STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES & ENVIRONMENT
LANSING

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October 12, 2010

Mr. James Saric, Remedial Project Manager
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard (SR-6J)
Chicago, Illinois 60604-3507

Dear Mr. Saric:

SUBJECT: Evaluation of Data for Portage Creek of the Allied Paper/Portage Creek/Kalamazoo River Superfund Site, Allegan and Kalamazoo Counties, Michigan

The Department of Natural Resources and Environment (DNRE) is in receipt of your recent e-mail in which you indicate the United States Environmental Protection Agency (U.S. EPA) is interested in moving forward with a removal action at Portage Creek. The DNRE fully supports the U.S. EPA addressing this critical source area in conjunction with the action upcoming for the Allied Paper Operable Unit. Portage Creek is immediately in and downstream of the former Bryant Mill Pond, a location acknowledged to have contained very high concentrations of polychlorinated biphenyl (PCB). Not unexpectedly, Portage Creek similarly has some of the highest concentrations of PCBs identified on this Superfund site. It is this agency's experience that evaluating every avenue to address source areas from upstream to downstream is a legitimate strategy for assuring more predictable remedial success over time.

The U.S. EPA is beginning the first stages of removal planning, as evidenced by the early mapping of Portage Creek by the FIELDS technical support team into various concentration-based approaches, using the Surface Weighted Average Concentration statistical method utilizing existing data. The DNRE is on record that relying on this particular tool for removal actions in dynamic sites such as sediment, riverine environments is detrimental to achieving successful remedial outcomes. The DNRE, having recently issued its report entitled "Geomorphic Feature Delineation and PCB Correlations in the Former Plainwell Impoundment" (Geomorphic Report), proposes that this stretch of Portage Creek would benefit from a similar analysis.

The current data set available for Portage Creek does not provide the information necessary to design a targeted removal strategy that limits the amount of material that needs to be removed that would result in a predictable overall low average for PCB concentration. In order to assure an eventual, successful remedial outcome, additional data collection is required.

The DNRE is proposing to assist the U.S. EPA in this early planning stage by collecting additional data consistent with the approach described in the Geomorphic Report. By better characterizing soils and sediments into geomorphic categories and by determining the effects from anthropogenic activities, the agencies will better understand the location and range of PCB contamination in the Portage Creek system. The DNRE has already preliminarily assessed the current data set using these principles and has determined that data gaps exist, confounding successful removal planning.

Enclosed with this letter are a variety of figures and data analysis tables. Please first refer to Figure 1. This figure categorizes Portage Creek into defined slope area (SA) segments. The defined slope areas have been refined based on field reconnaissance data including observed relative changes in water velocity as well as other bed, bank, and floodplain characteristics. The division of Portage Creek into these slope areas represents a fairly coarse approach in which break points are consistent with convenient physical features or structures, such as roads or bends in the creek. The DNRE has concluded that evaluating slope in this manner helps to identify those stretches of Portage Creek that contain the most highly contaminated PCB-bearing material. Additionally, low-lying floodplain areas currently exist along the creek; features that previous, conventional investigative approaches would not have fully characterized.

Next refer to Figure 2. This figure depicts all PCB data collected to date at all depths. For instream sediments, slope areas 1 and 5 represent areas of highest PCB concentrations and should be acknowledged as priority areas for removal. Slope areas 3 and 6 also represent elevated average PCB concentrations, but lack sufficient data for adequate characterization. Field observations have determined the existence of uncharacterized fines that must be analyzed before the priority of these areas can be determined. Using slope in conjunction with average PCB concentrations, slope areas 2, 4, and 7 represent defined reaches expected to have and actually demonstrate areas having lower average PCB concentrations. Field observations here also suggest additional data collection would be beneficial in an attempt to limit or eliminate the scope of removal action necessary in these areas. Additional figures and data analyses tables have been provided to illustrate the various approaches that can be employed to interpret the data presented differently for decision-making purposes.

As previously stated, the DNRE had already begun an analysis of existing data on Portage Creek, consistent with that outlined by the Geomorphic Report. A summary of that assessment by each slope area is enclosed as "Preliminary Summary of Slope Area Characteristics and Deficiencies." It was the DNRE's objective to issue an overall assessment of existing Portage Creek data in terms of the systematic approach outlined in the Geomorphic Report so it would be available when removal or remedial action was to occur on Portage Creek. However, in seeing the existing data plotted out, in conjunction with a recent field mapping exercise, it became clear that additional data collection is critical in planning for any removal or remedial project. The DNRE is instead now planning additional field activities to fill in data gaps that would best assist decision makers in how to allocate limited resources to an outcome that best serves long-term goals for this portion of the Kalamazoo River Superfund Site.

The DNRE has not fully developed the scope of work needed to address these data gaps. It is preferred to have the U.S. EPA assist us in this effort given our common responsibility for this site; but in trying to meet your consistent objective in making steady, definable progress on this site, time is of the essence. A first step in the process would be having a frank discussion about goals for any removal or subsequent remedial actions. Only after a shared understanding of goals for the resource is achieved can productive discussions about how to achieve those goals be possible. It will be necessary to mobilize yet this fall, collect additional needed data, and finalize an overall assessment that could be used to design a removal action. Only after additional data has been collected do we believe the agencies can identify the priority areas in Portage Creek needing action that will complement an eventual Proposed Plan and Record of Decision for the first reach of the Kalamazoo River Superfund Site.

Thank you for your consideration of this proposal. Please contact me to set up a meeting to discuss remedial goals for the site as well as additional data needs. I am also available to discuss any questions you may have, including our proposal to conduct more work on Portage Creek.

Sincerely,

Paul Bucholtz
Project Manager
Specialized Sampling Unit
Superfund Section
Remediation Division
517-373-8174

Enclosure
cc: Mr. David Kline, DNRE
Ms. Daria W. Devantier, DNRE
Mr. James Heinzman, DNRE
Ms. Judith Alfano, DNRE
Mr. John Bradley, DNRE
cc/enc: Mr. Todd King, CDM
Mr. Jeff Keiser, CH2M Hill
Ms. Rebecca Frey, U.S. EPA
Dr. Lisa Williams, United States Fish and Wildlife Service

Figure 1

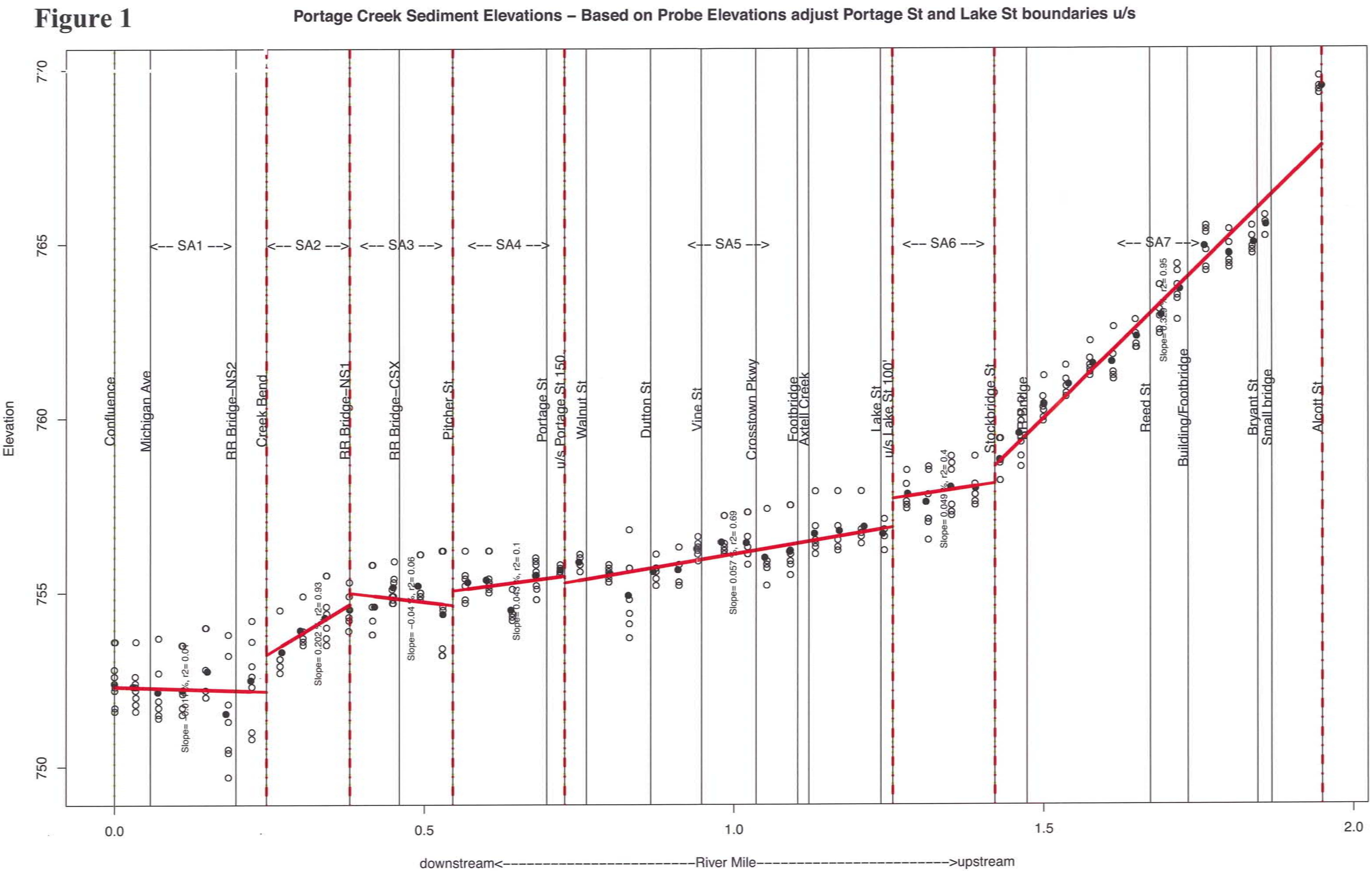
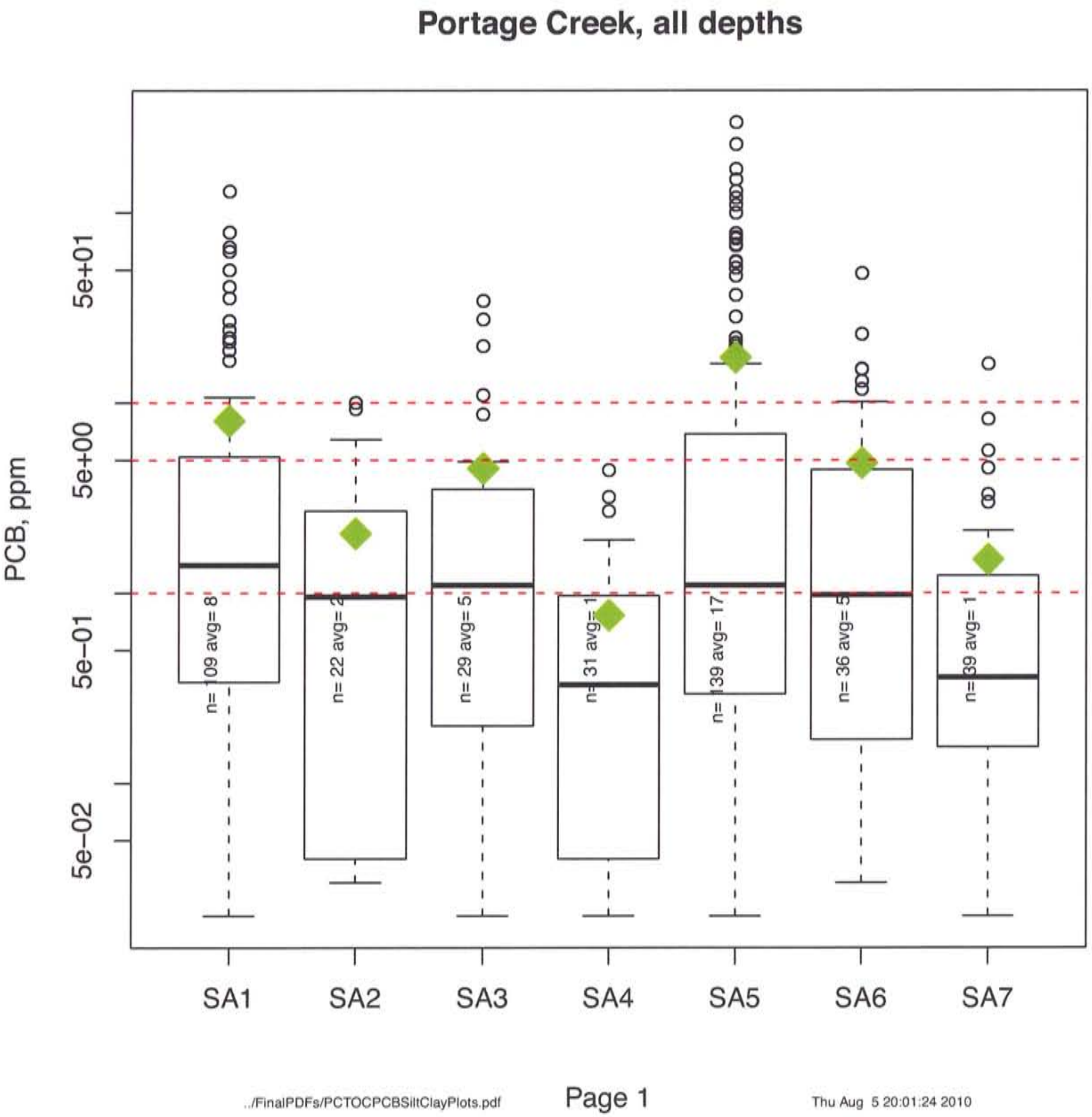

Portage Creek Sediment Elevations – Based on Probe Elevations adjust Portage St and Lake St boundaries u/s
Elevation
750
755
760
765
770
0.0
0.5
1.0
1.5
2.0
downstream<------------------------River Mile------------------------>upstream
<-- SA1 -->
<-- SA2 -->
<-- SA3 -->
<-- SA4 -->
<-- SA5 -->
<-- SA6 -->
<-- SA7 -->
Confluence
Michigan Ave
RR Bridge–NS2
Creek Bend
RR Bridge–NS1
RR Bridge–CSX
Pitcher St
Portage St
u/s Portage St 150
Walnut St
Dutton St
Vine St
Crosstown Pkwy
Footbridge
Axtell Creek
Lake St
u/s Lake St 100'
Stockbridge St
Reed St
Building/Footbridge
Bryant St
Small bridge
Alcott St
Slope= 0.202 %, r2= 0.93
Slope= -0.04 %, r2= 0.06
Slope= 0.043 %, r2= 0.1
Slope= 0.057 %, r2= 0.69
Slope= 0.049 %, r2= 0.4
r2= 0.95

Figure 2



Portage Creek, all depths
PCB, ppm
5e+01
5e+00
5e-01
5e-02
n= 109 avg= 8
n= 22 avg= 2
n= 29 avg= 5
n= 31 avg= 1
n= 139 avg= 17
n= 36 avg= 5
n= 39 avg= 1
SA1
SA2
SA3
SA4
SA5
SA6
SA7
../FinalPDFs/PCTOCPCBSiltClayPlots.pdf
Page 1
Thu Aug 5 20:01:24 2010

Preliminary Summary of Slope Area Characteristics and Deficiencies

The following descriptions are generally based upon segmenting the data by Slope Areas (SA). A map depicting the slope areas is provided. See figure 3.

SA1 represents a low slope and highly depositional slope area contiguous with the Kalamazoo River. This stretch may be affected by the Kalamazoo River in ways that the other SAs are not. SA1 contains significant depths of soft sediment, especially when compared to SA2 immediately upstream.

SA2 represents a high slope area of marginal deposition (i.e., contaminated deposits instream toward bank) and erosion (i.e., shallow depth of soft sediments and shallow depth to clean). SA2 is partially constricted by anthropogenic structures and steep banks that may serve to better (but not fully) protect the localized and accessible floodplain. An apparent change from upstream SAs is the increased contamination in surface (vs. subsurface) which may be a result of remobilized contaminated sediment from upstream areas.

SA3 represents a low slope and highly depositional stretch of creek. Similar to SA6, the existing data set fails to characterize the instream gray silts identified during reconnaissance coring activities. SA3 has a floodplain area (controlled in part by the railroad structures) that is relatively small compared to SA5, but contains depths of gray fines that should be characterized.

SA4 represents a moderately low slope area similar to SA5 although more constricted than SA5 and considerably less floodplain relief. This may have resulted in relatively higher energies with significantly less fines and a shallower depth to clean.

SA5 represents moderately low slope area with some of the most accessible floodplain relief in the study area supported by the urban construction and bridges through Walnut Street and Portage Street. This has resulted in a highly depositional stretch of creek that experiences more frequent flooding. The sediment of SA5 has been better characterized than other SAs, except for the Axtell Creek inlet which requires investigation. Flow in the lower part of SA5 becomes more constricted due to anthropogenic structures and might result in less contaminated mass toward the downstream end. A pond (possibly seasonal) on the east side of Portage Creek in Upjohn Park also exists as a potential catch for contamination that has not been characterized.

SA6 represents a moderately low slope of the study area with a gradational decrease in water velocity in comparison to SA7. SA6 is significant because it represents the first area of increased deposition downstream of SA7 and the original source, as demonstrated with the greater depths of soft sediment. This has apparently resulted in the deposition of fine grain material which is more noticeable in the mid and lower portions, sometimes overlain by coarser material. The existing data set does not characterize the nature of the gray silt deposits identified with cores during the reconnaissance activities.

SA7 represents the highest slope in the study area with flow often constricted by anthropogenic structures (such as concrete banks) in the upper portion. SA7 may contain native fines and experience more erosion than deposition consistent with the apparent shallow depth to clean material. The relatively low potential for mass contamination suggests this stretch of creek to have a relatively low priority for removal. The downstream end of SA7 includes a floodplain that might contain a significant mass of polychlorinated biphenyl (PCB) and should be characterized.

In-Stream Evaluation

The current data set available for Portage Creek does not provide the information necessary to design a targeted removal strategy that limits the amount of material that needs to be removed, which will achieve the objective of an overall low average PCB concentration. The current data allows for the prioritization of areas for removal (i.e., more critical and least critical). If a more refined remedial approach is desired, additional data collection will be necessary. In general, SA1, SA3, SA5, and SA6 represent areas of moderate to low slope with elevated average PCB concentrations requiring remediation. The remaining reaches (SA2, SA4, and SA7) appear to have lower average PCB concentrations where additional evaluation may be appropriate in consideration of limiting activity.

The two most significant instream areas that appear to have not been adequately characterized include SA3 and SA6. This conclusion is based on the existence of features consistent with other recognized areas of significance (i.e., SA1 and SA5), and visual field observations. Of particular interest are the gray, silt-rich sediments between Stockbridge Street and Lake Street, and between Pitcher Street and the railroad bridges.

Gray buried sediments between Dutton Street and Walnut Street, particularly the lower half, show the most obvious decrease in gradient from the source.

Specifically for SA3, an area of interest exists from just below Pitcher Street to the Norfolk Southern Railroad bridge "1" crossing. This area represents a length of creek with relatively lower slope (reinforced by the bridge construction). These sediments have a good potential to contain uncharacterized contaminated deposits.

Specifically for SA1, an area of interest exists from the bend in Portage Creek upstream of the Norfolk Southern Railroad bridge "2" crossing to the Kalamazoo River. This area represents the furthest downstream portion of Portage Creek which is influenced by the Kalamazoo River and slows considerably during high water events. These sediments have a good potential to contain contaminated deposits.

Floodplain Evaluation

Consistent with the Plainwell Impoundment Investigation Report results, gray color combinations and fine texture sediments/soils are correlated to elevated PCB concentration in the study area. Consistent with the Plainwell Impoundment Investigation Report, areas representative of past or present low energy depositional environments appear coincident with higher levels of PCBs. The areas representative of the most significant lower energy instream deposits appear coincident with portions of the creek with relatively low slope. The areas representative of the most significant lower energy floodplain deposits can be identified in locations where lower creek banks allow for more frequent overbank flow, and where adjacent low floodplain elevation topography exists. The floodplain areas adjacent to Portage Creek (downstream of

Operable Unit 1) can be prioritized given the existing data set, but must be characterized before remedial actions can be evaluated.

Specifically for SA7, the "Reed Court Floodplain" exists on the west side of Portage Creek downstream of Reed Street and upstream of the Railroad Bridge near Stockbridge Street. This area represents the first natural floodplain downstream of the source area that is subject to occasional flooding due to relatively low banks. The length of creek upstream to Bryant Street has much higher banks, and the banks are often reinforced with concrete. This feature is the most susceptible floodplain along the relatively high slope stretch of Portage Creek from the source area to Stockbridge Street. The larger floodplain and, in particular, the lower portions of this area have a good potential to contain contaminated deposits.

An evaluation of the Reed Court Floodplain was conducted and reported in the Addendum to Technical Memorandum 3, dated September 1996. Surficial PCB concentrations reported for the 1995 sampling locations ranged from 19 milligrams per kilogram (mg/kg) to 57 mg/kg with an average of 42 mg/kg. Sampling locations in this area were reportedly within a former stream channel. Such low-lying floodplain areas currently exist in several locations along the creek in all SA areas. These areas should be included for consideration during future remedial planning.

Specifically for SA5, the "Upjohn Park Floodplain." This feature exists on both sides of Portage Creek existing on the upstream end between Lake Street and the confluence with Axtell Creek and downstream to Walnut Street, and extends from the Crosstown Parkway on the west to beyond the eastern limits of Upjohn Park on the east. This floodplain is coincident with a stretch of Portage Creek with a relatively low slope, supported by the urban construction and bridges through Walnut Street and Portage Street. The most susceptible areas to deposition in this location are the vegetated portions (i.e., grassy areas in the park and other properties) and the included surface water bodies. The two water bodies identified in this area are Axtell Creek and the pond in Upjohn Park. Both of these surface water bodies have a good potential to contain contaminated deposits.

Specifically for SA3, the "Railroad Bridge Floodplain" exists on the east bank of Portage Creek between and slightly downstream of the CSX Railroad bridge crossing (just downstream of Pitcher Street) and the Norfolk Southern Railroad "1" bridge crossing (the upstream Norfolk Southern Railroad bridge crossing). This Area of Concern represents a length of creek with relatively lower slope (reinforced by the bridge construction) and has relatively lower banks in this stretch of creek. This floodplain is relatively small, has little topographic variation, and has a good potential to contain contaminated deposits.

In addition to the general slope characteristics, analysis of the data set identified several important correlations.

PCBs as a Function of River Mile

Figure 4 depicts individual PCB concentration data (open circles) plotted as a function of river mile (on a linear scale). Additionally, mean PCB concentrations (colored circles) were generated by averaging individual data points on a per 100th river mile basis and were depicted on the plot. The results of this basic analysis identify two broad areas of elevated PCB concentration, near the confluence (river mile 0.0 to 0.5) and in the vicinity of Upjohn Park (river mile 0.9 to 1.4).

Depth to Clean

Depth to clean was calculated for each core location based on the following procedure (See Figure 5). A range of "clean" thresholds was selected from 0.33 mg PCB/kg to 20 mg PCB/kg (0.33, 1, 2, 5, 10, and 20). For each threshold, the PCB concentration from the deepest core segment was compared to the threshold. If the deepest core segment reported a PCB result below the threshold, the core was determined to be "complete." For complete cores, the depth to clean was calculated as the top depth of the shallowest core segment that was both below the threshold and deeper than any other core reported with a PCB value above the threshold. Using the 1 part per million (ppm) threshold, SA4, SA2, and SA7 as lengths of creek represent the lowest depth to threshold.

Matrix Comparison

The data was analyzed for correlation between PCB concentration and sediment texture (See Figure 6). The combined data set was evaluated by using the "major matrix" identified in the core processing descriptions (the predominant soil type identified in the geologist description of the core log). Mean concentrations were calculated and box plots generated from all available data. The data set was also analyzed using the Department of Natural Resources and Environment (DNRE) description recorded during core processing. If core descriptions varied over sample intervals, they were classified as a "mix." Again, the silt, clay, and organic matrices had the highest averages (17, 49, and 17, respectively) and the high population of sand had a lower mean concentration of 5 ppm. This analysis indicates that higher PCB concentrations are associated with finer grained material. The elevated concentrations associated with the organic matrix may be related to the close proximity of the source and the fact that that the source material is associated with the organic paper fiber. PCB concentrations in the sand matrix are lower overall, but still relatively high when compared to existing criteria for the aquatic system. Also of note is the difference in analysis between Arcadis and DNRE core descriptions and points to the need for strict adherence to the Unified Soil Classification System.

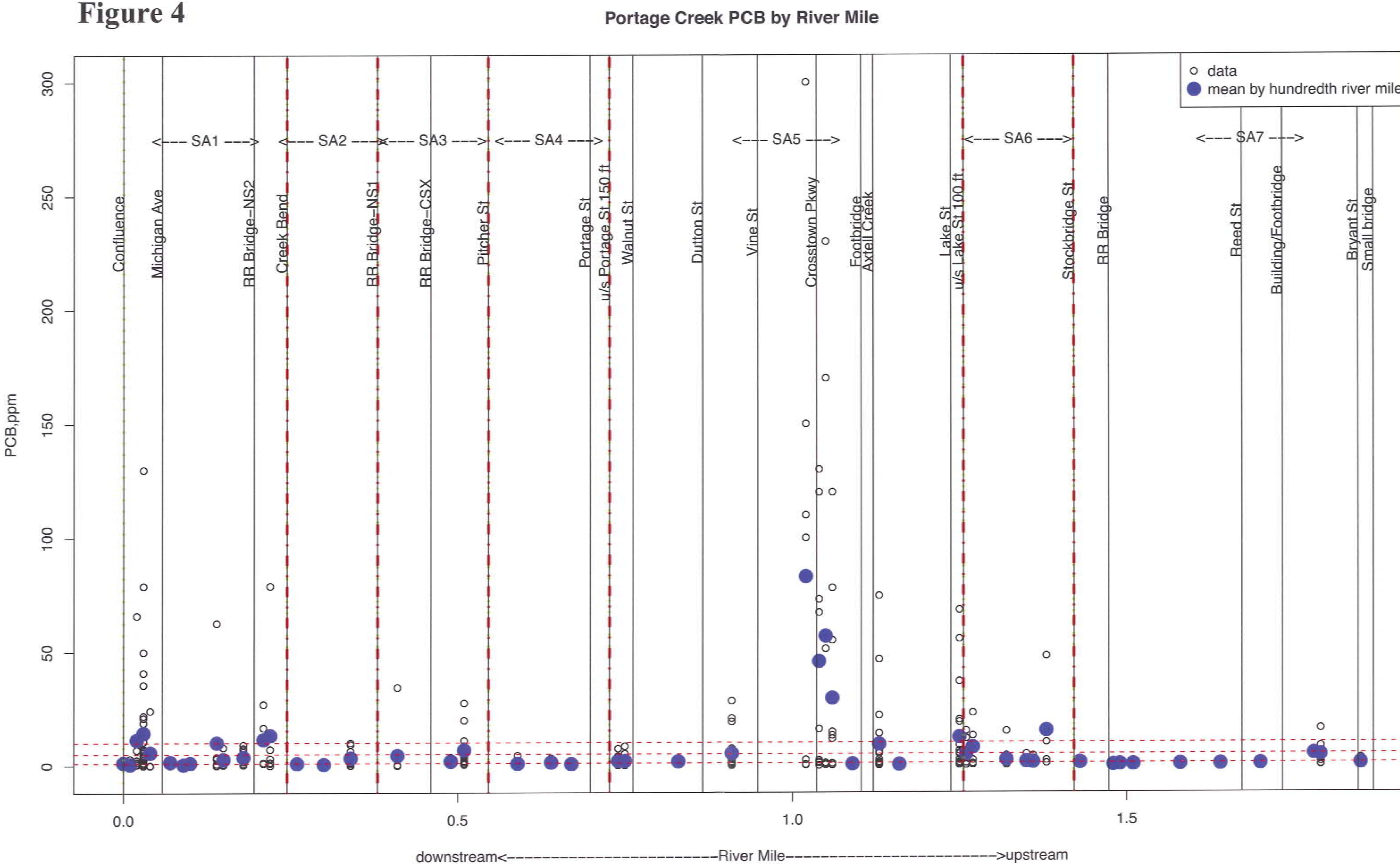
Color Comparison

The 2008 data set was evaluated for correlation of PCB concentration with color. The DNRE color was based on a matching of sample interval with the original core description. Shades of gray are shown to be most coincident with elevated PCB concentration (Figure 7). Gray and light gray represent the highest levels of PCB with averages of 83 and 26, respectively. The "Mix" category included situations where changes in sediment type and predetermined sample intervals did not match. The Arcadis color was also compared in a similar fashion. It is not clear how Arcadis used sample descriptions to determine the color of sample intervals. However, the "first" color description from the core processing notes was plotted against PCB concentration. This analysis shows samples with a mixed color description having the highest PCB concentration followed by those with dark gray color having an average of 21 ppm. Those with a brown color have the lowest average at 7 ppm. It should be recognized that the majority of samples were described by Arcadis as brown-gray in color. Also of note is the difference in analysis between Arcadis and DNRE core descriptions and points to the need for strict adherence to systematic color description scheme.

Prepared by: Paul Bucholtz/John Bradley
Superfund Section
Remediation Division
Department of Natural Resources and Environment
October 2010

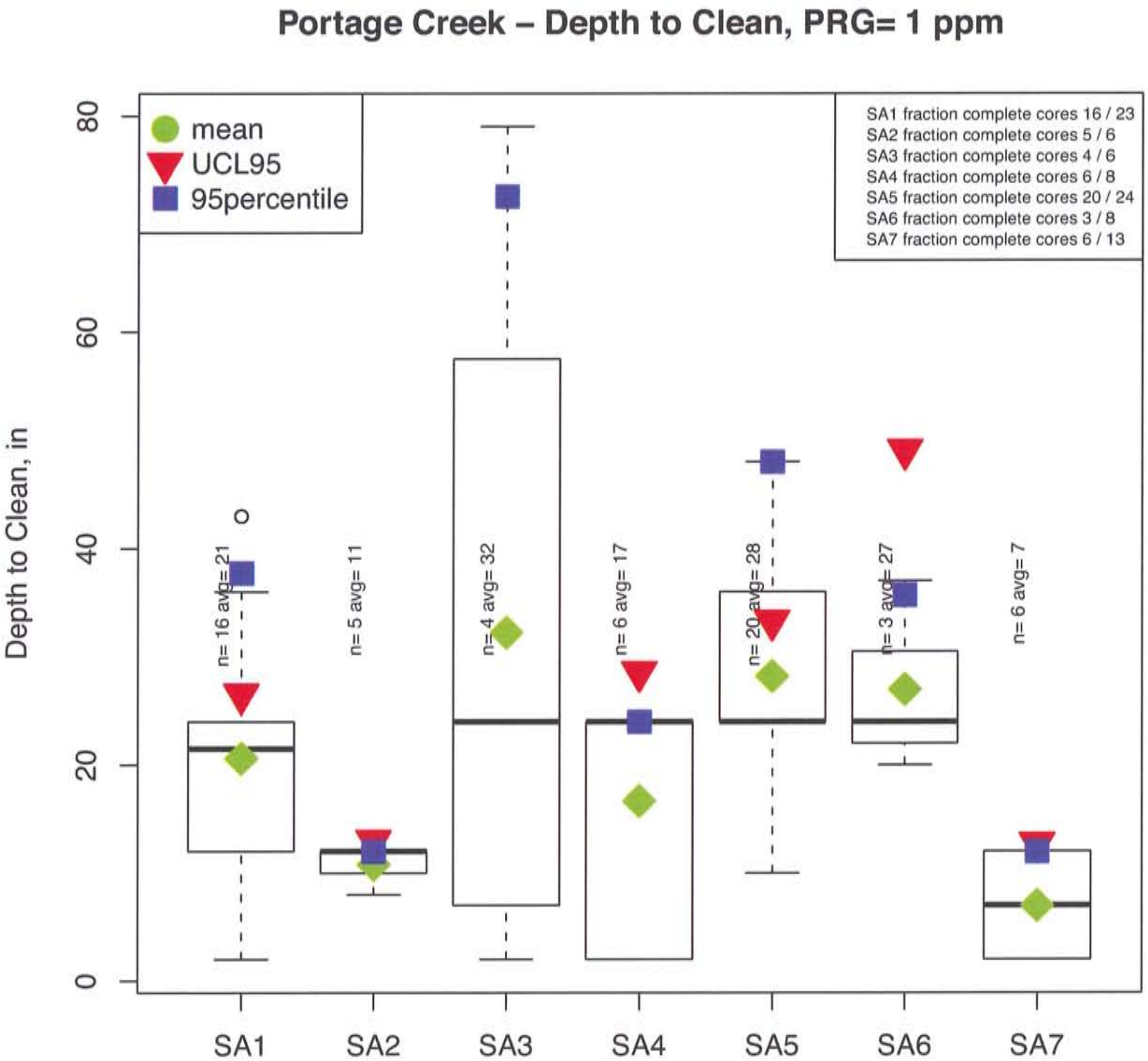
Notes:
(1) Image courtesy of (c)2008 NAVTEQ, (c)AND, (c)MapData Sciences Pty Ltd, (c)2007 Zenrin, Image courtesy of NASA, (c)Harris Corp, Earthstar Geographics LLC, Image courtesy of USGS, (c)EarthData, (c)Getmapping plc, (c)2008 GeoEye, (c)2005 Pasco, (c)GeoContent / (p) Intergraph, (c)2007 Terraltaly, (c)2007 Intermap, Image courtesy of the IndianaMap, Image courtesy of the Nevada State Mapping Advisory Committee, (c)2007 InterAtlas, (c)2008 Eurosense, (c)2008 IGP, (c)2008 IGN.
(2) Stream limit developed from aerial photograph taken by Air Land Surveys/CDM - Contract 99034, flown 4/24/1999, scale 1"=1330', pixel resolution = 1 foot, projection = MIS NAD83, vertical datum = NGVD88

Figure 4



Portage Creek PCB by River Mile
data
mean by hundredth river mile
PCB,ppm
0
50
100
150
200
250
300
<--- SA1 --->
<--- SA2 --->
<--- SA3 --->
<--- SA4 --->
<--- SA5 --->
<--- SA6 --->
<--- SA7 --->
Confluence
Michigan Ave
RR Bridge–NS2
Creek Bend
RR Bridge–NS1
RR Bridge–CSX
Pitcher St
Portage St
u/s Portage St 150 ft
Walnut St
Dutton St
Vine St
Crosstown Pkwy
Footbridge
Axtell Creek
Lake St
u/s Lake St 100 ft
Stockbridge St
RR Bridge
Reed St
Building/Footbridge
Bryant St
Small bridge
0.0
0.5
1.0
1.5
downstream<---------------------------River Mile---------------------------->upstream

Figure 5



Portage Creek – Depth to Clean, PRG= 1 ppm
mean
UCL95
95percentile
SA1 fraction complete cores 16 / 23
SA2 fraction complete cores 5 / 6
SA3 fraction complete cores 4 / 6
SA4 fraction complete cores 6 / 8
SA5 fraction complete cores 20 / 24
SA6 fraction complete cores 3 / 8
SA7 fraction complete cores 6 / 13
Depth to Clean, in
0
20
40
60
80
n= 16 avg= 21
n= 5 avg= 11
n= 4 avg= 32
n= 6 avg= 17
n= 20 avg= 28
n= 3 avg= 27
n= 6 avg= 7
SA1
SA2
SA3
SA4
SA5
SA6
SA7

Figure 6

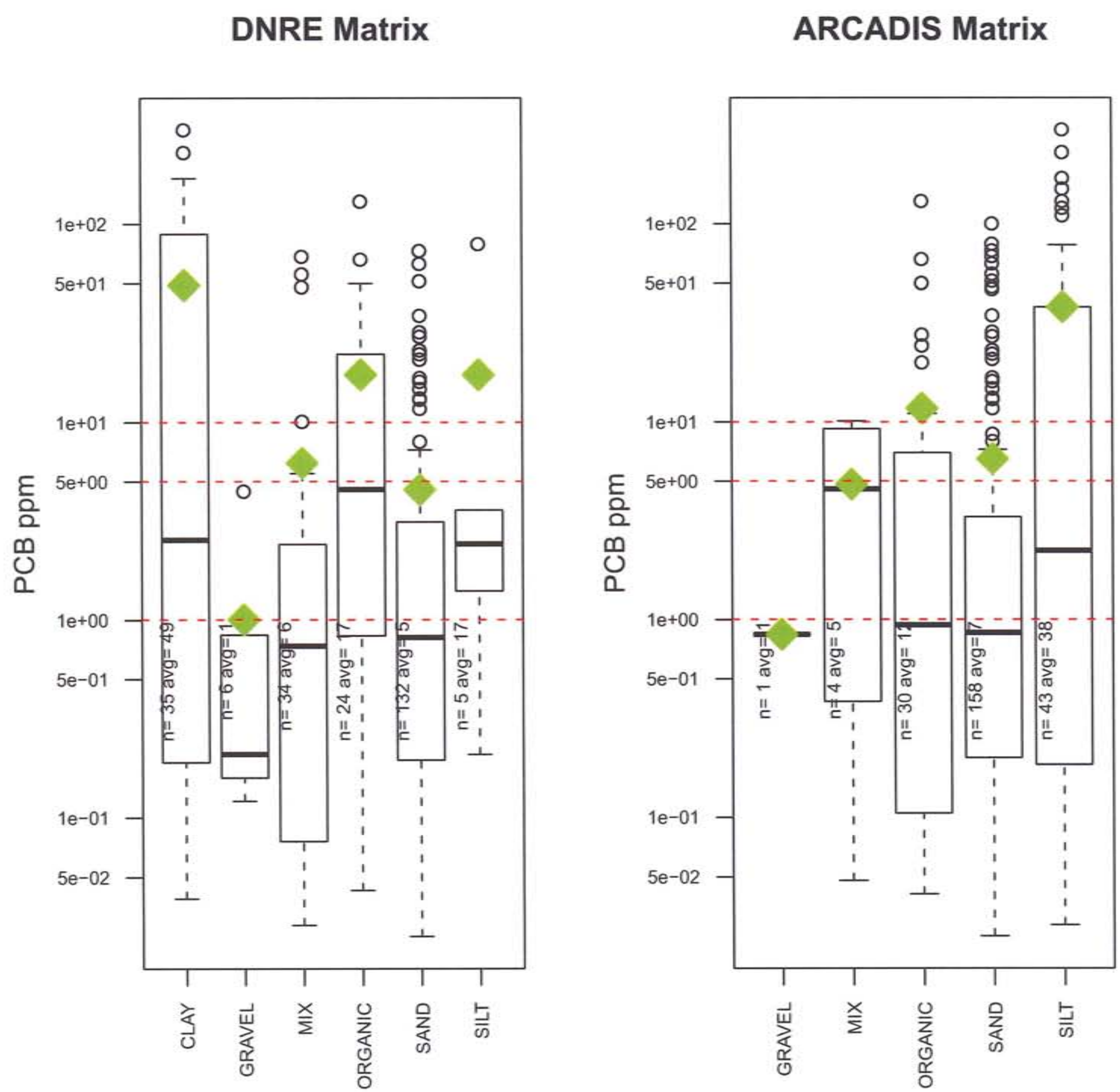
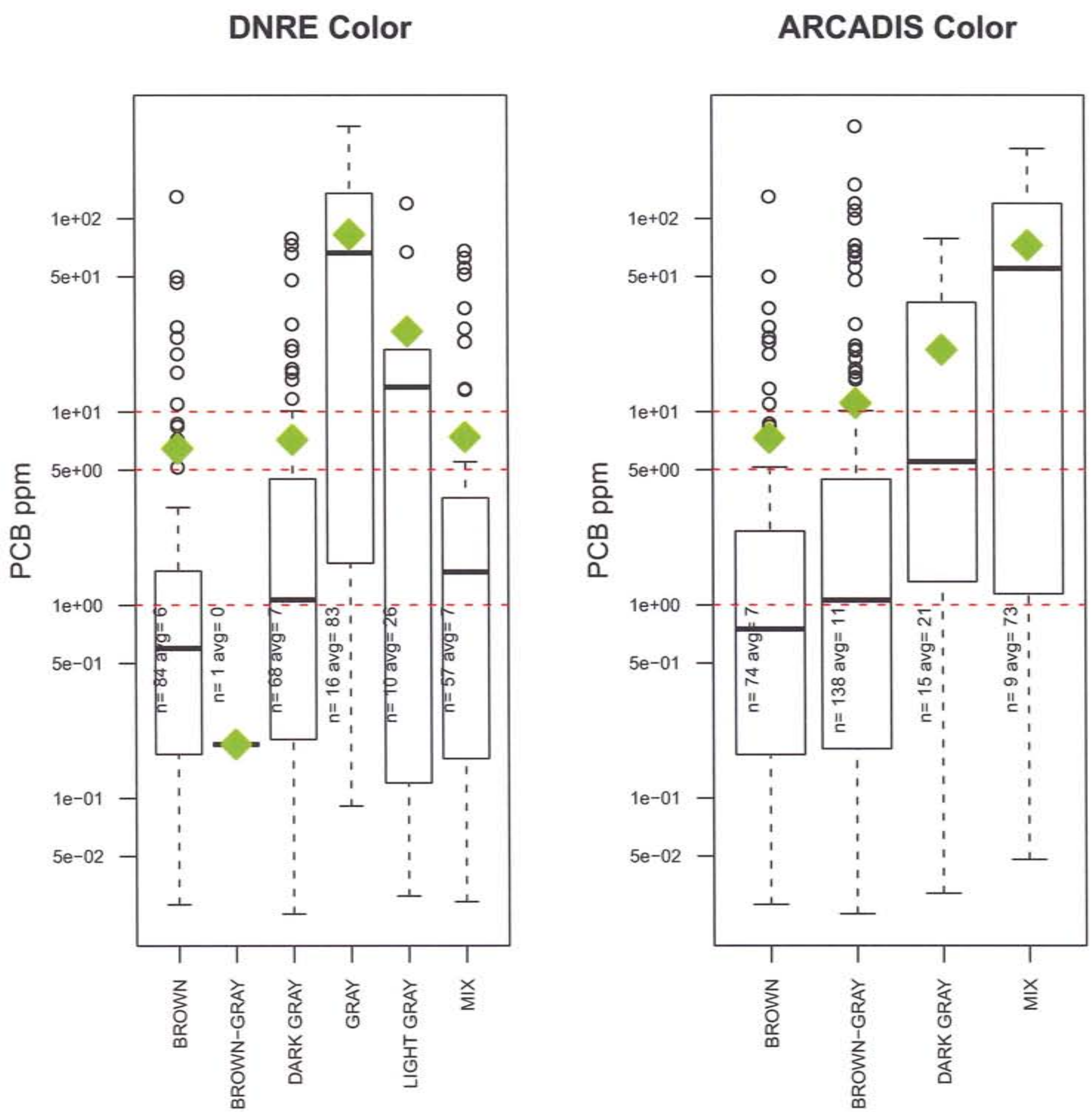

DNRE Matrix
ARCADIS Matrix
PCB ppm
1e+02
5e+01
1e+01
5e+00
1e+00
5e-01
1e-01
5e-02
n= 35 avg= 49
n= 6 avg= 1
n= 34 avg= 6
n= 24 avg= 17
n= 132 avg= 5
n= 5 avg= 17
CLAY
GRAVEL
MIX
ORGANIC
SAND
SILT
n= 1 avg= 1
n= 4 avg= 5
n= 30 avg= 12
n= 158 avg= 7
n= 43 avg= 38

Figure 7



DNRE Color
ARCADIS Color
PCB ppm
1e+02
5e+01
1e+01
5e+00
1e+00
5e-01
1e-01
5e-02
n= 84 avg= 6
n= 1 avg= 0
n= 68 avg= 7
n= 16 avg= 83
n= 10 avg= 26
n= 57 avg= 7
BROWN
BROWN-GRAY
DARK GRAY
GRAY
LIGHT GRAY
MIX
n= 74 avg= 7
n= 138 avg= 11
n= 15 avg= 21
n= 9 avg= 73