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LETTER REPORT SWAMP DELINEATION SAMPLING PHASE 3 AND 4 NCBC GULFPORT MS
12/15/1998
HARDING LAWSON ASSOCIATES

Harding Lawson Associates

December 15, 1998

GORDON
FILE

Southern Division
Naval Facilities Engineering Command
ATTN: Arthur Conrad
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29418

Dear Mr. Conrad:

SUBJECT: Swamp Delineation Sampling, Phases III and IV, Naval Construction Battalion Center (NCBC), Gulfport, Mississippi
Contract No. N62467-89-D0317/128

INTRODUCTION

This letter report presents the results of activities conducted to continue the surface-water and sediment dioxin delineation within the area north of NCBC Gulfport associated with the Outfall 3 Swamp. Results of the Phase I/Phase II Surface Water and Sediment Delineation Investigation activities indicated that an additional investigation was required to complete delineation of dioxin contamination within the Outfall 3 Swamp area (ABB Environmental Services, Inc. [ABB-ES], 1998). The extent of dioxin-contaminated sediment within the swamp was found to be more widespread than anticipated. Contamination extends into a shallow drainage feature which is believed to be associated with the southern branch of Turkey Creek. Variations in the drainage features within the swamp area, combined with past flooding, are most likely responsible for this extended area of contamination.

This report focuses on the February 1998 (Phase III) and June 1998 (Phase IV) sampling events, but also builds on conclusions developed during the previous two phases of the swamp surface water and sediment sampling activities.

BACKGROUND

The Outfall 3 Swamp was first identified as a potential receptor of dioxin-contaminated sediment from Site 8 during the Basewide Surface Water Sediment Sampling program (ABB-ES, 1996a). During that investigation, mapping of the primary drainage ditch exiting Site 8 – now called the herbicide orange (HO)

ditch – showed that surface water and sediment was transported through the ditch to the northwest, eventually exiting the base at Outfall 3 North (Figure 1). Outfall 3 North conveyed surface water and sediment directly into the swamp until the fall of 1995, when drainage alterations associated with the 28th Street roadway improvement project were completed. Flow from Outfall 3 is now diverted directly to Canal No. 1 (ABB-ES, 1996b).

The Outfall 3 Swamp is located off base on a privately-owned 35-acre parcel (Figure 1). An old drainage ditch excavated to convey surface water through the swamp area extends approximately 1,800 feet from Outfall 3 northwestward to a culvert under Canal Road. Flow from this culvert discharges into Canal No. 1. The surface topography of the area adjacent to this old drainage ditch or main channel is relatively level, prone to flooding, and densely vegetated.

Surface water at the north end of the swamp is primarily conveyed under Canal Road into Canal No. 1. However, the north end of the ditch also intersects a natural drainage feature just east of the Canal Road culvert and trends to the east-northeast. This natural drainageway appears to be associated with the southern branch of Turkey Creek. This section of the southern branch does apparently receive flow from the Outfall 3 Swamp during periods of flooding. West of Canal Road, the southern branch was reportedly filled in many years ago during previous drainage-improvement activities. The area that surrounds this drainage feature is also relatively level, prone to flooding, and densely vegetated.

In total, there have been four sampling phases in the swamp. The first two phases, which broadly focused on basewide dioxin-contamination concerns, included delineation of the extent of contamination in the sediments in the Outfall 3 Swamp. The third phase, conducted in February 1998, concentrated on lateral delineation adjacent to and extending outward from the swamp's main channel. The fourth phase conducted in June 1998 was designed to delineate the extent of dioxin contamination in the southern branch of Turkey Creek. The following sections assimilate findings and conclusions from these four sampling phases into one document.

OBJECTIVES

The primary objectives in conducting sediment sampling in the Outfall 3 Swamp and southern branch of Turkey Creek were to

- define the horizontal and vertical limits of dioxin contamination in the swamp;
- assess the distribution of congeners to determine the potential source(s) of dioxins in the swamp; and
- refine the conceptual model pertaining to the Outfall 3 Swamp and southern branch of Turkey Creek to support restoration and/or risk-based decisions.

The following section describes the sampling strategy developed to meet these objectives.

SAMPLING STRATEGY

The strategy developed for both areas in the swamp (Phases III and IV) included development and/or implementation of three components. These were (1) a site reconnaissance/survey, (2) refinement of the

conceptual model, and (3) conceptual model-based selection of the sample locations. The following discusses these components in greater detail.

Site Reconnaissance/Survey. The site reconnaissance and survey included the following activities:

- evaluating the hydraulic connection(s) between the main channel and secondary channels and/or between the main channel and flood areas;
- assessing flow directions that exist in the channels based on field observations of soil type, surface geomorphology and hydrology, as well as on evidence of depositional debris (leaves, pine needles, miscellaneous trash) piles. This field assessment also included the possibility that flow directions may differ between high-flow and low-flow conditions;
- estimating the most-probable limits of dioxin-contaminated deposition based on the above observations; and as a final activity,
- conducting a relational survey using a global positioning system (GPS) receiver and sonic range finders.

Refined Conceptual Model. The process of refining the conceptual model included the following:

- assessing which probable or possible transport mechanisms influenced movement of potentially contaminated sediment;
- determining which migration pathways may have received and "channeled" these potentially contaminated sediments; and after analysis of the survey observations; and
- developing a conceptual understanding of the migration pathways and area(s) of possible dioxin deposition.

Sample Selection Process. The final sample selection process was based on the refined conceptual model discussed above. Specifically, this process included the following:

- selecting sample locations around the areas of possible contamination to support evaluation of the horizontal extent of dioxin-containing sediments;
- positioning sample locations in selected channel locations to characterize maximum-contaminant levels, as well as collect congener distribution data; and
- selecting locations for a vertical profile of soil types and depositional environments to support evaluation of vertical distribution of dioxin.

All surface water and sediment samples were then collected from these conceptual model-based locations and analyzed for dioxins and furans using U.S. Environmental Protection Agency Method 8290.

These three components of the overall sampling strategy were implemented for both the Outfall 3 Swamp and the drainage feature associated with the southern branch of Turkey Creek. Discussion of the observations and findings associated with implementation of these components is provided below.

FIELD EFFORT

As previously discussed, the field effort that focused on the swamp area was conducted in two phases (Phases III and IV). The findings and observations of these efforts are divided into two parts: (1) the results of the delineation in the Outfall 3 Swamp, and (2) the results of the delineation activities in the southern branch of Turkey Creek. The following section describes the activities conducted during Phase III at the Outfall 3 Swamp. Description of the activities associated with the southern branch of Turkey Creek conducted during Phase IV follows the section covering Phase III.

Outfall 3 Swamp (Phase III) Activities. Analytical results from previous sampling activities (Phase II, October 1997) indicated that dioxin had been deposited as overbank deposits along the main channel of Outfall 3 Swamp. Two samples, WL009 and WL010, from the Phase II activities indicated that the linear extent (in-channel deposits) of dioxin contamination declined significantly downstream of sample location WL008. Also, surface water from a small channel that connects the main channel of the Outfall 3 Swamp and the southern branch of Turkey Creek was observed to flow *into* the main channel of the swamp. Therefore, the Phase III activities concentrated on delineating dioxin contamination adjacent to and extending laterally from the main channel of the Outfall 3 Swamp.

Site Reconnaissance/Survey Since the main channel in the Outfall 3 Swamp was manmade, there were no obvious natural floodplains available for mapping. Therefore, defining contaminant-migration pathways and areas of potential contamination, caused by flood-stage deposition, required the use of other indicators.

Early observations during the reconnaissance/survey efforts indicated that depositional patterns of miscellaneous debris (i.e., trash, twigs, and pine needles) may provide clues to the relative limits of flood-stage transgression. Conceptually, the most probable transport mechanism of dioxin-contaminated sediments in this swamp area adjacent to the main channel is due either to (1) past flooding originating from a breach in the channel's berm/levee or (2) simply overbank flooding where no levee exists. Flood-stage transgression, which create the migration pathways extending outward, most likely represent limits of, or extent of, potentially contaminated sediment. Possible migration pathways based on surface debris observations indicated by a change from an orderly pattern – indicative of surface water transportation prior to deposition – to a randomly dispersed pattern – very little surface water movement prior to deposition – were located. Observations of soil characteristics in the Outfall 3 Swamp did not detect any significant changes that could be used as an indicator of depositional extent.

The locations of the probable migration pathways, inferred from the debris patterns, were surveyed using range finder/compass and a GPS receiver (Figure 2). The lateral extent of this line from the main channel is in excess of 150 feet at some locations. The transport of debris materials and sediment that far into the Outfall 3 Swamp most likely occurred during heavy-precipitation/storm events when the swamp still received surface water from the base via Outfall 3 (pre-1995).

Conceptual Model – Outfall 3 Swamp The most likely source area for the dioxins observed in the swamp are HO from Site 8. This is based on the chain of dioxin-containing sample results and the high ratios (greater than 70 percent) of tetrachlorodibenzo-p-dioxin (TCDD) obtained from the previous phases and, as discussed below in this report, supported by recent results. Other potential sources include the use of HO in the ditches via direct application to control weeds and other potential storage sites near Site 8.

The established migration pathway from the source/source release areas on base includes the HO ditch from Site 8 to Outfall 3 and then discharging into the main channel of the Outfall 3 Swamp (Figure 2).

Based on the size and depth of the debris observed in the Outfall 3 Swamp, the primary transport mechanism of dioxin-contaminated sediments are the high surface-water velocities associated with large storm events. These storm events are responsible for the downstream migration of dioxin-contaminated sediments, as well as for the lateral extent/overbank deposition of these sediments.

While the transport of dioxin-contaminated sediments were most likely associated with storm event flow, the deposition of these sediments was likely influenced by the susceptibility of a given area to overbank flooding and the proximity to channel obstacles. The depositional patterns are the key to assessing dioxin-contaminated sediments.

Sample Selection Process Based on the conceptual model shown on Figure 2, a selection of sampling locations was established. The Phase III samples were collected to define the limits of dioxin contamination associated with overbank flooding and deposition adjacent to the main channel in Outfall 3. The results of the delineation efforts will be discussed in the Delineation Sampling Results section later in this report.

Southern Branch (Phase IV) Activities. Analytical results from Phase III indicated that dioxin had been deposited in the small channel that connects the Outfall 3 swamp's main channel to the southern branch of Turkey Creek. What was thought to be a low-flow tributary to the main channel actually received flow, possibly during storm events. Therefore, Phase IV concentrated on delineating dioxin within the drainage features associated with the southern branch of Turkey Creek. This section describes the reconnaissance survey, conceptual model development, and sample selection process conducted for the southern branch of Turkey Creek.

Site Reconnaissance/Survey Initial site reconnaissance activities indicated that the small channel connected to the Outfall 3 Swamp's main channel conveyed surface water and sediment directly into the southern branch of Turkey Creek, as shown on Figure 3. Further observation indicated that the southern branch of Turkey Creek has been cut off from the main channel (the northern branch) since the construction of Canal Road. The following paragraphs present general observations on the southern branch of Turkey Creek.

The southern branch of Turkey Creek supports flow only during periods of heavy precipitation. The main channel is shallow and generally 50 to 150 feet wide and consists of many smaller channels. The flow in the channel is to the east and northeast, as indicated by the patterns of deposition of surface debris material.

There are three distinct terrace levels associated with the southern branch of Turkey Creek. Each terrace was observed to have unique depositional patterns, soil types, and vegetation.

Terrace 1 – Terrace 1 is at the lowest elevation, or level, of this section of the former southern branch. This lowest terrace forms the main channel. The soil's surface consisted mainly of organic rich silts and clays (muck) up to 18 inches thick. Soils become increasingly sandy below 18 inches. This terrace supports very little understory vegetation due to frequent flooding and poor drainage. This terrace was identified to be the most likely to contain significant levels of dioxin contamination. The soils of this terrace correlate to the Ponzer Series (Soil Conservation Service [SCS], 1975).

Terrace 2 – Terrace 2 forms a margin that surrounds the Terrace 1 main channel(s), but at elevations slightly higher than Terrace 1. The organic rich surface soil layer is thinner and contains some sand. This terrace supports more understory vegetation, which is the key to visually distinguishing Terrace 1 from Terrace 2. If dioxin is present in Terrace 1, then Terrace 2 potentially contains dioxin-contaminated deposits associated with storm events. The soils of this terrace correlate to the Smithton Series (SCS, 1975).

Terrace 3 – Terrace 3 occurs along the highest elevations in the study area. The soils are well-drained, dark brown, fine to medium sands that support abundant understory vegetation. These coarser grained soils were the main distinguishing feature between this terrace and Terrace 2. The boundary between Terraces 2 and 3 most likely limits the extent of dioxin deposition. Flooding of the main channel is the most likely transport mechanism if dioxin contamination is present. The soils of this terrace correlate to the Hyde Series (SCS, 1975).

The final part of the site survey included using a GPS receiver to develop a working map of the study area. While the southern branch of Turkey Creek extends east and northeastward to the confluence with the northern branch, the study area was limited to the first 1,200 feet east of Canal Road. At 1,200 feet east of Canal Road, the southern branch of Turkey Creek deepens into a series of three pools (each about 5 feet deep), followed by a loss of definition of the channel. The eastern limit of the study area was established at the point between the pools and where the channel is less defined. The northern and southern boundaries of the study were established along the Terrace 2 and Terrace 3 boundaries. The limits of the study area, as well as other features mapped during the survey, are shown on Figure 3.

Conceptual Model – Southern Branch of Turkey Creek The most likely source area for the dioxins observed in the swamp are HO from Site 8. This is based on the chain of dioxin-containing sample results and the high ratios (greater than 70 percent) of TCDD, obtained from previous phases and, as discussed below in this report, supported by recent results.

The established migration pathways include the HO ditch (Figure 3) from Site 8 to the drainage channel in the Outfall 3 Swamp. From the Outfall 3 Swamp, a small channel conveys surface water and sediment into the southern branch of Turkey Creek.

Based on the size and depth of the debris observed in the Outfall 3 Swamp and the southern branch of Turkey Creek, the primary transport mechanism of dioxin-contaminated sediments are the high surface water velocities associated with large storm events. These storm events are responsible for the downstream migration of dioxin-contaminated sediments, as well as the lateral extent/overbank deposition of these sediments.

While the transport of dioxin-contaminated sediments were most likely associated with storm event flow, the deposition of these sediments was likely influenced by the elevation changes associated with the three

terraces discussed above. The depositional patterns are the key to assessing dioxin-contaminated sediments.

Sample Selection Process Based on the conceptual models shown in Figure 3, a selection of sampling locations was established. Terrace 3 samples were collected to define the horizontal or lateral limits of dioxin contamination, while Terrace 1 and Terrace 2 samples characterize the concentration and distribution of congeners of the dioxin contamination.

ANALYTICAL RESULTS

The goal of Phase III and Phase IV sampling was to define the horizontal and vertical limits of dioxin contamination that exists in the Outfall 3 Swamp and the southern branch of Turkey Creek, respectively. The horizontal extent of delineation included two components: (1) the length of channel contaminated (the linear extent) and (2) the extent of contamination that exists laterally (lateral extent) from the channels. The vertical extent of dioxin contamination was determined in both the Outfall 3 Swamp and southern branch of Turkey Creek by mapping the change in soil profiles from black, organic rich to the sandier and less organic subsoils. This type of vertical delineation has been successfully performed during the 28th Street Project (ABB-ES, 1996c), and confirmed through soil sampling associated with that project.

This section describes the results of the samples and the delineation limits established for the Phase III and Phase IV activities.

Outfall 3 Swamp. To delineate the Outfall 3 Swamp, samples were collected on either side of the limits potential contamination as defined in the description of possible migration pathway(s) in the conceptual model. The sample results confirmed the use of this approach. Table 1 (in Attachment B) separates the samples into those that were collected outside the limits of the migration pathway(s) and those collected inside the migration pathway(s) to more clearly illustrate the delineation results. Figure 4, Delineation Results – Outfall 3 Swamp, visually depicts this information.

These results are all lower than the higher levels observed during Phases I and II in the Outfall 3 Swamp main channel . Also, the TCDD ratio, defined as the percentage of the overall toxicity equivalent (TEQ) that is comprised of TCDD, is consistently above 70 percent (see Attachment C, Sample Results Tables). TCDD ratios in this range are a strong indication that these dioxins have HO as a source.

Samples WL032, WL033, and WL034 were collected in the small channel that connects the main channel of the Outfall 3 Swamp to the southern branch of Turkey Creek. These samples were expected to contain low levels of dioxin based on the observations that (1) surface water was flowing from Turkey Creek into the Outfall 3 Swamp at the time they were collected, and (2) the bottom of this small channel is approximately 3 feet higher in elevation than either the Outfall 3 Swamp or Turkey Creek. The results from these three samples ranged from 93 to 125 parts per trillion (ppt) (Figure 4). The relatively high levels of these three samples, along with TCDD ratios in excess of 75 percent (Attachment C), prompted the investigation into the southern branch of Turkey Creek (Phase IV).

Southern Branch of Turkey Creek. To delineate the southern branch of Turkey Creek, samples were collected on either side of the limits potential contamination, as defined in the description of possible migration pathway(s) in the conceptual model. However, in contrast to the investigation of the Outfall 3 Swamp, limits to this investigation had to be established. This limit was established just beyond a series of

large pools where the channel leveled out and was difficult to distinguish. Given this limit, it was decided that if dioxin concentrations were found to be low at this location, the delineation could be completed with the Phase IV sampling. If significant concentrations of dioxin were found in the sediment, then contamination may extend beyond the pools. Additional phases of sampling may be required if this second situation is encountered.

The sample results confirmed the use of a conceptual model-based approach. In the southern branch of Turkey Creek the changes in elevation and soil types (described above) were used to establish the possible migration pathways. Table 2 (in Attachment B) separates the samples into those that were collected outside the limit of the migration pathways and those collected inside the migration pathway to more clearly illustrate the delineation results. The samples collected outside the pathway were collected on what is called Terrace 3 in the Site Survey Section. Samples collected inside the migration pathways were collected from Terraces 1 and 2. Figure 5, Delineation Results in Southern Branch of Turkey Creek, visually depicts this information.

The majority of the samples from Phase IV were inside the limits of the migration pathway defined by the hydrologic boundary established between Terrace 2 and Terrace 3. Samples WL049, WL056, and WL061 were collected from the Terrace 3 soils to confirm the observational delineation. As was the case in the Outfall 3 Swamp, the TCDD ratios were in excess of 70 percent – a strong indication of an HO source.

The sample collected the furthest downstream (to the northeast) in the southern branch of Turkey Creek, WL065, produced the highest result observed in the study – 317 ppt. This sample was collected beyond the pools in an area lacking a well-defined channel. This result confirmed that the delineation in Turkey Creek has not yet defined an eastern or northeastern boundary.

CONCLUSIONS

The delineation boundaries established in the Outfall 3 Swamp are complete. As shown on Figure 4, the linear extent of dioxin contamination in the Outfall 3 Swamp greater than 30 ppt is approximately 1,800 feet, while the lateral extent averages approximately 200 feet. An estimate of aerial extent of dioxin contamination from these numbers is approximately 360,000 square feet (8.3 acres). Depth or vertical extent of contamination in the main channel of the swamp averages approximately 24 inches, while outside of the main channel the vertical extent averages 12 inches.

An approximate volume of sediment contaminated above 30 ppt, based on an average channel width of 10 feet and a overbank flood zone for the remaining 190 feet, is approximately 14,000 cubic yards. These numbers are rough approximations based on distances made from maps containing preliminary nonsurveyed data. The delineation is based on an assumed action level of 30 ppt.

The delineation boundaries for the southern branch of Turkey Creek are not yet complete. The objective of Phase IV was to delineate linearly and laterally simultaneously with the limited number of samples available. Unfortunately, the linear extent of dioxin contamination is likely beyond the study boundary of Phase IV activities. The approximate aerial extent of contamination included within the established migration pathway for the southern branch of Turkey Creek (Figure 5) at this point is 1,200 feet linear by an average lateral extent of 100 feet for a total of 120,000 square feet (2.8 acres). Given the average vertical delineation of approximately 12 inches, the estimated volume of sediment contaminated above 30 ppt is approximately 4,400 cubic yards. These numbers are rough estimates and should be updated with

more precise civil survey information. Also, these volume estimates for Turkey Creek are likely to increase when the delineation is completed.

The major source of surface water for the Outfall 3 Swamp and the southern branch of Turkey Creek, Outfall 3, has been diverted to Canal No. 1. While this greatly decreases surface-water velocities and, therefore, the potential for erosion and transportation of dioxin-contaminated sediment, the potential for migration still exists. Tropical storms (including hurricanes) could potentially produce surface-water velocities in the main channel of Outfall 3 Swamp and the southern branch of Turkey Creek to mobilize dioxins into the main channel of Turkey Creek and eventually into Bernard Bayou.

At the end of Phase IV, the preliminary estimates of contaminated sediment above 30 ppt have been determined for the Outfall 3 Swamp and the southern branch of Turkey Creek. These estimates are likely to change when civil survey data is available and when the delineation of Turkey Creek is complete. The total estimated aerial extent of dioxin-contaminated sediment from both the Outfall 3 Swamp and Turkey Creek is 11.1 acres. Based on vertical delineation of sediment, the total volume of contaminated sediment to date is approximately 18,400 cubic yards.

RECOMMENDATIONS

Outfall 3 Swamp. Linear, lateral, and vertical extent of delineation has been completed in the Outfall 3 Swamp to the confluence with the southern branch of Turkey Creek. Therefore, future activities in the Outfall 3 Swamp should include data-gathering to support the development of future remedial options. These activities included a civil survey of the manmade ditch system, sample locations, and the delineation boundary established laterally from the ditch.

A civil survey of the Outfall 3 Swamp would allow for a more accurate determination of (1) the volume of potentially contaminated soil, (2) potential impact on private land, and (3) the location of institutional controls to limit the potential exposure of the public.

Southern Branch of Turkey Creek. Delineation activities in the southern branch of Turkey Creek are incomplete at this time. The recommended approach to complete the delineation is (1) a focused historical research of aerial photography and/or flood studies, (2) a focused sampling phase to determine the linear extent of contamination in the southern branch of Turkey Creek, and (3) a delineation phase of sampling to determine the lateral and vertical extent of dioxin contamination. Again, these activities should be accompanied by a civil survey to support the development of future remedial options.

Based on the size of the part of Turkey Creek that could be potentially contaminated, an estimate of Phase V would be 15 samples, and of Phase VI would be approximately 35 samples.

Finally, based on the potential for continued migration of dioxin-contaminated sediment out of the southern branch of Turkey Creek, engineering controls, such as sediment recovery traps, should be considered until final remedial actions can take place. These controls could be placed on an interim basis at strategic locations even before the final delineation of Turkey Creek takes place.

Sincerely,

Harding Lawson Associates

Robert Fisher, P.G.
Technical Lead

Penny Baxter, P.G.
Project Manager

cc: Gordon Crane, NCBC Gulfport

[02540-028]

Attachments:

Attachment A: Figures
Attachment B: Tables
Attachment C: Sample Result Tables
Attachment D: Glossary
Attachment E: References

ATTACHMENT A

FIGURES

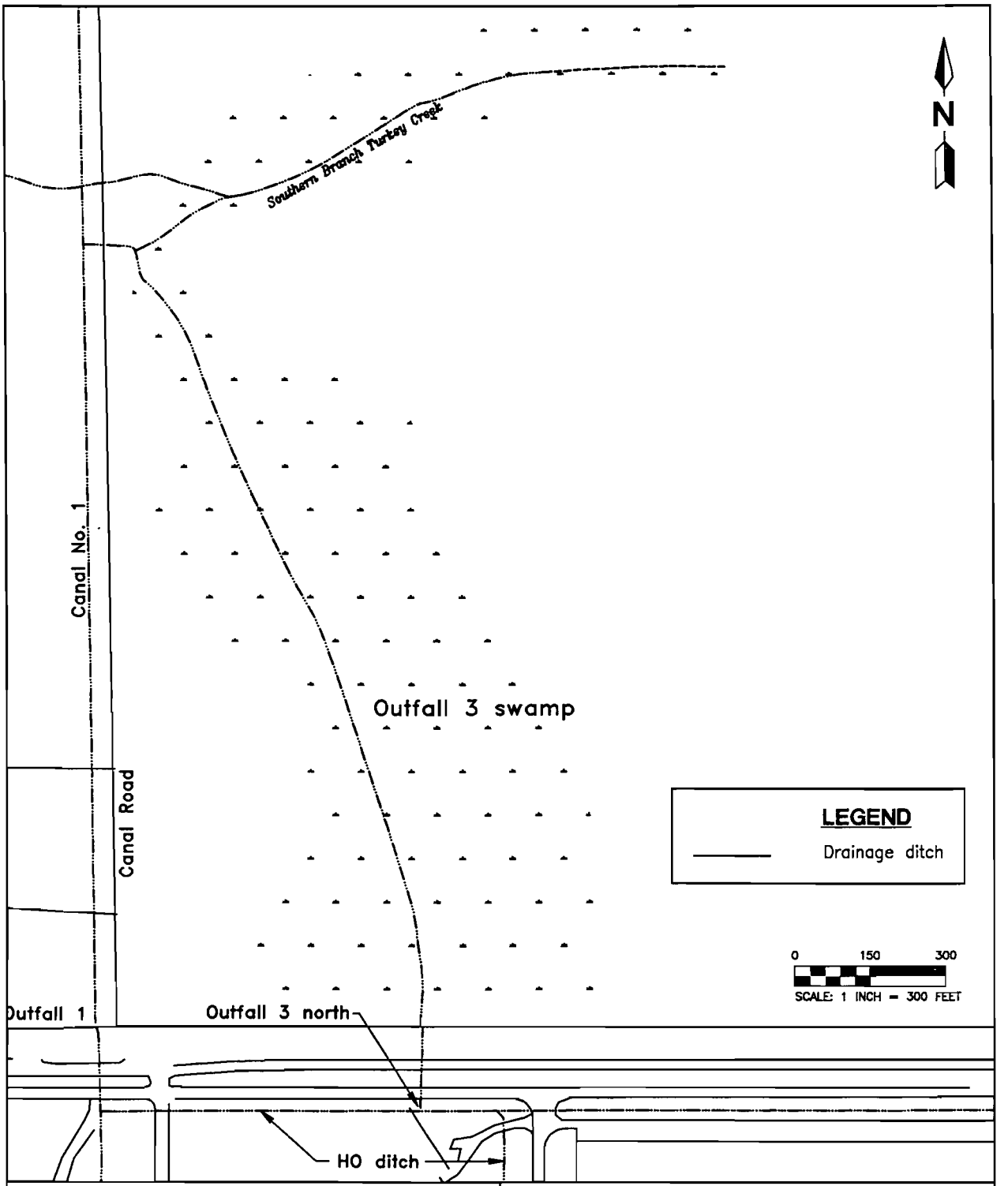

FIGURE 1
OUTFALL 3 SWAMP

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SWAMP DELINEATION SAMPLING
PHASES III AND IV

NAVAL CONSTRUCTION
BATTALION CENTER
GULFPORT, MISSISSIPPI

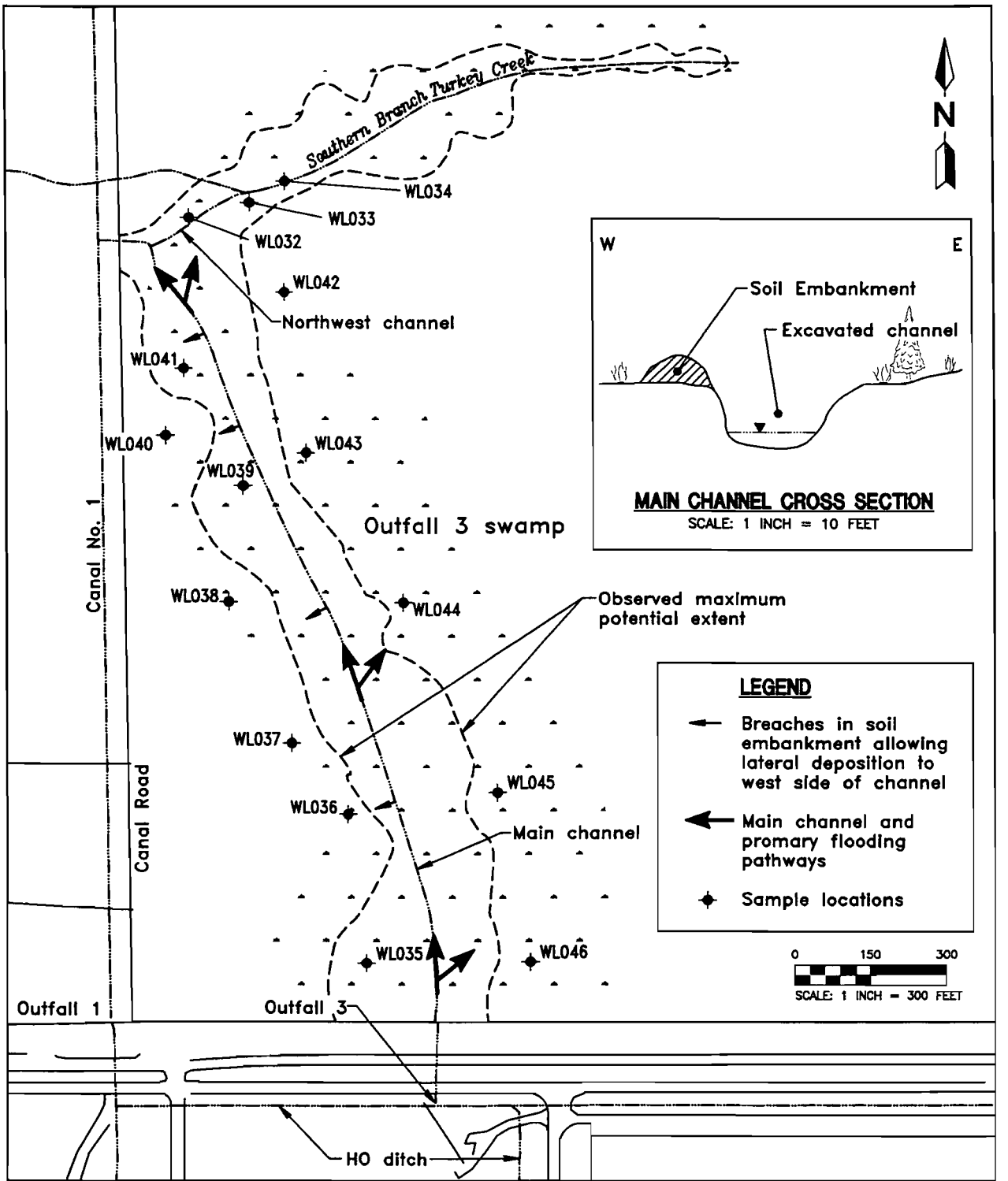

FIGURE 2
UPDATED CONCEPTUAL MODEL
OUTFALL 3 SWAMP

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SWAMP DELINEATION SAMPLING
PHASES III AND IV

NAVAL CONSTRUCTION
BATTALION CENTER
GULFPORT, MISSISSIPPI

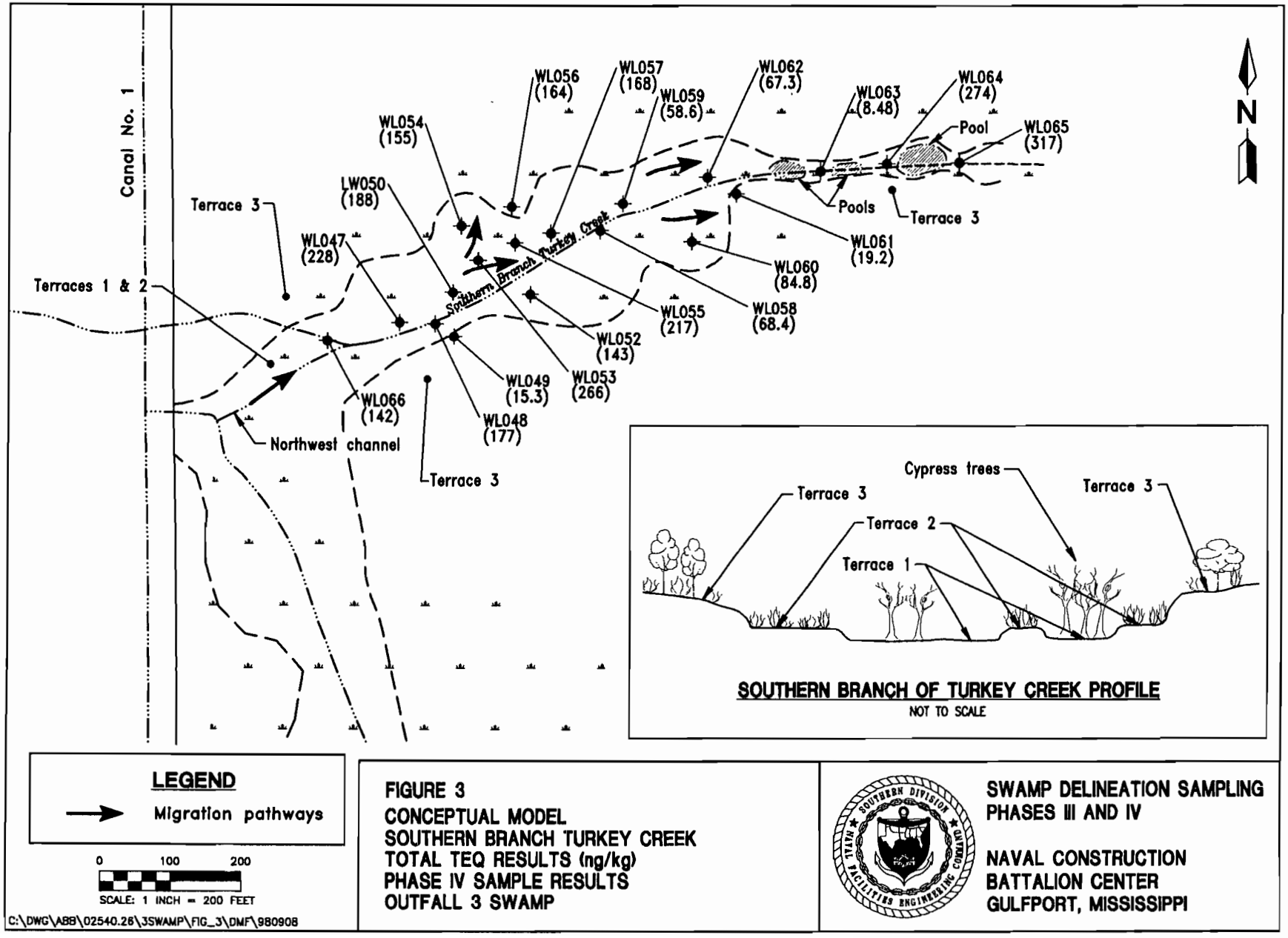

FIGURE 3
CONCEPTUAL MODEL
SOUTHERN BRANCH TURKEY CREEK
TOTAL TEQ RESULTS (ng/kg)
PHASE IV SAMPLE RESULTS
OUTFALL 3 SWAMP

SWAMP DELINEATION SAMPLING
PHASES III AND IV

NAVAL CONSTRUCTION
BATTALION CENTER
GULFPORT, MISSISSIPPI

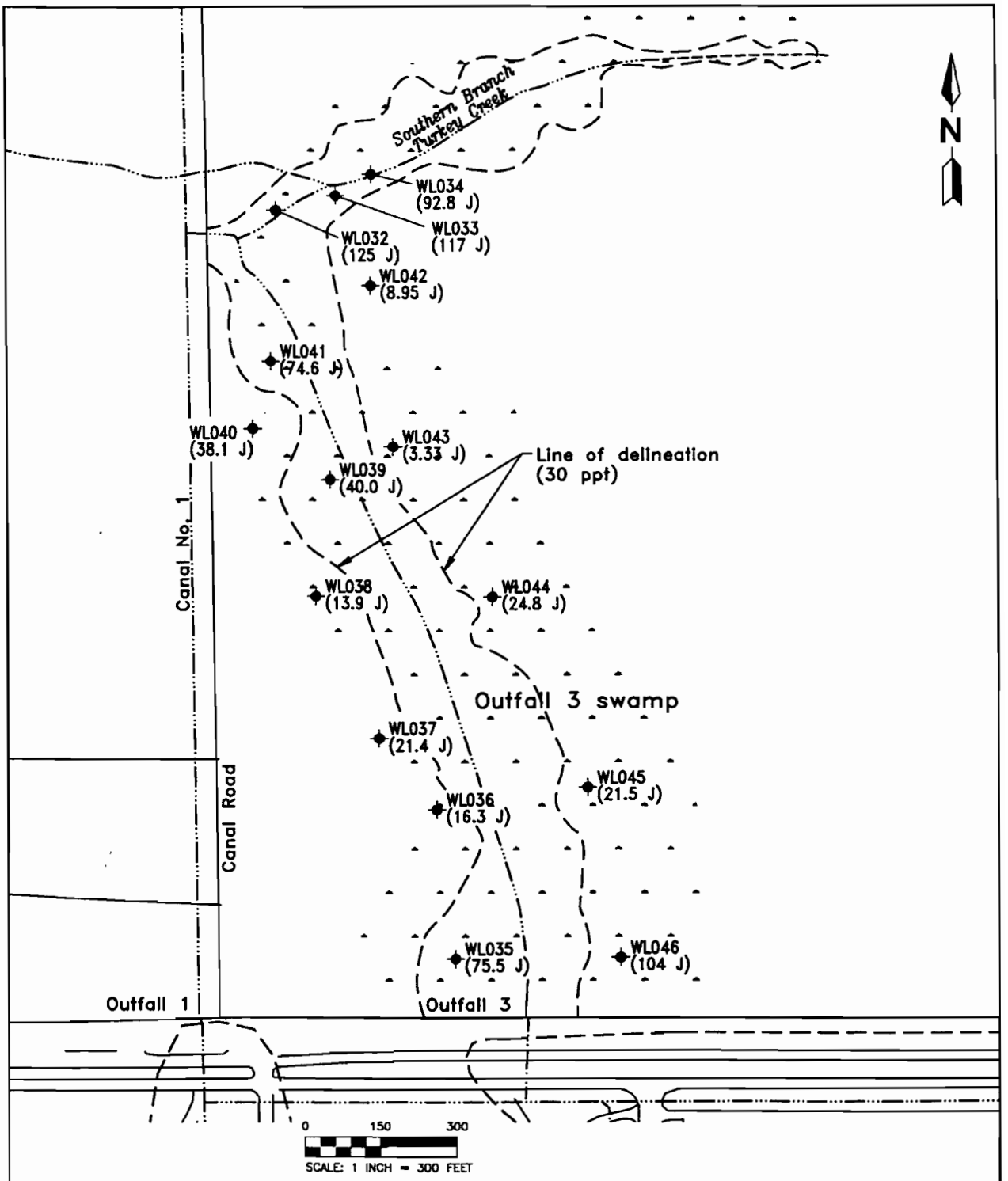

FIGURE 4
DELINEATION RESULTS FOR
OUTFALL 3 SWAMP
TOTAL TEQ RESULTS (ng/kg)
PHASE III SAMPLE RESULTS

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SWAMP DELINEATION SAMPLING
PHASES III AND IV

NAVAL CONSTRUCTION
BATTALION CENTER
GULFPORT, MISSISSIPPI

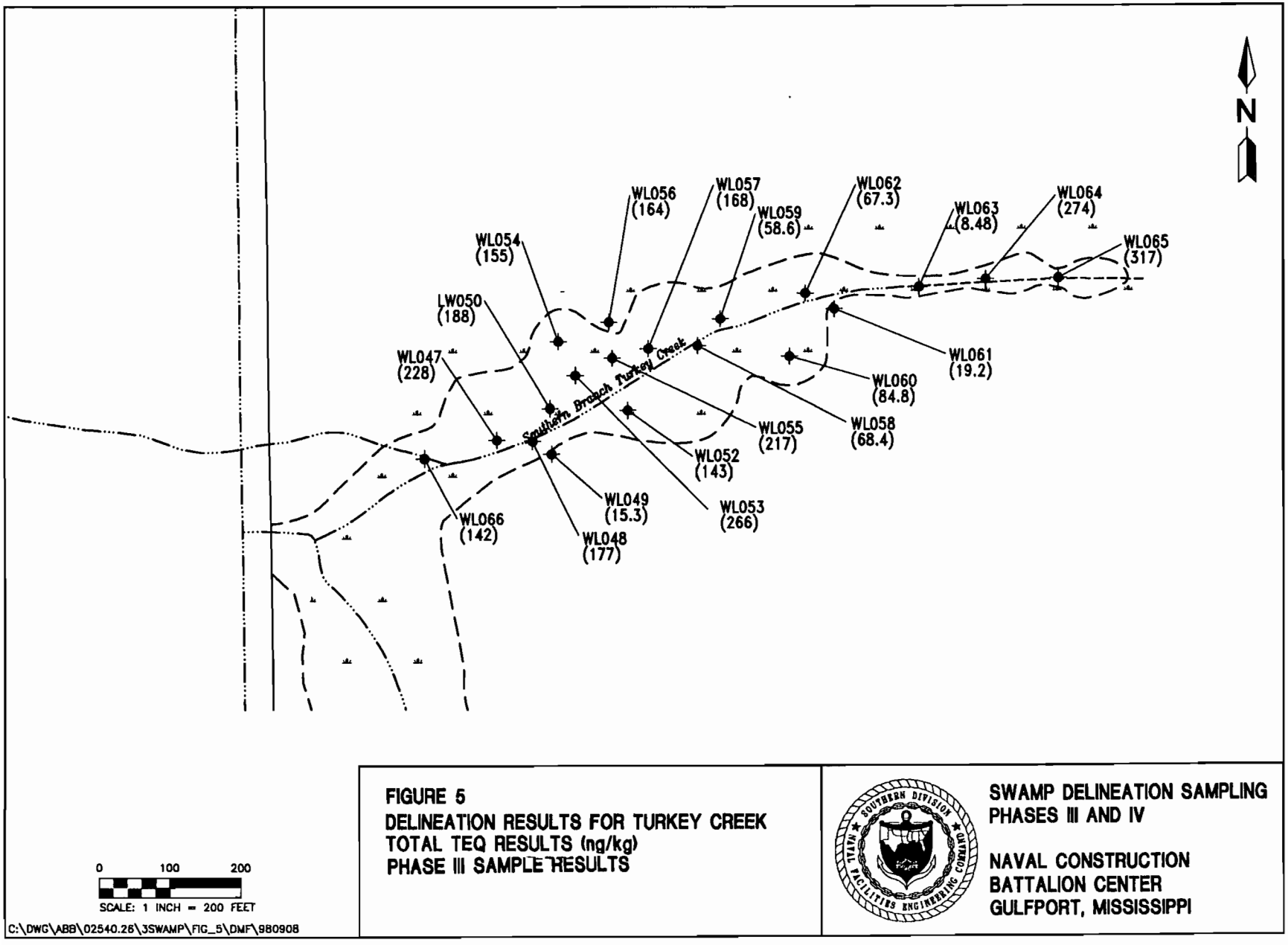

FIGURE 5
DELINEATION RESULTS FOR TURKEY CREEK
TOTAL TEQ RESULTS (ng/kg)
PHASE III SAMPLE RESULTS

SWAMP DELINEATION SAMPLING
PHASES III AND IV

NAVAL CONSTRUCTION
BATTALION CENTER
GULFPORT, MISSISSIPPI

ATTACHMENT B

TABLES

Table 1
Delineation Results at Outfall 3 Swamp

Swamp Delineation Sampling, Phases III and IV
Naval Construction Battalion Center
Gulfport, Mississippi

Sample ID	Inside Migration Pathway	Outside Migration Pathway	Result (ppt)
WL032	X		125
WL033	X		117
WL034	X		92.8
WL035	X		75.5
WL036		X	16.3
WL037		X	21.4
WL038		X	13.9
WL039	X		40.0
WL040	X		38.1
WL041	X		74.6
WL042		X	8.95
WL043		X	3.33
WL044		X	24.8
WL045		X	21.5
WL046	X		104

Notes: ID = identification.
ppt = parts per trillion.

Table 2
Delineation Results at the Southern Branch of Turkey Creek

Swamp Delineation Sampling, Phases III and IV
Naval Construction Battalion Center
Gulfport, Mississippi

Sample ID	Inside Migration Pathways	Outside Migration Pathways	Result (ppt)
WL047	X		228
WL048	X		177
WL049		X	15.3
WL050	X		188
WL051	X		61.4
WL052	X		143
WL053	X		266
WL054	X		155
WL055	X		217
WL056		X	16.4
WL057	X		168
WL058	X		68.4
WL059	X		58.6
WL060	X		84.8
WL061		X	19.2
WL062	X		67.3
WL063	X		8.48*
WL064	X		274
WL065	X		317
WL066	X		142

* Sample collected in large pool. Low result likely due to increased sedimentation in pool from surrounding sediment – not associated with channel.

Notes: ID = identification.
ppt = parts per trillion.

ATTACHMENT C

SAMPLE RESULT TABLES

CONSTITUENT		SITE	WL001	WL002	WL003	WL004	WL005	WL006
		SAMPLE ID	WL001D1P2	WL002D1P2	WL003D1P2	WL004D1P2	WL005D1P1	WL006D1P1
		DATE / TIME	05/16/97 / 14:01	05/16/97 / 14:21	05/16/97 / 14:41	05/16/97 / 15:01	05/17/97 / 10:45	05/17/97 / 10:45
		DEPTH (ft)	0.50	0.50	0.50	0.50	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		16.3	98.8	69.1	172	175	148 J
TCDD/TEQ Ratio	(%)		72	68	79	77	78	74

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL007	WL008	WL009	WL010	WL010	WL011
		SAMPLE ID	WL007D1P1	WL008D1P1	WL009D1P1	WL010D1P1	WL010D1D1	WL011D2P1
		DATE / TIME	05/17/97 / 10:55	05/17/97 / 10:55	05/17/97 / 11:10	05/17/97 / 11:05	05/17/97 / 11:05	10/12/97 / 12:50
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Duplicate 1	Primary
Total TEQ	(ng/kg)		228 J	254 J	2.10	11.2	15.6 J	0.404 J
TCDD/TEQ Ratio	(%)		77	83	0	76	79	0

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL012	WL013	WL014	WL015	WL015	WL016
		SAMPLE ID	WL012D2P1	WL013D2P1	WL014D2P1	WL015D2P1	WL015D2D1	WL016D2P1
		DATE / TIME	10/12/97 / 13:10	10/12/97 / 13:13	10/12/97 / 13:25	10/12/97 / 13:30	10/12/97 / 13:30	10/12/97 / 14:03
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Duplicate 1	Primary
Total TEQ	(ng/kg)		50.0 J	106 J	82.0 J	69.7 J	65.5 J	53.7 J
TCDD/TEQ Ratio	(%)		80	84	80	79	79	76

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL017	WL018	WL019	WL020	WL021	WL032
		SAMPLE ID	WL017D2P1	WL018D2P1	WL019D2P1	WL020D2P1	WL021D2P1	WL032D2P1
		DATE / TIME	10/12/97 / 14:10	10/12/97 / 14:18	10/12/97 / 14:30	10/12/97 / 15:20	10/12/97 / 15:33	02/19/98 / 10:20
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		92.4 J	94.2 J	37.1 J	418 J	204 J	125 J
TCDD/TEQ Ratio	(%)		78	80	81	91	85	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL033	WL034	WL035	WL036	WL037	WL038
		SAMPLE ID	WL033D2P1	WL034D2P1	WL035D2P1	WL036D2P1	WL037D2P1	WL038D2P1
		DATE / TIME	02/19/98 / 10:35	02/19/98 / 10:46	02/20/98 / 11:45	02/20/98 / 12:00	02/20/98 / 12:15	02/20/98 / 12:30
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		117 J	92.8 J	76.5 J	16.3 J	21.4 J	13.9 J
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL039	WL039	WL040	WL041	WL042	WL043
		SAMPLE ID	WL039D2P1	WL039D2D1	WL040D2P1	WL041D2P1	WL042D2P1	WL043D2P1
		DATE / TIME	02/20/98 / 16:15	02/20/98 / 16:15	02/20/98 / 16:00	02/20/98 / 15:30	02/20/98 / 15:45	02/20/98 / 16:30
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Duplicate 1	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		40.0 J	31.6 J	38.1 J	74.6 J	8.95 J	3.33 J
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL044	WL045	WL046	WL047	WL047	WL048
		SAMPLE ID	WL044D2P1	WL045D2P1	WL046D2P1	WL047D2P1	WL047D2D1	WL048D2P1
		DATE / TIME	02/20/98 / 12:45	02/20/98 / 13:00	02/20/98 / 13:15	06/05/98 / 14:15	06/05/98 / 14:15	06/05/98 / 14:20
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Duplicate 1	Primary
Total TEQ	(ng/kg)		24.8 J	21.5 J	104 J	228	209	176.748
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL049	WL050	WL051	WL052	WL053	WL054
		SAMPLE ID	WL049D2P1	WL050D2P1	WL051D2P1	WL052D2P1	WL053D2P1	WL054D2P1
		DATE / TIME	06/05/98 / 14:30	06/05/98 / 14:40	06/05/98 / 14:50	06/06/98 / 12:10	06/06/98 / 12:00	06/06/98 / 12:20
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		15.3	187.505	61.373	143.314	266.366	155.199
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL055	WL056	WL057	WL058	WL059	WL060
		SAMPLE ID	WL055D2P1	WL056D2P1	WL057D2P1	WL058D2P1	WL059D2P1	WL060D2P1
		DATE / TIME	06/06/98 / 12:25	06/06/98 / 12:30	06/06/98 / 12:45	06/06/98 / 12:50	06/06/98 / 13:05	06/06/98 / 13:15
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		216.709	16.4385	168.31	68.3694	58.6211	84.8183
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT		SITE	WL061	WL062	WL063	WL064	WL065	WL066
		SAMPLE ID	WL061D2P1	WL062D2P1	WL063D2P1	WL064D2P1	WL065D2P1	WL066D2P1
		DATE / TIME	06/06/98 / 17:30	06/06/98 / 13:30	06/06/98 / 17:20	06/06/98 / 17:15	06/06/98 / 16:50	06/06/98 / 16:30
		DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
		RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
Total TEQ	(ng/kg)		19.1556	67.2671	8.4793	274.5818	317.2193	141.5339
TCDD/TEQ Ratio	(%)		---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL RATIO UJ = estimated quantitation limit

CONSTITUENT (Units in ng/kg)	SITE	WL017	WL018	WL019	WL020	WL021	WL032
	SAMPLE ID	WL017D2P1	WL018D2P1	WL019D2P1	WL020D2P1	WL021D2P1	WL032D2P1
	DATE / TIME	10/12/97 / 14:10	10/12/97 / 14:18	10/12/97 / 14:30	10/12/97 / 15:20	10/12/97 / 15:33	02/19/98 / 10:20
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		71.8	75.3	30.1	379	174	100
1,2,3,7,8-PeCDD		3.9	4.3	1.5	8.3	7.1	5.1
1,2,3,4,7,8-HxCDD		7.8	7.7	2.4	11.1	11.1	6.6
1,2,3,6,7,8-HxCDD		17.6	17.9	5.6	25.8	25	23.5
1,2,3,7,8,9-HxCDD		18.8 J	20.9 J	7.3 J	25.1 J	26.9 J	22.0 J
1,2,3,4,6,7,8-HpCDD		477	480	150	598	623	593
1,2,3,4,6,7,8,9-OCDD		3950 J	1990 J	1350	4770	4710	4810 J
2,3,7,8-TCDF		10.2	9.7	3.3	107	39	13.2
1,2,3,7,8-PeCDF		1.5	1.3	0.63	3.4	1.9	1.8 J
2,3,4,7,8-PeCDF		1.8	1.6	0.8	3.8	2.3	1.8 J
1,2,3,4,7,8-HxCDF		6.8 J	7.5 J	1.9 J	14.8 J	11.1 J	8.9
1,2,3,6,7,8-HxCDF		5	4.5	1.5	10.4	6.5	6.0
2,3,4,6,7,8-HxCDF		5.5 J	5.2 J	2.5 J	6.5 J	5.4 J	11.2 J
1,2,3,7,8,9-HxCDF		0.6 U	0.47	0.3 U	0.89	0.6	0.65 J
1,2,3,4,6,7,8-HpCDF		142	133	45.4	181	170	135
1,2,3,4,7,8,9-HpCDF		7.8	8	2.4	11.7	10.6	9.4
1,2,3,4,6,7,8,9-OCDF		299 J	284 J	89.8	436	399	295 J
Total TCDD		77.9	81.7	42.2	414	192	115
Total PeCDD		15.5	17.8	10.1	46.6	33.2	30.9
Total HxCDD		158	162	59	225	209	187
Total HpCDD		948	939	312	1210	1200	1550
Total TCDF		48.4	48.7	22.4	286	104	54.4
Total PeCDF		67.1	74.9	31	236	173	90.0
Total HxCDF		147	138	47	241	197	177
Total HpCDF		391	390	123	540	500	397
Total TEQ		92.4 J	94.2 J	37.1 J	418 J	204 J	125 J

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U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

CONSTITUENT (Units in ng/kg)	SITE	WL033	WL034	WL035	WL036	WL037	WL038
	SAMPLE ID	WL033D2P1	WL034D2P1	WL035D2P1	WL036D2P1	WL037D2P1	WL038D2P1
	DATE / TIME	02/19/98 / 10:35	02/19/98 / 10:46	02/20/98 / 11:45	02/20/98 / 12:00	02/20/98 / 12:15	02/20/98 / 12:30
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		95.7	71.8	64.6	11.7	13.8	9.5
1,2,3,7,8-PeCDD		3.9 J	4.2 J	2.0 J	0.86 J	2.8 J	1.3 J
1,2,3,4,7,8-HxCDD		6.2	5.4	2.9 J	1.3 J	2.2 J	1.1 J
1,2,3,6,7,8-HxCDD		20.0	19.2	10.2	4.3 J	5.2	3.4 J
1,2,3,7,8,9-HxCDD		28.5 J	24.4 J	8.4 J	4.3 J	5.2 J	3.5 J
1,2,3,4,6,7,8-HpCDD		456	430	229	90.6	90.7	68.1
1,2,3,4,6,7,8,9-OCDD		4090 J	3710 J	1930 J	835 J	757	591 J
2,3,7,8-TCDF		9.6	8.5	3.8	1.0	2.5	1.5
1,2,3,7,8-PeCDF		2.3 J	1.5 J	0.84 J	0.35 J	2.7 J	1.1 J
2,3,4,7,8-PeCDF		1.8 J	2.3 J	1.2 J	0.70 J	2.3 J	1.1 J
1,2,3,4,7,8-HxCDF		7.1	6.9	5.0	2.4 J	3.6 J	1.6 J
1,2,3,6,7,8-HxCDF		4.6 J	6.1	3.0 J	1.2 J	2.9 J	1.4 J
2,3,4,6,7,8-HxCDF		8.4 J	11.3 J	5.9 J	2.5 J	3.5 J	1.9 J
1,2,3,7,8,9-HxCDF		0.3 U	0.44 J	2.1 J	0.1 U	4.0 J	1.8 J
1,2,3,4,6,7,8-HpCDF		112	126	74.1	28.8	29.1	19.9
1,2,3,4,7,8,9-HpCDF		6.0	7.0	0.1 U	1.8 J	3.3 J	1.7 J
1,2,3,4,6,7,8,9-OCDF		240 J	237 J	164 J	55.7 J	57.3	42.9 J
Total TCDD		107	96.8	78.4	18.0	18.7	19.2
Total PeCDD		18.4	34.0	7.2	8.9	3.6	4.4
Total HxCDD		172	160	76.4	43.7	32.7	23.7
Total HpCDD		839	830	462	189	182	138
Total TCDF		65.3	52.4	45.7	31.1	16.2	11.5
Total PeCDF		91.8	104	39.4	13.6	22.0	14.1
Total HxCDF		150	165	90.9	30.3	36.7	21.0
Total HpCDF		311	349	75.8	82.5	71.9	51.2
Total TEQ		117 J	92.8 J	75.5 J	16.3 J	21.4 J	13.9 J

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U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

CONSTITUENT (Units in ng/kg)	SITE	WL039	WL039	WL040	WL041	WL042	WL043
	SAMPLE ID	WL039D2P1	WL039D2D1	WL040D2P1	WL041D2P1	WL042D2P1	WL043D2P1
	DATE / TIME	02/20/98 / 16:15	02/20/98 / 16:15	02/20/98 / 16:00	02/20/98 / 15:30	02/20/98 / 15:45	02/20/98 / 16:30
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Duplicate 1	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		25.4	26.5	30.7	59.7	5.2	1.9
1,2,3,7,8-PeCDD		0.78 J	0.75 J	1.3 J	3.0 J	0.37 J	0.4 U
1,2,3,4,7,8-HxCDD		1.0 J	1.0 J	1.5 J	3.5 J	0.69 J	0.3 U
1,2,3,6,7,8-HxCDD		4.8 J	4.1 J	6.9	13.5	2.4 J	1.3 J
1,2,3,7,8,9-HxCDD		5.2 J	5.2 J	6.7 J	11.6 J	4.2 J	1.4 J
1,2,3,4,6,7,8-HpCDD		132	130	174	338	84.4	39.8
1,2,3,4,6,7,8,9-OCDD		1260	1270	1510	2800	1280	361
2,3,7,8-TCDF		2.4	2.4	3.1	7.8	0.88 J	0.68 J
1,2,3,7,8-PeCDF		0.36 J	0.42 J	0.44 J	0.69 J	0.17 J	0.3 U
2,3,4,7,8-PeCDF		0.53 J	0.3 U	0.59 J	1.1 J	0.29 J	0.3 U
1,2,3,4,7,8-HxCDF		1.7 J	1.5 J	2.7 J	4.9 J	0.79 J	0.73 J
1,2,3,6,7,8-HxCDF		1.2 J	1.1 J	1.6 J	3.7 J	0.63 J	0.55 J
2,3,4,6,7,8-HxCDF		2.3 J	1.9 J	3.1 J	6.8	1.0 J	0.72 J
1,2,3,7,8,9-HxCDF		0.08 U	0.4 U	0.17 J	0.25 J	0.07 U	0.3 U
1,2,3,4,6,7,8-HpCDF		38.4	34.9	47.9	106	18.8	11.6
1,2,3,4,7,8,9-HpCDF		1.2 J	1.1 J	2.2 J	5.1	0.77 J	0.3 U
1,2,3,4,6,7,8,9-OCDF		73.2	62.6	103	237	32.0	17.4
Total TCDD		36.7	34.9	54.1	79.6	7.6	2.8
Total PeCDD		4.2	4.3	7.1	21.2	1.9	0.97
Total HxCDD		41.1	42.5	58.1	106	25.2	10.1
Total HpCDD		271	267	345	690	166	75.8
Total TCDF		11.4	14.2	19.0	22.8	4.6	12.2
Total PeCDF		23.8	30.8	32.3	51.3	8.2	3.1
Total HxCDF		39.9	36.1	52.6	116	17.7	2.7
Total HpCDF		96.3	90.3	129	300	46.6	27.1
Total TEQ		40.0 J	31.6 J	38.1 J	74.6 J	8.95 J	3.33 J

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

Date: 08/20/98

CONSTITUENT (Units in ng/kg)	SITE	WL044	WL045	WL046	WL047	WL047	WL048
	SAMPLE ID	WL044D2P1	WL045D2P1	WL046D2P1	WL047D2P1	WL047D2D1	WL048D2P1
	DATE / TIME	02/20/98 / 12:45	02/20/98 / 13:00	02/20/98 / 13:15	06/05/98 / 14:15	06/05/98 / 14:15	06/05/98 / 14:20
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Duplicate 1	Primary
2,3,7,8-TCDD		14.6	12.6	89.3	189	173	138
1,2,3,7,8-PeCDD		1.3 J	2.2	2.3 J	7.6	8.89	6.93
1,2,3,4,7,8-HxCDD		2.1 J	2.1	3.8	13.3	13.9	11.8
1,2,3,6,7,8-HxCDD		8.0	6.1	14.8	44.6	38.1	37.2
1,2,3,7,8,9-HxCDD		10.6 J	9.6	10.8 J	54.2	51.2	52.6
1,2,3,4,6,7,8-HpCDD		242	161	381	796	741	8.61
1,2,3,4,6,7,8,9-OCDD		3180 J	1920 J	3070 J	6376	6284	7808
2,3,7,8-TCDF		2.3	2.1	6.3	19.6	16.8	14.1
1,2,3,7,8-PeCDF		0.33 J	1.6 J	0.77 J	1.24	2.53	1.23
2,3,4,7,8-PeCDF		0.62 J	1.4 J	1.1 J	2.46	1.5	3.67
1,2,3,4,7,8-HxCDF		2.3 J	2.6 J	4.9 J	15.1	14.3	12.4
1,2,3,6,7,8-HxCDF		1.7 J	2.1 J	3.6 J	9.36	9.46	8.85
2,3,4,6,7,8-HxCDF		3.1 J	3.0 J	6.5	8.14	11.1	8.17
1,2,3,7,8,9-HxCDF		0.24 J	2.9 J	0.2 U	<2.5	<2.5	<2.5
1,2,3,4,6,7,8-HpCDF		47.2	32.7	108	227	232	194
1,2,3,4,7,8,9-HpCDF		2.4 J	2.5 J	4.7 J	8.8	10.6	8.11
1,2,3,4,6,7,8,9-OCDF		90.0 J	69.6 J	242 J	452	421	435
Total TCDD		19.4	14.3	94.9	199	<1	138
Total PeCDD		6.3	3.9	6.6	42.7	<1	38.5
Total HxCDD		63.5	49.0	98.1	329	<2.5	327
Total HpCDD		454	317	771	1580	<2.5	1890
Total TCDF		28.6	15.1	32.6	66.4	<1	47.8
Total PeCDF		22.0	17.3	48.5	208	<1	154
Total HxCDF		52.6	38.7	88.4	258	<2.5	265
Total HpCDF		129	87.1	309	499	<2.5	455
Total TEQ		24.8 J	21.5 J	104 J	228	209	176.748

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

CONSTITUENT (Units in ng/kg)	SITE	WL049	WL050	WL051	WL052	WL053	WL054
	SAMPLE ID	WL049D2P1	WL050D2P1	WL051D2P1	WL052D2P1	WL053D2P1	WL054D2P1
	DATE / TIME	06/05/98 / 14:30	06/05/98 / 14:40	06/05/98 / 14:50	06/06/98 / 12:10	06/06/98 / 12:00	06/06/98 / 12:20
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		6.04	150	46.5	122	223	125
1,2,3,7,8-PeCDD		<1	8.98	3.77	5.11	9.98	9.33
1,2,3,4,7,8-HxCDD		<2.5	13.9	4.43	7.33	18.8	12.1
1,2,3,6,7,8-HxCDD		4.78	42.5	12.6	18.6	41.6	29.1
1,2,3,7,8,9-HxCDD		26.4	55.2	30.1	33.7	52.5	48.2
1,2,3,4,6,7,8-HpCDD		244	1020	334	478	745	693
1,2,3,4,6,7,8,9-OCDD		3386	8262	3410	4588	9062	7059
2,3,7,8-TCDF		<1	14.1	3.33	8.24	17.7	13.9
1,2,3,7,8-PeCDF		<1	1.25	1.78	1.52	2.72	1.77
2,3,4,7,8-PeCDF		<1	3.49	2.65	2.27	4.08	2.94
1,2,3,4,7,8-HxCDF		<2.5	13.4	6.2	7.28	16.5	11.3
1,2,3,6,7,8-HxCDF		<2.5	9.02	3.91	6.32	11.5	7.32
2,3,4,6,7,8-HxCDF		<2.5	8.48	4.72	5.67	10.5	6.73
1,2,3,7,8,9-HxCDF		<2.5	<2.5	3.09	(2.16)	<2.5	<2.5
1,2,3,4,6,7,8-HpCDF		21.6	264	54.1	93.6	228	153
1,2,3,4,7,8,9-HpCDF		<2.5	13.3	3.38	5.16	12.4	9.47
1,2,3,4,6,7,8,9-OCDF		56.2	612	114	210	376	343
Total TCDD		6.04	159	50.9	122	223	130
Total PeCDD		6.91	48	22.2	36	53.5	38
Total HxCDD		66.9	326	125	172	354	250
Total HpCDD		425	2080	625	893	1390	1300
Total TCDF		<1	52.2	6.9	9.87	60.5	39
Total PeCDF		8.6	156	44.1	87.2	251	85.1
Total HxCDF		16.1	301	53.1	126	304	185
Total HpCDF		48.9	558	119	218	550	354
Total TEQ		15.3	187.505	61.373	143.314	266.366	155.199

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed
( ) = Less than Reporting Limit
U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

CONSTITUENT (Units in ng/kg)	SITE	WL055	WL056	WL057	WL058	WL059	WL060
	SAMPLE ID	WL055D2P1	WL056D2P1	WL057D2P1	WL058D2P1	WL059D2P1	WL060D2P1
	DATE / TIME	06/06/98 / 12:25	06/06/98 / 12:30	06/06/98 / 12:45	06/06/98 / 12:50	06/06/98 / 13:05	06/06/98 / 13:15
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		175	9.46	134	54.4	45.4	66.5
1,2,3,7,8-PeCDD		8.01	1.23	6.5	2.73	3.17	3.68
1,2,3,4,7,8-HxCDD		15.3	<2.5	11.4	4.59	3.65	5.96
1,2,3,6,7,8-HxCDD		39.7	5.65	30.7	12	11.6	15.2
1,2,3,7,8,9-HxCDD		46.9	17.6	42.8	21.1	23.8	25.3
1,2,3,4,6,7,8-HpCDD		933	176	771	294	287	395
1,2,3,4,6,7,8,9-OCDD		7990	1790	6610	2660	2520	3610
2,3,7,8-TCDF		16.4	1.13	12.8	5.74	3.26	6.16
1,2,3,7,8-PeCDF		2.39	<1	2.02	<1	<1	1.08
2,3,4,7,8-PeCDF		2.83	<1	2.27	1.14	<1	1.58
1,2,3,4,7,8-HxCDF		13	<2.5	11	4.02	3.86	5.37
1,2,3,6,7,8-HxCDF		9.34	<2.5	7.44	2.72	2.6	3.62
2,3,4,6,7,8-HxCDF		13.9	<2.5	11.8	4.74	4.57	6.07
1,2,3,7,8,9-HxCDF		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
1,2,3,4,6,7,8-HpCDF		246	26.4	197	67.8	66.6	92
1,2,3,4,7,8,9-HpCDF		14.8	<2.5	10.2	3.94	3.51	5.05
1,2,3,4,6,7,8,9-OCDF		567	57.5	433	158	137	203
Total TCDD		187	11.9	145	60.7	56.5	78.1
Total PeCDD		70.7	4.31	64.1	25.9	39.5	39.4
Total HxCDD		346	67.4	277	117	128	158
Total HpCDD		1710	320	1410	537	504	720
Total TCDF		50.5	7.26	35.6	21.2	17.2	27.5
Total PeCDF		196	15.7	154	58.7	56.5	77.2
Total HxCDF		266	33.3	215	83.4	80.5	104
Total HpCDF		266	72.7	516	185	173	247
Total TEQ		216.709	16.4385	168.31	68.3694	58.6211	84.8183

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U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

Date: 08/20/98

CONSTITUENT (Units in ng/kg)	SITE	WL061	WL062	WL063	WL064	WL065	WL066
	SAMPLE ID	WL061D2P1	WL062D2P1	WL063D2P1	WL064D2P1	WL065D2P1	WL066D2P1
	DATE / TIME	06/06/98 / 17:30	06/06/98 / 13:30	06/06/98 / 17:20	06/06/98 / 17:15	06/06/98 / 16:50	06/06/98 / 16:30
	DEPTH (ft)	0.00	0.00	0.00	0.00	0.00	0.00
	RESULT TYPE	Primary	Primary	Primary	Primary	Primary	Primary
2,3,7,8-TCDD		14.3	53.7	6.24	246	278	116
1,2,3,7,8-PeCDD		<1	2.34	<1	6.57	8.11	5.24
1,2,3,4,7,8-HxCDD		<2.5	3.68	<2.5	9.58	13.3	8.64
1,2,3,6,7,8-HxCDD		4.48	11.8	<2.5	25.4	35.9	24.2
1,2,3,7,8,9-HxCDD		14.3	28.8	7.56	32.9	42.9	33.8
1,2,3,4,6,7,8-HpCDD		130	310	64.3	569	836	562
1,2,3,4,6,7,8,9-OCDD		1270	2530	607	4580	7110	4510
2,3,7,8-TCDF		1.32	3.95	<1	21.5	26.6	7.22
1,2,3,7,8-PeCDF		<1	<1	<1	1.56	1.995	1.09
2,3,4,7,8-PeCDF		<1	<1	<1	2.26	2.69	1.7
1,2,3,4,7,8-HxCDF		<2.5	3.84	<2.5	9.43	12.5	8.37
1,2,3,6,7,8-HxCDF		<2.5	<2.5	<2.5	5.98	7.91	5.83
2,3,4,6,7,8-HxCDF		<2.5	3.99	<2.5	9.88	12.8	9.05
1,2,3,7,8,9-HxCDF		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
1,2,3,4,6,7,8-HpCDF		20.7	62.2	10.8	149	219	156
1,2,3,4,7,8,9-HpCDF		<2.5	3.51	<2.5	8.47	12.2	7.74
1,2,3,4,6,7,8,9-OCDF		41.6	132	19.3	312	469	328
Total TCDD		17.6	60.5	8.64	260	293	135
Total PeCDD		12	24.6	6.27	52.4	64.5	70
Total HxCDD		63.9	131	35.6	231	323	236
Total HpCDD		230	550	109	1060	1560	1050
Total TCDF		5.67	18.1	6.06	82.6	82	37.4
Total PeCDF		15.9	41	9.91	159	189	101
Total HxCDF		25.8	53.2	13.2	183	243	175
Total HpCDF		54.2	172	26.9	400	596	417
Total TEQ		19.1556	67.2671	8.4793	274.5818	317.2193	141.5339

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U = non-detect, J = estimated, For RCL DIOX UJ = estimated quantitation limit

ATTACHMENT D

GLOSSARY

GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
GPS	global positioning system
HLA	Harding Lawson Associates
HO	herbicide orange
ppt	parts per trillion
TCDD	tetrachlorodibenzo-p-dioxin
TEQ	toxicity equivalent
USEPA	U.S. Environmental Protection Agency

ATTACHMENT E

REFERENCES

REFERENCES

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Harding Lawson Associates. 1998. Surface Water and Sediment Delineation Report. Prepared for SOUTHNAVFACENGCOM, North Charleston, South Carolina.

Soil Conservation Service. 1975. Soil Survey of Harrison County, Mississippi. United States Department of Agriculture Soil Conservation Service and Forest Service. June.