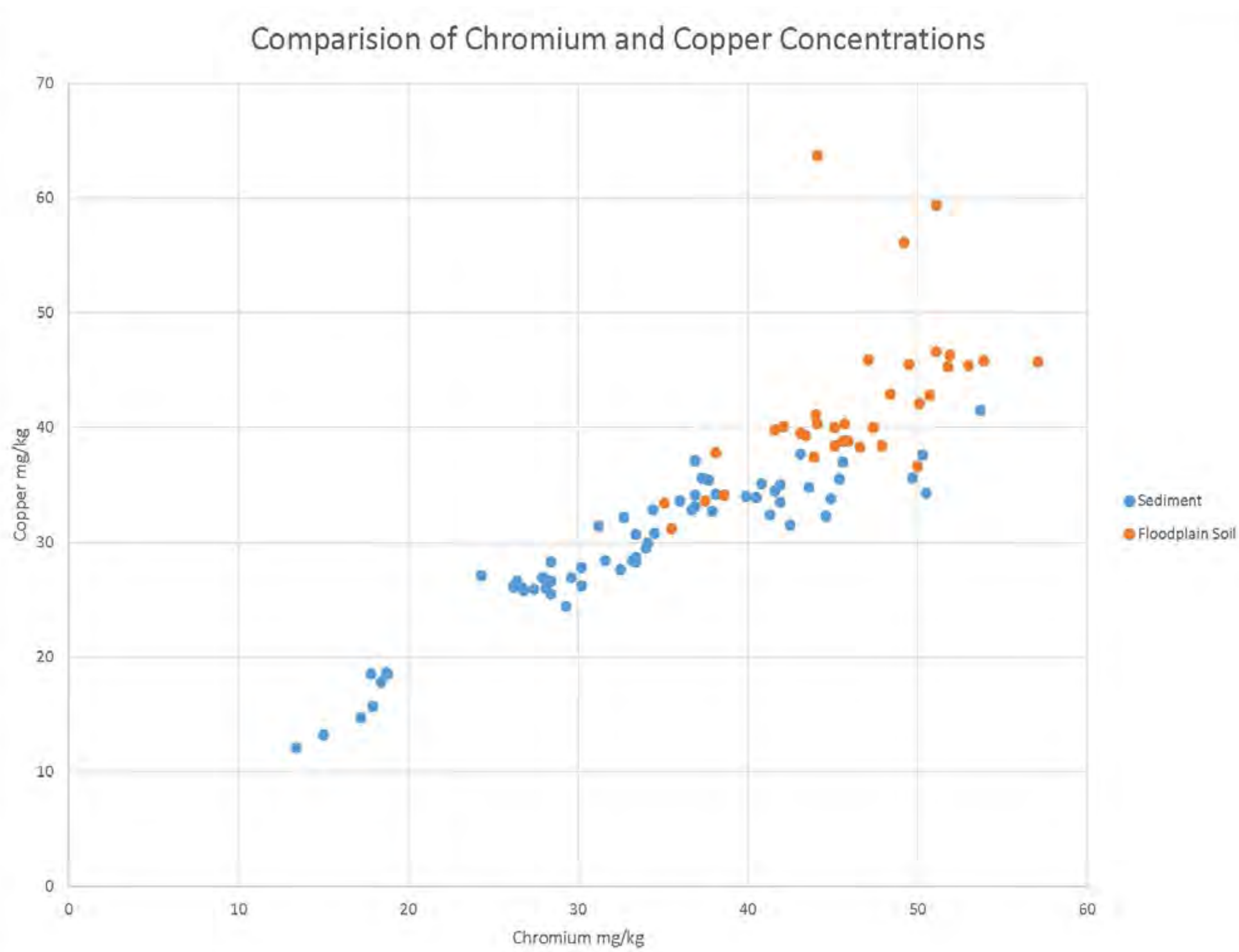

Figure 14
Comparison of Chromium and Copper Concentrations
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

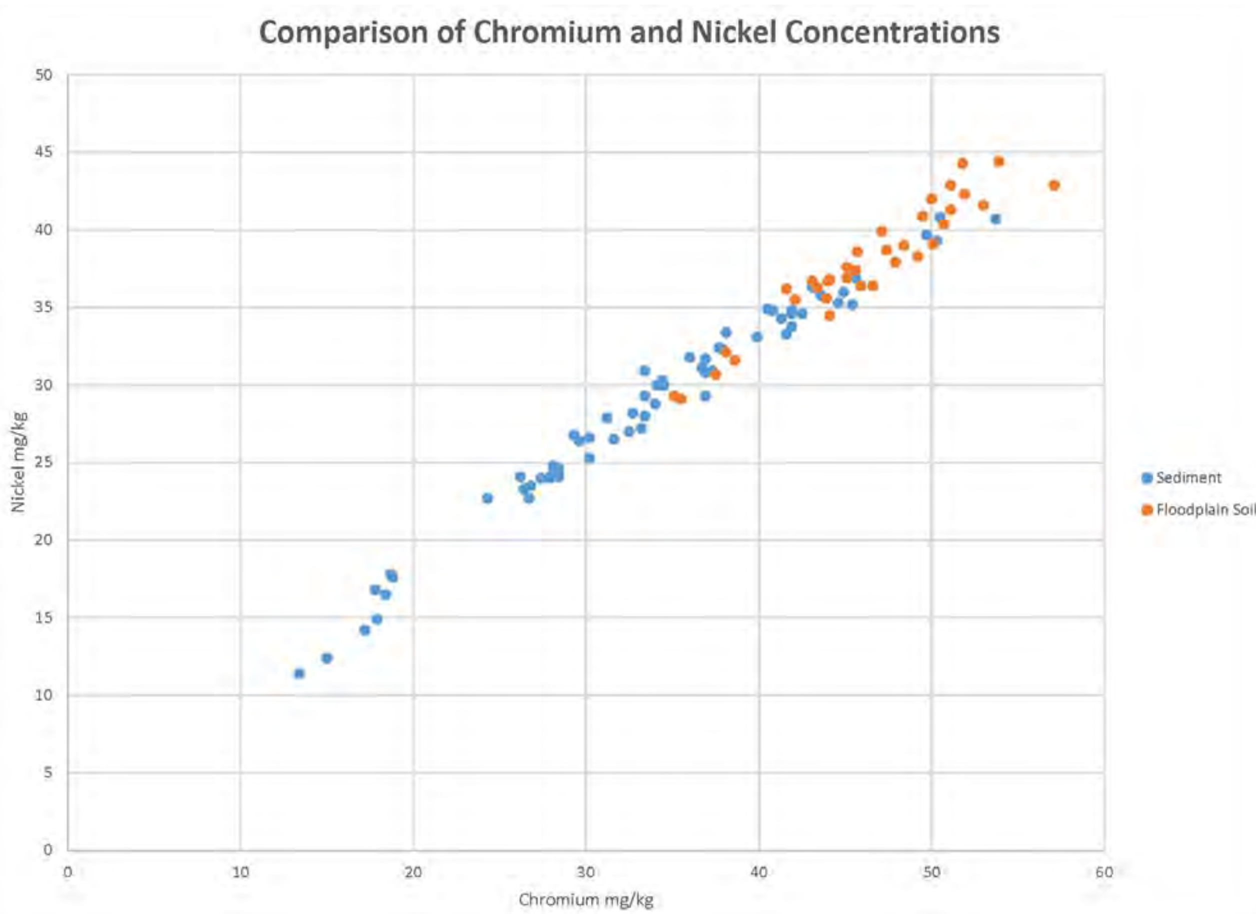

Figure 15
Comparison of Chromium and Nickel Concentrations
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI

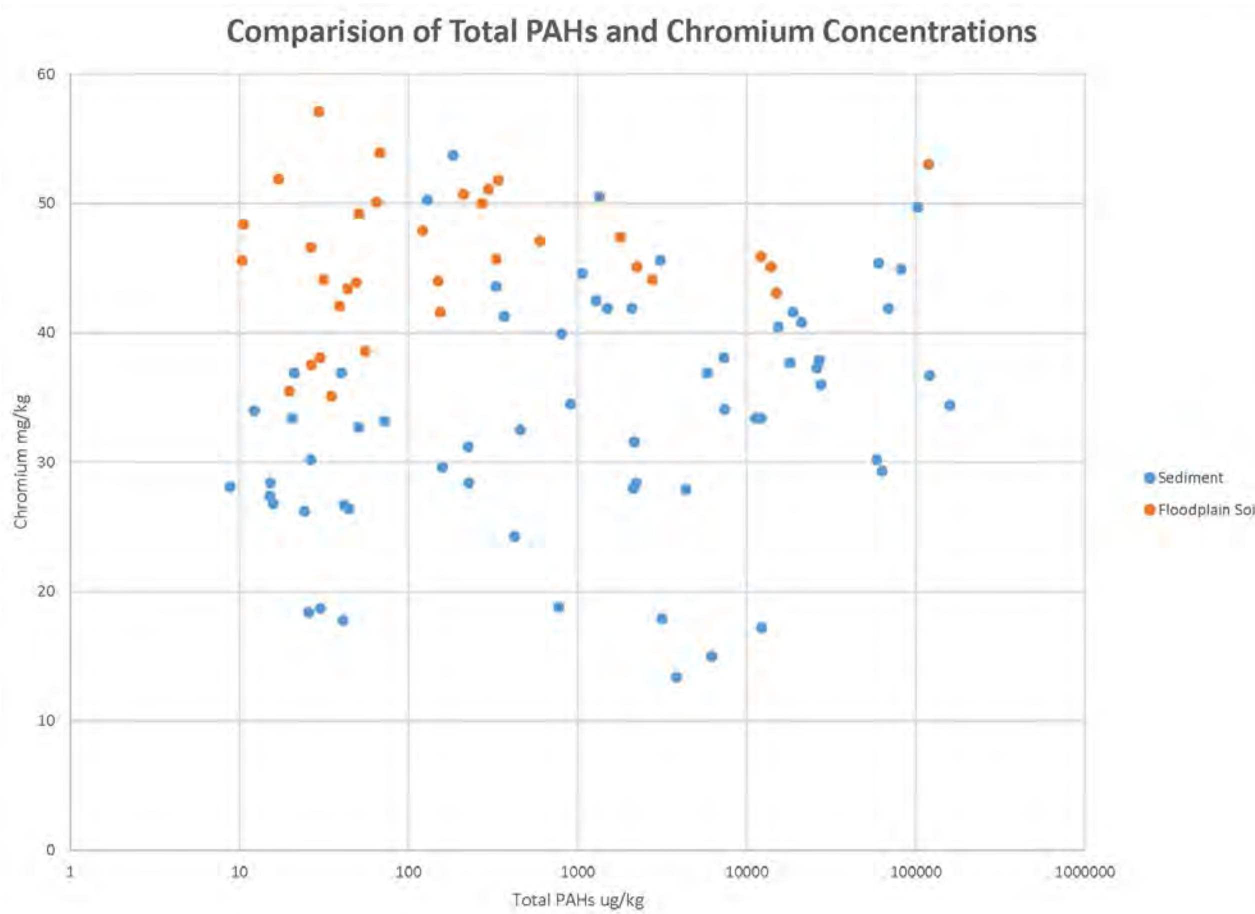

Figure 16
Comparison of Total PAHs and Chromium Concentrations
Crawford Creek/Nemadji River Sediment Characterization
Site Characterization Report
Superior, WI