N62604.AR.001596
NCBC GULFPORT
5090.3a

LETTER REGARDING PROPOSED ACTIVITIES TO ADDRESS DIOXIN CONTAMINATION AT SITE 6 NCBC GULFPORT MS
10/16/1995
ABB ENVIRONMENTAL

ASEA BROWN BOVERI

October 16, 1995

Commanding Officer
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, SC 29418

Attention: Mr. Art Conrad

Subject: Proposed activities to address dioxin contamination
N62467-89-D-0317/CTO 96

Dear Art:

Enclosed is the text from the proposed activities to address the dioxin contamination onbase. This text should only be used as a road map for planning and is not intended to be used otherwise. The activites proposed, we believe, will be inline with those requested by MSDEQ. The only item not included that the MSDEQ will probably want is addressing the downgradient side of the sites with permanent monitoring wells. We proposed to utilize Hydropunch technology to screen, rather than commit to permanent (and forever) wells.

If you have any questions, please call me at (615) 531-1922.

Sincerely,

ABB ENVIRONMENTAL SERVICES, INC.

Penny M. Baxter
Senior Project Manager

attach

pc: G. Crane/NCBC
file

[8505.072]

ABB Environmental Services, Inc.

1400 Centerpoint Blvd.
Suite 158
Knoxville, Tennessee 37932-1968

Telephone
(423) 531-1922

Fax
(423) 531-8226

I. INTRODUCTION

In June 1993, Southern Division, Naval Facilities Engineering Command (SOUTHNAVFAC-ENGCOM) issued Contract Task Order (CTO) NO. 096 for the Free-Phase Product Assessment and Interim Action Design at Site 6, Fire-Fighting Training Area, Naval Construction Battalion Center (NCBC), Gulfport, Mississippi. In September 1994, ABB Environmental Services, Inc. (ABB-ES), received a modification to the CTO requesting that an additional level of effort (LOE) be added to the CTO to sample groundwater at the other remedial investigation (RI) sites and to sample sediment and surface water at inflows and off flows at the Base perimeter. Based on findings of the most recent CTO, further delineation has been pursued through CTO modification to include a Focused Field Investigation (FFI) and removal action for dioxins detected off of the facility.

This Plan of Action (POA) describes the scope of services, schedule, and costs estimated to meet the objectives of this modification for CTO No. 096. The tasks included in this modification consist of the following activities:

1. management activities and
2. technical activities.

- <u>Management Activities</u>

  Management responsibilities include: cost tracking, internal and external cost reporting, communication, and deliverable processing and review. In addition, monthly progress reporting is included under Task 1.0.

  Task 1.0 - Project Management and Project Oversight

- <u>Technical Activities</u>

  Task 1.0 - Project Management;

  Task 2.0 - Planning Documents including Site Reconnaissance, Exposure Assessment, and Site Conceptual Model;

  Task 3.0 - Focused Field Investigation, including Phases 1 and 2 and investigation derived waste (IDW) management;

  Task 4.0 - Laboratory Analysis;

  Task 5.0 - Preliminary Risk Evaluation;

  Task 6.0 - Data Validation including Information Management;

  Task 7.0 - Baseline Risk Assessment, including human health and ecologic;

Task 8.0 - Treatability Study, specifically concrete testing and soil solvent extraction;

Task 9.0 - Focused Field Investigation (RFI) Report including Technical Briefings;

Task 10.0 - Focused Feasibility Studies, specifically Site 8 erosion control, sediment migration control, and leachate control;

Task 11.0 - Interim Record of Decision(s); and

Task 12.0 - Interim Removal Action (IRA) Preliminary Designs, specifically Site 8 erosion control, sediment migration control, and leachate control.

The following sections present the scope of services (Section II), project personnel (Section III), schedule (Section IV), and cost estimates (Section V) for each task. Attachment A presents the schedule for the execution of this effort, Attachment B presents the cost estimates and summary, Attachments C and D present supporting cost documentation, Attachment E presents the organization chart, and Attachment F presents the glossary for this POA.

II. SCOPE OF SERVICES

Task 1.0 Project Management. ABB-ES will provide management consistent with the needs of the project's objectives and ABB-ES' total quality management program. ABB-ES will prepare Technical and Financial Monthly Reports (TFMR) in accordance with the provisions of Part V, Section 3 of Contract No. N62467-89-D-0317. Each report will be in the format required in the contract (Part IX, Attachment A) and will summarize activities performed, problems encountered, and proposed problem resolutions. It will also include an updated schedule in Gantt™ format. ABB-ES will notify SOUTHNAVFACENGCOM upon discovery of significant new site conditions, including imminent hazard or substantial endangerment or deviation from the project schedule, plan, or budget.

Some specific responsibilities of this role include the following:

- overseeing the technical aspects of the project;
- initiating project activities;
- identifying and fulfilling resource requirements;
- monitoring task activities to ensure compliance with established budgets, schedules, and scope of work; and

- regularly interacting with the Engineer-in-Charge (EIC), the program manager, and others, as appropriate, on the status of the project.

The project schedule is provided in Attachment A.

Task 2.0 Planning Document. A concise planning document, or workplan, will be prepared for review by SOUTHNAVFACENGCOM and Base personnel. This document will present a two-phased approach to determining contaminant extent and potential receptor exposure. Proposed activities will meet project objectives and support informed decision making about contaminant release.

Workplan development will be supported by the following activities:

- a site reconnaissance to walk the onsite and offsite areas, conduct interviews with staff regarding storage and disposal of herbicide orange (HO), determine potential exposure pathways; and

- development of a site conceptual model (SCM), using information gained from the site reconnaissance and exposure pathway analysis as an interpretive tool to gain understanding of the site.

The SCM will compile information collected during site reconnaissance and exposure assessment and provide rationale for sample location selection. The SCM will form the basis for decision making during evaluation of field data and development of future sampling plans, as needed. A two-phase sampling program is proposed based on the desire to minimize analytical costs while delineating contaminant extent and supporting remediation.

The Phase 1 investigation will identify potential sources, quantify receptor exposure, and determine mechanisms for dioxin transport. Phase 2 of the field effort will delineate extent of contamination posing human health or ecologic risks and support remedial actions. Data collected during Phase 1 will be evaluated prior to Phase 2 mobilization and will minimize the number of sample locations and maximize the use of Phase 2 data to the fullest extent possible.

The following subtasks describe this two-phased approach.

Subtask 2.1 Site Reconnaissance Two associates will perform a records search and existing data review to support workplan development. Records of interest will include, but are not limited to, potential source area disposal records, aerial photographs, offsite property maps and deeds, Health Department public records, staff (active and retired) interviews, NCBC and city of Gulfport public works site maintenance records. Information obtained will be used to refine the conceptual model sources, depositional environment, and exposure pathways. One trip for two associates is proposed to support this activity. It is assumed that approval will not be solicited from the State of Mississippi prior to implementation of these activities or the workplan.

Subtask 2.2 Site Conceptual Model Essential to the understanding and communication of the presence and transport of dioxin, a SCM will be developed. The SCM will be used as a tool to enhance communication between the project team (Navy and ABB-ES), the Mississippi Department of Environmental quality (MSDEQ), and the restoration advisory board (RAB). The SCM will clarify current understanding of the site and potential dioxin sources. The SCM will be a three-faceted conceptual model consisting of (1) a concise narrative and description, (2) a pictorial view of the known or potential sources(s) of contamination with the associated release scenario(s), and (3) a logic diagram identifying information in parts 1 and 2, and decision points.

Specifically, the NCBC Gulfport SCM will address:

- operational history,
- sources and possible contaminants,
- migration pathways,
- media of concern
- exposure pathways and possible receptors, and
- presumptive remedies.

As information regarding source(s) is gained through the FFI, the SCM will be updated. The NCBC Gulfport SCM development will be an iterative process; a tool used to facilitate decision making and communication throughout the life of the project.

Initial development of the NCBC Gulfport SCM will include a draft (Revision 0) generated by ABB-ES, followed by an informal presentation and working session with SOUTHNAVFACENGCOM and Base personnel. A team comment and response period will resolve client comments resulting in submittal of the Revision 01 workplan SCM.

Revision 02 of the SCM will be provided within 8 weeks of receipt of the FFI Phase 1 data and will be presented during discussion of the Phase 1 preliminary risk evaluation (PRE). Following completion of the Phase 2 investigation, Revision 03 of the SCM will be provided and used in the interpretation and presentation of results in the FFI report.

Subtask 2.3 Workplan A workplan will be provided that will define sampling methodologies, describe field activities, and specify health and safety standards and practices to be followed during the field effort. In addition, site conditions (e.g., dust minimization, etc.) needed to minimize risk to site personnel and the public will be identified. The plan will identify sample locations and rationale to establish a clear understanding of the intended data use. A brief data quality objective discussion will be provided to support communication of data collection objectives. IDW management (including containerizing and staging) will be discussed in the plan as will community relations support.

Task 3.0 Focused Field Investigation. The purpose of the FFI is to identify the nature and extent of contamination onsite and offsite. The objectives to be met include identification and delineation of contaminant sources, development of IRA, and getting information needed to evaluate human health and ecological risk associated with contaminant release. A two-phased

field investigation is proposed to meet the objectives of NCBC Statement of Work CTO No. 096.

Phase 1 field investigative data collection will center on three potential source/release mechanisms:

- surface soil erosion from the Site 8 HO area,
- release to the canals and offsite ditches and swamps, and
- landfill leachate releases to surface drainage canals.

Phase 2 data collection will address delineation of extent and remedial action selection/design to reduce risk. With this focus, the following technical approach is proposed.

Subtask 3.1 Phase 1 Field Investigation

Subtask 3.1.1 Site 8 Soils Ongoing erosion of surface soils at Site 8 will be addressed by evaluating the volume of surface soils above the 4 parts per trillion (ppt) dioxin action level currently enforced at the site and estimating erosion/sedimentation rates. Dioxin levels accumulating in sediment recovery traps 5, 6, 8, 9, 10, and 11. These six traps are located to the north, south, and west of Site 8 and will support evaluation of the site as a dioxin source. Soil samples will be collected from untreated surface soils to quantify the extent present above the action level. Efforts will focus on collection of erodible soils.

Site 8 is an area approximately 1,500 feet long by 500 feet wide. The estimated number of samples is based on sample points located on 100-foot spacings across the site. Thirty percent of these locations are estimated to consist of friable soils, resulting in the collected and analyzed for full Contract Laboratory Program (CLP) suite. Analyses include CLP suite parameters including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticide/polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) inorganics and are summarized on Table 4-1.

Sediment recovery trap samples, taken above and below installed traps, will be collected and analyzed to determine effectiveness of the traps and estimate sedimentation rates. Up to 12 SRT sediment samples will be collected and analyzed from Site 8. SRT samples will be analyzed for dioxin only and are also summarized on Table 4-1.

In addition, to monitor potential airborne particulate exposure during the Site 8 soils investigation, three air monitoring stations, one upwind and two downwind will be monitored. Up to two 24-hour samples will be collected from each sampler, resulting in six air samples (Table 4-4). A full meteorologic station will be setup and maintained during the effort to complete the air monitoring program.

Subtask 3.1.2 Surface Water and Sediments

Base Drainage System. Ten distinct areas within the NCBC drainage system have been identified for collection of sediment samples. These areas include onsite locations that are either

Table 4-1
Dioxin Sediments, Site 8 Surface Soil Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Site 8									
Surface soil	15	15	15	15	15	15			15
Subtotal Field Samples									
Soil	15	15	15	15	15	15			15
Field Duplicates									
Soil	2	2	2	2	2	2			2
MS/MSD									
Soil	1	1	1	1	1	1			1
Quality Control									
Trip blanks	2								2
Rinsate blanks	1	1	1	1	1	1			1
Field blanks	1	1	1	1	1	1			1
Total Samples									
Soil	22	20	20	20	20	20			
Analytical Unit Cost ($)									
Soil($)	$225	$460	$230	$295	$200	$1,100		$50	
Cost Total									
Soil	$4,950	$9,200	$4,600	$5,900	$4,000	$22,000			$46,654
Total									$46,654

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
MS/MSD = matrix spike and matrix spike duplicate.

downgradient of or adjacent to suspected sources. The focus is to identify releases and delineate extent of dioxin and sediment contamination, identified in late 1994, that may pose a human health or ecological risk. One sediment sample from each of the 10 areas will be collected and analyzed for contaminants of concern (COC) characterization. Two remaining samples (e.g., downgradient) from each primary sample will be analyzed for dioxin only. Up to 10 surface water samples will be collected, at the same locations. Further, two sediment recovery trap samples, one taken above and one below installed traps, will be collected from SRTs 1, 2, 3, 4, 7, and 12. Samples will be analyzed to determine effectiveness of the traps and estimate sedimentation rates. Up to 12 SRT sediment samples will be collected and analyzed. SRT samples will be analyzed for dioxin only.

Sediment samples will be analyzed for CLP VOC, SVOC, pesticides/PCBs, TAL metals, and dioxin/furans. Surface water samples will be analyzed for CLP SVOC, pesticides/PCBs, TAL inorganics and dioxin/furans, based upon results from sampling conducted in late 1994. All proposed analyses are summarized on Table 4-2. Water samples will be collected as nonturbid samples, where possible, to minimize solids interference.

Data to support storm flow transport and volume estimates will be collected by installing up to 10 stream staff gauges and flumes. Canal dimensions and flow capacity will be measured at up to 20 locations across the area of interest to further support sediment transport assumptions. Up to five piezometer clusters (shallow and deep well pairs) will be installed to evaluate vertical components of flow near available stream elevation points. Independent well data loggers will be installed in up to six locations to monitor storm flow across the area. Sediment scour and deposition modeling will be performed the hydraulic re-mobilization of sediments present in the canals and ditches using meteorologic and flow data noted above.

Outfalls. Sediment samples will be collected from below outfalls 2, 3, and 4. Samples will be collected downstream in the outfall drainage, estimated at 25-foot intervals for the first 100 feet of drainage. Locations will be biased to ensure samples are taken from organic rich sediment depositional areas representing the greatest exposure to human or ecologic receptors. In summary, three CLP suite analyses samples will be collected from below the outfall and up to four additional dioxin only samples, per outfall, will be analyzed. Analytical parameters will consist of those noted above.

Staff gauges will be installed and monitored during routine water elevation surveys. Storm event data will be collected when possible. The data will be used to support sediment transport estimates and surface water and groundwater interaction.

28th Street Swamp. The 28th Street swamp has been divided into five geographic areas, based on the location of three primary channels through the swamp. Sediment samples will be collected from each of the five areas. One surface water will be collected from one location near the primary influent to the system. The sample will be analyzed for TCL SVOC, pesticide/PCBs, TAL metals, and dioxin/furans.

Table 4-2
Air Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Site 8									
Air						6			6
Subtotal Field Samples									
Air						6			
Field Duplicates									
Air						0			0
Total Samples									
Air ($)						6			
Analytical Unit Cost ($)									
Air ($)						$1,150			
Cost Total									
Air						$6,900			$6,900
Total									$6,900

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
MS/MSD = matrix spike and matrix spike duplicate.

Three sediment samples per area will be collected to provide lateral coverage of the main swamp. One sample per area will be analyzed for CLP analyses noted above, and the remaining two will be dioxin analyses only. Five CLP analyses and 10 dioxin only samples will be collected.

Surface water samples will be collected from the area. One sample will be collected from the system and analyzed for the CLP analyses noted above. Surface water samples will be nonturbid samples, where possible, to minimize solids interference. Collection of samples from within the swamp may pose special logistical problems; access will made from an all terrain, or similar vehicle suited for boggy areas. Sediment, surface water, and biota will be collected using this vehicle.

Sediment and surface water analyses are summarized in Table 4-2.

Site 3 Marsh. The marsh northwest of Site 3 will be sampled to determine if contaminants have been released from the Site 3 landfill. As the marsh is downgradient and adjacent to the landfill, the potential for the landfill to source surface water and potentially groundwater exists.

One surface water and two sediment samples will be collected from the marsh. The samples will be analyzed for TCL SVOC, pesticide/PCBs, TAL metals, and dioxin/furans.

Site 7/2. Due to the close proximity of landfills 7 and 2, the unit will be referred to as a single entity, Site 7/2. To determine if the site has released to the marsh south of the site, two sediment and one surface water samples are proposed. The samples will be analyzed for TCL SVOC, pesticide/PCBs, TAL metals, and dioxin/furans.

Sampling is proposed based on upon observation of flow to the south toward the marsh. Groundwater and surface water elevations will be monitored to define the hydraulic relationships in this area.

Reference Swamp. Sediment and surface water samples will be collected from a reference swamp within the region. Data will be collected to determine background and to evaluate urban runoff within the local area. Biota will be collected to support the understanding of background conditions. Three sediment and one surface water sample will be collected and analyzed for TCL SVOC, pesticide/PCBs, TAL metals, and dioxin/furans.

Reference Ditches. Sediment and surface water samples will be collected from a reference canal similar to the systems on-base. Data will be collected to determine background and to evaluate urban runoff within the local area. Biota will be collected to support the understanding of background conditions. Three sediment and one surface water sample will be collected and analyzed for TCL SVOC, pesticide/PCBs, TAL metals, and dioxin/furans.

Subtask 3.1.3 Biota Sampling Aquatic biota samples will be collected from areas with known sediment contamination onsite and offsite. A reference canal and swamp will also be analyzed to evaluate local, background conditions.

The following areas will sampled to support human health and/or ecological risk assessments:

- 28th Street swamp
- Canal number 1;
- HO canal;
- outfalls 2, 3 and 4;
- reference swamp; and
- reference canal.

The biota sampling will be conducted in three parts: a habitat survey, benthic marco-invertebrate sampling, and electro shock sampling of aquatic species.

Ecologic Habitat Survey. An ecologic survey of sample areas will be conducted by a staff botanist and aquatic ecologist. The survey will characterize the aquatic and terrestrial species, map vegetation and identify habitats present, including any threatened and/or endangered species, as well as critical habitat. The task will require two associates to be onsite for up to 5 days.

Invertebrate Sampling. A benthic macroinvertebrate survey will be conducted by an associated aquatic ecologist to establish the system baseline. One sediment sample from each area of concern will be submitted for sediment toxicity testing, using *Hyallela azteca* or equivalent. Sediment toxicity testing will also be conducted on one sample from each reference system.

Sediment and invertebrates will be collected for toxicity testing in conjunction with sediment sampling proposed under Subtask 3.2. The team will work in cooperation to ensure that representative samples are collected for each of the diverse end data users. The task will require one full 10-day sampling event.

Biota Collection. The proposed biota sampling program is based on the concept that human health and ecologic risk is defined by two representative species within each area of concern. Bass and crayfish will represent these two layers in the food chain. Whole body bass samples will represent the upper trophic level in human and ecologic risk exposure. Crayfish will represent lower trophic level food source and bottom dwellers in both human health and ecological risk assessments. Turtles and frogs will be collected on a limited basis, primarily due to the number of organisms typically found in similar systems. It is proposed that up to three crayfish, whole body bass, and bass filet be collected from each sample location. Based on the ability to archive tissue samples, biota will be collected as both filet and whole body samples. Whole body analyses will be performed first and risk calculated from those results, if the samples pose a risk then archived fillets will be analyzed and risk re-calculated. Use of whole body samples will over-estimate risk; therefore, if whole body does not pose a human health risk, then analysis of filet samples will not performed.

The estimate provided is based on the analysis of one whole body bass, and one crayfish per location. A single turtle and frog will be analyzed from the affected areas to quantify potential human exposure, via consumption. Up to 13 additional specimens, 10 bass or crayfish and 3 turtle or frogs, will be collected and archived for dioxin analyses only, if required. The archived samples will be analyzed following preliminary risk calculation on the whole body

results. All samples will be collected in one event. The samples will be analyzed on an as needed basis. All tissue samples will be analyzed for dioxin/furans, CLP pesticides/PCBs, TAL inorganics, and percent lipids. The total number of biota samples is provided in Table 4-3. The following summarizes the proposed species to be collected:

Biota Species Collection Summary

Ditches

10 whole body bass Up to 10 additional bass or crayfish dioxin only samples
10 crayfish
1 turtle

28th Street Swamp

5 whole body bass Up to 10 additional bass or crayfish dioxin only samples
5 crayfish
1 turtle
1 frog

Reference Swamp

3 whole body bass
3 crayfish

Reference Ditch

3 whole body bass
3 crayfish

Subtask 3.1.4 Leachate Discharge and Groundwater Evaluation

Groundwater Evaluation. ABB-ES proposes installation of up to eight facility boundary monitoring wells along the northern facility boundary. Offsite production wells and recent onsite groundwater data warrant monitoring groundwater leaving the facility. Based upon past residential water usage to the north, up to eight monitoring wells are proposed along the 28th Street right-of-way in the following areas:

- north of Site 3,
- north of Site 7/2,
- north of Site 8.

Leachate Discharge. Recent data indicates the need to evaluate leachate releases from landfill sites adjacent to the ditches (ABB-ES, 1995). To address this, up to two downgradient Hydropunch™ II, 2-inch polyvinyl chloride (PVC) temporary wells will be installed between the landfills and potential discharge points. At Site 3, the area between the site and the marsh to the northwest will be sampled. At Site 4, up to three Hydropunch™ temporary wells will be installed north and west of the site. Up to three temporary wells will be installed south and west

Table 4-3
Sediment and Surface Water Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Ditches and SRTs									
Sediment	22	22	22	22	22	42	10		42
Surface water	10	10	10	10	10	10			10
Outfalls									
Sediment	3	3	3	3	3	15	3		15
Surface water	3	3	3	3	3	3			
28th Street Swamp									
Sediment	5	5	5	5	5	15	5		15
Surface water	1	1	1	1	1	1			1
Site 3 Swamp									
Sediment	2	2	2	2	2	2	2		2
Surface water	1	1	1	1	1	1			1
Site 7/2 Swamp									
Sediment	2	2	2	2	2	2	2		2
Surface water	1	1	1	1	1	1			1
Reference Swamp									
Sediment	3	3	3	3	3	3	3		3
Surface water	1	1	1	1	1	1			
Reference Canal									
Sediment	3	3	3	3	3	3	3		3
Surface water	1	1	1	1	1	1			1
Subtotal Samples									
Soil and sediment	40	40	40	40	40	82	22		82
	18	18	18	18	18	18			

See notes at end of table.

Table 4-3 (Continued)
Sediment and Surface Water Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Field Duplicates									
Sediment	4	4	4	4	4	8	0		
Surface water	2	2	2	2	2	2			
MS/MSD									
Sediment	4	4	4	4	4	8			
Surface water	2	2	2	2	2	2			
Quality Control									
Trip blanks	20								20
Rinsate blanks	10	10	10	10	10	10			10
Field blanks	6	6	6	6	6	6			6
Total Samples									
Sediment	48	48	48	48	48	98	22		
Water	58	38	38	38	38	38			
Analytical Unit Cost ($)									
Soil ($)	$225	$460	$230	$295	$200	$1,100	$800	$50	
Water ($)	$210	$425	$200	$295	$135	$1,100			
Cost Total									
Sediment	$10,800	$22,080	$11,040	$14,160	$9,600	$107,800	$17,600		$193,080
Water	$12,180	$16,150	$7,600	$11,210	$5,130	$41,800			$94,070
Total									$287,150

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
MS/MSD = matrix spike and matrix spike duplicate.

of Site 5 to monitor flow downgradient of the site. Up to two temporary wells will be installed south and west of Site 5 to monitor flow downgradient of the site. Up to two temporary wells will be installed south and west of Site 7/2 to monitor flow away from the unit.

The wells will be completed as Hydropunch™ 2-inch PVC temporary wells with 3- to 4-foot screens. The wells will have a total depth of 10 feet.

Groundwater analysis will consist of CLP analyses, including, CLP VOC, SVOC, pesticides/PCBs, TAL inorganics, and dioxin/furans. Engineering parameters, alkalinity, sulfate, etc., will be collected from one groundwater sample at each site. No subsurface soil samples are proposed for chemical analysis. Slug tests will be performed in the new wells to determine hydraulic conductivity. Leachate and groundwater samples are summarized on Tables 4-5 and 4-6.

Subtask 3.2 Phase 2 Field Investigation FFI Phase 2 sampling is estimated to consist of additional samples from Site 8, the drainage system, two of the three Phase 1 NCBC outfalls, and the 28th Street swamp. It is assumed that all of these samples will require dioxin only analyses.

Subtask 3.2.1 Site 8 Soils Additional surface soil samples will be collected from Site 8 to define hot spots identified in Phase 1. Increased density on an estimated 30 percent of the Phase 1 sample locations is proposed. This assumes up to seven locations will be resampled with four samples collected on 50-foot spacings laterally from the hot spot. The total number of locations is estimated to be 28. Analyses will be dioxin only. Total number of quality assurance and quality control (QA/QC) samples and costs are provided in Table 4-7.

Subtask 3.2.2 Outfalls It is estimated that two of the three base outfalls will require additional sampling efforts. It is proposed that dioxin only samples be collected at 50-foot intervals along a 600-foot length of the canal. This will result in up to 12 locations per outfall. Analyses will be dioxin only. Total number of QA/QC samples and costs are provided in Table 4-8.

Subtask 3.2.3 28th Street Swamp It is estimated that up to 15 additional dioxin only samples will be collected from the swamp to delineate dioxin extent with in the marsh. This is based on the assumption that sediment does not extend beyond the boundary of the swamp. All analyses will be dioxin only. Total number of QA/QC samples and costs are provided in Table 4-8.

Investigation-derived Waste

During the course of the sampling activities, the IDW will be properly containerized. The drums will be labeled with the relevant information and staged at a central location within each site. All pertinent data will be furnished to the responsible Base personnel. It is assumed that the Base will be responsible for disposing the IDW. No funds have been included in this task to sample the containerized IDW or to dispose the waste in any manner. No funds, LOE, or travel have been included in task for supplemental trips to NCBC to address this issue.

Table 4-4
Biota Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Site 8									
Earthworm analysis			5	5		5			5
Ditches									
Tissue			21	21		31		31	31
28th Street Swamp									
Tissue			12	12		17		17	17
Reference Swamp									
Tissue			6	6		6		6	6
Subtotal Field Samples									
Tissue			50	50		65		60	65
MS/MSD									
Tissue			0	0		0		0	0
Total Samples									
Tissue			50	50		65		60	65
Analytical Unit Cost ($)									
Soil and tissue ($)	$225	$460	$230	$295	$200	$1,100		$50	
Cost Total									
Tissue			$11,500	$14,750		$71,500		$3,000	$100,750
Total									$100,750

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
MS/MSD = matrix spike and matrix spike duplicate.

Table 4-5
Leachate Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	GeoTech Parameters	Percent Lipid	Total
Leachate									
Site 4	5	5	5	5	5	5	1		5
Site 5	5	5	5	5	5	5	1		5
Subtotal Field Samples									
Water	10	10	10	10	10	10	2		10
Field Duplicates									
Water	1	1	1	1	1	1			1
MS/MSD									
Water	2	2	2	2	2	2			2
Quality Control									
Trip blanks	2								2
Rinsate blanks	1	1	1	1	1	1			1
Field blanks	2								2
Total Samples									
Water	18	14	14	14	14	14	2		18
Analytical Unit Cost ($)									
Water ($)	$210	$425	$200	$295	$135	$1,100	$156		
Cost Total									
Water	$3,780	$5,950	$2,800	$4,130	$1,890	$15,400	$312		$34,262
Total									$34,262

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
GeoTech = geotechnical parameters: alkalinity, total organic compound, chemical oxygen demand, sulfate, sulfide, sulfite, nitrate, nitrite, and chloride.
MS/MSD = matrix spike and matrix spike duplicate.

Table 4-6
Groundwater Sample Summary

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	GeoTech Parameters	Percent Lipid	Total
Groundwater									
Site 3	2	2	2	2	2	2	1		2
Site 4	3	3	3	3	3	3	1		3
Site 5	3	3	3	3	3	3	1		3
Sites 7/2	2	2	2	2	2	2	1		2
28th Street	8	8	8	8	8	8	0		8
Subtotal Field Samples									
Water	18	18	18	18	18	18	4		18
Field Duplicates									
Groundwater	2	2	2	2	2	2			
MS/MSD									
Groundwater	2	2	2	2	2	2			
Quality Control									
Trip blanks	4								4
Rinsate blanks	2	2	2	2	2	2			2
Total Samples									
Water	28	24	24	24	24	24	4		24
Analytical Unit Cost ($)									
Water ($)	$210	$425	$200	$295	$135	$1,100	$156		
Cost Total									
Water	$5,880	$10,200	$4,800	$7,080	$3,240	$26,400	$624		$58,224
Total									$58,224

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
GeoTech = geotechnical parameters: alkalinity, total organic compound, chemical oxygen demand, sulfate, sulfide, sulfite, nitrate, nitrite, and chloride.
MS/MSD = matrix spike and matrix spike duplicate.

Table 4-7
Phase 2, Site 8 Surface Soils

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Site 8									
Surface soils						28			28
Subtotal Field Samples									
Soil						28			28
Field Duplicates									
Soil						3			3
MS/MSD									
Soil						4			4
Quality Control									
Trip blanks									
Rinsate blanks						2			2
Field blanks						2			2
Total Samples									
Soil						39			39
Analytical Unit Cost ($)									
Soil ($)	$225	$460	$230	$295	$200	$1,100		$50	
Cost Total									
Soil						$42,900			$42,900

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
TAL = Target Analyte List.
MS/MSD = matrix spike and matrix spike duplicate.

Table 4-8
Phase 2, Sediments

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Location, Media, and Sample Type	TCL VOA	TCL SVOC	TCL Pest/PCB	TAL Inorganics	Herbicides	Dioxin/ Furans	Sediment Toxicity	Percent Lipid	Total
Outfalls									
Sediment						24			24
28th Street Swamp									
Sediment						15			15
Subtotal Samples									
Soil/Sediment						39			39
Field Duplicates									
Sediment						4			4
MS/MSD									
Sediment						4			4
Quality Control									
Rinsate blanks						5			5
Field blanks						4			4
Total Samples									
Sediment						56			56
Analytical Unit Cost ($)									
Soil ($)	$225	$460	$230	$295	$200	$1,100		$50	
Cost Total									
Sediment						$61,600			$61,600

Notes: TCL = target compound list.
VOA = volatile organic aromatic.
SVOC = semivolatile organic compound.
Pest/PCB = pesticide and polychlorinated biphenyl.
TAL = Target Analyte List.
MS/MSD = matrix spike and matrix spike duplicate.

Task 4.0 Laboratory Analysis. Laboratory analyses of soil, sediment, surface water, groundwater and aquatic tissue samples will be conducted under U.S. Environmental Protection Agency (USEPA) CLP methods and performed at Navy-approved laboratories. Analyses will include CLP VOC, SVOC, pesticides/PCBs, and TAL inorganic compounds including cyanide, herbicides, and dioxins/furans, unless otherwise noted. Sediment toxicity testing and geotechnical analyses will be conducted at a separate laboratory. All samples will be analyzed to Naval Energy and Environmental Support Activity (NEESA) level c requirements, where applicable. A summary of analyses is provided in Tables 4-1 through 4-6.

Task 5.0 Preliminary Risk Evaluation. A PRE will be prepared to evaluate whether exposure to the contaminants in the ditch system at NCBC Gulfport pose a potential risk to humans living in residential areas in and around the Base. This document is not a Baseline Risk Assessment but will help determine if unacceptable health risks are present at the site and if other protective actions are required.

The PRE will be conducted using the traditional four phases of a human health risk assessment (HHRA): data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization and uncertainty analysis (USEPA, 1989a). It will follow the guidance found in USEPA and MSDEQ guideline documents including:

- *Superfund Public Health Evaluation Manual* (USEPA, 1986);
- *Exposure Factors Handbook* (USEPA, 1989b);
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A* (USEPA, 1989a);
- *Guidance for Remediation of Uncontrolled Hazardous Substance Sites in Mississippi* (MSDEQ, 1990);
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors* (USEPA, 1991a);
- *Supplemental Region IV Risk Assessment Guidance* (USEPA, 1991b); and
- *Dermal Exposure Assessment: Principles and Applications* (USEPA, 1992).

Data Collection and Evaluation. In the first phase of the PRE, data collection and evaluation, the data will be reviewed and relevant information discussed. The validated data will be gathered into a database and review for completeness and adequacy as in conducting a Baseline Risk Assessment according to USEPA guidance (USEPA, 1992), The analytical methods used and quantitation limits of all samples will be reviewed and environmental samples with elevated quantitation limits or rejected results will be identified and their significance to the risk assessment evaluated.

Selection of Compounds of Potential Concern. A screening process will be implemented to identify those analytes potentially posing the greatest health risk to receptors at the site. USEPA Region III has developed risk-based screening concentrations (RBCs) for soil and groundwater associated with a lifetime excess cancer risk of 1×10^{-6} or a non-cancer Hazard Quotient of 0.1 assuming residential exposure (USEPA, 1994). Maximum concentrations of analytes detected in each medium will be compared with the RBCs. Those analytes detected in each medium above the RBCs will be considered Chemicals of Potential Concern (CPCs) and carried through the remainder of the human health risk assessment (HHBRA).

As a conservative measure, sediment analytical results will be compared to surface soil RBCs while surface water analytical results will be compared with groundwater RBC values. Analytes detected at levels below the RBCs will generally be dropped from the risk assessment unless, in the professional judgment of the risk assessor, they could present a human health risk disproportionate to the concentration of the chemical detected. Factors that can result in retention of a chemical as a CPC include weight of evidence classifications of toxicity values, mobility, persistence, and bioaccumulation.

In the next step, the exposure assessment, the potential for exposure to humans is examined. This part of the PRE will be conducted as part of a much larger exposure assessment of the ditch system and the surrounding areas.

Exposure Assessment. In the exposure assessment, the frequency, duration, magnitude, and routes of potential human exposure to site-related (i.e., the ditch system at NCBC Gulfport) contaminants will be evaluated. Because of the complexities of the ditch system and the diversity of the surrounding neighborhood areas, this task will be completed in several stages. These stages include:

- characterization of the potentially exposed human population;
- characterization of the exposure setting (i.e., the diverse geographic and demographic populations present at the site);
- identification of all potential exposure pathways, both direct and indirect;
- evaluation of identified population health status by review of existing epidemiologic and health maintenance studies conducted by State and Federal agencies; and
- construction of site conceptual model.

Toxicity Assessment. A brief discussion of the known toxicity of each CPC is covered in the third section of the PRE, the toxicity assessment. In this step, the carcinogenic potential for each CPC is evaluated using USEPA toxicity factors. Known non-carcinogenic toxicity resulting from exposure to each CPC is also presented along the relevant USEPA toxicity factors.

Risk Characterization and Uncertainty Analysis. In the fourth step, risk characterization, the potential carcinogenic and non-carcinogenic risks are calculated for each exposure pathway. The methodology and equations used in these calculations are also briefly reviewed.

After the carcinogenic and non-carcinogenic risks are discussed in the PRE, the underlying assumptions used in calculating these values will also be reevaluated. Assumptions that may tend to under or over estimate the actual carcinogenic and non-carcinogenic risks at the site will be identified and discussed.

Using these carcinogenic and non-carcinogenic risk ranges as the basis for comparing risks, the approach used in the PRE can be viewed as a screening tool. If the results of the PRE indicate unacceptable health risks to the human population, then a full Baseline Risk Assessment may need to be conducted to better characterize the nature and extent of these risks. Conversely, if the results of the PRE indicate a low potential for unacceptable health risks, then this information should be considered when establishing the need for additional studies.

Task 6.0 Data Validation.

Data Validation. Analytical data collected during this task will be validated according to NEESA Level C criteria.

Information Management. Maintaining integrity of electronic files and providing data quickly and efficiently to end users is addressed here as information management. Subtasks include quality control of input files, efficient distribution to data users, and enhanced output and reporting. Our proposal includes system configuration, data QA/QC, and electronic download to _____ (F.R.E.D.).

QA/QC will be made more efficient by first entering the chemical and physical data into Microsoft™ FoxPro™, a similar commercial database. Package subroutines available will allow QA/QC of the data electronically, saving considerable effort while ensuring data is accurately transferred from the laboratory into F.R.E.D.-compatible fields. The addition of this step will reduce overall data management effort by improving data use capabilities, without significant additional cost.

System configuration will consist of design and testing of import and export template lists for each chemical and physical parameter. Electronic downloading of validated chemical data will be enhanced by this step, as will data export to defined data end users (e.g., risk assessors and surface hydraulic modelers).

Electronic import of data files to F.R.E.D. will be performed in accordance with Navy requirements.

Task 7.0 Baseline Risk Assessment. The Baseline Risk Assessment to be completed for sediments at NCBC Gulfport will include both a HHRA (Subtask 7.1) and an Ecological Risk

Assessment (ERA) (Subtask 7.2). The HHRA evaluates the potential risks associated with contamination under current and potential future land uses assuming no remediation or institutional controls.

Human Health Risk Assessment. The Baseline Risk Assessment to be performed at NCBC Gulfport will include both a HHRA and an ERA. The HHRA will be conducted according to the appropriate Federal and State guidelines including:

- *Superfund Public Health Evaluation Manual* (USEPA, 1986);
- *Exposure Factors Handbook* (USEPA, 1989b);
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A* (USEPA, 1989a);
- *Guidance for Remediation of Uncontrolled Hazardous Substance Sites in Mississippi* (MSDEQ, 1990);
- *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors* (USEPA, 1991a);
- *Supplemental Region IV Risk Assessment Guidance* (USEPA, 1991b); and
- *Dermal Exposure Assessment: Principles and Applications* (USEPA, 1992).

The HHRA will be conducted in six parts:

- data evaluation and summarization,
- identification of CPCs,
- exposure assessment covering both present and future conditions at NCBC Gulfport,
- toxicity assessment of the CPCs,
- risk characterization and uncertainty analysis, and
- calculate Remedial Goal Options.

The results of the data evaluation and summarization will also be used for the ERA.

The validated data collected during the RI will be gathered into a database and reviewed for completeness and adequacy for conducting a Baseline Risk Assessment according to USEPA guidance (USEPA, 1992). The analytical methods used and quantitation limits of all samples

will be reviewed and environmental samples with elevated quantitation limits or rejected results will be identified and their significance to the risk assessment evaluated. Analytes not detected at least once in a medium will be eliminated from the HHBRA. Unless Tentatively Identified Compounds are judged, either by estimated concentration or number, or possibly influence the HHBRA, they will only be evaluated quantitatively.

Comparison of site-related samples with background samples will be conducted to identify naturally occurring inorganic analytes or other anthropogenic contaminants at the site. In accordance with USEPA Region IV guidance (USEPA, 1991d), inorganics detected at concentrations less than twice the arithmetic mean of representative background samples will be considered of natural origin and will not be considered in the HHRA.

Identification of Compounds of Potential Concern. A screening process will be implemented to identify those analytes potentially posing the greatest health risk to receptors at the site. USEPA Region III has developed RBCs for soil and groundwater associated with a lifetime excess cancer risk of 1×10^{-6} or a non-cancer Hazard Quotient of 0.1 assuming residential exposure (USEPA, 1994). Maximum concentrations of analytes detected in each medium will be compared with the RBCs. Those analytes detected in each medium above RBCs will be considered CPCs and carried through the remainder of the HHRA.

As a conservative measure, subsurface soil and sediment analytical results will be compared to surface soil RBCs while surface water analytical results will be compared with groundwater RBC values. Analytes detected at levels below the RBCs will generally be dropped from the risk assessment unless, in the professional judgment of the risk assessor, they could present a human health risk disproportionate to the concentration of the chemical detected. Factors that can result in retention of a chemical as a CPC include weight of evidence classifications of toxicity values, mobility, persistence, or bioaccumulation. Applicable or Relevant and Appropriate Requirements (ARARs) for chemicals present at the site will also be identified.

Exposure Assessment. In the exposure assessment, the potential for human exposures to the CPCs detected at the sites will be estimated in a four-step process that includes:

1. characterization of the exposure setting,
2. identification of exposure pathways,
3. construction of exposure scenarios, and
4. quantitation of exposures.

In characterizing the exposure setting, the risk assessor will evaluate both the physical characteristics of the site and the nature of surrounding populations to provide a basis for assessing potential exposures. Important site characteristics that may influence human contact with site contaminants include surface conditions, soil type, degree of vegetative cover, and conditions that may affect the migration of contaminants such as speed and direction of groundwater flow.

Population characteristics to be evaluated include the location of current populations relative to the site and usual activities of these populations. The presence of potentially sensitive subpopulations, such as children and elderly or infirmed persons, will also be confirmed.

The risk assessor will use information gained in the exposure assessment to identify potential exposure pathways. The site conceptual model describes the potential human exposure pathways. A completed exposure pathway describes the specific way that a human receptor comes into contact with site contaminants and links the source of contamination, a potential exposure point and/or migratory pathway, the location, and activities of human receptors.

To quantify contaminant exposures in the identified human receptors, exposure point concentrations for each CPC are calculated. In accordance with USEPA Region IV guidance, the exposure point concentration for a contaminant in a medium will be the lower of either the maximum detected concentration at the site or the 95 percent Upper Confidence Limit (95% UCL) of the estimated mean.

Except for groundwater results, one half the sample quantitation limit will be used as a surrogate value in the determination of the 95% UCL at sample points at which a chemical was not detected.

Exposure point concentrations for some exposure pathways may use the results from modeling rather than from field samples. Exposures to contaminants volatilizing from water used for lawn irrigation and indoor showers will be modeled.

Toxicity Assessment. The toxicity assessment summarizes available information on the potential toxic effects of the CPCs and provides an estimate of the relationship of dose to the likelihood or severity of adverse human health effects. The USEPA has gathered and analyzed toxicity information for the majority of chemicals expected at NCBC Gulfport. Weight of evidence classifications and numerical toxicity factors have been developed and subjected to extensive peer review. This toxicity information is made available in several sources including:

- USEPA Integrated Risk Information System (IRIS),
- USEPA Health Effects Assessment Summary Tables (HEAST),
- USEPA Environmental Criteria and Assessment Office (ECAO), and
- Agency for Toxic Substances and Disease Registry (ATSDR) Toxicology Profile.

Separate risk evaluations are conducted for carcinogenic and non-carcinogenic effects. The USEPA has derived cancer slop factors (CSFs) and reference doses (RfDs) to evaluate carcinogenic and noncarcinogenic risks, respectively.

In addition to the current RfD values, the risk assessment will include other information relevant to interpreting the significance of potential health risks. The critical study on which the RfD is based will be described, as will the critical effect in the study, any uncertainty and modifying factors applied to the development of the RfD, and the degree of confidence assigned to the RfD.

Route-to-route extrapolations, especially for dermal exposures, and absorption adjustments to toxicity values will be made by the risk assessor, as necessary and consistent with good professional judgment.

If no information is available about a specific chemical in these sources, the risk assessor will consult with USEPA Region IV risk assessment staff to determine appropriate toxicity values.

Risk Characterization. The risk characterization combines the results of the exposure and toxicity assessments in quantitative expressions of potential health risks associated with chemical exposure. As previously noted, carcinogenic risks are characterized differently than are non-carcinogenic risks.

The USEPA has established criteria for interpreting carcinogenic risk estimates calculated by the standard USEPA risk evaluation methodology used in the risk assessment.

The risk characterization will also contain an analysis of the uncertainties associated with the risk assessment process. Uncertainties, which will be addressed, arise from several sources:

- uncertainties in the representativeness of analytical data for actual chemicals and concentrations at the site,
- uncertainties in modeling results used to determine exposure point concentrations,
- uncertainties in exposure factors used to calculate intakes,
- uncertainties in the appropriateness of toxicity values, and
- potential for synergistic or antagonistic interaction of CPCs.

A probability analysis may also be conducted if the results of the HHRA warrant such a step. The probability analysis reviews and incorporates additional information concerning the assumptions used to calculate the human health risks at the sites. The results probability analysis will be used to provide risk managers with additional information concerning the probable nature of the risk associated with the site.

Remedial Goal Options. The last step in the HHRA will be to develop RGOs for each CPC for every media where the total cancer risk is greater than 1×10^{-4} or the hazard index is greater than 1.0. These RGOs, calculated using the exposure assumptions used in the HHRA, represent CPC concentrations associated of lifetime cancer risks of 1×10^{-4}, 1×10^{-5}, and 1×10^{-6} or with Hazard Quotients of 10, 1.0, and 0.1.

Ecological Risk Assessment. The baseline ERA for NCBC Gulfport will be completed according to current USEPA guidance for ecological assessments at hazardous waste sites. Guidance documents that will be consulted include *RCRA Facilities Investigation Guidance* (USEPA, 1989c), *Risk Assessment Guidance for Superfund Vol II: Environmental Evaluation Manual* (USEPA, 1989d), *Ecological Assessment of Hazardous Waste Sites: A Field and*

Laboratory Reference (USEPA, 1991c), and *Ecological Assessment of Superfund Sites: An Overview* (USEPA, 1991a).

The ERA will be completed as five subtasks including Ecological Characterization, Problem Formulation, Exposure Assessment, Ecotoxicity Assessment, and Risk Characterization.

Ecological Characterization. An ecological characterization will be completed for Site 3 landfill and burn area, Site 4 landfill, Site 5 landfill, Site 7/2 landfill, Site 8 storage area, ditches, and 28th Street marsh. The ecological characterization will characterize the aquatic and terrestrial habitat present with the purpose of identifying the plant and animal life within the habitats that may be exposed to contamination. The plant and animal life are ecological receptors of potential contamination in surface soil, surface water, and sediments. The ecological characterization will consist of sampling of aquatic macroinvertebrates, characterization of aquatic and wetland habitats, and characterization of terrestrial habitats. The ecological characterization will be completed by staff botanists and aquatic ecologists.

Aquatic benthic macroinvertebrates will be sampled at 25 of the sediment sampling locations in the ditches, 28th Street swamp, Site 3 swamp, Site 7/2 swamp, reference swamp, and reference canal. Macroinvertebrates will be collected by dip net sweeps and three replicate ponar dredge samples. The macroinvertebrates collected will be identified by a subcontract laboratory to the species level, if practical.

The vegetative cover of Site 3, Site 7/2, Site 8, and the immediate surrounding areas and ditches will be described qualitatively and the habitat it provides for terrestrial wildlife will be discussed. Based on the type of habitats identified, the ecologists will develop a list of terrestrial wildlife species that may inhabit the area of the sites, canals, and swamps.

The ecological characterization will be completed at the same time that surface water and sediment samples for toxicity testing are collected. The ecological characterization will require one 10-day shift at 12 hours per day for two ecologists.

Problem Formulation. Problem formulation is the first subtask in the ERA where the scope and the focus of the ERA is determined. Problem formulation includes identification of ecological receptors, potential exposure pathways, and CPCs. Based on the results, endpoints for the ecological assessment are then defined.

Potential Exposure Pathways and Receptors. Potential pathways of exposure to contamination in soil, surface water, and sediments are listed in Table 7-1. Potential ecological receptors that can be exposed will be identified based upon the findings of the ecological characterization.

Ecological Contaminants of Potential Concern (ECPCs). ECPCs represent the analytes detected in media (surface soil, surface water, sediments, and groundwater) that are considered in the ERA. The ECPCs represent the contaminants that can potentially pose a risk for ecological receptors. ECPCs will be selected based on comparison of maximum detected contaminants and background concentrations.

Table 7-1
Potential Exposure Pathways for Ecological Receptors

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Site	Contaminated Medium	Route of Exposure	Receptors Potentially Exposed
Site 3 Landfill and Burn Area, Site 4 Landfill, Site 5 Landfill, and Site 7/2 Landfill	Leachate and surface water	Direct contact and direct and indirect ingestion of contaminated water as a result of exposure to leachate.	Birds, mammals, reptiles, invertebrates, and plants
Ditches	Sediments and surface water	Direct contact and ingestion and consumption of contaminated food.	Fish, invertebrates, plants, and amphibians
Site 8 Storage Area	Surface soil	Direct contact and direct and indirect ingestion.	Birds, mammals, and reptiles
28th Street Marsh	Sediments and surface water	Direct contact and ingestion and consumption of contaminated food. Ingestion and consumption of contaminated food	Birds, mammals, and reptiles

All ECPCs selected for the ERA will be summarized in tables that include the frequency of detection, the range of detection limits, the range of detected concentrations, the average detected concentration, the average of concentrations including samples with nondetects, the 95 % UCL (only for analytes selected as ECPCs), screening criteria (if available), and screening background concentrations. Background will be determined by taking twice the average concentration detected in background samples for each of the inorganic analytes.

Identification of Endpoints. The endpoints that will be used in the Gulfport ERA are provided in Table 7-2. Measurements of actual toxicity and adverse effects are completed where possible to decrease uncertainties and to measure the adverse effects associated with the actual mixture of contamination present in the environmental media (soil, water, and sediments). The measurement and assessment endpoints for aquatic receptors, terrestrial and wetlands wildlife, and terrestrial plants and invertebrates are discussed separately. Assessment endpoints represent the ecological component to be protected while the measurement endpoints approximate or provide a measure of the achievement of the assessment endpoint.

Exposure Assessment. The exposure assessment will predict concentrations of ECPCs for each of the exposure pathways based on the site media results (surface water, sediments, soil, and earthworm tissue). For sediments and surface water, the exposure concentrations for ecological receptors will be equal to the concentrations measured in the samples.

Exposures to plants and soil invertebrates will be based on concentrations of analytes measured in surface soil samples at Site 8 only. Contaminant exposures to terrestrial wildlife species based on potential dietary exposures will be determined by using a simple food chain model and the results of analyses of earthworms exposed to soil from the site. The food chain model will predict contaminant concentrations in prey items based on the concentrations measured in soil, surface water, and sediments.

Ecotoxity Assessment. Toxicity information on individual ECPCs to receptor species (terrestrial wildlife, aquatic organisms, plants, etc.) will be collected from the available literature. This will include information from USEPA's aquatic toxicity database Aquatic Information Retrieval (AQUIRE). For each of the ECPCs, a value will be chosen that is protective of adverse effects for each of the endpoints selected (survival, reproductive effects, or growth).

Sediment samples from 28 sites will be submitted to a subcontract laboratory for sediment toxicity testing according to the American Society for Testing and Materials (ASTM) protocols for the amphipod (*Ampelisca abdita*) 10-day survival test (ASTM E1383-92) or the 14-day amphipod (*Hyallela azteca*) survival test (static renewal) (ASTM E1383-A1). Testing will be completed with 100 percent of the sediments submitted with four replicate chambers and no dilution. Six of the samples will serve as a field reference. Sediment samples for toxicity testing will be stored according to protocols established by ASTM E1391-90. For locations with salinity greater than 2, the *Ampelisca* test will be completed. For costing purposes, it is assumed that one half of the samples are to be tested with *Ampelisca* and the other half with *Hyallela*.

Table 7-2
Endpoints for Ecological Risk Assessment

Plan of Action
Base-wide Groundwater, Surface Water, and Sediment Sampling
Interim Remedial Action, Dioxin Source
Naval Construction Battalion Center
Gulfport, Mississippi

Media	Receptor	Assessment Endpoint	Measurement Endpoint
Surface water	Aquatic life (fish, invertebrates, plants, and amphibians)	Survival and maintenance of benthic macroinvertebrate community structure and function.	Field sampling and measurement of macroinvertebrate community structure and function.
			Contaminant concentrations in surface water associated with adverse effects to growth, reproduction, or survival of aquatic organisms.
			Field sampling and measurement of macroinvertebrate community structure and function.
		Survival and maintenance of fish and aquatic plant populations.	Contaminant concentrations in surface water associated with adverse effects to survival of the resident species or closely related species.
Sediments and soils	Aquatic life (fish, invertebrates, plants, and amphibians)	Survival and maintenance of benthic macroinvertebrate community structure and function.	Contaminant concentrations in surface water associated with adverse effects to survival of the resident species or closely related species.
		Survival and maintenance of fish and aquatic plant populations.	Contaminant concentrations in surface water associated with adverse effects to survival of the resident species or closely related species.
Surface water, sediments, and surface soils	Terrestrial and wetlands wildlife	Survival of wildlife populations and communities.	Oral contaminant exposure concentrations representing adverse effects to growth, reproduction, or survival of mammalian or avian laboratory test populations.

The results of the sediment testing will be reported as percent survival for the amphipods. The effects for field sites will be statistically compared by use of t-tests, analyses of variance, or regression analyses. Statistical analyses will be used to determine if the observed differences among the samples are statistically different.

Risk Characterization. The risk characterization will be based on the comparison of the ecotoxicity values with predicted contaminant exposure concentrations for each of the exposure pathways for each receptor. Risks will also be characterized for aquatic life based on the results of the macroinvertebrate sampling. The risk characterization will include an evaluation of uncertainties in the assessment. If risks are identified for ecological receptors, the magnitude and relevance of the predicted adverse effects will be discussed and interpreted. The ERA will be incorporated into the draft and final FFI report.

Task 8.0 Treatability Testing.

8.1 Concrete Testing Up to three concrete mixtures of 7028 dioxin ash from Sites 8 will be prepared and tested for structural integrity. The mixtures will consist of varied amounts (percentage by weight) of ash content and/or additives. Testing will be conducted at a subcontract geotechnical laboratory and will follow ASTM C150, Standard Specification for Portland Cement. Samples will be provided during the FFI field effort; no additional travel required. Waste material, although limited volumes are expected, will be disposed by the subcontracted laboratory.

A letter report will be issued in two iterations; written responses to Base comments will be generated and incorporated into the final document.

One trip for the staff engineer and task order manager (TOM) is proposed. The vendor trip will consist of 2 days.

Task 9.0 Focused Field Investigation Report. The physical and chemical data collected during the field activities will be evaluated and interpreted to determine contaminant presence or absence at the various sites. Evaluation of flow, gradient, and concentrations will determine whether or not Base activities are impacting the surrounding environment. Specific data to be evaluated under this subtask are all chemical and physical sample analyses and piezometric data collected during field activities.

After data have been evaluated and interpreted and human health and ecologic risk assessments are completed, ABB-ES will furnish a draft report to SOUTHNAVFACENGCOM outlining the activities completed, observations made, surveying activities, evaluations of data gathered, and conclusions. This report will provide tabulated data and furnish analytical data on the site maps for ease of review. Two iterations of this report are projected. The report will be furnished to the NCBC team including SOUTHNAVFACENGCOM, the Base, and U.S. Geological Survey (USGS). Upon receipt of comments from the team members, the report will be reissued and the results furnished to the State for information only.

Technical Briefings. Up to two technical briefings are proposed to report preliminary findings at the end of Phase 1 and at submittal of the FFI report. The briefing at the end of Phase 1 is planned to provide an overview of the preliminary risk evaluation results. It is proposed that the TOM and up to two technical staff attend the briefing at the Base. Presentation materials will be prepared; however, the presentation is intended to be an information scoping session.

The FFI report briefing is intended for Base and SOUTHNAVFACENGCOM personnel; however, it will be a formal presentation suitable for other viewers as well. It is also suggested that the TOM and up to two technical staff attend the briefing presented at the Base.

Task 10.0 Focused Feasibility Studies.

10.1 Site 8 Erosion Control Effective and cost efficient non-time critical remedial actions will be evaluated in a Focused Feasibility Study (FFS) for Site 8 to control surface soils (dioxin containing) and/or ash (F028 dioxin incineration ash). The process will involve the following steps:

- development of interim response actions,
- screen alternatives,
- evaluate alternatives, and
- outline design criteria.

The FFS will propose a preferred alternative; this in turn will be presented, under Task 11.0, Interim Record of Decision, as a Proposed Plan submitted for public review, under Task 11.0.

The FFS report will be issued in two iterations. Presentation of results will be made to Base personnel in Gulfport, the TOM and up to two technical associates will attend. Comments received from the Base will result in a written response to comments. A presentation to the regulators is proposed following resolution of comments and their incorporation into the final document.

Subtask 10.2 Sediment Migration Control Effective and cost efficient non-time critical remedial actions will be evaluated in a FFS to control sediments within the canal system on the Base and prevent their migration. The process will involve the following steps:

- development of interim response actions,
- screen alternatives,
- evaluate alternatives, and
- outline design criteria.

The FFS will propose a preferred alternative; this in turn will be presented, under Task 11.0, Interim Record of Decision, as a Proposed Plan submitted for public review, under Task 11.0.

The FFS report will be issued in two iterations. Presentation of results will be made to Base personnel in Gulfport; the TOM and two technical associates will attend. Comments received

from the Base will result in a written response to comments. A presentation to the regulators is proposed following resolution of comments and their incorporation into the final document.

Subtask 10.3 Sites 4 and 5 Leachate Control Effective and cost efficient non-time critical remedial actions will be evaluated in a FFS to address the control and/or collection of leachate potentially seeping from landfill cells and migrating into the canal system on the Base. Treatment of the recovered leachate is not within the scope of this FFS, based upon initial estimates of leachate volume. The process will involve the following steps:

- development of interim response actions,
- screen alternatives,
- evaluate alternatives, and
- outline design criteria.

The FFS will propose a preferred alternative; this in turn will be presented, under Task 11.0, Interim Record of Decision, as a Proposed Plan submitted for public review, under Task 11.0.

The FFS report will be issued in two iterations. Presentation of results will be made to Base personnel in Gulfport, the TOM and up to two technical associates will attend. Comments received from the Base will result in a written response to comments. A presentation to the regulators is proposed following resolution of comments and their incorporation into the final document.

Task 11.0 Proposed Plan (PP) and Interim Record of Decision (IROD).

Subtask 11.1 Site 8 Erosion Control The preferred alternative proposed under Subtask 10.1 for Site 8 erosion control will be presented, for public review, as a Proposed Plan (PP). Plan availability and physical location will be published in up to three local newspapers with a public hearing notice. A 30-day public comment period is estimated, with written response to comments provided to the Base, and the final copy of responses incorporated into the Administrative Record. This estimate assumes one revision to the response to public comments prior to publication.

The PP will be revised per changes agreed to by the Base in the response to comments and issued as final. This estimate does not include revision of the FFS or change in selected alternative resulting from public comments. It is assumed that interim record of decision (IROD) development will be initiated immediately following issuance of the final PP.

The IROD will document the site remedy selection, the selection process, and the ARAR analysis that supports the selection. The document will address the following:

- human health and ecological risk reduction,
- ARAR attainment or waiver justification,
- remedy cost effectiveness,
- identification of innovative treatment or resource recovery technologies used, and

- identification of interim system limitation(s) for full remediation.

Specifically, the IROD will provide the written comments and responses received through the public participation process. Specific changes to the selected alternative, as compared to the PP, will also be defined. The IROD will detail the extent of remedial goal attainment expected and describe the mechanisms to be emplaced to satisfy the comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) system review requirements.

The IROD will be placed in the administrative record and a notice of availability will be published in up to three local newspaper, indicating its availability for public inspection.

Subtask 11.2 Sediment Migration Control The preferred alternative proposed under Subtask 10.2 for sediment migration control will be presented for public review as a PP. Plan availability and physical location will be published in up to three local newspapers with a public hearing notice. A 30-day public comment period is estimated with written response to comments provided to the Base and the final copy of responses incorporated into the Administrative Records. This estimate assumes one revision to the response to public comments prior to publication.

The PP will be revised per changes agreed to by the Base in the response to comments and issued as final. This estimate does not include revisions of the FFS or change in selected alternative resulting from public comments. It is assumed that IROD development will be initiated immediately following issuance of the final PP.

The IROD will document the site remedy selection, the selection process, and the ARAR analysis that supports the selection. The document will address the following:

- human health and ecological risk reduction,
- ARAR attainment or waiver justification,
- remedy cost effectiveness,
- identification of innovative treatment or resource recovery technologies used, and
- identification of interim system limitation(s) for full remediation.

Specifically, the IROD will provide the written comments and responses received through the public participation process. Specific changes to the selected alternative, as compared to the PP, will also be defined. The IROD will detail the extent of remediation goal attainment expected and describe the mechanisms to be emplaced to satisfy CERCLA system review requirements.

The IROD will be placed in the administrative record and a notice of availability will be published in up to three local newspapers, indicating its availability for public inspection.

Subtask 11.3 Sites 4 and 5 Leachate Control The preferred alternative proposed under Subtask 10.3 for Sites 4 and 5 leachate control will be presented for public review as a PP. Plan availability and physical location will be published in up to three local newspapers with a public hearing notice. A 30-day public comment period is estimated, with written response to comments provided to the Base and the final copy of responses incorporated into the

administrative record. This estimate assumes one revision to the response to public comments prior to publication.

The PP will be revised per changes agreed to by the Base in the response to comments and issued as final. This estimate does not include revision of the FFS or changes in selected alternative resulting from public comments. It is assumed that IROD development will be initiated immediately following issuance of the final PP.

The IROD will document the site remedy selection, the selection process, and the ARAR analysis that supports the selection. The document will address the following:

- human health and ecological risk reduction,
- ARAR attainment or waiver justification,
- remedy cost effectiveness,
- identification of innovative treatment or resource recovery technologies used, and
- identification of interim system limitation(s) for full remediation.

Specifically, the IROD will provide the written comments and responses received through the public participation process. Specific changes to the selected alternative, as compared to the PP, will also be defined. The IROD will detail the extent of remedial goal attainment expected and describe the mechanisms to be emplaced to satisfy CERCLA system review requirements.

THE IROD will be placed in the administrative record and a notice of availability will be published up to three local newspapers, indicating its availability for public inspection.

Task 12.0 Interim Removal Action (IRA) Preliminary Design.

Subtask 12.1 Site 8 Erosion Control Preliminary design of the selected remedy will be prepared. The deliverable will consist of design drawings and specifications for up to 60 percent system design.

Drawings and specifications will meet Navy Standard Operating Procedures (SOPs) NB-DSIGN-001-00 through NB-DSIGN-007-00, where applicable. The design package will be issued in three iterations: 30 percent, draft 60 percent, and final 60 percent. A presentation to the Base will be made at both the 30 percent and draft 60 percent deliverables for review and comment resolution.

Subtask 12.2 Sediment Migration Control Preliminary design of the selected remedy will be prepared. The deliverable will consist of design drawings and specifications for up to 60 percent system design.

Drawings and specifications will meet Navy SOP NB-DSIGN-001-00 through NB-DSIGN-007-00, where applicable. The design package will be issued in three iterations: 30 percent, draft 60 percent, and final 60 percent. A presentation to the Base will be made at both the 30 percent and draft 60 percent deliverables for review and comment resolution.

Subtask 12.3 Sites 4 and 5 Leachate Control Preliminary design of the selected remedy will be prepared. The deliverable will consist of design drawings and specifications for up to 60 percent system design.

Drawings and specifications will meet Navy SOP NB-DSIGN-001-00 through NB-DSIGN-007-00, where applicable. The design package will be issued in 3 iterations: 30 percent, draft 60 percent, and final 60 percent. A presentation to the Base will be made at both the 30 percent and draft 60 percent deliverables for review and comment resolution.

III. PROJECT PERSONNEL

The proposed project organization for CTO No. 096, Modification 02, is presented in Attachment E. The designated project personnel for the base-wide sampling are as follows.

- Task Order Manager. The TOM for CTO No. 096, Modification 08, is Ms. Penny Baxter, Professional Geologist. Ms. Baxter is responsible for evaluating the appropriateness and adequacy of the technical services provided for the effort and for developing the technical approach and LOE required to address POA. Ms. Baxter is also responsible for the day-to-day conduct of the work. She will review ongoing quality control during the performance of work, the technical integrity of conclusions and recommendations, and the clarity and usefulness of project work products.

- Key Technical Team Members. Mr. Kurt Sichelstiel will the Technical Lead for this project and will be responsible for the overall technical approach for this investigation. Mr. Marland Dulaney will serve as risk assessment coordinator for this project. He will be responsible for the technical completeness of the human health and ecologic risk assessments. Mr. Bob Fisher will serve as the field team leader for sampling activities.

- Quality Review Board. A quality review board comprised of the board of technical directors and senior technical staff from the ABB-ES team will assist the TOM and Technical Leader by providing review of the technical aspects of the project to assure that they are produced in accordance with corporate policy and meet the requirements of SOUTHNAVFACENGCOM. Mr. Bob Lunardini will be the primary lead for the ABB-ES quality review board and in this role will assure the quality of the technical and engineering services and appropriateness of methodologies, conclusions, and recommendations of the project.

IV. SCHEDULE

Attachment A depicts the project schedule in Gantt format, indicating the estimated duration and initiation and completion dates of individual tasks for execution of this modification.