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SOURCE REMOVAL FOR EXCAVATION OF POLYAROMATIC HYDROCARBON CONTAMINATED SOIL FROM DRAINAGE DITCH ADJACENT TO PARADE FIELD NCBC GULFPORT MS

7/1/2000

CH2M HILL

SOURCE REMOVAL REPORT FOR THE EXCAVATION OF PCB CONTAMINATED SOIL FROM THE DRAINAGE DITCH ADJACENT TO THE PARADE FIELD

NAVAL CONSTRUCTION BATTALION CENTER GULFPORT GULFPORT, MISSISSIPPI

Revision No. 00

Unit Identification Code: N62604

Contract Task Order No. 0008
Contract No. N62467-98-D-0995

July 2000

Prepared by

CH2MHILL
Constructors, Inc.

115 Perimeter Center Place, N.E.

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Atlanta, GA 30346

Submitted to

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

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Art Conrad, Code 1865, Remedial Project Manager

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Source Removal Report
Excavation of PCB Contaminated Soil from the Drainage Ditch Adjacent to the Parade Field

Naval construction Battalion Center Gulfport
Gulfport, Mississippi

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July 2000

Prepared/Approved By:

Charles Radford, Project Manager _____ Date _____

Approved By:

R. Scott Newman, Program Manager _____ Date _____

Client Acceptance:

U.S. Navy Responsible Authority _____ Date _____

CERTIFICATION OF TECHNICAL DATA CONFORMITY (July 2000)

The contractor, CH2M HILL Constructors, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0002 are complete and accurate and comply with all requirements of this contract.

DATE: 7-6-00

NAME AND TITLE OF CERTIFYING OFFICIAL: Charles A. Radford

Charles A. Radford
Project Manager

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GLOSSARY

µg/L	micrograms per liter
ABB	ABB Environmental Services, Inc. (ABB became Harding Lawson Associates in August, 1998)
AECS	American Environmental Construction Services
bls	below land surface
BRAC	Base Realignment and Closure
CCI	CH2M HILL Constructors, Inc.
CFR	Code of Federal Regulations
COTR	Contracting Officer Technical Representative
CQC	Construction Quality Control
CTO	Contract Task Order
EPA	U.S. Environmental Protection Agency
GAC	granular activated carbon
HxCDF	Hexachlorinated-dibenzo-furan
IWS	Industrial Water Services
mg/kg	milligrams per kilogram
µg/L	Micrograms per liter
NAVFAC	Naval Facilities Engineering Command
NCBC	Naval Construction Batallion Center
OCPE	octachlorinated-biphenyl-ether
PCB	polychlorinated biphenyl
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
POTW	Publicly owned treatment works
QA/QC	quality assurance/quality control
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFB	Request for Bids
RFI	RCRA Facility Investigation
ROICC	Resident Officer in Charge of Construction
SCTL	soil cleanup target level
SVOC	semi-volatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act
TSS	total suspended solids
VOC	volatile organic compound

1.0 INTRODUCTION

CH2M HILL Constructors, Inc. (CCI) has been contracted by the Department of the Navy, Southern Division, Naval Facilities Engineering Command (Southern Division, NAVFAC), to prepare this Source Removal Report for work performed by CCI at Naval Construction Batallion Center (NCBC) Gulfport in Gulfport, Mississippi. This work was performed under Contract No. N62467-98-D-0995, Contract Task Order (CTO) No. 0008, and in accordance with the following documents:

- Management approach outlined in the CCI *Contract Management Plan* (July 1998)
- CCI *Basewide Work Plan* (May 1999)
- CCI *Work Plan Addendum* (April 1999)
- ABB Environmental Services, Inc. PCB Investigation Adjacent to the Parade Field *(October 1997)*

The objective of this report is to provide documentation of the source removal activities for the remediation of polychlorinated biphenyl (PCB) contaminated soil from the drainage ditch adjacent to the Parade Field at NCBC Gulfport.

This Source Removal Report is organized into seven sections of text as follows:

Section 1.0 Introduction includes a summary of the scope of the project, site setting, regulatory framework, and the remedial action objectives for the work.

Section 2.0 Significant Events includes a discussion of the chronology of events and problems encountered during the work.

Section 3.0 Performance Standards and Construction Quality Control includes the quality controls implemented during the work.

Section 4.0 Remedial Action Activities provides a summary of the activities undertaken during the performance of the work.

Section 5.0 Final Inspections documents the pre-final and final inspections performed in completing the work.

Section 6.0 Conclusions and Recommendations provides information on any conclusions and recommendations drawn by CCI during the performance of the work.

Section 7.0 References lists the references used in completing the work at the drainage ditch adjacent to the Field Parade.

The following support information is presented as appendices to this Source Removal Report:

- Appendix A Soil Analytical Data
- Appendix B Water Analytical Data
- Appendix C Transportation and Disposal Documentation
- Appendix D Permits and Approvals
- Appendix E Project Progress Photographs

1.1 PROJECT SCOPE. In a Cost Proposal dated March, 1999, CCI proposed to Southern Division, NAVFAC to perform the following activities at the drainage ditch adjacent to the Parade Field at NCBC Gulfport:

- Excavation, including off-site disposal, of PCB-contaminated ditch sediments from the ditch adjacent to the Parade Field.
- Containment and off-site disposal of accumulated contact water .
- Backfill of the excavated area, and site restoration.

1.2 SITE BACKGROUND. During an onsite Phase I dioxin delineation study, sample results obtained from the drainage ditch adjacent to the Parade Field indicated elevated levels of dioxins and furans, particularly hexachlorinated-dibenzo-furans (HxCDFs.) During further investigation, it was suspected that the HxCDFs were due to octachlorinated-biphenyl-ethers (OCPEs), which are suspected to have been introduced into the ditch from a transformer oil spill. Two samples originally collected during the Phase I field investigation were extracted and analyzed for PCBs. The results of these samples identified the presence of Aroclor-1260 (an indicator of electrical transformer oil) at levels of 180 and 120 parts per million (ppm) total PCB concentration.

Based on these results, a plan was prepared to assess the extent of the contamination and in July 1997 , field screening activities were initiated by ABB Environmental Services, Inc. (ABB). Field screening procedures were conducted, and a total of 10 sediment samples were collected and analyzed for PCBs. The results of the laboratory analysis identified the areal extent of the contamination to be 100 feet long by the width of the ditch, approximately 10 feet, based on a cleanup level of 1 ppm as determined by ABB. The depth of the contamination was determined to be generally less than 1.5 feet deep, with one area near the foot bridge estimated to be 3 feet deep. The maximum level of PCB contamination measured from this sampling event was 140 ppm. The laboratory analytical results of this sampling event are presented in Figure 1-1. The Investigation Report (prepared by ABB Environmental Services, Inc., October 1997) summarized the results of the investigation and provided recommendations for soil removal strategies.

1.3 REMEDIAL ACTION OBJECTIVES. As stipulated in the ABB investigation report, the Toxic Substances Control Act (TSCA) standards set forth in TSCA Verification of PCB Spill Cleanup, United States Environmental Protection Agency (USEPA) (1985 and 1986) specify a soil cleanup target level (SCTL) of 1 ppm for soils and sediments. Based on the horizontal and vertical extent of PCB contamination identified in the ditch adjacent to the Parade Field, the removal of approximately 80 cubic yards (120 tons) of ditch sediment and soil would be required to achieve the cleanup level of 1 ppm.

Institutional controls were installed and maintained to prevent the public from entering the contaminated area during the remedial activities. Excavating soils from the invert of the ditch required that water flowing through the ditch be diverted during construction, and that a coffer dam and by-pass pumping system be installed to divert ditch water from entering the open excavation. Groundwater or stormwater that contacted the contaminated soil would be collected, treated to below discharge standards, and analyzed prior to discharge.

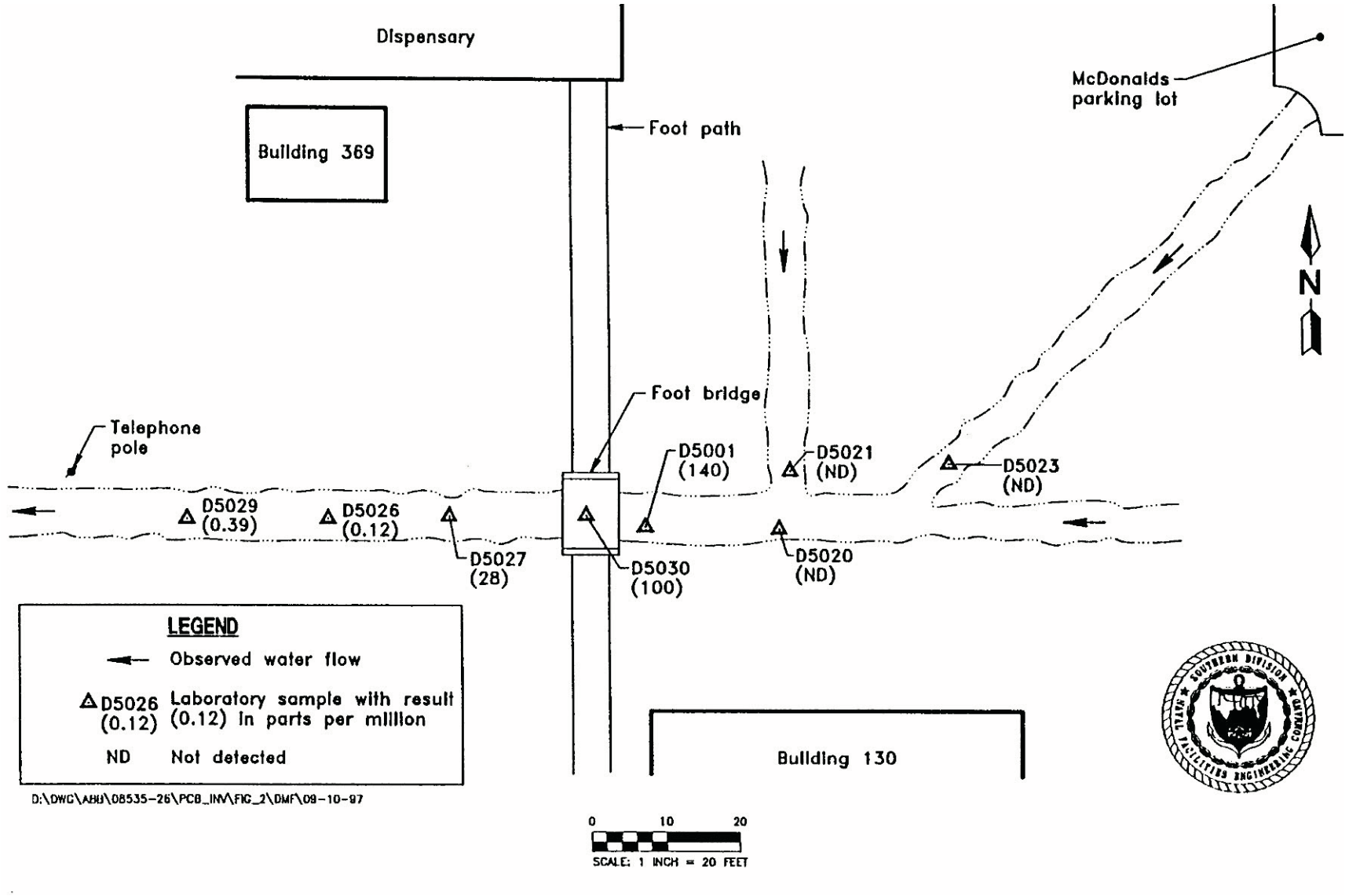

Figure 1-1
Laboratory PCB Results
PCB Investigation Adjacent to Parade Field
Naval Construction Battalion Center, Gulfport, Mississippi

2.0 SIGNIFICANT EVENTS

The following sections provide a timeline of major events and describes any problems encountered during performance of the work.

2.1 CHRONOLOGY OF EVENTS. The chronology of events for the remediation activities is presented in Table 2-1. A detailed description of these activities is presented in Section 4.0 of this report.

2.2 PROBLEMS ENCOUNTERED

2.2.1 Levels of PCB Contamination. During the site investigation performed by ABB (October 1997) PCBs in the drainage ditch were recorded at levels up to 140 ppm. However, after the initial excavation of the ditch soils to the proposed limits specified in the Site Investigation Report, post-excavation analytical results identified soils containing PCBs at levels up to 1,260 ppm.

An additional 1.5-foot layer of soil was removed in the area with remaining contamination, and the section was re-sampled. Results of this post excavation sampling identified PCB contamination at levels up to 16,300 ppm. Based on these two rounds of sample results, which identified increasingly higher levels of contamination, the excavation activities were temporarily suspended and a soil sampling program using direct push technology was initiated to identify the levels of contamination and the actual areal extent of the contaminated soil. The results of the direct push sampling event showed that although PCB contamination existed at depths up to 22 feet below land surface (bls), the PCB concentration levels declined significantly as the depth increased.

2.2.2 Field PCB Sampling and Screening. The Work Plan and Sampling and Analysis Plan included provisions to perform real-time immunoassay PCB screening at the project site. The objective of this testing procedure was to analyze post-excavation sidewall soil to determine if the levels of contamination at the limits of excavation were below the specified cleanup levels, allowing decisions regarding additional excavation to be made in the field rather than waiting for the results of laboratory analysis.

The analytical results of the immunoassay testing indicated that the soil was below the cleanup action levels (1 ppm); however, confirmatory laboratory analytical results showed that areas existed where contamination remained above the action levels. An accurate correlation between the field testing and laboratory analytical results was not established, and the field testing was discontinued.

2.2.3 Accumulation of Contact Water. Based on the anticipated levels of contamination and quantity of excavation, it was estimated that approximately 2,300 gallons of stormwater or groundwater would require containment and disposal. As the actual level of contamination and quantity of contaminated soil increased, the duration of the work was extended into a period when a weather pattern of severe thunderstorms and heavy rains moved through the Gulfport area. As a result, the quantity of contact water generated increased to approximately 120,000 gallons.

TABLE 2-1
Chronology of Events

Event	Date
CCI Request for Bids	March 11, 1999
CCI Pre-Bid Meeting	March 16, 1999
Bids Received	March 30, 1999
Issuance of Funding Authorization by Southern Division, NAVFAC	May 21, 1999
Subcontractor Work Plan Submittals	June 4, 1999
Subcontractor Work Plan Review, Revision, Re-submittal, and Approval	June 4 – July 9, 1999
Subcontract Award	July 9, 1999
Pre-Construction Conference	August 9 , 1999
Mobilization for Construction	August 9, 1999
Initial Excavation of Contaminated Ditch Soils	August 10 – August 13, 1999
Second Phase of Contaminated Soil Excavation	August 18 – 20, 1999
Field Investigation Sampling to Determine Actual Depth of Contamination (DPT Sampling)	August 29 – September 2, 1999
Third Phase of Contaminated Soil Excavation	September 14 – 16, 1999
Backfill and Ditch Restoration	September 16
Collection and Containerization of Contact Water During All Phases of Excavation	August 10 – September 16, 1999
Initial Phase of Water Treatment	October 4 – 21, 1999
Water Treatment System Design and Treatability Study	October 21 – November 10, 1999
Procurement and Installation of Modified Water Treatment System	November 17 – December 4, 1999
Second Phase of Water Treatment	December 4, 1999 – January 18, 2000
Transport and Dispose of Containerized Soil	February 28 – March 2, 2000
Final Site Restoration and Inspection	February 28 – March 2, 2000
Demobilization	March 3, 2000

2.2.4 Onsite Water Treatment. As discussed, because of the increased volume of contact water and the PCB concentrations in this water (up to 40 µg/L), an onsite water treatment system was installed to treat the water to meet the unrestricted discharge cleanup levels of 0.5 µg/L. The treated water was then discharged to the Harrison County Publicly Owned Treatment Works (POTW). Because this POTW does not have the capability to treat/remove PCB contamination, it was determined that the water would have to meet the 0.5 µg/L cleanup levels prior to discharge. The system design (sand and bag filtration, and carbon adsorption) was based on using components which had been used on similar projects; however, after two unsuccessful attempts of treating the water, it was determined that modifications to the system were required to achieve the cleanup standard. Laboratory analysis of the treated water revealed that colloidal clay silts suspended in the water were

submicron in size and could neither be trapped by the filtration components nor adsorbed by the activated carbon.

Industrial water treatment systems routinely use specialty polymers to remove total suspended solids (TSS) through a process of flocculation and coagulation. The electrostatic surface charge of the clay silt particles causes the particles to repel and remain indefinitely in suspension. The polymer reagent has an affinity for the clay silt particles, and, when blended into the water, causes the clay silt and fall out of suspension .

A field bench-scale treatability study was conducted during which various polymers were tested for their ability to remove the TSS from the water, and the reagent that proved most successful at coagulating the silt was selected for use. The additional components required for the flocculation process were added to the existing system, and treatment of the water using this process proved successful at removing the PCB contaminated silt to below the treatment standard of 0.5 µg/L for unrestricted discharge.

Eight frac tanks containing the contaminated water were treated. Following treatment, and all but the last two tanks were found to be below the 0.5 µg/L treatment standard. PCBs were present in the contents of the last two batches at 2.1 and 1.6 µg/L respectively, which, while not meeting the unrestricted discharge criteria of 0.5 µg/L, did meet the standard for disposal at properly permitted industrial water treatment facility designed to treat/remove PCB contamination. Therefore, a total of 24,900 gallons of treated water from the last two tanks were transported and disposed at Industrial Water Services, (IWS) Mobile, Alabama .

2.2.5 Residual Contamination. The second phase of excavation was terminated at a depth of 3-feet and 4.5 feet, respectively, (approximately 9 feet bls) below the original invert elevation of the ditch. At the 9-foot depth, groundwater was encountered and the ditch sidewall soils were sloughing off into the ditch. Before beginning the third and final phase of excavation, it was decided that the excavation would extend only to a depth of approximately 10 feet and 14.5 feet, respectively, bls. Material was removed to these depths, and soil samples were obtained from the bottom of the excavation. Laboratory analysis of these post-excavation confirmation samples revealed the presence of residual PCB contamination at levels above the SCTLs at three sample locations . The location of the areas of residual contamination is shown on Figure 4-7.

Evaluation of further remedial efforts of this small area of contamination was not included in the scope of this project and will be conducted separately.

3.0 PERFORMANCE STANDARDS AND CONSTRUCTION QUALITY CONTROL

The performance standards for the removal of PCB contaminated soil from the drainage ditch are described in detail in the NCBC Gulfport Basewide Work Plan (CCI, May 1999) and the Work Plan Addendum No. 01 (April 1999).

The objective of the work was to remediate PCB contaminated soils and ditch sediments from the drainage ditch located adjacent to the Parade Field, in accordance with the recommendations of the investigation report dated October 5, 1997, prepared by ABB. This work involved the excavation and offsite disposal of PCB contaminated soils and sediments. Field sampling during the work was conducted by CCI and CCI's subcontractor, American Environmental Construction Services (AECS). Laboratory analysis was performed by Accutest Laboratory, Orlando, Florida, and Severn Trent Laboratories, Inc., Pensacola, Florida.

The following quality controls were implemented during the course of the project and are described in detail in this section:

- Field observation
- Excavation control
- Confirmation sampling and analysis

3.1 FIELD OBSERVATION. CCI's site superintendent and construction quality assurance officer provided oversight of all field operations throughout the course of the project. Detailed records of subcontractor activities were maintained in field log books and site field records, including daily Contractor Production Reports and Contractor Quality Control Reports completed by CCI and its subcontractors. In addition, photographs of all site activities were collected throughout the project. Representative photographs documenting the work are included in Appendix E.

3.2 EXCAVATION CONTROL. The areal extent of the proposed soil excavation was determined based on information provided in the ABB investigation report (October 1997). Dimensions of the excavation were scaled from the drawings and were laid out in the field by measuring in the upstream and downstream direction, using the existing foot bridge as the reference point. The proposed 10-foot width of the excavation was measured in the transverse direction along the invert and sideslopes of the ditch.

During excavation, the actual depths were monitored and measured by CCI field personnel as the excavation progressed. When the proposed limits of excavation for each phase was reached, excavation was terminated and confirmation soil samples were taken.

3.3 CONFIRMATION SAMPLING AND ANALYSIS. In accordance with the CCI workplan and Request for Bids (RFB), the areal extent of the contaminated soil was initially determined based on field analysis using immunoassay field test kits. These test kits were calibrated for the anticipated range of levels of contamination expected to be encountered. Field samples were collected and properly containerized, and the analysis was performed at NCBC Gulfport.

In accordance with TSCA requirements specified in 40 CFR 761, Subpart O, the soil sampling frequency was laid out on 1.5-meter intervals in each direction. At each 1.5-meter longitudinal interval along the 100-foot excavation area, samples were taken from the bottom of the excavation at the left, center, and right edges of the 10-foot wide excavated area, and composited for analysis. During the initial phase of excavation, the soil sample material was split and one part was used for the field immunoassay testing, and the other part was analyzed in the offsite laboratory. Because the results of the immunoassay analysis were deemed unreliable, the immunoassay testing procedure was not used during the subsequent phases of excavation, and laboratory analysis was used to determine the limits of contamination.

4.0 REMEDIAL ACTION ACTIVITIES

4.1 REMEDIAL ACTION PARTICIPANTS. The remedial action participants and their respective responsibilities for this project are shown on Figure 4-1.

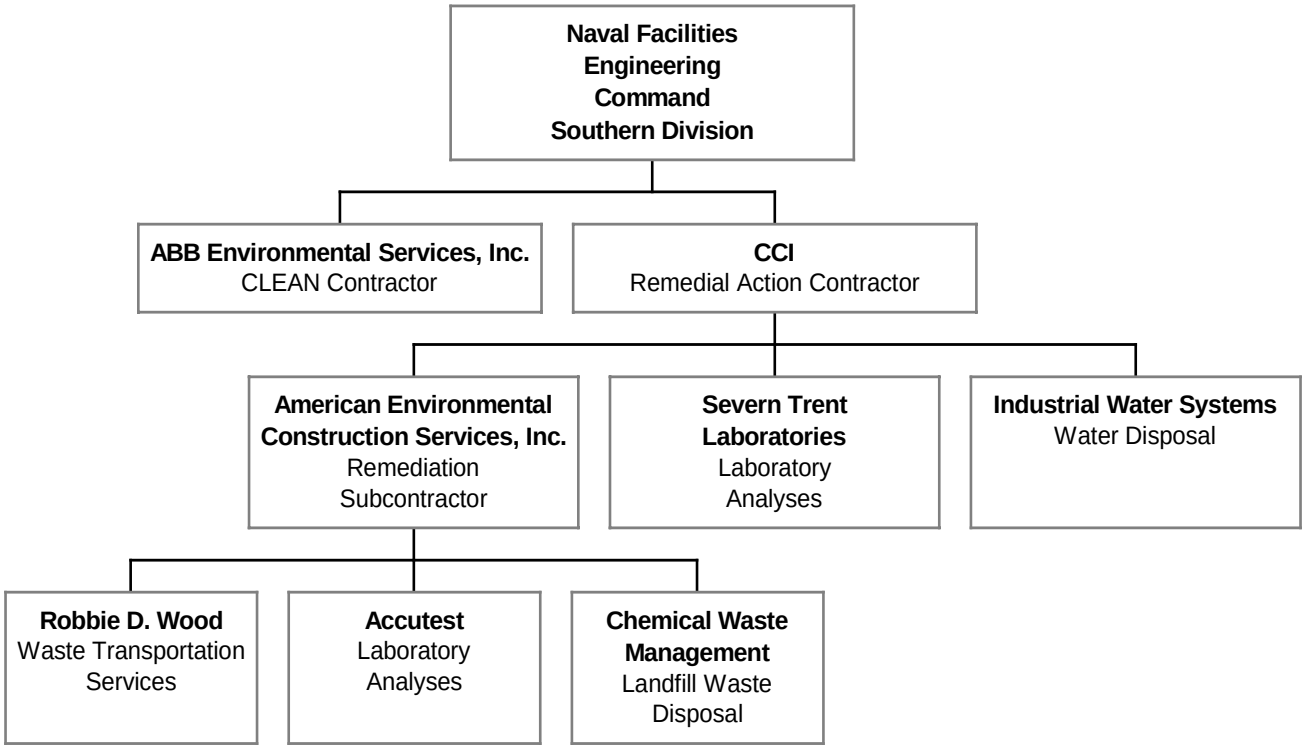

Figure 4-1
Project Organization

4.2 SUMMARY OF REMEDIAL ACTION ACTIVITIES. The following sections describe the construction activities and schedule, confirmation sampling, waste characterization and disposal, and site restoration activities associated with the soil removal operations. The major construction activities and a chronology of events are provided in Section 2.0.

4.2.1 Mobilization and Pre-Construction Activities. CCI and subcontractor personnel mobilized to NCBC Gulfport on August 9, 1999. A pre-construction conference was conducted and was attended by representatives from the Resident Officer in Charge of Construction (ROICC) office, NCBC Gulfport, CCI, and subcontractors. During the meeting, the remedial objectives of the project were outlined, and the methods and procedures to be implemented during performance of the work were reviewed.

Temporary field support facilities to support the construction activities were installed and construction fencing was placed around the perimeter of the work zone. The horizontal limits of the proposed excavation were determined and laid out based on dimensions scaled from Figure 1 in the ABB report. The sampling grid for the initial excavation limits is presented in Figure 4-2. Excavation equipment , by-pass pumping system components, roll-off containers, and soil drying reagent were delivered to the site and staged.

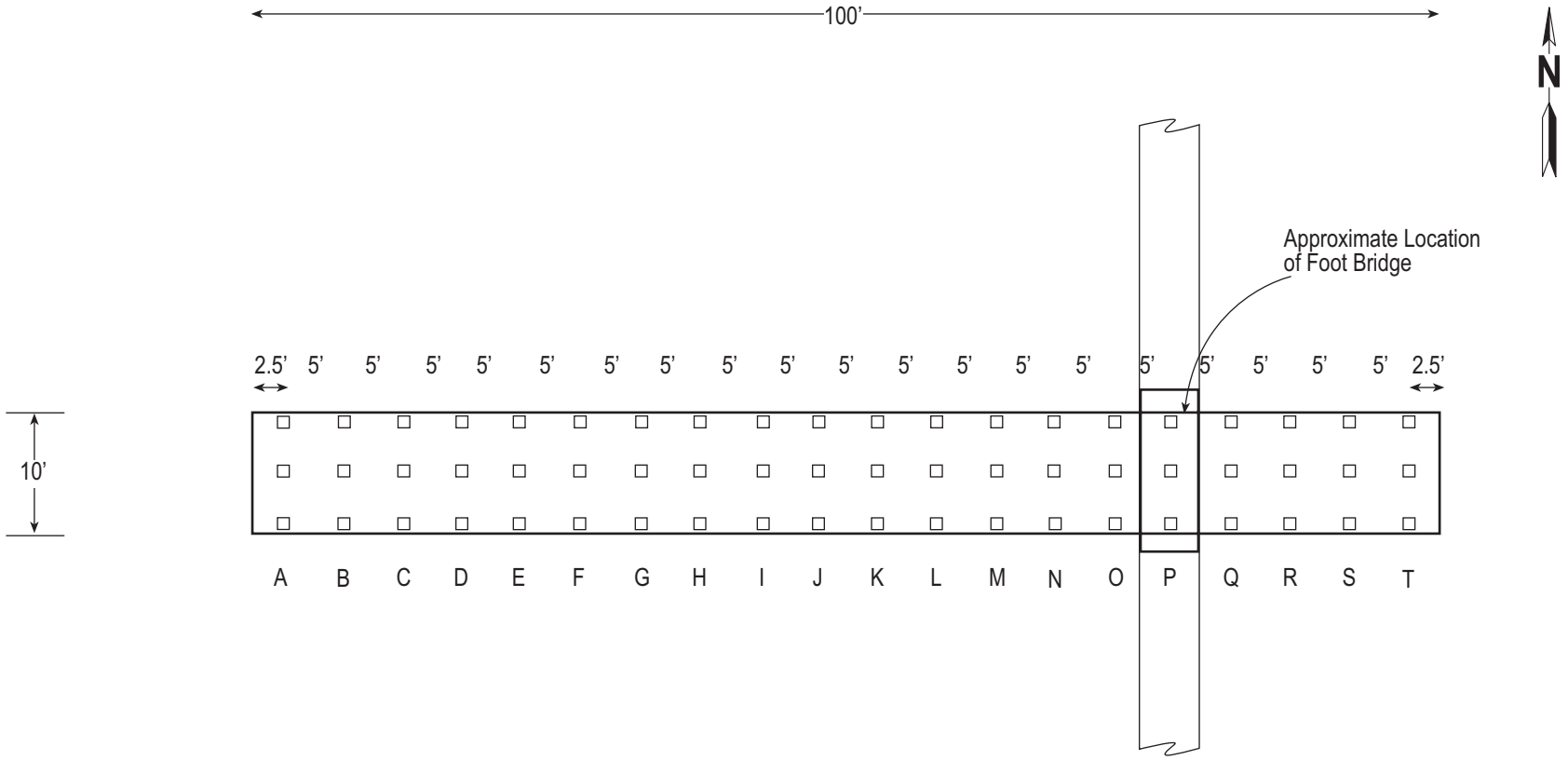

Figure 4-2
Post Excavation (Initial Phase) Soil Sampling Locations
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

4.2.2 Initial Soil Excavation. Prior to excavation activities, earthen coffer dams were installed upstream and downstream of the excavation zone to prevent ditch water from entering the area of excavation. The coffer dams were constructed of imported fill material, placed and compacted to the elevation of the top of the ditch. Heavy rain on the afternoon of August 10 caused the water level in the ditch to rise to the top level of the upstream coffer dam. The bypass pumping system was not of sufficient capacity to handle the flow of water encountered, and to prevent flooding of the ditch, the coffer dams were removed. The following day, the coffer dams were reinstalled and the bypass pumping system was supplemented with an additional 6-inch pump. Following thunderstorms and heavy rain the bypass pumping operations were activated and pumping and containment of contact water initiated. It was apparent that the volume of contact water generated by the intense rainfall would exceed the capacity of the 1,500-gallon contact water storage tank and a 20,000-gallon trailer-mounted frac tank was delivered to the site and staged for water storage.

Excavation of the ditch soil was performed to the areal extent described in the work plan, i.e., 100 feet long by 10 feet wide by 1.5 deep, and 3.0 feet deep. The limits of the initial excavation are shown on Figure 4-3. The excavated soil was saturated with water, and in order to meet the landfill disposal facility maximum moisture requirements, vermiculite oil-dry was mixed into the soil until the blended material passed the Paint Filter Liquids Test, Method 9095, SW-846. A ratio of approximately 5 percent (by weight) of vermiculite was used to reduce the moisture content to the desired level.

Heavy rainfall each day during this phase of excavation contributed to the accumulation of additional contact water. In order to prevent flooding over the top of the upstream coffer dam into the excavation area, an additional 6-inch pump was added to the bypass pumping and contact water collection systems.

The laboratory analytical confirmation results, summarized in Table 4-1, revealed that residual PCB contamination was present at concentrations above the action levels in a number of locations in the ditch at levels up to 1,240 ppm (sample S).

TABLE 4-1
Soil Sampling Analytical Results, Initial Phase

Sample Identifier	PCB Concentration (ppm)	Sample Identifier	PCB Concentration (ppm)
A	0.27	K	2.8
B	ND	L	1.8
C	ND	M	0.12
D	ND	N	15.8
E	0.27	O	44.1
F	ND	P	345
G	ND	Q	212.0
H	0.78	R	734
I	3.7	S	1,240
J	0.6	T	400

ND – non-detectable
ppm – parts per million

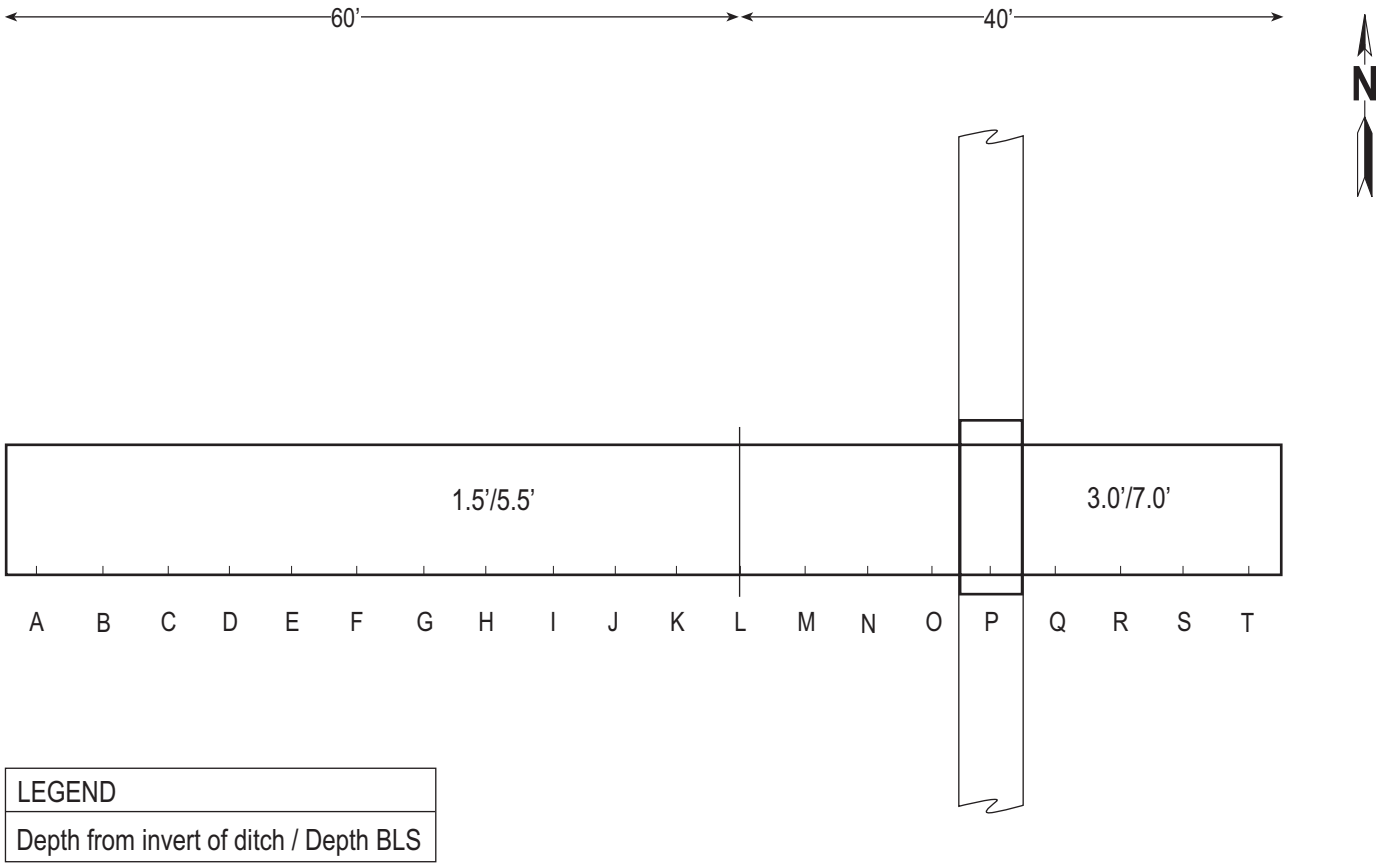

Figure 4-3
Limits of Excavation, Initial Phase
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

4.2.3 Excavation, Phase 2. In accordance with the provisions of the Work Plan, an additional 18 inches of soil was excavated from the area where residual contamination had been identified. The area of additional excavation is identified in Figure 4-4. Following the soil removal, the excavation was re-sampled on the 1.5-meter grid system (Figure 4-2) to determine if any contamination remained in the ditch. The laboratory analytical results again identified the presence of PCB contamination at several locations, at levels up to 16,300 ppm (sample P). The results of the second round of confirmation sampling are presented in Table 4-2.

TABLE 4-2
Soil Sampling Analytical Results, Phase 2

Sample Identifier	Level of PCB Concentration (ppm)
H	ND
I	.3
J	.9
K	ND
L	2.0
M	12.0
N	21.9
O	319
P	16,300
Q	6.0
R	308
S	137
T	31

ND – non detectable
ppm – parts per million

During this phase of the excavation, progress was again impeded by heavy rainfall. The bypass pumping system was again augmented by the addition of extra pumping capacity. Significant quantities of contact water continued to be generated as rain water was removed from the area within the upstream and downstream coffer dams. During this period, water samples from both the ditch and frac tank No. 1 were collected and analyzed for the presence of PCBs. PCBs were detected in the frac tank at a concentration of 10.4 µg/L, and also in the ditch water sample at 10.2 µg/L. The analytical results of these samples are provided in Appendices A and B.

4.2.4 Soil Sampling. The high levels of contamination encountered during Phase 2 had not been anticipated, and because the level of contamination was continuing to increase as the depth of the excavation advanced, exploratory soil samples were collected to better define the actual limits and extent of the PCB contamination. Utilizing a direct push rig, a series of soil samples were obtained from the ditch at varying depths at each sample location.

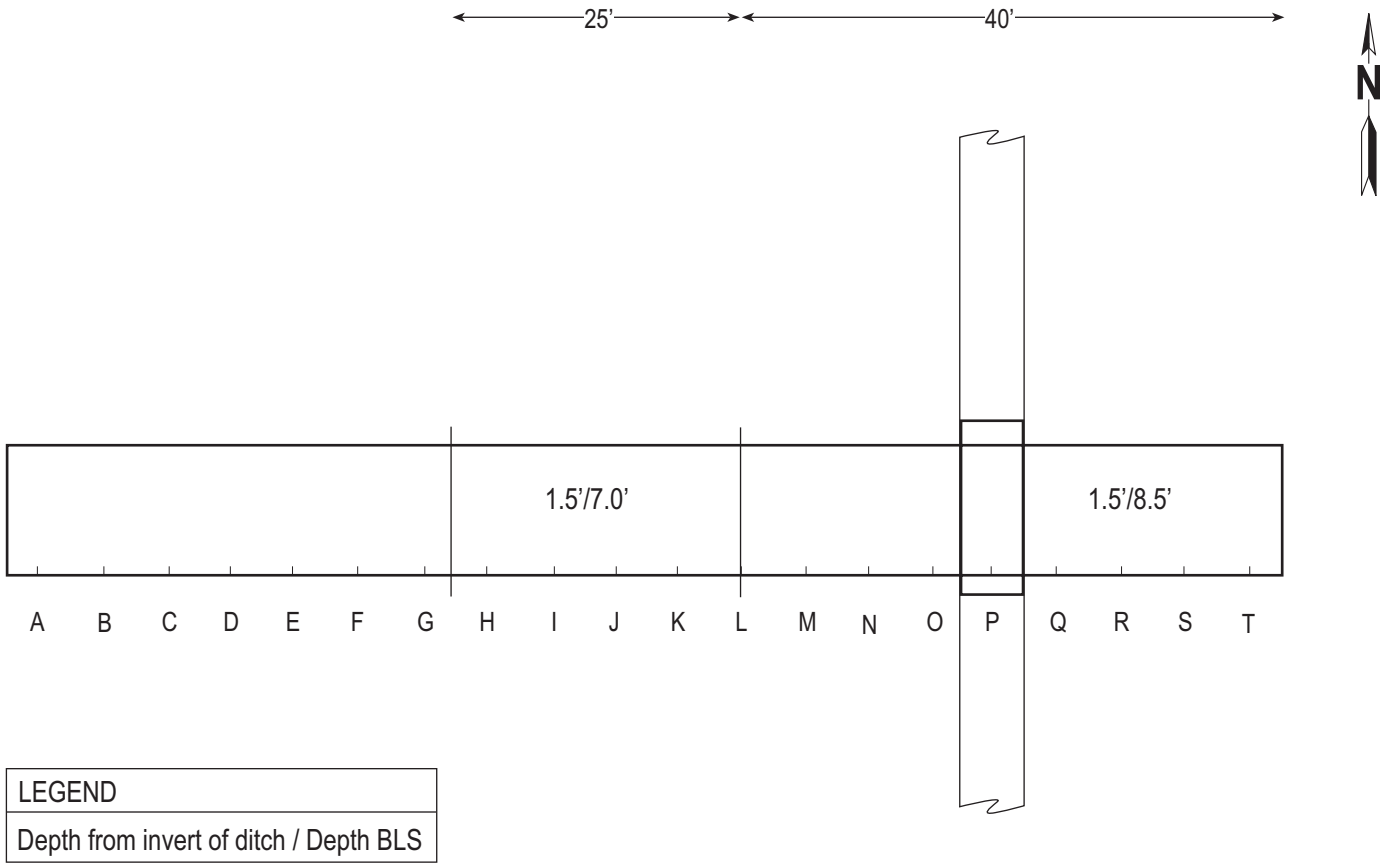

Figure 4-4
Limits of Excavation, Phase 2
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

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The laboratory analytical results identified soil contamination at levels above the cleanup action level of 1 ppm at several locations. The sampling locations are presented in Figure 4-5. The analytical results from each sample location are summarized in Table 4-3.

TABLE 4-3
Direct Push Soil Sampling Analytical Results

Sample Location Identifier	PCB Concentration (ppm)				
	Depth (feet bls)				
	10	13	16	19	22
L-d	ND	ND	ND		
L-e*					
N-d	ND	ND	ND		
N-e*					
P-d	ND	ND	ND	ND	ND
P-e	ND	ND	ND	ND	ND
R-d	960	.69	.48	1.7	6.3
R-e	ND	ND	ND	ND	ND
T-d	ND	ND	ND	ND	ND
T-e	ND	ND	ND	ND	ND
V-e	ND	ND	ND		
X-e	ND	ND	ND		
2-e	ND	ND	ND		

ND – non detectable
ppm – parts per million
* Soil samples were not able to be collected at these locations because the drill rig was not able to access the edge of the ditch due to high water.

During the direct push soil sampling event, it was decided to gather information regarding potential groundwater contamination at the site, and groundwater samples were also collected at several locations. Results of the groundwater sampling indicated the presence of Aroclor 1260 at the concentrations shown in Table 4-4. Note however, that Aroclor 1260 was also detected in the equipment rinsate blank at 1.0 µg/L, which could indicate that the water sample results may have been compromised by inherent flaws with using the direct push sampling technique for collecting water samples (as compared to sampling from monitoring wells). Results of the groundwater sampling may be used during the evaluation of future remedial efforts at the drainage ditch site.

During the direct push sampling event, bypass pumping and contact water accumulation also continued. Additional frac tanks were mobilized to contain the accumulated storm water.

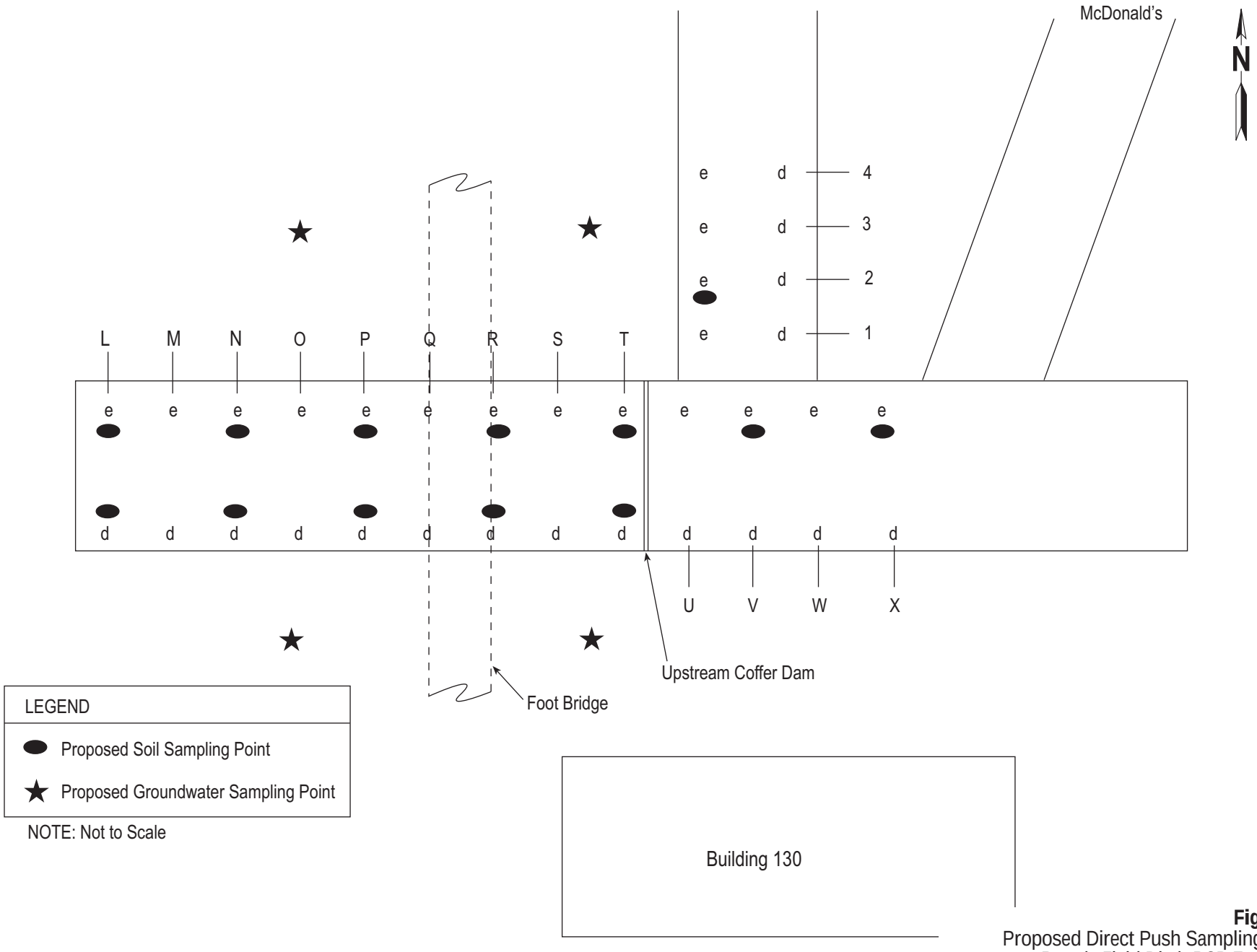

Figure 4-5
Proposed Direct Push Sampling Points
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

TABLE 4-4
Direct Push Water Sampling Analytical Results

Sample Location Identifier	PCB Concentration (µg/L)
Northeast	0.5
Northwest	ND
Southeast	0.2
Southwest	0.5

µg/L – micrograms per liter

4.2.5 Excavation, Phase 3. Based on the results of the soil sampling program conducted following the second phase of excavation which identified the presence of PCB contaminated soil, and the results of the DPT sampling investigation, a third and final phase of excavation was performed. In order to remove soil adjacent to and underneath the pedestrian footbridge, the bridge was removed. An additional 3 feet of soil was excavated between Stations K and O (to a total depth of approximately 10 feet bls) and an additional 6 feet of soil was removed between Stations P and T (to a total depth of approximately 14.5 feet bls.) A plan view of the areas of additional excavation is provided in Figure 4-6. Post-excavation confirmation samples collected identified three locations where PCB contamination remained at levels above the soil cleanup target levels (SCTLs). The post excavation analytical results are summarized in Table 4-5 and shown on Figure 4-7.

TABLE 4-5
Post Excavation Soil Sampling Analytical Results

Sample Identifier *	PCB Concentration (ppm)	Depth of Sample (feet bls)
K 3	ND	10
L 3	ND	10
M 3	9.1	10
N 3	ND	10
O 3	.3	10
P 6	15.2	14.5
Q 6	.7	14.5
R 6	ND	14.5
S 6	3.3	14.5
T 6	ND	14.5

* Letter indicates the sample station location. Number indicates depth of sample below the then existing invert of the ditch.
ND – non detectable
ppm – parts per million

During this last phase of soil excavation, heavy rainfall continued to impact the excavation operations. Contact water in the ditch was removed and pumped to frac tanks that were staged adjacent to the excavation area.

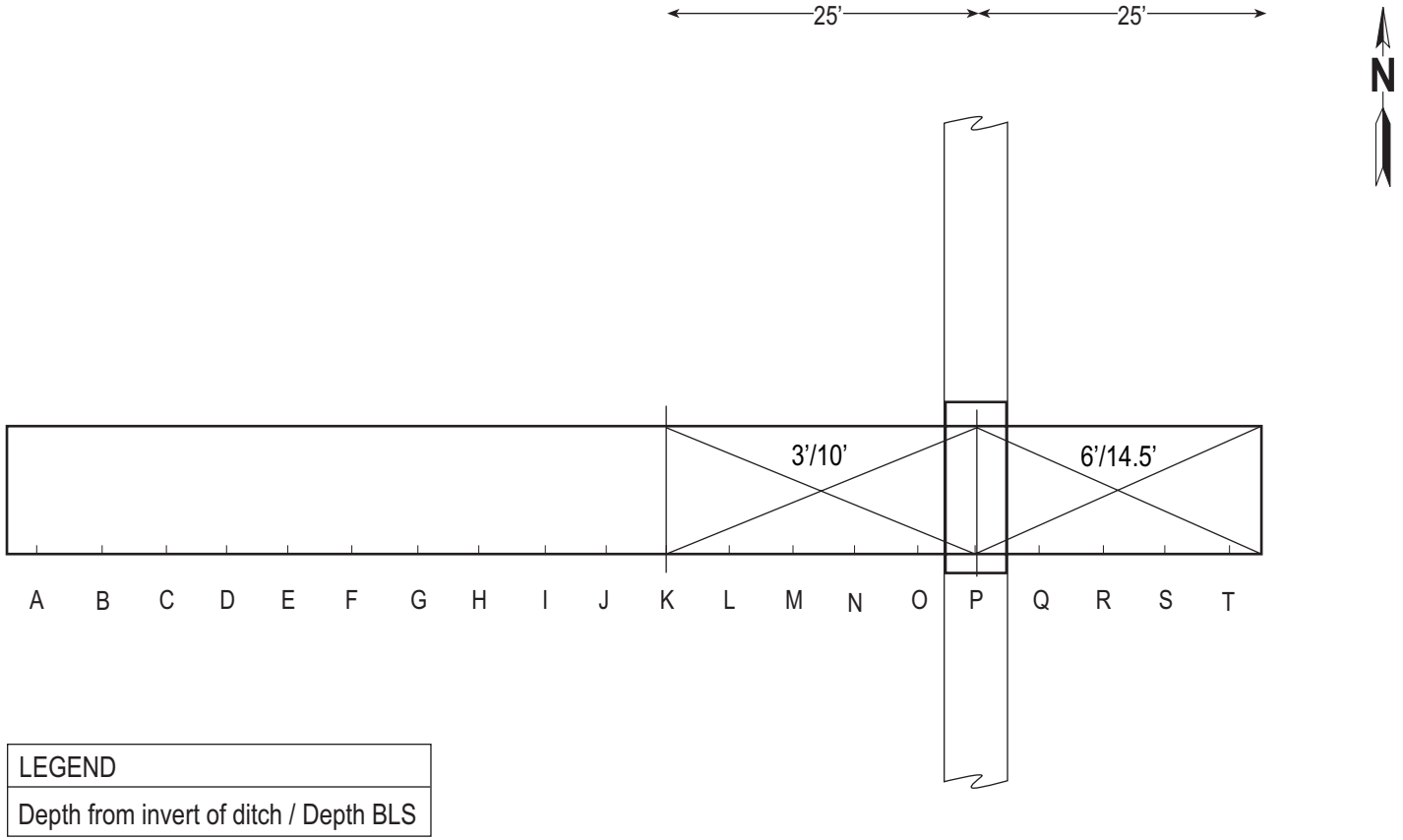

Figure 4-6
Limits of Excavation, Phase 3
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

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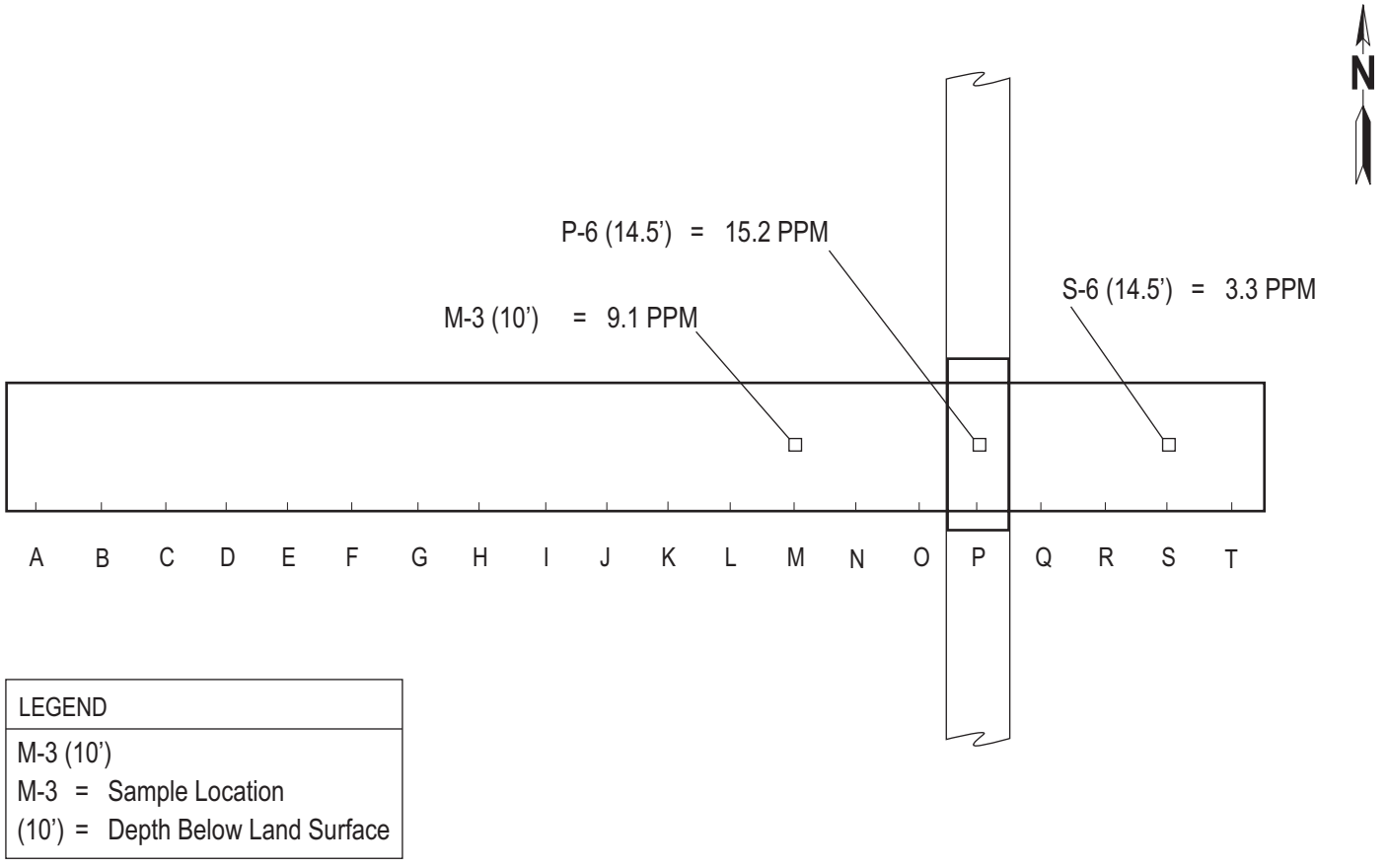

Figure 4-7
Post-Excavation Soil Sampling Analytical Results
Parade Field Ditch PCB Excavation
Naval Construction Battalion Center, Gulfport, Mississippi

4.2.6 Backfill and Site Restoration. After the third phase of excavation was completed, the excavated area of the ditch was restored to the original elevations. Imported fill material was placed and compacted, and sod was installed on all disturbed areas. A sheet of 6-mil plastic liner was placed into the areas of the ditch where residual contamination was found prior to installing the backfill material to separate the native soil and backfill should additional excavation or exploration be performed in the future. The pedestrian foot bridge across the ditch was reinstalled following the ditch restoration.

4.2.7 Onsite Water Treatment, Initial Phase. As previously discussed, the required treatment level under TSCA for unrestricted discharge of contact water is 0.5 µg/L, and the treatment level for discharge to a permitted treatment facility is 3.0 µg/L. A water sample from frac tank No. 1 contained PCBs at a concentration of 10.4 µg/L, and a sample of water from the ditch collected during the initial phase of excavation contained PCBs at a concentration of 10.4 µg/L. Therefore, as required under TSCA, it was necessary to pre-treat the water prior to discharge.

The initial treatment system design was based on removing suspended sediment particles via filtration using a 10-micron bag filter, and adsorption of the dissolved PCBs via activated carbon. Mobilization and erection of the water treatment system components was conducted on October 4 and 5, 1999, and the initial phase of water treatment began on October 5.

The laboratory analytical results on the treated water indicated that the water did not meet the cleanup criteria of 0.5 µg/L (Table 4-6). In fact, the PCB content of several of the tanks was higher than the original two samples taken from the ditch and frac tank No. 1. It was determined that the higher concentrations in water were associated with the increased PCB concentrations in soil from the subsequent phases of excavation, following the initial phase of excavation when the water samples were collected.

TABLE 4-6
Initial Water Treatment Phase Post Treatment Analytical Results

Frac Tank Identifier	Analytical Results (µg/L)
CW – 2	0.8
CW – 3	16.0
CW – 4	24.0
CW – 5	9.2
CW – 6	45.0

µg/L – micrograms per liter

It was determined that the higher levels of contamination in the treated water were related to PCBs clinging to the silt contained in the ditch water. The treated water was cloudy due to the suspended solids that had not been captured in the filtration components of the system. An analysis of (TSS) was performed, and the results of one sample indicated a TSS content of 25,500 ppm, or 2.5 percent (Appendix B).

4.2.8 Water Treatment, Phase 2. In order to filter the silt particles from the water, two 5,000-gallon sand filtration cells were added to the system, and the 25-micron filter was replaced with a 5-micon bag filter.

After these system modifications were implemented, a second phase of water treatment was started. After treating only two frac tanks of water, the treated water remained cloudy. This was an indication that, even with the added filtration components, the system was still not removing the suspended solids. Treatment operations were suspended, and a sample of treated water was analyzed for PCB content. The analytical results, 2.84 µg/L PCB content, confirmed that the modified filtration system was not removing the PCB entrained silt particles.

4.2.9 Design and Construction of Water Treatment System Modifications. CCI performed an analysis of alternative treatment technologies for removal of the silt. Flocculation and coagulation systems are routinely used in industrial water treatment systems to remove suspended solids, and this technology was selected for further evaluation.

A bench-scale test was conducted on samples of the contact water. Six alternative polymer-based reagents were selected for testing, and on November 3, 1999, the bench-scale test was conducted at the project site. The objective of the pilot test was to identify a reagent that would coagulate the silt into larger masses which would: 1) become heavy enough to fall to the bottom of the treatment vessel, and 2) become large enough to be trapped by the filtration system. Novus CE2665, a polymer manufactured by BetzDearborn, was determined to be the most effective reagent and was selected as the polymer to be used in the flocculation system.

The system design, comprised of three major components: the polymer addition and mixing system, clarifier chamber, and granular activated carbon (GAC) filtration system, was finalized by CCI and the system components were procured, mobilized to the site, and installed. A process flow diagram for the water treatment system is contained in the Work Plan Addendum, Revision No. 02, PCB Ditch Excavation Project Onsite Water Treatment System. This system was comprised of three major components: the polymer addition and mixing system, the clarifier, and the filtration system. Each of these systems is briefly discussed below.

Polymer Addition and Mixing System. The polymer, CE-2665, is a high molecular weight cationic emulsion polymer. As delivered from the manufacturer, it was a very viscous fluid that had to be diluted with water prior to its addition to the turbid water stream. This was accomplished in a polymer blending unit. The polymer blending unit is a packed unit designed to blend a known quantity of the polymer with a known quantity of potable water, resulting in a polymer solution that is low in viscosity, and will mix readily with the turbid water stream. The polymer solution was injected at a controlled rate upstream of the pump that transfers the turbid water to the clarifier. This pump is a centrifugal pump that provides adequate mixing of the polymer solution and the turbid water. Following the injection of the polymer solution, the turbid water was pumped to a slow mix tank. Low energy mixing was provided in this tank to facilitate the formation of large floc particles. The slow mix tank is a small tank located above the clarifier. The water flowed by gravity from the slow mix tank into the clarifier.

Clarifier. The clarifier used on this site is a rectangular, V-bottom tank with a surface area of approximately 300 square feet. Solids settle to the bottom of the clarifier, and the supernatant water overflows through a nozzle into a receiver tank. The supernatant water was pumped from the receiver tank to the filtration system. A screw in the bottom of the clarifier to conveyed the settled solids (sludge) to a withdrawal nozzle located at the end of the vessel. Sludge was pumped from the withdrawal nozzle using a diaphragm pump into a holding tank or was removed using an excavator and transferred into roll-off containers for solidification.

Filtration System. The filtration system was comprised of two filters and a granular activated carbon (GAC) bed. The first filter was a sand filter. The second filter was a bag filter with a 1-micron bag. With the addition of the appropriate polymer, and the resulting floc formation, these filters were adequate to remove any solids that are not removed in the clarifier. The carbon filter was in place to remove any trace PCBs that are dissolved in the water.

4.2.10 Water Treatment, Phase 3. Treatment of contaminated water using the modified treatment system commenced on December 4, 1999, and continued through January 18, 2000. A total of 98,354 gallons of water was successfully treated to below 0.5 µg/L, and discharged to the Harrison County POTW. The water was discharged via the NCBC Gulfport sanitary sewer system, in accordance with a letter of agreement with Harrison County dated October 4, 1999. The water treatment analytical results are provided in Appendix D, and are summarized in Table 4-7.

TABLE 4-7

Treated Water Laboratory Analytical Results Summary

Contact Water Batch Identification	Laboratory Analytical Results (µg/L)	Quantity (gallons)
Batch CW – 1	.3	18,600
Batch CW – 2	.2	17,104
Batch CW – 3	.3	18,774
Batch CW – 4	.2	14,910
Batch CW – 5	.3	9,950
Batch CW – 6	.2	19,016
Total quantity discharged to Harrison County POTW		98,354
Batch CW – 7	2.1	14,000
Batch CW – 8	1.6	10,900
Total quantity disposed at offsite industrial water treatment facility		24,900
Total quantity of treated water discharged or disposed		123,254

µg/L – micrograms per liter

The treated water contents of the last two tanks did not meet the unrestricted discharge criteria of 0.5 µg/L; however, the results were below the acceptance level for discharge to an industrial treatment facility. The option of retreating the water through the system versus

transporting offsite for disposal was evaluated, and it was decided to dispose of the remaining 24,900 gallons of water at Industrial Water Systems (IWS), Mobile, Alabama.

4.2.11 Treatment System Decontamination. Following completion of the treatment activities, each of the system components and frac tanks were decontaminated by pressure washing and hand cleaning. Residual sludges and decontamination rinsate was blended into the soil in the rolloff containers and disposed with the soil.

4.2.12 Transportation and Disposal of Soil. During the initial phase of excavation, 163.05 tons of contaminated material was removed from the ditch and was transported and disposed as non-hazardous PCB remediation waste at the Waste Management, Inc., permitted hazardous waste landfill in Emelle, Alabama, consistent with the TSCA PCB remediation requirements (40 CFR 761.61). During the subsequent phases of excavation, an additional 215.75 tons of soil was removed and was also transported and disposed at Waste Management, Inc., Emelle, Alabama landfill. A total 378.80 tons of soil was disposed from the project at the Waste Management landfill. Table 4-8 summarizes the quantity of soil covered by each manifest.

TABLE 4-8
Summary of Contaminated Soil Transportation and Disposal Manifests and Weights

Manifest Number	Net Weight (tons)	Manifest Number	Net Weight (tons)
860983	12.65	887506	14.91
860984	14.19	887507	16.89
860986	16.46	887508	17.98
860987	11.71	887509	17.02
860988	9.87	887510	18.01
860989	9.76	887511	17.50
860990	10.70	887512	16.52
860991	13.58	887513	15.30
860992	16.83	887514	16.95
860985	19.59	887515	15.37
860993	11.84	887516	12.83
860994	15.87	887517	7.94
887504	14.97		
887505	13.56	**Total**	>378.80

4.2.13 Final Site Restoration and Demobilization. After the decontamination and demobilization of the water treatment system and removal of the remaining soil in roll-off containers, the project site was restored to its original condition. All disturbed areas were graded, and covered with either seed or sod to match the existing conditions prior to commencement of work. Following the final inspection of the site, CCI and subcontractor personnel and equipment demobilized from the site.

5.0 FINAL INSPECTION

On March 3, 2000, the ROICC and CCI's Site Superintendent / QC Manager performed an inspection of the excavation areas at the drainage ditch adjacent to the Parade Field for compliance and acceptance.

5.1 PARTICIPANTS. The following individuals participated in the final inspection:

- Billy Byrd / ROICC
- Gordon Crane, NCBC Gulfport
- Jzonn Cureton / CCI

5.2 DEFICIENCIES. During the final inspection, conditions at the Parade Field ditch site were found to be in acceptable condition and there were no items identified requiring correction or re-work.

6.0 CONCLUSIONS AND RECOMMENDATIONS

1. Based on certified weigh tickets generated at Waste Management, Inc.'s Emelle, Alabama, landfill disposal facility, a total of 378.80 tons of PCB contaminated soil was excavated from the Parade Field ditch and disposed as non-hazardous, PCB remediation waste.

2. A total of 123,254 gallons of contact water was pumped from the ditch during the excavation phases; 98,354 gallons were treated to below 0.5 ppb and were discharged to the Harrison County POTW via the NCBC Gulfport sanitary sewer system and 24,900 gallons were treated to below 3.0 ppb and were transported and disposed at IWS in Mobile, Alabama.

3. Confirmation soil sampling performed following the final round of excavation identified three spot locations where Aroclor 1260 contamination remains at levels above the soil cleanup target level of 1 PPM. Analysis of the cumulative results of soil sampling performed following each of the three rounds of excavation indicates that any residual contamination at the site is limited to these three discrete spot locations, which are identified in Table 4-5 and Figure 4-7.

   Because of the difficulty of excavating at these depths (10 feet bls, and 14.5 feet bls, respectively, elevations which are below the groundwater table of approximately 8 feet bls), it was determined that further attempts at excavation would not be attempted. Additional excavation would require installing an extensive groundwater dewatering system (e.g., wellpoints) and shoring and bracing system, which is not considered practical considering the small quantity of soil involved and the levels of contamination.

   Based on the source removal work and confirmation sampling results described herein, the majority of constituents harmful to human health and the environment have been removed. To validate this removal action and further confirm that no threat to human health or the environment exists, it is recommended that a risk analysis be performed at the site. The risk analysis would confirm present and potential future risk of the levels of constituents remaining at the site.

REFERENCES

CH2M HILL Constructors, Inc. *Contract Management Plan*. July 1998.

CH2M HILL Constructors, Inc. *Basewide Work Plan, NCBC Gulfport*. May 1999.

CH2M HILL Constructors, Inc. *Work Plan Addendum No. 01*. April 1999.

ABB Environmental Services, Inc., *Field Investigation Report*. October 1997

Appendix A

Soil Analytical Results

Appendix B

Water Analytical

Appendix C

Transporation and Disposal

Appendix D

Permits and Approvals

Appendix E

Project Progress Photographs