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FINAL EXTENDED SITE INSPECTION WORK PLAN FOR CAUSEWAY LANDFILL SITE 3

MCRD PARRIS ISLAND SC

8/3/1990

KEMRON ENVIRONMENTAL SERVICES

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FINAL REPORT

EXTENDED SITE INSPECTION WORKPLAN
THE CAUSEWAY LANDFILL
MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
UIC: M00263

Report to:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
Charleston, South Carolina

August 1990

KEMRON
ENVIRONMENTAL SERVICES

PROTECTING OUR ENVIRONMENTAL FUTURE

RELEASE OF THIS DOCUMENT REQUIRES PRIOR NOTIFICATION OF THE COMMANDING GENERAL OF THE MARINE CORPS RECRUIT DEPOT, PARRIS ISLAND, SOUTH CAROLINA

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS N/A
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION/AVAILABILITY OF REPORT N/A
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 819-200	5. MONITORING ORGANIZATION REPORT NUMBER(S) N/A
6a. NAME OF PERFORMING ORGANIZATION KEMRON Environmental Svcs. — 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION Marine Corps Recruit Depot
6c. ADDRESS (City, State, and ZIP Code) 1815 Century Blvd., Ste. 150 Atlanta, GA 30345	7b. ADDRESS (City, State, and ZIP Code) Parris Island, South Carolina 29905
8a. NAME OF FUNDING/SPONSORING ORGANIZATION SOUTHNAV FACENGCOM — 8b. OFFICE SYMBOL (If applicable) N/A	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER N62467-87-D-0650
8c. ADDRESS (City, State, and ZIP Code) 2155 Eagle Drive P.O. Box 10068 Charleston, SC 29411	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO: PROJECT NO: TASK NO: WORK UNIT ACCESSION NO:

11. TITLE (Include Security Classification)
Extended Site Inspection Workplan The Causeway Landfill, Marine Corps Recruit Depot, Parris Island, South Carolina

12. PERSONAL AUTHOR(S)
Kurt D. Hausner, Russell K. Fraze, Charles E. Beck

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final	FROM _____ TO _____	1990 August 3	30

16. SUPPLEMENTARY NOTATION
N/A

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This document is the workplan for performing an Extended Site Inspection (ESI) at the Causeway Landfill located at the Marine Corps Recruit Depot, Parris Island, South Carolina. The purpose of the ESI is to determine whether or not this site should advance to the Remedial Investigation/Feasibility Study (RI/FS) phase of the Navy Installation Restoration Program.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION N/A
22a. NAME OF RESPONSIBLE INDIVIDUAL Glenn C. Bradley	22b. TELEPHONE (Include Area Code) (803) 743-0582 — 22c. OFFICE SYMBOL 115

DD Form 1473, JUN 86 — Previous editions are obsolete. — SECURITY CLASSIFICATION OF THIS PAGE

S/N 0102-LF-014-6603

DISTRIBUTION LIST	NUMBER OF COPIES DISTRIBUTED
Commanding Officer Southern Division Attn: Code 11517 Naval Facilities Engineering Command 2155 Eagle Drive, P.O. Box 10068 Charleston, SC 29411-0068	3
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EXECUTIVE SUMMARY

This document is a workplan for performing an Extended Site Inspection (ESI), at the Causeway Landfill, located at the Marine Corps Recruit Depot. The purpose of this ESI is to determine whether this site is free of environmental threats and may be dropped from further study or whether it should advance to the Remedial Investigation/Feasibility Study (RI/FS) phase of the Navy Installation Restoration Program.

A Site Inspection (SI), has been performed on the site. Based on evidence developed during the SI, this site was proposed to be dropped from further study. USEPA and DHEC judged this to be premature and recommended that specific additional data be gathered at this site. This document is a workplan for collecting that additional data.

FORWARD

The Department of the Navy developed the Navy Installation Restoration Program (NIRP) to identify, assess, and clean up or control environmental contamination from past hazardous waste disposal operations and hazardous material spills at Navy and Marine Corps activities. The NIRP program is a component of the Defense Environmental Restoration Program, which is codified in SARA Section 211.

The NIRP program uses a six-phase approach to manage past disposal sites. Phase I, the Preliminary Assessment (PA), consists of collecting and reviewing all available evidence of contamination that may pose a potential threat to human health or the environment. Phase II, the Site Inspection (SI), augments data collected in the PA through sampling and field data to determine if further investigation is required. Phase III, the Remedial Investigation (RI), is a field effort to collect sufficient information to characterize sites for development and evaluation of remedial responses. Phase IV, the Feasibility Study (FS), involves selecting remedial alternatives based on cost, environmental effects, and engineering feasibility. Phase V, the Remedial Design (RD), includes design of remedial technologies selected in the FS. Phase VI, the Remedial Action (RA), implements the RD.

This report outlines the workplan for conducting an extended site inspection (ESI) at the Marine Corps Recruit Depot, Parris Island, South Carolina. The report also includes procedures and standards for the Sampling and Analysis Plan (Field Sampling Plan and Quality Assurance Project Plan) and the Health and Safety Plan to be followed while implementing the ESI workplan.

ACKNOWLEDGEMENTS

The site inspection team thanks the many people at the Marine Corps Recruit Depot in Parris Island, South Carolina and the Southern Division Naval Facilities Engineering Command, who cooperated to make successful completion of this study possible. We would also like to gratefully acknowledge the efforts and assistance of the Naval Energy and Environmental Support Activity.

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CHAPTER 1. INTRODUCTION

1.1 PROGRAM BACKGROUND. This document describes a workplan for the proposed Extended Site Inspection (ESI) of a potential hazardous waste site at the Marine Corps Recruit Depot (MCRD), Parris Island, South Carolina. In addition, this document includes a Sampling and Analysis Plan (SAP) and a Site Specific Health and Safety Plan, Chapters 3.0 and 4.0, respectively. The site is known as the Causeway Landfill (Figures 1-1, 1-2). It is also referenced as Site 3 in previous studies at the MCRD.

1.2 SITE HISTORY. The site, a causeway that connects Parris Island and Horse Island, was constructed from solid waste and fill dirt across a tidal marsh of the Broad River. The causeway is approximately 0.8 miles long and has an elevation of approximately ten feet above mean sea level (MSL). A two lane gravel road is constructed along the center of the causeway. The site was the major recipient of solid waste generated by MCRD from 1960 to 1966 and again from 1968 to 1972. In addition to trash, other solids and hazardous wastes were disposed at the Causeway via MCRD dumpsters and trash cans (Table 1-1). Wastes uncovered during daily causeway construction activities were burned each night. No alternative fuels were used for burning.

Upon completion of the causeway in 1972, the area between the causeway and Scout Island became a salt water impoundment. Culverts and locks were installed in the causeway at two locations in 1975 to partially reconnect the impounded area with the sea. Only domestic trash was encountered during the installation of these culverts and locks.

Migration of contaminants from this site is possible but has not been documented. The landfill was built upon clay marsh soils within tidal elevations. Tidal ebb and flow flushes and drains porous zones of the Causeway which may allow contaminants to leach out into surrounding areas. Vertical migration of contaminants is unlikely due to the clay content of the marsh soils. Potential receptors include fish and shellfish within the marsh and predatory species, including man, which feed on them.

1.3 PRIOR STUDIES. Two prior studies have been performed on the Causeway Landfill. The Naval Energy and Environmental Support Activity (NEESA) performed the Initial Assessment Study (IAS) and indicated that further investigation of the site was warranted due to the potential for contamination resulting from the Causeway Landfill. The IAS was the functional equivalent of a CERCLA preliminary assessment.

McClelland Engineers, Inc., of Houston, Texas, performed the verification study, now termed Site Inspection (SI), of the Causeway Landfill to determine if contamination had occurred. Eight surface water and eight shallow soil sediment samples were collected from the water line adjacent to the causeway. The surface soil/sediment samples were assayed for priority pollutant volatile organic compounds, acid and base/neutral extractable organics including PCBs and pesticides, total metals (As, Ba, Be, Cd, Cr, Pb, Hg, Se, and Ag), and EP toxic metals (As, Cd, Cr, Pb, and Hg). Hexavalent chromium (CrVI) was analyzed in five of the soil samples as the total chromium concentrations exceeded the lower limit of determination for total chromium. The surface water samples were assayed for priority pollutant volatile organic compounds, acid and base/neutral extractable organics including PCBs and pesticides, total metals (As, Ba, Be, Cd, Cr,

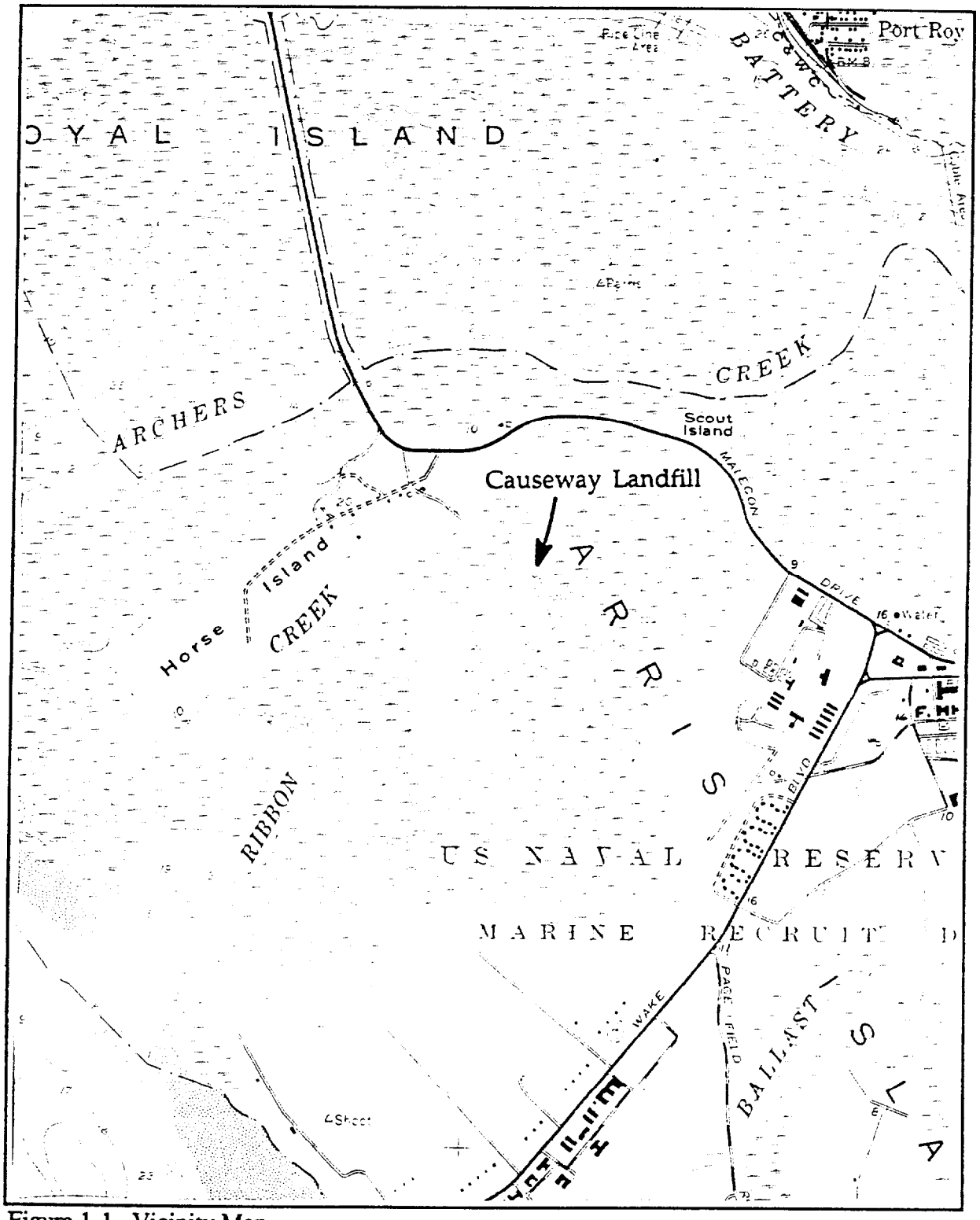

Figure 1-1 Vicinity Map.

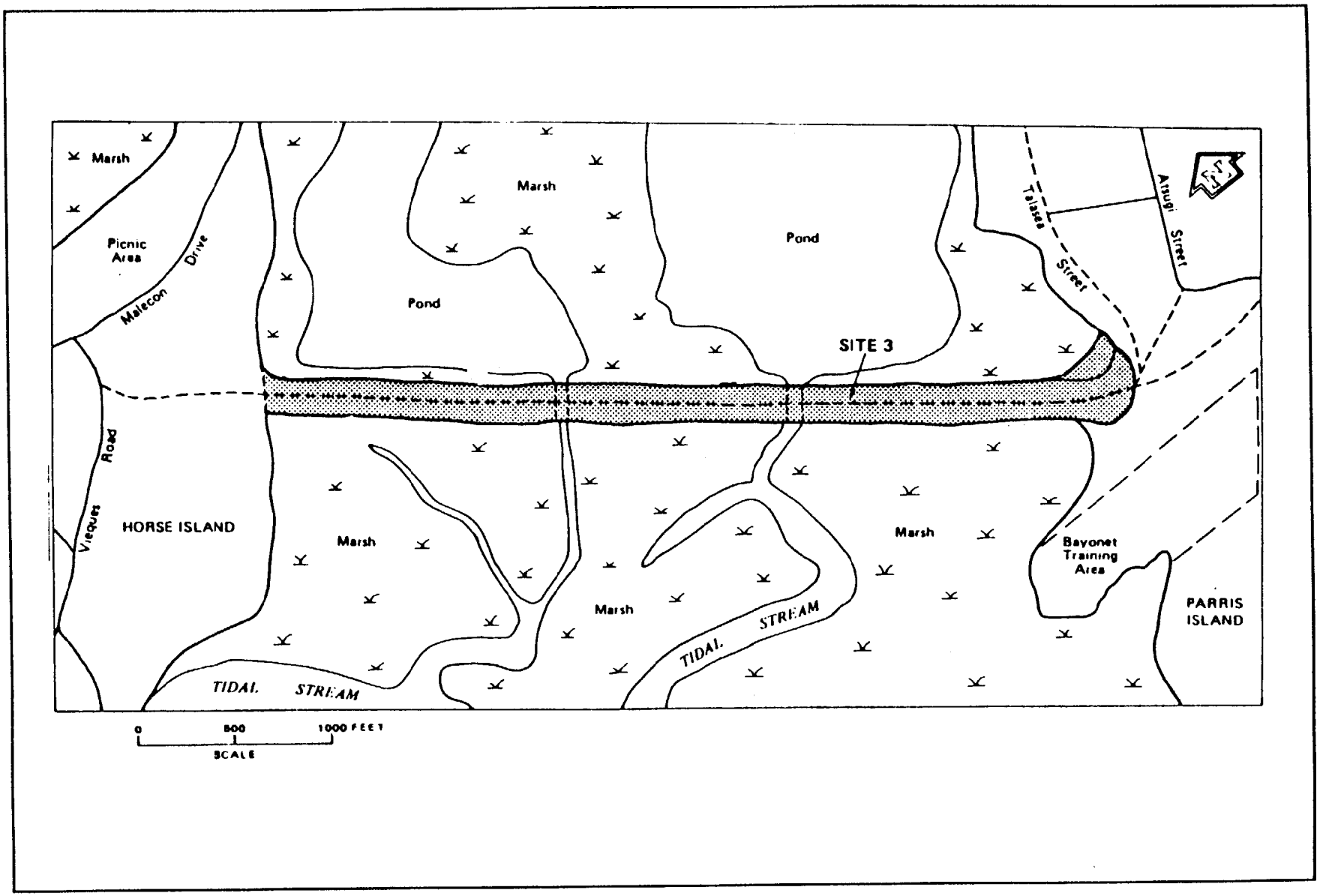

Figure 1-2 Site Map. (Source: NEESA 13-094)

Table 1-1. Summary of Waste Deposited at Causeway Landfill (1960-1972)
Parris Island, South Carolina

Waste Types	Estimated Totals	Source
Domestic Trash	50,000 ton	Entire Depot
Construction Debris	unknown	unknown
Solid Paint Wastes	28.2 ton	Paint Shop
Empty Pesticide Containers	20,000	Pest Control Shop
Cleaning Rags	3 ton	Garages and Shops
Spent Absorbent	2 ton	Automobile Hobby Shops
Solvent Sludge	32 lb.	Automobile Hobby Shops
Perchloroethylene Still Bottom	5,600 gal.	Dry Cleaning Plant
Mercury Amalgam	2 ton	Dental Clinic
Beryllium Waste	3 lb.	Dental Clinic
PCB Contaminated Oil	15 lb.	Electrical Shop

Pb, Hg, Se, and Ag), and the indicator parameters total organic carbon, pH, and specific conductance.

The results of these assays indicated that no priority pollutant volatile organic compounds were detected in the surface soil/sediment and surface water samples. In addition, no heavy metals were identified that exceeded allowable limits as set forth in the EPA Interim Primary Drinking Water Standards or the EPA Ambient Saltwater Quality Criteria. Concentrations of chromium exceeded the lower limit of determination for five sediment samples. However, none of these five samples exhibited hexavalent chromium at concentrations above the lower limit of determination for this constituent at 0.010 mg/1. Based on these results, McClelland recommended that no further studies were warranted at the Causeway Landfill. South Carolina Department of Health and Environmental Control (DHEC) along with the EPA judged this recommendation to be premature and suggested that further study was warranted. McClelland included these recommendations in their Final SI report.

Waters around the causeway are used for recreational fishing with consequent consumption of aquatic organisms. Concerned over biomagnification and related phenomena, both DHEC and EPA asked that a study be performed to determine if humans may be impacted via consumption of the fauna from areas surrounding the causeway. This document is a workplan for that study.

CHAPTER 2. PROPOSED FIELD INVESTIGATION

This section describes observations to be made, samples to be collected, and assays to be performed. The rationale for selection of the above mentioned criteria is also presented.

2.1 OBJECTIVES. The general objective of this ESI is to gather sufficient data to demonstrate that this site either poses no threat or poses potential threat to public health. If a threat is detected, the objective is to quantify that threat and determine an appropriate response. Collection of soil and water samples is not planned at this time because previous studies have demonstrated that significant contamination is not quantifiable in area waters and soils.

Specific objectives for this site are:

- To collect relevant samples of aquatic life in the marsh;
- To determine the concentrations of any contaminants present in the specimens; and
- To determine if contamination poses a threat to public health.

2.2 METHODS.

2.2.1 Aquatic Life Sampling A representative sampling of aquatic life likely to be consumed by humans will be collected. Mr. Gary Duke of the Natural Resources and Environmental Affairs Office (NREAO), MCRD, indicated that the primary species harvested in the impoundment by humans are mullet and shrimp. Therefore, mullet and shrimp will be the primary focus of this study. Oysters, clams, and crabs will also be retrieved. Additional species of fish may be sampled if they are found to be collected in sufficient numbers to suggest that they may form a significant component of the area harvest.

Sampling is preferred to be performed during the on-rush of high tide in the late summer or fall of the year. Areas adjacent to both sides of the causeway will be sampled for aquatic fauna.

Samples will be collected via boat using various methods. Gill nets will be utilized to collect fish. The gill nets will be checked every hour in order to avoid an over-kill of fish. Cast nets will be utilized primarily to catch shrimp and secondarily to collect fish. Shellfish will be collected with an oyster rake hand pulled through the retrieval area. Crabs will be caught using a crab basket baited with fish.

Six individuals representative of the local population in both size and year class will be collected from each fish species and prepared for laboratory analyses. Species specific samples will be labeled numerically (i.e., Genus species, sample #).

Samples of crustacean and molluscan specimens including crabs, shrimp, clams, and oysters will each consist of approximately 15 specimens of legally harvestable size. Collected specimens will be prepared for laboratory analyses, with species specific samples being labelled numerically.

2.2.2 Laboratory Assays Sample analyses will be performed using a subcontracted laboratory. Tissue samples of each specimen will be prepared, preserved on ice, and shipped to the laboratory via overnight delivery. Tissue samples of fish will consist of the entire organism for small fish and separate liver and muscle samples for larger fish ($\geq$ 40 grams). Tissue samples of all other specimens will consist of the entire organism.

Each sample will be analyzed for mercury (Hg), acid and base/neutral extractables, polynuclear aromatic hydrocarbons (PAH), and pesticides and PCBs (polychlorinated biphenyls). The proposed field sampling protocol is listed in Table 2-1.

2.3 RATIONALE.

2.3.1 Aquatic Life Sampling Both sides of the causeway will be sampled to determine if aquatic fauna have been impacted. This will assist in determining whether the fauna adjacent to the causeway have been contaminated, thereby posing a threat to the public. In order to maximize the chances of collecting edible-size specimens of finfish, it is preferred that sampling be performed in the late summer or fall during the on-rush of high tide. Late summer or fall sampling will allow collection of larger specimens because summer is the period of most rapid growth for most aquatic species and migratory species that utilize the marsh during the summer season. Sampling at high tide is preferred because aquatic fauna are known to be more active during this time.

The primary species used for human consumption in the impoundment and marsh are mullet and shrimp. Therefore, primary specimens will consist of these species. However, macroinvertebrates (Mollusca, Crustacea) are important members of the food web, and their well-being is reflected in the well-being of higher forms such as fish. Macroinvertebrates are sensitive to stress and often serve as good indicators of environmental perturbations resulting from introduced contaminants. Therefore, oysters, clams and crabs will also be collected from the sample areas even if the species collected are not generally consumed by humans.

2.3.2 Laboratory Assays Assays to be performed were selected based on the types of constituents potentially present at the site, their persistence, and their tendency to biomagnify. The parameters to be assayed (mercury, acid and base/neutral extractables, pesticides and PCBs, and PAH) were chosen because of the potential for their presence in the causeway fill material and because most known bioaccumulative toxins can be detected with this set of assays.

Table 2-1. Proposed Field Sampling Protocol.

Specimen	Sample Type	Number of Samples	Number of Blanks	Laboratory Assays*
Mullet	liver/tissue	6	1	BNA PAH
Fish**	liver/tissue	6	1	Hg Pesticides
Oyster	whole organism	15	1	PCB
Crab	whole organism	15	1	
Clam	whole organism	15	1	
Shrimp	whole organism	15	1	

* All samples will be assayed for all constituents
** Depending on capture rates
NOTE: Number of samples are estimates

CHAPTER 3.0 SAMPLING AND ANALYSIS PLAN

The following sections describe the methods to be utilized to assure collection of usable data during the site inspection. Elements of this program include project organization, sampling protocols, laboratory protocols, and quality control checks.

3.1 PROJECT DESCRIPTION. The site under investigation is known as the Causeway Landfill. Various solid wastes were disposed of at the site between 1960 and 1972.

To characterize the threat to humans, aquatic life will be sampled from the surrounding waters. Sampling protocols are described in this SAP. The rationale for particular kinds of sampling are discussed in Chapter 2 of this ESI Workplan.

3.2 PROJECT ORGANIZATION AND RESPONSIBILITIES. This section describes project organization, lines of authority and responsibility of various personnel for particular tasks and quality assurance on the project.

3.2.1 Project Manager The project manager will be responsible for overall supervision and all administrative duties related to the project. Besides directing overall ESI activities, he will be responsible for ensuring full compliance with the QA/QC plan, the health and safety plan, and state and federal regulations. He will have final authority over and responsibility for all activities conducted in connection with various phases of the ESI and will provide lines of communication between the contractor, Southern Division, and the MCRD NREAO.

3.2.2 Project Ecologist The project ecologist will direct site personnel during sampling operations. He will report directly to the project manager and will be responsible for assuring compliance with the QA/QC plan during the above operations. The project ecologist will control submittal of collected samples to the laboratory for analyses.

3.2.3 Project Quality Assurance Officer The project quality assurance officer will be responsible for updating and reviewing compliance with program and site-specific QA/QC plans to assure that objectives of the plan are consistently met. He will review data recorded in the field log books and laboratory analytical data to validate conformity with standards set forth in the QA/QC plan. If changed conditions warrant, he will update the QA/QC plan to comply with DHEC and USEPA guidelines.

3.2.4 Site Supervisors Site supervisors will direct field teams under the overall direction of the project ecologist. As site manager, each supervisor will be responsible for assuring that QA/QC procedures are strictly followed by field technicians and all subcontractors under his direction. He will report any deviations from QA/QC procedures to the project ecologist or quality assurance officer.

3.3 QA/QC OBJECTIVES AND PROCEDURES.

3.3.1 QA/QC Objectives Data generated during the ESI will provide the basis for deciding whether this site poses no substantial threat and may be dropped from further study or whether an RI/FS must be performed. Therefore, data collected during the investigation needs to be of sufficient quality to support this decision. In order to provide data that presents a valid

characterization of the site, QA/QC procedures for the ESI at MCRD have been developed. Implementation and enforcement of these procedures will assure the validity of data generated during the investigation.

3.3.2 Field QA/QC Procedures This section describes the field Quality Assurance and Quality Control procedures. All personnel involved in this project will be required to read, understand, and comply with the procedures, methods, and protocols described in this section. The project manager and project ecologist will insure that field operations are conducted in accordance with these procedures in order to assure the validity of all data generated during field activities.

The project ecologist will see to it that the following information is recorded in a site-specific field notebook:

- The identity of site personnel and any other personnel present;
- Specimen identification and sample number;
- Sample location;
- Date, time, tidal height (water depth) of sampling area;
- Sampler;
- Weather conditions; and
- Mass of specimen.

3.3.3 Laboratory QA/QC Procedures The laboratory Quality Assurance Officer will direct analytical procedures so that they strictly follow the laboratory QA/QC program to assure the accuracy and precision of analytical results. The laboratory QA/QC procedures include:

- Appropriate sample storage;
- Appropriate sample preparation methods;
- Appropriate analytical methods;
- Appropriate calibration and analytical procedures;
- Data handling, review, and reporting; and
- Internal QA/QC control.

All these procedures are detailed explicitly in the laboratory's QA/QC manual and are only briefly referred to here.

3.4 SAMPLING PROTOCOLS. During the ESI, aquatic life will be collected for laboratory analysis. This will be accomplished by a variety of methods including gill nets, cast nets, crab baskets, and oyster rakes.

Gill nets will be placed perpendicular to the tidal movement to ensure fish will be captured. To avoid over-kill, the nets will be checked every hour until sufficient sample quantities have been obtained. Cast nets and oyster rakes will also be utilized. Crab baskets will be baited with dead fish and set in position simultaneously with gill net placement. These will be checked every two hours and removed when a sufficient sample quantity is obtained.

All samples will be recorded in the field notebook and placed in properly labeled containers. A blank label is depicted in Figure 3-1.

3.5 SAMPLE CUSTODY. Strict chain-of-custody procedures will be followed by all personnel. Possession and handling of samples will be recorded from the time of collection through analysis and final disposition.

Cleaned sample containers will be securely packed, sealed, and delivered to the field crew by the laboratory. The sample containers will be opened by authorized personnel only. A pre-printed label will subsequently be affixed to each container. Preservative, when appropriate, will also be added to each sample container. Chain-of-custody forms (Figure 3-2) will be filled out immediately after sample collection. A copy of the form will accompany the samples to the laboratory via overnight delivery.

3.6 ANALYTICAL PROCEDURES. The analytical procedures for various constituents of interest are described in detail in the laboratory's QA/QC Plan. Due to the recent development of special methods for testing animal tissue, new EPA methods are becoming available for some assays (USEPA, 1989), although no private laboratories are utilizing them. As the methods become available to the public sector, these methods will be utilized. Presently, the samples will be assayed using current EPA methods as noted: Hg (7471), pesticide and PCB (8080), PAH (8100), and acid and base/neutral extractables (8250).

3.7 DATA, REDUCTION, VALIDATION, AND REPORTING. Data transfer, reduction, validation, and reporting are primarily functions of the analytical laboratory. The project manager generally provides an interpretation of the data based on site conditions and characteristics. These interpretations may include acceptable statistical techniques. Laboratory procedures for data reduction, validation, and reporting are described in the laboratory's QA/QC Plan. These procedures follow those given in each of the EPA's approved methods (40 CFR Part 136 and SW-846).

Contamination will be determined to pose a threat to public health if the mean plus one standard error exceeds the FDA levels in food. If these levels are not exceeded it will be concluded that the aquatic fauna is safe for human consumption and that no threat to public health exists.

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SITE: _____ SAMPLE TYPE: _____
PROJECT NO.: _____ MEDIUM: _____
SAMPLE LOCATION: _____ TIME: _____
_____
SAMPLER: _____ DATE: _____
PRESERVATIVE: _____ SAMPLE NO.: _____

Figure 3-1 Sample Label.

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CHAIN OF CUSTODY RECORD

16550 Highland Road
Baton Rouge, Louisiana 70810
(504) 293-8650

PROJ. NO. | PROJECT NAME

SAMPLERS: (Signature)

STA.NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS

Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for Laboratory By (Signature)	Date/Time	Remarks	

Figure 3-2 Chain-of Custody Form.

3.8 INTERNAL QUALITY CONTROL. The intra-laboratory control program is a continuing systematic, in-house regime intended to ensure the production of analytical data of continuing high validity. Its functions are:

- To provide a measure of the precision of analytical methods;
- To maintain a continuing assessment of the accuracy and precision of analysts with the laboratory group;
- To identify weak methodology and provide a continuing source of research into problems aimed at overcoming deficiencies;
- To provide a permanent record of instrument performance as a basis for validating data and projecting repair or replacement needs;
- To detect training needs within the analytical group; and
- To upgrade the overall quality of laboratory performance.

The intra-laboratory control checks for analytical work are described in the laboratory's QA/QC Plan.

3.9 PERFORMANCE AND SYSTEM AUDITS. A system audit is a qualitative evaluation of all components of the measurement systems to determine their proper section and use. After systems (procedures) are operational and generating data, performance audits are conducted periodically to determine the accuracy of the total measurement system. The performance and system audits of analytical works are stated in the laboratory's QA/QC Plan.

3.10 DATA ASSESSMENT PROCEDURES. Analytical performance measurements are described in the laboratory's QA/QC Plan.

3.11 CORRECTIVE ACTION. The purpose of the laboratory's internal corrective action protocol is to investigate and resolve any quality control problems related to field sampling procedures and sample custody. In the event of a QA problem, the quality assurance officer will review the sampling procedures utilized in the field to determine whether the sample integrity was compromised. The investigation will include interviews with the site supervisor and other site personnel, review of field notes, and examination of chain-of-custody documents. The project quality assurance officer will also coordinate with the laboratory's quality assurance officer concerning any incident of questionable analytical results or internal QC data. He will work with the laboratory staff to resolve any problems and implement appropriate corrective action. Any corrective action deemed necessary by DHEC, USEPA, or MCRD QA offices will be followed.

The internal laboratory corrective action procedures for analytical work are described in the laboratory's QA/QC Plan.

3.12 QUALITY ASSURANCE REPORTS. The project quality assurance officer will report to the project manager concerning the performance of measurement systems and data quality. The final contamination assessment report will include a separate QA section summarizing all data quality information, significant quality assurance problems, if any, recommended solutions, and the outcome of any corrective actions. A copy of this report will be forwarded to Southern Division, DHEC, USEPA, and MCRD QA offices.

Laboratory quality assurance reports will also be compiled and included in its report. The nature and content of laboratory QA reports are described in the laboratory's QA/QC Plan.

CHAPTER 4.0 HEALTH AND SAFETY PLAN

4.1 INTRODUCTION. This Health and Safety Plan (HASP) addresses health and safety concerns associated with the site investigation at the Causeway Landfill, Marine Corps Recruit Depot on Parris Island, South Carolina. It covers all site investigators, other workers, Naval personnel, and the general public as required by the interim final rule covering work at CERCLA sites (29 CFR 1910.120). The HASP describes standard operating field procedures. In addition, it includes available information on the site and on known or suspected contaminants. It sets required levels of protection, decontamination procedures, the location of the suspected zone of contamination, and provides other pertinent information giving greater particularity to standard procedures.

The purpose of this program is to assure adequate protection against known and potential hazards which may be encountered during the ESI at the Causeway Landfill. Involved individuals must be familiar with standard operating procedures as well as other specific instructions described in the HASP. These requirements for protecting the health and safety of involved individuals are applicable throughout the investigation.

The planned levels of protection are based on limited knowledge of the extent and magnitude of contamination at the site, and are intended to be protective in the event that worst case conditions are encountered. The level of protection will be modified accordingly as more information becomes available and as conditions warrant. The project manager will have final authority to approve field activities and to establish personal protection levels for all field work as necessary. However, the project manager may delegate certain aspects of this authority to the ranking individual at the site as may be appropriate.

Achievement of HASP objectives requires that all involved personnel be adequately trained and familiarize themselves with the provisions described below regarding medical surveillance, safety practices, use of personal protective equipment, and procedures for field inspections and sampling operations, sample handling and shipping, etc. The program also provides procedures for contingencies which may be encountered during various phases of the site investigation. Lines of command are set out to deal with situations which may arise.

The HASP has been compiled to comply with existing requirements of the Occupational Safety and Health Administration (OSHA), the EPA, and state and local agencies for all activities to be conducted. Updated rules and regulations covering the ESI will be followed and incorporated as they become applicable.

The site where work will be conducted is described in Chapter 1.0. Additional information and a description of work to be performed is contained in Chapter 2.0. Project organization and lines of command are described in Section 3.2.

4.2 POTENTIAL RISKS. A variety of potential risks will accompany implementation of the ESI. These include the general physical hazards associated with working out-of-doors and working from a boat on open water and those typical of work in wet, tidally influenced areas. Muddy conditions will dominate the site and the presence of biting insects should be anticipated. Due to the periodic action of the tides at the site, unstable surfaces are expected and associated hazards should not be discounted by site workers.

Chemical exposure hazards are not expected due to the nature of the sampling protocol.

4.3 PERSONAL PROTECTIVE EQUIPMENT AND SAFETY MEASURES. This section specifies personal protective equipment and general safety measures to be used on site. The site supervisor may specify additional measures during the morning safety meeting and must specify additional measures at any time when in his judgement additional measures are warranted. Whenever existing measures may be inadequate to properly protect worker safety, the site supervisor will stop work and evacuate personnel until adequate measures can be implemented.

The site supervisor is responsible for monitoring his workers' exposure as described in Section 4.5.

During the sampling protocol, workers will have a personal floatation device (USCG Approved) within reach in case the boat capsizes. Depending on site conditions, additional personal protective equipment may be deemed necessary by the site supervisor.

4.4 TRAINING. Each morning before work begins, the project manager or his delegate will hold a meeting to discuss procedures to be used on that day with particular emphasis on potential hazards that may be encountered and how to deal with them. In addition, before changes in the nature of the work to be performed, site supervisors will review safety procedures with potentially impacted workers.

4.5 SURVEILLANCE. The project manager shall ensure that all workers at the site have been examined by an occupational medicine physician within the past 12 months, and is otherwise under medical surveillance in compliance with 29 CFR 1910.120(f). The Project Manager will review the medical surveillance program of any subcontractor used to ensure compliance with applicable standards.

The site supervisor will establish a buddy system for work at the site prior to the work beginning. Among other aspects of the buddy system will be a requirement that each worker report to the site supervisor any breach of safety measures, physical or procedural, and any signs of heat stress pertaining to himself or his buddy. The site supervisor will observe the progress of the work with particular attention to compliance with safety procedures and signs of heat stress. During breaks in the work, either as a whole or by individuals, the site supervisor will interrogate workers regarding safety compliance and heat stress and make an appropriate examination of the same.

4.6 EMERGENCY RESPONSE. In the event of an emergency on site during the ESI field activities, the project manager will serve as emergency coordinator.' The project manager will have the authority to commit team resources as they may be required to prevent, reduce, or eliminate the emergency. The following procedures are guidelines for response to emergencies.

During the performance of work tasks within high hazard areas, a minimum of three personnel shall be used. In the event of a personal injury or exposure to one member of the team, the other members will provide assistance in exiting the site.

If a personal injury occurs, the project manager shall arrange for immediate first aid and transport to the base infirmary. The injured person must be accompanied to the infirmary by a team member who can provide information to medical personnel related to possible chemical exposure and a means of contacting the physician holding medical surveillance records on the injured person.

CHAPTER 5. REFERENCES

Initial Assessment Study of Marine Corps Recruit Depot, Parris Island, South Carolina. NEESA 13-095, Naval Energy and Environmental Support Activity, Port Hueneme, California. 1986.

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