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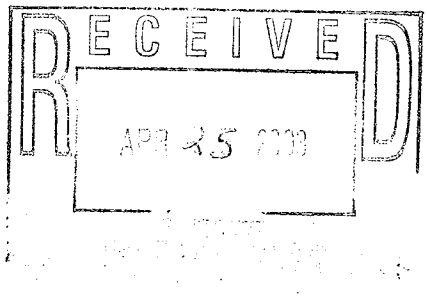

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Subject: North Lawrence Oil Dump Site
Work Assignment No. D003826-08
Biological Monitoring Report (Post-Remediation)

This letter report presents the results of the post-remediation biological monitoring program conducted during the period of 5-9 November 2002, and the baseline biological monitoring program conducted at the North Lawrence Oil Dump Site (NLODS) during the period of 4-8 November 1996. The goal of this letter report is to compare post-remediation biomonitoring results in the remediated and unremediated portions of the wetland with the 1997 baseline biomonitoring results, and to provide recommendations for potential future biological monitoring to determine the success of the remedial actions.

The 1996 biological sampling was administered following the tasks and objectives presented in the Biological Sampling Plan (ABB-ES, 1996). The purpose of the sampling program was to determine a baseline level of contamination in biota within the proposed unremediated area of the NLODS wetland prior to remediation, focusing on lead and PCB concentrations in biota at three trophic levels. Samples were collected from the proposed unremediated area of the NLODS wetland and an offsite reference area. Biota sampled included small mammals, terrestrial invertebrates, plants and amphibians.

The 2002 biological sampling was administered following the tasks and objectives presented in the Work Plan (HLA, 2002). The purpose of the sampling program was to determine post-remediation levels of contamination in biota within the remediated and unremediated NLODS wetlands, focusing on lead and PCB contamination in biota at three trophic levels. Biota sampled included small mammals, terrestrial invertebrates, and plants. Amphibians were not observed in the wetlands; however, weather conditions during this sampling event were much more seasonal (colder) than during the 1996 sampling event, and the ponded water in the remediated wetland was frozen.

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This report contains a discussion of field activities, sample handling and analytical procedures, and analytical results.

1.0 FIELD ACTIVITIES

Field activities performed as part of the biomonitoring program include:

- identification of a suitable reference wetland (1996 program),
- description of the habitat in the remediated portion of the NLODS wetland (2002 program),
- establishment of transects (1996 program for NLODS unremediated wetland, and 2002 program for NLODS remediated wetland), and
- sample collection (1996 and 2002 program).

Each of these activities is discussed below.

1.1 IDENTIFICATION OF THE REFERENCE WETLAND (1996)

In 1996 a suitable location for the reference wetland was identified from information provided in a report titled *Contamination Pathways Characterization, Summary Report, Contamination Pathways RI/FS, York Oil Superfund Site, Moira, New York* (Blasand, Bouck & Lee, Inc, 1995). The actual location was identified in the field by ABB-ES and NYSDEC personnel. The location of this wetland relative to the NLODS wetland is shown in Figure 1.

Although this site is a suitable reference location, there were some differences in hydrological conditions and dominant vegetation forms between the reference and NLODS wetland. At the NLODS wetland, water was ponded and at or near the surface throughout the site, whereas at the reference wetland, most of the dry land within the reference wetland was associated with microrelief around the shrubs and trees present at the site. The NLODS wetland is a forested wetland with a well-developed shrub-dominated understory. The reference wetland is a forested/scrub-shrub wetland, dominated by shrubs and saplings (< 30 feet tall), with emergent grasses dominating the understory/ground cover at the site in distinct tussocks with mound and pool microrelief. The lower-lying areas of the NLODS wetland, containing more emergent plants, were more consistent with the reference wetland.

1.2 DESCRIPTION OF HABITAT IN REMEDIATED PORTION OF WETLAND (2002)

In 2002 site conditions in the remediated portion of the NLODS wetland were documented. Figure 2 shows the approximate area and layout of the remediated portion of the wetland. It is a low-lying area surrounded by a mix of forested wetland and upland to the north and north west, forested wetland to the west and south, and open upland associated with the former lagoon area and disposal cell to the east. The entire area is well vegetated with a variety of herbaceous species. The

remediated portion of the wetland is an emergent wetland dominated by sedges of the genus *Carex* and cattails *(Typha* sp.*)*. Other species observed included water plantain (*Alisma plantago-aquatica*), woolly sedge (*Scirpus cyperinus*), rush (*Juncus* sp.), and bulrush (*Scirpus* sp). Standing water was present throughout much of the remediated wetland, ranging from two inches to greater than one foot deep, with the deepest standing water located at the eastern end. The water depth through the majority of the wetland was three to six inches.

1.3 ESTABLISHMENT OF TRANSECTS (1996 AND 2002)

Transects were established during both the 1996 and the 2002 field programs, as described below.

1.3.1 1996

In 1996, transects were established at both the NLODS and reference wetlands. These transects were primarily established for purpose of small mammal trapping, but plant and invertebrate samples were also collected from these areas. At the NLODS wetland, five transects (Transects NLODS-1 through -5) were established, each one beginning at the edge of the area to be excavated and radiating out, as shown in Figure 2. At the reference wetland, five transects (Transects REF-1 through -5) were established roughly perpendicular to Route 11, beginning at the edge of the scrub-shrub habitat and extending south. Because of the shape of the wetland, transects REF-4 and REF-5 were angled to the southeast and east, respectively (Figure 3). The transects at both the NLODS and reference wetlands were marked at the beginning and end with grade stakes. The stakes were clearly labeled with the transect numbers and locations.

1.3.2 2002

In 2002, transects were re-established in the unremediated portion of the NLODS wetland (Transects NLODS-1 through -5), and new transects were established in the remediated portion of the wetland (Transects NLODS-6 through -10). Transects NLODS-1 through -5 were set in the same locations as in 1996; previous flagging and stakes allowed for re-establishment of the same transects. Transects NLODS-6 through -10 were set as shown in Figure 2. Due to wet conditions, traps in the remediated wetland were set in clusters of two to three in drier locations in the vicinity of each transect, rather than in a single straight line.

1.4 SAMPLE COLLECTION (1996 AND 2002)

In 1996, species at three different trophic levels were sampled to evaluate biotransfer of lead and PCBs throughout the food chain. The three trophic levels included plants, invertebrates, and amphibians and small mammals. A total of ten samples each of earthworms, small mammals, and plants were collected (five from the NLODS wetland and five from the reference wetland). In

addition, one amphibian sample was collected from each of the wetlands. A summary of small mammals collected is presented in Table 1. Table 2 contains a summary of the earthworms, plants and amphibians collected. A copy of the field notes are presented in Appendix A.

Sample collection in 2002 included collection of sediment samples from the reference wetland and from the remediated portion of the NLODS wetland (shown on Figures 3 and 2, respectively), and collection of biological samples from the remediated and unremediated portions of the NLODS wetland. No additional biological sampling was conducted in the reference wetland and biota concentrations in this area would not be expected to have changed greatly over time.

The three trophic levels sampled in 2002 included plants, invertebrates, and small mammals. A total of 10 plant sample were collected (five from the unremediated wetland, and five from the remediated wetland). A total of 6 earthworm samples were collected (three from the unremediated wetland, and three from the remediated wetland). No amphibian samples were collected. A summary of small mammals collected is presented in Table 1a. Table 2a contains a summary of the earthworms and plants collected. A copy of the field notes are presented in Appendix A.

During the 2002 field effort, field notes and other sample collection data were recorded in the site field notebook in a manner similar to that described for the 1996 field effort. Field data records are included in Appendix B.

Additional details regarding sample collection sediment, small mammals, invertebrates, plants, and amphibians are presented in the following subsections.

1.4.1 Sediment

Three samples (and one duplicate) were collected from the remediated wetland. Three samples were also collected from the reference wetland, in order to document sediment concentrations associated with the biological samples collected from there in 1996 (no sediment samples were collected from the reference wetland in 1996).

1.4.2 Small Mammals

This subsection discusses the small mammal sampling methods used in 1996 and 2002.

1.4.2.1 1996

Small mammals were collected using snap traps placed in both the NLODS and reference wetlands. A total of fifty traps were set in the NLODS wetland over a four day period, to give a total of 200 trap nights, from 4-8 November 1996 (Figure 2). In the reference area, fifty traps were set on 6

November 1996. An additional 50 traps were set in the reference area on 7 November 1996, to increase the number of trap nights at the reference area to 150. In the NLODS wetland snap traps were placed in transects roughly coinciding with existing sediment sample locations from outside the area to be excavated. In the reference wetland snap traps were set in five transects of ten traps each set in parallel lines spaced approximately 30 feet apart, within a scrub-shrub habitat. The snap traps were baited with a mixture of rolled oats and peanut butter. The approximate location of the transects are shown in Figure 3. A total of 28 small mammals from four separate taxa were collected from the NLODS wetland. The white-footed mouse (*Peromyscus leucopus*) was the most common small mammal species collected at the NLODS and reference wetlands. Other small mammal species collected at the NLODS and reference wetlands included the short-tailed shrew (*Blarina brevicauda*), meadow vole (*Microtus pennsylvanicus*), and masked shrew (*Sorex cinereus*). In the reference wetland a total of 8 small mammals were collected. These included the white-footed mouse, short-tailed shrew, and masked shrew. No meadow voles were collected from the reference wetland.

A subset of the small mammals collected from the NLODS and reference wetlands were composited into five separate samples, respectively (Table 3). In the NLODS wetland each sample was a composite of two to six individuals, because of their small size relative to the sample quantity requested by the laboratory for the chemical analyses (25 g for PCBs, 15 g for percent lipid, and 10 g for lead). Femur bones were removed, composited, and analyzed for lead; the remainder of the organisms were composited and analyzed for PCBs and percent lipid. In the reference wetland, three of the five samples consisted of a composite of two individuals, the remaining two samples were composed of a single individual.

1.4.2.2 2002

In 2002, small mammals were collected using snap traps placed in both the remediated and unremediated wetlands. Small mammals were not collected from the reference wetland, as those concentrations would not be expected to have changed significantly. A total of fifty traps were set in the remediated and unremediated wetlands over a four day period, to give a total of 200 trap nights from 5-9 November, 2002 (Figure 2). In the unremediated wetland, the 1996 transects were identified, and traps were set in line with those transects, spaced roughly 20 feet apart. The snap traps were baited with a mixture of rolled oats and peanut butter. Conditions in the remediated wetland were extremely wet, with standing water present throughout much of the central portion of the wetland. Transects were established in areas of highest ground, biased towards the outer edges which were most dry and therefore most likely to provide small mammal habitat. The approximate location of the transects in the remediated wetland are shown in Figure 2.

A total of seven small mammals from three separate taxa were collected from the remediated NLODS wetland. The meadow vole (*Microtus pennsylvanicus*) was the most common small

mammal species collected at the remediated wetland. A total of 18 small mammals from four separate taxa were collected from the unremediated NLODS wetland. The white footed mouse (*Peromyscus leucopus*) was the most common small mammal collected at the unremediated wetland. Other small mammal species collected in 2002 at the NLODS wetlands included the short-tailed shrew (*Blarina brevicauda*), and masked shrew (*Sorex cinereus*).

The small mammals collected from the remediated and unremediated wetlands were composited into five separate samples, respectively (Table 3A). Each sample was a composite of one to five individuals.

1.4.3 Invertebrates

This subsection discusses the invertebrate sampling methods used in 1996 and 2002.

1.4.3.1 1996

In 1996, earthworms were collected from five locations within the NLODS and reference wetlands. An area of roughly one meter square was sampled in order to gather enough sample quantity to conduct the requested chemical analysis. A hand shovel was used to dig worms, each shovel full was sorted and any earthworms present were composited. Approximately 50 grams of earthworms were collected at each location. Earthworm sample locations are indicated in Figures 2 and 3 for the NLODS wetland and reference wetland, respectively.

1.4.3.2 2002

In 2002, earthworms were collected from three locations within the remediated portion of the wetland and from three locations in the unremediated portion of the wetland. Due to the wet conditions in the remediated wetland, earthworm samples were collected along the northern edge where conditions were drier. Sampling methods were the same as those used in the 1996 field effort. Earthworm sample locations are indicated on Figure 2.

1.4.4 Plants

This subsection discusses the plant sampling methods used in 1996 and 2002.

1.4.4.1 1996

In 1996, herbaceous plants were collected from five locations in the NLODS and reference wetlands. The targeted species, identified in the field, was from the sedge family *Cyperaceae*. All of the plants collected were of the genus *Carex*. Plant species from this genus are a common food

source for birds and small mammals and they were present in abundance at both the NLODS and reference wetlands. Plant samples consisted of a composite of the edible portions of several plants. Samples were collected with clippers. Plant sample locations are indicated in Figures 2 and 3 for the NLODS wetland and reference wetland. Although five samples were collected only four were analyzed, as one of the plant samples from both locations was eliminated in order to allow the analysis of the amphibian samples.

1.4.4.2 2002

In 2002, herbaceous plants were collected from five locations in the remediated wetland and five locations in the unremediated wetland. The targeted species was from the sedge family Cyperaceae. All of the plants collected were of the genus *Carex*. Plant samples consisted of a composite of the edible (above-ground) portions of several plants. Samples were collected using clippers. Plant sample locations are indicated on Figure 2.

1.4.5 Amphibians

This subsection discusses the amphibian sampling methods used in 1996 and 2002.

1.4.5.1 1996

During the sampling program, frogs of the genus *Rana* were observed throughout the NLODS wetland. A decision was made in the field, to collect an amphibian sample, as they would likely represent a primary food source for medium size mammals and wading birds (e.g., raccoons and great blue herons). Six green frogs (*Rana clamitans melanota*) were collected from the NLODS wetland and retained for chemical analysis. However, in the reference wetland amphibians seemed to be less prevalent. This was probably due to the denser ground cover present at the reference wetland. One northern leopard frog (*Rana pipens*) was collected reference wetland during the sampling program, and retained for chemical analysis.

1.4.5.2 2002

No frogs were observed in the NLODS wetland during the 2002 sampling event; weather conditions during this sampling event were much more seasonal (colder) than during the 1996 sampling event. The ponded water in the remediated wetland was frozen.

2.0 SAMPLE HANDLING, PREPARATION, AND ANALYSIS

Samples were shipped to the analytical laboratory at 4° C, and analyzed within the required sample holding times. Biological samples were homogenized to a uniform consistency by chopping into

pieces and blending with liquid nitrogen into a powder. Plant, invertebrate, and amphibian samples were analyzed for percent lipid, total PCBs, and lead. For small mammals, femur bones were removed and analyzed for lead only; and the remainder of the body was analyzed for percent lipid and total PCBs.

For total lead, samples were digested using Method 3050 and analyzed using Method 6010 (ICP Trace). For PCBs, samples were extracted using Method 3540 and analyzed using Method 8080. Cleanup of PCB samples included florisil (Method 3620). Percent lipid was measured using Method 9071 for Modified Oil and Grease.

Sediment samples were analyzed for lead and PCBs using the NYSDOH Analytical Service Protocol (ASP) method 239.2 CLP-M and 8080, respectively.

3.0 ANALYTICAL RESULTS

Analytical results for sediments, small mammals, invertebrates, plants, and amphibians are discussed below. A copy of the 2002 data package, as received from the analytical laboratory, is presented in Appendix C. The 1996 data package was presented in the original 1997 letter report (ABB-ES, 1997). A copy of the Data Usability Summary Report for the 2002 sampling event is included as Appendix D.

3.1 SEDIMENT

This subsection discusses the sediment analytical results for 1996 and 2002.

3.1.1 1996

No sediment samples were collected in 1996. Previously collected sediment data were used to represent baseline sediment conditions in the unremediated wetland. Sediment concentrations from the reference area [identified as part of the York Oil Superfund Site RI/FS (Blasand, Bouck, and Lee, Inc.1995)] were used to represent reference (background) sediment concentrations.

3.1.2 2002

Three sediment samples were collected from the reference wetland to obtain comparable sediment results from this previously unsampled area. Three sediment samples were collected from the remediated wetland to document post-remediation sediment concentrations. Samples were analyzed for PCBs and lead. Sediment samples were not collected from the unremediated wetland as sediment concentrations in this area are not expected to have changed.

In the NLODS remediated wetland, Aroclors 1254 and 1260 were detected in one of three samples (SD-603) at concentrations of 260 and 250 micrograms per kilogram (ug/kg), respectively (note: these concentrations represent an average of the sample and its duplicate). Lead was detected in all samples at concentrations ranging from 22.7 to 179.5 milligrams per kilogram (mg/kg). The maximum concentration of lead was also detected at SD-603. As shown on Figure 2, SD-603 is located near the outlet of the former lagoon. PCBs were non-detect in the other two sediment samples from the middle and western end of the wetland, and lead concentrations in those two samples (34.9 and 22.7 mg/kg) were comparable to reference levels (ranging from 22.7 to 30.8 mg/kg).

In the reference wetland, PCBs were non-detect in all three samples. Lead was detected at concentrations ranging from 22.7 to 30.8 mg/kg. These levels are comparable to the average and maximum concentrations of 24.4 and 37.1 mg/kg previously reported at the reference wetland (Blasand, Bouck, and Lee, 1995).

3.2 SMALL MAMMALS

This subsection discusses the small mammal analytical results for 1996 and 2002.

3.2.1 1996

The small mammals collected at the NLODS and reference wetlands were analyzed for PCBs, percent lipids, and lead (Table 4). The following PCB congeners were analyzed for: Aroclor-1016, -1221,-1232, -1242, -1248, -1254, and -1260. In small mammals, Aroclor-1254 and -1260 were the only PCBs detected. In the NLODS wetland, Aroclor-1260 was detected in two short-tailed shrews at 91 ug/kg and 250 ug/kg. In the reference wetland Aroclor-1254 was detected in a white-footed mouse at 120 ug/kg. The percent lipids measured in small mammals having detected concentrations of PCBs were 4.42 and 5.46 percent (NLODS wetland) and 7.44 percent (reference wetland). Lead concentrations detected in femurs in small mammals collected in the NLODS wetland ranged from 1.3 to 11.5 mg/kg. In the reference wetland detected lead concentrations ranged from 0.59 to 5.5 mg/kg. The average and maximum detected concentrations of lead in femurs of small mammals from the NLODS wetland were greater than two times those detected in the reference wetland.

3.2.2 2002

The small mammals collected from the remediated and unremediated NLODS wetlands were analyzed for PCBs, percent lipids, and lead (Table 4). The PCB congeners analyzed for were the same as those analyzed for in 1996. PCBs were all non-detect in the unremediated wetland. Aroclor-1260 was the only congener detected in the remediated wetland, and it was detected in only one sample (BIO-710) at a concentration of 0.110 mg/kg. The percent lipids measured in this

sample was 3.96 percent; those in the small mammals where PCBs were non-detect ranged from 2.1 to 7.0 percent. Lead was detected in two of the four small mammal femur samples from the remediated wetland at concentrations of 0.92 and 1.3 mg/kg. Lead was detected in 5 of 6 small mammal femur samples from the unremediated wetland at concentrations ranging from 0.32 to 1.9 mg/kg.

3.3 INVERTEBRATES

This subsection discusses the invertebrate (earthworm) analytical results for 1996 and 2002.

3.3.1 1996

The earthworms collected in 1996 at the NLODS and reference wetlands were analyzed for PCBs, percent lipids, and lead (Table 5). PCBs were not detected in earthworms collected from the NLODS or reference wetlands. The percent lipids measured in earthworms ranged from 1.22 to 1.66 and 1.08 and 1.61 in the NLODS and reference wetlands, respectively. Lead was detected in all of the invertebrate samples collected in the NLODS and reference wetlands. Lead concentrations detected in earthworms from the NLODS wetland ranged from 0.98 to 2.4 mg/kg. In the reference wetland, lead was detected in earthworms at concentrations that ranged from 0.35 to 1.2 mg/kg. Similar to results for the small mammals, average and maximum detected concentrations of lead in earthworms from the NLODS wetland were greater than two times those detected concentrations in the reference wetland.

3.3.2 2002

The earthworms collected in 2002 from the remediated and unremediated NLODS wetlands were analyzed for the same analytes as those in 1996 (Table 5). PCBs were not detected in either of the two earthworm samples analyzed from the unremediated wetland; a third earthworm sample collected from the unremediated wetland (Bio 721) was not analyzed for PCBs due to insufficient sample quantity. Aroclor 1260 was detected in two of the three earthworm samples from the remediated wetland at concentrations at 0.089 and 0.069 mg/kg. Lead was detected in all of the earthworm samples collected. Lead concentrations detected in earthworms from the remediated wetland ranged from 4.6 to 21 mg/kg, while those in earthworms from the unremediated wetland ranged from 1.7 to 5.1 mg/kg.

3.4 PLANTS

This subsection discusses the plant analytical results for 1996 and 2002.

3.4.1 1996

Plants collected in 1996 at the NLODS and reference wetlands were analyzed for PCBs, percent lipids, and lead (Table 6). PCBs were not detected in plants collected from the NLODS or reference wetlands. The percent lipids measured in plants ranged from 0.45 to 1.24 percent and 0.74 to 1.10 percent in the NLODS and reference wetlands, respectively. Lead was detected in all of the plants sampled from the NLODS and reference wetlands. In the NLODS wetland, detected concentrations of lead ranged from 0.25 to 1.8 mg/kg. In the reference wetland, lead concentrations ranged from 0.17 to 0.35 mg/kg. Similar to results for the small mammals and invertebrates, lead was detected at higher concentrations in the NLODS wetland. Average and maximum detected concentrations of lead were three and six times greater, respectively, in the NLODS wetland as compared to the reference wetland.

3.4.2 2002

The plants collected in 2002 from the remediated and unremediated NLODS wetland were analyzed for the same analytes as those in 1996. Neither PCBs nor lead were detected in plants from either the remediated or unremediated wetland. The percent lipids measured in plants ranged from 0.50 to 0.79 percent in the unremediated wetland, and from 0.3 to 0.65 percent in the remediated wetland.

3.5 AMPHIBIANS

This subsection discusses the amphibian analytical results for 1996 and 2002.

3.5.1 1996

In 1996, frogs (*Rana spp.*) collected at the NLODS and reference wetlands were analyzed for PCBs, percent lipids, and lead (Table 7). PCBs were not detected in frogs collected from the NLODS or reference wetlands. The percent lipids measured in frogs were slightly higher in the reference wetland as compared to the NLODS wetland (2.13 and 1.46 percent, respectively). Lead was detected in frog samples collected from both the NLODS and reference wetlands (0.07 and 0.28 mg/kg, respectively). Unlike the other biota, lead was detected at a higher concentration in the frog collected from the reference wetland.

3.5.2 2002

No frogs were collected during the 2002 sampling event.

4.0 RISK EVALUATION

This section contains a brief discussion and interpretation of these measured tissue concentrations relative to baseline ecological risks. In the 1990 and 1992 ecological risk assessments (E.C. Jordan, 1990; 1992), risks to ecological receptors from PCBs and lead in the NLODS wetland were evaluated through the use of a food web model. Potential risks for certain receptors (shrew, woodcock, and garter snake) were identified, based on an HI>1.

In 1996, risks were recalculated using PCB and lead concentrations measured in small mammals, invertebrates (earthworms), amphibians (frogs), and plants collected from the NLODS wetland and the reference wetland. In the NLODS wetland, the contribution of sediment was evaluated by considering only the concentrations from samples that would remain following remediation (i.e., from outside of the area to be remediated); these were identified in the Sediment Toxicity Characterization Report (ABB-ES, 1995).

In 2002, risk were recalculated using PCB and lead concentrations from 2002 measured in small mammals, invertebrates (earthworms), and plants collected from remediated and unremediated portions of the NLODS wetland. Risks for the reference wetland were also recalculated to incorporate the 2002 sediment sample results from this area.

Sediment sample locations are identified in Figure 2, and the analytical results are presented in Table 8. The risk calculations for the NLODS wetlands and reference wetland are presented in the following tables:

Table 9A – unremediated wetland risks, using 1996 data
Table 9B – unremediated wetland risks, using 2002 data
Table 9C – remediated wetland risks, using 2002 data
Table 10A – reference wetland risks, using pre-1996 sediment data/1996 tissue data
Table 10B – reference wetland risks, using 2002 sediment data/1996 tissue data

The exposure assumptions presented in the baseline ecological risk assessment (E.C. Jordan, 1992) were used to recalculate risks. Exposure routes for the shrew and woodcock included direct sediment ingestion, ingestion of contaminated invertebrates, and ingestion of contaminated plants. For the garter snake, exposure routes included direct ingestion of contaminated sediment, invertebrates, small mammals, and herptofauna. The assumed dietary composition for the garter snake was changed slightly in the 1996 assessment (from that used previously) to include herptofauna instead of small birds, as site-specific chemical data on this prey species was available in 1996. For the 2002 calculations, the dietary composition was shifted to assume no herptofauna. The assumed dietary composition was not shifted back to include small birds, as

there are no tissue data for small birds; instead, that portion of the diet was shifted to small mammals.

Risks were quantitatively evaluated using hazard quotients (HQs), which were calculated by dividing the estimated exposure level (TBD) by the reference toxicity value (RTV). Acute exposure HQs were calculated by dividing the dose based on the maximum concentration of PCBs and lead in sediment and prey species by the acute RTVs; chronic exposure HQs were calculated by dividing the dose based on average concentrations of PCBs and lead in sediment and prey species by the chronic RTV. This is consistent with the approach used in the two existing ecological risk assessments for NLODS (E.C. Jordan, 1990; and 1992).

4.1 1996

The findings presented in Table 9A suggest that small mammals that forage exclusively within the unremediated NLODS wetland could potentially be at risk as a result of lead concentrations, although acute and chronic HQs were only slightly greater than 1 (HQs of 1.37 and 9.33, respectively). Incidental ingestion of sediment containing lead is the pathway contributing to the majority of predicted exposure and risk. PCB HQs for the shrew, woodcock, and garter snake were all well below 1, indicating that PCBs do not appear to present a risk to ecological receptors in the NLODS wetland. The results of the risk evaluation of the reference wetland (Table 10A) indicate that small mammals that forage exclusively within the reference wetland could potentially be at risk from chronic exposure to lead, although the chronic exposure HQ for small mammals only slightly exceeded 1 (HQ of 1.24). None of the other wildlife HQs calculated for the reference area exceeded 1.

4.2 2002

The findings presented in Table 9B suggest that small mammals that forage exclusively within the unremediated NLODS wetland could still potentially be at risk as a result of lead concentrations. Although acute risks were only slightly greater than one (HQ of 1.43), chronic risks were an order of magnitude higher (HQ of 10.1). This HQ is slightly higher than the pre-remediation HQ of 9.33, and is attributable to the higher concentrations detected in earthworms collected in 2002 (average of 3.1 mg/kg) relative to those in worms collected in 1996 (average of 1.7 mg/kg).

Examination of the lead concentrations in the small mammals themselves, however, indicates that actual exposures for small mammals have decreased. The average lead concentration in 2002 was 1.03 mg/kg, compared to an average of 4.56 mg/kg in 1996.

The findings presented in Table 9C suggest that small mammals that forage exclusively within the remediated NLODS wetland could also potentially be at risk as a result of lead concentrations.

Although acute risks were less than one, chronic risks were greater than one (HQ of 15.4). Although this HQ is higher than the HQ in the unremediated wetland, it likely represents a substantial decrease from the HQ that would have been calculated under pre-remediation conditions.

PCB HQs for the shrew, woodcock, and garter snake were all well below 1, indicating that PCBs do not appear to present a risk to ecological receptors in the NLODS wetland.

The results of the risk evaluation of the reference wetland that incorporate the 2002 sediment data (Table 10B) are similar to those from 1996, indicating that small mammals that forage exclusively within the reference wetland could potentially be at risk from chronic exposure to lead, although the chronic exposure HQ for small mammals only slightly exceeded 1 (HQ of 1.29). None of the other wildlife HQs calculated for the reference area exceeded 1.

There are uncertainties associated with the RTVs used in the assessment (from the 1992 risk assessment). More recent compilations of RTVs (e.g., that done by Oak Ridge National Laboratories in 1996 (Sample et al., 1996), suggests that this value may be overly conservative. Sample et al. report LOAEL and NOAEL values for lead of 80 mg/kg-day and 8.0 mg/kg-day, respectively, based on a 3-generation study using laboratory rats, in which decreased offspring weight and kidney damage were reported. If the NOAEL value of 8.0 mg/kg-day was used (rather than the RTV of 2.5 mg/kg-day), the HQ for lead in the unremediated wetland would be 4.8; if the LOAEL value were used, the HQ for lead would be 0.48. This comparison demonstrates the uncertainties associated with the selection and use of RTVs, and potential influence on the risk conclusions.

5.0 DATA TRENDS – 1996 VS 2002 IN REMEDIATED AND UNREMEDIATED WETLANDS

Table 11 contains a presentation of sediment and biological tissue results from 1996 and 2002 field programs for the unremediated, remediated, and reference wetlands. Analytical results for PCBs and lead between sampling events and areas are discussed below.

5.1 PCBs

Figure 4 presents a graphical presentation of PCB sediment concentrations in the unremediated, remediated, and reference wetlands in 1996 and 2002. For PCBs, the average sediment concentration in the unremediated wetland was 642 ug/kg (0.642 mg/kg). The average sediment concentration in the area of the NLODS wetland targeted for remediation in 1996 (prior to remediation) was 9400 ug/kg. The average PCB sediment concentration in the remediated area measured in 2002 was 188 ug/kg (0.188 mg/kg), demonstrating that PCB sediment concentrations

in the remediated wetlands have decreased substantially and are now lower than those in the surrounding unremediated wetlands.

In 1996, PCB concentrations in biological tissue from the NLODS wetland were non-detect except in small mammals, where the average PCB concentration in unremediated areas was 0.123 mg/kg. In 2002, PCB concentrations in biological tissue from the unremediated wetland non-detect in all samples, including small mammals. PCB concentrations in small mammals from the remediated wetland in 2002 (average 96 ug/kg) were lower than those in small mammals from the unremediated wetland in 1996 (average 123 ug/kg).

For PCBs, the biological results do not appear to have changed significantly despite a decrease in average sediment concentration to 0.188 mg/kg in the remediated wetland in 2002.

However, PCB concentrations in small mammals from both the remediated and unremediated wetland in 2002 (average 96 ug/kg and non-detect, respectively) are below those from the reference wetland (average 112 ug/kg).

5.2 LEAD

Figure 5 presents a graphical presentation of lead sediment concentrations in the unremediated, remediated, and reference wetlands in 1996 and 2002. For lead, the average sediment concentration in unremediated areas was 234 mg/kg. The average sediment concentration in the area of the NLODS wetland targeted for remediation in 1996 (prior to remediation) was 1040 mg/kg. The average lead sediment concentration in sediment samples from the remediated area collected in 2002 was 79 mg/kg, again demonstrating that lead sediment concentrations in the remediated wetlands have decreased substantially and are now lower than those in the surrounding unremediated wetlands.

Lead concentrations in biological tissue from the NLODS wetland from 2002 differed slightly from those in 1996. In the unremediated wetland, lead concentrations in earthworms in 2002 were slightly higher than those from 1996 (average concentration of 1.7 mg/kg in 1996 vs. 3.1 mg/kg in 2002). Lead concentrations in plants in both the remediated and unremediated wetlands were non-detect, but detection limits are slightly higher than those from 1996.

In the unremediated wetland, lead concentrations in small mammal femur bones in 2002 were lower than those from 1996 (average concentration of 4.5 mg/kg in 1996 vs. 1 mg/kg in 2002). Lead concentrations in small mammal femur bones from the remediated area (average of 1.31 mg/kg) are comparable to those in small mammal femurs from the unremediated areas (average of 1.03 mg/kg).

The lead concentrations in small mammal femurs from the unremediated wetland have decreased, but lead concentrations in worms have increased. Lead concentrations in the remediated wetland sediment have decreased to an average of 79 mg/kg. Lead concentrations in small mammal femurs from both the remediated and unremediated wetland are now below those from the reference wetland.

6.0 SUMMARY AND CONCLUSION

The results of the 1996 baseline biomonitoring program indicate that PCB and lead concentrations in biota within the NLODS wetland were lower than the levels assumed in the Baseline Ecological Risk Assessment (E.C. Jordan, 1990; 1992). With the exception of the frog samples, lead concentrations in biological tissue samples collected from the NLODS wetland appeared to be slightly elevated relative to those from the reference wetland. The results of the risk evaluation indicated that lead may pose a potential risk to small mammals in both the NLODS and reference wetland; however, the primary contributing pathway was direct sediment ingestion, not food chain exposure. The lead HQs for both reference and NLODS wetlands exceeded one (HQs of 1.24 and 9.33, respectively).

The results of the 2002 post-remediation biomonitoring program indicate that lead concentrations in earthworm tissue samples collected from the NLODS wetland are slightly elevated relative to those from the reference wetland, but that lead concentrations in small mammal femurs collected from both the remediated and unremediated NLODS wetlands are comparable to those from the reference wetland. The results of the risk evaluation indicate that the risks posed by lead in both the remediated and unremediated NLODS wetlands are higher than those in the reference area, but the primary contributing pathway is still direct sediment ingestion, not food chain exposure.

Lead concentrations in sediments in both the remediated and unremediated wetland sediments are higher than concentrations from the reference wetland. The concentrations in small mammal femurs in organisms from both the remediated and unremediated wetland (average of 1.31 and 1.03 mg/kg, respectively) are less than those from the reference wetland (average of 2.0 mg/kg), indicating that the lead in sediment at the site does not appear to be as bioavailable to small mammals.

The overall conclusions of this investigation are as follows:

1) Lead and PCB concentrations in remediated area sediments have been substantially reduced as a result of the remediation activities at the site,
2) PCB concentrations in small mammals in the unremediated wetland appear to be unchanged, but they are comparable to those from the reference location,
3) Results of the food chain model indicate that PCBs do not appear to pose a risk to ecological receptors,

4) The results of the food chain model indicate potential risks to small mammals such as the shrew due to lead, with HQs greater than those from the reference location. There is uncertainty associated with the toxicity benchmarks used to calculate these HQs, with more recent benchmarks indicating that risks could be significantly lower than predicted,
5) In addition, lead concentrations in small mammal tissue are now lower than those from the reference location, indicating that regardless of the concentrations in sediment and earthworms, the small mammal body burden, and therefore overall exposures of the small mammals, are not significantly different from that at the reference wetland, and
6) These results indicate that additional post-remediation biomonitoring does not appear to be warranted.

Please call me at 207-775-5401 if you have any questions.

Sincerely,

HARDING LAWSON ASSOCIATES

Glenn Daukas
Project Manager

Appendices

cc: R. Koeppicus – NYSDEC
A. Fogg - HLA
File

ABB-ES, 1997. *Baseline Biological Monitoring Report;* prepared for New York State Department of Environmental Conservation; July, 1997

ABB-ES, 1996. *Biological Sampling Plan;* prepared for New York State Department of Environmental Conservation; September, 1996.

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Dietz, D.D., D.E. McMilland, and P. Mushak, 1979. "Effects of Chronic Lead Administration on Acquisition and Performance of Serial Position Sequences by Pigeons"; Toxicol. Appl. Pharmacol.; Vol. 47; 377-384.

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FIGURES

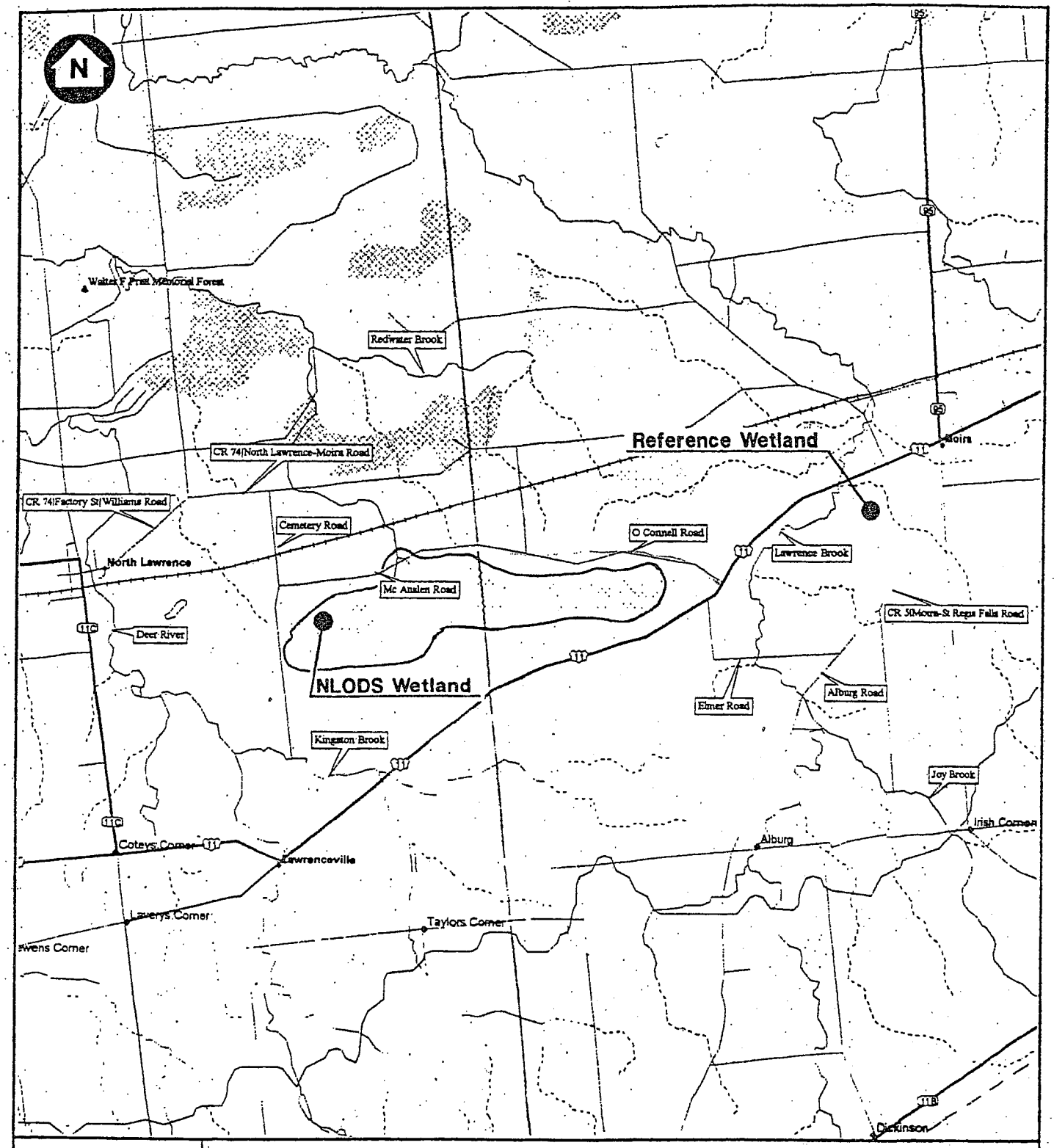

FIGURE 1
SITE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY
Harding Lawson Associates

08749-07 C&P

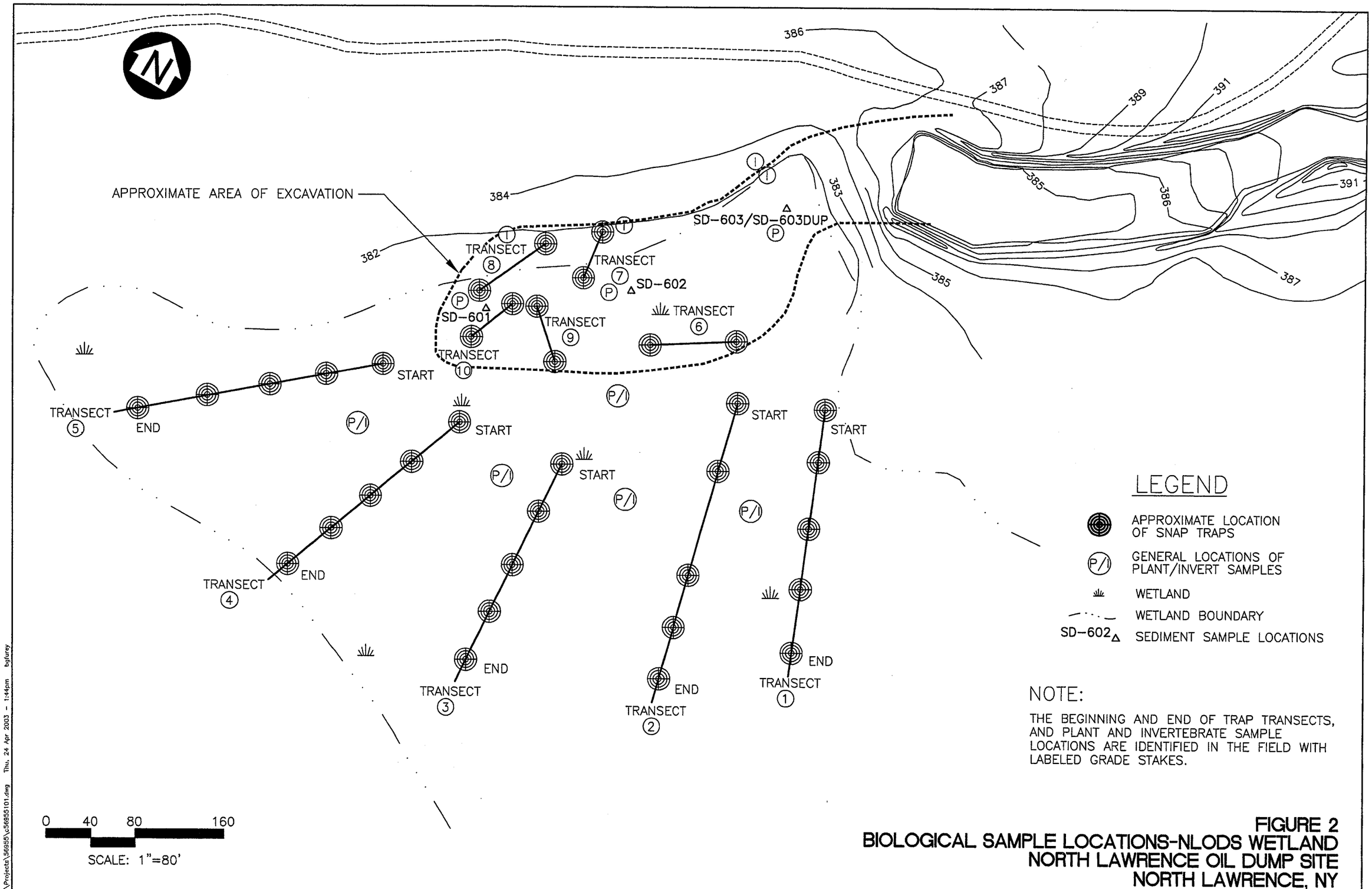

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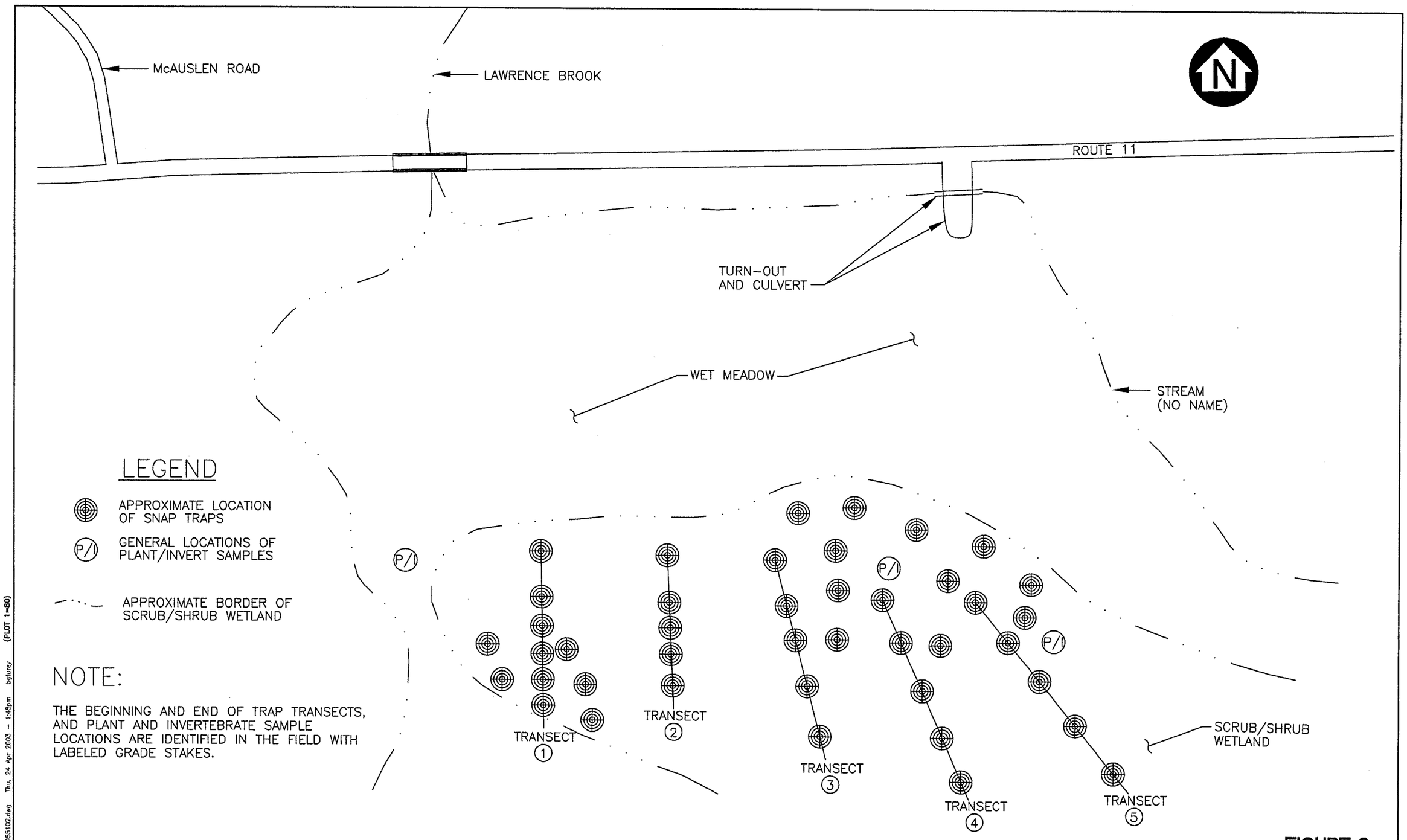
FIGURE 2
BIOLOGICAL SAMPLE LOCATIONS-NLODS WETLAND
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

Harding Lawson Associates



LEGEND

- APPROXIMATE LOCATION OF SNAP TRAPS
- P/I GENERAL LOCATIONS OF PLANT/INVERT SAMPLES
- APPROXIMATE BORDER OF SCRUB/SHRUB WETLAND

NOTE:

THE BEGINNING AND END OF TRAP TRANSECTS, AND PLANT AND INVERTEBRATE SAMPLE LOCATIONS ARE IDENTIFIED IN THE FIELD WITH LABELED GRADE STAKES.

NOT TO SCALE

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FIGURE 3
BIOLOGICAL SAMPLE LOCATIONS-REFERENCE WETLAND
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

Harding Lawson Associates

FIGURE 4
Trend Analysis - PCBs In Sediment
North Lawrence Oil Dump Site
North Lawrence, NY

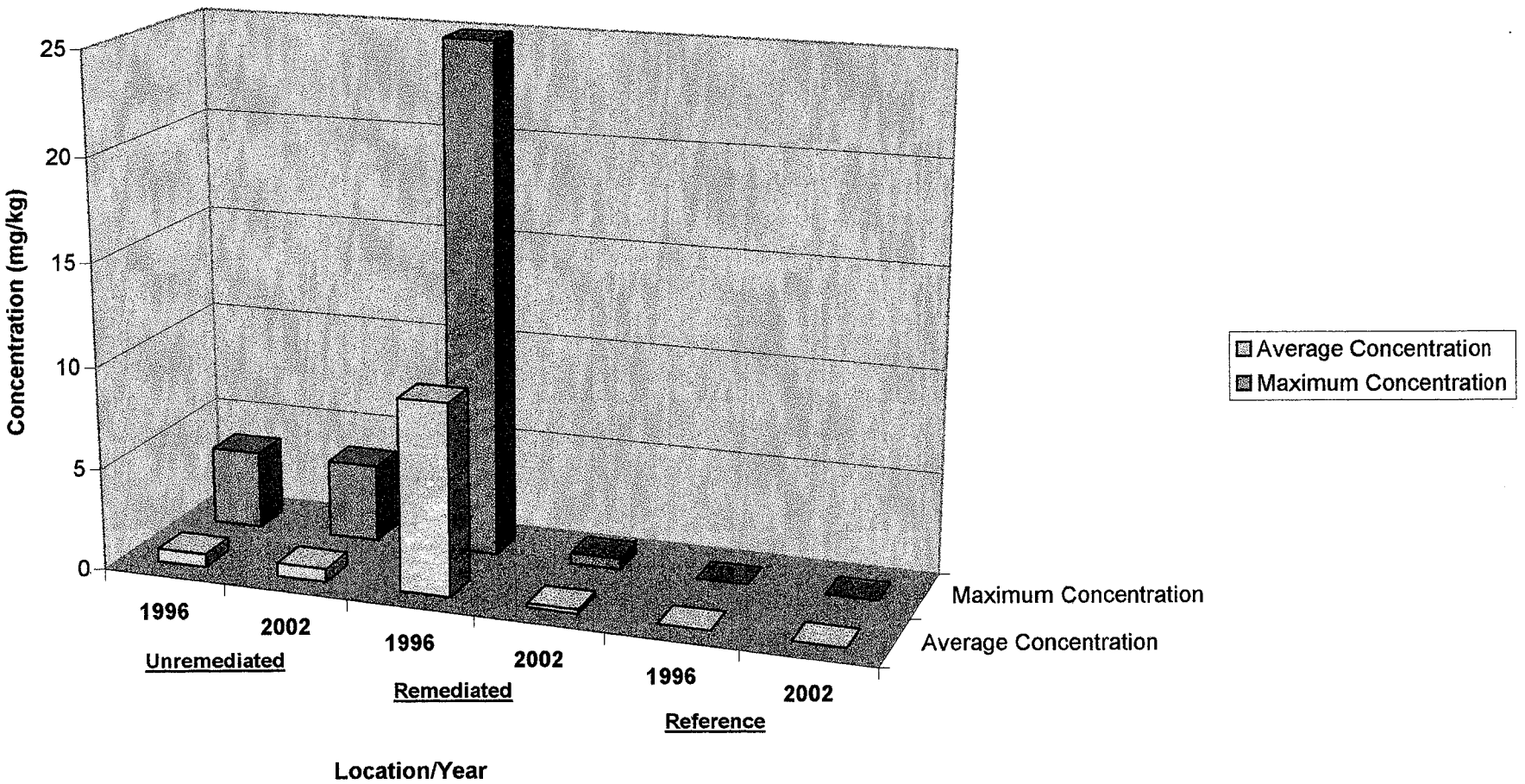
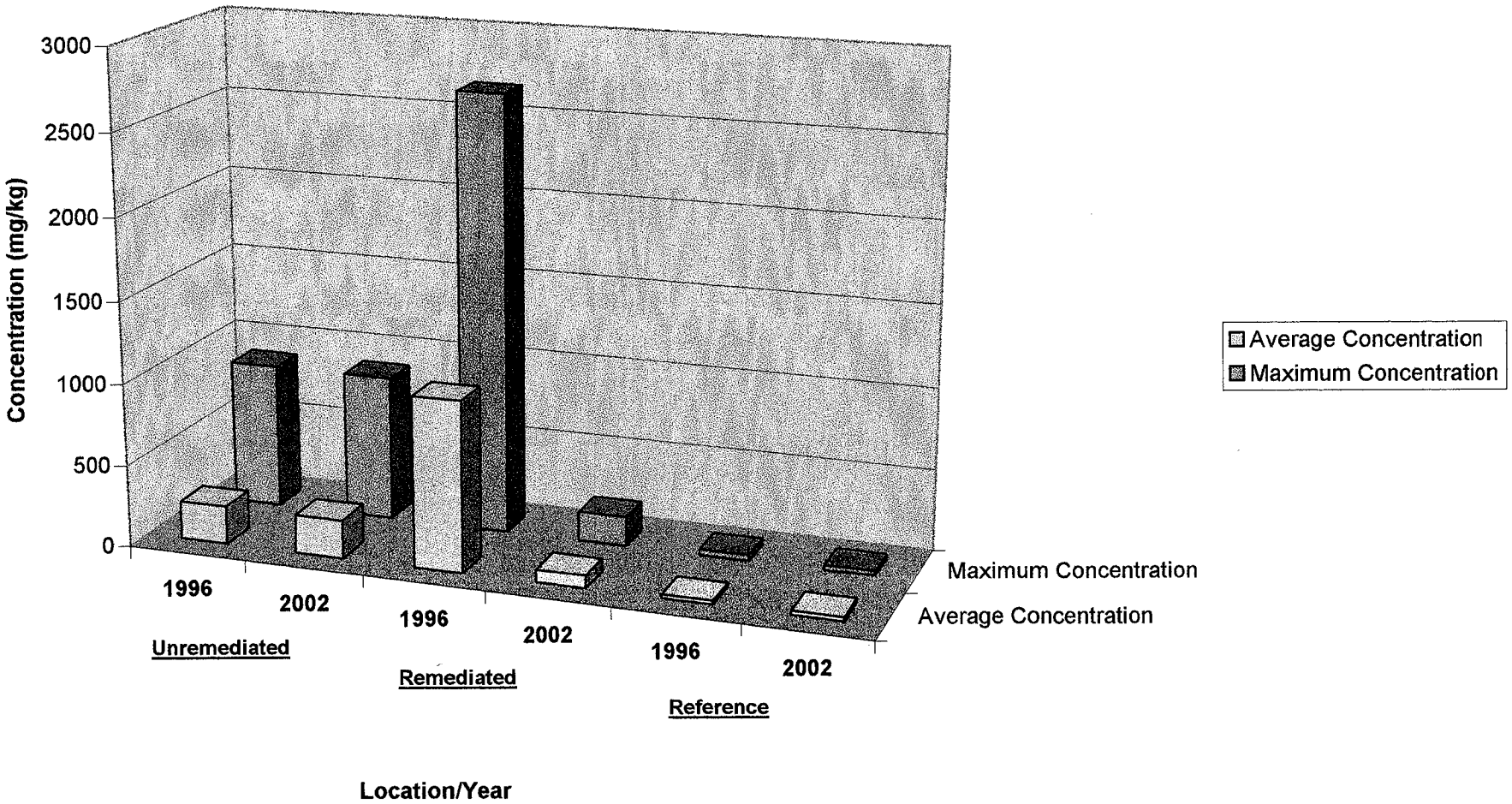


FIGURE 5
Trend Analysis - Lead In Sediment
North Lawrence Oil Dump Site
North Lawrence, NY



TABLES

TABLE 1

SUMMARY OF SMALL MAMMALS COLLECTED IN 1996 AT THE NLODS AND REFERENCE WETLANDS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SITE	TRANSECT	TRAP #	SPECIES	WEIGHT (g)	DATE	TIME
NLODS	1	4	STS	17	11/5/96	755
NLODS	1	9	WFM	15	11/5/96	804
NLODS	1	10	WFM	12	11/5/96	812
NLODS	2	3	WFM	12	11/5/96	825
NLODS	3	6	MV	13	11/5/96	834
NLODS	5	5	WFM	19	11/5/96	851
NLODS	5	1	STS	20	11/5/96	858
NLODS	5	1	STS	20	11/5/96	1134
NLODS	1	2	MS	1	11/6/96	718
NLODS	1	9	WFM	12	11/6/96	731
NLODS	1	10	WFM	20	11/6/96	735
NLODS	2	3	WFM	16	11/6/96	746
NLODS	2	2	WFM	14	11/6/96	752
NLODS	3	1	WFM	13	11/6/96	759
NLODS	3	6	MV	11	11/6/96	805
NLODS	5	1	STS	18	11/6/96	823
NLODS	5	1	STS	17	11/6/96	1515
NLODS	1	4	STS	25.5	11/7/96	705
NLODS	1	9	WFM	24	11/7/96	715
NLODS	4	2	STS	23	11/7/96	730
NLODS	1	4	MV	20	11/8/96	800
NLODS	1	6	MS	4.5	11/8/96	800
NLODS	1	9	WFM	19	11/8/96	800
NLODS	2	8	WFM	17.5	11/8/96	800
NLODS	3	8	WFM	25	11/8/96	800
NLODS	3	4	WFM	20.5	11/8/96	800
NLODS	4	6	MV	26	11/8/96	800
NLODS	5	1	MV	34.5	11/8/96	800
REF	2	7	WFM	15.5	11/7/96	820
REF	3	10	MS	4.5	11/7/96	835
REF	3	5	WFM	15	11/7/96	840
REF	5	8	MS	5	11/7/96	845
REF	1	8	WFM	17	11/7/96	850
REF	2	?	STS	22	11/8/96	1000
REF	1	1	WFM	20	11/8/96	1000
REF	1	2	WFM	21	11/8/96	1000

NOTES:
WFM = white-footed mouse (Peromyscus leucopus)
STS = short-tailed shrew (Blarina brevicauda)
MS = masked shrew (Sorex cinereus)
MV = meadow vole (Microtus pennsylvanicus)

SAMPLES 96 MAMMALS

TABLE 1A

SUMMARY OF SMALL MAMMALS COLLECTED IN 2002 AT THE NLODS WETLAND

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SITE	TRANSECT	TRAP #	SPECIES	WEIGHT (g)	DATE	TIME	
UNREM	3	8	MS	3.5	11/6/2002	7:45	
UNREM	4	8	WFM	17	11/6/2002	8:55	
UNREM	4	9	STS	15	11/6/2002	9:01	
UNREM	5	8	MS	4	11/6/2002	9:45	
UNREM	1	1	STS	21	11/7/2002	7:54	
UNREM	1	4	STS	20	11/7/2002	8:07	
UNREM	2	10	STS	28	11/7/2002	8:22	
UNREM	2	8	WFM	21	11/7/2002	8:29	
UNREM	5	2	MS	3.5	11/7/2002	10:23	
UNREM	5	3	STS	19	11/7/2002	15:15	
UNREM	1	4	WFM	11[a]	11/8/2002	8:05	
UNREM	2	9	WFM	20	11/8/2002	8:20	
UNREM	3	7	MS	3	11/8/2002	8:25	
UNREM	4	2	WFM	14.5	11/8/2002	8:45	[b]
UNREM	4	2	WFM	22.5	11/8/2002	8:45	[c]
UNREM	4	5	WFM	16	11/8/2002	8:50	
UNREM	4	6	MV	28	11/8/2002	8:50	
UNREM	4	8	MS	3.5	11/8/2002	8:52	
REM	7	3	STS	18.5	11/5/2002	8:45	
REM	8	7	MS	4	11/6/2002	11:00	
REM	9	9	MV	28	11/6/2002	14:40	
REM	10	7	MV	30	11/7/2002	8:05	
REM	6	1	MV	23	11/7/2002	8:15	
REM	6	8	MV	21	11/7/2002	15:11	
REM	8	6	MV	31	11/8/2002	9:20	

NOTES:

[a] = mouse was half-eaten prior to collection - femurs still intact.

[b] = one of 2 traps at this trap location

[c] = one of 2 traps at this trap location

UNREM = Unremediated wetland

REM = Remediated wetland

WFM = white-footed mouse (Peromyscus leucopus)

STS = short-tailed shrew (Blarina brevicauda)

MS = masked shrew (Sorex cinereus)

MV = meadow vole (Microtus pennsylvanicus)

TABLE 2

SUMMARY OF WORMS, PLANTS, AND FROGS
COLLECTED IN 1996 AT THE NLODS AND REFERENCE WETLANDS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SITE	TRANSECT	ORGANISM	WEIGHT (g)	DATE	TIME
NLODS	T1-W	WORM	46	11/5/96	1500
NLODS	T2-W	WORM	50+	11/5/96	1530
NLODS	T5-W	WORM	50+	11/6/96	1510
NLODS	T5(N)-W	WORM	50+	11/6/96	1542
NLODS	T1(N)-W	WORM	50+	11/6/96	1630
REF	R1-W	WORM	NA	11/7/1996	930
REF	R2-W	WORM	NA	11/7/1996	1000
REF	R3-W	WORM	NA	11/7/1996	1220
REF	R4-W	WORM	NA	11/7/1996	1630
REF	R5-W	WORM	NA	11/7/1996	1700
NLODS	T1-P	PLANT	NA	11/6/96	1415
NLODS	T2-P	PLANT	NA	11/6/96	1430
NLODS	T3-P	PLANT	NA	11/6/96	1440
NLODS	T4-P	PLANT	NA	11/6/96	1450
NLODS	T5-P	PLANT	NA	11/6/96	1500
REF	R1-P	PLANT	NA	11/7/1996	1100
REF	R2-P	PLANT	NA	11/7/1996	945
REF	R3-P	PLANT	NA	11/7/1996	955
REF	R4-P	PLANT	NA	11/7/1996	1025
REF	R5-P	PLANT	NA	11/7/1996	1020
NLODS	T2-F	FROG	> 50	11/6/1996	1700
REF	R5-F	FROG	NA	11/7/1996	1020

TABLE 2A

SUMMARY OF WORMS AND PLANTS COLLECTED IN 2002 AT THE NLODS WETLAND

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLE#	SITE	TRANSECT	TRAP #	SPECIES	WEIGHT (g)	AMPLE DA	TIME
Plants							
BIO-711	UNREM	T1-P	---	PLANT	---	11/7/2002	9:05
BIO-712	UNREM	T2-P	---	PLANT	---	11/7/2002	9:20
BIO-713	UNREM	T3-P	---	PLANT	---	11/7/2002	9:35
BIO-714	UNREM	T4-P	---	PLANT	---	11/7/2002	9:45
BIO-715	UNREM	T5-P	---	PLANT	---	11/7/2002	10:00
BIO-716	REM	T6-P	---	PLANT	---	11/7/2002	14:00
BIO-717	REM	T7-P	---	PLANT	---	11/7/2002	14:10
BIO-718	REM	T8-P	---	PLANT	---	11/7/2002	14:15
BIO-719	REM	T9-P	---	PLANT	---	11/7/2002	14:25
BIO-720	REM	T10-P	---	PLANT	---	11/7/2002	14:40
Earthworms							
BIO-721	UNREM	T1-W	---	WORM		11/8/2002	12:00
BIO-722	UNREM	T2-W	---	WORM		11/7/2002	14:45
BIO-723	UNREM	T5-W	---	WORM		11/7/2002	16:30
BIO-724	REM	T6-W	---	WORM		11/8/2002	10:00
BIO-725	REM	T8-W	---	WORM		11/6/2002	17:00
BIO-726	REM	T10-W	---	WORM		11/6/2002	15:00

NOTES:
UNREM = Unremediated wetland
REM = Remediated wetland

TABLE 3

SAMPLE NUMBERS AND COMPOSITING OF BIOLOGICAL SAMPLES
COLLECTED IN 1996 AT THE NLODS AND REFERENCE WETLANDS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLE #	SITE	TRANSECT	TRAP #	DATE	TIME	SPECIES	WEIGHT (g)	SHIPPED
Small Mammals								
BIO-601	**included the following organisms:**							
	NLODS	1	9	11/5/96	804	WFM	15	11/6/96
	NLODS	1	10	11/5/96	812	WFM	12	11/6/96
	NLODS	1	9	11/6/96	731	WFM	12	11/6/96
	NLODS	1	10	11/6/96	735	WFM	20	11/6/96
	NLODS	1	9	11/7/96	715	WFM	24	11/7/1996
	NLODS	1	9	11/8/96	800	WFM	19	11/8/1996
BIO-602	**included the following organisms:**							
	NLODS	2	3	11/5/96	825	WFM	12	11/6/96
	NLODS	2	3	11/6/96	746	WFM	16	11/6/96
	NLODS	2	2	11/6/96	752	WFM	14	11/6/96
	NLODS	2	8	11/8/96	800	WFM	17.5	11/8/1996
BIO-603	**included the following organisms:**							
	NLODS	1	4	11/5/96	755	STS	17	11/6/1996
	NLODS	1	4	11/7/96	700	STS	25.5	11/7/1996
BIO-604	**included the following organisms:**							
	NLODS	1	2	11/6/96	718	MS	1	11/6/1996
	NLODS	1	6	11/8/96	800	MS	4.5	11/8/1996
BIO-605	**included the following organisms:**							
	NLODS	5	1	11/5/96	858	STS	20	11/6/1996
	NLODS	5	1	11/5/96	1134	STS	20	11/6/1996
	NLODS	5	1	11/6/96	823	STS	18	11/6/1996
	NLODS	5	1	11/6/96	1515	STS	17	11/7/1996
BIO-606	**included the following organisms:**							
	REF	1	1	11/8/96	1000	WFM	20	11/8/1996
	REF	1	2	11/8/96	1000	WFM	21	11/8/1996
BIO-607	**included the following organisms:**							
	REF	1	8	11/7/96	850	WFM	17	11/7/1996
BIO-608	**included the following organisms:**							
	REF	3	10	11/7/96	835	MS	4.5	11/7/1996
	REF	5	8	11/7/96	845	MS	5	11/7/1996
BIO-609	**included the following organisms:**							
	REF	2	?	11/8/96	1000	STS	22	11/8/1996
BIO-610	**included the following organisms:**							
	REF	2	7	11/7/96	820	WFM	15.5	11/7/1996

SAMPLES 96 COMPOSITE

TABLE 3

SAMPLE NUMBERS AND COMPOSITING OF BIOLOGICAL SAMPLES
COLLECTED IN 1996 AT THE NLODS AND REFERENCE WETLANDS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLE #	SITE	TRANSECT	TRAP #	DATE	TIME	SPECIES	WEIGHT (g)	SHIPPED
	REF	3	5	11/7/96	840	WFM	15	11/7/1996
Earthworms								
BIO-611	NLODS	T1-W		11/5/96	1500	WORM	46	11/6/1996
BIO-612	NLODS	T2-W		11/5/96	1530	WORM	50+	11/6/1996
BIO-613	NLODS	T5-W		11/6/96	1510	WORM	50+	11/7/1996
BIO-614	NLODS	T5(N)-W		11/6/96	1542	WORM	50+	11/7/1996
BIO-615	NLODS	T1(N)-W		11/6/96	1630	WORM	50+	11/7/1996
BIO-616	REF	R1-W		11/7/96	930	WORM	---	11/7/1996
BIO-617	REF	R2-W		11/7/96	1000	WORM	---	11/7/1996
BIO-618	REF	R3-W		11/7/96	1220	WORM	---	11/7/1996
BIO-619	REF	R4-W		11/7/96	1630	WORM	---	11/8/1996
BIO-620	REF	R5-W		11/7/96	1700	WORM	---	11/8/1996
Plants								
BIO-621	NLODS	T1-P		11/6/96	1415	PLANT	---	11/7/1996
BIO-622	NLODS	T2-P		11/6/96	1430	PLANT	---	11/7/1996
BIO-623	NLODS	T3-P		11/6/96	1440	PLANT	---	11/7/1996
BIO-624	NLODS	T4-P		11/6/96	1450	PLANT	---	11/7/1996
BIO-625	REF	R1-P		11/7/96	1100	PLANT	---	11/7/1996
BIO-626	REF	R2-P		11/7/96	945	PLANT	---	11/7/1996
BIO-627	REF	R3-P		11/7/96	955	PLANT	---	11/7/1996
BIO-628	REF	R4-P		11/7/96	1025	PLANT	---	11/7/1996
Frogs								
BIO-629	NLODS	T2-F		11/6/96	1700	FROG	> 50	11/7/1996
BIO-630	REF	R5-F		11/7/96	1020	FROG	---	11/7/1996

NLODS = North Lawrence Oil Dump Site
REF = Reference Wetland
Species abbreviations:
WFM = white-footed mouse (Peromyscus leucopus)
STS = short-tailed shrew (Blarina brevicauda)
MS = masked shrew (Sorex cinereus)
MV = meadow vole (Microtus pennsylvanicus)

TABLE 3A
SAMPLE NUMBERS AND COMPOSITING OF BIOLOGICAL SAMPLES COLLECTED IN 2002 AT THE NLODS WETLAND
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLE#	SITE	TRANSECT	TRAP #	SPECIES	WEIGHT (g)	SAMPLE DATE	TIME
Small Mammals							
BIO-701	**included the following organisms:**						
	UNREM	1	1	STS	21	11/7/2002	7:54
	UNREM	1	4	STS	20	11/7/2002	8:07
	UNREM	2	10	STS	28	11/7/2002	8:22
BIO-702	**included the following organisms:**						
	UNREM	1	4	WFM	11[a]	11/8/2002	8:05
	UNREM	2	8	WFM	21	11/7/2002	8:29
	UNREM	2	9	WFM	20	11/8/2002	8:20
BIO-703	**included the following organisms:**						
	UNREM	4	2	WFM	14.5	11/8/2002	8:45
	UNREM	4	2	WFM	22.5	11/8/2002	8:45
	UNREM	4	5	WFM	16	11/8/2002	8:50
	UNREM	4	8	WFM	17	11/6/2002	8:55
BIO-704	**included the following organisms:**						
	UNREM	4	6	MV	28	11/8/2002	8:50
BIO-705	**included the following organisms:**						
	UNREM	3	7	MS	3	11/8/2002	8:25
	UNREM	3	8	MS	3.5	11/6/2002	7:45
	UNREM	4	8	MS	3.5	11/8/2002	8:52
	UNREM	5	2	MS	3.5	11/7/2002	10:23
	UNREM	5	8	MS	4	11/6/2002	9:45
BIO-706	**included the following organisms:**						
	UNREM	4	9	STS	15	11/6/2002	9:01
	UNREM	5	3	STS	19	11/7/2002	15:15
BIO-707	**included the following organisms:**						
	REM	8	7	MS	4	11/6/2002	11:00
BIO-708	**included the following organisms:**						
	REM	6	1	MV	23	11/7/2002	8:15
	REM	6	8	MV	21	11/7/2002	15:11
BIO-709	**included the following organisms:**						
	REM	8	6	MV	31	11/8/2002	9:20
	REM	9	9	MV	28	11/6/2002	14:40
	REM	10	7	MV	30	11/7/2002	8:05
BIO-710	**included the following organisms:**						
	REM	7	3	STS	18.5	11/5/2002	8:45

NOTES:
[a] = mouse was half-eaten prior to collection - femurs still intact.
UNREM = Unremediated wetland
REM = Remediated wetland
WFM = white-footed mouse (Peromyscus leucopus)
STS = short-tailed shrew (Blarina brevicauda)
MS = masked shrew (Sorex cinereus)
MV = meadow vole (Microtus pennsylvanicus)

TABLE 3A
SAMPLE NUMBERS AND COMPOSITING OF BIOLOGICAL SAMPLES COLLECTED IN 2002 AT THE NLODS WETLAND
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLE#	SITE	TRANSECT	TRAP #	SPECIES	WEIGHT (g)	SAMPLE DATE	TIME
Plants							
BIO-711	UNREM	T1-P	---	PLANT	---	11/7/2002	9:05
BIO-712	UNREM	T2-P	---	PLANT	---	11/7/2002	9:20
BIO-713	UNREM	T3-P	---	PLANT	---	11/7/2002	9:35
BIO-714	UNREM	T4-P	---	PLANT	---	11/7/2002	9:45
BIO-715	UNREM	T5-P	---	PLANT	---	11/7/2002	10:00
BIO-716	REM	T6-P	---	PLANT	---	11/7/2002	14:00
BIO-717	REM	T7-P	---	PLANT	---	11/7/2002	14:10
BIO-718	REM	T8-P	---	PLANT	---	11/7/2002	14:15
BIO-719	REM	T9-P	---	PLANT	---	11/7/2002	14:25
BIO-720	REM	T10-P	---	PLANT	---	11/7/2002	14:40
Earthworms							
BIO-721	UNREM	T1-W	---	WORM		11/8/2002	12:00
BIO-722	UNREM	T2-W	---	WORM		11/7/2002	14:45
BIO-723	UNREM	T5-W	---	WORM		11/7/2002	16:30
BIO-724	REM	T6-W	---	WORM		11/8/2002	10:00
BIO-725	REM	T8-W	---	WORM		11/6/2002	17:00
BIO-726	REM	T10-W	---	WORM		11/6/2002	15:00

NOTES:
UNREM = Unremediated wetland
REM = Remediated wetland

TABLE 4

SMALL MAMMAL TISSUE ANALYSIS RESULTS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLES COLLECTED NOVEMBER 1996

Media	Sample ID	% Lipid	Aroclor-1254 ug/kg wet wt.	Aroclor-1260 ug/kg wet wt.	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.[b]	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt.
UNREMEDIATED WETLAND									
WFM	BIO601	5.50	< 50	< 50	< 50	1.3	0.649	< 50	4
WFM	BIO602	3.68	< 50	< 50	< 50	1.7	0.742	< 50	7
STS	BIO603	4.42	< 52	91	91	3.4	0.561	207	8
MS	BIO604	8.70	< 450	< 450	< 450	4.9	0.35	< 450	8
STS	BIO605	5.46	< 50	250	250	11.5	0.531	533	25
				Average [c]	123	4.56		203	10
				Maximum	250	11.5		533	25
REFERENCE LOCATIONS									
WFM	BIO606	5.21	< 73	< 73	< 73	0.59	0.61	< 73	2
WFM	BIO607	8.31	< 250	< 250	< 250	1.3	0.508	< 250	3
MS	BIO608	6.96	< 430	< 430	< 430	1.9	0.546	< 430	4
STS	BIO609	5.88	< 130	< 130	< 130	5.5	0.543	< 130	12
WFM	BIO610	7.44	120	< 83	120	0.75	0.55	267	2
				Average [c]	112	2.0		142	4
				Maximum	120	5.5		267	12

[a] The following PCBs were analyzed for and not detected in the small mammals: Aroclor-1016, -1221, -1232, -1242, -1248. Sample Quantitation Levels (SQLs) ranged from 50 to 450 ppb.
[b] Lead analysis was conducted on femur bones only.
[c] Averages were calculated using half the detection limits for non-detects.
WFM = White-footed mouse
STS = Short-tailed shrew
MS = Masked shrew
MV = meadow vole

SAMPLES COLLECTED NOVEMBER 2002

Media	Sample ID	% Lipid	Aroclor-1260 µg/kg wet wt.	Total PCB µg/kg wet wt.[a]	Lead mg/kg wet wt.[b]	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt.
UNREMEDIATED WETLAND								
STS	BIO-701	2.92	< 83	< 83	1.9	0.733	< 83	7.1
WFM	BIO-702	3.60	< 50	< 50	0.7	0.757	< 50	2.9
WFM	BIO-703	4.00	< 50	< 50	0.32	0.792	< 50	1.5
MV	BIO-704	6.04	< 50	< 50	< 0.73	0.782	< 50	NA
MS	BIO-705	5.12	< 120	< 120	1.4	0.574	< 120	3.3
STS	BIO-706	2.09	< 50	< 50	0.84	0.799	< 50	4.2
			Average [c]	ND	1.032		34	3.8
			Maximum	ND	1.9		NA	7.1
REMEDIATED WETLAND								
MS	BIO-707	7.02	< 550	< 550	< 5.3	0.433	< 550	< 5.3
MV	BIO-708	3.45	< 50	< 50	< 0.76	0.764	< 50	< 0.76
MV	BIO-709	2.82	< 50	< 50	0.92	0.807	< 50	4.8
STS	BIO-710	3.96	**110**	**110**	1.3	0.667	330.3	3.9
			Average [c]	96	1.313		110	4.3
			Maximum	110	1.3		533	4.8

[a] The following PCBs were analyzed for and not detected in the small mammals: Aroclor-1016, -1221, -1232, -1242, -1248, -1254. Sample Quantitation Levels (SQLs) ranged from 50 to 550 ppb.
[b] Lead analysis was conducted on femur bones only.
[c] Averages were calculated using half the detection limits for non-detects.
WFM = White-footed mouse
STS = Short-tailed shrew
MS = Masked shrew
MV = meadow vole

TABLE 5

EARTHWORM TISSUE ANALYSIS RESULTS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLES COLLECTED NOVEMBER 1996

Media	Sample ID	% Lipid	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt
UNREMEDIATED WETLAND							
EW	BIO611	1.22	< 50	2.4	0.861	< 50	17
EW	BIO612	1.26	< 50	2.3	0.866	< 50	17
EW	BIO613	1.66	< 50	0.99	0.841	< 50	6
EW	BIO614	1.38	< 50	0.98	0.852	< 50	7
EW	BIO615	1.49	< 130	1.7	0.897	< 130	17
		Average	ND	1.7		ND	13
		Maximum	ND	2.4		ND	17
REFERENCE LOCATIONS							
EW	BIO616	1.23	< 99	0.35	0.872	< 99	2.7
EW	BIO617	1.33	< 67	0.6	0.857	< 67	4.2
EW	BIO618	1.08	< 50	0.52	0.859	< 50	3.7
EW	BIO619	1.34	< 50	1.2	0.854	< 50	8.2
EW	BIO620	1.61	< 100	0.37	0.848	< 100	2.4
		Average	ND	0.61		ND	4.3
		Maximum	ND	1.2		ND	8.2

[a] The following PCBs were analyzed for and not detected:
Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and 1260. Sample Quantitation Levels (SQLs) ranged from 50 to 130 ppb.
EW = Earthworms
ND = Not Detected

SAMPLES COLLECTED NOVEMBER 2002

Media	Sample ID	% Lipid	Aroclor-1260 ug/kg wet wt.	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt
UNREMEDIATED WETLAND								
EW	BIO-721	NA[1]	NA[1]	NA[1]	2.6	NA[1]	NA[1]	NC
EW	BIO-722	1.47	< 50	< 50	5.1	0.811	< 50	27
EW	BIO-723	1.72	< 56	< 56	1.7	0.766	< 56	7
			Average	ND	3.1		NC	17
			Maximum	ND	5.1		NC	38
REMEDIATED WETLAND								
EW	BIO-724	2.24	89	89	21	0.763	376	88.6
EW	BIO-725	1.90	< 82	< 67	4.6	0.792	< 67	22.1
EW	BIO-726	1.74	69	69	17	0.826	397	97.7
			Average	64	14		269	69.5
			Maximum	89	21		397	97.7

[a] The following PCBs were analyzed for and not detected:
Aroclor-1016, -1221, -1232, -1242, -1248 and -1254. Sample Quantitation Levels (SQLs) ranged from 50 to 82 ppb.
EW = Earthworms
NA[1] = not analyzed due to insufficient sample mass.
NC = not calculated
ND = Not Detected

TABLE 6

PLANT TISSUE ANALYSIS RESULTS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

SAMPLES COLLECTED NOVEMBER 1996

Media	Sample ID	% Lipid	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt.
UNREMEDIATED WETLAND							
PL	BIO621	0.45	< 50	1	0.822	< 50	6
PL	BIO622	0.54	< 50	0.25	0.754	< 50	1
PL	BIO623	0.56	< 50	0.56	0.789	< 50	3
PL	BIO624	1.24	< 50	1.8	0.575	< 50	4
		Average	ND	0.9		ND	3.4
		Maximum	ND	1.8		ND	6.0
REFERENCE LOCATIONS							
PL	BIO625	1.10	< 50	0.17	0.492	< 50	0.33
PL	BIO626	1.00	< 50	0.33	0.568	< 50	0.76
PL	BIO627	0.94	< 50	0.35	0.455	< 50	0.64
PL	BIO628	0.74	< 50	0.25	0.529	< 50	0.53
		Average	ND	0.28		ND	0.57
		Maximum	ND	0.35		ND	0.76

[a] The following PCBs were analyzed for and not detected:
Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260. Sample Quantitation Level (SQL) was 50 ppb for all samples.
PL = Plants
ND = Not Detected

SAMPLES COLLECTED NOVEMBER 2002

Media	Sample ID	% Lipid	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt.
UNREMEDIATED WETLAND							
PL	BIO-711	0.54	< 50	< 1	0.704	< 50	< 1
PL	BIO-712	0.72	< 50	< 0.99	0.653	< 50	< 0.99
PL	BIO-713	0.50	< 50	< 1	0.777	< 50	< 1
PL	BIO-714	0.70	< 50	< 1	0.618	< 50	< 1
PL	BIO-715	0.79	< 50	< 1	0.629	< 50	< 1
		Average	ND	ND		ND	ND
		Maximum	ND	ND		ND	ND
REMEDIATED WETLAND							
PL	BIO-716	0.47	< 50	< 1	0.64	< 50	< 1
PL	BIO-717	0.30	< 50	< .94	0.65	< 50	< .94
PL	BIO-718	0.65	< 50	< .95	0.52	< 50	< .95
PL	BIO-719	0.61	< 50	< .98	0.59	< 50	< .98
PL	BIO-720	0.45	< 50	< .92	0.69	< 50	< .92
		Average	ND	ND		ND	ND
		Maximum	ND	ND		ND	ND

[a] The following PCBs were analyzed for and not detected:
Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260. Sample Quantitation Level (SQL) was 50 ppb for all samples.
PL = Plants
ND = Not Detected

TABLE 7

FROG TISSUE ANALYSIS RESULTS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

Media	Sample ID	% Lipid	Total PCB ug/kg wet wt.[a]	Lead mg/kg wet wt.	% Moisture	Total PCB ug/kg dry wt.	Lead mg/kg dry wt.
Site Location							
FR	BIO629	1.46	< 50	0.07	0.808	< 50	0.36
Reference Location							
FR	BIO630	2.13	< 130	0.28	0.741	< 130	1.08

[a] The following PCBs were analyzed for and not detected Aroclor-1016, -1221, -1232, -1242, -1248, -1254, and -1260. Sample Quantitation Levels (SQLs) ranged from 50 to 130 ppb.
FR = Frog

TABLE 8

SEDIMENT ANALYTICAL RESULTS

NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

Date/Area	Sample Location	PCBs (ug/kg)	Lead (mg/kg)
1996/Unremediated	501	210 U	16.4
	502	480	318
	503	510	888
	504	1300	708
	507	530 U	131
	508	370	203
	509	3800	282
	513	93 U	1.7
	514	130 U	17
	516	120 U	3
	517	110 U	5.4
	Average [a]	642	234
	Maximum	3800	888
2002/Remediated	601	49 U	34.9
	602	56 U	22.7
	603 [c]	510	179.5
	Average [a]	187.5	79.0
	Maximum	510	179.5
1996/Reference [b]	Average [b]	ND	24.4
	Maximum [b]	ND	37.1
2002/Reference	REF1	ND	30.8
	REF2	ND	22.7
	REF3	ND	23.5
	Average	ND	25.7
	Maximum	ND	30.8

[a] Average calculated using half the SQL for non-detects.
[b] Source: Table 4-5, Contamination Pathways Characterization Summary Report (RI/FS)(Blasland, Bouck & Lee, 1995).
[c] Average of sample and duplicate.

TABLE 9A

Estimated Risk: Calculated with 1996 Pre-Remediation Tissue Data
Unremediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

I. Site-Specific Concentration

		PCBs mg/kg	Lead mg/kg
Sediment [a]	Max.	3.8	888
	Avg.	0.642	234
Small Mammals [b]	Max.	0.25	11.5[c]
	Avg.	0.123	4.5[c]
Earthworms [b]	Max.	ND	2.4
	Avg.	ND	1.7
Plants [b]	Max.	ND	1.8
	Avg.	ND	0.9
Amphibians [b]	Max.	ND	0.07
	Avg.	ND	0.07

II. Exposure Assumtions [c]

Receptors:	Percent Prey in Diet: Inverts	Plants	Small Mammals	Herpeto-fauna	Soil	Site Foraging Frequency	Ingestion Rate (kg/day)	Body Weight (kg)
Shrew	85%	10%	0%	0%	5%	1	0.037	0.021
Woodcock	85%	10%	0%	0%	5%	0.03	0.22	0.22
Snake	85%	0%	5%	5%	5%	0.3	0.023	0.27

III. Risk Calculations

Receptors:		Total Body Dose		RTVs [d]		Hazard Quotient	
		PCBs	Lead	PCBs	Lead	PCBs	Lead
Shrew	Acute	3.35E-01	8.21E+01	100	60	3.35E-03	1.37E+00
	Chronic	5.66E-02	2.33E+01	6.4	2.5	8.84E-03	9.33E+00
Woodcock	Acute	5.70E-03	1.40E+00	9.1	75	6.26E-04	1.86E-02
	Chronic	9.63E-04	3.97E-01	5	6.25	1.93E-04	6.35E-02
Snake	Acute	5.18E-03	1.20E+00	100	60	4.86E-05	1.98E-02
	Chronic	9.78E-04	3.42E-01	6.4	2.5	1.53E-04	1.37E-01

RISKCALC site96

TABLE 9A

Estimated Risk: Calculated with 1996 Pre-Remediation Tissue Data
Unremediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

NOTES:

[a] Average and maximum sediment concentrations were calculated from all sample locations that would remain after excavation (Table 8).

[b] Site specific PCB and lead tissue concentrations (wet weight).

[c] Lead was analyzed for in the femur bones of small mammals only.

[d] RTVs for PCBs are presented in the Draft Final Baseline Ecological and Public Health Risk Assessment (E.C.Jordan, 1992). Lead RTVs were selected from the following sources:

60= LOAEL, based on mortality in guinea pigs (Sax,1984)
2.5= LOAEL, based on increased fetal resorption;decreased fetal body weight (McClain and Becker, 1972).
75= LOAEL, based on mortality in rock doves (Kendall and Scanlon, 1985).
6.25= LOAEL, based on kidney pathology; learning deficiencies (Anders et al., 1982 and Dietz et al., 1979).

ND = Not Detected

RTV = Reference Toxicity Value

TABLE 9B

Estimated Risk: Calculated with 2002 Post Remediation Tissue Data,
Unremediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

I. Site-Specific Concentration

		PCBs mg/kg	Lead mg/kg
Sediment [a]	Max.	3.8	888
	Avg.	0.642	234
Small Mammals [b]	Max.	ND	1.9
	Avg.	ND	1
Earthworms [b]	Max.	ND	5.1
	Avg.	ND	3.1
Plants [b]	Max.	ND	ND
	Avg.	ND	ND

II. Exposure Assumtions [c]

Receptors:	Percent Prey in Diet					Site Foraging Frequency	Ingestion Rate (kg/day)	Body Weight (kg)
	Inverts	Plants	Small Mammals	Herpeto-fauna	Soil			
Shrew	85%	10%	0%	0%	5%	1	0.037	0.021
Woodcock	85%	10%	0%	0%	5%	0.03	0.22	0.22
Snake	85%	0%	10%	0%	5%	0.3	0.023	0.27

III. Risk Calculations

Receptors:		Total Body Dose		RTVs [d]		Hazard Quotient	
		PCBs	Lead	PCBs	Lead	PCBs	Lead
Shrew	Acute	3.35E-01	8.59E+01	100	60	3.35E-03	1.43E+00
	Chronic	5.66E-02	2.53E+01	6.4	2.5	8.84E-03	1.01E+01
Woodcock	Acute	5.70E-03	1.46E+00	9.1	75	6.26E-04	1.95E-02
	Chronic	9.63E-04	4.30E-01	5	6.25	1.93E-04	6.88E-02
Snake	Acute	4.86E-03	1.25E+00	100	60	4.86E-05	2.08E-02
	Chronic	8.20E-04	3.69E-01	6.4	2.5	1.28E-04	1.48E-01

TABLE 9B

Estimated Risk: Calculated with 2002 Post Remediation Tissue Data, Unremediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

NOTES:
[a] Average and maximum sediment concentrations were calculated from all sample locations that would remain after excavation. Source: Table 8, Sediment Toxicity Characterization Reprot (ABB-ES, 1995).
[b] Site specific PCB and lead tissue concentrations (wet weight).
[c] Lead was analyzed for in the femur bones of small mammals only.
[d] RTVs for PCBs are presented in the Draft Final Baseline Ecological and Public Health Risk Assessment (E.C.Jordan, 1992). Lead RTVs were selected from the following sources:

60= LOAEL, based on mortality in guinea pigs (Sax,1994)
2.5= LOAEL, based on increased fetal resorption;decreased fetal body weight (McClain and Becker, 1972).
75= LOAEL, based on mortality in rock doves (Kendall and Scanlon, 1985).
6.25= LOAEL, based on kindney pathology; learning deficiencies (Anders et al., 1982) and Dietz et al., 1979).

NA = Not Analysed
NC = Not Calculated
RTV = Reference Toxicity Value

TABLE 9C

Estimated Risk: Calculated with 2002 Post-Remediation Tissue Data
Remediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

I. Site-Specific Concentration

		PCBs mg/kg	Lead mg/kg
Sediment [a]	Max.	0.51	180
	Avg.	0.188	79
Small Mammals [b]	Max.	0.11	1.3
	Avg.	0.096	1.3
Earthworms [b]	Max.	0.089	14
	Avg.	0.064	21
Plants [b]	Max.	ND	ND
	Avg.	ND	ND

II. Exposure Assumtions [c]

Receptors:	Percent Prey in Diet					Site Foraging Frequency	Ingestion Rate (kg/day)	Body Wieght (kg)
	Inverts	Plants	Small Mammals	Herpeto-fauna	Soil			
Shrew	85%	10%	0%	0%	5%	1	0.037	0.021
Woodcock	85%	10%	0%	0%	5%	0.03	0.22	0.22
Snake	85%	0%	10%	0%	5%	0.3	0.023	0.27

III. Risk Calculations

Receptors:		Total Body Dose		RTVs [d]		Hazard Quotient	
		PCBs	Lead	PCBs	Lead	PCBs	Lead
Shrew	Acute	1.78E-01	3.68E+01	100	60	1.78E-03	6.14E-01
	Chronic	1.12E-01	3.84E+01	6.4	2.5	1.76E-02	1.54E+01
Woodcock	Acute	3.03E-03	6.27E-01	9.1	75	3.33E-04	8.36E-03
	Chronic	1.91E-03	6.54E-01	5	6.25	3.83E-04	1.05E-01
Snake	Acute	2.87E-03	5.37E-01	100	60	2.87E-05	8.96E-03
	Chronic	1.88E-03	5.60E-01	6.4	2.5	2.93E-04	2.24E-01

TABLE 9C

Estimated Risk: Calculated with 2002 Post-Remediation Tissue Data
Remediated Wetland

North Lawrence Oil Dump Site
North Lawrence, New York

NOTES:
[a] Average and maximum sediment concentrations were calculated from 3 sediment samples from 2002.
[b] Site specific PCB and lead tissue concentrations (wet weight).
[c] Lead was analyzed for in the femur bones of small mammals only.
[d] RTVs for PCBs are presented in the Draft Final Baseline Ecological and Public Health Risk Assessment (E.C.Jordan, 1992). Lead RTVs were selected from the following sources:

60= LOAEL, based on mortality in guinea pigs (Sax,1994)
2.5= LOAEL, based on increased fetal resorption;decreased fetal body weight (McClain and Becker, 1972).
75= LOAEL, based on mortality in rock doves (Kendall and Scanlon, 1985).
6.25= LOAEL, based on kindney pathology; learning deficiencies (Anders et al., 1982) and Dietz et al., 1979).

NA = Not Analysed
NC = Not Calculated
RTV = Reference Toxicity Value

TABLE 10A

Estimated Risk: Calculated with 1996 Reference Location Tissue Data

North Lawrence Oil Dump Site
North Lawrence, New York

I. Site-Specific Concentration

		PCBs mg/kg	Lead mg/kg
Sediment [a]	Max.	ND	37.1
	Avg.	ND	24.4
Small Mammals [b]	Max.	0.12	5.5
	Avg.	0.11	2
Earthworms [b]	Max.	ND	1.2
	Avg.	ND	0.61
Plants [b]	Max.	ND	0.35
	Avg.	ND	0.3
Amphibians [b]	Max.	ND	0.28
	Avg.	ND	0.28

II. Exposure Assumtions

Receptors:	Percent Prey in Diet					Site Foragin(Frequency	Ingestion Rate (kg/day)	Body Weight (kg)
	Inverts	Plants	Small Mammals	Herpeto-fauna	Soil			
Shrew	85%	10%	0%	0%	5%	1	0.037	0.021
Woodcock	85%	10%	0%	0%	5%	0.03	0.22	0.22
Snake	85%	0%	5%	5%	5%	0.3	0.023	0.27

III. Risk Calculations

Receptors:		Total Body Dose		RTVs [c]		Hazard Quotient	
		PCBs	Lead	PCBs	Lead	PCBs	Lead
Shrew	Acute	NC	5.13E+00	100	60	NC	8.55E-02
	Chronic	NC	3.11E+00	6.4	2.5	NC	1.24E+00
Woodcock	Acute	NC	8.73E-02	9.1	75	NC	1.16E-03
	Chronic	NC	5.30E-02	5	6.25	NC	8.48E-03
Snake	Acute	1.53E-04	8.09E-02	100	60	1.53E-06	1.35E-03
	Chronic	1.41E-04	4.73E-02	6.4	2.5	2.20E-05	1.89E-02

RISKCALC ref-96

TABLE 10A

Estimated Risk: Calculated with 1996 Reference Location Tissue Data

North Lawrence Oil Dump Site
North Lawrence, New York

NOTES:

[a] Source: Table 4-5, Contamination Pathways Characterization Summary Report Contamination Pathways (RI/FS)(Blasland, Bouck & Lee, 1995).

[b] Reference location PCB and lead tissue concentrations (wet weight).

[c] RTVs for PCBs are presented in the Draft Final Baseline Ecological and Public Health Risk Assessment (E.C.Jordan, 1992). Lead RTVs were selected from the following sources:

60= LOAEL, based on mortality in guinea pigs (Sax,1994)
2.5= LOAEL, based on increased fetal resorption;decreased fetal body weight (McClain and Becker, 1972).
75= LOAEL, based on mortality in rock doves (Kendall and Scanlon, 1985).
6.25= LOAEL, based on kindney pathology; learning deficiencies (Anders et al., 1982) and Dietz et al., 1979).

ND = Not Detected

NC = Not Calculated; PCBs were not detected in sediment or prey items for these receptors.

RTV = Reference Toxicity Value

TABLE 10B

Estimated Risk: Calculated with 2002 Reference Location Sediment Data (and 1996 Tissue Data)

North Lawrence Oil Dump Site
North Lawrence, New York

I. Site-Specific Concentration

		PCBs mg/kg	Lead mg/kg
Sediment [a]	Max.	ND	30.8
	Avg.	ND	25.7
Small Mammals [b]	Max.	0.12	5.5
	Avg.	0.11	2
Earthworms [b]	Max.	ND	1.2
	Avg.	ND	0.61
Plants [b]	Max.	ND	0.35
	Avg.	ND	0.3
Amphibians [b]	Max.	ND	0.28
	Avg.	ND	0.28

II. Exposure Assumtions

Receptors:	Percent Prey in Diet					Site Foragin Frequency	Ingestion Rate (kg/day)	Body Weight (kg)
	Inverts	Plants	Small Mammals	Herpeto-fauna	Soil			
Shrew	85%	10%	0%	0%	5%	1	0.037	0.021
Woodcock	85%	10%	0%	0%	5%	0.03	0.22	0.22
Snake	85%	0%	5%	5%	5%	0.3	0.023	0.27

III. Risk Calculations

Receptors:		Total Body Dose		RTVs [c]		Hazard Quotient	
		PCBs	Lead	PCBs	Lead	PCBs	Lead
Shrew	Acute	NC	4.57E+00	100	60	NC	7.62E-02
	Chronic	NC	3.23E+00	6.4	2.5	NC	1.29E+00
Woodcock	Acute	NC	7.79E-02	9.1	75	NC	1.04E-03
	Chronic	NC	5.49E-02	5	6.25	NC	8.79E-03
Snake	Acute	1.53E-04	7.28E-02	100	60	1.53E-06	1.21E-03
	Chronic	1.41E-04	4.90E-02	6.4	2.5	2.20E-05	1.96E-02

TABLE 10B

Estimated Risk: Calculated with 2002 Reference Location Sediment Data (and 1996 Tissue Data)

North Lawrence Oil Dump Site
North Lawrence, New York

NOTES:
[a] Average and maximum sediment concentrations from 3 reference area sediment samples collected in 2002 (Table 8)
[b] Reference location PCB and lead tissue concentrations (wet weight) from 1996.
[c] RTVs for PCBs are presented in the Draft Final Baseline Ecological and Public Health Risk Assessment (E.C.Jordan, 1992). Lead RTVs were selected from the following sources:

60= LOAEL, based on mortality in guinea pigs (Sax,1994)
2.5= LOAEL, based on increased fetal resorption;decreased fetal body weight (McClain and Becker, 1972).
75= LOAEL, based on mortality in rock doves (Kendall and Scanlon, 1985).
6.25= LOAEL, based on kindney pathology; learning deficiencies (Anders et al., 1982) and Dietz et al., 1979).

NA = Not Analysed
NC = Not Calculated
RTV = Reference Toxicity Value

TABLE 11

Summary of Sediment and Tissue Data - Unremediated, Remediated, and Reference Wetlands, in 1996 and 2002

North Lawrence Oil Dump Site
North Lawrence, New York

PCB concentrations (mg/kg)												
	UNREMEDIATED				REMEDIATED				REFERENCE			
	1996		2002		1996		2002		1996		2002	
MEDIA/ORGANISM	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max
sediment	0.642	3.8	--	--	--	--	0.188	0.510	--	--	ND	ND
plant	ND	ND	ND	ND	--	--	ND	ND	ND	ND	--	--
worm	ND	ND	ND	ND	--	--	0.06	0.09	ND	ND	--	--
frog	ND	ND	--	--	--	--	--	--	ND	ND	--	--
smmammal (femurs only)	0.123	0.25	ND	ND	--	--	0.1	0.11	0.112	0.12	--	--

Lead concentrations (mg/kg)												
	UNREMEDIATED				REMEDIATED				REFERENCE			
	1996		2002		1996		2002		1996		2002	
MEDIA/ORGANISM	avg	max	avg	max	avg	max	avg	max	avg	max	avg	max
sediment	234	888	-- --	--	--	--	79	180	24.4	37.1	25.7	30.8
plant	0.9	1.8	ND	ND	--	--	ND	ND	0.28	0.35	--	--
worm	1.7	2.4	3.1	5.1	--	--	14	21	0.61	1.2	--	--
frog	0.07	0.07	-- --	--	--	--	--	--	0.28	0.28	--	--
smmammal (femurs only)	4.56	11.5	1	1.9	--	--	1.3	1.3	2.0	5.5	--	--

APPENDIX A

Field Notes

Projects (continued)

11/4 [1240] pm A. FOGG + C. LYMAN
ARRIVE, OVERCAST, GUSTY/WINDY 45-50°F
MET UP W/ JOHN NADEAU, SIGNED IN
CONTRACTOR'S LOG BOOK
UNPACKED + DRIVE TO SITE

[1345] COUNTED OUT TRAPS, GOT
BEARINGS ON SITE. S PART IS REPORTEDLY
PRETTY WET, SO MAY HAVE TO INCREASE DENSITY
OF TRAPS

[1545] FINISHED SETTING SNAP TRAPS
5 TRANSECTS T1 → T5
10 TRAPS PER TRANSECT

TRANSECT 1 Starts in close approximation (South of)
SD samp location SD-214
2 starts in close approximation (South of)
SD SAMP LOCATION SD 246
3 STARTS AT/NEAR
SD-509/419
4 STARTS AT/NEAR
SD-412
5 SD 409 + west along
wetland boundary

[1550] A FOGG + C. LYMAN LEAVING SITE
BACK TO FIELD TRAILER TO TRACK
DOWN DRY ICE SUPPLIER

②

MIKE COX - DEC CONSTRUCTION

At IEM trailer
389-5086

DEPOT ROAD + IEM are sister companies
Wallace Coles - Asst PM, H+S

AFF
11-4-96

③

11/5/96

[0715] A. Figg + C. Lyman @ field trailer to prep. Off to check traps @ NLODS. Cool + lt. rain (~45°F)

[0755] @ T1 #4 shrew short-tailed
wt: 30g (-13g tare)
Body: 90mm
Tail: 22mm
Hfoot: 14mm
Sex:

[0804] @ T1-9, Wht ft. Mouse/Deermouse
wt. 28g (-13g t)
Body: 80 mm
Tail: 80
Hfoot: 20
Sex Male.

[0812] @ T1-10 Wht ft Mouse/Deermouse
wt: 25g (-13g t)
Body: 73mm
Tail: 78mm
Hfoot: 15mm
Sex: Male

④ 11/4/96 NLODS

0825 @ T2-3, wht foot.
wt: 25g (-13gt)
Body: 85 mm
Tail: 78 mm
H foot: 20 mm
Sex: Male

0834 @ T3-6, (Vole) woodland
wt: 26g (-13gt)
Body: 80 mm
Tail: 28 mm
Hfoot: 17 mm
Sex: female

0851 @ T5-5 (wht foot mouse)
wt: 32g (-13gT)
Body: 90 mm.
Tail: 90 mm
Hfoot: 20 mm
Sex: female

0958 @ T5-1 (Shrew)
wt 33g (-13gt)
Body: 95 mm.
Tail: 25 mm
Hfoot: 15 mm
Sex: female

11/4/96 ⑤
NLODS

0900
- Afogg / Clymon Mob back to field trailer after running trap line.
@DJ: Photocopy maps, Get ice.

0920
- Afogg / Clymon mobilize to get ice (for 2nd rounds) & find and set traps @ Ref. Site

1030
~~Afogg~~ @ Site trailer, to locate Ref site calling PM to determine LOND owners @ GROUND Ref site & directions on how to get to the Ref. Location.

1035 C. LYMAN to site to ~~Stake~~ MARK Beginning and end of Biological Sampling transects.
Lables on flagged stake include Transect # and "begining" and "END". (Biological sampling transects.

6

11/5/96
NLODS

[1134] C. LYMAN finished marking Biological Sample Transects
Collected Short tail Shrew @ TS-1 ⇒ 2ND Shrew collected today 11/5
Wt: 33g (-13+)
Body: 85 mm
Tail: 25 mm
H. foot: 15 mm
sex: female.

[1140] C. LYMAN MOBILIZE BACK TO TRAILER to meet A. Fogg.

[1200] A. Fogg & C. Lyman Mobilize to the CROSSROADS to get Lunch & p/u flagging tape!

[1300] A. Fogg & C. Lyman Return to site trailer & p/u Shovels for Earthworm Sampling. NYSDEC (Rich ~~Sxxxx~~ Koeppicus) has arrived on site. A. Fogg & Rich Proceed on site walk over, discussing Ref location for this field effort. C. LYMAN proceeds to transect #1 to do

11/5/96
NLODS

7

(CONT) Earthworms.

[1410] A. FOGG and Rich K. Walked transects (primarily outer boundaries). Then took off in Rich's car to look at old NLODS ref. location on McAuslan Rd. Walked in & along NE side - narrow band of forested wetland type habitat - could run a couple of long transects there. Walked back out & then in along the S. side of the wetland. Also could sample here. Rich worried about lead contam. from site.

[1500] Andrea & Rich back to Field trailer to look at lead data. Decreases as it goes to McAuslan Rd but still there. Spoke w/ Glenn D & he said if Rich felt we needed to use the York reference site, we should.

[1530] Andrea & Rich off to search for the site & talk to neighbors re: property owner of the site. Drove around & found access off a bridge (Rte 11) which was not posted. ? nearby house ~~was~~ - no one was home. Walked back in - very wet & hummocky. At the back was a woody area - shrubs & saplings mostly. Diff. from our wetland (NLODS) but should

be able to get some small mammals then

1630 Andrea + Rick back to field trailer to see how Chuck is doing. Found out that Fed Ex "drop off" is @ Plattsburgh Airport — 75 miles away. Decided to keep samples on ice overnight. A. Fogg + C. Lyman offsite @ 1700

Andrea L. Fogg
11-5-96

0700 A. Fogg + C. Lyman onsite. Cool + mostly cloudy mid to upper 40°s. Calm.

0712 A Fogg + C Lyman proceed to transects to check traps.

0718 @ T1-2 (~~Least Shrew~~? CM) - tail Bicolor - Dark tip - light underside
- MASKED SHREW (IMMA.)
wt: 13g (-12g t)
Body: 47mm
tail: 35mm
Hfoot: 10mm
Sex: Male

0731 @ T1-9 (Wht foot)
wt: 24 (-12g t)
Body: 80mm
tail: 75mm
Hfoot: 20mm
Sex: Male

0735 @ T1-10 (Wht foot) deer?
wt: 32g (-12g t)
Body: 85mm
tail: 92mm
Hfoot: 18mm
Sex: Male

11/6/96
NLODS

0746 @ T2-3 (Wht-foot)
Wt: 28g (-12g)
body: 80mm
Tail: 80mm
Hfoot: 16mm
Sex: Male

0752 @ T2-2 (Whtft
Wt: 26g (-12gt)
body: 70mm
tail: 75mm
Hfoot: 19mm
Sex: ~~M~~ female

0759 @ T3-1 Whtfoot
wt: 25 (-12g)
Body: 75mm
tail: 72mm
Hfoot: 18mm
Sex: female

0805 @ T3-6 (Vole
Wt: 23g (-12g)
Body: 67mm
tail: 27mm
HFOOT: 13mm
Sex: Male

11/6/96
NLODS

0823 @ T5-1 (Shrew)
Wt: 30g (-12g)
Body: 98mm
Tail: 20mm
H foot: 15mm
Sex: female

0850 have bagged + labeled all samples bagged up the ice + got bubble wrap.

Wt of earthworm samples:
T# ~~1~~-W 11/5/96 46g
T# ~~2~~-W 11/5/96 50g

1000 finished chain of custody
faxed to HES
Sealed up fed Ex cooler

1020 At Reference Location

1205 Finished flagging 5 transects
R1 → R5. 10 traps each
Started w/ R1 @ loc. I flagged
when Rich K. was here yesterday
The next couple of ~~traps~~ places where we

NWODS 11/6/96

Would have put transect in area far too wet / wet meadow

1240 Hogg & CLYMAN Break for LUNCH.

1330 Hogg & Clyman Back on site, to collect EW's & plants.

1415
Transect 1 @ Trap #5 Collected Carex sp. from ponded area.

1430
Transect 2 @ Trap #6 collected ~~Carex~~ sp

1440
Transect 3 @ Trap #4 collected Carex sp. C. Lyman said he was having trouble finding worms

1450
Transect 4 @ Trap #3 collected Carex sp.

1500
Transect 5 @ Trap #4 collected Carex sp.

1510 Transect 5 Worm (T5-W) (50+ g) is N ✓ of Transect 5 in a slightly more upland area - many worms. Could not find worms anywhere around Transect 3 - too wet prob. b/c found worms @ Transect 1 + 2 - closer to source of contam. and upgradient

1515 A. Hogg to collect specimen just ✓ caught in T5 #1 another B. brevicauda
Short-tailed shrew

wt 30 g (-13 T)
body 95 mm
tail 20 mm
h.foot 15 mm
sex male

1542 T5 (NW) 50+ g (further NW from T5-W taken above)

1630
T (NORTH) W 33 g

1645 Have seen many frogs in the water collected adjacent to cleared

area. C. Lyman off w/ headlamp and bag to catch - if successful, we will substitute 1 frog for 1 worm sample + composite 2 of the worm samples that were collected - will need to OK w/ Rich (?) 1st; consider + see if we can get one at the 8 (?) area.

1700 C. Lyman got frogs
A. Fogg + C. Lyman demob + offsite
Called Matt Marks @ HES + spoke w/ him re: compositing - asked him to [illegible] or worm samples as well as mammals

Andrea L Fogg
11/6/96

11/7/96

0700 A. Fogg + C. Lyman on site

0705
T1 #4 short tailed shrew
wt 37.5 g (+T)
body 90 mm
tail 21 mm
h. foot 19 mm
sex F

T1 #9 WFM
wt 30 g (+T)
body 87 mm
tail 91 mm
h foot 21 mm
sex M

T3 #5 missing

T4 #2 short-tailed shrew
wt 35 g (+T)
body 83 mm
tail 23 mm
h foot 15 mm
sex M

Several traps missing - blowing leaves, etc may have obscured them, or they may have been dragged off

0750

bag wt = 13g

820 R2 #7 Wfm still alive
wt 27.5g(FT) hf 19
body 82mm sex F
tail 72mm

835 R3 #10 shrew bicolor tail black tip
wt. 16.5g(FT) hfoot 10mm
body 52mm sex Caitrea
tail 39mm

840 R3 #5 wfooted mouse
wt 27g(FT) h. foot 20mm
body 78mm sex M
tail 73mm

845 R5 #8 ~~wt~~ shrew
wt 17 hf = 11mm
body 55mm sex = M
tail 35mm

850 R1 #8
Wf mouse

wt 29g(FT) h. foot 19mm
body 76mm sex M
tail 32mm but not ff

925 A. Fogg + C. Lyman put out a dozen more traps - ½ around R1 #8
~ around R2
back to vehicle to get stakes, shovel, baggies for plants + worms, + more traps
+ put out C. Lyman digging worms
A. Fogg putting in stakes, collecting ~~plant~~ plant samples, + putting out more traps

945 A. Fogg collected R2 plant sample nr. R2-10. State @ R2-1

955 A Fogg collected R3 plant sample nr R3-1. State @ R3-1

1020 A Fogg collected ~~#10~~ leopard frog @ R5-1. State @ R5-1

12

Collected plant sample @ R4 + R5

1025 Stake at R4-1

Collected plant sample @ R1

Went to help Chuck w/ getting worm samples

Collected 3 worm samples

1230 went to lunch

1320 back at trailer to pack up stuff.

Fed Ex won't come today, so John will freight to Plattsburg sample cooler

NOTES for cooler

- 10 plant samples
  - T3 11/6/96 1440
  - T4 11/6/96 1450
  - T5 11/6/96 1500
  - T2 11/6/96 1430
  - T1 11/6/96 1415
  - R1 11/7/96
  - R2
  - R3
  - R4
  - R5 ↓

13

Samples (cont'd)

11/6 T5-1, T1-4, T1-9, T4-2, R3-10, R5-8, R1-8, R3-2, R2-7 } sm. mamm.

worms { R2 W, R3 W, T5(N) W, T5 W, T1 N W

1500 Called Chet re: where gloves are.

~~Gloves~~ (AF)

395-1069-306 TRACKING #

will be delivered by 4:30 pm

1530 finished packing sample cooler for John to take to drop off this pm.

215 McKinslen Rd

~~Nor~~ N. Lawrence, NY 12967

pick-up #4

1600 Back to Ref. site to collect last 2 worm samples from R2 Transect R1.

~~164~~ 1700 Last 2 worm samples collected

A. Fogg + Cheyenne offsite 11/7/96

(20)

0700

11/8/96 N. Fogg + C. Lyman onsite
Heavy rain. Collected samples + traps
labeled baggies + processing back in
0800 field trailer.

T1-4 meadow vole
wt. 32g (+T) h. foot 15mm
body 83 mm sex ?
tail 36 mm

T1-6 masked shrew
wt. 16.5 g (+T)
body 55 mm
tail 38 mm
h. foot 10 mm
sex M

T1-9 wh-footed mouse
wt. 31g
body 73 mm
tail 78 mm
h. foot 19 mm
sex F

T2-8 wh footed mouse
wt 29.5 g (+T) tail 76 mm sex M
body 76 mm h. foot 20 mm

(21)

T3-8 white footed mouse
wt 37 g (+T)
body 89 mm
tail 79 mm
h. foot 19 mm
sex F

T3-4 white footed mouse (w/fleas)
wt 32.5 g
body 78 mm
tail 63 mm
h. foot 20 mm
sex F

T4-6 ~~meadow~~ woodland (NF) vole
wt 38 g +T
body 97 mm
tail 32 mm
h. foot 18 mm
sex M

T5-1 woodland vole
wt 46.5 g (+T) h. foot 20 mm
body 103 mm sex M
tail 35 mm

(22)

0805 call WW Video - not open (g?)
off to reference area
0905 done w/ ref-area. Removed
traps - will catalog spp -
when we get back to trailer
after we sort from motel
1000 Back to field trailer. C. Lyman
packing up. A. Figy cataloging
last couple of spp.

R2 - short tailed shrew
wt 34 g (+T)
body 85 mm
tail 25 mm
h.foot 15 mm
sex F

R1-1
R1 - white footed mouse
Wt. 32 g (+T)
body 85 mm
tail 65 mm
h.foot 18 mm
sex F

(23)

R1-2 White footed mouse
wt. 33 g (+T)
body 80 mm
tail 76 mm
h.foot 20 mm
sex ?

1045 filling out chain of custody
will fax to Matt Meabo
packing coolers
+ demob.

1100 faxed COC + called Matt
Marks re: Sat. delivery.
A Figy + C. Lyman offsite

Andrea J. Figy
1/8/06

11/4/02 North Lawrence Dump Site 56955-2

0500 leaving Portland, Maine Andrew Fogg Tige Cunningham

1200 arrived at site N. Lawrence NY.

1210 initial site drive through to establish sample area

1230 lunch

1310 arrived back @ site, unlocked gate w/ key. light rain, temp 50° F, light wind

1320 locating sample positions on maps to set morse traps.

Transect Names S = start E = end
NLODS-1 through 5 - woods, same as sampled previously
NLODS-6 through 10 - in remed. wetland
Total 50 traps - 10 per transect

1330 Walked woods looking for old stakes. Found some & worked from there. Found 80517, 50-9, 50513.

1400 Did line from 50-9 to 50-513 - Start transect of NLODS-2 from that. Staked locations about 20 ft. apart. Grade stakes at start & end & flagging orange pin flags at trap locations. Heavy flagging as needed for visibility

NLODS

measured ~ 80 ft NE of NLODS-2 & started NLODS-1. It looked well-assisted w/ old location.

1505 Set traps at transect NLODS-1 on way back out.

1530 TC back to Transect NLODS-2 to set traps there
AF scoped out transect 6 in remediated wetland.
met Mr. St. Hillaire - new property owner asked for a gate key (we said no). Wanted to know how long we'd be there, etc. b/c he & his family were hunting.

1645 remediated wetland is very wet. picked a few higher spots & used clustered traps using headlamps.
AF scoped out transect 7. TC. finished baiting Transect 6.

5:30pm - AF/TC opposite

Andrew J. Fogg 11/4/02

11/5/02 NLODS

715 arrive onsite AFogg / T Cunningham
cloudy ~35°F no wind
Objectives by noon
→ check existing traps
→ finish laying out transects
~~after noon~~
– dig for worms
~~collect plants~~
8:00 Mike Cox DEC Construction
arrives onsite. Told him re:
J. St. Hillaire
845 M. Cox offsite. AF called Glenn D.
T.C off to check traps @ 1+2
A.F checked @ 6+7. Caught 1
STS @ ______. All other traps
at all other transects empty
T1-8 missing
T1-2, 4, missing bait
T2-9 missing
9:00 AF/TC set Transect 3
9:30 Set Transect 4. Found flags of
previous transects. Verified w/
a couple of Sed locs that were
still tagged w/ metal tag
1000 set Transect 5. Found prev.
flags & set accordingly
1105 AF to set Transects 8, 9 + 10
TC – move Transect 6, then help bait

NLODS

~~put~~ Transects in remediated wetland
are not linear. Generally clustered
on dry land, near upgrad. edge

1220 AF/TC offsite to lunch & ice/PB
1330 AF/TC to Ref Loc. to get sed.
1400 Back to MOTEL to GET GPS
RAN INTO MIKE KOEPPICUS
AF → REF LOC
FOUND BRIDGE/TURNOFF
HIKED BACK IN – COULDN'T FIND ANY
STAKES/FLAGGING
DECIDED TO GRAB 3 SAMPLES
100 FT APART N 44.81245°
SD REF 1 W 074.56925°
2 N 44.81286
W 074.56973
3 N 44.81315
W 074.56936

SDREF 1 FINE DK BR BLK ORGANIC
1455 MUD FINE SILT
found remnant flagging!
SDREF 2 FINE DK BR ORGANIC
1505
SDREF 3 – 1533 dk br/blk shallow A horizon
15 gray ~~sandy~~ underneath
silty clay

11/6/02 NLOOS

1550 headed back to site
disconnect

1624 collected rinsate blank
AKD sampler blank
SD3 NLOOS11502

1635 ready to collect 3 sed
samples will call
them SD-601, 602, 603
(new series = 600)

1645 @ SD-601 @ far end of wetland
in very little standing water
N: 44.79965°
W: 074.64570°

1655 collected SD601, SD601DUP, MSD
med grayish brown coarse sandy
silt w/ sm. gravel + trace organics

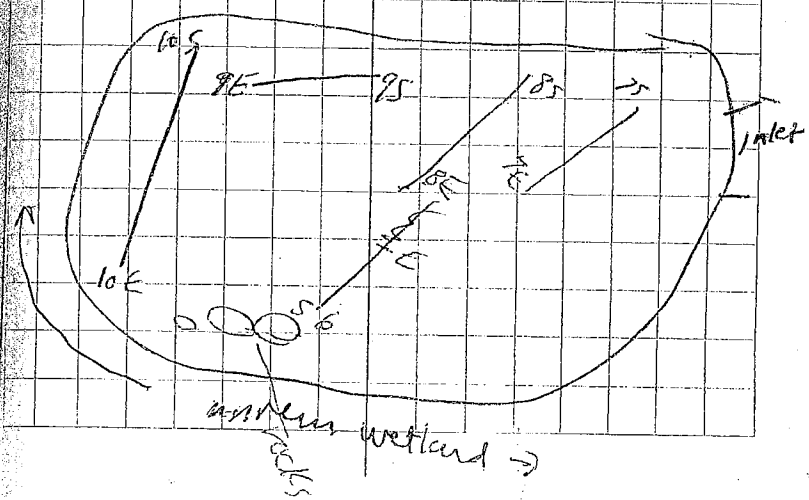
1710 collected SD602
med grayish brown coarse sandy
silt w/ sm. gravel - same as prev.
N 44.79983° in ~8" standing water
W 074.64544°

1730 collected SD603 / SD603Dup
desc - same as above in ~6" standing
N 44.80013 water
W 074.64515

1800 depart for the day - clearing / organizing van
Rich Koeppicus mentioned that he'd seen a
frog in the wetland so we will keep our eyes
open tomorrow

Notes on remediated wetland:

dom by cattails, species A
Alisma
Carex sp. (tussock?)
2' - >1 ft depth
1° @ 3-6"
deepest at eastern end near
former lagoon
some rebar in w/ end



MODS

11/6/02
700 arrive onsite
1-2" snow 32°F cloudy
scattered sleet/fr. rain/rain
started checking traps @ MODS-1

[730] R. Koeppicus showed up. went w/ us checking traps.
None @ Transects MODS-1 or -2
T3-8 masked shew
T4-8, wfm
T4-9 STS
T5-8 MS
T8-7 MS

[1000] R Koeppicus off-site
measurements to take on sm. mammals:
sp.
wt
hind foot (L)
body
tail
sex
will record in order collected

T7-3
11/5/02 sp STS
wt. ~~18.5g~~ 18.5 g
h.foot 14mm.
body 97 mm
tail 24 mm
sex female

11/6/02 T3-8 735 (AF)
sp MS.
wt 3.5g
h foot 10 mm
body 54 mm
tail 37 mm
sex female

11/6/02 0855 T4-8
sp. Wfm
wt 17. g
hfoot 20mm
body 84 mm
tail 82 mm
sex Male

NLODS

11/6/02 T5-8 (945)
sp MS
wt 4.0 g
hf 12 mm
body 47 mm
tail 38 mm
Sex unkn

11/6/02 T8-7 ~~$~~ (1100)
sp MS
wt 4.0 g
hf 11 mm
body 53 mm
tail 42 mm
sex Female

11/6/02 T4-9 (901)
sp STS
wt 15 g
hf 13 mm
body 86 mm
tail 19 mm
Sex male

11/6/02 T7-1 (AF)
sp ~~STS~~ MV
wt 28 g
hf 18 mm
body 70 mm
tail 32 mm
sex Male

1130 spoke w/ G. Daukas - gave him update
1200 helped TC finish bubblewrapping sed samples in prep for shipping tmorrow
1220 AF/TC off site for lunch
~~1300~~ 1320 AF/TC onsite
1400 TC COLLECTING ELWORMS
AF COLLECTING PLANTS FROM ~~UNRE~~ REMED WETLAND
~~1430~~ 1440 AF ~~COLLECTING PLANTS~~ FROM TC-9 SM MAMMAL ~~UNREMED WETLAND~~ (AF)
DECIDED TO PUT OUT MORE TRAPS
PUT OUT 25 MORE TRAPS IN UNREM. WETLAND (5 per transect) co-located w/ existing locations
PUT OUT 25 MORE TRAPS IN EDGE OF REMED. WETLAND.
1500-1700 TC COLLECTED 2 ELWORM SAMPLES FROM REMED. WETLAND
1700-1800 RINSED OFF ELWORMS, STRAIGHTENED UP VEHICLE, ETC.
1810 AF/TC OFF SITE

Andrea L. Figg
11/6/02

MLODS

11/7/02 AF/TC onsite 7:10 am
cold (20°) + clear, lt wind
objective for this am
— check traps
— get plants
— cooler ready to ship

[0800] M. Cox arrived onsite
Did rounds of remed. traps w/me.
A couple missing. Most those w/
frozen food - will re-bait later when
it warms up

[0835] T10-7 ~~STS~~ MV
frozen in traps so will thaw to
remove

[0845] T6-1 STS
also frozen in trap.

[0830] AF calls Cass - having trouble
w/ #s. Called GD + left msg.
AF to get plants

[0900] AF finished plants from remed
area.
TC got 3 sm. mammals

[1000] AF finished plants from unrem. area
TC on Transect 14

decon water frozen

Notes on Plants:

PL1-5 (905) had to range
along/around transect 1 to get
plants

Sm. mammal MVole

T10-7 ~~STS~~ (805 AM)
wt. 30 g
hf 19 mm
body ~100 mm head + neck bent so diff to gauge
tail 37 mm
sex female

T6-1 ~~STS~~ MV (815 am)
wt 23 g
hf 18
body 85
tail 25
sex male

[1050] TC back - finished ✓ traps +
GPSing transects all 10.
Caught 5 sm. mammals

[1100] AF to get + bag ice to ship samples

NLODS

[1145] cooler sealed COC copy in file
will leave @ front desk
lunch
[1300] back on site. Called for msgs.
Gave Glenn update
worm samples from
[130-245] T2-W
[3-430] T5-W
~~T1-W if possible~~
~~T6-W "~~
[1640] back to van to clean up worm samples
[1700] AF weighing/IDing smmammals
TG decon ~~[illegible]~~ (AF)

T1-1 (0754)
sp. STS
wt 20 g
hf 14 mm
body 101 mm
tail 21 mm
sex male

T1-4 (0807)
sp STS
wt 20 g
hf 14 mm
body 90 mm bent/hard to gauge
tail 26 mm
sex male

T2-10 (0822)
sp STS
wt 28 g
hf 14 mm
body 78 mm
tail 21 mm
sex female

T2-8 (0829)
sp. Wfm
wt 21 g
hf 21 mm
body 80 mm
tail 83 mm
sex male

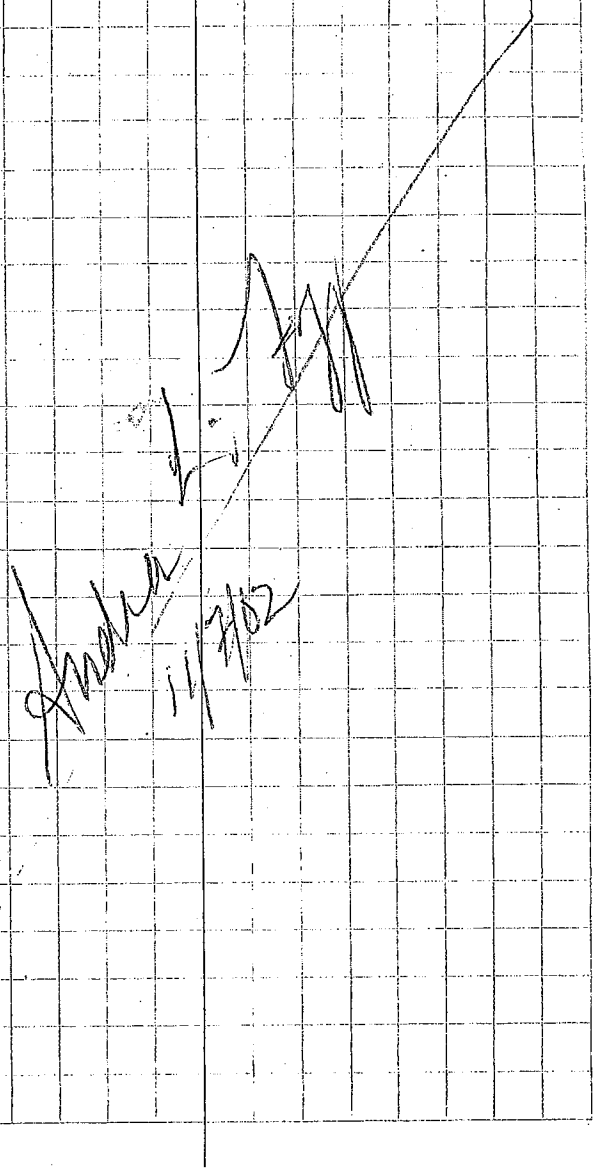
11/7/02 MOODS

TS-2 (1033)
sp m.s.
wt 12.5 g 3.5 g
hf 11 mm
body 61 mm
tail 39 mm
sex female

TS-8 (1511)
sp m
wt 21 g
hf 16 mm
body ~80 mm est - best/hand ts gauge
tail 70 mm
sex male

TS-3 (1515)
sp STS
wt 19 g
hf 15 mm
body 95 mm est - best/hand ts gauge
tail 70 mm
sex Female

11/8/01 BE/TC offsite



11/7/02

NOTES

11/8/02

[720] AF/TC onsite
called in hours for this week
objectives
- collect traps
- log spp.
- 2 more worm samples
1 remediated
1 unremediated
- site photos
- descr. habitat - bag species (representative) to ID
- prep biota coolers for shipping

[740] AF off to collect traps
TC ~~[illegible]~~ worm samples

[905] ½-1" snow in woods
AF got 8 sm. mammals from woods (T1-T5) 2nd
TC almost done w/ worm sample in remed. area

[945] AF got 1 sm. mammal from remed. wetland (T6-T10)
TC still working on worm sample - slow going this am.

sm. mammals caught today:

T1-4 (805)
sp WFM
wt 11g - half eaten. Hind legs still intact
hf 17mm
body 90mm estimate
tail 94mm
sex unk

T2-9 (820)
sp WFM
wt 20g
hf 19mm
body 85mm
tail 80mm
sex male

T3-7 (825)
sp MS
wt 3.0g
hf 11mm
body 50mm
tail 36mm
sex female

11/8/02 MOOS

T4-2a (2 traps at this loc - both full)
(845)
sp wfm
wt 14.5 g
hf 18 mm
body 50 mm
tail 74 mm
sex female

T4-2b
(845)
sp wfm
wt 22.5 g
hf 20 mm
body 82 mm hard to gauge - bent
tail 92 mm
sex male

T4-5 (850)
sp wfm
wt 16 g
hf 20 mm
body 85 mm hard to gauge - bent
tail 75 mm
sep male

T4-6 (850)
sp. MV
wt 28 g
hf 17 mm
body 103 mm
tail 34 mm
sex female

T4-8 852
sp MS
wt 3.5 g
hf 11 mm
body ~45 mm hard to gauge
tail 42 mm
sex unkn

T8-6 (920)
sp MV
wt 31 g
hf 20 ~~20~~ mm
body ~120 mm hard to gauge - bent
tail 33 mm
sex male

NLWDS

Airbills - 8372-3851-8699 [illegible]
- 8372-3851-8703 PU/EW

AF/TC completed 1 more eworm
sample @ Transect 1
back to van to pack samples

1500 AF/TC offsite

[illegible] 1/8/12

APPENDIX B

Sediment Sample Field Data Records

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: N. LAWRENCE OIL DUMP SITE
Project Number: 56955-2
Sample Location ID: SDREF-1

Site: REFERENCE LOCATION
Date: 11-5-02
Time: Start: 1445 End: 1455
Signature of Sampler: MF/JC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP

WATER DEPTH AT SAMPLE LOCATION _____ (ft)

DEPTH OF SAMPLE FROM TOP OF WATER _____ (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] NONE, GRAB INTO BOTTLE
[ ] BOMB SAMPLER
[ ] PUMP _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD _____

TEMPERATURE _____ Deg. C. SPEC. COND. _____ µmhos/cm pH _____ Units DISS. O_2 _____ ppm

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID: _____

SAMPLE LOCATION SKETCH:
[ ] YES
[ ] NO

METHOD USED:
[ ] WINKLER
[ ] PROBE

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0-0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[✓] SS BOWL

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR _____
[✓] COLOR dk brn/blk
[ ] _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[ ] SAND
[✓] ORGANIC muck/fine silt
[ ] GRAVEL

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID: _____

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	
[ ] PEST/PCB	[ ]	[✓]	[ ]	4 oz	[✓]	
xf [ ] INORGANICS	[ ]	[✓]	[ ]		[ ]	
[ ] TPH	[ ]	[ ]	[ ]		[ ]	
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	
[ ] LEAD	[ ]	[✓]	[ ]	2 oz	[✓]	

NOTES/SKETCH

N 44.81245°
W 074.56925°

Harding Lawson Associates

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: N. LAWRENCE OIL DUMP SITE
Project Number: 56955-2
Sample Location ID: SDREF-2

Site: REFERENCE LOCATION
Date: 11-5-02
Time: Start: 1505 End: 1515
Signature of Sampler: AJ/TC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP

WATER DEPTH AT SAMPLE LOCATION _____ (ft)

DEPTH OF SAMPLE FROM TOP OF WATER _____ (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] NONE, GRAB INTO BOTTLE
[ ] BOMB SAMPLER
[ ] PUMP _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD _____

TEMPERATURE _____ Deg. C. SPEC. COND. _____ µmhos/cm pH _____ Units DISS. O_2 _____ ppm

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLE LOCATION SKETCH:
[ ] YES
[ ] NO

METHOD USED:
[ ] WINKLER
[ ] PROBE

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0 - 0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[✓] SS BOWL

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR _____
[✓] COLOR dk brown
[ ] _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[ ] SAND
[✓] ORGANIC
[ ] GRAVEL

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	
[✓] PEST/PCB	[ ]	[✓]	[ ]	AG 4 oz	[✓]	
[ ] INORGANICS	[ ]	[ ]	[ ]		[ ]	
[ ] TPH	[ ]	[ ]	[ ]		[ ]	
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	
[✓] Lead	[ ]	[✓]	[ ]	8 oz	[✓]	

NOTES/SKETCH

N 44.81 286
W 074. 56973

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: N. LAWRENCE OIL DUMP SITE
Project Number: 56955-2
Sample Location ID: SD REF-3
Site: REFERENCE LOCATION
Date: 11-5-02
Time: Start: 1525 End: 1533
Signature of Sampler: AJ/TC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP

WATER DEPTH AT SAMPLE LOCATION _____ (ft)

DEPTH OF SAMPLE FROM TOP OF WATER _____ (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] NONE, GRAB INTO BOTTLE
[ ] BOMB SAMPLER
[ ] PUMP _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD _____

TEMPERATURE _____ Deg. C. SPEC. COND. _____ µmhos/cm pH _____ Units DISS. O_2 _____ ppm

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLE LOCATION SKETCH:
[ ] YES
[ ] NO

METHOD USED:
[ ] WINKLER
[ ] PROBE

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0-0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[✓] SS BOWL

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR
[✓] COLOR dk br/blk
[ ] _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[ ] SAND
[✓] ORGANIC
[ ] GRAVEL

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

Shallow A horizon
grey silty clay beneath

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	
[✓] PEST/PCB	[ ]	[✓]	[ ]	4 oz	[✓]	
[ ] INORGANICS	[ ]	[ ]	[ ]		[ ]	
[ ] TPH	[ ]	[ ]	[ ]		[ ]	
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	
[✓] Lead	[ ]	[✓]	[ ]	2 oz	[✓]	

NOTES/SKETCH

N 44.81315
W074.56936

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: N. Lawrence Oil Dump Site
Project Number: ~~599~~ 56955-2
Sample Location ID: SD-601
* also SD-601 MS + SD-601 MSD

Site: Remediated Wetland
Date: 11-5-02
Time: Start: 1640 End: 1655
Signature of Sampler: AJ/TC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP
Wetland

WATER DEPTH AT SAMPLE LOCATION < 0.5 (ft)

~~DEPTH OF SAMPLE FROM TOP OF WATER ______ (ft)~~

~~EQUIPMENT USED FOR COLLECTION:~~
~~[ ] NONE, GRAB INTO BOTTLE~~
~~[ ] BOMB SAMPLER~~
~~[ ] PUMP ______~~

~~DECONTAMINATION FLUIDS USED:~~
~~✓ ALL USED~~
~~[ ] ETHYL ALCOHOL~~
~~[ ] 25% METHANOL/ 75% ASTM TYPE II WATER~~
~~[ ] DEIONIZED WATER~~
~~[ ] LIQUINOX SOLUTION~~
~~[ ] HEXANE~~
~~[ ] HNO_3 SOLUTION~~
~~[ ] POTABLE WATER~~
~~[ ] NONE~~

~~VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD ______~~

~~TEMPERATURE ______ Deg. C SPEC. COND. ______ µmhos/cm pH ______ Units DISS. O_2 ______ ppm~~

~~[ ] FIELD DUPLICATE COLLECTED~~
~~DUPLICATE ID:~~

~~SAMPLE LOCATION SKETCH:~~
~~[ ] YES~~
~~[ ] NO~~

~~METHOD USED:~~
~~[ ] WINKLER~~
~~[ ] PROBE~~

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0-0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[✓] SS Bowl

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR
[ ] COLOR Med gr-brown
[ ]

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[✓] SAND
[✓] ORGANIC
[✓] GRAVEL
coarse sandy silt w/small gravel + trace organics

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID: ~~SD-601~~ (NC) ~~also 601 MS~~ (NC)
also SD-601 MS + SD-601 MSD

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	/ / /
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	/ / /
[ ] PEST/PCB	[ ]	[✓]	[ ]	~~8~~ 4 oz.	[✓]	/ / /
[ ] INORGANICS	[ ]	[ ]	[ ]		[ ]	/ / /
[ ] TPH	[ ]	[ ]	[ ]		[ ]	/ / /
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	/ / /
[✓] Lead	[ ]	[✓]	[ ]	2 oz.	[✓]	/ / /

NOTES/SKETCH

far end of remediated wetland

N. 44.79965

W 074.64570°

Harding Lawson Associates

9910003(e) L 21

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: N LAWRENCE AIRPORT SITE
Project Number: 56995-2
Sample Location ID: SD-602

Site: REMEDIATED WETLAND
Date: 11-5-02
Time: Start: 1700 End: 1740
Signature of Sampler: AF/TC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP

WATER DEPTH AT SAMPLE LOCATION 0.75 (ft) WETLAND

DEPTH OF SAMPLE FROM TOP OF WATER _____ (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] NONE, GRAB INTO BOTTLE
[ ] BOMB SAMPLER
[ ] PUMP _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD _____

TEMPERATURE _____ Deg. C. SPEC. COND. _____ µmhos/cm pH _____ Units DISS. O_2 _____ ppm

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLE LOCATION SKETCH:
[ ] YES
[ ] NO

METHOD USED:
[ ] WINKLER
[ ] PROBE

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0-0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[✓] SS BOWL

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR
[ ] COLOR med grayish/brown
[ ] _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[✓] SAND
[✓] ORGANIC
[✓] GRAVEL
Coarse Sandy Silt w/ sm. gravel & trace organic

[ ] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	
[✓] PEST/PCB	[ ]	[✓]	[ ]	4 oz	[✓]	
[ ] INORGANICS	[ ]	[ ]	[ ]		[ ]	
[ ] TPH	[ ]	[ ]	[ ]		[ ]	
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	
[✓] Lead	[ ]	[✓]	[ ]	2 oz	[✓]	

NOTES/SKETCH

middle of remediated wetland

N 44 79.83°
W 074. 64544°

SURFACE WATER AND SEDIMENT SAMPLE FIELD DATA RECORD

Project: NLAWRENCE AL DUMP SITE
Project Number: S6995-2
Sample Location ID: SD-603
Site: REMEDIATED WETLAND
Date: 11-5-02
Time: Start: 1720 End: 1730
Signature of Sampler: AJ/TC

SURFACE WATER INFORMATION

TYPE OF SURFACE WATER:
[ ] STREAM [ ] RIVER
[ ] POND/LAKE [ ] SEEP
WETLAND

WATER DEPTH AT SAMPLE LOCATION 0.5 (ft)

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

DEPTH OF SAMPLE FROM TOP OF WATER _____ (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] NONE, GRAB INTO BOTTLE
[ ] BOMB SAMPLER
[ ] PUMP _____

VELOCITY MEASUREMENTS OBTAINED? [ ] YES, SEE FLOW MEASUREMENT DATA RECORD _____

TEMPERATURE _____ Deg. C. SPEC. COND. _____ µmhos/cm pH _____ Units DISS. O_2 _____ ppm

[N] FIELD DUPLICATE COLLECTED
DUPLICATE ID:

SAMPLE LOCATION SKETCH:
[ ] YES
[ ] NO

METHOD USED:
[ ] WINKLER
[ ] PROBE

SEDIMENT INFORMATION

DEPTH OF SEDIMENT SAMPLE 0-0.5 (ft)

EQUIPMENT USED FOR COLLECTION:
[ ] GRAVITY CORER
[ ] S.S. SPLIT SPOON
[ ] DREDGE
[✓] HAND SPOON
[ ] ALUMINUM PANS
[ ] SS BUCKET
[ ] SS Bowl

TYPE OF SAMPLE COLLECTED:
[✓] DISCRETE
[ ] COMPOSITE

SAMPLE OBSERVATIONS:
[ ] ODOR
[ ] COLOR med grayish brown
[ ] _____

DECONTAMINATION FLUIDS USED:
✓ ALL USED
[ ] ETHYL ALCOHOL
[ ] 25% METHANOL/ 75% ASTM TYPE II WATER
[ ] DEIONIZED WATER
[ ] LIQUINOX SOLUTION
[ ] HEXANE
[ ] HNO_3 SOLUTION
[ ] POTABLE WATER
[ ] NONE

SEDIMENT TYPE:
[ ] CLAY
[✓] SAND
[✓] ORGANIC
[✓] GRAVEL

coarse sandy silt w/ sm. gravel trace organics

[✓] FIELD DUPLICATE COLLECTED
DUPLICATE ID: SD-603DUP

SAMPLES COLLECTED

✓ IF REQUIRED AT THIS LOCATION	MATRIX: SURFACE WATER	MATRIX: SEDIMENT	✓ IF PRESERVED WITH ACID-BASE	VOLUME REQUIRED	✓ IF SAMPLE COLLECTED	SAMPLE BOTTLE IDS
[ ] VOC	[ ]	[ ]	[ ]		[ ]	
[ ] SVOC	[ ]	[ ]	[ ]		[ ]	
[✓] PEST/PCB	[ ]	[✓]	[ ]	4 oz	[✓]	
[ ] INORGANICS	[ ]	[ ]	[ ]		[ ]	
[ ] TPH	[ ]	[ ]	[ ]		[ ]	
[ ] TCLP	[ ]	[ ]	[ ]		[ ]	
[✓] Lead	[ ]	[✓]	[ ]	2 oz	[✓]	

NOTES/SKETCH

near (east) end of remediated wetland

N 44.60013
W 074.64515

APPENDIX C

Analytical Results/Data

ANALYTICAL DATA SUMMARY
SEDIMENT SAMPLES FOR PCBs AND LEAD
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		Rinsate Blank	Remediated Wetland				Reference Location		
	Sample ID:	SB-NLODS11502	SD-601	SD-602	SD-603	SD-603 DUP	SDREF1	SDREF2	SDREF3
	Sample Date:	11/5/02	11/5/02	11/5/02	11/5/02	11/5/02	11/5/02	11/5/02	11/5/02
	Matrix:	Aqueous (µg/L)	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment	Sediment
Method	Parameter								
SW6010-S	Lead		34.9	22.7	166	193	30.8	22.7	23.5
SW6010-W	Lead	1.4 U							
SW8082	Aroclor 1016	1 U	49 U	56 U	77 U	79 U	200 U	100 U	110 U
SW8082	Aroclor 1221	2 U	100 U	110 U	160 U	160 U	410 U	210 U	220 U
SW8082	Aroclor 1232	1 U	49 U	56 U	77 U	79 U	200 U	100 U	110 U
SW8082	Aroclor 1242	1 U	49 U	56 U	77 U	79 U	200 U	100 U	110 U
SW8082	Aroclor 1248	1 U	49 U	56 U	77 U	79 U	200 U	100 U	110 U
SW8082	Aroclor 1254	1 U	49 U	56 U	340	180	200 U	100 U	110 U
SW8082	Aroclor 1260	1 U	49 U	56 U	330 J	170	200 U	100 U	110 U
D2216	Percent Moisture		32.9	40.8	57.1	58.4	83.6	67.6	69.9

Notes:
Units: PCBs µg/kg
Lead mg/kg
U = not detected at reported quantitation limit.
J = result is estimated

ANALYTICAL DATA SUMMARY
SMALL MAMMAL FEMUR LEAD ANALYSIS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

SMALL MAMMAL FEMUR CONCENTRATIONS - UNREMEDIATED WETLAND						
Sample ID:	**BIO-701 FEMURS**	**BIO-702 FEMURS**	**BIO-703 FEMURS**	**BIO-704 FEMURS**	**BIO-705 FEMURS**	**BIO-706 FEMURS**
Sample Date:	11/6/02	11/6/02	11/6/02	11/6/02	11/6/02	11/6/02
Lab ID:	830886-011	830886-012	830886-013	830886-014	830886-015	830886-016
Method						
SW6010B Lead	1.9 J	0.7 J	0.32 J	0.73 U	1.4 J	0.84 J

Notes:
Units = mg/kg
U = not detected at reported quantitation limit
J = result is estimated

ANALYTICAL DATA SUMMARY
SMALL MAMMAL FEMUR LEAD ANALYSIS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

SMALL MAMMAL FEMUR CONCENTRATIONS - REMEDIATED WETLAND				
Sample ID:	**BIO-707 FEMURS**	**BIO-708 FEMURS**	**BIO-709 FEMURS**	**BIO-710 FEMURS**
Sample Date:	11/6/02	11/6/02	11/6/02	11/6/02
Lab ID:	830886-017	830886-018	830886-019	830886-020
Method				
SW6010B Lead	5.3 U	0.76 U	0.92 J	1.3 J

Notes:
Units = mg/kg
U = not detected at reported quantitation limit
J = result is estimated

ANALYTICAL DATA SUMMARY
SMALL MAMMAL
PCB ANALYSIS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		UNREMEDIATED WETLAND					
	Sample ID:	**BIO-701 WHOLE**	**BIO-702 WHOLE**	**BIO-703 WHOLE**	**BIO-704 WHOLE**	**BIO-705 WHOLE**	**BIO-706 WHOLE**
	Sample Date:	11/6/02	11/6/02	11/6/02	11/6/02	11/6/02	11/6/02
	Lab ID:	830886-001	830886-002	830886-003	830886-004	830886-005	830886-006
Method	Parameter						
EnChem*	Lipid (%)	2.92	3.6	4	6.04	5.12	2.09
SW8082	Aroclor 1016	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1221	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1232	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1242	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1248	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1254	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Aroclor 1260	83 U	50 U	50 U	50 U	120 U	50 U
SW8082	Total PCBs	83 U	50 U	50 U	50 U	120 U	50 U
	Percent Moisture	73.3	75.7	79.2	78.2	57.4	79.9

Notes:
Units = µg/kg wet weight
U = not detected at reported quantitation limit
J = result is estimated
* = Percent Lipid value determined by an ENCHEM laboratory method.

ANALYTICAL DATA SUMMARY
SMALL MAMMAL
PCB ANALYSIS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		REMEDIATED WETLAND			
	Sample ID:	BIO-707 WHOLE	BIO-708 WHOLE	BIO-709 WHOLE	BIO-710 WHOLE
	Sample Date:	11/6/02	11/6/02	11/6/02	11/6/02
	Lab ID:	830886-007	830886-008	830886-009	830886-010
Method	Parameter				
EnChem*	Lipid (%)	7.02	3.45	2.82	3.96
SW8082	Aroclor 1016	550 U	50 U	50 U	91 U
SW8082	Aroclor 1221	550 U	50 U	50 U	91 U
SW8082	Aroclor 1232	550 U	50 U	50 U	91 U
SW8082	Aroclor 1242	550 U	50 U	50 U	91 U
SW8082	Aroclor 1248	550 U	50 U	50 U	91 U
SW8082	Aroclor 1254	550 U	50 U	50 U	91 U
SW8082	Aroclor 1260	550 U	50 U	50 U	110
SW8082	Total PCBs	550 U	50 U	50 U	110
	Percent Moisture	43.3	76.4	80.7	66.7

Notes:
Units = µg/kg wet weight
U = not detected at reported quantitation limit
J = result is estimated
* = Percent Lipid value determined by an ENCHEM laboratory method.

ANALYTICAL DATA SUMMARY
BIOTA SAMPLES FOR LEAD AND PCBs
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		UNREMEDIATED PLANTS				
	Sample ID:	**BIO-711**	**BIO-712**	**BIO-713**	**BIO-714**	**BIO-715**
	Sample Date:	11/7/02	11/7/02	11/7/02	11/7/02	11/7/02
	Lab ID:	828296-001	828296-002	828296-003	828296-004	828296-005
Method	Parameter					
SW6010B	Lead	1 U	0.99 U	1 U	1 U	1 U
SW8082	Aroclor 1016	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1221	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1232	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1242	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1248	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1254	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1260	50 U	50 U	50 U	50 U	50 U
SW8082	Total PCBs	50 U	50 U	50 U	50 U	50 U
	Percent Moisture	70.4	65.3	77.7	61.8	62.9
EnChem*	Lipid	0.54	0.72	0.5	0.7	0.79

Notes:
Units: PCBs µg/kg; Lead mg/kg
U = not detected at reported quantitation limit
* = Percent Lipid value determined by an ENCHEM laboratory method.

ANALYTICAL DATA SUMMARY
BIOTA SAMPLES FOR LEAD AND PCBs
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		REMEDIATED PLANTS				
	Sample ID:	**BIO-716**	**BIO-717**	**BIO-718**	**BIO-719**	**BIO-720**
	Sample Date:	11/7/02	11/7/02	11/7/02	11/7/02	11/7/02
	Lab ID:	828296-006	828296-007	828296-008	828296-009	828296-010
Method	Parameter					
SW6010B	Lead	1 U	0.94 U	0.95 U	0.98 U	0.92 U
SW8082	Aroclor 1016	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1221	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1232	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1242	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1248	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1254	50 U	50 U	50 U	50 U	50 U
SW8082	Aroclor 1260	50 U	50 U	50 U	50 U	50 U
SW8082	Total PCBs	50 U	50 U	50 U	50 U	50 U
	Percent Moisture	64	65.2	52	59.3	69.3
EnChem*	Lipid	0.47	0.3	0.65	0.61	0.45

Notes:
Units: PCBs µg/kg; Lead mg/kg
U = not detected at reported quantitation limit
* = Percent Lipid value determined by an ENCHEM laboratory method.

ANALYTICAL DATA SUMMARY
BIOTA SAMPLES FOR LEAD AND PCBs
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		UNREMEDIATED WORMS		
	Sample ID:	**BIO-721**	**BIO-722**	**BIO-723**
	Sample Date:	11/8/02	11/7/02	11/7/02
	Lab ID:	828296-011	828296-012	828296-013
Method	Parameter			
SW6010B	Lead	2.6	5.1	1.7
SW8082	Aroclor 1016	NA[1]	50 U	56 U
SW8082	Aroclor 1221	NA[1]	50 U	56 U
SW8082	Aroclor 1232	NA[1]	50 U	56 U
SW8082	Aroclor 1242	NA[1]	50 U	56 U
SW8082	Aroclor 1248	NA[1]	50 U	56 U
SW8082	Aroclor 1254	NA[1]	50 U	56 U
SW8082	Aroclor 1260	NA[1]	50 U	56 U
SW8082	Total PCBs	NA[1]	50 U	56 U
	Percent Moisture	NA[1]	81.1	76.6
EnChem*	Lipid	NA[1]	1.47	1.72

Notes:
Units: PCBs µg/kg; Lead mg/kg
U = not detected at reported quantitation limit
NA[1] = not analyzed due to insufficient sample volume.
* = Percent Lipid value determined by an ENCHEM laboratory method.

ANALYTICAL DATA SUMMARY
BIOTA SAMPLES FOR LEAD AND PCBs
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NY

		REMEDIATED WORMS		
	Sample ID:	**BIO-724**	**BIO-725**	**BIO-726**
	Sample Date:	11/8/02	11/6/02	11/6/02
	Lab ID:	828296-014	828296-015	828296-016
Method	Parameter			
SW6010B	Lead	21	4.6	17
SW8082	Aroclor 1016	75 U	82 U	50 U
SW8082	Aroclor 1221	75 U	82 U	50 U
SW8082	Aroclor 1232	75 U	82 U	50 U
SW8082	Aroclor 1242	75 U	82 U	50 U
SW8082	Aroclor 1248	75 U	82 U	50 U
SW8082	Aroclor 1254	75 U	82 U	50 U
SW8082	Aroclor 1260	89	82 U	69
SW8082	Total PCBs	89	82 U	69
	Percent Moisture	76.3	79.2	82.6
EnChem*	Lipid	2.24	1.9	1.74

Notes:
Units: PCBs µg/kg; Lead mg/kg
U = not detected at reported quantitation limit
* = Percent Lipid value determined by an ENCHEM laboratory method.

APPENDIX D

Data Usability Summary Report for 2002 Data

DATA USABILITY SUMMARY REPORT
2002 SAMPLING EVENT
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

Introduction:

Sediment and biota samples were collected at the North Lawrence Oil Dump Site in November 2002 and submitted for off-site laboratory analyses. Biota samples were analyzed by ENCHEM of Madison, Wisconsin for PCBs (EPA 8082), lead (EPA 6010B), and lipids (ENCHEM lab procedure). Sediment samples were analyzed by H2M Labs, Inc. of Melville, New York for PCBs (EPA 8082), lead (EPA 6010B), and percent moisture (EPA 160.3M). Deliverables for the off-site laboratory analyses included a Category B deliverable as defined in the New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocols (NYSDEC, 1995).

A project chemist review was completed based on NYSDEC Division of Environmental Remediation guidance for Data Usability Summary Reports (NYSDEC, 1997). USEPA Region II validation guidelines were also used as a reference for QC result evaluations when completing chemist reviews (USEPA, 1992; USEPA, 2002). The project chemist review included evaluations for data package completeness, holding times, QC data (blanks, instrument calibrations, duplicates, surrogate recovery, and spike recovery), data transcription, electronic data reporting, calculations, and data qualification. With the exception of the items discussed below, results are interpreted to be usable as reported by the laboratory. The following qualifiers are used in the final data presentation.

U = target analyte is not detected at the reported detection limit
J = concentration is estimated

Biota results are reported as wet weight. However, percent moisture determinations were completed on the biota samples (with the exception of the mice femurs) and percent moisture data are reported.

LEAD Analysis

In accordance with inorganics reporting procedures, analytes detected between the method detection limit and the laboratory quantitation limit are reported with a B qualifier. These B qualifiers were changed to a J during the data review.

Spike Results

One low concentration tissue spike (0.35 mg/kg) and one high concentration tissue spike (100 mg/kg) for lead was analyzed by ENCHEM Labs. The low end spike had a percent recovery above the laboratory limits at 191%. The high end spike has a percent recovery of 90%. Lead concentrations detected in worm samples ranged from 2.6 mg/kg to 21 mg/kg. Professional judgment was used not to qualify sample detections based on the

high percent recovery of the low-end LCS; however, sample results may be potentially biased high.

PCB Analysis

There was insufficient sample mass to analyze biota (worm) sample 828296-011 (T1-W) for PCBs; therefore, no PCB data are available for this sample.

Aroclor 1260 in sediment sample SD603 was qualified (P) by the laboratory due to calculated concentrations between the two GC columns was greater than 25%. USEPA Region II validation guidelines state that aroclor concentrations with percent differences between the two analytical columns between 26% and 70% are qualified estimated (J). The (P) qualifier was removed in the final data set, and results were qualified (J) indicating the result is considered estimated.

Reference:

New York State Department of Environmental Conservation (NYSDEC), 1995. "Analytical Services Protocols"; 10/95 Edition; October 1995.

New York State Department of Environmental Conservation (NYSDEC), 1997. "Guidance for the Development of Data Usability Reports"; Division of Environmental Remediation; September 1997.

U.S. Environmental Protection Agency (USEPA), 1992. "Evaluation of Metals Data for the Contract Laboratory Program based on SOW 3/90"; USEPA Region II; HW-2; Revision 11; January 1992.

U.S. Environmental Protection Agency (USEPA), 2002. "SW-846 Method 8082"; USEPA Region II; HW-23B; Revision 1.0; May 2002.