

M00263.AR.000106
MCRD PARRIS ISLAND
5090.3a

MASTER WORK PLAN VOLUME 1 OF 3 FOR INSTALLATION RESTORATION PROGRAM
MCRD PARRIS ISLAND SC
3/27/1998
BROWN AND ROOT ENVIRONMENTAL

03.04.00.00

01

159

Rev. 0
03/27/98

Master Work Plan

Marine Corps Recruit Depot

Parris Island, South Carolina

U.S. EPA Identification Number

SC6 170 022 762

Volume I of III



Southern Division

Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0020

March 1998

Rev. 0
03/27/98

MASTER WORK PLAN

**MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
U.S. EPA IDENTIFICATION NUMBER
SC6 170 022 762**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406**

**Submitted by:
Brown & Root Environmental
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220**

**CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0020**

VOLUME I OF III

MARCH 1998

PREPARED BY:



**MARK SPERANZA, P.E.
TASK ORDER MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA**

APPROVED FOR SUBMITTAL BY:



**DEBBIE WROBLEWSKI
PROGRAM MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA**

PREFACE

Volume II Master Work Plan (MWP) is the second volume in a series of three MWPs used in support of installation restoration work at Marine Corps Recruit Depot (MCRD) Parris Island. Volume I MWP contains overall project scope and objectives, overall investigation strategies, project organization, and facility background information. Volume II MWP contains environmental field investigation methods and procedures. Volume III MWP outlines the framework for conducting installation restoration work at the MCRD.

The MWPs are reviewed periodically and revised as necessary. The MWPs incorporate generic environmental investigative procedures applicable to potential activities throughout the Depot. The MWP approach reduces time and cost associated with reproduction, shipping, and review of repetitious material that was previously reviewed and approved. The MWP is reviewed and approved by the U.S. Environmental Protection Agency (U.S. EPA), and the South Carolina Department of Health and Environmental Control (SCDHEC), thereby reducing the "in house" review time required for approval of site-specific plans.

The Volume II MWP consists of the following documents:

- The Master Field Sampling Plan (Master FSP)
- The Master Quality Assurance Plan (Master QAP)
- The Project Health & Safety Plan (Project HASP)

The Master FSP presents standard operating procedures for potential investigations at MCRD Parris Island. The Master FSP specifies requirements for all field work and serves as a complete guide for use in the field by all members of the field investigation team. The Master QAP defines and documents the quality assurance/quality control (QA/QC) system used to ensure that the precision, accuracy, representativeness, comparability, and completeness (the PARCC parameters) of the environmental data acquired are known, documented, and adequate to satisfy the data quality objectives addressed by each project. The Project HASP outlines procedures for the protection of personnel performing field investigation activities. The Project HASP specifies personnel responsibilities and restrictions, establishes requirements, and describes the use of evaluation techniques.

Site-specific addenda will be issued to provide the specific criteria for the investigation of individual sites at MCRD Parris Island. Site-specific addenda, referred to as Site-Specific Work Plans, will be developed by Brown & Root Environmental (B&R Environmental) under the Comprehensive Long-term Environmental Action Navy (CLEAN III), contract Number N62467-94-D-0888. The Site-Specific Work Plans will utilize the standard procedures and criteria established in the MWPs. Site-Specific Work Plans will include only the additional information required to execute field work at a given site, such as location and depth of soil borings, location and depth of monitoring wells, constituents being sampled, or any other condition or configuration applicable to the given site that may affect the execution of work. Site-Specific Work Plans will be issued as needed to support the ongoing field investigations at the Depot.

**TABLE OF CONTENTS
VOLUME I
MASTER WORK PLAN**

SECTION

**RESPONSE TO REGULATORY COMMENTS TO THE DRAFT AND DRAFT FINAL MASTER WORK
PLAN, VOLUME I**

MASTER PROJECT PLAN

APPENDICES

- A PARTNERING TEAM CORRESPONDENCE, IR SITE RECOMMENDATIONS**
- B RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA**

ACRONYMS/ABBREVIATIONS

AOC	Area of Concern
ARARs	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
B&R Environmental	Brown & Root Environmental
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action Navy
CMS	Corrective Measures Study
COE	United States Army Corps of Engineers
CS	Confirmatory Sampling
CWA	Clean Water Act
DERP	Defense Environmental Restoration Program
DQO	Data Quality Objective
DRMO	Defense Reutilization and Marketing Office
ESI	Extended Site Inspection
FOL	Field Operations Leader
FS	Feasibility Study
FSP	Field Sampling Plan
FTP	Fire Training Pit
GIS	Geographic Information Systems
gpd	Gallons Per Day
gpm	Gallons Per Minute
GPS	Global Positioning System
HASP	Health and Safety Plan
IR	Installation Restoration
IRP	Installation Restoration Program
Master PP	Master Project Plan
MCAS	Marine Corps Air Station
MCRD	Marine Corps Recruit Depot
MCX	Marine Corps Exchange
mgd	million gallons per day
MWP	Master Work Plan
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan

NFA	No Further Action
NFI	No Further Investigation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
PA	Preliminary Assessment
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RPM	Remedial Project Manager
SAA	Satellite Accumulation Area
SARA	Superfund Amendments and Reauthorization Act
SCDHEC	South Carolina Department of Health and Environmental Controls
SCDNR	South Carolina Department of Natural Resources
SI	Site Inspection
SWMU	Solid Waste Management Unit
TOM	Task Order Manager
U.S. EPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VOCs	Volatile Organic Compounds
VSI	Visual Site Inspection
WP	Work Plan

**RESPONSE TO REGULATORY COMMENTS TO THE
DRAFT AND DRAFT FINAL MASTER WORK PLAN, VOLUME I
MCRD PARRIS ISLAND, SOUTH CAROLINA**

**STATE OF SOUTH CAROLINA, HAZARDOUS WASTE SECTION
DIVISION OF HYDROGEOLOGY, BUREAU OF SOLID AND HAZARDOUS WASTE MANAGEMENT
RESPONSE TO SCDHEC COMMENTS TO DRAFT MASTER WORK PLAN,
VOLUME I (MASTER PROJECT PLAN) - COMMENTS RECEIVED 11/20/96
MCRD, PARRIS ISLAND, SOUTH CAROLINA**

COMMENTS - Johnny Tapia, Environmental Engineering Associate

1. **Comment:** Section 1.2

Cost-efficient should be replaced by cost-effective. This whole section should be revised and reworded. As written, it is confusing and makes little sense.

Response: Cost-efficient will be changed to cost-effective. Text will be reviewed and revised to clarify meaning.

2. **Comment:** Section 1.2.1

"Overall Scope", Section (3) should be taken out. The goal is not to deem a site or sites as No Further Action (NFA), it should be to characterize nature and extent of contamination and implement appropriate corrective measures.

Response: Agree in part. Although characterizing the site for nature and extent of contamination is the objective of the investigation, this is done to determine if there is an unacceptable risk to human health and the environment. Sufficient data collection is needed to support the conclusion of whether an unacceptable risk is present, thereby requiring or not requiring an action to address the unacceptable risk. The paragraph will be clarified so that it will not be misinterpreted that the goal is not to simply reach an NFA.

3. **Comment:** Section 1.3

The Navy's Installation Restoration (IR) Program history is not relevant for the preparation of a Work Plan to cleanup the Base. Consider removing this section.

Response: Agree in part. Although the Navy agrees that a description of the IR history does not directly support the execution of cleanup activities, the Navy feels that it is appropriate and useful to provide this information in the "generic" document to present the basis of the Navy cleanup program, therefore, the Navy proposes to keep this section in the Work Plan.

4. **Comment:** Page 1-9

Sites 6, 10, and 11 have not been described in the text. All sites should be described in the text no matter what program they are being investigated under or if some consensus was reached in previous years to stop or continue the investigation at those sites. A complete listing and description of the sites will help to have a full understanding of present and past conditions at the Base and possible relation among sites. In addition, there should be some order describing the sites.

Response: Agree. Section 1.5.2 and 1.5.3 will be combined and provide a description, problems identified, and actions taken to date for all sites identified.

5. **Comment:** Section 1.5.2

A figure with the location of all sites (SWMUs and AOCs) should be included in this section of the Work Plan.

Response: Agree. A figure showing site locations will be included.

6. **Comment:** Section 3.3

"Contingency Plan." This paragraph should be reworded. As written, it is not understandable. It also should be added that all changes and deviations from the approved Work Plan, will be included in the Report of Field Activities.

Response: The paragraph will be reworded as follows: "Actual site conditions may necessitate minor deviations (i.e., slight adjustment of boring locations due to physical interferences) from approved work plans. Any problems encountered in the field will be brought to the immediate attention of the B&R Environmental TOM. The TOM, in consultation with the Navy, U.S. EPA and SCDHEC will determine an appropriate course of action so as to minimize impact to the schedule or budget. All deviations from approved work plans will be approved by the Navy, U.S. EPA and SCDHEC prior to enactment and will be recorded in the RI/RFI Report."

COMMENTS - Donald Hargrove, Hydrogeologist

1. **Comment:** Section 1.1: Summary of Scoping Documents

This section needs to contain information concerning compliance with the Resource Conservation and Recovery Act (RCRA). Please revise this section to include RCRA along with CERCLA and NCP as a standard for compliance.

Response: The section will be revised to indicate that RCRA requirements will also be used as a standard for compliance.

2. **Comment:** Section 1.5.2: Site Descriptions

The appropriate Solid Waste Management Unit (SWMU) numbers must be included with all site specific descriptions and discussions. Please revise.

Response: Equivalent SWMU numbers will be added.

3. Section 1.5.3: Actions Taken

a. **Comment:** The appropriate Solid Waste Management Unit (SWMU) numbers must be included with all site specific descriptions and discussions. Please revise.

Response: Equivalent SWMU numbers will be added.

b. **Comment:** The IR Team made determinations separate from the RFA recommendations for each SWMU. Listed below are each of the SWMUs with the State's determinations. These determinations basically mirror the RFA recommendations, except where the IR team determined to perform confirmatory sampling on certain SWMUs.

SWMU 1 (Site 1) Incinerator Landfill. The State agrees with the IR Team recommendation for an RFI.

SWMU 2 (Site 2) Borrow Pit Landfill. The State agrees with the IR Team recommendation for an RFI.

SWMU 3 (Site 3) Causeway Landfill. The State agrees with the IR Team recommendation for an RFI.

SWMU 4 (Site 4) Dredge Spoils Area FTP. The State understands that this area is going to be evaluated under SWMU 13.

SWMU 5 (Site 5) Former Paint Shop Disposal Area. The State agrees with the IR Team recommendations for confirmation sampling.

SWMU 7 (Site 7) Page Field Fire Training Pit. The State agrees with the IR Team recommendation for confirmation sampling.

AOC A&B (Site 8) PCB Spill Areas. The State agrees with the IR Team recommendation for confirmation sampling.

SWMU 8 (Site 9) Paint Waste Storage Area. There is a typographical error in the second sentence "...soil were ed soil was removed and disposed." Please revise. The State agrees with the IR team determination to perform confirmatory sampling in conjunction with SWMU 16.

SWMU 10 (Site 12) Jericho Island Disposal Area. The State agrees with the IR Team recommendation for confirmation sampling.

SWMU 13 (Site 13) Inert Disposal, Dredge Spoils Area. The State agrees with the IR Team recommendation for confirmation sampling.

SWMU 14 (Site 14) Storm Sewer Outfalls. The State agrees with the IR Team recommendation for Phase II Sampling in conjunction with the SWMU 2 RFI due to the close proximity of these two SWMUs.

SWMU 15 (Site 15) Dirt Roads. The States agrees with the IR Team recommendation for Phase II Sampling.

SWMU 16 (Site 16) Pesticide Rinsate Disposal Area. The State agrees with the IR Team recommendation for an RFI.

SWMU 21 Weapons Power Plant Oil/Water Separator. The State agrees with the IR Team recommendation for confirmation sampling.

SWMU 27 Equipment Parade Deck SAA. The State agrees with the IR Team recommendation for Confirmation sampling.

SWMU 32 Laundry SAA. The State agrees with the IR team recommendation for confirmation sampling.

SWMU 35 DRMO Salvage Yard. The State agrees with the IR Team recommendation for confirmation sampling.

SWMU 39 Electrolyte Basin/Tank. The State agrees with the IR team recommendation for confirmation sampling.

SWMU 41 Former Incinerator. The State agrees with the IR Team recommendation for confirmation sampling in conjunction with the RFI at SWMU 1 due to the close proximity of these two SWMUs.

SWMU 45 This site needs to be assigned a SWMU number. The State agrees with the IR team recommendation for an RFI.

It is understood that the following SWMUs and sites fall under the authority of the State UST Program: AOC C (Site 10), SWMU 9, SWMU 17, SWMU 18, AOC D (Site 19), SWMU 28, SWMU 38, SWMU 43.

Response: No changes required except correcting the typo in the Site 9 description. Site 45 is not identified as a SWMU since it was not recorded as a SWMU in the RFA.

4. **Comment:** Section 2.1.1

The Beaufort Arch and the Ridgeland Trough (discussed in this section) should be shown in a figure with respect to Parris Island. Please revise.

Response: Agree. The information will be illustrated in Figure 2-3.

5. **Comment:** Section 2.1.1

The type and order of the figures throughout the text need to be revised. The first figure should be a general map of South Carolina showing the location of Parris Island. The second figure should be a large scale map of the area. At that point the generalized lithological section, regional geological profile, and the groundwater data can be presented.

Response: Agree. Type and order of figures will be included/ordered as recommended.

6. **Comment:** Figure 2-2

Typographical error: "St. Helens Island" should be "St. Helena Island".

Response: Noted: Although this is a typo that is carried over from the reference the figure is extracted from, the figure will be revised.

7. **Comment:** Figure 2-3

Figure 2-3 needs to be revised to show the location of Paris Island and Doggie Island. Also, the location of line A-A' that is the reference line for the cross-section in figure 2-2 needs to be added.

Response: It is not the intent of Figure 2-2 to show a cross-section of Figure 2-3, therefore, the A-A' annotation on Figure 2-2 will be deleted.

8. Section 2.1.2.2 Oligocene

a. **Comment:** Typographical error: "agrillaceous" should be "argillaceous".

Response: Agree. The text will be revised.

b. **Comment:** Last sentence: Does the top of the Hawthorn Fm. range from 20' to 120' bls at Parris Island specifically or is this a regional observation? Please be more specific with respect to Parris Island.

Response: The Oligocene appear to be more closely associated with the Cooper Marl rather than the Hawthorn Formation. This is a regional feature, not specific to Parris Island and will be clarified in the text as such.

9. **Comment:** Section 2.1.2.3 Miocene

First Paragraph: When referring to counties, any Georgia counties need to be labeled as such: e.g., Chatham County, GA Please revise.

Response: Agree. "GA" will be added to Chatham County.

10. **Comment:** Section 2.1.2.4 Quaternary

First Paragraph: Typographical error: "Pamico" should be "Pamplico".

Response: Agree. The typographical error will be corrected.

11. **Comment:** Section 2.1.3 Soils

This section should refer to Wando-Seabrook-Seewee, Coosaw-Williman-Ridge land, and Bohicket-Capers-Handsboro as "Units" or "Soil Units".

Response: Agree. Wando-Seabrook-Seewee, Coosaw-Williman-Ridge land, and Bohicket-Capers-Handsboro will be referred to as soil units.

12. Section 2.1.3.1 Wando-Seabrook-Seewee Unit

a. **Comment:** First paragraph: Change "association" to "Unit" to match name as mentioned in comment 11.

Response: Agree. Changes will be incorporated.

b. Second paragraph

i. **Comment:** Fifth sentence: The term "map unit" should be defined or replaced with a better term for describing the map view boundaries of this unit.

Response: Agree. Changes will be incorporated.

ii. **Comment:** Sixth sentence: Change to "...about 60 percent of **the area within this soils unit** is woodland...".

Response: Agree. Changes will be incorporated.

iii. **Comment:** Rewrite the eighth sentence. "Droughtiness" is an odd word that should be defined or replaced with something more suitable.

Response: Agree. Changes will be incorporated. "droughtiness" will be changed to "dryness".

13. Coosaw-Williman-Ridge land Unit

a. **Comment:** First paragraph: replace "association" with "unit".

Response: Agree.

b. **Comment:** The term "map unit" needs to be revised as per comment 1-12.b.i.

Response: Agree.

c. **Comment:** Second paragraph: typographical error: "Wiliiman".

Response: Agree. Text will be modified.

d. **Comment:** Page 2-12, top of page: there is a reference to Table 2-6 that is not in this document. Please revise.

Response: Tables 2-5 and 2-6 are incorrectly presented in the document and will be moved and renumbered appropriately.

14. Section 2.1.3.3 Bohicket-Capers-Handsboro Unit

a. **Comment:** First paragraph: replace "association" with "unit".

Response: Agree. The text will be revised.

b. **Comment:** Second paragraph: the term "map unit" needs to be revised as per comment 1-12.b.i.

Response: Agree. The text will be revised. "map unit" will be replaced with "soil unit" (typo).

c. **Comment:** Next to last sentence: "...are in marsh grasses." should be changed to "are associated with marsh grasses."

Response: Agree. The text will be revised.

15. **Comment:** Figure 2-4

Typographical error in title. "Unity" should be "Unit".

Response: Agree. The title will be revised.

16. Table 2-1 Soil Properties: This table is not referred to in the text.

- a. **Comment:** If this is the table being referred to on page 2-12 as Table 2-6 (as per comment 1-13d), the seasonal high water table is not shown. Please revise.

Response: The table is referenced in the last sentence of paragraph 2.1.3.

- b. **Comment:** The column describing sites affected should be revised to list the SWMUs affected.

Response: SWMU numbers will be listed in parenthesis next to their respective site number.

17. Section 2.2.2 Tertiary Limestone Aquifer

- a. **Comment:** First paragraph, last sentence: This sentence contains odd working. "...even though it is not everywhere the principal aquifer,..." should be revised.

Response: Agree. The text will be revised accordingly.

- b. **Comment:** Second paragraph, first sentence: This sentence is misleading. The Tertiary Limestone Aquifer occupies much more than a 60 mile radius from MCRD. The first paragraph in this section describes it as being much larger. Please revise.

Response: Agree. The text will be revised accordingly.

- c. **Comment:** Fourth paragraph, third sentence: Revise to "Two hydrogeologic zones within the Tertiary Limestone Aquifer lie beneath the MCRD Parris Island area."

Response: Agree. The text will be revised accordingly.

18. **Comment:** Figure 2-6

Typographical error in the title: "Terciary" should be "Tertiary". Please revise.

Response: Agree. The title will be revised.

19. Figure 2-7 Topography and Flood Hazard.

- a. **Comment:** This figure should be oriented North/South with the North arrow on the figure. Please revise.

Response: The figure will be reoriented to show north toward top of page.

- b. **Comment:** There is no reference for this figure. Please revise.

Response: The figure is referenced in Section 2.4.

20. Section 2.6 Installation Ecosystems.

- a. **Comment:** Second paragraph: This paragraph needs to be revised (updated). The regulatory agencies involved are: the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (U.S. EPA) Region 4, the South Carolina Department of Natural Resources (SCDNR), and the South Carolina Department of Health and Environmental Control (SCDHEC). The South Carolina Coastal Council has become part of SCDHEC and is now called the Office of Ocean and Coastal Resource Management. The South Carolina Water Resources Commission has been divided with one part going into SCDHEC and the other part going into SCDNR.

Response: Agree. The text will be revised.

- b. **Comment:** Third paragraph: The last sentence is vague and needs to be rewritten to describe "a particular activity in question". Please revise to clarify.

Response: Agree. The text will be revised.

- c. **Comment:** Fourth paragraph: Typographical error: "Jancus" should be "Juncus". Also, all Latin names for animals and plants should be either italicized or underlined. Please revise.

Response: Agree. The text will be revised.

- d. **Comment:** Last paragraph, page 2-22: This paragraph needs to be updated with respect to threatened or endangered plant and animal species at the MCRD. For example, the American alligator (alligator mississippiensis) is no longer endangered or threatened. Please revise.

Reference: The Office of Wildlife and Freshwater Fisheries Biology and Mgt.
South Carolina Department of Natural Resources
1000 Assembly Street
Columbia, SC 29201

Response: Agree. The text will be revised.

21. **Comment:** Section 2.8 Water Usage

Figure 136 is referenced twice in the text (page 2-23 and 2-24) but not included in the document. Please include this figure in the revised document.

Response: The section will be revised.

22. References

- a. **Comment:** The reference section needs to be revised. The following is a list of authors not properly referenced:

Hassen, 1985
Hayes, 1979
Glowacs, and others, 980
SCDHEC, 1982
Stuck, 1980.

Response: Agree. The reference section will be updated.

b. **Comment:** The following references are listed on the reference page but not used in the text:

McClelland Consultants, May, 1990
ABB Environmental Services, Inc., Aug. 1992
A.T. Kearney, Inc., Apr., 1990
Master Plan for MCRD, PI, Sept., 1992
U.S. EPA, Aug., 1988
U.S. EPA, Aug., 1989

Response: Agree. The reference section will be updated.

**U.S. EPA REGION 4
RESPONSE TO RPM COMMENTS TO THE DRAFT MASTER WORK PLAN,
VOLUME I - COMMENTS RECEIVED 8/2/96
MCRD PARRIS ISLAND, SOUTH CAROLINA**

1. **Comment:** Page 1-4, Paragraph 1

Specific examples on when to use less stringent DQO procedures don't appear entirely appropriate. Key factor to consider is: what are the consequences of making an incorrect decision. In first instance, higher DQO data may still be needed to determine whether or not action is needed - even if the prescribed action is presumptive. Also, if little information is known about a site, and very high SQLs are used, result may be elimination of a site which still poses some risk. Thus, the potential decision errors in these instances (due to use of less stringent DQO procedures) may not be acceptable.

Response: Specific references will be omitted to eliminate any confusion/concern over the prospect of collecting data that will not support program objectives.

2. **Comment:** Page 1-8, Table 1-1

Need to discuss with you rationale for modifying RFA recommendations for some sites from RFI or CS to NFA (SWMUs 4,6,12, 38, and 42).

Response: Based on the site's characteristics or it's association with USTs, a determination was made not to further evaluate these sites under the Installation Restoration Program. These determinations are documented in a 18 July 1995 letter from SCDHEC to MCRD Parris Island. This letter will be provided in an Appendix to the Master Project Plan.

3. **Comment:** Page 1-11

Include description of SWMU 45 (since interim action will presumable not address all concerns for this SWMU).

Response: Agree. An appropriate description will be included.

**U.S. EPA REGION 4
RESPONSE TO ESD COMMENTS TO THE DRAFT MASTER WORK PLAN,
VOLUME I - COMMENTS RECEIVED 8/2/96
MCRD PARRIS ISLAND, SOUTH CAROLINA**

Master Work Plan

1. **Comment:** The Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, (EISOPQAM), May, 1996, should be used and referenced for all field sampling.

Response: It is agreed that the EISOPQAM should be referenced for all field sampling; however, the purpose of the Master Project Plan is to present the overall project scope and objectives, project organization, and Depot background information. The appropriate location to reference the EISOPQAM is Volume II of the Master Work Plan in the Master Field Sampling Plan.

2. **Comment:** Pages 1-3 through the end of Section 1 are missing. The missing pages include the facility history and site descriptions.

Response: If the U.S. EPA RPM wishes for the ESD to review this information, please provide missing pages for review/comment.

**U.S. EPA REGION 4
PREPARED BY KHAFRA ENGINEERING CONSULTANTS, INC.
RESPONSE TO COMMENTS TO THE DRAFT MASTER WORK PLAN,
VOLUME I - COMMENTS RECEIVED 8/2/96
MCRD PARRIS ISLAND, SOUTH CAROLINA**

GENERAL COMMENTS

1. **Comment:** The Master Work Plan (MWP), Sections 1.4 and 1.5, provide facility background information and site investigation history. However, a site location map for Parris Island in relation to counties and highways and a map showing the individual sites listed in Table 1-1 are missing. Two more figures should be added to these sections showing the location of Parris Island in relation to highways and counties and the location of the individual sites at MCRD which are listed in Table 1-1.

Response: Two figures will be added; a regional map and a site location map.

2. **Comment:** The MWP, 1.5.2, Page 1-12, Paragraphs 3 and 4, describe the results of previous investigations at Sites 7 and 8. No further investigation was recommended for each of these sites. However, in Table 1-1, confirmatory sampling (CS) is the prescribed action for these sites. The rationale for confirmatory sampling or no further investigation should be discussed in the text.

Response: The rationale is provided in the text. Additional text can be added to clarify.

3. **Comment:** The MWP, Section 1.5.3, Page 1-11, Paragraph 7, indicates that in the aquatic animal study completed in August 1993 "certain contaminants were detected but no contaminants exceeded" USFDA action levels. However, since the certain detected contaminants are not specified, it is unclear if they are bioaccumulative. If they are, the contamination will have ecological impacts although the contaminants did not exceed USFDA action levels. The text should specify the contaminants detected in the aquatic animal samples as well as potential ecological impacts.

Response: Agree. The contaminants detected will be identified. The paragraph will be modified to indicate that human health and ecological impacts will be evaluated as part of the baseline risk assessment for the site, since the human health impact due to the contaminants detected has not been specifically identified and ecological impacts were not addressed as part of the 1993 aquatic animal study.

4. **Comment:** The MWP, Section 1.5.3, Page 1-11, Paragraph 7, indicates that no priority pollutants or heavy metals were greater than drinking water standards after surface water and sediment samples were analyzed. However, it is unclear why the results of the surface water and sediment samples were used to compare the drinking water standards. Drinking water standards are used to compare groundwater results (U.S. EPA, 1988). The text should explain why the surface water and sediment sample results were used to compare with drinking water standards.

Response: The SI reports that "...no priority pollutant organic compounds were identified in the sediment and water samples. In addition, no heavy metals were identified that exceeded allowable limits set forth in the U.S. EPA Interim Primary Drinking Water Standards or the U.S. EPA Ambient Saltwater Quality Criteria.". The text will be modified accordingly. Presumably, these standards were used as a basis of comparison to determine if a problem may exist at this site.

5. **Comment:** The MWP, Section 1.5.3, Page 1-13, Paragraphs 3, 4, and 8, recommend Phase II Sampling at select sites. However, the definition of Phase II sampling and how it differs from confirmatory sampling are not presented. The difference between Phase II and confirmatory sampling should be presented.

Response: Phase II sampling is a RCRA programmatic term. These paragraphs simply acknowledge that the Team feels that additional effort is required at these sites. No changes are proposed.

6. **Comment:** The MWP, Section 1.5.3, Page 1-12, Paragraph 1, indicates that since no VOCs or toxic concentrations of heavy metals were in any soil samples, no further action for Site 4 (Dredge Spoils Area Fire Training Pit) was recommended. However, the text does not specify the toxic concentrations of heavy metals and standards which were used to compare these concentrations. The text should specify the toxic concentrations of heavy metals in the samples and the applicable standards which support the recommendation of no further action for the site.

Response: This issue has been overcome by events since the State concurred with a Parris Island NFA recommendation in a correspondence dated 23 August 1989. Since the Team is still concerned with the condition of groundwater beneath the dredge spoils due to the fire training operations, further evaluation of this site will be conducted via Site 13 (which site 4 is contained within) to address groundwater. The paragraph will be modified to reflect this decision.

7. **Comment:** The MWP, Section 2.2.1, Page 2-13, Paragraph 2, states that the hydraulic conductivity was calculated to be 0.8 ft/day, the hydraulic conductivity of clean fine Holocene sand was estimated as 13 ft/day, and Pleistocene sand was 0.1 to 1.0 ft/day. However, the text does not describe the character of all the sand units. Thus, the hydraulic conductivity values presented cannot be verified by reviewing the literature.

Response: This section describes the shallow aquifer. The first paragraph of the section describes the unconfined shallow aquifer as "generally of permeable, fine to medium, Pleistocene age sands.". The third paragraph compares the calculated hydraulic conductivity of the Pleistocene sands of Parris Island to be within the known range of similar Pleistocene sands of Hilton Head Island. No changes are proposed.

8. **Comment:** The MWP, Figures 2-1 through 2-7, are too small and illegible. Also, the legends are difficult to read, the text is unclear, and contour line and groundwater flow directions are missing. The figures should be revised accordingly.

Response: Clearer figures will be provided to the greatest extent possible.

9. **Comment:** The MWP, Figure 2-7, Page 2-19, presents a map of topography and flood hazards for MCRD Parris Island. However, the figure is confusing and unclear. The legend shows the same symbol for three different entities. It is not possible to find the 100-year flood plain or the contours lines because of the faintness of the lines. This figure should be revised to clearly show the 100-year flood plain, the areas of saltwater marsh, the areas of minimal flooding, and the contours lines.

Response: A clearer figure will be provided.

10. **Comment:** The MWP, Section 2.8, Page 2-23, Paragraph 4, discusses total gross water use. However, it is unclear if the total gross use is on an annual basis and if it applies only to Parris Island or to all surrounding islands and communities. The text should indicate if the values are on an annual basis and where these values apply.

Response: The text will specify that total gross water usage is for Beaufort County and that the values are daily values based on yearly usage.

11. **Comment:** The MWP, Section 3.3, Page 3-2, states that all contingency plans will be approved through the Navy RPM before enacted. However, the plans should also be approved by the state and U.S. EPA before enacting as stated in the 40 CFR. The text should be revised and all contingency plans should be reviewed by the appropriate agencies.

Response: Agreed. The paragraph will be modified to ensure that any deviations from approved work plans shall be approved by the state and U.S. EPA.

SPECIFIC COMMENTS

Master Work Plan

1. **Comment:** MWP, Table 1-1, Page 1-8.

This table presents information on the IR sites at MCRD Parris Island. However, the table footnotes do not explain the significance of the text in bold. Also, some of the acronyms appearing on the table are not defined. The table should be revised accordingly.

Response: Table 1-1 will be revised to address this comment

2. **Comment:** MWP, Section 1.5.2, Page 1-12, Paragraph 5, Sentence 2.

The text discusses the removal and disposal of six inches of surface soil. However, the complete meaning of the sentence is unclear because of a typographical error. The typographical error should be corrected.

Response: Agreed. The typographical error will be corrected.

3. **Comment:** MWP, Section 2.1.1, Page 2-1, Paragraph 3, Sentences 1 and 2.

The text states that the most conspicuous and hydrogeologically important structural feature in the Low Country is the Beaufort Arch. However, the location of the "Low Country" or the Beaufort Arch is not presented in any figures. These features should be shown on an appropriate figure.

Response: Agreed. The Beaufort Arch will be illustrated in Figure 2-3.

4. **Comment:** MWP, Figure 2-5, Page 2-14.

This figure shows the groundwater flow directions at MCRD Parris Island. However, the figure title does not indicate which aquifer is shown. The aquifer that the groundwater flow directions apply to should be added to the figure title. A separate figure should be presented for each aquifer with its flow direction.

Response: This information is referenced in Section 2.2.1 (Shallow Aquifer). The title will be modified to identify it as the shallow GW flow map. The deep aquifer is presented in Figure 2-6.

5. **Comment:** MWP, Figure 2-6, Page 2-15.

This figure shows the potentiometric surface of the Tertiary Limestone Aquifer at MCRD Parris Island. However, the estimated groundwater flow direction is not presented. The figure should be modified to show the direction of groundwater flow. In addition, the typographical error for Tertiary should also be corrected.

Response: A GW flow arrow can be placed on the figure to show estimated flow direction. The typographical error will be corrected.

6. **Comment:** MWP, Section 2.2.2.1, Page 2-16, Paragraph 5, Sentence 2.

The text states that thick low permeability formations are present in the Ridgeland Trough. However, the location of this trough is not depicted on any figures. The trough location should be shown on a figure.

Response: Agreed. The feature will be identified on Figure 2-3.

7. **Comment:** MWP, Section 3.3, Page 3-2, Paragraph 3, Sentence 1.

This sentence is incomplete. The sentence should be edited, and the text should be revised accordingly.

Response: Agreed. The text will be clarified accordingly.

References

United States Environmental Protection Agency, 1991, Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites, Office of Emergency and Remedial Response, Washington D.C., U.S. EPA/540/P-91/001.

United States Environmental Protection Agency, 1988, Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, Office of Emergency and Remedial Response, Washington, DC, U.S. EPA/540/6-89/004.

United States Environmental Protection Agency, 1994, Soil Screening Guidance, Office of Emergency and Remedial Response, Hazardous Site Control Division, Washington, DC, U.S. EPA/540/R-94/101, PB95-963529.

United States Environmental Protection Agency, 1991, Standard Operating Procedures and Quality Assurance Manual, U.S. EPA Region 4, Environmental Services Division, Athens, GA.

United States Environmental Protection Agency, 1994, Supplemental Guidance to RAGS: Region 4 Bulletin. Development of Health Based Preliminary Remediation Goals, Remedial Goal Options, and Remediation Levels. U.S. EPA Region 4, Waste Management Division, Atlanta, GA.

**RESPONSE TO B&R ENVIRONMENTAL COMMENTS TO THE
DRAFT MASTER WORK PLAN, VOLUME I - COMMENTS RECEIVED 8/14/96
MCRD PARRIS ISLAND, SOUTH CAROLINA**

GENERAL COMMENTS:

1. **Comment:** Editorial comments are marked on document.
Response: Editorial comments will be incorporated.

2. **Comment:** The document should have a regional map showing the relative location of Parris Island within the State of South Carolina. This figure should be presented as Figure 1-1. This document should have a detailed Site Map of Parris Island presented as Figure 1-2.
Response: A regional map and a Site map will be included new figures.

3. **Comment:** B&R Environmental is in the process of reviewing documents associated with local habitats and will revise Section 2.6, Installation Ecosystems, and provide it when completed.
Response: The revisions have been received and will be incorporated into the Work Plan.

SPECIFIC COMMENTS

1. **Comment:** Page iii

Brown & Root Environmental is referred to as B&R Environmental throughout the document not BRE.
Response: Agree. The acronym will be corrected throughout Volume I as necessary.

2. **Comment:** Page v

Insert "RFI" into list as "RCRA Facility Investigation or Inspection." Be consistent throughout text regarding the use of investigation verses inspection as this changes from paragraph to paragraph.
Response: Agreed. An acronym list will be added to list and Volume I will be reviewed for consistency and corrected as necessary.

3. **Comment:** Page 1-5, Section 1.4, First Paragraph

The term "American Indian" is not politically correct. Consider using the term "Native American." Remove the archeological phrase ceramic and the parentheses around "Late." The chronological table should begin with, "1562 - French establish Charleforte as this is the first significant historical event."
Response: Agreed. All three comments will be incorporated.

4. **Comment:** Page 1-6, Section 1.5

Last sentence - change to: "MCRD investigated the six potential areas of concern that were identified during the PA and an additional three potential areas of concern that were identified during the SI." MCRD has identified one additional potential area of concern since the completion of the SI.

Response: Agreed.

5. **Comment:** Page 1-7, Section 1.5.2, "Site 2", second sentence

Need to explain the significance of dirt roads associated with this site. Were these roads sprayed with oils or sludge for dust control?

Response: A portion of Site 15/SWMU 15 (Dirt Roads) is located adjacent to Site 2. PCB-containing oils were once sprayed on the roads for dust control purposes. This will be explained in the overview of Site 15/SWMU 15.

6. **Comment:** Page 1-10, Top of the page

Define yard wastes.

Response: Yard waste is comprised of grass clippings, leaves, tree trimmings, etc. The text will be modified accordingly.

7. **Comment:** Page 1-10, Site 16

Elaborate on aquifer *capacity*.

Response: Agreed. The text will be modified accordingly.

8. **Comment:** Page 1-11

Recommend combining Section 1.5.3 with Section 1.5.2 such that the reader does not have to keep flipping pages back and forth. The combined sections could be set up as follows:

Site Description: Dry cleaning facility...

Problem: PCE was historically released...

Action: Installed three monitoring wells during the SI...

Results: SI recommended an RI/FS...

Response: Agreed. The sections will be combined and will present Site description, Problem, Action, and Results. Additionally, a section on proposed action will be presented.

9. **Comment:** Page 1-14, RFA Site 39

Statement that a Preliminary Assessment is recommended, it seems from the previous section that the PA (RFA) was already conducted and a Site Investigation (SI), or RFI, is appropriate. Revise sentence to read SI, or RFI, rather than PA if this is correct.

Response: A PA was essentially completed in the form of the RFA. According to Table 1-1, RFA confirmatory sampling (CS) is recommended. The text will be changed accordingly to reflect RFA CS being recommended for this site.

10. **Comment:** Page 2-6, Section 2.1.2.3

Third sentence reads, "This thin limestone is hydrogeologically important for several reasons." Need to identify what these reasons are.

Response: This paragraph continues to identify why this unit is important: Wells that are open to this unit have a high sulfide content; is locally discontinuous; is frequently eroded in coastal Beaufort County; and when present serves as a confining unit to the overlying Pleistocene deposits, as well as to the underlying Tertiary Limestone Aquifer. No changes proposed.

11. **Comment:** Page 2-7, Section 2.1.2.4, third paragraph

Is there a reference for the origins of the ironstone features? Comment - the soil staining is probably due to oxidation as a result of a fluctuation in water table elevation. However, it could also be due to other factors such as changes in soil mineralogy or a long capillary fringe zone.

Response: The paragraph continues to describe that these ironstone features are probably due to seasonal fluctuations in the near-surface water table. No changes proposed.

12. **Comment:** Page 2-13, first paragraph

Revise "ground water" to "groundwater" throughout document.

Response: Agreed. Changes will be made throughout the document.

13. **Comment:** Page 2-13, second paragraph, first sentence

Need to provide a reference for this value.

Response: Agreed. This was reported in the IAS. The reference will be added.

14. **Comment:** Page 2-16, Section 2.2.2 (Tertiary Limestone Aquifer), second paragraph

It is stated that the aquifer supplies surrounding areas with usable water. The source of water for the depot should also be discussed here.

Response: Agreed. The Depot is served by the Beaufort, Jasper, Colleton County water District.

15. **Comment:** Page 2-19 and 2-20, Figure 2-7

Consider a larger version of this figure for the final work plan. This version is very hard to read.

Response: A clearer figure will be provided.

16. **Comment:** Page 2-23 and 2-24, Section 2.8 (Water Usage)

There are references to Figure 136. The number appears to be incorrect.

Response: Agreed. The paragraph will be corrected.

17. **Comment:** Page R-1

The following references are missing: Hayes, 1979; Hassen, 1985; Glowacz and others, 1980; SCDHEC, 1980; SCDHEC. 1982; Stuck, 1980.

Response: The missing references will be added to the reference list.

**RESPONSE TO SOUTH CAROLINA DEPARTMENT OF NATURAL RESOURCES (SCDNR)
COMMENTS TO DRAFT FINAL MASTER WORK PLAN, VOLUME I - COMMENTS RECEIVED 1/2/98
MCRD, PARRIS ISLAND, SOUTH CAROLINA****COMMENTS - Robert E. Duncan, Environmental Programs Director**1. **Comment:** General

Site 13/SWMU 11: Inert Disposal area A and Site 13/SWMU 12: Inert Disposal Area B - SWMU 11 is located on the south side of Horse Island adjacent to Ribbon Creek, and SWMU 12 is located near Elliott's Beach in the southeast section of the depot. The latter site is also within the boundary of a State Shellfish Ground (SSG-064) that is periodically open to commercial and recreational shellfish harvesting. The rationale given in the MWP (Volume I, Section 1.5.2) for the recommendation of No Further Action at both sites is that each was a "state-controlled domestic landfill". Does this imply that precautions were taken to ensure that no hazardous materials were disposed of in these unlined landfills, or that sampling of soils, groundwater, sediments, and surface water adjacent to these sites revealed no off-site migration of any contaminants that might have been disposed of in these landfills? If so, this should be clarified in the text of the MWP. If no such evidence exists, the SCDNR recommends that the Partnering Team reconsider these sites for further investigation of possible off-site migration of contaminants into adjacent estuarine habitats.

Response: A decision was made in 1995 for NFA. However, further evaluation will be conducted to address trustee concerns. Changes will be made to the MWP, as appropriate, after the Partnering Team has reevaluated these sites.

2. **Comment:** General

Site 15/SWMU 15: Dirt Roads - As stated in the site-specific work plan for Sites 2 and 15 (which the SCDNR will review and comment on separately from the MWP), waste oil, cutting oil, petroleum-based solvents, hydraulic fluids, and water-based coolants had been sprayed on dirt roads throughout the MCRD for dust suppression from 191 until 1966. The SCDNR is concerned that the investigation of dirt roads will be limited to those roads accessing the Borrow Pit Landfill (Site 2/SWMU 2) and Inert Disposal Area B (Site 13/SWMU 12). It appears from the MWP site map (Volume I, Figure 1-2) that there is at least one other road (ending near an unnamed creek south of Elliott's Beach, and within the SSG referred to above) that may be a continuing source of contamination to intertidal marsh or creek habitat. The SCDNR recommends that the Partnering Team reconsider including this, and any other dirt roads adjacent to estuarine habitat, for further investigation of possible off-site migration of contaminants.

Response: The dirt road ending near an unnamed creek south of Elliott's Beach will be included in the RI/RFI and the text of the MWP will be modified accordingly.

3. **Comment:** Volume I, page 1-21, paragraph 8, line 4

The dirt road accessing Elliott's Beach is not "near Site 2/SWMU 2" as stated.

Response: Agree. The dirt road accessing Elliott's Beach is not near Site 2/SWMU 2. "(Near Site 2/SWMU 2) will be removed from this sentence.

SCDNR COMMENTS TO DRAFT FINAL MWP, VOLUME I - 1/2/98

4. **Comment:** Volume I, page 2-28, paragraph 2, line 3

Include appropriate species of sea turtles among those "threatened or endangered animal species ... known to occur in or around the Depot."

Response: The following sea turtles will be included: Kemp's ridley, green, hawksbill, leatherback, and loggerhead. The text will also state that turtles do enter Port Royal Sound; however, there is no evidence of nesting.

**RESPONSE TO SCDHEC
COMMENTS TO DRAFT FINAL MASTER WORK PLAN, VOLUME I - COMMENTS RECEIVED 12/19/97
MCRD PARRIS ISLAND, SOUTH CAROLINA****COMMENTS - Don Hargrove, Hydrogeologist**

1. Comment 3: The response concerning SWMU 45 is not adequate. The following documents provide data concerning the environmental conditions at the Dry Cleaner's Facility:
 - a. South Carolina Department of Health and Environmental Control Spill Report, District Log No. 94-045 (dated 14 March 1994)
 - b. Tetrachloroethylene Contamination Assessment and Conceptual Corrective Action Plan, US Marine Corps Recruit Depot Dry Cleaning Facility (dated June 1994)
 - c. Groundwater Assessment results for the Parris Island Dry Cleaners Facility (received by the Division of Hydrogeology on 29 August 1996);
 - d. Technical Memorandum For Well Installation and Air Sparging Pilot Test (dated December 1996)
 - e. Summary Report For Air Sparging Pilot Test Dry Cleaner Site MCRD Parris Island (dated February 1997)
 - f. Technical Memorandum For Groundwater Evaluation and Air Sparging Pilot Study, Building 193, Parris Island, SC (dated February 1997)
 - g. DRAFT Engineering Evaluation and Remedial Work Plan Air Sparging and Soil Vapor Extraction, Dry Cleaning Facility, Building 193 (dated 17 March 1997)
 - h. DRAFT Engineering Evaluation and Remedial Work Plan/Interim Removal Action, Site 45, Dry Cleaners Facility, Building 193 (June 1997);
 - i. DRAFT Engineering Evaluation and Interim Removal Remedial Work Plan/Interim Measure Work Plan, Site 45/SWMU 45, Revision 0 (dated September 1997);
 - j. DRAFT FINAL Master Work Plan, Volume I of III (dated November 1997)

Designation as a Solid Waste Management Unit (SWMU) is appropriate at this time. The data presented in these documents provide information concerning the reason for the contamination, steps taken to assess the contamination in both the soils and the groundwater, remediation of the contaminated soils, and proposed remedial technologies for the contaminated groundwater.

From this point on, all references to Building 193 (the dry cleaners facility) should acknowledge this area as a SWMU. In order to further promote the RCRA/CERCLA integration that the Tier I Team at MCRD is attempting, it is suggested that this area be referred to as "SITE/SWMU-45". Please revise the text to reflect this aspect of the integration of RCRA and CERCLA.

Response: In all future reports, communication, etc., Building 193 will be referred to as Site 45/SWMU 45.

SCDHEC COMMENTS TO DRAFT FINAL MWP, VOLUME I - 12/19/97

2. Comment 16b: Table 2-1 is not inclusive of all the SITES/SWMUs at MCRD. SITES/SWMUs 17-45 are missing. Please revise the table to include all of the SITES/SWMUs at MCRD.

Response: Table 2-1 will be revised to include Sites/SWMUs where further action will be taken. Sites/SWMUs with a NFA recommendation will not be added to the table.

**RESPONSE TO THE U.S. FISH AND WILDLIFE SERVICE
COMMENTS TO DRAFT FINAL MASTER WORK PLAN, VOLUME I - COMMENTS RECEIVED 2/26/98
MCRD PARRIS ISLAND, SOUTH CAROLINA**1. **Comment:** Pages RTC-13 and RTC-14

The Service concurs with Khafra Engineering Consultants, Inc.'s comments regarding listing of detected contaminants and explanation of values used for comparisons and recommendation of no further action. We agree that comparison of surface water and sediment sample results to drinking water standards is inappropriate. We also found that in the Verification Step sampling, laboratory analyses were often limited to only a few metals and the only organic compound analyses performed were field headspace sampling for volatiles. Conclusions were drawn regarding "EP toxicity" which was not defined. In general, we believe much of the verification sampling was inadequate in that there was no laboratory analysis for constituents that could be reasonably expected at a given site, all appropriate media were not sampled, and inappropriate values were used for comparisons to determine whether further investigation should be conducted. We are aware that the Verification Step investigations were conducted some time ago - the report is dated May 1990 - and that it may be infeasible for the Marine Corps' consultants to explain either the rationale for data collection and laboratory analyses or the recommendations in current documents. However, we believe it is important to include in current documents as much as possible of the information upon which decisions were and continue to be made.

Response: The historical data is presented primarily to provide background information. The data is considered old and is/will be of little value for determining sampling approaches to the RI/RFI

2. **Comment:** Pages 1-15 and 1-16, Site 4/SWMU 4: Dredge Spoils Area Fire Training Pit (FTP)

Please refer to our earlier comments regarding Site 4. Also, according to the Verification Step report, lab samples were analyzed only for Cd, Cr, and Pb; VOCs received only field screening, not laboratory analysis.

Response: It is suggested that the need for additional sampling at Site/SWMU 4 be discussed at a future Partnering Team meeting.

3. **Comment:** Pages 1-20 and 1-21, Site 13/SWMU 11: Inert Disposal Area A; Site 13/SWMU 12: Inert Disposal Area B; and Site 13/SWMU 13: Inert Disposal Area C

Please refer to our earlier comments regarding these sites. The fact that Areas A and B were "state-controlled domestic landfills" does not mean that disposal of hazardous substances did not occur. We concur with the recommendation for sampling within Disposal Area C and suggest that sampling of Disposal Areas A and B would be appropriate if these areas have not been sampled. A number of "domestic landfills" have been listed on the National Priorities List (Superfund List) nationwide and within South Carolina, have been shown to contain numerous hazardous substances, and have required some type of remedial action.

Response: It is suggested that the need for additional sampling at these Sites/SWMUs be discussed at a future Partnering Team meeting.

4. **Comment:** Page 1-21, Site 14/SWMU 14: Storm Sewer Outfalls

As noted earlier, screening should also focus on outfalls that do or may receive surface water runoff from areas of contaminated surface soils.

Response: Agree. Screening will also focus on outfalls that do or may receive surface water runoff from areas of contaminated surface soil. The description of Site 14/SWMU 14 will be revised accordingly.

5. **Comment:** Page 1-21, Site 15/SWMU 15: Dirt Road

See earlier comments and those provided by the SCDNR.

Response: Concerning the U.S. Fish and Wildlife comment to Site/SWMU 15, it is agreed that potential investigation of paved roads should be delayed until the results of the RFI/RI are available. At this time, the need for additional investigation can be discussed by the Partnering Team. No change to the Volume I MWP is proposed.

Please see the response to SCDNR comments.

6. **Comment:** Page 2-25

To our knowledge, the SCDNR has no regulatory authority over dredge and fill operations in jurisdictional wetlands and deepwater habitats. Please consult with the SCDNR regarding this statement.

Response: Agree. The text will be changed to reflect that the SCDNR has no regulatory authority over dredge and fill operations in jurisdictional wetlands and deepwater habitats. However, SCDNR does review and comment on permit applications for such operations.

7. **Comment:** Page 2-28

The U.S. Fish and Wildlife Service has the responsibility for Section 7 consultations under the Endangered Species Act. A list of federally-listed species known to occur in Beaufort County will be provided. The discovery of a nesting pair of bald eagles at the MCRD in January 1998 should be noted.

Response: The Navy looks forward to receiving a list of species having federal concerns. Upon receipt, this information will be incorporated into Section 2.6. The nesting pair of bald eagles will also be noted.

Master Project Plan

Marine Corps Recruit Depot

Parris Island, South Carolina

U.S. EPA Identification Number

SC6 170 022 762



Southern Division

Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0020

March 1998

Rev. 0
03/27/98

MASTER PROJECT PLAN

**MARINE CORPS RECRUIT DEPOT
PARRIS ISLAND, SOUTH CAROLINA
U.S. EPA IDENTIFICATION NUMBER
SC6 170 022 762**

**COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

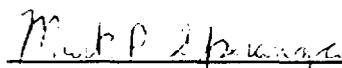
**Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406**

**Submitted by:
Brown & Root Environmental
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220**

**CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0020**

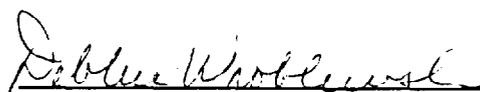
MARCH 1998

PREPARED BY:



**MARK SPERANZA, P.E.
TASK ORDER MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA**

APPROVED FOR SUBMITTAL BY:



**DEBBIE WROBLEWSKI
PROGRAM MANAGER
BROWN & ROOT ENVIRONMENTAL
PITTSBURGH, PENNSYLVANIA**

TABLE OF CONTENTS MASTER PROJECT PLAN

<u>SECTION</u>	<u>PAGE</u>
1.0 INTRODUCTION	1-1
1.1 SUMMARY OF SCOPING DOCUMENTS.....	1-1
1.2 OVERALL SCOPE AND OBJECTIVES.....	1-2
1.2.1 Overall Scope.....	1-2
1.2.2 Overall Objectives.....	1-2
1.2.3 Data Quality Objectives.....	1-2
1.2.4 Geographic Information System.....	1-4
1.3 NAVY IR PROGRAM HISTORY.....	1-5
1.4 FACILITY HISTORY.....	1-5
1.5 FACILITY ENVIRONMENTAL REGULATORY HISTORY.....	1-10
1.5.1 Chronology.....	1-10
1.5.2 Status of Installation Restoration Sites.....	1-11
2.0 BACKGROUND INFORMATION	2-1
2.1 GEOLOGY.....	2-1
2.1.1 Structural Geology.....	2-1
2.1.2 Descriptive Geology.....	2-7
2.1.3 Soils.....	2-10
2.2 REGIONAL HYDROGEOLOGY.....	2-14
2.2.1 Shallow Aquifer.....	2-14
2.2.2 Tertiary Limestone Aquifer.....	2-15
2.3 REGIONAL SURFACE WATER HYDROLOGY.....	2-22
2.4 REGIONAL TOPOGRAPHY.....	2-22
2.5 ADJACENT LAND USE.....	2-22
2.6 BIOLOGICAL FEATURES.....	2-25
2.6.1 Ecosystems.....	2-25
2.6.2 Threatened or Endangered Species.....	2-27
2.7 CLIMATOLOGY.....	2-28
2.8 WATER USAGE.....	2-30
2.9 FACILITY ACCESS.....	2-31
3.0 PROJECT MANAGEMENT TASKS	3-1
3.1 BASE SUPPORT.....	3-1
3.2 PROJECT PERSONNEL.....	3-2
3.3 CONTINGENCY PLAN.....	3-2
REFERENCES	R-1
 <u>APPENDICES</u>	
A	PARTNERING TEAM CORRESPONDENCE, IR SITE RECOMMENDATIONS
B	RARE, THREATENED, AND ENDANGERED SPECIES OF SOUTH CAROLINA

TABLE OF CONTENTS (CONTINUED)
MASTER PROJECT PLAN

TABLES

<u>NUMBER</u>		<u>PAGE</u>
1-1	IR Site Determinations.....	1-12
2-1	Soil Properties.....	2-12
2-2	Beaufort County Distribution Records of Endangered, Threatened, and Candidate Species.....	2-29

FIGURES

<u>NUMBER</u>		<u>PAGE</u>
1-1	Region Map.....	1-7
2-1	Generalized Lithological Section.....	2-3
2-2	Generalized Regional Geological Profile.....	2-5
2-3	Structure-Contour Map of the top of the Santee Limestone.....	2-6
2-4	Soil Unit Map of MCRD Parris Island and Vicinity.....	2-11
2-5	Groundwater Flow Map.....	2-17
2-6	Potentiometric Surface of the Tertiary Limestone Aquifer.....	2-19
2-7	Topography and Flood Hazard.....	2-23

1.0 INTRODUCTION

This Master Project Plan (MPP) has been prepared by Brown & Root Environmental (B&R Environmental) for the Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC) under the Navy Comprehensive Long-term Environmental Action Navy (CLEAN) Program, Contract Number N62467-94-D-0888, Contract Task Order (CTO) 0020. This Master PP outlines the overall scope and objectives of the environmental investigations at the Marine Corps Recruit Depot (MCRD) Parris Island, South Carolina. Additionally, this document contains overall investigation strategies, project organization, and facility background information.

1.1 SUMMARY OF SCOPING DOCUMENTS

In addition to this Master PP, provided as Volume I Master Work Plan (MWP), the following scoping documents were prepared and are a part of the MWP for installation restoration (IR) work at MCRD Parris Island.

- Volume II MWP:
 - Master Field Sampling Plan (Master FSP)
 - Master Quality Assurance Plan (Master QAP)
 - Project Health and Safety Plan (Project HASP)
- Volume III MWP:
 - Master Decision Document

The IR Program activities to be conducted pursuant to this Master PP will comply with applicable requirements established under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as implemented through the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (March 1990). Additionally, IR activities will also comply with those requirements established under the Resource Conservation and Recovery Act (RCRA). Additional guidance for such activities is contained in the United States Environmental Protection Agency (U.S. EPA) Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (U.S. EPA, 1988), the Navy/Marine Corps Installation Restoration Manual (February 1992), and OSWER Directive 9902.3-2A, RCRA Corrective Action Plan (U.S. EPA, 1994). The Navy IR Program is discussed in Section 1.3 of this Master PP.

1.2 OVERALL SCOPE AND OBJECTIVES

Southern Division NAVFAC has the responsibility for ensuring that IR projects are performed efficiently in the most cost-effective and timely manner, while ensuring the protection of both human health and the environment. Additionally, NAVFAC must ensure that IR projects achieve regulatory compliance and site closure requirements. For these reasons, clearly focused investigations are required to help improve the efficiency of the IR process.

The following sections describe the overall scope and objectives and generic processes and requirements for implementing the Data Quality Objective (DQO) process. In addition to this introduction, Site-Specific Work Plans (WPs) will be prepared for specific projects. The Site-Specific Work Plans will review the fundamentals of the DQO process, as well as present a detailed discussion of the site-specific objectives.

1.2.1 Overall Scope

Southern Division NAVFAC has developed a policy and approach to improve the efficiency of the site investigation and restoration process through the appropriate use of new guidance from U.S. EPA (Guidance for the Data Quality Objectives Process, U.S. EPA, September 1994), innovative technologies when warranted (e.g., direct-penetration technology, onsite analyses), and new tools and methods for data analysis (e.g., geostatistics, geographic information systems [GIS]). Together, these items should provide for a more clearly focused investigation.

1.2.2 Overall Objectives

The overall goal of IR work at MCRD Parris Island is to adequately characterize environmental contamination to determine whether there is a risk to human health and the environment and therefore to determine whether further investigation and characterization is needed. If further investigation is required, the nature and extent of contamination will be defined with the objective of developing and designing appropriate remedial actions. However, if risks are acceptable, and applicable or relevant and appropriate requirements (ARARs) are met, No Further Action may be pursued. Specific objectives for a given project at MCRD Parris Island will be presented in the Site-Specific WPs.

1.2.3 Data Quality Objectives

The DQO process is a systematic procedure, based on the scientific method, to define the criteria by which data collection activities are performed. The goal of the DQO process is to develop a strategy for the efficient collection of data that is of sufficient quality and quantity to support defensible decision making

while eliminating unnecessary precision beyond what is required. The most efficient way to accomplish these goals is to establish criteria for defensible decision making before the study begins and then develop a data collection design based on these criteria.

The complete DQO process consists of seven steps. A detailed description of the DQO process is beyond the scope of this document; however, the U.S. EPA guidance previously cited (U.S. EPA, 1994) should be reviewed by all decision makers involved in the project. Following is a brief description of each step in the DQO process:

- Step 1: State the Problem** - Concisely describe the problem to be studied. Review prior studies and existing information to gain a sufficient understanding to define the problem.
- Step 2: Identify the Decision** - Identify what questions the study will attempt to resolve and what actions may result.
- Step 3: Identify the Inputs to the Decision** - Identify existing data and what information needs to be obtained and the measurements that need to be taken to resolve the decision statement.
- Step 4: Define the Study Boundary** - Specify the time periods and spatial area to which decisions will apply. Determine when and where data should be collected.
- Step 5: Develop a Decision Rule** - Define the statistical parameter(s) of interest, specify the action level, and integrate the previous DQO outputs into a single statement that describes the logical basis for choosing among alternative actions.
- Step 6: Specify Tolerable Limits on Decision Errors** - Define the decision maker's tolerable decision error rates based on a consideration of the consequences of making an incorrect decision.
- Step 7: Optimize the Design for Obtaining Data** - Evaluate information from the previous steps and generate alternative data collection design. Choose the most resource-effective design that meets all DQOs.

The above steps are generally related in a downward decision flow; however, during development of the DQOs, the answers to subsequent questions may require a review of the previous step(s). In addition, the DQO steps must be reviewed during the data collection activities to allow for changes to the proposed

plan that will better optimize the design. Therefore, the DQO process is an iterative procedure requiring dynamic work plans and input from decision makers to qualify all decisions made before and during the design and implementation of the data collection activities.

To ensure effective use of resources, Southern Division NAVFAC has determined that it is appropriate to implement the DQO process during the planning stages of all studies that require data collection, before the data are collected. The DQO process applies to all studies; however, the depth and detail of the process will vary with the complexity of the particular study. In addition, the DQO process is a flexible planning tool. For projects where the likelihood of making decision errors is small, where decision errors are not critical, or where prescriptive procedures/remedies are mandated, the DQO process can be used less intensively.

In line with the DQO process, Southern Division NAVFAC has identified several operational processes to aid and assist in the DQO process. These processes will be implemented for all Southern Division NAVFAC projects. They are as follows:

- Preparation of a dynamic site-specific work plan that fully integrates the DQO process.
- Presentation of a DQO summary statement and logic flow diagram in the site-specific work plan that describes the decision-making process for data collection activities.
- Provision of if-then rules for reasonable deviations from the proposed plan.
- Involvement of multidiscipline teams in the decision-making process during the data collection activities.
- Requirement of daily field communications between the Field Operations Leader (FOL) and the technical leader.

1.2.4 Geographic Information System

A GIS is being developed for MCRD Parris Island. A GIS is a computer system designed to organize and present data and to provide support for the complex decision-making processes involved with resource management. GIS provides this capability by associating graphic data with database information. Many sets of graphic data, called "layers", may be overlaid and integrated for analysis. These layers include such variables as vegetation, soils, wetlands, geology, topography, environmental parameters

(contaminants and concentrations), and aquifer data. Some historical environmental data and all future environmental data will be incorporated into the GIS.

Spatial environmental data, such as soil boring and monitoring well locations, site boundaries, and topography, will be incorporated into the GIS system. Accurate spatial data (e.g., land survey and/or Global Positioning System [GPS]) will be collected during future environmental activities at MCRD Parris Island. Analytical environmental data, such as soil and water chemical analysis and geotechnical analysis of soils and sediments, will also be incorporated into the database of the GIS system to be integrated with the graphic data. The GIS will be used as a tool for making future environmental decisions at the Depot.

1.3 NAVY IR PROGRAM HISTORY

The identification, investigation, and cleanup of hazardous waste sites at MCRD Parris Island is conducted in accordance with the Department of the Navy IR Program. This program is designed to identify, assess, characterize, and clean up or control contamination from past hazardous waste disposal operations and hazardous materials spills at Navy and Marine Corps facilities. CERCLA and the Superfund Amendments and Reauthorization Act of 1986 (SARA) established a series of programs for the cleanup of hazardous waste disposal and spill sites nationwide. One of these programs, the Defense Environmental Restoration Program (DERP), is codified in SARA Section 211 (10 USC 2701). The IR Program is a component of the DERP.

Initial guidance for the Navy's IR Program was published in May 1988. The IR Manual was revised in 1992 to represent a compilation of DERP requirements, policy, and guidance for both the United States Navy and the United States Marine Corps and updated to incorporate the many changes that have occurred in the IR Program since 1988. The latest version of the manual is titled Navy/Marine Corps Installation Restoration Manual, February 1992.

1.4 FACILITY HISTORY

MCRD Parris Island is located along the southern coast of South Carolina approximately 1 mile south of the city of Port Royal and 3 miles south of the city of Beaufort (see Figure 1-1). MCRD Parris Island covers approximately 8,047 acres, consisting of dry land, salt marshes, saltwater creeks, and ponds, as shown in Figure 1-2. MCRD Parris Island is the reception and recruit training facility for the Marine Corps for enlisted men from states east of the Mississippi River and for enlisted women nationwide.

MCRD Parris Island has had a long and varied history. The area's earliest confirmed inhabitants were Native Americans of the Late Archaic Period (2500 B.C. to 1000 B.C.). For a brief time, the Indians and



DRAWN BY D. PERRY	DATE 13-NOV-97	 Brown & Root Environmental	CONTRACT NUMBER —	OWNER No. —
CHECKED BY	DATE		APPROVED BY —	DATE —
COST/SCHEDULE-AREA		REGIONAL MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA	APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING No. FIGURE 1-1	REV 0

P:\GIS\WRP\PARRIS.APR 13-NOV-97 DNP REGIONAL MAP LAYOUT

SOURCE: USGS QUAD (PARRIS ISLAND, O32D80C6) AND MCRD PARRIS ISLAND



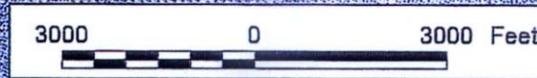
LEGEND

● 11 Solid Waste Management Unit Number

NOTE

For a SWMU's corresponding Site Number, refer to Table 1-1.

- SWMU 14: Storm Sewer Outfalls - system includes more than 60 outfalls throughout MCRD.
- SWMU 42: Sanitary Sewer System - system consists of pipes below ground throughout MCRD.
- SWMU 44: Dumpsters - metal roll-off boxes located throughout MCRD.



NO.		DATE		REVISIONS		DRAWN BY D. PERRY		DATE 24-NOV-97		Brown & Root Environmental		CONTRACT NO.		OWNER NO.	
						CHECKED BY				INSTALLATION RESTORATION SITE MAP MCRD PARRIS ISLAND PARRIS ISLAND, SOUTH CAROLINA		APPROVED BY		DATE	
						COST/SCHED-AREA						APPROVED BY		DATE	
						SCALE AS NOTED						DRAWING NO. Figure 1-2		REV. 0	

European colonists lived together on Parris Island. The French established Charlesfort in 1562 and left in early 1563. In 1566, the Spanish established the village of Santa Elena and remained there until 1587. The following is a summary of the area's history (MCRD Parris Island, 1992).

- 1562** French establish Charlesfort
- 1566** Menendez establishes Fort San Felipe
- 1568** First Spanish settlers arrive to populate Santa Elena.
- 1570s** Governor Menendez dies.
- 1570s** Local Native Americans overrun Fort San Felipe and cause its evacuation.
- 1580** Spanish re-establish a colony, Fort San Marcos.
- 1586** Spanish withdraw to St. Augustine.
- 1883** The Federal government began purchasing land on Parris Island to establish a Naval Base as a coaling and supply depot.
- 1891** The Navy started construction of a wooden drydock.
- 1893** Parris Island is hit by a hurricane that further delays completion of the drydock.
- 1895** By the summer, the drydock was completed.
- 1903** Navy Yard reverts to a coaling station.
- 1909** Almost all Navy activities had ceased and the base was commanded by a Marine Corps Lieutenant Colonel who oversaw an officers training school.
- 1910** For a brief period, a recruit depot was established.
- 1911** The school and recruit depot were moved and the base was used as a Disciplinary Barracks.
- 1915** With hostilities in Europe, the Marines relocated their Recruit Training Depot from Norfolk to Parris Island. At the time of the United States entrance into World War I, the Marine Corps numbered only 13,000 men and Parris Island supported a mere 835 recruits. However, before the war ended, the Depot was training more than 13,000 recruits at a time. More than 500 temporary buildings were erected, which provided space for over 10,000 men, while another 2,000 lived in tents.
- 1920s** A dirigible mooring mast was erected on the island and was used by the airships Los Angeles and Akron.
- 1933** The Civilian Works Authority cleared a large portion of the island for a new landing field.
- 1930s** During the 1930s, much of Parris Island was closed down and at one point, there were only 180 recruits on hand. Hostilities in Asia and Europe caused the Marine Corps to increase in size, and by 1940, Parris Island was experiencing a new revival.
- 1941** At the time of the attack on Pearl Harbor, there were 2,869 recruits in four training battalions and 3,553 permanent personnel on Parris Island. Within two months, the numbers had grown to nearly 15,000 recruits in 13 battalions and over 5,000 supporting personnel.

- 1940s** From December 7, 1941 to August 14, 1945, over 200,000 recruits passed through Parris Island. The peak load was 18,000 recruits in August 1945. Demobilization came quickly. By the end of 1946, all but three recruit battalions had been deactivated.
- 1952** At the outbreak of the Korean War, the base received a large influx of recruits and reservists. Before the year was out, eight recruit battalions were formed, and in March 1952, a new peak of recruits was reached with over 24,000 men undergoing training at one time. In all, some 138,000 Marines graduated from Parris Island for service in the Korean War.
- 1960** During the 1960s, the Depot continued to grow. During the Vietnam War, over 200,000 recruits graduated from Parris Island.
- Present** Since the end of U.S. involvement in the Vietnam War, the Depot has continued to operate as a recruit training facility. Training levels have generally remained steady, with the number of recruits undergoing training at a given time ranging from 9,000 to 11,000.

1.5 FACILITY ENVIRONMENTAL REGULATORY HISTORY

1.5.1 Chronology

With the passing of SARA by Congress in 1986, the government required the U.S. EPA to develop a list of federal facilities where hazardous waste had been generated, stored, treated, disposed, or where there might have been a release of hazardous waste to the environment. Federal facilities on the list were required to conduct a Preliminary Assessment (PA) by April 1988.

A PA was completed at the MCRD in September 1986. The PA identified 16 areas of potential concern and recommended 6 for further study. No further action was recommended at the remaining 10 sites. Under the Navy Installation Restoration Program (IRP), a Remedial Investigation Verification Step was completed in May 1990. The Verification Step is the functional equivalent of a Site Inspection (SI) in the CERCLA process. This study will be referred to as the SI throughout the remainder of this document. MCRD investigated the six potential areas of concern that were identified during the PA and an additional three potential areas of concern.

In addition to the above, a RCRA Facility Assessment (RFA) was completed as a result of an April 1990 permit request for the site's Hazardous Waste Storage Building. U.S. EPA requires an RFA for facilities seeking a RCRA permit. The RFA is similar in scope to the PA/SI process. The RFA identified 44 Solid Waste Management Units (SWMUs) and 4 Areas of Concern (AOCs), of which 21 (20 SWMUs and 1 AOC) were recommended for no further action. Of the remaining 27 site study areas, 19 are IRP sites (not including the one additional site study area mentioned above). The RFA recommended a RCRA Facility Investigation (RFI) for all the site study areas that were earlier investigated.

In March 1994, an accidental spill of tetrachloroethene occurred adjacent to a dry cleaning facility. This area was subsequently added to the list of Depot IR sites as Site/SWMU 45.

The MCRD Parris Island Partnering Team, composed of Navy, Marine Corps, state, and U.S. EPA representatives, has reviewed all site study areas identified to date and provided recommendations for any additional action. Table 1-1 is a complete list of site study areas, a description of concerns, and actions taken. Correspondence documenting Partnering Team concurrence on the recommendations is provided in Appendix A. Sites recommended for additional action by the Partnering Team are shaded.

1.5.2 Status of Installation Restoration Sites

This section provides an overview of the IR sites at MCRD Parris Island, South Carolina. For each site, the following information is summarized: (1) a description of the site, (2) the problem encountered, (3) actions taken to date, (4) results (if any) of actions taken, and (5) proposed actions.

Information presented in this section was obtained from several sources: the PA report, (NEESA, 1986), the SI report (McClelland, 1990), the RFA report (A.T. Kearney, 1990), and the Extended Site Inspection Report (ABB-ES, 1993).

Site 1/SWMU 1: Incinerator Landfill

Description: The Incinerator Landfill is located in the northeast section of Horse Island. Employees at the MCRD discarded incinerator ash, liquid, and solid wastes in this landfill from 1921 to 1965. SWMU 41, Former Incinerator, is located adjacent to Site 1/SWMU 1.

Problem: The sources of waste include the paint shop, former Naval Hospital, pest control shop, automotive hobby shop, dry cleaning plant, dental clinic, mechanical trade shop, electrical shop, and furniture/upholstery shop. It is likely that quantities of hazardous wastes from these sources were co-disposed with the solid waste disposed of in this landfill.

Action To Date: Four wells were installed around the landfill (three at the marsh boundary and one inland) during the SI. The area was also addressed in the RFA.

TABLE 1-1

IR SITE DETERMINATIONS
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Site/SWMU Number	Description	PA/SI Recommendation	RFA Recommendation	Partnering Team Recommendation ⁽¹⁾⁽²⁾
SITE 1/SWMU 1	Incinerator Landfill	RI	RFI	RI/RFI
SITE 2/SWMU 2	Borrow Pit Landfill	RI	RFI	RI/RFI
SITE 3/SWMU 3	Causeway Landfill	RI	RFI	RI/RFI
SITE 4/SWMU 4	Dredge Spoils Area Fire Training Pit (FTP)	NFI	RFI	Limited SI (w/site 13 RFA/CS)
SITE 5/SWMU 5	Former Paint Shop Disposal Area	NFI	RFA CS	SI/RFA CS
SITE 6/SWMU 6	Former Automotive Hobby Shop Spill Area	NFI	RFI	State UST Program
SITE 7/SWMU 7	Page Field FTP	NFI	RFA CS	RFA CS
SITE 8/AOC A&B	PCB Spill Areas	NFI	RFA CS	RFA CS
SITE 9/SWMU 8	Paint Waste Storage Area	NFI	NFA	RFA CS (w/site 16 RI/RFS)
SITE 10/AOC C	Gasoline Spill Area	NFI	NFA	State UST Program
SITE 11/SWMU 9	Former MCX Service Station Spill Area	NFI	RFA CS	State UST Program
SITE 12/SWMU 10	Jericho Island Disposal Area	NFI	RFA CS	RFA CS
SITE 13/SWMU 11	Inert Disposal, Horse Island (Disposal Area A)	NFI	RFA CS	NFI/NFA
SITE 13/SWMU 12	Inert Disposal, Elliots Beach (Disposal Area B)	NFI	RFI	NFI/NFA
SITE 13/SWMU 13	Inert Disposal, Dredge Spoils Area (Disposal Area C)	NFI	RFA CS	RFA CS
SITE 14/SWMU 14	Storm Sewer Outfalls	NFI	RFA CS	SI/RFA CS
SITE 15/SWMU 15	Dirt Roads	NFI	RFA CS	RI/RFI (w/site 2 RI/RFI)
SITE 16/SWMU 16	Pesticide Rinsate Disposal Area	RI	RFI	RI/RFI
SITE 17/SWMU 17	AS-16 UST	NFI	RFI	State UST Program
SITE 18/SWMU 18	AS-18 UST	NFI	RFI	State UST Program
SITE 19/AOC D	Former MCX Service Station UST	NFI	RFI	State UST Program
SWMU 19	Diesel Wash Pad		NFA	NFI/NFA
SWMU 20	Power Station Oil/Water Separator		NFA	NFI/NFA
SWMU 21	Weapons Power Plant OW Separator		RFA CS	RFA CS
SWMU 22	Motor Pool Car Wash		NFA	NFI/NFA

TABLE 1-1

IR SITE DETERMINATIONS
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Site/SWMU Number	Description	PA/SI Recommendation	RFA Recommendation	Partnering Team Recommendation ⁽¹⁾⁽²⁾
SWMU 23	Indoor Dental Lab Satellite Accumulation Area (SAA)		NFA	NFI/NFA
SWMU 24	Dental Lab SAA		NFA	NFI/NFA
SWMU 25	Paint Shop SAA		NFA	NFI/NFA
SWMU 26	Pesticide Shop SAA		NFA	NFI/NFA
SWMU 27	Equipment Parade Deck SAA		RFA CS	RFA CS
SWMU 28	Power Plant SAA		RFA CS	State UST Program
SWMU 29	Indoor Motor Pool SAA		NFA	NFI/NFA
SWMU 30	Empty Drum Storage Area		NFA	NFI/NFA
SWMU 31	Weapons Power Plant SAA		NFA	NFI/NFA
SWMU 32	Laundry SAA		NFA	RFA CS (w/site 45 RI/RFI)
SWMU 33	Outdoor Motor Pool SAA		NFA	NFI/NFA
SWMU 34	Motor Pool Waste Oil AST		NFA	NFI/NFA
SWMU 35	DRMO Salvage Yard		RFA CS	RFA CS
SWMU 36	Hazardous Waste Storage Building		NFA	State RCRA Closure Program
SWMU 37	Overflow Storage Pad		NFA	NFI/NFA
SWMU 38	Waste Oil UST		RFA CS	State UST Program
SWMU 39	Electrolyte Basin/Tank		NFA	RFA CS
SWMU 40	Wastewater Treatment Plant		NFA	NFI/NFA
SWMU 41	Former Incinerator		NFA	RI/RFI (w/site 1 RI/RFI)
SWMU 42	Sanitary Sewer System		RFA CS	NFI/NFA
SWMU 43	Motor Pool Waste Oil UST		RFA CS	State UST Program
SWMU 44	Dumpsters		NFA	NFI/NFA
SITE/SWMU 45	Dry Cleaning Spill Area			RI/RFI

1 Shaded text indicates further action proposed at site.

2 Status is a result of partnering meeting evaluating each site (SCDHEC, 1995 and NAVFAC, 1995).

AOC Area of Concern
AST Aboveground Storage Tank
CS Confirmatory Sampling
DRMO Defense Reutilization and
Marketing Office

ESI Extended Site Inspection
FTP Fire Training Pit
MCX Marine Corps Exchange
NFA No Further Action
NFI No Further Investigation

PA Preliminary Assessment
PCB Polychlorinated Biphenyls
RFA RCRA Facility Assessment
RFI RCRA Facility Investigation

RI Remedial Investigation
SAA Satellite Accumulation Area
SI Site Inspection
UST Underground Storage Tank

Results: Dissolved lead was detected in groundwater samples. Lab results from sediment samples collected from the nearby marsh detected chloroform, total chromium, and total lead.

Proposed Actions: A Remedial Investigation (RI)/RFI is planned for 1998.

Site 2/SWMU 2: Borrow Pit Landfill

Description: The landfill is located in the central portion of Horse Island in the north section of the Depot. The landfill is located approximately 100 feet from a tidal inlet. Solid wastes, construction debris, and paint wastes were placed in this landfill from 1966 to 1968. A section of Site 15/SWMU 15 (Dirt Roads) is located adjacent to the landfill.

Problem: Past records indicate that some quantity of hazardous waste (e.g., paint thinner, solid paint wastes, and tetrachloroethene [PCE] still bottoms) was disposed of in the Borrow Pit Landfill.

Action To Date: Three wells were installed around the landfill during the SI. The area was also addressed in the RFA.

Results: Lab results detected chloroform, 1,2-dichloroethane, dissolved chromium, and dissolved lead in groundwater samples. In the tidal inlet near the landfill, dissolved cadmium and dissolved chromium were detected in surface waters, and chloroform was detected in sediments.

Proposed Actions: An RI/RFI is planned for 1998.

Site 3/SWMU 3: Causeway Landfill

Description: During 1960 to 1972, this landfill was created from solid waste and fill materials, forming a causeway connecting Horse Island to Parris Island. Material was dropped directly into the salt marsh.

Problem: Hazardous waste (e.g., polychlorinated biphenyl [PCB] oil and solid paint waste) has also reportedly been dumped into this landfill.

Action To Date: Surface water and sediment samples were collected along the base of the causeway during the SI. An extended site inspection to assess the impact on fish and shellfish was recommended and completed in August 1993. The area was also addressed in the RFA.

Results: As concluded in the SI, no priority pollutant organic compounds were detected in the sediment and water samples. In addition, no heavy metals were identified at levels that exceeded allowable limits set forth in the U.S. EPA Interim Primary Drinking Water Standards or the U.S. EPA Ambient Saltwater Quality Criteria.

As concluded in the extend site inspection, PAH levels, with the exception of some liver samples, were generally low, with most PAHs either not detected at all or reported below the detection limit. Fluoranthene was generally the most abundant PAH in oyster tissue. Highest PCB concentrations were detected on the pond side of the causeway. Aroclor 1254 was reported most often. Samples collected on the tidal creek side had lower concentrations of PCBs than the pond side of the causeway. The DDT metabolite/degradation product 4,4-DDE was consistently the most abundant pesticide. Other pesticides that were frequently determined to be present included 4,4-DDD, trans-nonchlor, cis-chlordane, and mirex. Mercury concentrations were uniformly low among the different Parris Island sites. Although these contaminants were detected, no contaminants exceeded U.S. Food and Drug Administration action levels.

Proposed Actions: An RI/RFI is planned for 1998.

Site 4/SWMU 4: Dredge Spoils Area Fire Training Pit (FTP)

Description: This site is located approximately 600 feet northeast of Cuba Street and Ballast Creek junction in the east section of the Depot. This site was used for fire-fighting training between the 1940s and 1960s.

Problem: Waste fuels, oils, and small quantities of petroleum-based solvents were placed into the training pit. Approximately 300 to 400 gallons of flammable liquids were burned per training session. One training session was conducted each month.

Action To Date: Soil borings were installed near the suspected location of the training pit during the SI. The area was also addressed in the RFA.

Results: Lab samples detected no volatile organic compounds (VOCs) or toxic concentrations of heavy metals in any soil samples.

Proposed Actions: A limited SI/RFA confirmatory sampling (CS) will be conducted to evaluate the site's potential impact to groundwater. This investigation will be conducted in conjunction with Site 13/SWMU 13.

Site 5/SWMU 5: Former Paint Shop Disposal Area

Description/Problem: The Former Paint Shop Disposal Area is suspected to be located behind the Main Power Plant, Building 160, on about a 30-square-foot area on the shore; however, the exact location of the area is unknown, since tidal action and periodic storms have washed away the remains. From the 1930s to the 1960s, dried waste paint and solvents were allegedly dumped at the edge of the Beaufort River.

Action To Date/Results: The area was recommended for No Further Investigation in the PA; however, the RFA recommended additional study because paint wastes were allegedly poured directly onto bare soil along the riverbank.

Proposed Actions: Sampling, as a part of an SI/RFA CS, will be conducted to screen this site for an RI/RFI.

Site 6/SWMU 6: Former Automotive Hobby Shop Spill Area

Description: The area consists of a 500-gallon, steel underground storage tank (UST) and the surrounding soil area. The tank is located in the southeast section of the Depot.

Problem: The area was contaminated by surface spills of waste oil from 1969-1982.

Action To Date/Results: The site was investigated during the SI and was recommended for No Further Action. However, the area was also addressed in the RFA and was recommended for further action due to documented soil contamination at the site.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

Site 7/SWMU 7: Page Field FTP

Description: The former concrete pit was located at the south end of Henderson Street at Page Field in the central section of the Depot. The pit was constructed on a concrete pad that was the apron of the former runway.

Problem: This concrete pit held waste fuels and waste oils which were burned for training purposes from the mid-1960s to 1976. Use was discontinued when a leak was discovered.

Action To Date: This structure has been demolished. Additional sampling was conducted as an addendum to the SI. A soil-gas vapor survey was performed around the perimeter of the site. Three shallow groundwater monitoring wells were installed. The area was also addressed in the RFA.

Results: Lab results identified no VOCs in the soil-gas. No dissolved metals were detected in groundwater samples at levels in excess of Drinking Water Standards

Proposed Actions: The MCRD Parris Island Partnering Team will review groundwater flow before concurring with the No Further Investigation as recommended in the SI. RFA CS will also be conducted.

Site 8/AOC A and B: PCB Spill Areas

Description/Problem: In 1983 and 1984, two PCB spills from transformers occurred. The first occurred on an asphalt pad adjacent to Building 450 in the northeast section of the Depot. The second occurred on a grass-covered area adjacent to Building 111 in the northeast section of the Depot.

Action To Date/Results: In November 1985, PCB-contaminated soil was excavated and disposed of off site. This area was recommended for No Further Investigation in the PA; however, the RFA recommended that the effectiveness of the soil removal be demonstrated.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS for this site.

Site 9/SWMU 8: Paint Waste Storage Area

Description: The Paint Waste Storage Area is an unpaved area adjacent to Building 864. This area was used by the paint shop as a temporary storage area for paint wastes from 1969 to 1984.

Action To Date/Results: In 1984, approximately 6 inches of surface soil were removed and disposed of. The area was covered with concrete pavement. The area was addressed in the PA and was recommended for No Further Investigation. However, the RFA concluded that additional study was needed to demonstrate the effectiveness of the soil removal.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS in conjunction with the RI/RFI planned for Site 16 (SWMU 16).

Site 10/AOC C: Gasoline Spill Area

Description/Problem: In December 1983, a 97-gallon spill of unleaded gasoline occurred at the fuel storage area adjacent to Building 170.

Action To Date: Contaminated soil was removed and shipped off site for disposal as hazardous waste. The area was also addressed in the RFA.

Results: The area was addressed in the PA and was recommended for No Further Investigation. However, the RFA concluded that additional study was needed to demonstrate the effectiveness of the soil removal.

Proposed Actions: The MCRD Parris Island Partnering Team has recommended the site for evaluation under South Carolina's UST Program.

Site 11/SWMU 9: Former MCX Service Station Spill Area

Description: The area is associated with a gasoline station that was demolished in 1985. The gasoline station was adjacent to Building 404 in the northeast section of the Depot.

Problem: From 1969 to 1983, garage personnel poured used crankcase oil from small containers into a UST. Spillage occurred while carrying and transferring the oil to the tank.

Action To Date: In 1983, contaminated soil was excavated and shipped off the Depot for disposal as hazardous waste. The area was also addressed in the RFA.

Proposed Actions: The MCRD Parris Island Partnering Team has recommended this site for evaluation under South Carolina's UST program.

Site 12/SWMU 10: Jericho Island Disposal Area

Description: This area is located along the central part of the southern edge of Jericho Island in the northwest section of the Depot.

Problem: The City of Beaufort and residents of Beaufort County disposed of incinerator ash and domestic waste from 1955 to 1968. The wastes were disposed of on the edge of the island stretching southward into the marsh. Parris Island took possession of Jericho Island in 1968.

Action To Date/Results: The area was recommended for No Further Investigation in the PA; however, the RFA recommended further action.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS for this site.

Site 13/SWMU 11: Inert Disposal Area A

Description/Problem: Inert Disposal Area A is located on the south side of Horse Island. This unlined landfill contained inert material, such as construction debris and yard waste. The landfill was active from 1979 to 1991.

Action To Date/Results: The area was recommended for No Further Investigation in the PA. The RFA recommended further evaluation.

Proposed Actions: The MCRD Parris Island Partnering Team recommends No Further Action for this site because it was a state-controlled domestic landfill.

Site 13/SWMU 12: Inert Disposal Area B

Description/Problem: Inert Disposal Area B is located near Elliot's Beach in the southeast section of the Depot. This unlined landfill received inert material such as construction debris and yard waste (e.g., grass clippings, leaves, and tree trimmings). The landfill was active from 1976 to 1979 as a temporary solid waste landfill.

Action To Date/Results: The area was recommended for No Further Investigation in the PA. The RFA recommended an RFI for Inert Disposal Area B.

Proposed Actions: The MCRD Parris Island Partnering Team recommends No Further Action for this site because it was a state-controlled domestic landfill.

Site 13/SWMU 13: Inert Disposal Area C

Description/Problem: This area is located at the Dredge Spoils Area FTP (Site 4/SWMU 4). Inert Disposal Area C received dredge spoils from the marine basin and Ballast Creek. The Dredge Spoils Area Fire Training Pit is located beneath the dredge spoils at the site.

Problem: Contaminated soils from the former Fire Training Pit (Site 4/SWMU 4) may also be mixed with the dredge spoils.

Action To Date/Results: The area was recommended for No Further Investigation in the PA; however, the RFA recommended additional study for the area because it is underlain by Site 4/SWMU 4.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS for this site.

Site 14/SWMU 14: Storm Sewer Outfalls

Description: A storm sewer piping system has been in place since 1918 and exists throughout the Depot. The system includes more than 60 outfalls that empty into the surrounding surface waters.

Problem: Reportedly, waste from garages and other maintenance shops, a dispensary, dental clinic, photo laboratory, steam plant, and cooling tower could have been discharged into the storm sewers before the mid 1970s.

Action To Date/Results The area was recommended for No Further Investigation in the PA; however, the RFA recommended additional study because releases may be likely due to the age of the piping system.

Proposed Actions: Additional samples will be taken as part of an SI/RFA CS. Screening will concentrate on those outfalls that originate in potential industrial areas. Additionally, screening will focus on outfalls that potentially receive runoff from areas of contaminated surface soil.

Site 15/SWMU 15: Dirt Roads

Description/Problem: Throughout Parris Island, waste oils were deposited on dirt roads from 1941 to 1966 for dust control. Many of these roads are now paved. The roads that most recently received oils are a 1.5 mile section of a dirt road accessing Elliot's Beach and the road accessing the Inert Disposal Area B.

Action To Date: The area was recommended for No Further Investigation in the PA; however, the RFA recommended additional study.

Proposed Actions: The dirt roads will be addressed in conjunction with Site 2/SWMU 2 during the RI/RFI planned for 1998. The dirt road ending near the unnamed creek south of Elliot's Beach will also be included in this investigation.

Site 16/SWMU 16: Pesticide Rinsate Disposal Area

Description: The bare soil area used for disposal of pesticide rinsate is located next to Building N-282 in the northeast section of the Depot. From 1950 to 1978, Depot personnel poured rinse water from pesticide use on the ground at this site. A deep water well, connected to the underlying limestone aquifer, is about 80 feet from this site. This well is a capacity use well used by the state.

Problem: The area received pesticide sprays and rinsewater containing various pesticides.

Action To Date: Soil borings were advanced and the samples collected at this site during the SI. The area was also addressed in the RFA.

Results: The pesticide, p,p-dichlorodiphenyl-trichloroethane (DDT) and its degradation products p,p-dichlorodiphenyl-dichloroethylene (DDE) and p,p-dichlorodiphenyl-dichloroethane (DDD) were detected.

Proposed Actions: Additional studies will be conducted as part of an RI/RFI to support a baseline risk assessment.

Site 17/SWMU 17: AS-16 UST

Description/Problem: This area is located at Page Field in the central section of the Depot and once contained four 25,000 gallon concrete USTs. The USTs stored aviation gasoline and water/fuel mixture.

Action To Date/Results: The site was addressed in the RFA and was recommended for further study. In 1991, the tanks and impacted soils were removed and a closure report was submitted to the state.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

Site 18/SWMU 18: AS-18 UST

Description/Problem: This area is located at Page Field in the central section of the Depot and once contained four 50,000-gallon concrete USTs. The USTs stored aviation gasoline and water/fuel mixture.

Action To Date/Results: The tanks have been abandoned in place, and associated piping and impacted soils have been removed. The site was addressed in the RFA and was recommended for further study.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

Site 19/AOC D: Former MCX Service Station UST

Description/Problem: The MCX Service Station was formally located at Building 850 in the northeast section of the Depot. Four 5,000-gallon USTs remain in this location.

Action To Date: Three groundwater monitoring wells were installed and sampled. Gas monitoring in the unsaturated zone was also conducted.

Results: The SI reported that fuel components are present in the subsurface vapor in the vicinity of the USTs; however, the vapors appear to be localized and do not show significant signs of migration from the tank area. No groundwater contamination was identified in monitoring wells present at the site.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

SWMU 19: Diesel Wash Pad

Description/Problem: This site is located next to Building 864 in the northeast section of the Depot and consists of two concrete pads. The unit is primarily used for washing lawn mowers.

Actions To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's visual site inspection (VSI) or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 20: Power Station Oil/Water Separator

Description/Problem: The oil/water separator is located along the Beaufort River at the Power Plant in the northeast section of the Depot. The unit receives runoff from the No. 6 fuel unloading area and the secondary containment for the No. 6 oil tanks.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 21: Weapons Power Plant Oil/Water Separator

Description: The oil/water separator is located in the west section of the Depot. Active since the 1980s, this site receives runoff from a fuel oil unloading area. Effluent from the separator is discharged into the marsh. Waste oil is periodically skimmed off the surface of the separator and transferred to SWMU 36.

Problem: Effluent from the separator is discharged to the marsh. Releases to surface water are dependent on the effectiveness of the separator.

Action To Date: The area was addressed in the RFA and was recommended for additional study.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS.

SWMU 22: Motor Pool Car Wash

Description/Problem: The area is located at Building 155 in the northeast section of the Depot. A wash pad drains to the an oil/water separator with a capacity of 500 gallons. Oil is drummed and transferred to the Hazardous Waste Storage Building (SWMU 36), and the water is discharged to the Sanitary Sewer System (SWMU 42).

Problem: The area generates washwater contaminated with oil, grease, and fuel (diesel and gasoline).

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 23: Indoor Dental Lab Satellite Accumulation Area (SAA)

Description: This SAA consists of a small metal cabinet located inside the Dental Clinic. Wastes are stored in cardboard boxes and are transferred to the Hazardous Waste Storage Building (SWMU 36) prior to offsite disposal.

Problem: Small amounts of waste X-ray chemicals, such as fixer and developer, are stored in this SAA.

Action To Date/Results: The area was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 24: Dental Lab SAA

Description: This SAA consists of a small metal storage shed used for storing medical waste generated at the Dental Clinic. Medical waste is contained in cardboard boxes then transferred off site to the hospital located at the Marine Corps Air Station (MCAS) in Beaufort.

Problem: Non-liquid hospital/medical wastes such as paper and gauze are stored in this SAA.

Action To Date/Results: The area was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 25: Paint Shop SAA

Description: This SAA is located in Building N-281 in the northeast section of the Depot.

Problem: Waste paint, stripper, thinner, and paint solids are stored in this SAA.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 26: Pesticide Shop SAA

Description: This SAA is located on a concrete loading dock adjacent to Building 401 in the northeast section of the Depot.

Problem: Pesticide containers are stored in drums situated on a concrete pad. The SAA receives waste naphtha containers and many smaller pesticide containers and bags.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 27: Equipment Parade Deck SAA

Description: The SAA is located on an asphalt pad located in the northeast section of the Depot. The Depot uses this site as an equipment laydown area and for storage of salvage items. The site is an asphalt pad approximately 1000 square feet in area.

Problem: Signs of stained and cracked asphalt have been noted in the vicinity of the SAA.

Action To Date/Results: The area was addressed in the RFA and was recommended for further study because the pad was in poor condition and severely stained.

Proposed Actions: Additional sampling efforts will be conducted as part of an RFA CS to screen this area for an RI/RFI.

SWMU 28: Power Plant SAA

Description: The SAA is located on a small concrete pad located outdoors next to the Power Station Oil/Water Separator (SWMU 20) in the northeast section of the Depot.

Problem: The SAA receives small amounts of waste oil from the power plant operations.

Action To Date/Results: During the RFA, it was observed that the concrete pad was stained and appeared in poor condition. RFA CS was recommended.

Proposed Actions: Additional study and cleanup of this site will be conducted under South Carolina's UST program.

SWMU 29: Indoor Motor Pool SAA

Description: This SAA is located inside the Motor Pool in the northeast section of the Depot.

Problem: The SAA is used to store brake drums (containing asbestos), used oil dry (contaminated with oil and fuel), oil filters, and rags (contaminated with fuel, oil, or naphtha).

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 30: Empty Drum Storage Area

Description: Empty drums are staged outdoors in the vicinity of Building 867 in the northeast section of the Depot. The empty drums are stored at this location unrinsed until they are transferred off site for salvage.

Problem: The drums previously contained oil, cleaning materials, and materials containing hazardous constituents.

Action To Date/Results: The area was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 31: Weapons Power Plant SAA

Description: This SAA is located on the back side of the Weapons Power Plant and is situated on a small brick pad next to the building.

Problem: This SAA receives waste No. 6 fuel oil and waste oil.

Action To Date/Results: The area was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 32: Laundry SAA

Description: This site is located at Building 193, Depot Dry Cleaners. Fifty-five gallon drums are staged in the vicinity of the dry-cleaning machines on concrete floors.

Problem: The SAA receives PCE still bottoms.

Action To Date/Results: The area was included the RFA and was recommended for No Further Action.

Proposed Actions: Because of the 1994 PCE spill at the Dry Cleaning Facility, this site will be addressed in conjunction with Site/SWMU 45. RFA CS will be conducted.

SWMU 33: Outdoor Motor Pool SAA

Description: This SAA is located along the exterior west wall of the Motor Pool in the northeast section of the Depot.

Problem: Waste oil is stored in this SAA.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 34: Motor Pool Waste Oil Aboveground Storage Tank (AST)

Description: The AST is located at the Motor Pool in the northeast section of the Depot. The tank was previously located at SWMU 33 and has been moved to its current location.

Problem: The tank receives waste oil.

Action To Date/Results: During the RFA, an oily stain was observed. It was concluded that this stain was the result of the recent movement of the tank. No evidence of past release was identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 35: Defense Reutilization and Marketing Office (DRMO) Salvage Yard

Description: The salvage yard is located on Horse Island in the north section of the Depot. Since 1964, this 3-acre site has received salvage items from Parris Island and the Marine Corps Air Station (MCAS).

Problem: Approximately 80 percent of the area is paved with asphalt. Cracked asphalt has been noted in an area used for lead-acid battery storage.

Action To Date: Screening samples were taken during 1995.

Results: The area was addressed in the RFA and was recommended for further study because cracked asphalt was observed beneath pallets of lead acid batteries.

Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS.

SWMU 36: Hazardous Waste Storage Building

Description: The building is located on Boki Street near Malecon Drive in the northeast section of the Depot. Drums containing hazardous waste are stored on pallets. The floor of the storage area is coated with a sealant, and secondary containment is provided by the building's concrete foundation of the shed.

Problem: Hazardous wastes are stored within the building and include asbestos waste, liquid paint waste, PCE still bottoms, pesticide cans, rags from Motor Transport and Weapons Cleaning, and soil contaminated with motor oil or No. 6 fuel oil.

Action To Date/Results: During the RFA, no evidence of release was observed or identified in the available file material.

Proposed Actions: The site has been referred to the South Carolina RCRA Closure Program.

SWMU 37: Overflow Storage Pad

Description: The Overflow Storage Pad is a concrete pad located at the west end of the Hazardous Waste Storage Building (SWMU 36).

Problem: This unit is occasionally used to store paint wastes normally managed by SWMU 25 and overflow from SWMU 36.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 38: Waste Oil UST

Description: The Waste Oil UST is a 500-gallon steel tank located at the Diesel Shop in the northeast section of the Depot.

Problem: The UST received waste oil from vehicle maintenance activities and reportedly, liquid paint waste from Site 9/SWMU 8.

Action To Date/Results: During the RFA, no evidence of release was observed or identified in the available file material. However, it was suggested that the Depot determine whether the UST received the alleged paint wastes.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

SWMU 39: Electrolyte Basin

- Description: A battery acid tank is suspected to have been present outside the battery room at Motor Transportation, Building 155 in the northeast section of the Depot. Employees no longer deposit acid into this tank.
- Problem: The tank collected used battery acid removed during battery maintenance.
- Action To Date/Results: The area was addressed in the RFA; however details of the tanks size and associated piping are unknown.
- Proposed Actions: The MCRD Parris Island Partnering Team recommends RFA CS.

SWMU 40: Wastewater Treatment Plant

- Description: The treatment plant is located along the Beaufort River in the northeast section of the Depot.
- Problem: The plant receives boiler blowdown, oil/water separator effluent, laundry effluent, and domestic sewage. In the past, the plant received neutralized battery acids, vehicle wash-rack effluents, and pesticide container rinsate.
- Action To Date/Results: The site was addressed in the RFA. No further action was recommend at the treatment plant other than continued compliance with National Pollution Discharge Elimination System (NPDES) permit conditions.
- Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 41: Former Incinerator

- Description: The Former Incinerator was located adjacent to the Incinerator Landfill (Site 1/SWMU 1) on Horse Island in the north section of the Depot. Operations ceased in 1959, and the incinerator has been removed since this time.
- Problem: In addition to domestic trash, the Former Incinerator received solid paint wastes.

Action To Date/Results: The area of the Former Incinerator was addressed in the RFA and was recommended for no further action.

Proposed Actions: The MCRD Parris Island Partnering Team has recommended an evaluation of this site in conjunction with the RI/RFI for Site 1.

SWMU 42: Sanitary Sewer System

Description: The Sanitary Sewer System consists of pipes of varying sizes and materials located below-ground throughout Parris Island. The system receives wastewater from oil/water separators and domestic sources and transfers it to the Sanitary Wastewater Treatment Plant (SWMU 40).

Problem: The system receives discharge from Depot oil/water separators, cooling tower blowdown, and demineralized regenerant. In the past, the system has received pesticide container rinsate, small amounts of waste oil, anti-freeze, and neutralized battery acid.

Action To Date/Results: The site was addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended for this site.

SWMU 43: Motor Pool Waste Oil UST

Description: The UST is located in the vicinity of the Outdoor Motor Pool SAA (SWMU 33) in the northeast section of the Depot. The tank capacity is 500 gallons. The tank is constructed of steel and has been inactive since 1982.

Problem: The unit received waste oil.

Action To Date/Results: The site was addressed in the RFA. Severe staining was observed around the inlet of the UST.

Proposed Actions: Any additional study and cleanup of this site will be conducted under South Carolina's UST program.

SWMU 44: Dumpsters

Description/Problem: The dumpsters are metal rolloff boxes that are located throughout the Depot. The waste is transferred off site to a sanitary landfill.

Action To Date/Results: The dumpsters were addressed in the RFA. No evidence of release was observed during the RFA's VSI or identified from available file material.

Proposed Actions: No further investigation or action has been recommended.

Site 45/SWMU 45: Dry Cleaning Facility Spill Area

Description/Problem: This area is adjacent to a former dry cleaning facility. In March 1994, Parris Island personnel responded to an accidental spill of PCE from the PCE storage tank and determined that there had been past dry-cleaning solvent releases at the site.

Action To Date: The impacted soils from the recent inadvertent release have been removed and properly disposed of in a hazardous waste landfill. Parris Island conducted a PCE contamination assessment, and an outside engineering firm developed a conceptual corrective action plan.

Results: Old spills/leaks were discovered during the assessment, as well as PCE and associated degradation products trichloroethene, 1,2-dichloroethene, and petroleum-based solvents.

Proposed Actions: An interim removal action is planned for 1998 to minimize further migration of contaminants in the groundwater. Afterwards, an RI/RFI will be conducted to evaluate final remedy of the site.

2.0 BACKGROUND INFORMATION

2.1 GEOLOGY

2.1.1 Structural Geology

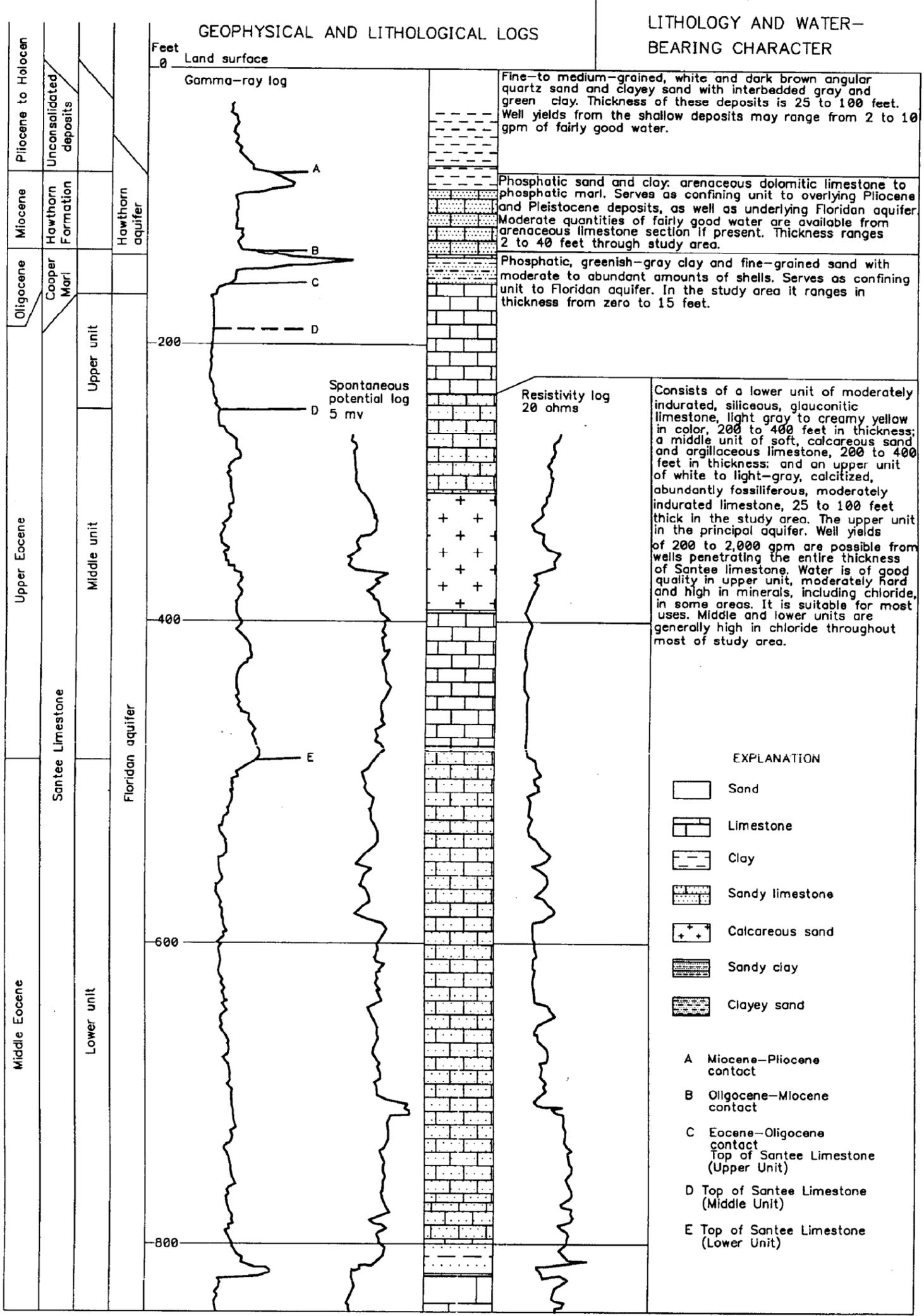
A generalized geologic column section of the Beaufort County area is shown in Figure 2-1. Geologic structure has an important influence on the hydrogeology of the Tertiary Limestone Aquifer in the Beaufort-Jasper County area, widely referred to as the Low Country. A generalized regional geological profile showing the surficial sands, the low-permeability Hawthorn Formation, and the Santee Limestone comprising the Tertiary Limestone Aquifer, is presented in Figure 2-2.

The regional structural setting of the Tertiary Limestone Aquifer influences (1) the occurrence and extent of saltwater intrusion in the aquifer, (2) the thickness -- or absence -- of confining beds over the aquifer, and (3) the permeability distribution, particularly in the upper part of the aquifer. Thus the position of the top of the Tertiary Limestone Aquifer with respect to sea level has been important in the past geologic history of this aquifer and is also important at the present time. The upper surface of the aquifer has a regional dip (or slope) generally trending toward the southeast. This surface is locally highly irregular with structural highs (arches) and lows (troughs) present, as indicated in Figure 2-3.

The most conspicuous and hydrogeologically important structural feature in the Low Country is the Beaufort Arch, a structural high with a northeast-trending axis. The Beaufort Arch is located in central Beaufort County. Over the axis of the Beaufort Arch, the top of the Tertiary Limestone Aquifer ranges from about 40 to 20 feet below mean sea level (msl) and is occasionally less than 20 feet below msl. Because of this shallow depth, tidal rivers and estuaries that are more than 20 feet deep actually penetrate the upper surface of the Tertiary Limestone Aquifer. During Pleistocene time, when sea level was much lower than it is at present, the top of the Tertiary Limestone Aquifer in the Beaufort area was scoured by rivers flowing into the sea. Miocene confining beds that were originally deposited over the Eocene limestone composing the aquifer were removed in some areas by the scouring. Mining of river phosphate and channel dredging may have also been responsible for removing confining beds in the Beaufort River.

A structural low, the Ridgeland Trough, has a northeast-trending axis extending from just northwest of Hardeeville in Jasper County to the vicinity of Highway 21 in northern Beaufort County. Along the axis of this structural basin, the top of the Tertiary Limestone Aquifer occurs at an elevation of greater than

This page intentionally left blank.

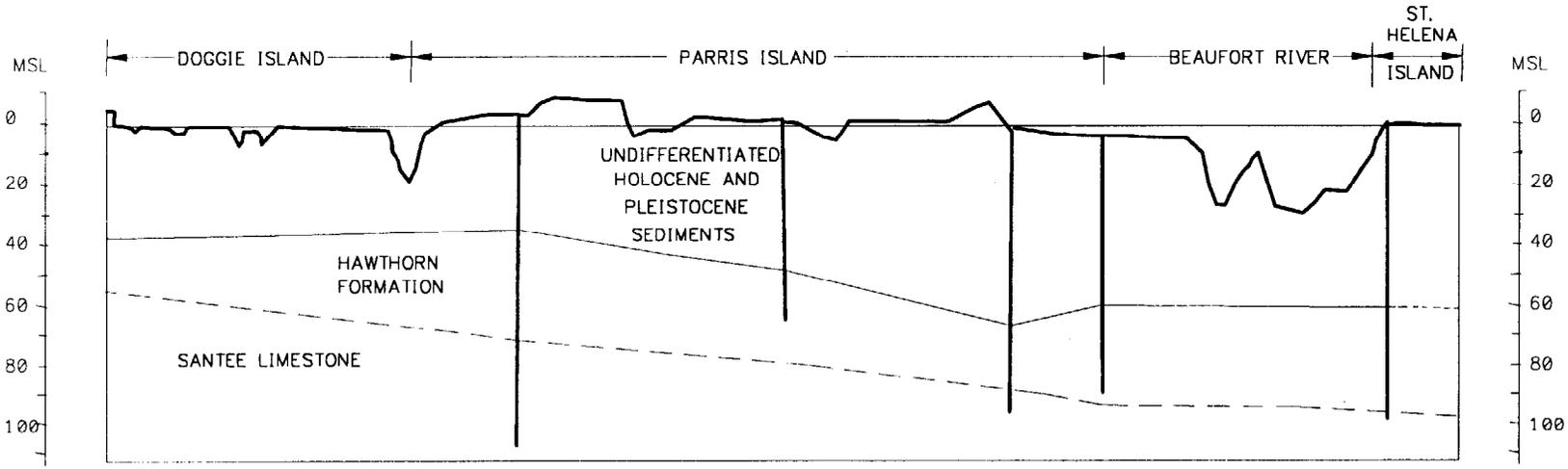


SOURCE: HASSEN, 1985

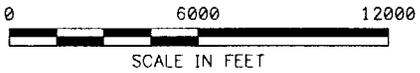
DRAWN BY HJP	DATE 10/21/97		CONTRACT NO. 7394	OWNER NO. _____
CHECKED BY	DATE	GENERALIZED LITHOLOGICAL SECTION MCRD PARRIS ISLAND	APPROVED BY	DATE
COST/SCHED-AREA			APPROVED BY	DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-1	REV. 0

099703/P (MPP)

2-5



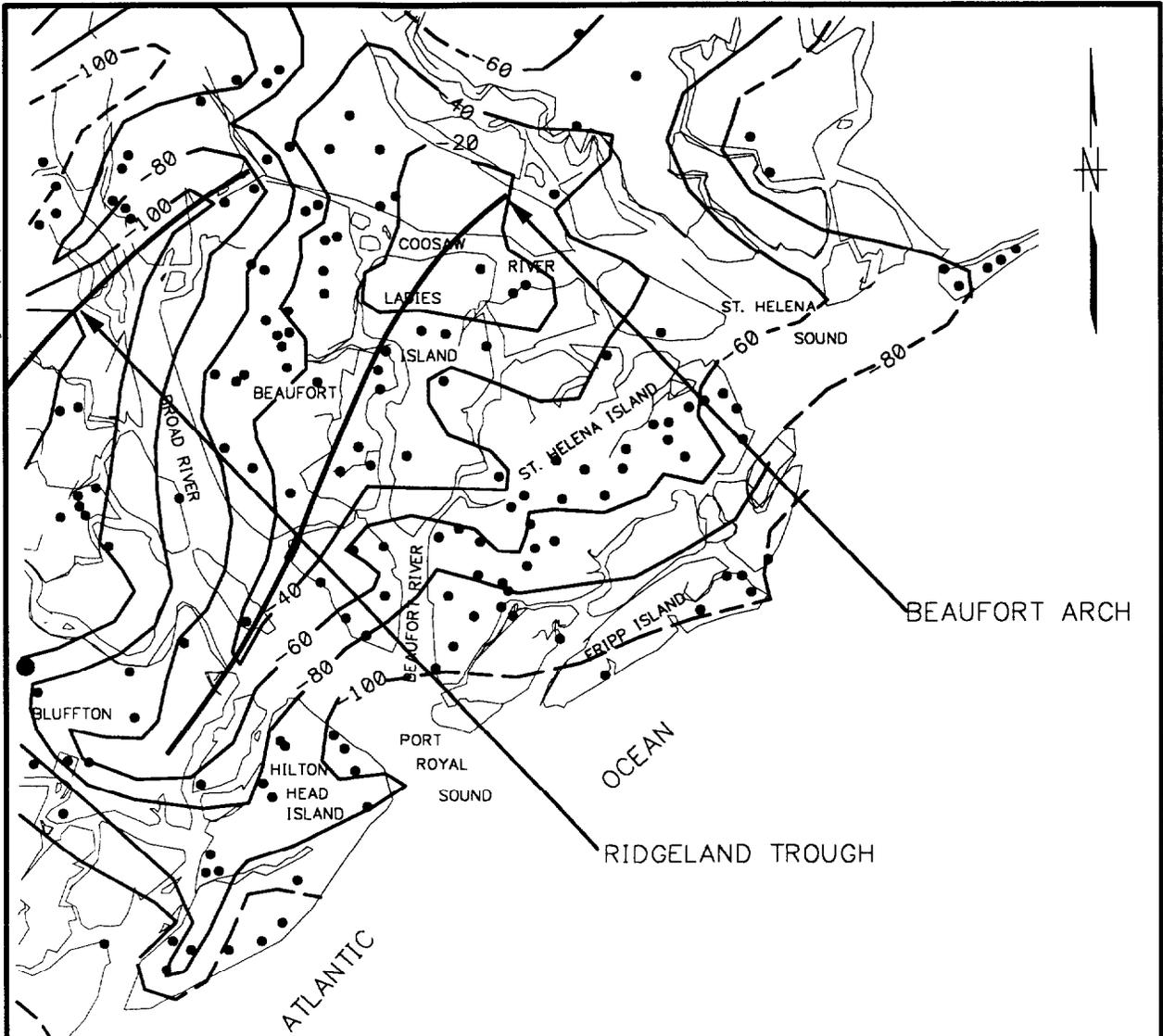
SOURCE: DAMES & MOORE, 1988



DRAWN BY HJP DATE 10/21/97	 Brown & Root Environmental	CONTRACT NO. 7394	OWNER NO. -----	
CHECKED BY DATE		APPROVED BY DATE	APPROVED BY DATE	
COST/SCHED-AREA SCALE AS NOTED		GENERALIZED REGIONAL GEOLOGICAL PROFILE MCRD PARRIS ISLAND		DRAWING NO. FIGURE 2-2
				REV. 0

CTO 0020

ACAD: 7394cm32.dwg 10/23/97 TAD



EXPLANATION

CONTOURS SHOW ALTITUDE OF TOP OF PRINCIPAL ARTESIAN AQUIFER. DASHED WHERE APPROXIMATE. CONTOUR INTERVAL 20 FEET. DATUM IS MEAN SEA LEVEL.

● WELL LOCATION



DRAWN BY HJP	DATE 10/23/97		CONTRACT NO. 7394	OWNER NO. _____
CHECKED BY _____	DATE _____		APPROVED BY _____	DATE _____
COST/SCHED-AREA _____	STRUCTURE-CONTOUR MAP OF THE TOP OF THE SANTEE LIMESTONE MCRD PARRIS ISLAND		APPROVED BY _____	DATE _____
SCALE AS NOTED			DRAWING NO. FIGURE 2-3	REV. 0

FORM CADD NO. SOUTH_AV.DWG - REV 0 - 02/07/97

100 feet below msl, and in southwestern Jasper County, the top of the aquifer occurs at an elevation of more than 200 feet below msl.

In reference to groundwater hydrology, these geologic structures are important with respect to the depth of the Tertiary Limestone Aquifer below salty surface water bodies. The structures are also important because confining beds overlying the aquifer are thick in structural troughs, but are thin over structural highs.

2.1.2 Descriptive Geology

The rocks beneath MCRD Parris Island that are described in the following sections are those containing the Tertiary Limestone Aquifer and overlying units extending to the surface. The rocks are described from the oldest to the youngest, encompassing (1) Eocene Limestones; (2) Oligocene Limestones and marls; (3) Miocene limestones, sands and clays; and (4) Pleistocene sands and clays. The Tertiary Limestone Aquifer corresponds to the Eocene limestones and the surficial aquifer to the Pleistocene sands.

2.1.2.1 Eocene

Various geologic formations, or parts thereof, comprise the Tertiary Limestone Aquifer in the South Carolina Coastal Plain. About 55 miles north of MCRD Parris Island, the Tertiary Limestone Aquifer is composed almost entirely of the Santee Limestone, although locally some beds immediately below the Santee Limestone could logically be considered part of the aquifer. In the Low Country area, the Tertiary Limestone Aquifer is mainly composed of the Santee Limestone of Middle Eocene and Late Eocene age. In some areas it is composed of a limestone of Oligocene age, and in southwestern Beaufort County it is composed of a thin limestone of Miocene age.

The Santee Limestone is primarily composed of limestones that vary from relatively pure, to impure limestone containing clay or shale, to relatively thick marls. In the Low Country area, the Santee limestone is divided into three main lithologic units (Hayes, 1979), which are summarized as follows. The uppermost unit consists of white, cream-colored, or light-grey fossiliferous limestone and, in places, is composed almost entirely of fossil remains; this unit ranges in thickness from essentially zero to more than 200 feet. The middle unit consists of sandy or clayey limestone and ranges from 200 to 600 feet thick. The lower unit is indurated, siliceous, glauconitic, light grey to creamy yellow limestone that averages about 30 feet in thickness. The structural contour of the top of the Santee Limestone is shown in Figure 2-2.

2.1.2.2 Oligocene

Oligocene limestone overlies the Santee Limestone in southwestern Beaufort County, and when water-bearing, it is considered to be part of the Tertiary Limestone Aquifer. In other areas, rocks of Oligocene age may be non-water-bearing and thus part of the overlying confining beds. These rocks of Oligocene age have either been referred to as the Cooper Marl or considered to be part of the Santee Limestone (Hayes, 1979). The Cooper Marl has been assigned to the early Oligocene. In the area near MCRD Parris Island, the Cooper Marl consists of phosphatic, greenish-grey clay and fine-grained sand with a moderate to very abundant amount of shells. In several areas of South Carolina, the Cooper Marl contains sections of argillaceous to clean limestone, which may yield large amounts of good water. The Cooper Marl in the Parris Island area serves as a confining unit to the underlying Tertiary Limestone Aquifer, retarding the movement of contaminants into the aquifer. The thickness of the Cooper Marl ranges from 0 to 15 feet, reflecting the amount of erosion prior to deposition of the Hawthorn Formation. Within the region of the Depot, the top of the deposit is 20 to 120 feet below land surface (Hassen, 1985).

2.1.2.3 Miocene

A thin (5- to 15-foot-thick) Lower Miocene limestone, known as the Tampa Limestone and the "Tampa Limestone equivalent," overlies Oligocene rocks in southwestern Beaufort County and southern Jasper County. Depending on location, this thin limestone has been considered either part of the Tertiary Limestone Aquifer or part of the overlying confining beds. This thin limestone is hydrogeologically important for several reasons. Wells that are open to the Tampa Limestone have a noticeably high content of hydrogen sulfide, which imparts a rotten-egg odor to the water. This unit is composed of phosphatic sand, sandy marl, or sandy clay in eastern Chatham County, and southwestern Beaufort County. It occurs just above the Oligocene-Miocene boundary. This thin stratigraphic unit in southwestern Beaufort County is included in the Hawthorn Formation, which consists of Miocene deposits that appear to be locally discontinuous and varying in lithologic features across most of coastal South Carolina. The Hawthorn Formation consists of sandy, clayey materials that are frequently eroded in coastal Beaufort County. When present in the study area, this formation serves as a confining unit to the overlying Pleistocene deposits, as well as to the underlying Tertiary Limestone Aquifer.

Potential of the Hawthorn Formation as an aquifer in the study area is doubtful, owing to its thinness and general lithology; little is known about its water-bearing characteristics. In the areas of Jasper, Hampton, and Colleton Counties, (Hayes, 1979) yields of 50 to 200 gallons per minute of potable water are reported from this formation (Hassen, 1985).

2.1.2.4 Quaternary

The Pleistocene Epoch was marked by sea-level fluctuations that are recorded in the sediment depositional record as land emergence and submergence cycles. As a result of the sea-level fluctuations, the Pleistocene sediments are in many cases reworked, deposited as barrier islands, cut by erosional channels, and interbedded with alluvium. Geomorphologically, the "cycles" are reflected as four terrace formations, which are from oldest to youngest: Pamplico, Princess Anne, Silver Bluff, and Recent (Glowacz, and others, 1980), of which the Princess Anne, Silver Bluff, and Recent deposits are present on Parris Island.

The Princess Anne and Silver Bluff Formations occur near the surface in the area as high permeability beach-ridge deposits and low permeability clays (marsh deposits) located between the beach-ridge deposits. The permeable beach-ridges of these formations are generally vegetated with hardwoods and have erosional scarp faces that tend to trend somewhat parallel to the Atlantic Ocean. Approximate elevations for the terrace formations are Princess Anne, 16 to 8 feet above msl, and Silver Bluff, 8 to 0 feet above msl.

Water tables tend to be very shallow in the swampy, topographically lower elevations, and range from surface grade to approximately 3 feet deep. In the topographically higher portion of the formations, consisting of older beach-ridges and bar deposits, the water table ranges from surface grade to a maximum of about 10 feet deep. Ironstone deposits are commonly found in this barrier island deposit, and are low in permeability, and range from reddish brown to black in color (depending on the iron and manganese content). The iron-manganese-cemented sands range in thickness from 10 feet to sand-size concretions. These ironstone features are thought to represent past and present geochemical changes-of-state of iron and manganese due to seasonal fluctuations of the near-surface water table. In typical vertical soil profiles, the near-surface mottled zones caused by iron-manganese staining can be considered an indicator of the local, seasonal, high water table elevation. The more massive concretions may represent a biogenic precipitate in Pleistocene marsh (backbarrier) environments. The sandy dune and beach faces of the barrier islands have deeper water than the marshy backbarrier deposits (Glowacz, and others, 1980).

Recent deposits occur as thin surficial veneers near the present coastline. Examples of these deposits are Fripp Island and the seaward side of Hilton Head Island. The recent deposits consist of beaches, sand dunes, and alluvium. Most of the Recent alluvium consists of silt and clays of very low permeability (Glowacz, and others, 1980).

2.1.3 Soils

Soils at MCRD Parris Island have been mapped by the U.S. Soil Conservation Service as both individual soils and groupings of soils (units). The Depot has been mapped as having 15 individual soil types, but only 8 types are present beneath the identified sites. Three soil units have been mapped for the Depot (Figure 2-4); these will be described below and the eight individual soil types will be explained in detail. The physical properties of the individual soil types are tabulated in Table 2-1.

2.1.3.1 Wando-Seabrook-Seewee Soil Unit

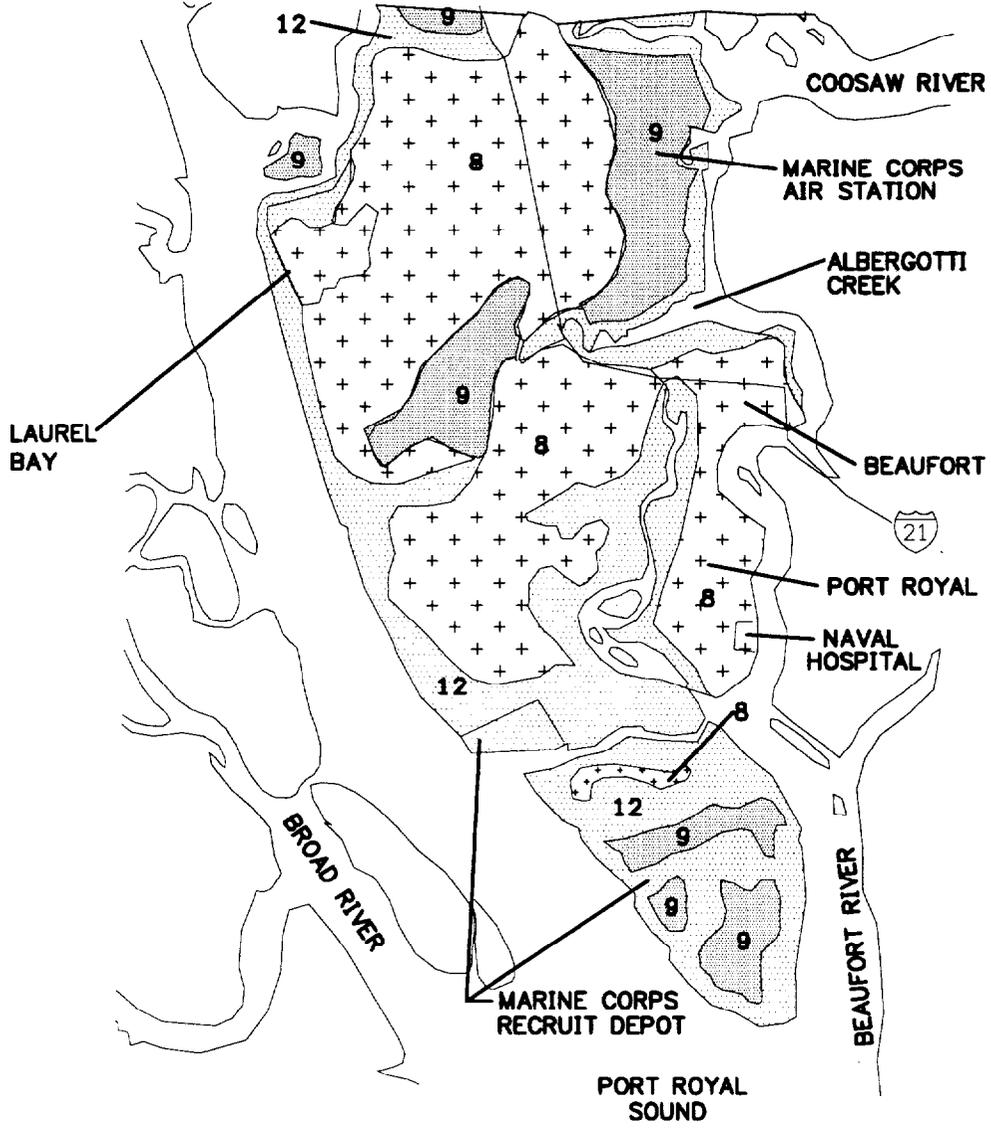
Excessively drained, moderately well drained, and somewhat poorly drained soils that are sandy throughout make up this unit. Horse Island is made of this soil unit. This soil unit constitutes about 31 percent of Beaufort County. The unit is about 24 percent Wando soils, 18 percent Seabrook soils, 11 percent Seewee soil, and 47 percent minor soils.

Wando soils are in the higher areas of the soil unit and are excessively drained. Seabrook soils are in intermediate areas and are moderately well drained. Seewee soils are commonly in slightly lower areas than Seabrook soils and are somewhat poorly drained. All of these soils are sandy throughout and differ primarily in drainage. The minor soils in this soil unit are the somewhat poorly drained Ridgeland soils, the poorly drained Baratari soils, and the very poorly drained Polawana and Rosedhu soils. In Jasper and Beaufort Counties, about 60 percent of the soils contained within this soil unit are woodland, 20 percent have been developed for urban and recreational uses, and 20 percent are used for cultivated crops, truck crops, or pasture. With the exception of the soils in the higher areas, wetness is the main limitation to use of these soils. Dryness is a limitation to the excessively drained soils in the higher areas. There is rapid leaching in all of these soils. All soils in this unit, except the excessively drained Wando soils, have a seasonally high water table.

2.1.3.2 Coosaw-Williman-Ridgeland Soil Unit

Somewhat poorly drained and poorly drained soils that have a thick sandy surface layer and a loamy subsoil, and somewhat poorly drained soils that are sandy throughout, make up this soil unit. This soil unit comprises about 13 percent of Beaufort County. The unit is about 21 percent Coosaw soils, 20 percent Williman soils, 13 percent Ridgeland soils, and 46 percent minor soils.

ACAD: 7394cm33.dwg 10/24/97 HP



- LEGEND**
- 8 [Cross-hatch pattern] WANDO-SEABROOK-SEEWEE SOIL UNIT
 - 9 [Stippled pattern] COOSAW-WILLIMAN-RIDGELAND SOIL UNIT
 - 12 [White background] BOHICKET-CAPERS-HANDBORO SOIL UNIT

SOURCE: ADAPTED FROM STUCK, 1980

DRAWN BY HJP DATE 10/23/97	Brown & Root Environmental	CONTRACT NO. 7394	OWNER NO.
CHECKED BY DATE		APPROVED BY DATE	
COST/SCHED-AREA 	SOIL UNIT MAP MCRD PARRIS ISLAND		APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 2-4

FORM CADD NO. SOUTH_AV.DWG - REV D - 02/07/97

099703/P (MPP)

2-12

CTO 0020

TABLE 2-1
SOIL PROPERTIES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 1 OF 2

Soil Symbol - Soil Name	Depth (in.)	USDA Texture	United Soil Classification	Percent Clay &	Liquid Limit (%)	Plasticity Index	Corrosion Risk Steel/Concrete	Sites Affected ⁽¹⁾
Bk - Bohicket Unit 12	0-10 10-40 49-80	Silty clay loam Silty clay, clay Variable	CH, MH CH, MH ----	90-100 70-95 ----	60-100 50-100 ----	30-60 19-60 ----	High/High High/High ----	Sites 1 (1), 5 (5), 12 (10), 14 (14), 19 (19), 20 (20), 22 (22), 23 (23), 24 (24), 25 (25), 28 (28), 29 (29), 30 (30), 31 (31), 32 (32), 33 (33), 34 (34), 38 (38), 39 (39), 40 (40), 43 (43), 45 (45)
CE - Capers Association Unit 12	0-22 22-68	Silty clay loam Clay, silty clay	MH MH	70-100 75-100	50-80 60-80	15-40 18-40	High/High High/High	Site 3 (3), 21 (21), 41 (41)
Cs - Coosaw Unit 9	0-27	Loamy fine sand	SM	15-30	---	NP	Moderate/High	Sites 4 (4), 6 (6), 11 (9), 13 (11-13) Site 15 (15)
	27-31	Sandy loam, fine sandy loam	SM, SM-SC	20-40	30	NP-7	Moderate/High	
	31-77	Sandy clay loam, fine sandy loam, sand loam	SM, SC, SM-SC	25-50	15-35	2-15	Moderate/High	
Mu - Murad Unit 9	0-49	Fine sand	SM, SP-SM	10-25	---	NP	Moderate/High	Sites 7 (7), 8 (AOC A and B), 17 (17), 18 (18) Site 15 (15)
	49-60	Sandy loam, fine sandy loam, sandy clay loam	SM, SM-SC, SC	25-50	40	NP-15	Moderate/High	
	60-80	Fine sandy loam, sandy clay loam, sandy clay	SM, SC, CL, SM-SC	36-65	25-50	5-25	Moderate/High	
Sw - Seewee	0-25	Fine sand	SP-SP, SM	5-20	---	NP	Low/High	Site 15 (15)
	25-45	Fine sand, sand	SP, SP-SM, SM	2-15	---	NP	Low/High	
	45-80	Fine sand, sand	SP, SP-SM, SM	1-15	---	NP	Low/High	
Wa - Wahee Unit 9	0-13 13-40	Fine sandy loam Clay, clay loam, silty clay	SM, SM-SC CL, CH	30-50 70-90	30 41-60	NP-7 18-32	Moderate/High High/High	Site 13 (11-13)
	40-62	Sandy clay loam, clay loam, silty clay loam	CL	36-65	30-50	11-25	High/High	
Wd - Wando Units 8 and 9	0-52	Fine sand	SP-SM, SM	5-25	---	NP	Low/Moderate	Sites 2 (2), 8 (AOC A and B), 27 (27), 35 (35), 36 (36), 37 (37) Sites 9 (8), 10 (AOC C), 13 (11-13), 16 (16), 26 (26)
	52-85	Sand, fine sand	SP, SP-SM, SM	2-20	---	NP	Low/Moderate	
Wn - Williman Unit 9	0-26 26-80	Loamy fine sand Sandy loam, fine sandy loam, sandy clay loam	SM SM-SC, CL-ML, SC, CL	15-35 30-65	25 15-35	NP-3 3-15	High/High High/High	Site 13 (11-13) Site 15 (15)

03/27/98
Rev. 0

099703/P (MFP)

2-13

CTO 0020

TABLE 2-1

SOIL PROPERTIES
MCRD PARRIS ISLAND, SOUTH CAROLINA
PAGE 2 OF 2

Soil Symbol - Soil Name	Depth (in.)	Permeability (in/hr)	Available Water Capacity (in/in)	Shrink-Swell Potential	Erosion Hazard	Hydrologic Group	High Water Table Depth (ft)/Kind	Sites Affected ⁽¹⁾
Bk - Bohicket Unit 12	0-10 10-49 49-80	0.6-0.2 0.06 ---	0.14-0.18 0.12-0.16 ---	High High ---	---	D	+3-0/Apparent	Sites 1 (1), 5(5), 12 (10), 14 (14), 19 (19), 20 (20), 22 (22), 23 (23), 24 (24), 25 (25), 28 (28), 29 (29), 30 (30), 31 (31), 32 (32), 33 (33), 34 (34), 38 (38), 39 (39), 40 (40), 43 (43), 45 (45)
CE - Capers Association Unit 12	0-22 22-68	0.06-0.2 0.06	0.01-0.03 0.01-0.03	Very High Very High	---	D	+1-1.0/Marsh	Site 3 (3), 21 (21), 41 (41)
Cs - Coosaw Unit 9	0-27 27-31 31-77	6.0-20 2.0-6.0 0.6-2.0	0.06-0.11 0.08-0.13 0.08-0.16	Low Low Low	Slight	D	1.0-2.0/Apparent	Sites 4 (4), 6 (6), 11 (9), 13 (11-13) Site 15 (15)
Mu - Murad Unit 9	0-49 49-60 60-80	6.0-20 0.6-2.0 0.6-2.0	0.05-0.11 0.1-0.17 0.11-0.18	Very Low Very Low Very Low	Slight	C	1.5-3.0/Apparent	Sites 7 (7), 8 (AOC A and B), 17 (17), 18 (18) Site 15 (15)
Sw - Seewee	0-25 25-45 45-80	6.0-2.0 0.6-6.0 6.0-2.0	0.05-0.08 0.04-0.07 0.04-0.07	Very Low Very Low Very Low	Slight	B	1.0-2.0/Apparent	Site 15 (15)
Wa - Wahee Unit 9	0-13 13-40 40-62	0.6-2.0 0.06-0.2 0.2-0.6	0.10-0.15 0.12-0.20 0.12-0.20	Low Moderate Moderate	Slight	D	0-1.0/Apparent	Site 13 (11-13)
Wd - Wando Units 8 and 9	0-52 52-85	6.0-20 6.0-20	0.05-0.08 0.03-0.07	Very Low Very Low	Slight	A	6.0/--	Sites 2 (2), 8 (AOC A and B), 27 (27), 35 (35), 36 (36), 37 (37) Sites 9 (8), 10 (AOC C), 13 (11-13), 16 (16), 26 (26)
Wn - Williman Unit 9	0-26 26-80	2.0-6.0 0.6-2.0	0.05-0.11 0.10-0.16	Very Low Low	Slight	D	0-1.0/Apparent	Site 13 (11-13) Site 15 (15)

1 A site's respective SWMU number is listed in parenthesis.

Rev. 0
03/27/98

Coosaw soils are predominant in the higher areas and are somewhat poorly drained. Williman soils are in low areas and are poorly drained. Both of these soils have a sandy surface layer 20 to 40 inches thick and a loamy subsoil. Ridgeland soils commonly occupy intermediate areas, are sandy throughout, and are somewhat poorly drained. All of these soils have a seasonal high water table. Among the minor soils in this soil unit are the excessively drained Wando soils, the moderately well drained Seabrook soils, the somewhat poorly drained Murad soils, and the very poorly drained Deloss and Polawana soils. About 50 percent of this unit is woodland, 15 percent has been developed for urban and recreational uses, and 35 percent is used for truck crops, other crops, and pasture. Wetness is the main limitation to use of these soils.

2.1.3.3 Bohicket-Capers-Handsboro Soil Unit

Very poorly drained mineral and organic soils that are flooded daily or occasionally by saltwater, and adjacent upstream areas that are flooded occasionally by freshwater, comprise this unit.

This soil unit consists of about 53 percent Bohicket soils, 17 percent Capers soils, 7 percent Handsboro soils, and 23 percent minor soils. Bohicket soils are commonly found in slightly lower areas than Capers and Handsboro soils. Frequently adjacent to tidal streams, they are flooded by saltwater to a depth of 6 to 36 inches twice daily. Capers soils are commonly in areas a few inches higher than Bohicket soils and are not as highly dissected by small tidal streams. Both Capers and Bohicket soils have a silty clay loam surface layer and are underlain by clay and clay loam. Handsboro soils are very poorly drained, organic soils that are flooded daily or occasionally by saltwater. Among the minor soils in this soil unit are small islands of the excessively drained Wando soils, the moderately well drained Seabrook soils, the poorly drained Argent soils, and the very poorly drained Santee soils. Most of the soils in this map unit are associated with marsh grasses. The hazard of flooding, excessive salt and sulfur, and low bearing strength are some of the limitations to use of these soils.

2.2 REGIONAL HYDROGEOLOGY

2.2.1 Shallow Aquifer

In the MCRD Parris Island area, the shallow, unconfined aquifer is generally of permeable, fine to medium, Pleistocene age sands. These sands are primarily subangular and quartzitic, containing carbonate shell fragments, heavy minerals, glauconite, and finely disseminated organics. Holocene age sediments generally consist of coarser, more angular, and less indurated (compacted) sands than the Pleistocene age soils. River alluvium consists of silty, micaceous, fine to medium sand. Lenticular bodies of iron-cemented sand occur throughout the Pleistocene sediments.

Surface relief is relatively low. The area is drained by fresh and brackish water streams inland and by tidal streams along the coast. The water table in the MCRD Parris Island area usually ranges from 0 to 10 feet and is most commonly found at a depth of 3 feet. Water table fluctuations are a function of recharge, evaporation, and transpiration and have been observed to be as great as 6.5 feet at some locations (Glowacz, and others, 1980). Groundwater table fluctuations due to tidal action have been measured to occur as far as 1,800 feet inland from the marsh edge (SCWRC, unpublished field data). The water table elevation drops near drainage ditches to reflect discharge into the ditches.

Hydraulic conductivity at the Depot was calculated to be 0.8 ft/day (3×10^{-4} cm/s)(Glowacz and others, 1980). The hydraulic conductivity of clean fine Holocene sands of the surficial aquifer at the southwestern end of Hilton Head Island was estimated as 13 ft/day (5×10^{-3} cm/s). Pleistocene sands on Hilton Head Island had a hydraulic conductivity of 0.1 to 1.0 ft/day (4×10^{-5} cm/s to 4×10^{-4} cm/s) (Glowacz and others, 1980).

The direction of groundwater flow in the upper portion of the shallow surficial aquifer is generally toward the nearest surface water body, such as a pond, river, tidal creek, or the ocean (Figure 2-5). The hydraulic gradients are usually low and are nearly flat; they are always less than 1 percent except near ditches which dewater small areas. The rate of groundwater flow in the shallow aquifer is generally less than 2 feet per day, typically in the range of 0.2 to 1.2 ft/day (SCDHEC, 1982).

2.2.2 Tertiary Limestone Aquifer

The Tertiary Limestone Aquifer, as it is referred to in South Carolina, extends continuously from South Carolina into Florida. Depending on the locality, this aquifer system has been referred to as the principal artesian aquifer, Floridan Aquifer, Ocala Aquifer, principal limestone aquifer, Santee Aquifer, and more recently as the southeastern limestone aquifer.

The Tertiary Limestone Aquifer occupies a large geographical area in the South Carolina Coastal Plain (Figure 2-6) and supplies groundwater to hundreds of wells. In the Central Coastal Plain, this aquifer occurs at or near land surface and is tapped by many small-diameter wells less than 100 feet deep. In many locations throughout the Central Coastal Plain, groundwater in the aquifer occurs largely under unconfined conditions, although artesian (confined) conditions are common. Toward the south and southeast, the aquifer is capped by confining beds of the Cooper Marl, and artesian conditions predominate. In the Low Country (including the Beaufort area north of MCRD Parris Island), the aquifer system again occurs near land surface, and confining beds vary from essentially 0 to more than

This page intentionally left blank.

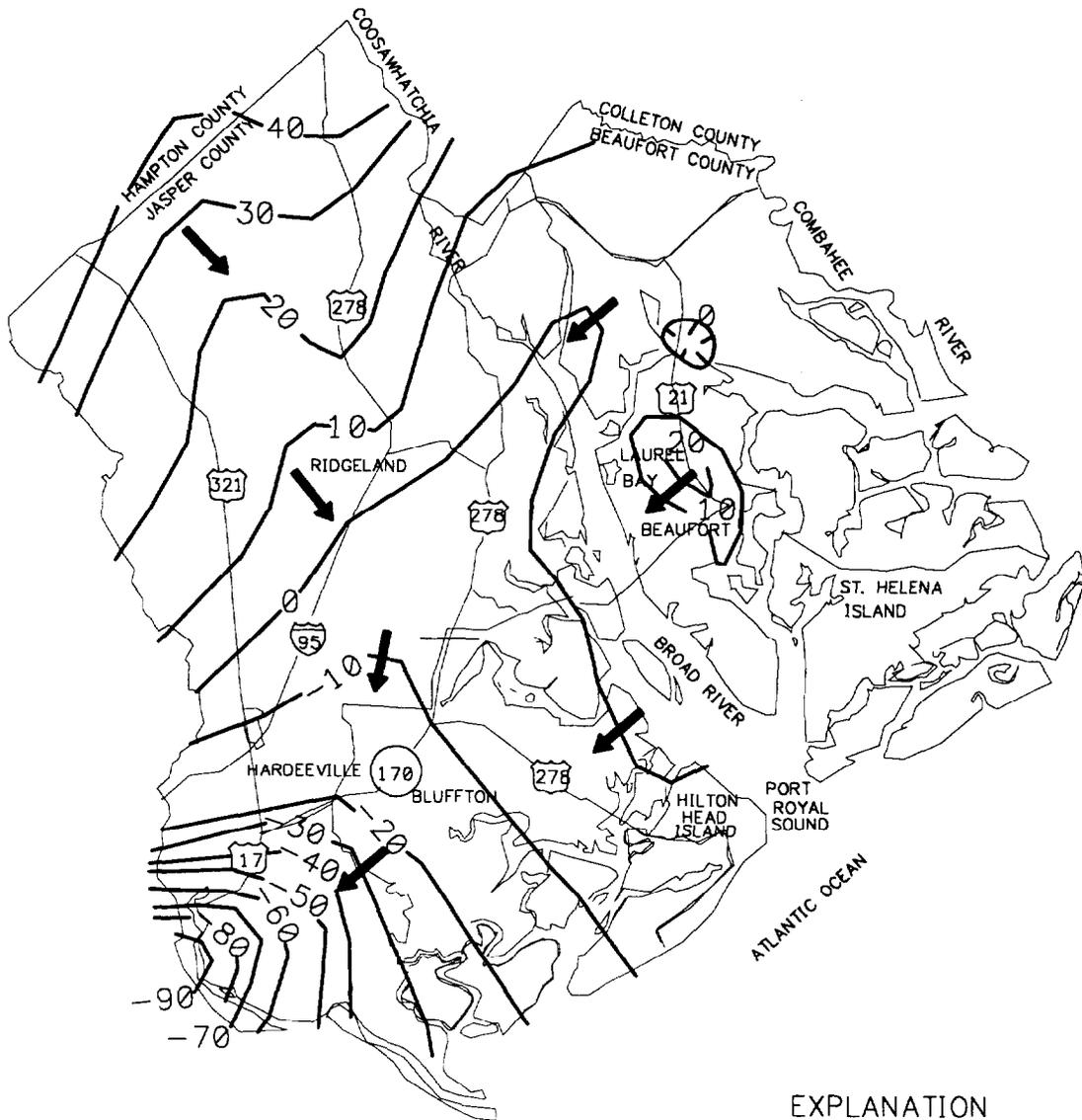
SOURCE: DAMES & MOORE, 1986



<p>4000 0 4000 Feet</p>		<p>LEGEND - - - Groundwater Divides → Flow Direction</p>	
<p>DRAWN BY D. PERRY</p>	<p>DATE 13-NOV-87</p>	<p> Brown & Root Environmental</p>	<p>CONTRACT NUMBER —</p>
<p>CHECKED BY</p>	<p>DATE</p>	<p>SHALLOW AQUIFER GROUNDWATER FLOW MAP MCRD PARRIS ISLAND</p>	<p>OWNER No. —</p>
<p>COST/SCHEDULE-AREA</p>	<p>SCALE AS NOTED</p>	<p>APPROVED BY —</p>	<p>DATE —</p>
		<p>DRAWING No. FIGURE 2-5</p>	<p>REV 0</p>

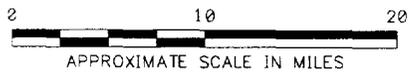
P:\GIS\WPARRIS\APR 13-NOV-87 DNP GROUNDWATER FLOW LAYOUT

ACAD: 7394cm34.dwg 10/23/97 HP



EXPLANATION

-  POTENTIOMETRIC CONTOUR, IN FEET ABOVE OR BELOW (-) SEA LEVEL.
-  GROUNDWATER FLOW DIRECTION



SOURCE: HASSEN, 1985

DRAWN BY HJP	DATE 10/23/97	 Brown & Root Environmental	CONTRACT NO. 7394	OWNER NO. _____
CHECKED BY	DATE		APPROVED BY	DATE
COST/SCHED-AREA		POTENTIOMETRIC SURFACE OF THE TERTIARY Limestone AQUIFER (DEEP AQUIFER) MCRD PARRIS ISLAND	APPROVED BY	DATE
SCALE AS NOTED			DRAWING NO.	REV.
			FIGURE 2-6	0

FORM CADD NO. SOUTH_AV.DWG - REV 0 - 02/07/97

150 feet in thickness. Groundwater of this aquifer occurs mainly under artesian conditions at MCRD Parris Island.

The Tertiary Limestone Aquifer is the most important source of groundwater in the Low Country area, and wells generally less than 250 feet deep tap this aquifer system. The aquifer is the only source of potable groundwater west, north, and east of MCRD Parris Island. It is conservatively estimated that over 4,000 wells tap this aquifer in the Low Country and that this aquifer system probably supplies over 80 percent of the groundwater used in this area. The Depot is served by the Beaufort, Jasper, and Colleton County Water Districts.

Groundwater in the Tertiary Limestone Aquifer occurs in solutionally enlarged openings or cavities in the limestone. In general, groundwater occurs in a series of broadly defined water-bearing (permeable) zones that serve as aquifers and are separated by less permeable rocks. Two hydrogeologic zones within the Tertiary Limestone Aquifer lie beneath the MCRD Parris Island area. They dip toward Savannah, Georgia, and are parallel to the geologic unit (or formation) boundaries. These two hydrogeologic units consist of (1) a 200-foot-thick Upper Hydrogeologic Unit that contains an upper permeable zone, and (2) an 800-foot-thick Lower Hydrogeologic Unit that has relatively low permeability compared to the Upper Unit except for a lower permeable zone.

The Upper Hydrogeologic Unit is composed primarily of the upper part of the Santee Limestone and has a greater overall permeability and yields much greater quantities of groundwater to wells than the Lower Unit.

2.2.2.1 Upper Hydrogeologic Unit

The Upper Hydrogeologic Unit below MCRD Parris Island consists of the uppermost permeable zone of the Tertiary Limestone Aquifer. This upper permeable zone occurs throughout most of Beaufort County. However, it thins over the Beaufort Arch and has been completely eroded approximately 20 miles north of MCRD Parris Island.

Recharge of the Upper Unit in South Carolina occurs over most of Beaufort County east of the Broad River and over a 30-mile-wide zone trending northwest of the city of Beaufort along the South Carolina-Georgia border. Areas west of the Depot are not recharge zones because of the thick, low permeability formations within the Ridgeland Trough. A 30-mile-wide, eastwest trending recharge zone is present from 60 to 90 miles north of MCRD Parris Island. These zones delineate potential effective porosity at the

ground surface; actual recharge is affected by the thickness and vertical permeability of overlying soils and rock formations.

The Upper Hydrogeologic Unit supplies most of the groundwater used from the Tertiary Limestone Aquifer in the Low Country. In some areas of the coastal parts of the Low Country, including Parris Island, water-bearing zones contain salt water.

The average transmissivity of the upper permeable zone of the Tertiary Limestone Aquifer in western Beaufort County (i.e., all of Beaufort County west of the Broad River) and southern Jasper County is about 370,000 gallons per day per foot (gpd/ft) and in eastern Beaufort County is notably less than 75,000 gpd/ft. The transmissivity of the upper permeable zone in northern Jasper County and southwestern and southeastern Hampton County is estimated to range from 75,000 gpd/ft to 220,000 gpd/ft, with transmissivities in the western and southwestern parts of the area due to increased thickness of the upper permeable zone (Hayes, 1979).

The average hydraulic conductivity of the upper permeable zone of the Tertiary Limestone Aquifer (determined by dividing the average transmissivity by average thickness) is estimated to be 400 feet per day (ft/d) (1.4×10^{-1} centimeters per second (cm/s)) in western Beaufort County, Jasper County, and southeastern and southwestern Hampton County. The upper permeability zone in eastern Beaufort County is estimated to have an average hydraulic conductivity of 175 ft/d (6.2×10^{-2} cm/s) (Hayes, 1979).

2.2.2.2 Lower Hydrogeologic Unit

The water-bearing properties of the Lower Hydrogeologic Unit are not well known in much of the Low Country. Wells that are drilled into the Lower Hydrogeologic Unit are usually also open to the Upper Unit.

The Lower Unit is not a single unit but is a thick, complex unit that is composed of both aquifers and confining beds. Prolific aquifers do not occur in the Lower Unit because these rocks are primarily impure limestone or marl. Aquifers in the Lower Unit contain saline formation water in the coastal parts of the Low Country, such as below MCRD Parris Island. Chloride and dissolved solids generally increase with depth in these zones.

The transmissivity of the lower permeable zone of the Tertiary Limestone Aquifer in northern Colleton County and northeastern Hampton County is estimated to range from 37,000 gpd/ft to as low as 3,700 gpd/ft, with transmissivity decreasing to the north and northeast. The average transmissivity of the lower permeable zone of the Tertiary Limestone Aquifer in southern Colleton County is estimated to be

30,000 gpd/ft. The hydraulic conductivity of the lower permeable zone of this aquifer is estimated to vary between 75 and 100 ft/d (10^{-2} cm/sec) in eastern Beaufort County, Colleton County, and northeastern Hampton County (Hayes, 1979).

2.3 REGIONAL SURFACE WATER HYDROLOGY

Drainage off the land surface is to the nearest surface water body. Three generally east-west creeks drain much of the Depot. Archers Creek is at the northern boundary of the Depot and connects Battery Creek to the north with the Broad River to the west of Parris Island. Ribbon Creek drains the area between Horse and Parris Islands and flows westward into the Broad River. Ballast Creek enters the Beaufort River and drains central Parris Island. Smaller unnamed creeks drain the areas west and east of Page Field.

The Beaufort and Broad Rivers meet at the south end of Parris Island to form Port Royal Sound, which extends about 4 miles southeastward to the Atlantic Ocean.

2.4 REGIONAL TOPOGRAPHY

MCRD Parris Island lies in the Lower Coastal Plain physiographic province. Elevations range from sea level to 22 feet above mean sea level (msl). The Depot consists of Parris Island (the largest and most developed island), seven smaller named islands, many small unnamed islands, salt marshes, and related tidal creeks (Figure 2-7). Because of the low elevation, most of the Depot is within the 100-year flood plain. The majority of the area of Parris Island north of Ballast Creek, the east central area of Page Field, and the central part of Horse Island are the only surfaces above the 100-year flood plain.

The Depot covers 6,710 acres: 1,645 acres are improved, 5,065 are unimproved. The unimproved and improved areas consist of 1,400 acres of managed forests. An additional 3,816 acres are wetlands.

2.5 ADJACENT LAND USE

By nature of being an island, MCRD Parris Island has no development in close proximity. The surrounding areas are estuarine, however, and support considerable commercial and recreational fishing, boating, and water recreation. The mainland closest to Parris Island is developed as a residential area. Hilton Head Island, a major recreational area, is located approximately 3 miles southwest of Parris Island, across Port Royal Sound.

SOURCE: FEDERAL EMERGENCY MANAGEMENT AGENCY, 1986



DRAWN BY D. PERRY	DATE 24-NOV-87	Brown & Root Environmental FLOOD HAZARD MAP MCRD PARRIS ISLAND	CONTRACT NUMBER —	OWNER No. —
CHECKED BY	DATE		APPROVED BY —	DATE —
COST/SCHEDULE-AREA			APPROVED BY —	DATE —
SCALE AS NOTED			DRAWING No. FIGURE 2-7	REV 0

P1Q25MPPARRIS.APR 24-NOV-87 DNP FLOOD HAZARD LAYOUT

2.6 BIOLOGICAL FEATURES

2.6.1 Ecosystems

2.6.1.1 Wetlands

There are eight types of wetlands and deepwater habitats found on MCRD Parris Island according to the National Wetlands Inventory (1989). Five of these are estuarine (saltwater) habitats and three are palustrine (freshwater). The estuarine communities occupy the vast majority of the wetland and deepwater habitats at MCRD Parris Island. The most common estuarine community is estuarine, intertidal, emergent (E2EM). Other estuarine communities are the estuarine, subtidal, unconsolidated bottom (E1UB); estuarine, intertidal, scrub-shrub (E2SS); estuarine, intertidal, unconsolidated shore (E2US); and estuarine, intertidal, streambed (E2SB). The three palustrine community types occupy a very small portion of MCRD Parris Island and are found in the vicinity of the airfield and around the obstacle course. These three types are palustrine, emergent (PEM); palustrine, scrub-shrub (PSS); and palustrine, forested (PFO).

In South Carolina, three agencies have regulatory control over dredge and fill operations in jurisdictional wetlands and deepwater habitats. They are the U.S. Army Corps of Engineers (COE), U.S. EPA Region 4, and the South Carolina Department of Health and Environmental Control (SCDHEC). The South Carolina Department of Natural Resources (SCDNR) does not have regulatory authority over such operations; however, this agency reviews and comments on permit applications for such activities.

COE, which exercises the broadest jurisdiction, requires permits for the discharge of dredge or fill materials into waters of the United States, pursuant to section 404 of the Clean Water Act (CWA). COE also regulates construction of certain structures of work in or affecting navigable waters of the United States, pursuant to Section 10 of the Rivers and Harbors Act of 1899. South Carolina requires permits for any dredging, filling, construction, or alteration activity in, on, or over any navigable waterway of the state. SCDHEC requires water quality certification for dredge, fill, and construction projects in the state's "coastal zone" and requires permits in accordance with the Coastal Zone Management Plan. Without SCDHEC's Office of Ocean and Coastal Resource Management's certification, a permit for a dredge, fill, or construction project in the "coastal zone" cannot be issued by the permitting agency.

The largest natural vegetation community found on MCRD Parris Island is the saltwater marsh. Saltwater marshes occupy expansive areas that are alternately flooded and drained by changing tides. The most common plant found in this community is smooth cordgrass (*Spartina alterniflora*). Other plants found

about Parris Island are black needlerush (*Juncus roemerianus*), seashore saltgrass (*Distichlis spicata*), and glasswort (*Salicornia virginica*).

The saltwater marshes and adjacent estuarine waters support a diverse assemblage of fauna, particularly fish and crustaceans. Shellfish and crustaceans, such as blue crabs (*Callinectes sapidus*), stone crabs (*Menippe* sp.), shrimps (*Penaeus* and *Palaemonetes* spp.), American oysters (*Crassostrea virginica*), common blue mussels (*Mytilus edulis*), and the Atlantic ribbed mussel (*Geukensia demissus*), live in the marshes in large numbers. Marshes also support large numbers of animals that prey upon the fish and crustaceans. These predators include mammals, such as raccoons (*Procyon lotor*), mink (*Mustela vison*), and river otter (*Lutra canadensis*); wading birds, such as tricolored herons (*Egretta tricolor*) and snowy egrets (*Egretta thula*); various shorebirds and gulls; brown pelicans (*Pelecanus occidentalis*); and large numbers of wintering water fowl, such as lesser scaup (*Aythya affinis*), ring-necked ducks (*Aythya collaris*), and common mergansers (*Mergus merganser*); and fish, such as red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), summer flounder (*Paralichthys dentatus*), and the southern flounder (*Paralichthys lethostigma*).

2.6.1.2 Uplands

Upland vegetation communities include forested and open (field and lawn) areas. MCRD Parris Island contains approximately 1,422 acres of forest land, most of which is occupied by slash pine (*Pinus elliottii*) and loblolly pine (*Pinus taeda*). These forest lands are managed for "multiple-use", such as wildlife habitat, aesthetics, soil erosion control, threatened and endangered species habitat, outdoor recreation, and timber production. The managed pine forests support a number of wildlife species, including white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and bobwhite (*Colinus virginianus*).

The upland plant communities also include temperate evergreen forest and maritime forest. Areas of the island that have never been filled or excavated tend to support the temperate evergreen forest. The extreme southern tip of the island (south of the golf course) is maritime forest with many large live oaks. Jericho and Doggie Islands are temperate evergreen forest, surrounded by salt marsh. Horse Island is covered with both pine forest (in the fill and borrow areas) and temperate evergreen forest (in relatively undisturbed areas), and is surrounded by salt marsh.

The temperate evergreen forest is characterized by evergreen oaks, such as the live oak (*Quercus virginiana*) and laurel oak (*Quercus laurifolia*), and other evergreen trees and shrubs, such as the bull bay or southern magnolia (*Magnolia grandiflora*), red bay (*Persea borbonia*), sweet bay (*Magnolia virginiana*), and yaupon (*Ilex vomitoria*). The understory includes many runner or vine species, such as poison ivy

(*Rhus radicans*), Virginia creeper (*Parthenocissus quinquefolia*), muscadine grape (*Vitis rotundifolia*), and greenbriar (*Smilax rotundifolia*).

The maritime forest is a temperate evergreen forest that has been modified by salt spray and constant sea breezes. As a result, salt-tolerant species dominate. These species include trees and shrubs such as the live oak (*Quercus virginiana*), yaupon (*Ilex vomitoria*), wax myrtle (*Myrica cerifera*), and cabbage palmetto (*Sabal palmetto*). Typically, these species are stratified in bands along the ocean-facing beaches of islands. The band of vegetation nearest the ocean is composed of the most salt-tolerant species, wax myrtle, followed by the yaupon, and then a live oak-cabbage palmetto association. Undergrowth is typically sparse in maritime forest, although greenbriar (*Smilax rotundifolia*) vines are common in areas that do not support significant populations of large herbivores, such as white-tailed deer and feral hogs.

The common mammalian herbivores of the area include the white-tailed deer (*Odocoileus virginianus*), the eastern cottontail (*Sylvilagus floridanus*), the marsh rabbit (*Sylvilagus palustris*), the gray squirrel (*Sciurus carolinensis*), the fox squirrel (*Sciurus niger*), the cotton rat (*Sigmodon hispidus*), and the cotton mouse (*Peromyscus gossypinus*). Carnivores include the gray fox (*Urocyon cinereoargenteus*), mink (*Mustela vison*), striped skunk (*Mephitis mephitis*), river otter (*Lutra canadensis*), and bobcat (*Lynx rufus*). The common bird species include the bobwhite (*Colinus virginianus*), the barred owl (*Strix varia*), chuck-wills-widow (*Caprimulgus carolinensis*), blue jay (*Cyanocitta cristata*), common crow (*Corvus brachyrhynchos*), fish crow (*Corvus ossifragus*), mockingbird (*Mimus polyglottos*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamaicensis*), and mourning dove (*Zenaida macroura*).

Common reptiles and amphibians include the yellow rat snake (*Elaphe obsoleta quadrivittata*), black racer (*Coluber constrictor*), red-bellied water snake (*Nerodia erythrogaster*), eastern cottonmouth (*Agkistrodon piscivorus*), narrow-mouthed toad (*Gastrophryne carolinensis*), southern toad (*Bufo terrestris*), squirrel treefrog (*Hyla squirella*), bullfrog (*Rana catesbeina*), diamondback terrapin (*Malaclemys terrapin*), eastern glass lizard (*Ophisaurus ventralis*), and the broad-headed skink (*Eumeces laticeps*). The American alligator (*Alligator mississippiensis*), which is federally listed as threatened in the Beaufort area, may be found in freshwater ponds, ditches, and occasionally in marshes. Freshwater fishes include largemouth bass (*Micropterus salmoides*), sunfishes (*Lepomis* spp.), the brown bullhead (*Ameiurus nebulosus*), eastern mosquitofish (*Gambusia holbrooki*), and killifish (*Fundulus* spp.).

2.6.2 Threatened or Endangered Species

A study conducted by Southern Division, Naval Facilities Engineering Command, identified threatened and endangered plants and animals that occur or potentially occur on MCRD Parris Island. Section 7 of the

Endangered Species Act states "each Federal Agency shall, in consultation with and with the assistance of the Secretary [of the Department of the Interior], insure any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species." South Carolina also provides protection to threatened or endangered animal species, but presently does not have any regulations that protect threatened or endangered plant species.

No threatened or endangered plant species are known to occur on MCRD Parris Island. Four threatened or endangered animal species are known to occur in or around the Depot. They are the bald eagle, wood stork, least tern, and the West Indian manatee. Bald eagles are occasional visitors, and one pair of nesting bald eagles was discovered at MCRD Parris Island in January 1998. Wood storks are also known to use the estuarine environment in and around the Depot, but there are no known rookeries on MCRD Parris Island. Least terns have been observed feeding in the Third Battalion Pond. Their preferred nesting habitat of beaches is limited on the installation, and their nesting status is not known. Manatees have been recorded in the estuaries around MCRD Parris Island but are transient species in the area and occur rarely. Table 2-2 provides a list of endangered, threatened, and candidate species known to occur, or possibly occurring in Beaufort County, based on records maintained by the U.S. Fish and Wildlife Service, and current as of December 29, 1997. The following sea turtles may occur in the area: Kemp's ridley, green, hawksbill, leatherback, and loggerhead. These turtles are known to enter Port Royal Sound; however, there is no evidence of nesting. A complete listing of rare, threatened, and endangered species of South Carolina is provided in Appendix B.

2.7 CLIMATOLOGY

MCRD Parris Island is in the southernmost region of South Carolina, where the climate is milder than elsewhere in the state. This low-lying coastal area has numerous islands, inlets, streams, and marshes and a temperature regime that clearly reflects the influences of its maritime and southerly location. The climate is subtropical, with long and hot summers followed by short and mild winters. Precipitation is abundant, averaging about 49 inches per year and remaining within the range of 40 to 58 inches during most years. Precipitation in the amount of one-tenth inch or more falls on an average of about 77 days per year. The annual distribution shows a major monthly maximum of about 7 inches in July and a major monthly minimum of about 2 inches in November. The period of April through October, which includes the growing season for most crops in this area, receives an average of about 34 inches of rain, about 70 percent of the annual total.

TABLE 2-2

**BEAUFORT COUNTY DISTRIBUTION RECORDS OF ENDANGERED,
THREATENED, AND CANDIDATE SPECIES
MCRD PARRIS ISLAND, SOUTH CAROLINA**

Species	Status	Certainty of Occurrence ^a
West Indian manatee (<i>Trichechus manatus</i>)	E	Known
Finback whale (<i>Balaenoptera physalus</i>)	E	Known
Humpback whale (<i>Megaptera novaeangliae</i>)	E	Known
Northern right whale (<i>Eubaleana glacialis</i>)	E	Known
Sei whale (<i>Balacnoptera borealis</i>)	E	Known
Sperm whale (<i>Physeter catodon</i>)	E	Known
Peregrine falcon (<i>Falco peregrinus</i>)	E (S/A)	Known
Bald eagle (<i>Haliaeetus leucocephalus</i>)	T	Known
Wood stork (<i>Mycteria americana</i>)	E	Known
Red-cockaded woodpecker (<i>Picoides borealis</i>)	E	Known
Piping plover (<i>Charadrius melodus</i>)	T	Known
Kemp's ridley sea turtle (<i>Lepidochelys kempii</i>)	E	Known
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	E	Known
Loggerhead sea turtle (<i>Caretta caretta</i>)	T	Known
Green sea turtle (<i>Chelonia mydas</i>)	T	Known
Flatwoods salamander (<i>Ambystoma cingulatum</i>)	PT	Known
Shortnose sturgeon (<i>Acipenser brevirostrum</i>)	E	Known
Pondberry (<i>Lindera melissifolia</i>)	E	Known
Canby's dropwort (<i>Oxypolis canbyi</i>)	E	Possible
Chaff-seed (<i>Schwalbea americana</i>)	E	Known
Dusky shark (<i>Carcharhinus obscurus</i>)	C	Possible
Sand tiger shark (<i>Odontaspis taurus</i>)	C	Possible
Night shark (<i>Carcharhinus signatus</i>)	C	Possible
Speckled hind (<i>Epinephelus drummondhayi</i>)	C	Possible
Jewfish (<i>E. itijara</i>)	C	Possible
Warsaw grouper (<i>E. nigritus</i>)	C	Possible
Nassau grouper (<i>E. striatus</i>)	C	Possible

- a Occurrence in Beaufort County based on records maintained by U.S. Fish and Wildlife Service. Current as of December 29, 1997.
- E Endangered
- T Threatened
- S/A Due to similarity of appearance
- PT Proposed to be listed as threatened
- C U.S. Fish and Wildlife Service or National Marine Fisheries Service has on file sufficient information on biological vulnerability and threat(s) to support proposals to list this species.

Spring is a season of transition between a rather uniform winter and a rather uniform summer. March is typically a month of heavy rains and warming temperatures. April tends to be dry, but scattered thunderstorm activity begins as summer begins. April and May are the months of greatest tornado hazard, during the March-through-October tornado season.

Summers are warm and humid. Maximum daily temperatures are near or above 90° Fahrenheit (F), and minimum daily temperatures are 65 to 70° F. Temperatures in excess of 100° F are usually recorded on two to five days each year. Maritime tropical air persists in the area for extended periods during summer. The abundant supply of warm, moist, relatively unstable air produces frequent scattered showers and thunderstorms. About 54 thunderstorms occur in an average year, 16 in July. Hailstorms are infrequent, occurring one to five times per year, and are usually of little consequence. The tropical storm season is generally considered to be the period from June through October. Hurricanes are rare to the area, but tropical storms occur on an average of about once every 2 or 3 years.

Autumn begins warm, humid, and showery, but changes to a warm, relatively dry, and pleasant Indian summer, which tends to take place in October and continue into November. The first freezing temperatures in the area can be expected in the middle of November, but the onset of frost tends to be quite variable from year to year and from place to place. Tropical storms or hurricanes occasionally bring heavy rains and strong winds to the area during this season.

The winter season is short and mild. It is also relatively dry, accounting for only about 20 percent of the average annual precipitation. Average daily maximum and minimum temperatures are 63° F and 38° F, respectively. The average winter temperature is about 50° F. Freezing temperatures occur about 27 days per year. Winter precipitation normally comes in the form of rain associated with fronts. Measurable snowfall seldom occurs. Freezing rain occurs some winters, but damaging ice storms are rare (Stuck, 1980).

2.8 WATER USAGE

Total gross water use for Beaufort County is currently estimated at 29.3 million gallons per day (mgd) with 50 percent of this withdrawal (14.7mgd) consumed. These values are daily averages based on yearly usage. This gross use is 12th in the State of South Carolina. The leading water uses are public supply (11.2 mgd), agricultural irrigation (6.5 mgd), and self-supplied domestic (6.4 mgd). Groundwater supplies 82 percent of the gross use.

Public supply withdrawal represents 38 percent of gross use and 8 percent of consumptive use, with groundwater being the only source utilized. Approximately 6.2 mgd of surface water is transported into this sub-basin from the lower Savannah River Sub-basin for public supply use.

Self-supplied domestic use accounts for 22 percent of the gross use and 37 percent of the consumptive use. Groundwater is the only source of water supply used.

Agricultural water use represents 25 percent of gross use and 50 percent of consumptive use. Irrigation demand makes up 89 percent of this use with groundwater accounting for 54 percent of the demand. This surface-water withdrawal is the largest in the sub-basin, with most of the irrigated acreage located in the upper half of the sub-basin. When averaged over the 5-month growing season, irrigation water use is even more significant, equaling 16 mgd and comprising 41 percent of gross use and 66 percent of consumptive use in the sub-basin. Livestock withdrawals are equally divided between groundwater and surface water sources.

Self-supplied industrial use represents 15 percent of the gross use and 6 percent of the consumptive use. Groundwater supplies 57 percent of the demand.

Total gross use is projected to increase 220 percent to 94.0 mgd by the year 2020. Consumptive use is projected to grow almost 380 percent to 70.9 mgd by 2020. Most of the growth in both gross and consumptive use is due to the projected increase in agricultural irrigation. This should remain the leading water use. Groundwater will remain the most heavily used source of supply.

2.9 FACILITY ACCESS

Because of its island nature, MCRD Parris Island has a single point of access for vehicular traffic. Military police stationed at the entrance currently monitor incoming traffic, stopping those without official stickers. Commercial vehicles are inspected before entering or leaving the Depot.

3.0 PROJECT MANAGEMENT TASKS

Responsibilities and authorities of management and support personnel are further detailed in the Master QAP (Section 2.0) and in the Site-Specific QAPP Addendum.

3.1 BASE SUPPORT

The Navy Remedial Project Manager (RPM) is:

Mr. Art Sanford
SOUTHDIVNAVFACENCOM
P.O. Box 190010
North Charleston, SC 29419-9010
Phone: (803) 820-7482

The MCRD Parris Island Point of Contact is:

Mr. Tim Harrington
Marine Corps Recruit Depot
G-4 NREAO
P.O. Box 19001
Parris Island, SC 29905-9001
Phone: (803) 525-2630

Throughout the duration of the site characterization activities, various support functions will be provided by MCRD Parris Island personnel, as described below:

- MCRD Parris Island will assist with the location of utilities and furnish up-to-date drawings and/or a Facilities & Maintenance (Public Works) point of contact. (B&R Environmental will secure clearance for intrusive activities at each location with the point of contact before intrusion and will employ an electromagnetic pipe and cable locator as an additional measure of clearing utilities. Prior to mobilization, B&R Environmental will conduct a site visit and mark sample locations.)
- Personnel from MCRD Parris Island will sign disposal manifests for investigative-derived wastes, including any drill cuttings, well development fluids, or decontamination fluids suspected to be hazardous and requiring proper disposal according to applicable state and/or federal regulations. (Drums are provided by B&R Environmental.) Waste handling criteria are developed in more detail in Section 2.0 of the Master Field Sampling Plan (Volume II of this Master Work Plan).

In addition, MCRD Parris Island personnel will aid in arranging the following:

- Secure staging areas for decontamination operations and for storing equipment and supplies. More than one area may be required.
- Provide a supply (e.g., fire hydrant, stand pipe, etc.) of large quantities of potable water and electricity for equipment cleaning, etc.
- Provide a suitable area for setup of an operations field trailer near electric and phone service. (B&R Environmental will be responsible for arranging for utility connections.)
- Coordinate field activities with the facility to minimize the impact to Depot functions.

3.2 PROJECT PERSONNEL

The Brown & Root Environmental Task Order Manager (TOM) is:

Mark Speranza
Brown & Root Environmental
Foster Plaza 7
661 Andersen Drive
Pittsburgh, PA 15220
Phone: (412) 921-8916
Fax: (412) 921-4040

Support staff include geology, chemistry, engineering, health and safety, and drafting personnel.

3.3 CONTINGENCY PLAN

Actual site conditions may necessitate minor deviations (i.e., slight adjustment of boring locations due to physical interferences) from approved work plans. Any problems encountered in the field will be brought to the immediate attention of the B&R Environmental TOM. The TOM, in consultation with the Navy, U.S. EPA, and SCDHEC, will determine an appropriate course of action so as to minimize impact to the schedule or budget. All deviations from approved work plans will be approved by the Navy, U.S. EPA, and SCDHEC prior to enactment and will be recorded in the RI/RFI Report.

REFERENCES

ABB Environmental Services, Inc., 1993. Extended Site Inspection Report, Causeway Landfill, Marine Corps Recruit Depot, Parris Island, South Carolina. Charleston, South Carolina.

Glowacz, Michael E., Clyde M. Livingston, Curtis L. Gorman, and Charles R. Clyner, 1980. Economic and Environmental Impact of Land Disposal of Wastes in the Shallow Aquifers of the Lower Coastal Plain of South Carolina; Vol. VIII: Summary—Beaufort and Jasper Counties. South Carolina Department of Health and Environmental Control, Ground-Water Protection Division.

Hassen, Jeffrey A. 1985. Groundwater Conditions in the Ladies and St. Helena Islands Area, South Carolina. Report No. 147, South Carolina Water Resources Commission.

Hayes, Larry R. 1979. The Groundwater Resources of Beaufort, Colleton, Hampton and Jasper Counties, South Carolina. Report No. 9, South Carolina Water Resources Commission.

A. T. Kearney, Inc., 1990. Interim RCRA Facility Assessment of United States Marine Corps Recruit Depot, Parris Island, South Carolina. Chicago, Illinois, April.

McClelland Consultants (environmental), Inc., 1990. Remedial Investigation Verification Step, Marine Corps Recruit Depot, Parris Island, South Carolina. Houston, Texas, May.

MCRD Parris Island, 1992. Master Plan for Marine Corps Recruit Depot, Parris Island, South Carolina, September.

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

NAVFAC (Naval Facilities Engineering Command), 1995. Letter dated June 12, 1995, to SCDHEC. RE: Recommendations for Future Actions (at MCRD Parris Island).

SCDHEC (South Carolina Department of Health and Environmental Control), 1982. Fripp Island Ground-Water Investigation, Beaufort County, South Carolina. Ground-Water Protection Division.

SCDHEC (South Carolina Department of Human Health and Environmental Controls), 1995. Letter dated July 18, 1995. RE: Recommendations for Future Actions (at MCRD Parris Island).

Stuck, W. M., 1980. Soil Survey of Beaufort and Jasper Counties, South Carolina. U.S. Department of Agriculture, Soil Conservation Service.

U.S. EPA, 1994. OSWER Directive 9902.3-2A, RCRA Corrective Action Plan.

U.S. EPA, (U.S. Environmental Protection Agency), 1994. Guidance for the Data Quality Objectives Process QA/G-4, September.

APPENDIX A

**PARTNERING TEAM CORRESPONDENCE
IR SITE RECOMMENDATIONS**



UNITED STATES MARINE CORPS
 MARINE CORPS RECRUIT DEPT. EASTERN RECRUITING REGION
 P.O. BOX 19001
 PARRIS ISLAND, SOUTH CAROLINA 29905-9001

IN REPLY REFER TO

6280
 NREAO
 12 Jun 95

From: Commanding General, Marine Corps Recruit Depot/Eastern
 Recruiting Region, P.O. Box 19001, Parris Island

Subj: NATIONAL PRIORITY LIST (NPL) MEETING OF 8 JUNE 1995

Encl: (1) Meeting Agenda/Minutes
 (2) ATSDR Site Visit/Summary and Information Package
 (3) Comprehensive Listing of IRP Sites

1. Enclosure (1) is submitted for your records.
2. Please review enclosures (2) and (3) and provide comments to the Natural Resources and Environmental Affairs Officer by 21 July 1995.
3. Major concerns and grouping of sites will be discussed in a conference call scheduled between MCRD, EPA, SouthDiv, and SCDHEC at 0900 on 21 July 1995.
4. If you have questions, please contact Ms. Johnsie Nabors at (803) 525-2779/2630 or Mr. Tim Harrington at 525-3400.


 F. L. TURNER
 By direction

Distribution:
 SouthDiv (Mr. Scott Glass)
 EPA, Region IV (Mr. Jay Bassett)
 SCDHEC/Columbia (Mr. Rabon)
 SCDHEC/Port Royal:
 Mr. Berry
 Mr. Stevens
 Mr. Puerifoy

Meeting Agenda

IR Team. MCDR Parris Island Site Screening Exercise

8 June 1995

Meeting Participants: Bruce Patterson - MCRD Parris Island
Johnsie Nabors - MCRD Parris Island
Suzanne Rushing - MCRD Parris Island
Tim Harrington - MCRD Parris Island
Russel Berry - SCDHEC
Jim Peurifoy - SCDHEC
Roger Stevens - SCDHEC
Brent Rabon - SCDHEC
Paul Bergstrand - SCDHEC
Jay Bassett - EPA
Scott Glass - NAVFAC

1. 0800 - 1145 Review Site Summary and Information Package
2. 1145 - 1300 Break for Lunch
3. 1300 - 1500 Site Tours
4. 1500 - 1515 Discuss Progress of FFA Negotiations
5. 1515 - 1530 Discuss Status of Formal Partnering
6. 1530 - 1545 Discuss Planning/Development of Generic RI/FS Work Plans
7. 1545 - 1600 Discuss Participation of IR Team Members in ATSDR Site Visit
8. 1600 - 1615 Wrap-up and Adjourn

8 June 1995 Minutes

- It was agreed upon that major concerns and grouping of sites would be addressed during a telephone conference call on 21 July 1995 at 0900. Mr. Glass, SouthDiv, will be responsible for initiating the call.

- FFA negotiations were discussed. The kickoff letter from EPA is anticipated during August 1995.

- MCRD Parris Island and EPA discussed the benefits of formal partnering from both an administrative and practical perspective. The State voiced reservations due to past experience. However, they are willing to give full consideration to the program.

- MCRD Parris Island, SouthDiv and EPA will begin to develop generic RI/FS workplans. The State offered to provide information from other sites that would aid in the development of the workplans.

- EPA and the Columbia and Beaufort offices of SCDHEC were invited to attend the ATSDR meeting scheduled for 19 June 1995. The Beaufort SCDHEC office will attend. EPA and Columbia SCDHEC will not attend.

- A windshield tour of sites was conducted. The locations of RFA site 27 and site 25 were clarified.

ATSDR SITE VISIT
MCRD PARRIS ISLAND
SITE SUMMARY AND INFORMATION PACKAGE

1. Introduction:

1.1 This package is prepared for the Agency for Toxic Substances and Disease Control (ATSDR) to assist in the assessment of Installation Restoration (IR) sites located at Marine Corps Recruit Depot (MCRD) Parris Island.

1.2 MCRD Parris Island was recently placed on the National Priorities List (NPL). ATSDR is mandated to provide an independent Public Health Assessment (PHA) for each site on the NPL. ATSDR is scheduled to conduct the initial site visit 19 June 1995 through 21 June 1995, in support of the PHA of MCRD Parris Island.

2. Installation Description and History:

2.1 MCRD Parris Island is located on a barrier island in the southeast corner of South Carolina. The island consists of 30 to 40 feet of unconsolidated soils, containing a surficial aquifer, underlain by a limestone aquifer. The two formations are physically and hydraulically separated by 20 to 30 feet of low permeability soil forming an aquitard. The surficial aquifer is hydraulically connected to the surrounding rivers, creeks and marshes and is effected by tidal influences. The underlying limestone aquifer is used as a drinking water source in other parts of the county and regions south but is not currently used at Parris Island area due to high salinity. Drinking water is supplied to MCRD Parris Island by the Beaufort/Jasper Sewer and Water Authority.

2.2 The Depot provides training for male recruits east of the Mississippi and all female recruits, upon entry into the Marine Corps. Parris Island was initially established as a Naval Station and Shipyard in 1893. A wooden drydock was completed in 1893 and was used periodically for ship maintenance for approximately 30 years. The entire Island was transferred to the Marine Corps in 1915 to be used as a recruit depot. A small airfield (Page Field) was established in 1932 for use in training Marine Corps and Navy pilots. The airfield was expanded for use during the World War II effort and was deactivated in 1946 after the war.

2.3 Past disposal practices of wastes generated from facility, grounds and automobile maintenance operations are the primary concern at MCRD Parris Island. Releases of petroleum products and solvents have also occurred. A primary human health concern is the migration of these contaminants into the surrounding wetlands effecting local fish and shellfish colonies, that may be consumed by human populations.

3. IR Program History:

3.1 An Initial Assessment Study (IAS) was completed September 1986. The IAS is the functional equivalent to the Preliminary Assessment (PA) of the current Navy Installation Restoration Program (NIRP). Sixteen sites were assessed and six (sites 1, 2, 3, 4, 6 and 16) were recommended for confirmation study. The remaining sites (sites 5 and 7-15) were not recommended for confirmation study.

3.2 A Remedial Investigation Verification Step was completed May 1990, where the six sites recommended for confirmation study plus three additional sites (sites 17, 18 and 19) were investigated. The verification step is the functional equivalent to the Site Inspection (SI) of the NIRP. Three sites (sites 1, 2 and 16) were recommended for Remedial Investigation. One site (site 3) was recommended for Extended Site Inspection. Four sites (sites 6, 17, 18 and 19) were transferred to the Underground Storage Tank (UST) program. Site 4 was recommended for No Further Evaluation. One additional site (proposed site 45) has been identified since completion of the verification step. This site has not yet been included into the NIRP process. Refer to paragraph 4 for a description of these NIRP sites and Figure 1 for site locations.

3.3 A Hazard Ranking System (HRS II) scoring was completed May 1992 yielding a score of 71.59. The installation was re-scored by EPA in August 1994 yielding a score of 50.00. As a result of the EPA's HRS II scoring, the Depot was proposed for the NPL in August 1994 and was listed January 17 1995.

3.4 In addition to the NIRP process described above, a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was completed in April 1990. The RFA was conducted since the Depot submitted a Part A permit for the Hazardous Waste Storage Building. An RFA is required for facilities seeking a RCRA permit. The Part A permit was withdrawn prior to issue of the RFA Report, but the Depot remains as Interim Status to date.

3.4.1 A total of 48 Sites were identified by the RFA. The RFA Sites included all 19 NIRP sites. The RFA recommended a RCRA Facility Inspection (RFI) for all the sites that were investigated by the RI Verification Step. In addition, the Inert Disposal Area (RFA Site 12) was recommended for RFI. Phase II sampling or integrity testing was recommended for seventeen Sites (RFA Sites 5, 7, 9, 10, 11, 13, 14, 15, 21, 27, 28, 35, 38, 42, 43, AOC A and AOC B). Refer to paragraph 5 for a description of these additional RFA Sites. Site AOC C was recommended for No Further Investigation pending Record Review. The remaining sites (RFA Sites 8, 19, 20, 22-26, 29-34, 36, 37, 39-41 and 44) were recommended for No Further Investigation.

3.5 Additional sites have been identified since MCRD Parris Island was proposed for the NPL. These new sites are recommended for a Preliminary Assessment (PA). Refer to paragraph 6 for a description of these newly identified sites.

4. Site Summaries:

4.1 Site 1 - Incinerator Landfill (Figure 2):

- Active from 1921 to 1965, the landfill received incinerator ash, combustible and non-combustible liquid and solid wastes. The landfill extends into the present-day marsh. RFA Site 41, Former Incinerator is associated with this site.
- Four wells were installed around the landfill (3 at the marsh boundary and 1 inland) during the verification step. Dissolved lead was detected at 0.101 ppm in groundwater samples and chloroform at 351 ppb, total chromium at 5.30 ppm and total lead at 204 ppm were detected in sediment samples collected in the adjacent marsh.
- The site was recommended for Remedial Investigation/Feasibility Study (RI/FS) by the verification step. RI/FS is expected to start June 1996.

4.2 Site 2 - Borrow Pit Landfill (Figure 3):

- Active from 1966 to 1968, the landfill received solid wastes, construction debris and paint wastes. The landfill was located in an abandoned borrow pit located within 100 feet of a tidal inlet. A portion of Site 15, Dirt Roads is associated with this site.
- Three wells were installed around the landfill during the verification step. Chloroform at 12 ppb, 1,2-dichloroethane at 20 ppb, dissolved chromium at .10 ppm and dissolved lead at 0.073 ppm were detected in groundwater samples. Dissolved cadmium at 0.083 ppm and dissolved chromium at 0.14 ppm were detected in surface waters and chloroform at 81 ppb was detected in sediments collected from the tidal inlet adjacent to the landfill.
- The site was recommended for RI/FS by the verification step. RI/FS is expected to start June 1996.

4.3 Site 3 - Causeway Landfill (Figure 4):

- Active from 1960 to 1972, the landfill was constructed from solid waste and fill material, forming a causeway connecting Horse Island and Parris Island. Material was deposited directly into the salt marsh. Hazardous waste was also reportedly deposited in this landfill. The Causeway was upgraded in the mid 1970s to upgrade the culverts connecting the water bodies on either side of the structure. No debris, other than clean fill material, was reportedly uncovered during this upgrade.
- Surface water and sediment samples were collected along the base of the causeway during the verification step. No priority pollutants or heavy metals in excess of drinking water standards were detected.
- The site was recommended for an extended site inspection to assess the impact to nearby fish and shellfish to determine the need for an RI/FS. A biota study was completed in August 1993. While certain contaminants were detected, no contaminants exceeded U.S. Food and Drug Administration (USFDA) action levels. Although there were no cases where USFDA action levels were exceeded, it is not possible to conclude that there is no public health risk associated with the consumption of seafood caught at this site based on these findings. Additional

studies to support a baseline risk assessment, to be conducted as a part of the RI, is expected. RI/FS is expected to start June 1996.

4.4 Site 4 - Dredge Spoils Area Fire Training Pit (Figure 5):

- The site was used for fire fighting training between the 1940s and 1960s. The exact location of the training pit is unknown since the original site has been covered with dredge spoils. Waste fuels and oils and small quantities of petroleum-based solvents were deposited into the training pit. Approximately 300 to 400 gallons of flammable liquids were burned per training session with one training session being conducted each month.
- Soil borings were advanced adjacent to the spoils area berm near the suspected location of the training pit. No volatile organic compounds or toxic concentrations of heavy metals were detected in any soil samples.
- This site was recommended for no further action by the verification step, however, limited Site Inspection is expected to be performed to evaluate any potential impact to groundwater since this was not addressed by the verification step. The SI is expected to start fiscal year 1997.

4.5 Site 6 - Former Automotive Hobby Shop Spill Area (Figure 6):

- Spills occurred at this site from 1969 to 1982 while disposing of waste lube oils into a UST (AS-26).
- This site was recommended for removal from the IR program by the verification step. The tank and impacted soils were removed in 1990 and a closure report was submitted to the state. Additional cleanup at this site is warranted. Any additional work will be conducted under the State program(s).

4.6 Site 16 - Pesticide Rinsate Disposal Area (Figure 7):

- Rinse water from pesticide operations was deposited directly onto the ground at this site from 1950 to 1978. A deep water well, connected to the underlying limestone aquifer, is located approximately 80 feet from this site. This well is used by the state to monitor aquifer capacity. This well has been damaged and may provide a pathway to the underlying limestone aquifer.
- Soil borings were advanced at this site during the verification step and pesticide DDT and degradation products DDE and DDD were detected.
- The site was recommended for RI/FS by the verification step. Additional studies to support a baseline risk assessment, to be conducted as a part of the RI, is expected. The RI/FS is expected to start June 1996.

4.7 Site 17 - Page Field Tanks (AS-16) (Figure 8):

- This site consisted of four inactive 25,000 gallon concrete USTs containing a water/fuel mixture.
- This site was recommended for removal from the IR program by the verification step. The tanks and impacted soils were removed in 1991 and a closure report was submitted to the state. Additional study at this site is warranted. Any additional study and cleanup of this site will be conducted under State program(s).

4.8 Site 18 - Page Field Tanks (AS-18) (Figure 9):

- This site consisted of four inactive 50,000 gallon concrete USTs containing a water/fuel mixture.
- This site was recommended for transfer from the IR program to the UST program by the verification step. The tanks have been abandoned in place and associated piping and impacted soils have been removed. Groundwater analysis is in progress, to determine the extent of groundwater contamination along the former pipeline. A Contamination Assessment Report is scheduled for issue March 1996. Cleanup efforts are expected to begin October 1996.

4.9 Site 19 (RFA Site AOC D) - MCX Service Station (Figure 10):

- This site consisted of four inactive 6000 gallon steel USTs that contained gasoline. This site is associated with the former building 850.
- This site was recommended for transfer from the IR program to the UST program by the verification step. The tanks and associated piping have been removed and a soil vapor extraction system is in place and operational. In addition, a pump and treat system is scheduled for installation October 1995.

4.10 Proposed Site 45 - Dry Cleaning Facility Spill Area (Figure 11):

- This site is located adjacent to an active dry cleaning facility.
- MCRD Parris Island personnel responded to an accidental release of Tetrachloroethylene (PCE) from the PCE storage tank containment basin in March 1994. The impacted soils were removed and properly disposed of in a hazardous waste landfill.
- A PCE contamination assessment was conducted and a conceptual corrective action plan was developed by an outside engineering firm (S&ME) contracted by the Moral Welfare and Recreation office at Parris Island. Old spills/leaks were discovered during the assessment when PCE and breakdown products Trichloroethylene (TCE) and cis-1,2-Dichloroethylene (DCE) along with petroleum-based solvents were detected. An air sparging/soil vapor extraction technology was suggested for cleanup of the site.
- This site is being considered for an interim action, to be accomplished at the beginning of fiscal year 1996. The follow-up RI/FS is expected to start June 1996.

5. RFA Conclusions:

5.1 Site 5 - Former Paint Shop Disposal Area:

- Active from 1930s to 1960s, dried waste paint and solvents were allegedly deposited at the edge of the Beaufort river, over approximately a 30 foot section of bank behind the Main Power Plant, building 160. The site was covered with marsh soil and construction rubble during 1972. The exact location of this site is unknown since the remains have been eroded by tidal action and periodic storms.

- This site was recommended for RFA Phase II Sampling. Sampling are expected to be conducted as part of an SI to screen this site for RI/FS. The SI is expected to start fiscal year 1997.

5.2 Site 7 - Page Field Fire Training Pit:

- This site was active from the mid 1960s to 1976. The concrete pit, constructed on a concrete pad received waste fuels and waste oils that were burned for training purposes. The site was abandoned approximately 2 to 4 months after a leak was discovered. The structure has been demolished.
- This site was recommended for RFA Phase II Sampling. Additional sampling was conducted by an Addendum to the RI Verification Step. A soil gas vapor survey was conducted around the perimeter of the site and no VOCs were identified. Three shallow ground water monitoring wells were installed and no dissolved metals (cadmium, chromium and lead) exceeding Drinking Water Standards were detected. This site was recommended for No Further Investigation by the Addendum to the Verification Step. The IR team considers determination of groundwater flow to be warranted prior to concurring with the No Further Investigation recommendation to ensure no data gaps exist.

5.3 Site 11 (RFA Site 9) - MCX Service Station Spill Area:

- This site is associated with the area around the inlet to a 500 gallon waste oil tank located adjacent to the former building 850. The tank was active from 1969 to 1983. Contaminated soils around the inlet were removed in 1983.
- This site was recommended for RFA Phase II Sampling. The exact location and condition of this site is unknown at this time. Any additional investigations at this site shall be conducted by State program(s).

5.4 Site 12 (RFA Site 10) - Jericho Island Disposal Area:

- Active from 1955 to 1968, this site was used by area residents for uncontrolled open dumping. The site received domestic trash, placed on the edge of the island extended southward to the marsh.
- This site was recommended for RFA Phase II Sampling. This site, along with adjoining Doggie Island, shall be assessed and cleaned of debris if warranted. Screening samples may be taken if determined to be appropriate. This determination shall be made by the IR team consisting of representatives from the EPA, the State, the Installation and the Navy Engineering Field Division.

5.5 Site 13 (RFA Site 11) - Inert Disposal Area A:

- Located on the south side of Horse Island, this unlined landfill receives inert material such as construction debris and yard waste. The landfill was active from 1979 to 1991 and was closed by the state.
- This site was recommended for RFA Phase II Sampling. The IR Team recommends no further action for this site since was a state controlled domestic landfill.

- 5.6 Site 13 (RFA Site 12) - Inert Disposal Area B:
- Located near Elliot's Beach, this unlined landfill received inert material such as construction debris and yard waste. The site was active from 1976 to 1979 as an interim status solid waste landfill and was closed by the state.
 - This site was recommended for RFI. The IR Team recommends no further action for this site was a state controlled domestic landfill.
- 5.7 Site 13 (RFA site 13) - Inert Disposal Area C:
- This site received dredge spoils from the marina basin and Ballast Creek. The site is underlain by the Dredge Spoils Area Fire Training Pit.
 - This site was recommended for RFA Phase II Sampling. Since there is no evidence of hazardous materials existing in the spoils, this site is recommended for no further action by the IR team. In addition, the State has approved no further action for this site.
- 5.8 Site 14 (RFA Site 14) - Storm Sewer Outfalls:
- This site consists of the piping system that has been in place since 1918. The system includes more than 60 outfalls that discharge into the surrounding surface waters. Small amounts of wastes from garages and other shops, dispensary/dental clinic, photo lab, steam plant and cooling tower were reportedly discharged into the storm sewers prior to the mid 1970s.
 - This site was recommended for RFA Phase II Sampling. Additional samples are expected to be taken as part of an SI to screen this site. Any screening will concentrate on the outfalls that originate from potential industrial sources.
- 5.9 Site 15 (RFA Site 15) - Dirt Roads:
- Waste oils were deposited on dirt roads throughout the Depot from 1941 to 1966 for dust control. Many of these roads have since been paved over with asphalt.
 - This site was recommended for RFA Phase II Sampling. The IR team recommends no further action since the only remaining dirt roads of concern that have not been paved are adjacent to site 2 and will be addressed as part of the RI/FS for Site 2.
- 5.10 RFA Site 21 - Weapons Power Plant Oil/Water Separator:
- Active since the 1980s, this site receives runoff from a fuel oil unloading area. Effluent from the separator flows to the nearby marsh.
 - This site was recommended for RFA Phase II Sampling. Any additional effort for this site will be conducted under State program(s).
- 5.11 RFA Site 27 - Equipment Parade Deck Satellite Accumulation Area:
- This site is located on the former 3rd Battalion Parade Deck. The site is approximately 1000 square feet in size located on an asphalt pad approximately 1 acre in size. The site is used as an equipment laydown area and for storage of salvage items. Evidence of stained and cracked asphalt was noted

- This site was recommended for RFA Phase II Sampling. Sampling are expected to be conducted as part of an SI to screen this site for RI/FS. The SI is expected to start fiscal year 1997.
- 5.12 RFA Site 28 - Power Station Satellite Accumulation Area:
- This site is a small outdoor concrete pad located behind the Main Power Plant, used for storage of kerosene, waste oil and waste oil contaminated soils since the mid 1980s. The pad is cracked and stained.
 - This site was recommended for RFA Phase II Sampling. Any required screening samples shall be conducted under State program(s).
- 5.13 RFA Site 35 - Defense Reutilization and Marketing Office (DRMO) Salvage Yard:
- Approximately 3 acres in size, this site has received salvage items from the Depot and the Marine Corps Air Station in Beaufort since 1964. Approximately 80% of the yard is paved with asphalt. Cracked asphalt was noted beneath lead-acid batteries placed in the area. All batteries are required to be drained prior to DRMO receiving the material.
 - This unit was recommended for RFA Phase II Sampling. Screening samples shall be taken as part of an SI.
- 5.14 RFA Site 38 - Underground Waste Oil Tank:
- Active since the 1970s, this site is located at the Diesel shop, building 864 and received waste oil and paint wastes. The is no longer active and are scheduled to be removed during fiscal year 1996.
 - This site was recommended for RFA Phase II Sampling. Screening effort for this site shall be performed under State program(s).
- 5.15 RFA Site 39 - Electrolyte Basin:
- This site is associated with the battery acid tank outside the battery room at the Motor Transport, building 155. The tank received used battery acid disposed of during battery maintenance. Acid is no longer deposited into the tank. Details of the tank configuration, condition any connection to the Sanitary Sewer is unknown at this time.
 - This site is recommended for a Preliminary Assessment (PA).
- 5.16 RFA Site 41 - Former Incinerator:
- This site is associated with Site 1, Incinerator Landfill. Ash collected in the incinerator sink during incinerator operations was deposited into the adjacent landfill.
 - -This site shall be evaluated in conjunction with the RI/FS for Site 1.
- 5.17 RFA Site 42 - Sanitary Sewer System:
- The system has been in place since 1918 and transfers wastewater to the on-site wastewater treatment facility. Effluent from the treatment facility is discharged to the Beaufort River.

- This site was recommended for RFA Phase II Sampling. This site is recommended for no further action by the IR team since the outfall is regulated by the NPDES permit.
- 5.18 RFA Site 43 - Motor Pool Underground Waste Oil Tank:
- This site (tank 176) is located near the Outdoor Motor Pool and received waste oils. The tank has been inactive since approximately 1982, is scheduled for removal during fiscal year 1996. Staining was noted around the tank inlet.
 - This site was recommended for RFA Phase II Sampling. Initial screening efforts for this site shall be conducted under State program(s).
- 5.19 Site 8 (RFI Sites AOC A and AOC B) - PCB Spill Areas:
- These sites are associated with PCB spills from transformers in 1983 and 1984. In both cases, the spills were cleaned up and PCB contaminated materials were properly disposed of.
 - Phase II Sampling was recommended by the RFA but the IR Team recommended for No Further Investigation for these sites pending Document Reviews to ensure adequacy of cleanup.
- 5.19 Site 9 (RFI Site AOC C) - Gasoline Spill Area
- This site is associated with a spill of approximately 97 gallons of gasoline near building 170 in 1983. Contaminated soils were removed and disposed.
 - Phase II Sampling was recommended by the RFA but the IR Team recommended for No Further Investigation for this site.
6. Newly Identified Sites Proposed for PA: -
- 6.1 Septic Tanks: Several inactive septic tanks exist in areas where there was a potential for hazardous substances to have been introduced. These areas include the 13th hole of the golf course (pesticides) and the Old Hobby Shop (oils and solvents). Both active and inactive septic tanks exist in other locations on the island but are not being considered for assessment since there is potential for having received contaminants.
- 6.2 Old Dry Cleaning Facility: A dry cleaning facility existed prior to the dry cleaning that is presently used. The exact location of the facility is unknown. Although there are no known releases from this facility, the site is included since dry cleaning facilities historically have exhibited a high potential for releases.
- 6.3 Transformer Staging Area: The Base Operating Service Contractor used a fenced area behind building 177 for the storage of transformers between approximately 1990 and 1992. PCB contaminated transformers may have been stored at this location.

- 6.4 Hobby Shop: Contamination is suspected in an abandoned steam line condense pit adjacent to the current Hobby Shop. The type, source and extent of the contaminant is unknown.
- 6.5 Old Photo Shop: The Old Photo Shop was located at the former building 853. Although there are no known releases from this facility, the site is included since photo shops historically have exhibited a high potential for releases.
- 6.6 Existing Photo Shop: The Photo Shop is located in building 283. Although there are no known releases from this facility, the site is included since dry cleaning facilities historically have exhibited a high potential for releases.
- 6.7 DRMO: The DRMO is located at building 629 and 630. The history of operations at this site are uncertain and there is a potential for past releases.
- 6.8 Rifle Ranges: This item concerns military small arms ranges and recreational ranges such as skeet ranges. The EPA is currently developing regulations for ranges. Assessment of ranges will not progress until regulatory guidelines are in place.
- 6.9 Daylight Infiltration Course: This site has been investigated by an Addendum to the Verification Step and was recommended for No Further Investigation. The IR Team proposes limited investigation of this site to ensure data gaps do not exist.
- 6.10 Old Weapons Cleaning Areas: Weapons cleaning practices are proposed for assessment to determine if solvent wastes generated during cleaning operations were accumulated at a given site(s).

Comprehensive Listing of IRP Sites

<u>Description</u>	<u>Site No.</u>
Incinerator Landfill	Site 1
Borrow Pit Landfill	Site 2
Causeway Landfill	Site 3
Dredge Spoils Fire Training Pit	Site 4
Former Paint Shop Disposal Area	Site 5
Former Automotive Hobby Shop Spill Area	Site 6
Page Field Fire Training Pit	Site 7
PCB Spill Areas	Site 8 (RFA Site AOC A/B)
Paint Waste Storage Area	Site 9 (RFA Site 8)
Gasoline Spill Area	Site 10 (RFA Site AOC C)
MCX Service Station Spill Area	Site 11 (RFA Site 9)
Jericho Island Disposal Area	Site 12 (RFA Site 10)
Inert Disposal Area A	Site 13 (RFA Site 11)
Inert Disposal Area B	Site 13 (RFA Site 12)
Inert Disposal Area C	Site 13 (RFA Site 13)
Storm Sewer Outfalls/System	Site 14
Dirt Roads	Site 15
Pesticide Rinsate Disposal Area	Site 16
Page Field Tanks (AS-16)	Site 17
Page Field Tanks (AS-18)	Site 18
MCX Service Station	Site 19 (RFA Site AOC D)
Diesel Shop Vehicle Washing Pad	RFA Site 19
Power Station Oil/Water Separator	Site 20
Weapons Power Plant Oil/Water Separator	Site 21
Motor Transport Car Wash	Site 22
Indoor Dental Lab SAA	Site 23
Dental Lab SAA	Site 24
Paint Shop SAA	Site 25
Pesticide SAA	Site 26
Equipment Parade Deck	Site 27
Power Station SAA	Site 28
Indoor Motor Pool SAA	Site 29
Empty Drum Storage Area	Site 30
Weapons Power Plant SAA	Site 31
Laundry SAA	Site 32
Outdoor Motor Pool SAA	Site 33
Motor Pool Waste Oil Tank	Site 34
DRMO Salvage Yard	Site 35
Hazardous Waste Storage Building	Site 36
Overflow Storage Pad	Site 37
Underground Waste Oil Tank	Site 38

Comprehensive Listing of IRP Sites (Continued)

<u>Description</u>	<u>Site No.</u>
Electrolyte Basin/Tank	Site 39
Sanitary Wastewater Treatment Plant	Site 40
Former Incinerator	Site 41
Sanitary Sewer System	Site 42
Motor Pool Underground Waste Oil Tank	Site 43
Dumpsters	Site 44
Dry Cleaning Facility Spill Area	Site 45 (Proposed)

IRP Sites Recommended for RI/FS

<u>Description</u>	<u>Site No.</u>
Incinerator Landfill	Site 1/41
Borrow Pit Landfill	Site 2/15
Causeway Landfill	Site 3
Pesticide Rinsate Disposal Area	Site 16
Dry Cleaning Facility Spill Area	Site 45 (Proposed)

IRP Sites Recommended for SI

<u>Description</u>	<u>Site No.</u>
Dredge Spoils Fire Training Pit	Site 4
Former Paint Shop Disposal Area	Site 5
Page Field Fire Training Pit	Site 7
Jericho Island Disposal Area	Site 12 (RFA Site 10)
Storm Sewer Outfalls/System	Site 14
Equipment Parade Deck	Site 27
DRMO Salvage Yard	Site 35

IRP Sites Recommended for PA

<u>Description</u>	<u>Site No.</u>
Electrolyte Basin/Tank	Site 39
Septic Tanks	
Old Dry Cleaning Facility	

IRP Sites Recommended for PA (Continued)

<u>Description</u>	<u>Site No.</u>
Transformer Staging Area	
Hobby Shop	
Old Photo Shop	
Existing Photo Shop	
DRMO	
Rifle Ranges	
Daylight Infiltration Course	
Old Weapons Cleaning Areas	

IRP Sites Recommended for NFI

<u>Description</u>	<u>Site No.</u>
PCB Spill Areas	Site 8 (RFA Site AOC A/B)
Inert Disposal Area A	Site 13 (RFA Site 11)
Inert Disposal Area B	Site 13 (RFA Site 12)
Inert Disposal Area C	Site 13 (RFA Site 13)
Diesel Shop Vehicle Washing Pad	RFA Site 19
Power Station Oil/Water Separator	Site 20
Motor Transport Car Wash	Site 22
Indoor Dental Lab SAA	Site 23
Dental Lab SAA	Site 24
Paint Shop SAA	Site 25
Pesticide SAA	Site 26
Equipment Parade Deck	Site 27
Power Station SAA	Site 28
Indoor Motor Pool SAA	Site 29
Empty Drum Storage Area	Site 30
Weapons Power Plant SAA	Site 31
Laundry SAA	Site 32
Outdoor Motor Pool SAA	Site 33
Motor Pool Waste Oil Tank	Site 34
Sanitary Wastewater Treatment Plant	Site 40
Sanitary Sewer System	Site 42

IRP Sites Recommended for Transfer to State Programs

<u>Description</u>	<u>Site No.</u>
Former Automotive Hobby Shop Spill Area	Site 6
Gasoline Spill Area	Site 10 (RFA Site AOC C)
MCX Service Station Spill Area	Site 11 (RFA Site 9)
Page Field Tanks (AS-16)	Site 17
Page Field Tanks (AS-18)	Site 18
MCX Service Station	Site 19 (RFA Site AOC D)
Weapons Power Plant Oil/Water Separator	Site 21
Hazardous Waste Storage Building	Site 36
Overflow Storage Pad	Site 37
Underground Waste Oil Tank	Site 38
Motor Pool Underground Waste Oil Tank	Site 43

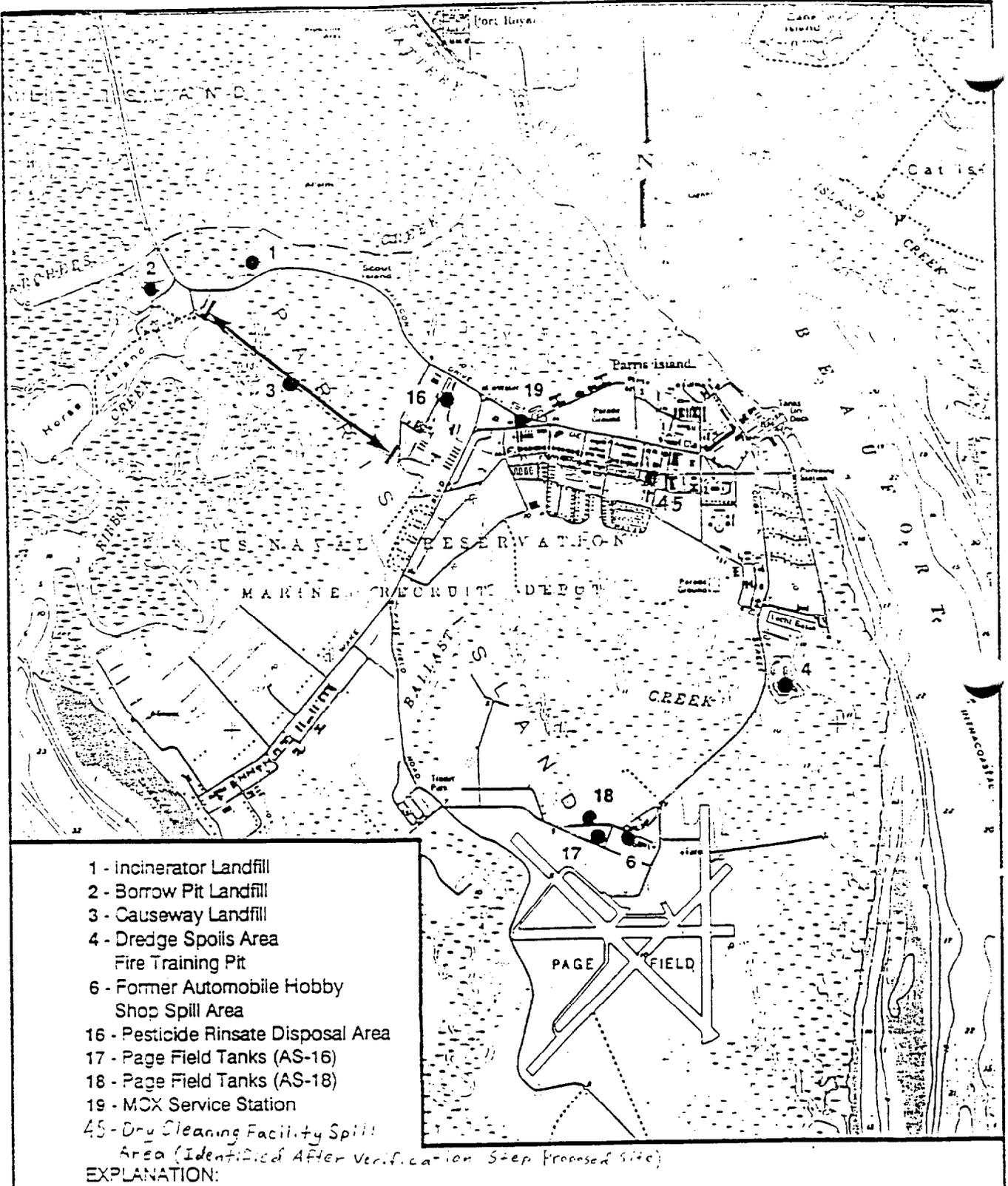
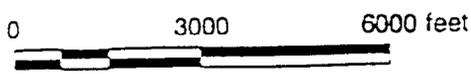
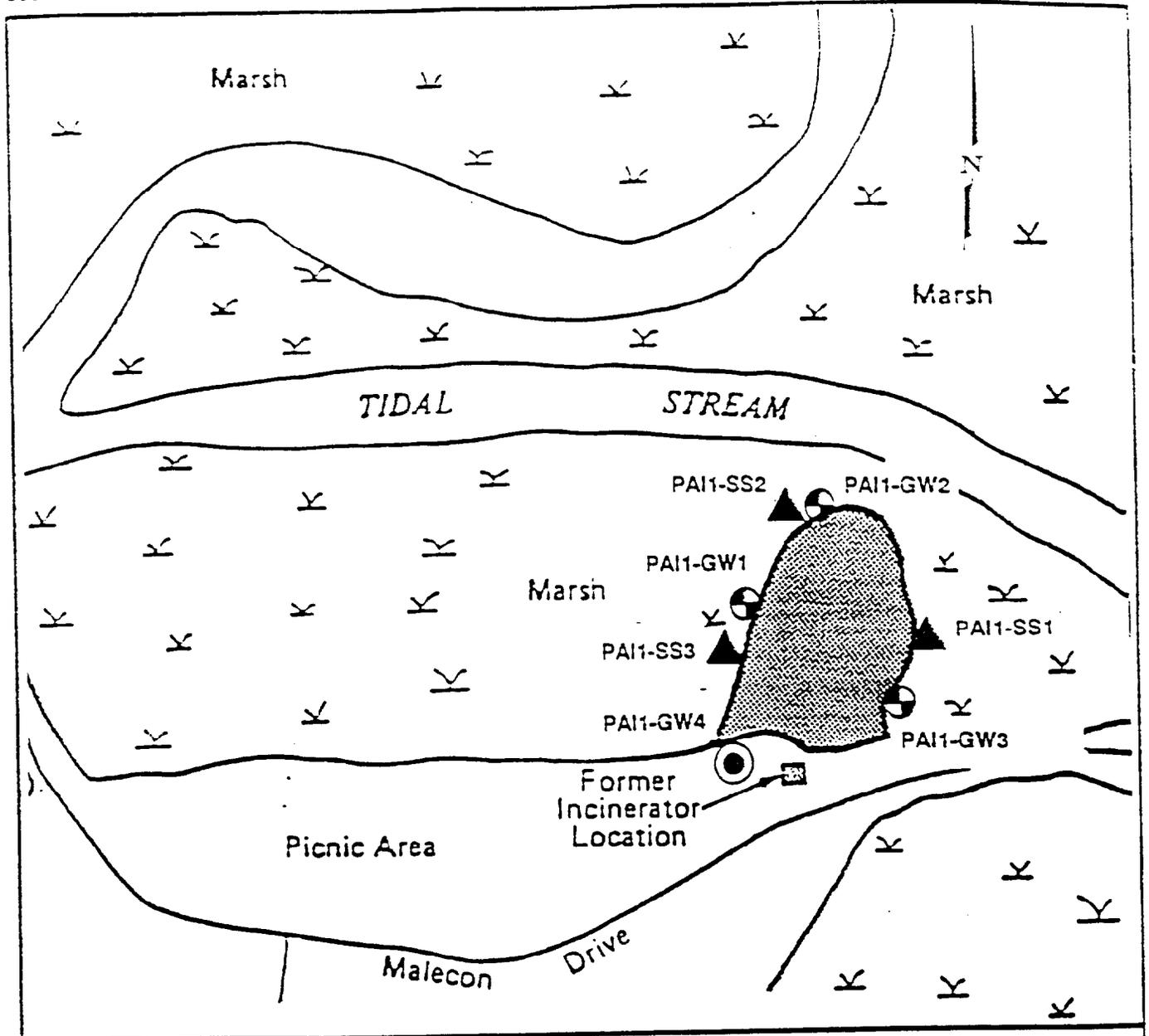


FIGURE 1
 SHOWING LOCATIONS OF WASTE MANAGEMENT UNITS



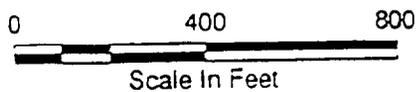


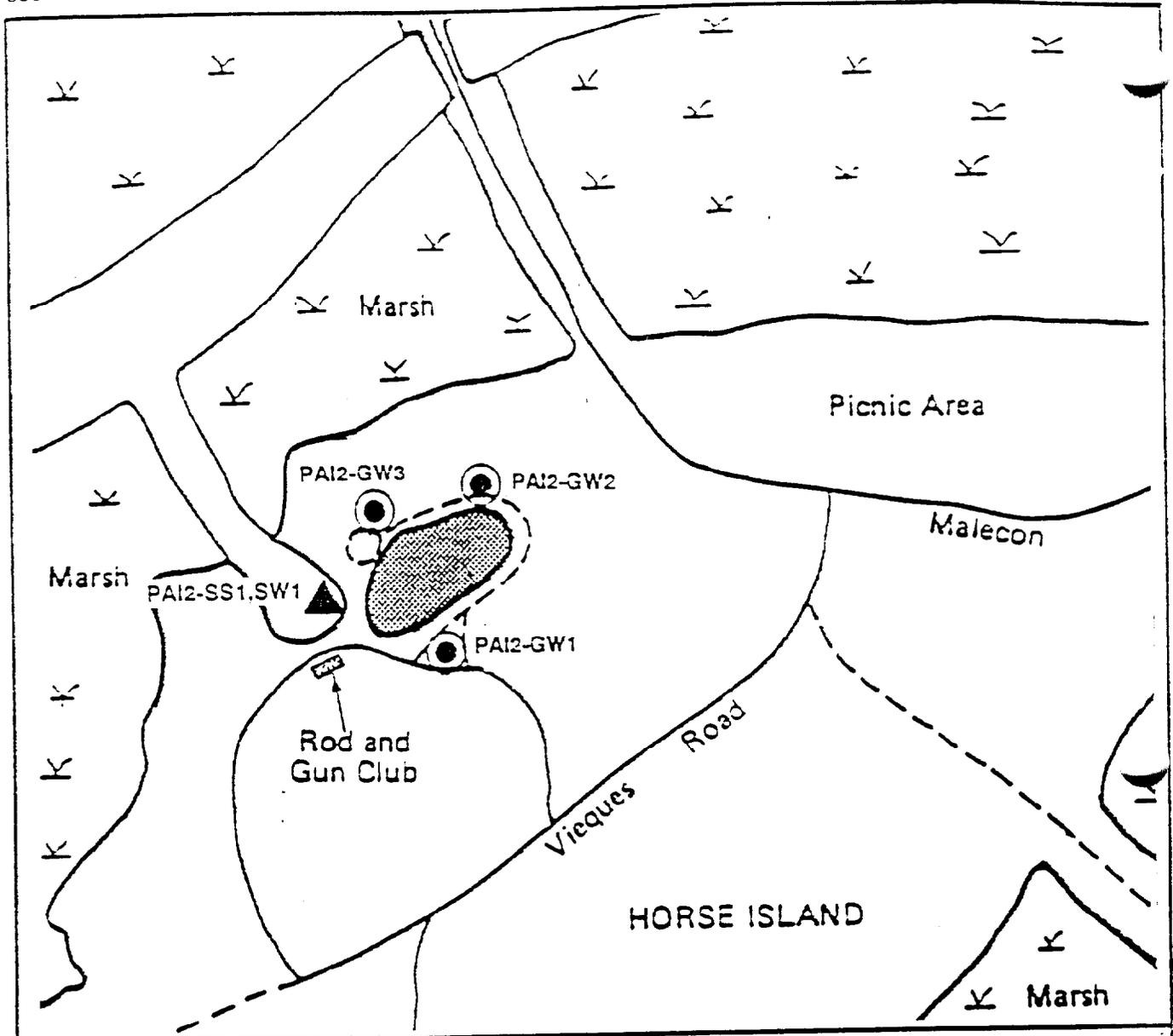
EXPLANATION:

- PAI1-GW4 ● Monitoring well/groundwater sample
- PAI1-GW3 ⊙ Temporary piezometer/groundwater sample
- PAI1-SS3 ▲ Surface sediment samples
- Site
- ▣ Structure

(modified from surveyor's notes)

FIGURE 2
SAMPLING LOCATIONS AT SITE 1





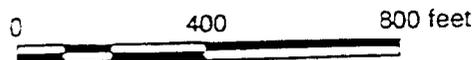
EXPLANATION:

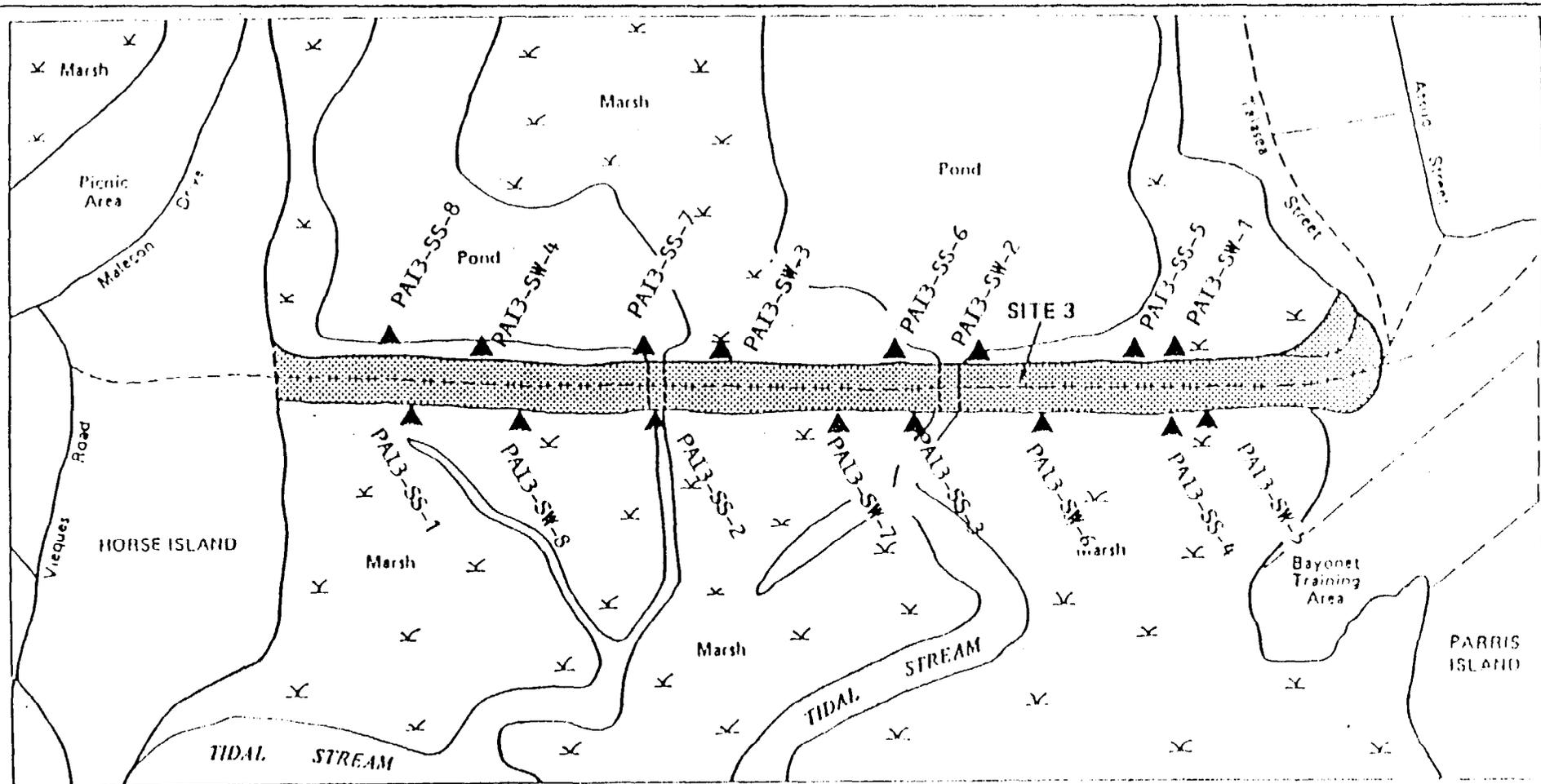
- Monitoring well/groundwater sample
- ▲ Surface water and sediment samples
- ▨ Site
- ▩ Structure
- Dirt Road

(modified from IAS reports)



FIGURE 3
SAMPLING LOCATIONS AT SITE 2



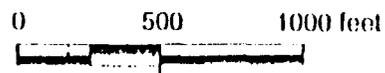


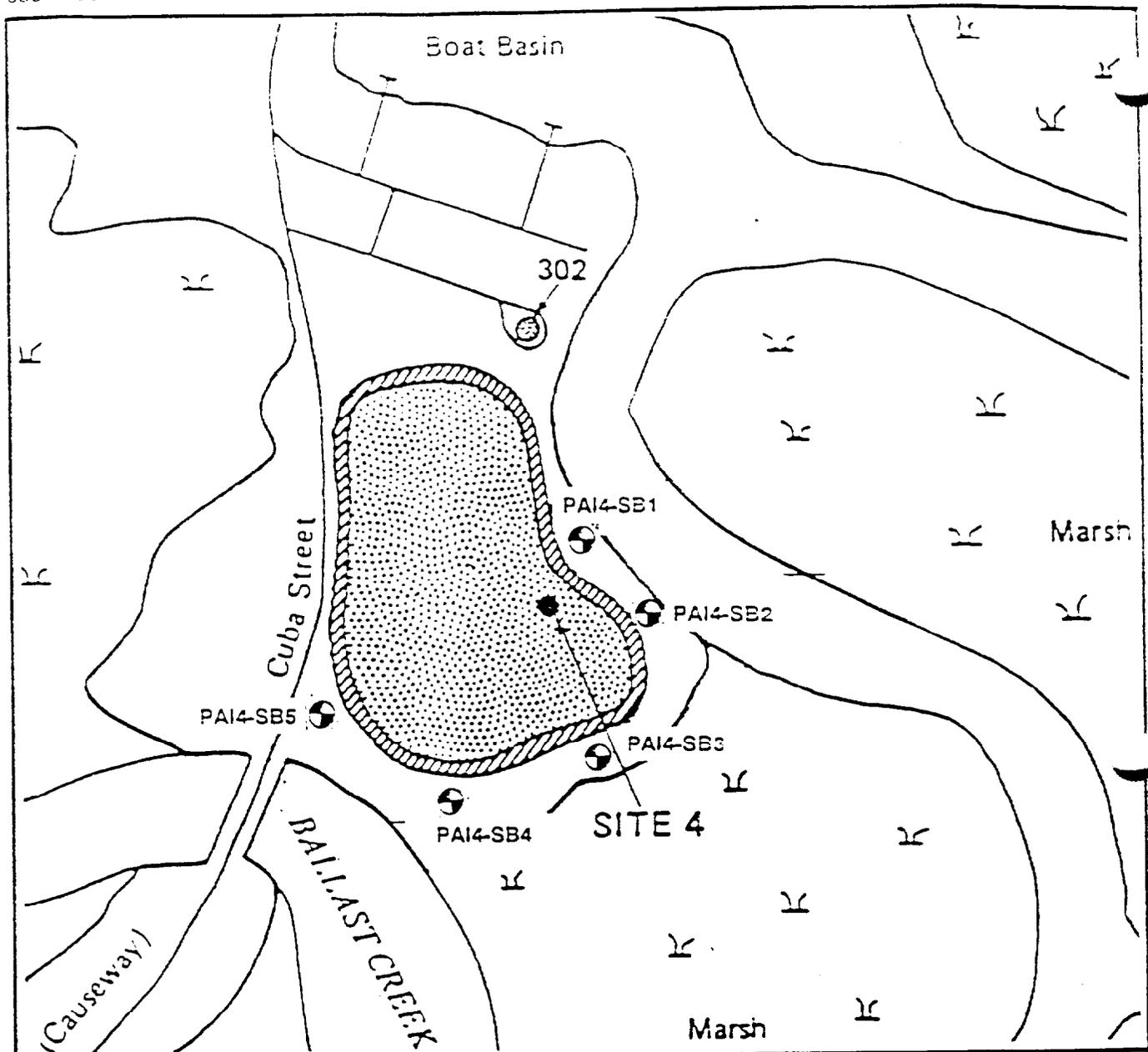
EXPLANATION:

Note: These are approximate locations

- ▲ Seep/surface water and causeway sediment sample
- Site
- Dirt Road

FIGURE 4
SAMPLING LOCATIONS AT SITE 3





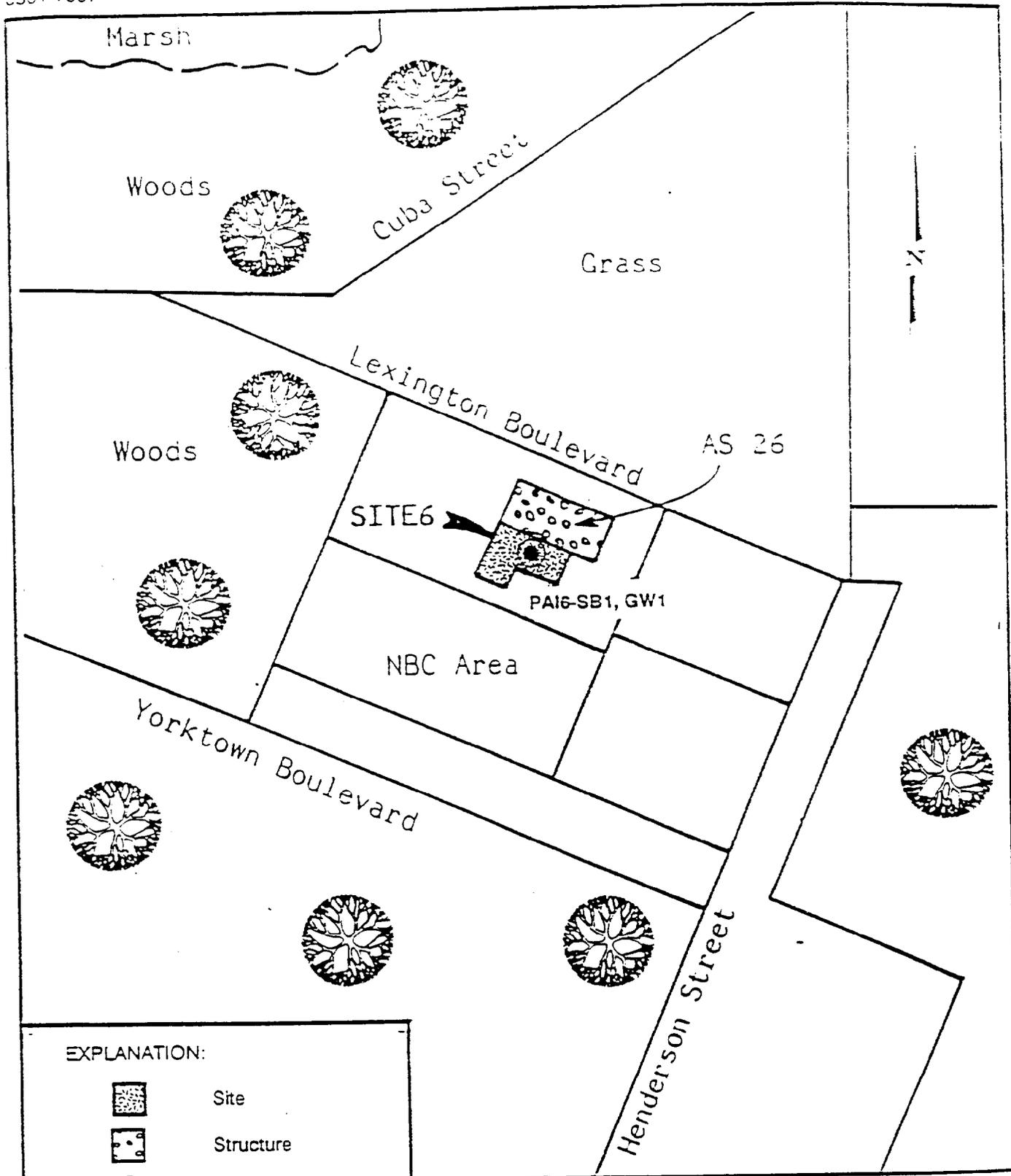
EXPLANATION:

-  Soil boring
-  Dredge Spoils Area
-  Spoils Area Berm
-  Structure
-  Site



FIGURE 5
SAMPLING LOCATIONS AT SITE 4



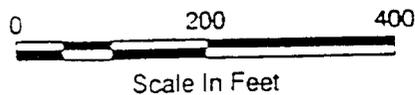


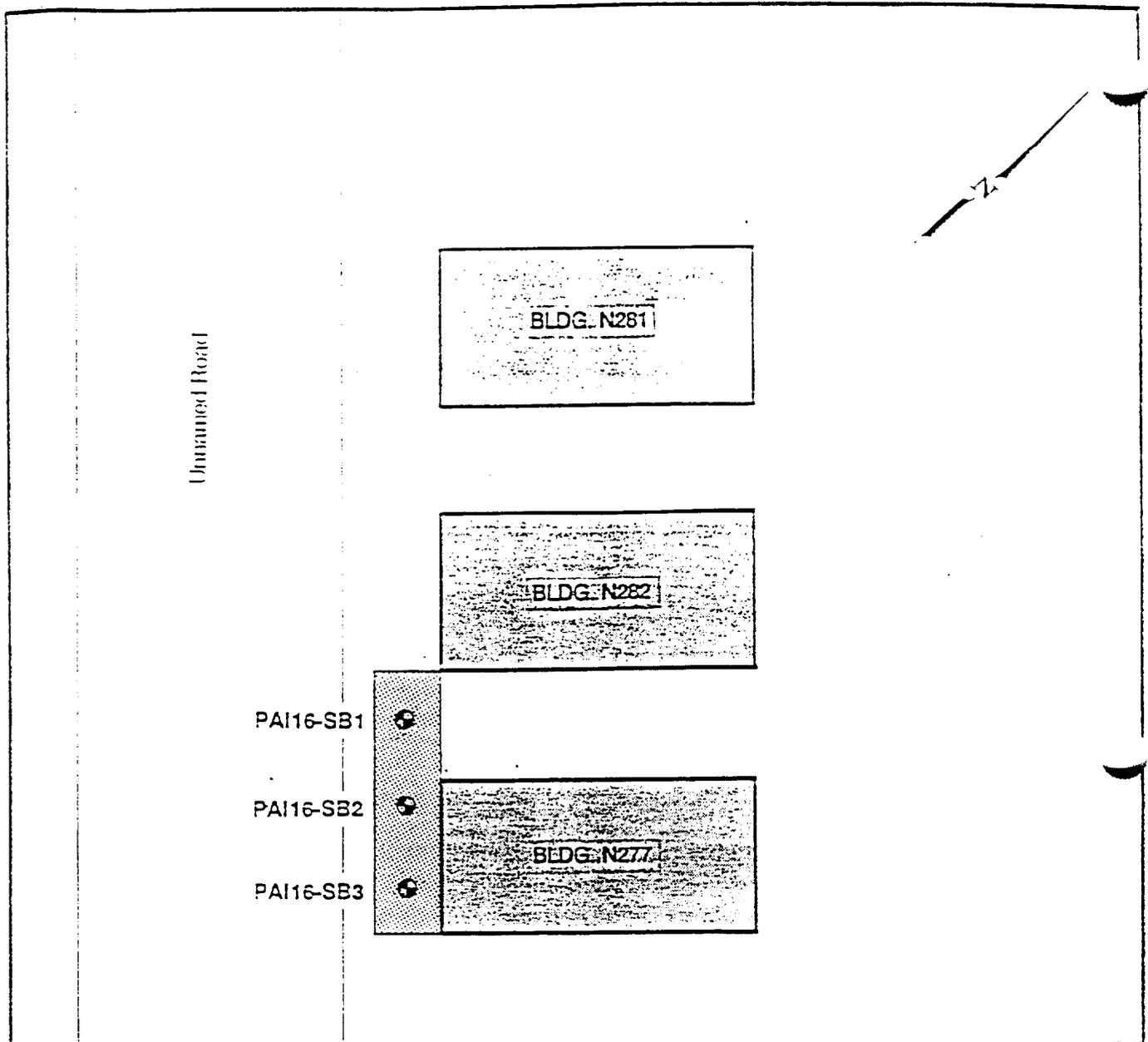
EXPLANATION:

-  Site
-  Structure
-  Monitoring well

(modified from IAS report)

FIGURE 6
SAMPLING LOCATIONS AT SITE 6





EXPLANATION:



Site



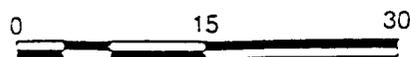
Structure



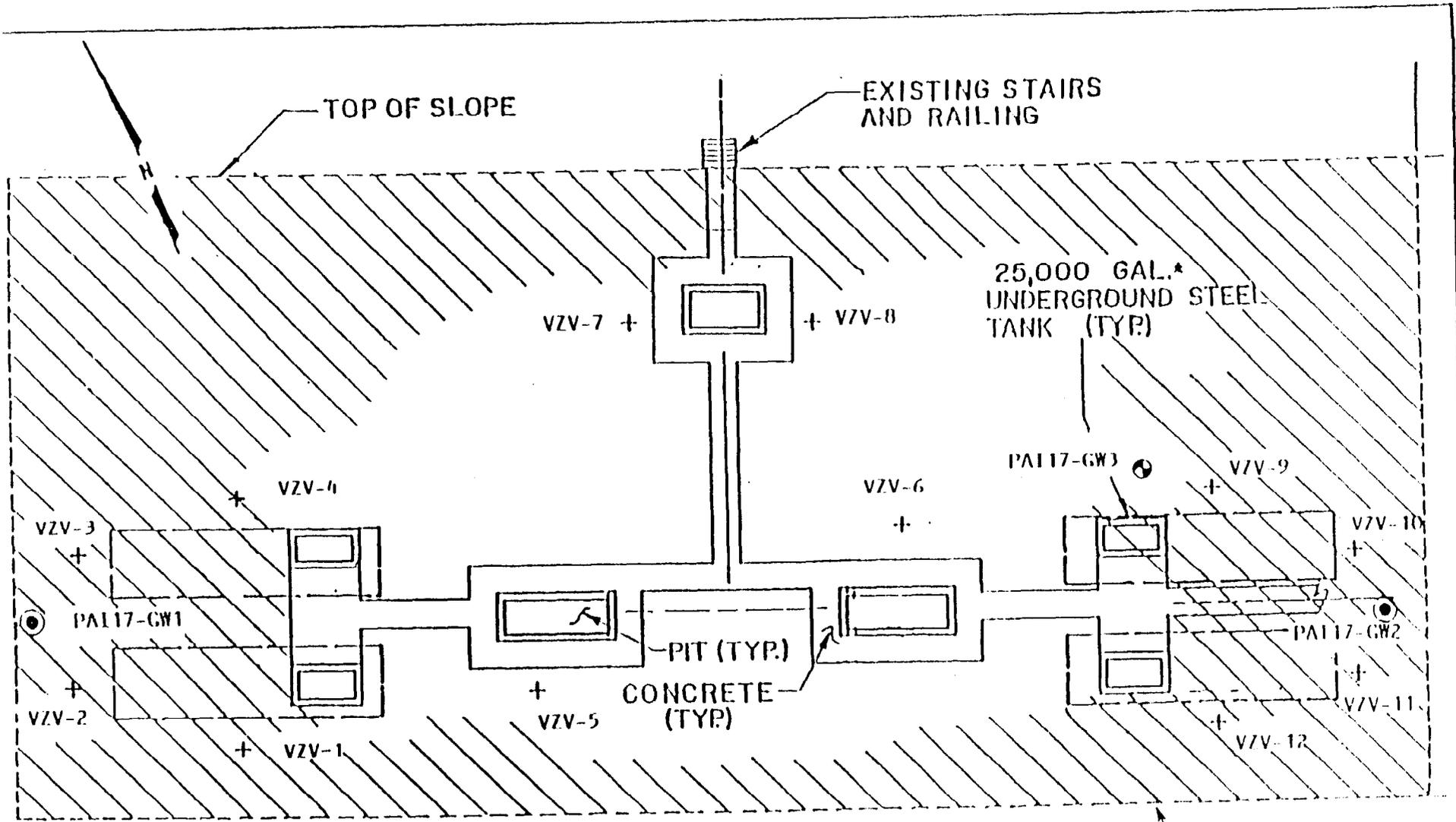
Soil boring

(modified from IAS report)

FIGURE 7
SAMPLING LOCATIONS AT SITE 16



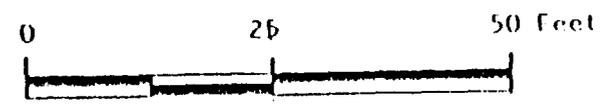
Scale In Feet

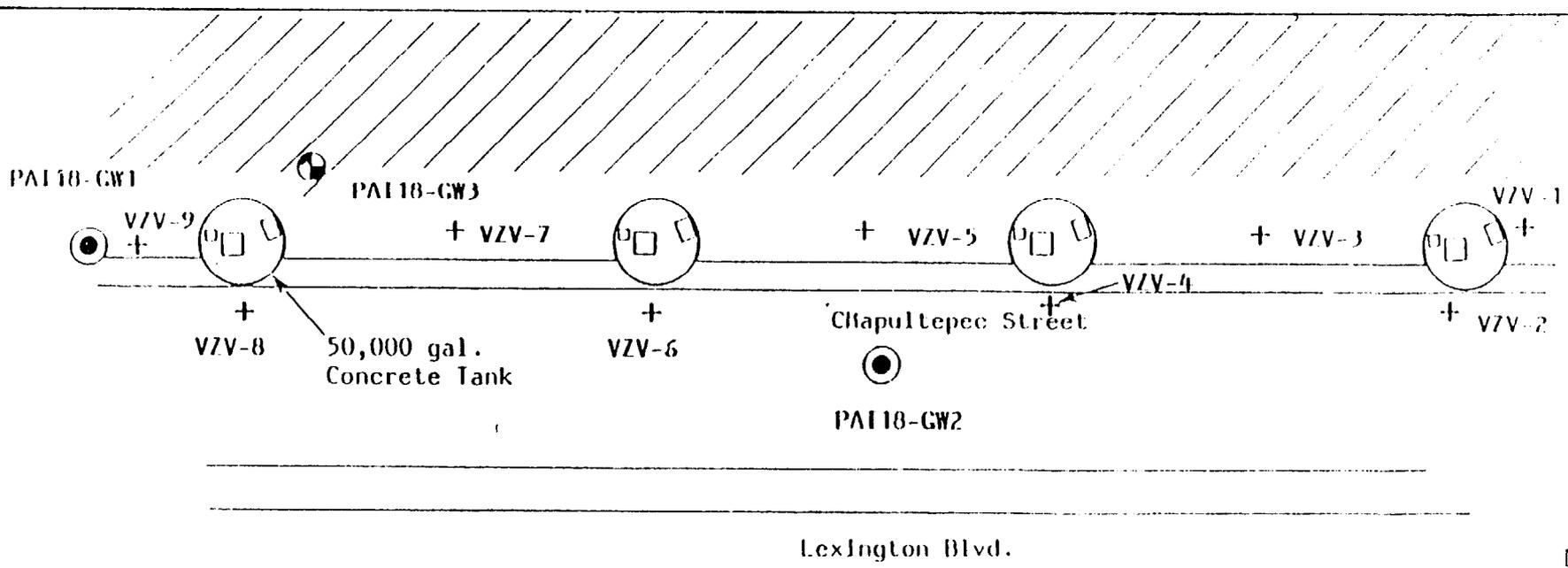


EXPLANATION:

- Existing monitoring well, Installed by previous contractor
- ⊙ Monitoring well
- + VZV probe location

FIGURE 8
SAMPLING LOCATIONS AT SITE 17



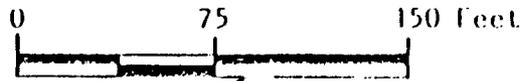


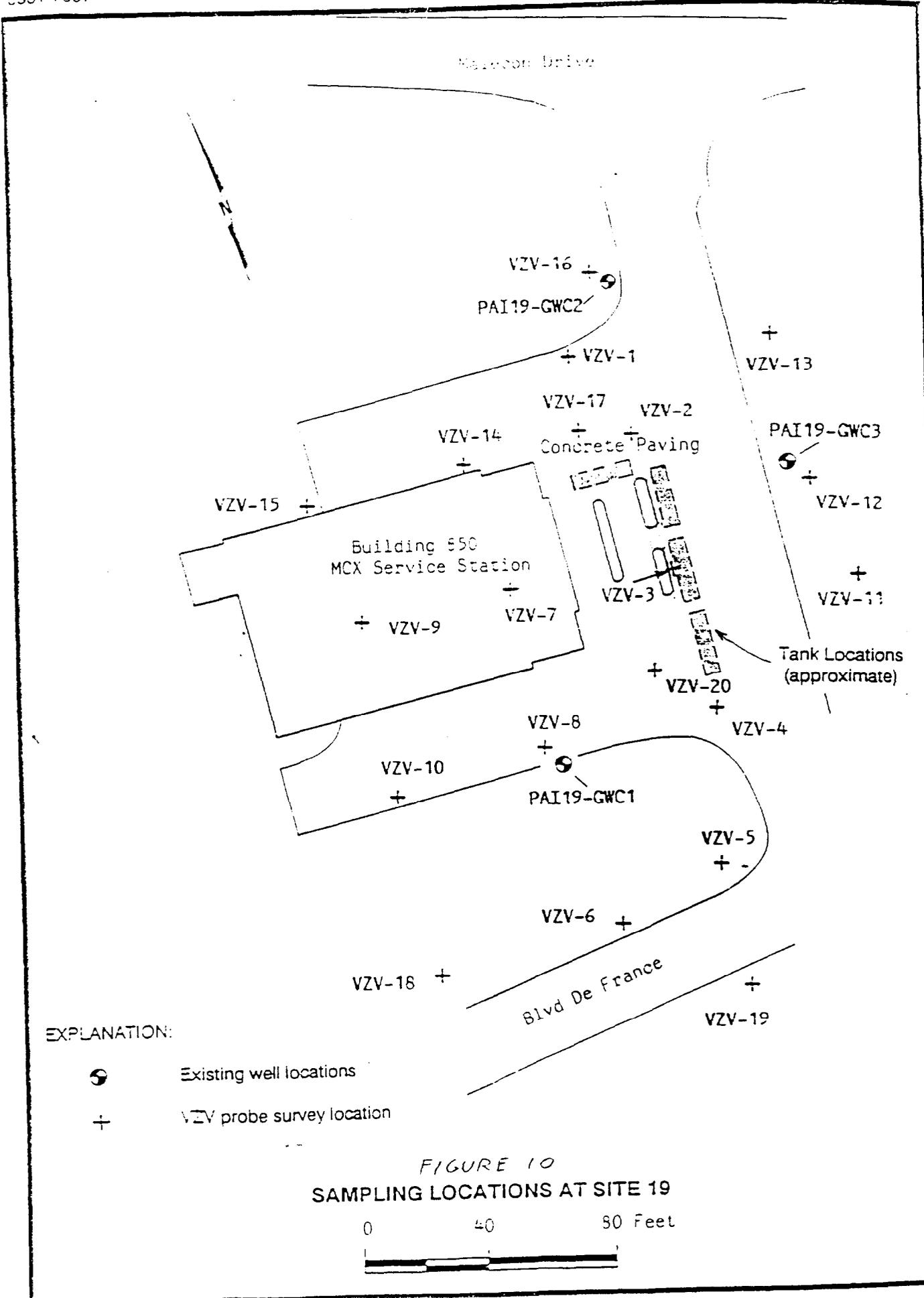
EXPLANATION:

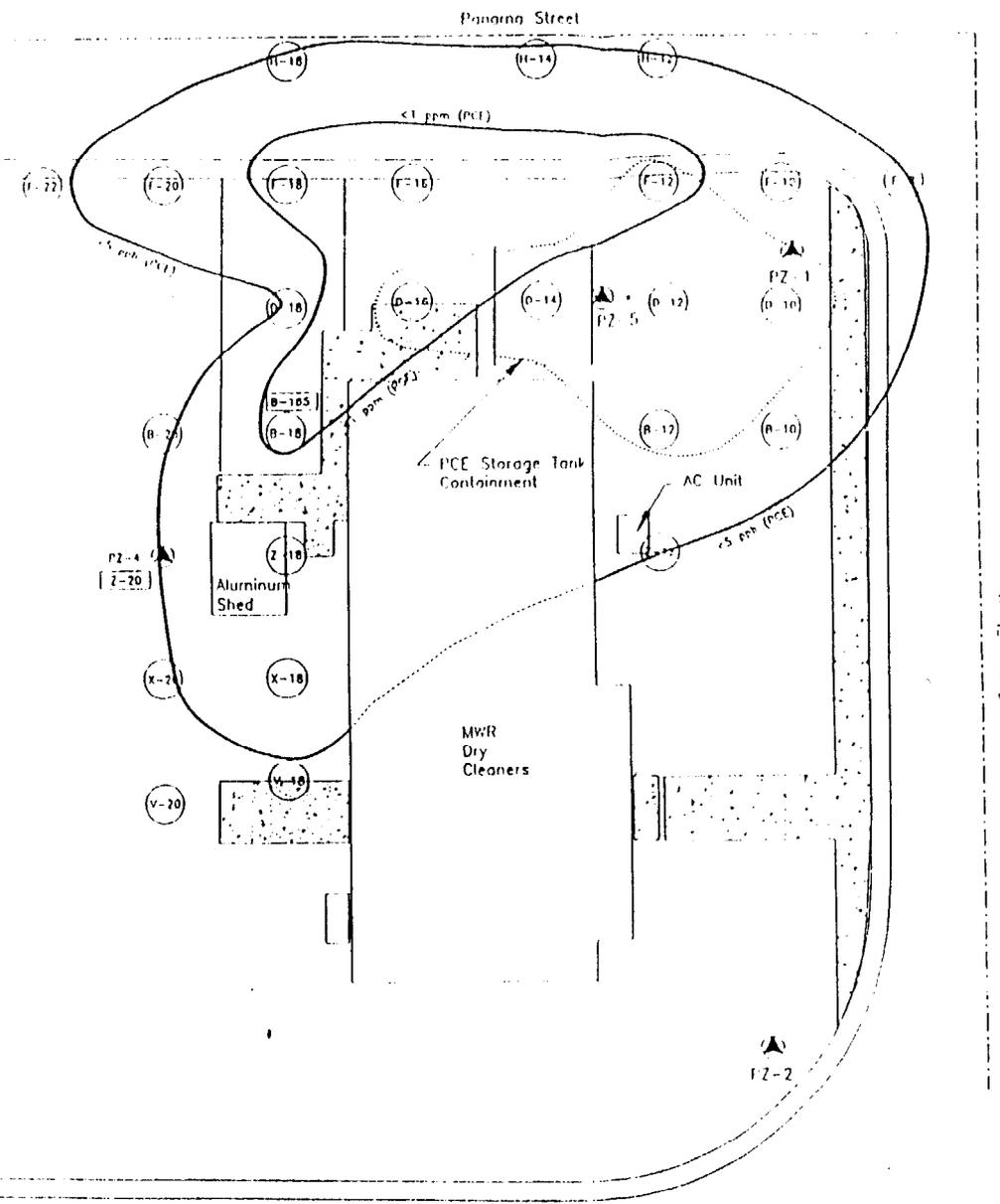
-  Area Inaccessible to VZV Probe equipment
- PAI18-GW3  Existing monitoring well, Installed by previous contractor
- PAI18-GW1  Monitoring well
- VZV-6  VZV Probe location

(modified from MCRD engineering drawings)

FIGURE 9
SAMPLING LOCATIONS AT SITE 18







Legend

- (PZ-#) Air Sample
- (B-#) Additional Sample
- (B-#) Borehole
- (D-#) Diameter
- (PZ-#) Estimated Groundwater Depth
- (#) Estimated Groundwater Concentration
- (#) Infiltration Contour
- (#) Pore Free Bore
- (#) Pore Free Well
- (#) Estimated Groundwater Concentration



Groundwater Inconcentration Map
GC Analysis
MWR Dry Cleaners
Parris Island, South Carolina

SCALE 1" = 20'	DRAWN BY ST	DATE 6-14-94
JOB NO. 1134-94-202	INCHES 7	

FIGURE 11
SAMPLE LOCATIONS AT SITE 45 (PROPOSED)

CERTIFIED MAIL

18 July 95

Commanding General/MCRD/ERR
ATTN: AC/SI&L (NREAO)
P. O. Box 19001
Parris Island, SC 29905-9001

RE: Interim RCRA Facility Assessment (RFA) Report for the Marine Corps Recruit Depot
dated 4 April 1990.

Dear Commanding General:

The Bureau of Solid and Hazardous Waste Management of the South Carolina Department of Health and Environmental Control (Department) has reviewed the above-referenced submittal with respect to the requirements of R.61-79 of the South Carolina Hazardous Waste Management Regulations, the EPA RCRA Facility Assessment Guidance document dated October 1988, and the EPA Region IV Environmental Compliance Branch Standard Operating Procedures and Quality Assurance Manual (SOP/QAM) dated 1 February 1991.

In addition, the Department has reviewed the MCRD memorandum dated 12 June 95 (SUBJ: National Priority List (NPL) Meeting of 8 June 95) detailing the results of the MCRD Site Screening Exercise of 6 & 7 June 95. A draft of the correspondence's contents was presented to the Department during the 8 June 95 meeting at the MCRD in which the Department, the Environmental Protection Agency, and MCRD base personnel were represented. Based upon the results of the review, the Department has made one of the following determinations for each of the solid waste management units (SWMUs) listed in the Interim RFA dated 4 April 90 (Comments on a number of SWMUs are also listed below and SWMU-specific decisions are listed in the Attachment).

1. No Further Action (NFA)
 - a. The Department concurred with the MCRD NFA recommendation for the Dredge Spoils Area Fire Training Area (SWMU 4) in correspondence (Baize to Nabors) dated 23 August 89.
 - b. The Department concurs with the MCRD recommendation for NFA at the Inert Disposal Area A (SWMU 11) and the Inert Disposal Area B (SWMU

12). These landfills were permitted by the state (Domestic Waste Permit Numbers 909 and 905, respectively) and reportedly managed only cellulosic construction debris and yard waste.

- c. The Department concurred with the MCRD NFA recommendation for the Daylight Infiltration Course in correspondence (Baize to Nabors) dated 23 August 89. Please note that this site has been listed on page ten of the MCRD memorandum dated 12 June 95.

2. RCRA Facility Assessment Addendum (RFA Addendum)

The Department was unable to make final decisions on a number of SWMUs due to insufficient information. A more comprehensive RFA than the assessments reported in the 4 April 90 Interim RFA is warranted at the following SWMUs (a more comprehensive RFA would include more detailed descriptions of the SWMU or historical analytical data).

- a. The Department concurs with the MCRD and Environmental Protection Agency recommendation to further assess the Jericho Island Disposal Area (SWMU 10).
- b. The MCRD indicated that analytical data may be available for the Equipment Parade Deck Satellite Accumulation Area (SWMU 27) [location of a Polychlorinated Biphenyl (PCB) spill], the PCB Spill Area A (AOC A), and the PCB Spill Area B (AOC B).

Should analytical data or other relevant information become available from the MCRD file search, this information should be incorporated in the RFA Addendum. Should analytical data not be available for the sites, then RCRA Facility Assessment Confirmatory Sampling is required.

- c. The Department concurs with the MCRD and Environmental Protection Agency recommendation to further assess the Electrolyte Basin (SWMU 39).

3. RCRA Facility Assessment Confirmatory Sampling (RFA CS)

- a. RFA CS is required for the groundwater at the Inert Disposal Area C (SWMU 13). The limited sampling at the Dredge Spoils Area Fire Training Pit (SWMU 4) which underlies SWMU 13 was reported in the Remedial Investigation Verification Step dated April 1989. The investigation, however, did not include sampling of the groundwater at

SWMU 13.

- b. The Department generally requires investigation of oil/water separators to be managed by this Bureau as RCRA Subtitle C SWMUs; the Weapons Power Plant Oil/Water Separator (SWMU 21) requires RFA CS.
- c. The Laundry Satellite Accumulation Area (SWMU 32) minimally requires RFA CS. The MCRD may perform RFA CS at SWMU 32 in an effort to eliminate this SWMU from further investigation or combine the investigation at SWMU 32 with the required RCRA Facility Investigation at the Dry Cleaning Facility Spills Area (SWMU 45). Please note the following comments.
 - i. There is high potential that SWMU 32 may be a contributing source unit for known tetrachloroethylene (PCE) contamination reported at SWMU 45, as SWMU 32 is located in close proximity and reportedly managed large quantities of PCE (Interim RFA, April 1990).
 - ii. The Tetrachloroethylene Contamination Assessment and Conceptual Corrective Action Plan dated June 1994 concluded that additional releases of lesser magnitude may have occurred at SWMU 45 over a period of time due to the size of the PCE groundwater plume and soils conditions.

4. RCRA Facility Investigation (RFI)

Self-explanatory. See the RCRA Facility Investigation Guidance document (EPA-530/SW-89-031).

5. RCRA Hazardous Waste Management Unit Closure (RCRA Closure)

The Hazardous Waste Storage Building (SWMU 36) is undergoing closure activities per the South Carolina Hazardous Waste Management Regulations. Provided there is no groundwater contamination at the interim status hazardous waste management unit, SWMU 36 will not be addressed under the MCRD's RCRA corrective action program.

6. State Underground Storage Tank Program (State UST)

As the contamination at certain SWMUs evidences primarily petroleum contamination or chemical constituents of petroleum products and the SWMUs

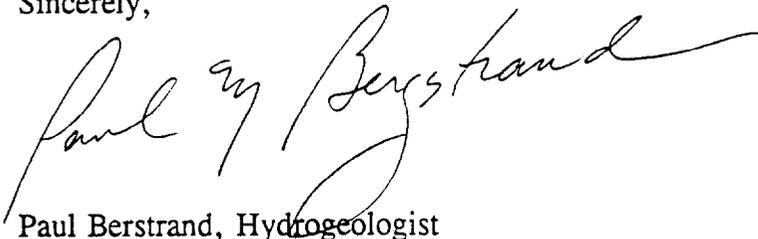
Commanding General
18 July 95
Page 4

reportedly managed only virgin petroleum products, the SWMUs in Attachment 1 with the State Underground Storage Tank (State UST) designation will be managed by Mr. Tim Mettlen in the Department's Groundwater Protection Division (GWPD). Noting the following Bureau comments, further correspondence concerning these SWMUs should be directed to Mr. Mettlen.

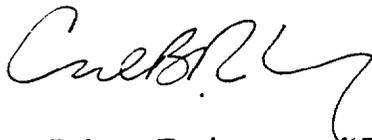
- a. In response to the MCRD's Closure Report dated 13 October 92, the Department concurred with the recommendations for further assessment at the Former Automotive Hobby Shop Spill Area (SWMU 6) in correspondence (McInnis to Commanding General) dated 24 Nov 92.
- b. Soil sampling activities are required at the Gasoline Spill Area (AOC C).
- c. The Department required further tank removal/assessment activities to be coordinated with the Department's GWPD at the Page Field Tanks (SWMUs 17 and 18) and the MCX Service Station (AOC D) in correspondence (Baize to Nabors) dated 23 August 89.

The Department appreciates the opportunity to comment on these submittals and looks forward to reviewing the submittal of the RCRA Facility Assessment (RFA) Addendum which will contain the SWMUs listed in the attachment (See Comment 2 above) and proposed for further assessment in the MCRD memorandum of 12 June 95. Should there be any questions, please contact Paul Bergstrand at (803)896-4016 or Brent Rabon at (803)896-4179.

Sincerely,



Paul Bergstrand, Hydrogeologist
Hazardous Waste Section
Bureau of Solid and Hazardous Waste Management



Brent Rabon, Environmental Engineer
Hazardous Waste Permitting Section
Bureau of Solid and Hazardous Waste Management

Commanding General

18 July 95

Page 5

Attachment

cc: Mr. Jay Bassett, EPA Region IV
Mr. Russell Berry, SCDHEC-Low Country
Mr. Scott Glass, Southern Division
Mr. Tim Mettlen, SCDHEC

**SCDHEC Final Determinations on the Interim RCRA Facility Assessment
dated 4 April 90 for the Marine Corps Recruit Depot**

SWMU NUMBER	SWMU NAME	SCDHEC DETERMINATION
1	Incinerator Landfill	RFI
2	Borrow Pit Landfill	RFI
3	Causeway Landfill	RFI
4	Dredge Spoils Area Fire Training Area	NFA
5	Former Paint Shop Disposal Area	RFA CS
6	Former Automotive Hobby Shop Spill Area	State UST
7	Page Field Fire Training Pit	RFA CS
8	Paint Waste Storage Area	RFA CS
9	MCX Service Station Spill Area	State UST
10	Jericho Island Disposal Area	RFA Addendum
11	Inert Disposal Area A	NFA
12	Inert Disposal Area B	NFA
13	Inert Disposal Area C	RFA CS
14	Storm Sewer System	RFA CS
15	Dirt Roads	RFI (in coordination with SWMU 2) ¹
16	Pesticide Rinsate Disposal Area	RFI
17	Page Field Tanks (AS-16)	State UST
18	Page Field Tanks (AS-17)	State UST
19	Diesel Shop Vehicle Washing Pad	NFA
20	Power Station Oil/Water Separator	NFA
21	Weapons Power Plant Oil/Water Separator	RFA CS
22	Motor Car Transport Car Wash	NFA

23	Indoor Dental Lab Satellite Accumulation Area	NFA
24	Dental Lab Satellite Accumulation Area	NFA
25	Paint Shop Satellite Accumulation Area	NFA
26	Pesticide Satellite Accumulation Area	NFA
27	Equipment Parade Deck Satellite Accumulation Area	RFA Addendum
28	Power Station Satellite Accumulation Area	State UST
29	Indoor Motor Pool Satellite Accumulation Area	NFA
30	Empty Drum Storage Area	NFA
31	Weapons Power Plant Satellite Accumulation Area	NFA
32	Laundry Satellite Accumulation Area	RFA CS
33	Outdoor Motor Pool Satellite Accumulation Area	NFA
34	Motor Pool Waste Oil Tank	NFA
35	DRMO Salvage Yard	RFA CS
36	Hazardous Waste Storage Building	RCRA Closure
37	Overflow Storage Pad	NFA
38	Underground Waste Oil Tank	State UST
39	Electrolyte Basin	RFA Addendum
40	Sanitary Wastewater Treatment Plant	NFA
41	Former Incinerator	RFI (in coordination with SWMU 1)
42	Sanitary Sewer System	NFA
43	Motor Pool Underground Waste Oil Tank	State UST

44	Dumpsters	NFA
AOC A	PCB Spill Area A	RFA Addendum
AOC B	PCB Spill Area B	RFA Addendum
AOC C	Gasoline Spill Area	State UST
AOC D	MCX Service Station	State UST
45	Dry Cleaning Facility Spills Area	RFI

SCDHEC will make a final decision on remaining dirt roads upon review of the analytical data to be collected from the dirt road at SWMU 2.

21 July 1995

I. Meeting Minutes: MCRD PARRIS ISLAND IR TEAM TELECON MEETING

II. ATTENDEES:

EPA Region IV: Mr. Jay Bassett
 SCDHEC: Mr. Brent Rabon
 Mr. Paul Bergstrand
 Mr Russell Berry (District Office)
 MCRD: Ms. Johnsie Nabors
 Ms. Suzanne Rushing
 Mr. Tim Harrington
 SOUTHDIV: Mr. Scott Glass

III. DISCUSSIONS

1. A Telecon meeting was held 21 July 1995 among the MCRD Parris Island IR Team members to discuss the Site Summary Package developed by SouthDiv, Parris Island and EPA Region IV. This package was developed to catalog the IR sites at MCRD Parris Island and make a determination of each site's status. This telecon was scheduled during the 8 June 1995 meeting at Parris Island to give SCDHEC ample time to review the package and provide comments. SCDHEC provided comments via a 18 July 1995 letter. This letter was used as the basis for discussing the various sites. The State agreed with the majority of Navy/Marine Corps and EPA recommendations, with some exceptions noted. See Attachment (A) for site determinations agreed upon by the IR team members.
2. The RCRA/CERCLA integration issue at MCRD Parris Island was discussed. EPA presented the view that the IR Program at Parris Island is guided by the CERCLA process and that the integration language was developed to manage ongoing RCRA corrective actions and RCRA programs into the CERCLA cleanup process. Since the facility is not permitted and there are no ongoing RCRA corrective actions, it is not apparent what is intended to be integrated. The Navy concurred with this basic position. A final resolution to this issue, that all parties can agree to, has not yet been reached.
3. The status of FFA negotiations were discussed. It is expected that SouthDiv counsel will reply to the EPA letter concerning Whiting Field negotiations next week. Parris Island negotiations are expected to follow close behind. EPA indicated that they will start FFA negotiations by September regardless of the status of the Whiting Field agreement. The Navy/Marine Corps does not desire to start Parris Island negotiations until Whiting Field negotiations are far enough along to provide the basic framework required to prevent inconsistencies between the two agreements. The Navy/Marine Corps is hopeful that the Whiting Field negotiations will have progressed to the point that will allow the start of Parris Island negotiations by September.
4. The status of Community Relations Plan/Restoration Advisory Board (CRP/RAB) development was discussed. A Navy Environmental Health Center (NEHC) representative met with the Parris Island Public Affairs Office 20 July 1995. NEHC is expected to develop the CRP for Parris Island and establish a RAB, with the assistance of a subcontractor. It is anticipated that NEHC will only establish the RAB and not provide RAB support for future RAB meetings. Ms. Tiki Whitfield of EPA Region IV has been in contact with NEHC and is expected to participate in the development of the CRP/RAB.
5. Suzanne Rushing indicated that a recent spill has occurred at the Dry Cleaning Facility (proposed site 45). A tank was found while removing impacted soils during the spill response. Suzanne indicated that lab samples are forthcoming and that she would provide this information to the other team members when available.

6. Suzanne Rushing announced that she will be leaving Parris Island in August. Tim Harrington will be taking over the duties associated with the IR Program currently performed by Ms. Rushing. Ms. Rushing also announced that MCRD Parris Island has a new Commanding General and Assistant Chief of Staff I&L. General J. D. Humble is the new CG and Col. M. D. Hilton is the new Asst. C/S I&L.

DECISIONS MADE:

1. It was decided to address Site 4, Dredge Spoils Area Fire Training Pit as NFI and investigate the groundwater under the site via an SI of Site 13, Inert Disposal Area C (RFA Site 13). This is consistent with the States position, since the State has already documented Site 4 as NFI. It was discussed that associating the investigation with the dredge spoils area site may lead to the characterization of dredge spoils, which is undesirable. It is considered that this can be prevented by limiting the scope of the investigation to groundwater and specifically stating these objectives when developing the SI.
2. It was decided to address Site 9 (RFA Site 8), Paint Waste Storage Area along with the RI expected to be conducted at Site 16, Pesticide Rinsate Disposal Area, due to the close proximity of these two sites.
3. It was decided to address Site 32, Laundry SAA with the RI expected to be conducted at Site 45, since these two sites are associated with the same building.

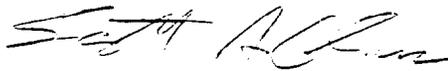
ITEMS TABLED:

1. The State recommended Site 21, Weapons Power Plant Oil/Water Separator for SI. The MCRD indicated that records from pumping out oil/water separators may exist for this site. If records show that no hazardous constituents have been detected (indicating that no past spills have occurred), the Site may be dropped from the IR program, otherwise the site will be recommended for SI.
2. The State recommended Site 27, Equipment Parade Deck SAA and Site 8, PCB Spill Areas (RFA AOC A and B) for SI. There is a concern that PCBs may still be present at these sites. The MCRD indicated that records may exist that would document the cleanup of these sites. If records show adequate cleanup, the sites may be dropped from the IR program, otherwise the sites will be recommended for SI.

ACTION ITEMS:

1. MCRD shall research records associated with pumping out oil/water separators to determine if hazardous constituents are likely to be present at Site 21.
2. MCRD shall research records associated with PCB spill cleanup to determine if adequate documentation exists to confirm cleanup of Sites 8 and 27.

Respectfully Submitted,



Scott A. Glass
SouthDiv RPM

DETERMINATION OF IR SITES AT MCRD PARRIS ISLAND

SITE NO.	SITE DESCRIPTION	DETERMINATION
1	Incinerator Landfill	RI
2	Borrow Pit Landfill	RI
3	Causeway Landfill	RI
4	Dredge Spoils Area Fire Training Pit	NFI
* 5	Former Paint Shop Disposal Area	SI
6	Former Automotive Hobby Shop Spill Area	State UST
7	Page Field Fire Training Pit	SI
* 8 (RFA AOC A & B)	PCB Spill Areas A and B	NFI pending record review → CS
* 9 (RFA Site 8)	Paint Waste Storage Area	SI (in coordination w/16)
10 (RFA AOC C)	Gasoline Spill Area	State UST
11 (RFA Site 9)	MCX Service Station Spill Area	State UST
* 12 (RFA Site 10)	Jericho Island Disposal Area	PA → CS?
13 (RFA Site 11)	Inert Disposal Area A (Horse Island)	NFI
13 (RFA Site 12)	Inert Disposal Area B (Elliot's Beach)	NFI
* 13 (RFA Site 13)	Inert Disposal Area C (Dredge Spoils Area)	SI
* 14	Storm Sewer System/Outfalls	SI
* 15	Dirt Roads	RI (in coordination w/2) → CS?
16	Pesticide Rinsate Disposal Area	RI
17	Page Field Tanks (AS-16)	State UST
18	Page Field tanks (AS-18)	State UST
19 (RFA AOC D)	MCX Service Station	State UST
RFA Site 19	Diesel Shop Vehicle Washing Pad	NFI
20	Power Station Oil/Water Separator	NFI
* 21	Weapons Power Plant Oil/Water Separator	NFI pending record review → CS
22	Motor Transport Car Wash	NFI
23	Indoor Dental Lab Satellite Accumulation Area	NFI
24	Dental Lab Satellite Accumulation Area	NFI
25	Paint Shop Satellite Accumulation Area	NFI
26	Pesticide Satellite Accumulation Area	NFI
* 27	Equipment Parade Deck Satellite Accumulation Area	NFI pending record review → CS
28	Power Station Satellite Accumulation Area	State UST
29	Indoor Motor Pool Satellite Accumulation Area	NFI
30	Empty Drum Storage Area	NFI
31	Weapons Power Plant Satellite Accumulation Area	NFI
32	Laundry Satellite Accumulation Area	RI (in coordination w/45)
33	Outdoor Motor Pool Satellite Accumulation Area	NFI
34	Motor Pool Waste Oil tank	NFI
* 35	DRMO Salvage Yard	SI
36	Hazardous Waste Storage Building	State Closure
37	Overflow Storage Pad	NFI
38	Underground Waste Oil Tank	State UST
39	Electrolyte Basin/Tank	PA
40	Sanitary Waste Water Treatment Plant	NFI
41	Former Incinerator	RI (in coordination w/1)
42	Sanitary Sewer System	NFI
43	Motor Pool Underground Waste Oil Tank	State UST
44	Dumpsters	NFI
45	Dry Cleaning Facility Spill Area	RI

19 requiring additional action

APPENDIX B

**RARE, THREATENED, AND ENDANGERED
SPECIES OF SOUTH CAROLINA**

KEY

ELCODE - element code, indicating taxonomic class in cols 1 and 2:

- AA - Animals, Amphibians
- AB - Animals, Birds
- AF - Animals, Fish
- AM - Animals, Mammals
- AR - Animals, Reptiles
- I - Invertebrate Animals
- PD - Plants, Dicots
- PG - Plants, Gymnosperms
- PM - Plants, Monocots
- PP - Plants, Pteridophytes (ferns)
- N - Non-vascular Plants

GRANK/SRANK - the Nature Conservancy rating of degree of endangerment:

- G1 - Critically imperiled globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction
- G2 - Imperiled globally because of rarity or factor(s) making it vulnerable
- G3 - Either very rare throughout its range or found locally in a restricted range, or having factors making it vulnerable
- G4 - Apparently secure globally, though it may be rare in parts of its range
- G5 - Demonstrably secure globally, though it may be rare in parts of its range
- GH - Of historical occurrence throughout its range, with possibility of rediscovery
- GX - Extinct throughout its range
- G? - Status unknown

- S1 - Critically imperiled state-wide because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation
- S2 - Imperiled state-wide because of rarity or factor(s) making it vulnerable
- S3 - Rare or uncommon in state
- S4 - Apparently secure in state
- S5 - Demonstrably secure in state
- SA - Accidental in state (usually birds or butterflies that are far outside normal range)
- SE - Exotic established in state
- SH - Of historical occurrence in state, with possibility of rediscovery
- SN - Regularly occurring in state, but in a migratory, non-breeding form
- SR - Reported in state, but without good documentation
- SX - Extirpated from state
- S? - Status unknown

STATUS - legal status:

- FE - Federal Endangered
- FT - Federal Threatened
- NC - Of Concern, National (unofficial - plants only)
- RC - Of Concern, Regional (unofficial - plants only)
- SE - State Endangered (official state list - animals only)
- ST - State Threatened (official state list - animals only)
- SC - Of Concern, State
- SX - State Extirpated
- PE/PT/C - Proposed or candidate for federal listing

All information is based on the existing S.C. Heritage Trust database, and we do not assume that it is complete. Areas not yet inventoried by our biologists may contain significant species or communities. Also, our data are always in need of updating because as natural populations change over time, species must be added, dropped, or reclassified.

***Key attached to the back of the list!

June 22, 1971

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....ELCLASS..STATUS...GRANK...SRANK...NAME.....COMNAME.....

ANIMALS--VERTEBRATE

ELCODE	ELCLASS	STATUS	GRANK	SRANK	NAME	COMNAME
ABNKC12040	A	SC	G4	S7	ACCIPITER COOPERII	COOPER'S HAWK
AFCAD01010	A	FE	G3	S3	ACIPENSER BREVIROSTRUM	SHORTNOSE STURGEON
AAABC01012	A	SC	G5T5	S5	ACRIS CREPITANS CREPITANS	NORTHERN CRICKET FROG
ABPBX91050	A	SC	G3	S3	AIMOPHILA AESTIVALIS	BACHMAN'S SPARROW
AFCQB06040	A	SC	G5	S7	AMBLOPLITES RUPESTRIS	ROCK BASS
AAAAA01030	A	SE	G2G3	S1	AMBYSTOMA CINGULATUM	FLATWOODS SALAMANDER
AAAAA01146	A	SC	G5T5	S2S3	AMBYSTOMA TIGRINUM TIGRINUM	EASTERN TIGER SALAMANDER
AAAAD01010	A	SC	G3G4	S1	ANEIDES AENEUS	GREEN SALAMANDER
ARAAG01010	A	SC	G5	S7	APALONE FEROX	FLORIDA SOFTSHELL
AMAGJ01020	A	FE	G2	S7	BALAENA MYSTICETUS	BOWHEAD WHALE
AMAGH01030	A	SC	G5	S7	BALAEOPTERA ACUTOROSTRATA	MINKE WHALE
AMAGH01020	A	FE	G3	S1	BALAEOPTERA BOREALIS	SEI WHALE
AMAGH01050	A	SC	G4	S7	BALAEOPTERA EDENI	BRYDE'S WHALE
AMAGH01040	A	FE	G2	S7	BALAEOPTERA MUSCULUS	BLUE WHALE
AMAGH01010	A	FE	G3	S7	BALAEOPTERA PHYSALUS	FIN WHALE
ABNYF13040	A	FE	GX	SX	CAMPEPHILUS PRINCIPALIS	IVORY-BILLED WOODPECKER
ARAAA01010	A	FT	G3	S3	CARETTA CARETTA	LOGGERHEAD
ABNNB03070	A	FT	G3	S7	CHARADRIUS MELODUS	PIPING PLOVER
ABNNB03040	A	ST	G5	S37	CHARADRIUS WILSONIA	WILSON'S PLOVER
ARAAA02010	A	FT/SE	G3	S7	CHELONIA MYDAS	GREEN TURTLE
ARAAD02010	A	SC	G5	S5	CLEMMYS GUTTATA	SPOTTED TURTLE
ARAAD02040	A	ST	G3	S1	CLEMMYS MUHLENBERGII	BOG TURTLE
AMAFF09020	A	SC	G5	S2S3	CLETHRIONOMYS GAPPERI	SOUTHERN RED-BACKED VOLE
AMAFF09024	A	SC	G5T4	S2S3	CLETHRIONOMYS GAPPERI CAROLINENSIS	CAROLINA RED-BACKED VOLE
ABNPB06020	A	ST	G5	S7	COLUMBINA PASSERINA	COMMON GROUND-DOVE
AMABB05010	A	SC	G5	S37	CONDYLURA CRISTATA	STAR-NOSED MOLE
AMACC08020	A	SE	G3G4	S27	CORYNORHINUS RAFINESQUII	RAFINESQUE'S BIG-EARED BAT
ARADE02040	A	SC	G5	S7	CROTALUS HORRIDUS	TIMBER RATTLESNAKE
AAAAC01010	A	SC	G4	S7	CRYPTOBRANCHUS ALLEGANIENSIS	HELLBENDER
ABPBX03180	A	FE	G1	SA	DENDROICA KIRTLANDII	KIRTLAND'S WARBLER
ABPBX03100	A	SC	G5	S4	DENDROICA VIRENS	BLACK-THROATED GREEN WARBLER
ARAAC01010	A	FE	G3	SA	DERMOCHELYS CORIACEA	LEATHERBACK
AAAAD03010	A	SC	G4	S7	DESMOGNATHUS AENEUS	SEEPAGE SALAMANDER
ARADB11011	A	FT/SE	G4T3	S7	DRYMARCHON CORAIS COUPERI	EASTERN INDIGO SNAKE
ABNKC04010	A	SE	G5	S2	ELANOIDES FORFICATUS	AMERICAN SWALLOW-TAILED KITE
AFCQB09050	A	SC	G2	S1	ELASSOMA BOEHLKEI	CAROLINA PYGMY SUNFISH
AFCQB09060	A	SC	G2G3	S7	ELASSOMA OKATIE	BLUEBARRED PYGMY SUNFISH
ARAAA03010	A	FE	G3	S7	ERETHOCHELYS IMBRICATA	HAWKBILL
AFCQC02150	A	ST	G3	S7	ETHEOSTOMA COLLIS	CAROLINA DARTER
AFCQC02250	A	SC	G5	S1	ETHEOSTOMA FLABELLARE	FANTAIL DARTER
AFCQC02320	A	SC	G4G5	S4	ETHEOSTOMA HOPKINSI	CHRISTMAS DARTER
AFCQC02870	A	SC	G5	S17	ETHEOSTOMA ZONALE	BANDED DARTER
AMAGJ02010	A	FE	G1	SA	EUBALAENA GLACTALIS	BLACK RIGHT WHALE
ARACH01010	A	ST	G5	S1	EUMECES ANTHRACINUS	COAL SKINK
ARACH01012	A	ST	G5T5	S7	EUMECES ANTHRACINUS PLUVIALIS	SOUTHERN COAL SKINK
ABNKD06071	A	FE	G4T4	S7	FALCO PEREGRINUS ANATUM	AMERICAN PEREGRINE FALCON
ABNKD06074	A	FT/SE	G4T4	S7	FALCO PEREGRINUS TUNDRIUS	ARCTIC PEREGRINE FALCON
AMAJH01020	A	SC	G5	SH	FELIS CONCOLOR	MOUNTAIN LION
AMAJH01022	A	FE	G5TH	S1	FELIS CONCOLOR COUGUAR	EASTERN COUGAR
AMAGE11010	A	SC	G4	S7	FERESA ATTENUATA	PYGMY KILLER WHALE
AFCNB04060	A	SC	G5	S1	FUNDULUS DIAPHANUS	BANDED KILLIFISH
AMAGE10020	A	SC	G5	S7	GLOBICEPHALA MACRORHYNCHUS	SHORT-FINNED PILOT WHALE
AMAGE10010	A	SC	G5	S7	GLOBICEPHALA MELAS	LONG-FINNED PILOT WHALE
ARAAF01030	A	SE	G3	S1	GOPHERUS POLYPHEMUS	GOPHER TORTOISE

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
AMAGE08010	A	SC	G5	S7	GRAMPUS GRISEUS	GRAMPUS
ABNKC10010	A	FT	G4	S2	HALIAEETUS LEUCOCEPHALUS	BALD EAGLE
ARADB17030	A	SC	G4G5	S7	HETERODON SIMUS	SOUTHERN HOGNOSE SNAKE
AAABC02010	A	ST	G4	S2S3	HYLA ANDERSONII	PINE BARRENS TREEFROG
AAABC02030	A	SC	G5	S5	HYLA AVIVOCA	BIRD-VOICED TREEFROG
AFCJC06020	A	SC	G5	S7	HYPENTELIUM NIGRICANS	NORTHERN HOG SUCKER
ABNKC09010	A	SC	G5	S4	ICTINIA MISSISSIPPIENSIS	MISSISSIPPI KITE
ARAAE01010	A	SC	G5	S7	KINOSTERNON BAURII	STRIPED MUD TURTLE
AMAGB02010	A	SC	G5	SA	KOGIA BREVICEPS	PYGMY SPERM WHALE
AMAGB02020	A	SC	G4	S7	KOGIA SIMUS	DWARF SPERM WHALE
ARADB19050	A	SC	G5	S2	LAMPROPELTIS TRIANGULUM	MILK SNAKE
ABPBR01030	A	SC	G4G5	S3	LANIUS LUDOVICIANUS	LOGGERHEAD SHRIKE
AMACC05030	A	SC	G5	S7	LASIURUS CINEREUS	HOARY BAT
AMACC05040	A	SC	G4G5	S7	LASIURUS INTERMEDIUS	NORTHERN YELLOW BAT
ARAAA04010	A	FE	G1	SA	LEPIDOCHELYS KEMPII	KEMP'S RIDLEY
AAAAD10010	A	SC	G4	S2	LEUROGNATHUS MARMORATUS	SHOVELNOSE SALAMANDER
ABPBX09010	A	SC	G3G4	S4	LIMNOTHLYPIS SWAINSONII	SWAINSON'S WARBLER
AFCJB51050	A	SC	G5	S7	LUXILUS COCCOGENIS	WARPAINT SHINER
AMAGH02010	A	FE	G3	S1	MEGAPTERA NOVAEANGLIAE	HUMPBACK WHALE
ABNYF04040	A	SC	G5	S7	MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER
AMAGA02020	A	SC	G4	S7	MESOPLONDON DENSIROSTRIS	DENSE-BEAKED WHALE
AMAGA02040	A	SC	G3	S7	MESOPLONDON MIRUS	TRUE'S BEAKED WHALE
AMAFF11010	A	SC	G5	S4	MICROTUS PENNSYLVANICUS	MEADOW VOLE
ARADC02010	A	SC	G5	S2	MICRURUS FULVIUS	EASTERN CORAL SNAKE
AMAJF02020	A	SC	G5	S7	MUSTELA NIVALIS	LEAST WEASEL
ABNGF02010	A	FE	G4	S1S2	MYCTERIA AMERICANA	WOOD STORK
AMACC01030	A	ST	G3	S2S3	MYOTIS AUSTRORIPARIUS	SOUTHEASTERN MYOTIS
AMACC01130	A	ST	G3	S1	MYOTIS LEIBII	EASTERN SMALL-FOOTED MYOTIS
AMACC01010	A	SC	G5	S37	MYOTIS LUCIFUGUS	LITTLE BROWN MYOTIS
AMACC01150	A	SC	G4	S3S4	MYOTIS SEPTENTRIONALIS	NORTHERN MYOTIS
AMACC01100	A	FE	G2	S1	MYOTIS SODALIS	INDIANA MYOTIS
AMAFH02010	A	SC	G5	S47	NAPAEZAPUS INSIGNIS	WOODLAND JUMPING MOUSE
AMAFF08010	A	SC	G5	S3S4	NEOTOMA FLORIDANA	EASTERN WOODRAT
AMAFF08013	A	SC	G5T5	S3S4	NEOTOMA FLORIDANA FLORIDANA	EASTERN WOODRAT
AMAFF08015	A	SC	G5T5	S3S4	NEOTOMA FLORIDANA HAEMATOREIA	SOUTHERN APPALACHIAN WOODRAT
ARADB22010	A	SC	G5	S2	NERODIA CYCLOPION	GREEN WATER SNAKE
ARADB22080	A	SC	G5	S2	NERODIA FLORIDANA	FLORIDA GREEN WATER SNAKE
AFCJB28180	A	SC	G5	S7	NOTROPIS BIFRENATUS	BRIDLED SHINER
AFCJB28330	A	SC	G4	S17	NOTROPIS CHILITICUS	REDLIP SHINER
AFCJB28600	A	SC	G5	S7	NOTROPIS LEUCIODUS	TENNESSEE SHINER
AFCJB28900	A	SC	G4	S7	NOTROPIS SPECTRUNCULUS	MIRROR SHINER
ABNNF07010	A	FE	G1	SX	NUMENIUS BOREALIS	ESKIMO CURLEW
AMALC02023	A	SC	G5T1Q	S7	ODOCOILEUS VIRGINIANUS HILTONENSIS	HILTON HEAD DEER
AMALC02025	A	SC	G5THQ	S7	ODOCOILEUS VIRGINIANUS TAURINSULAE	BULLS ISLAND DEER
AMALC02026	A	SC	G5THQ	S7	ODOCOILEUS VIRGINIANUS VENATORIA	HUNTING ISLAND DEER
ARACB02020	A	SC	G4	S1S2	OPHISAURUS COMPRESSUS	ISLAND GLASS LIZARD
ARACB02040	A	SC	G3	S7	OPHISAURUS MIMICUS	MIMIC GLASS LIZARD
AMABB03010	A	SC	G5	S7	PARASCALOPS BREWERI	HAIRY-TAILED MOLE
ABMFC01020	A	SC	G4	S1S2	PELECANUS OCCIDENTALIS	BROWN PELICAN
AMAJG01010	A	SC	G5	SA	PHOCA VITULINA	HARBOR SEAL
AMAGC01010	A	FE	G3	S1	PHYSETER MACROCEPHALUS	SPERM WHALE
ABNYF07060	A	FE	G3	S2	PICOIDES BOREALIS	RED-COCKADED WOODPECKER
ARADB26010	A	SC	G5	S3S4	PITUOPHIS MELANOLEUCUS	PINE OR GOPHER SNAKE
ARADB26012	A	SC	G5T4	S7	PITUOPHIS MELANOLEUCUS MELANOLEUCUS	NORTHERN PINE SNAKE

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
ARADB26013	A	SC	G5T3?	S2	PITUOPHIS MELANOLEUCUS MUGITUS	FLORIDA PINE SNAKE
ABNGE02010	A	ST	G5	S?	PLEGADIS FALCINELLUS	GLOSSY IBIS
AAAAD12210	A	SE	G4	S2	PLETHODON WEBSTERI	WEBSTER'S SALAMANDER
AAABC05070	A	SC	G5	S3S4	PSEUDACRIS TRISERIATA	WESTERN CHORUS FROG
AAAAG01010	A	ST	G5	S2	PSEUDOBANCHUS STRIATUS	DWARF SIREN
AAAAD13012	A	SC	G5T4	S3S4	PSEUDOTRITON MONTANUS FLAVISSIMUS	GULF COAST MUD SALAMANDER
AAABH01270	A	SC	G4	S1	RANA CAPITO	GOPHER FROG
AAABH01160	A	SC	G5	S?	RANA PALUSTRIS	PICKEREL FROG
AAABH01200	A	SC	G5	S3	RANA SYLVATICA	WOOD FROG
AFCJB37010	A	SC	G5	S1	RHINICHTHYS ATRATULUS	BLACKNOSE DACE
AMAFB07040	A	SC	G5	S4	SCIURUS NIGER	EASTERN FOX SQUIRREL
ARADB31010	A	SC	G5	S?	SEMINATRIX PYGAEA	BLACK SWAMP SNAKE
AFCJB41030	A	ST	G3	S2	SEMOTILUS LUMBEE	SANDHILLS CHUB
AMABA01010	A	SC	G5	S?	SOREX CINEREUS	CINEREUS OR MASKED SHREW
AMABA01180	A	SC	G5	S4	SOREX FUMEUS	SMOKY SHREW
AMABA01250	A	SC	G5	S3S4	SOREX HOYI	PYGMY SHREW
AMAJF05010	A	SC	G5	S4	SPILOGALE PUTORIUS	EASTERN SPOTTED SKUNK
AMAGE01010	A	SC	G5	S?	STENELLA ATTENUATA	PANTROPICAL SPOTTED DOLPHIN
AMAGE01050	A	SC	G5	S?	STENELLA COERULEOALBA	STRIPED DOLPHIN
AMAGE01060	A	SC	G5	SA	STENELLA FRONTALIS	ATLANTIC SPOTTED DOLPHIN
AMAGE01030	A	SC	G5	SA	STENELLA LONGIROSTRIS	SPINNER DOLPHIN
ABNNM08100	A	ST	G4	S3	STERNA ANTILLARUM	LEAST TERN
AMAE01080	A	SC	G5	S3	SYLVILAGUS AQUATICUS	SWAMP RABBIT
AMAE01090	A	SC	G4	S2?	SYLVILAGUS OBSCURUS	APPALACHIAN COTTONTAIL
AMAFB08010	A	SC	G5	S3?	TAMIASCIURUS HUDSONICUS	RED SQUIRREL
ABPBG07010	A	ST	G4	S1?	THRYOMANES BEWICKII	BEWICK'S WREN
AMAKA01010	A	FE	G2?	S1S2	TRICHECHUS MANATUS	MANATEE
AMAGE04010	A	SC	G5	S4	TURSIOPS TRUNCATUS	BOTTLE-NOSED DOLPHIN
ABNSA01010	A	SC	G5	S4	TYTO ALBA	BARN-OWL
AMAJB01010	A	SC	G5	S3?	URSUS AMERICANUS	BLACK BEAR
ABPBX01010	A	FE	GH	SX	VERMIVORA BACHMANII	BACHMAN'S WARBLER
AMAFH01010	A	SC	G5	S?	ZAPUS HUDSONIUS	MEADOW JUMPING MOUSE
AMAGA03010	A	SC	G4	S?	ZIPHIUS CAVIROSTRIS	GOOSE-BEAKED WHALE

ANIMALS--INVERTEBRATE

IITRI1H050	I	SC	G7	S?	AGARODES GRISEUS	
IMBIV02100	I	SC	G3	S?	ALAS MIDONTA VARICOSA	BROOK FLOATER
IMBIV04040	I	SC	G3G4	S?	ANODONTA COUPERIANA	BARREL FLOATER
ICMAL50040	I	SC	G1	S1	DISTOCAMBARUS YOUNGINERI	A CRAYFISH
IMGASK2180	I	SC	G7	S?	ELIMIA CATENARIA	GRAVEL ELIMIA
IMBIV14070	I	SC	G4	S?	ELLIPTIO CONGARAEA	CAROLINA SLAB SHELL
IMBIV14140	I	SE	G1	S?	ELLIPTIO FRATERNA	BROTHER SPIKE
IMBIV14180	I	SC	G3	S?	ELLIPTIO LANCEOLATA	YELLOW LANCE
IMBIV17090	I	SE	G2	S?	FUSCONAIA MASONI	ATLANTIC PIGTOE
IMBIV21050	I	SC	G4	S?	LAMP SILIS CARIOSA	YELLOW LAMP MUSSEL
IMBIV21200	I	SC	G3	S?	LAMP SILIS SPLENDIDA	RAYED PINK FATMUCKET
IMBIV22040	I	FE	G1	S1	LAS MIGNONA DECORATA	CAROLINA HEELSPLITTER
I100026070	I	SC	G2G3	S?	MACROMIA MARGARITA	MARGARET'S RIVER CRUISER
IITRI05010	I	SC	G1G3	S1S3	POLYCENTROPUS CARLSONI	CARLSON'S POLYCENTROPUS CADDISFLY
IITRIA4010	I	SC	G7	S?	PSEUDOGOERA SINGULARIS	
IITRI02020	I	SC	G7	S?	PSILOTRETA FRONTALIS	
IMBIV54010	I	SC	G5	S?	PYGANODON CATARACTA	EASTERN FLOATER
ITUNI15010	I	SC	G7	S?	SIGMORIA ARCUATA	A MILLIPEDE

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....ELCLASS..STATUS...GRANK...SRANK...NAME.....COMNAME.....

ITUNI15020	I	SC	G7	S7	SIGMORIA MACRA	A MILLIPEDE
ITUNI15030	I	SC	G7	S7	SIGMORIA QUADRATA	A MILLIPEDE
ITUNI15040	I	SC	G7	S7	SIGMORIA ROBUSTA	A MILLIPEDE
ITUNI15050	I	SC	G7	S7	SIGMORIA SHELFORDI	A MILLIPEDE
ILARA08030	I	SC	G3	S7	SPHODROS COYLEI	
IMBIV42030	I	SC	G5	S7	STROPHITUS UNDULATUS	SQUAWFOOT
IIOO080110	I	SC	G3	S1S3	STYLURUS TOWNESI	TOWNES' CLUBTAIL
IMBIV43070	I	SC	G3	S1S3	TOXOLASMA PULLUS	SAVANNAH LILLIPUT
IMBIV55010	I	SC	G5	S7	UTTERBACKIA IMBECILLIS	PAPER POND SHELL
IMBIV47040	I	SC	G4	S7	VILLOSA CONSTRICTA	NOTCHED RAINBOW
IMBIV47190	I	SC	G3G4	S7	VILLOSA DELUMBIS	EASTERN CREEKSHELL
IMBIV47170	I	SC	G4Q	S7	VILLOSA VIBEX	SOUTHERN RAINBOW
IITRI78030	I	SC	G7	S7	WORMALDIA THYRIA	

PLANTS--NONVASCULAR

NBHEP05030	N	SC	G7	S7	ANEURA MAXIMA	
NBHEP07030	N	SC	GH	S7	CHEILOLEJEUNEA EVANSII	
NLLEC75010	N	FE	G2	S1	GYMNODERMA LINEARE	ROCKY GNOME LICHEN
NBHEP1P070	N	SC	G4	S7	JUNGERMANNIA FOSSOMBRONIOIDES	
NBHEP1W080	N	SC	G1	S7	LOPHOCOLEA APPALACHIANA	
NBHEP2H040	N	SC	G1Q	S7	PELLIA APPALACHIANA	
NBHEP2M070	N	SC	G2	S7	PLAGIOCHILA CADUCILOBA	GORGE LEAFY LIVERWORT
NBHEP2M0P0	N	SC	G2	S7	PLAGIOCHILA SULLIVANTII	
NBMUS81040	N	SC	G2G3	S7	PLAGIOMNIUM CAROLINIANUM	MOUNTAIN WAVY-LEAF MOSS
NBHEP2Q0B0	N	SC	G1Q	S7	PORELLA JAPONICA SSP APPALACHIANA	
NBMUS9Q070	N	SC	G5	S7	RHIZOMNIUM APPALACHIANUM	LARGE-LEAVED MNIMUM

PLANTS--VASCULAR

PDACE010C0	P	SC	G5	S1S2	ACER PENNSYLVANICUM	STRIPED MAPLE
PDRAN010A0	P	SC	G4	S2	ACONITUM UNCINATUM	BLUE MONKSHOOD
PDHPC01050	P	RC	G37	S1	AESCULUS PARVIFLORA	SMALL-FLOWERED BUCKEYE
PDSCR01020	P	SC	G3G4	S7	AGALINIS APHYLLA	COASTAL PLAIN FALSE-FOXGLOVE
PDSCR01130	P	SC	G3	S1	AGALINIS AURICULATA	EARLEAF FOXGLOVE
PDSCR010G0	P	SC	G47	S7	AGALINIS LINIFOLIA	FLAX LEAF FALSE-FOXGLOVE
PDSCR010H0	P	SC	G5	S7	AGALINIS MARITIMA	SALT-MARSH FALSE-FOXGLOVE
PDER11R010	P	SC	G4G5	S1	AGRIMONIA POPULIFOLIA	CAROLINA DOG-HOBBLE
PDROS03040	P	NC	G3	S1	AGRIMONIA INCISA	INCISED GROOVEBUR
PDROS03070	P	SC	G5	S1	AGRIMONIA PUBESCENS	SOFT GROOVEBUR
PMLIL01050	P	SC	G4G5	S7	ALETRIS OBOVATA	WHITE COLICROOT
PMLIL020J0	P	SC	G5	S7	ALLIUM CERNUUM	NODDING ONION
PMLIL020P0	P	SC	G3G4	S7	ALLIUM CUTHBERTII	STRIPED GARLIC
PDAMA040Z0	P	FT	G2	S1	AMARANTHUS PUMILUS	SEABEACH AMARANTH
PDFAB08052	P	SC	G3T2	S7	AMORPHA GEORGIANA VAR GEORGIANA	GEORGIA LEADPLANT
PDFAB08060	P	SC	G47	S7	AMORPHA GLABRA	SMOOTH INDIGOBUSH
PDFAB080E0	P	SC	G3	S1	AMORPHA SCHWERINII	SCHWERIN INDIGOBUSH
PDSCR02010	P	FT	G2	S1	AMPHIANTHUS PUSILLUS	POOL SPRITE
PMPOA08010	P	SC	G4	S7	AMPHICARPUM MUEHLENBERGIANUM	BLUE MAIDEN-CANE
PMPOA0C0Q2	P	SC	G5T3T4	S1	ANDROPOGON GYRANS VAR STENOPHYLLUS	NARROW LEAVED BLUESTEM
PMPOA0C0D0	P	SC	G47	S7	ANDROPOGON MOHRII	BROOMSEDGE
PDRAN04010	P	SC	G47	S7	ANEMONE BERLANDIERI	SOUTHERN THIMBLE-WEED
PDRAN04030	P	SC	G5	SH	ANEMONE CAROLINIANA	CAROLINA ANEMONE
PMPOA0D010	P	SC	G5	S7	ANTHAENANTIA RUFA	PURPLE SILKYSCALE

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK....	SRANK....	NAME.....	COMNAME.....
PDBRA06170	P	SC	G3G4	S1	ARABIS MISSOURIENSIS	MISSOURI ROCK-CRESS
PMORC04010	P	RC	G4	S1	ARETHUSA BULBOSA	BOG ROSE
PMPOA0K090	P	SC	G4?	S?	ARISTIDA CONDENSATA	PIEDMONT THREE-AWED GRASS
PDAR101080	P	SC	G5	S2	ARISTOLOCHIA MACROPHYLLA	PIPEVINE
PDAR1010J0	P	SC	G5	S?	ARISTOLOCHIA TOMENTOSA	WOOLLY DUTCHMAN'S-PIPE
PDASCO21E0	P	RC	G3?	S1	ASCLEPIAS PEDICELLATA	SAVANNAH MILKWEED
PPASPO2050	P	RC	G4	S1	ASPLENIUM BRADLEYI	BRADLEY'S SPLEENWORT
PPASPO20J0	P	NC	G2Q	S1	ASPLENIUM HETERORESILIENS	WAGNER'S SPLEENWORT
PPASPO20T0	P	RC	G4	S1	ASPLENIUM MONANTHES	SINGLE-SORUS SPLEENWORT
PPASPO2100	P	SC	G4	S1	ASPLENIUM PINNATIFIDUM	LOBED SPLEENWORT
PPASPO2170	P	SC	G5	S1S2	ASPLENIUM RESILIENS	BLACK-STEM SPLEENWORT
PPASPO2180	P	SC	G5	S2	ASPLENIUM RHIZOPHYLLUM	WALKING-FERN SPLEENWORT
PPASPO21K0	P	SC	G5	S?	ASPLENIUM TRICHOMANES	MAIDENHAIR SPLEENWORT
PDASTOT070	P	NC	G3	S1	ASTER AVITUS	ALEXANDER'S ROCK ASTER
PDASTOT180	P	SC	G2G3	S?	ASTER GEORGIANUS	GEORGIA ASTER
PDASTOT1N0	P	SC	G5	S?	ASTER LAEVIS	SMOOTH BLUE ASTER
PDASTOT200	P	SC	G5	S?	ASTER NOVAE-ANGLIAE	NEW ENGLAND ASTER
PDASTOT340	P	SC	G5	S?	ASTER SPECTABILIS	SHOWY ASTER
PDFAB0F580	P	SC	G3	S?	ASTRAGALUS MICHAUXII	SANDHILLS MILKVETCH
PDFAB0F9F0	P	SC	G4	S?	ASTRAGALUS VILLOSUS	A MILK-VETCH
PDSCR06020	P	SC	G3G5Q	S1	BACOPA CYCLOPHYLLA	COASTAL-PLAIN WATER-HYSSOP
PDAST02020	P	SC	G2G3	S?	BALDUINA ATROPURPUREA	PURPLE BALDUINA
PDAST02030	P	SC	G4	S?	BALDUINA UNIFLORA	ONE-FLOWER BALDUINA
PDFAB0G080	P	SC	G4?	S?	BAPTISIA LANCEOLATA	LANCE-LEAF WILD-INDIGO
P0BET02010	P	SC	G5	S1	BETULA ALLEGHANIENSIS	YELLOW BIRCH
PPOPH01090	P	SC	G4?	S?	BOTRYCHIUM LUNARIOIDES	WINTER GRAPE-FERN
PDSAX04010	P	SC	G4	S1	BOYKINIA ACONITIFOLIA	BROOK SAXIFRAGE
PMBUR02010	P	SC	G4G5	S?	BURMANNIA BIFLORA	NORTHERN BURMANNIA
PMPOA18020	P	NC	G4	S?	CALAMOVILFA BREVIPILIS	PINE-BARRENS REED-GRASS
PMORC0C010	P	SC	G5?	S?	CALOPOGON BARBATUS	BEARDED GRASS-PINK
PML1LOE050	P	RC	G4G5	S2	CAMASSIA SCILLOIDES	WILD HYACINTH
PDCAM0U010	P	SC	G5	S1	CAMPANULA AMERICANA	TALL BELLFLOWER
PMCAN01030	P	SC	G5?	S4	CANNA FLACCIDA	BANDANA-OF-THE-EVERGLADES
PDBRA0K070	P	SC	G2	S?	CARDAMINE CLEMATITIS	MOUNTAIN BITTER CRESS
PDBRA0K1D0	P	SC	G4?	S?	CARDAMINE DISSECTA	DIVIDED TOOTHWORT
PDBRA0K0E0	P	SC	G3	S?	CARDAMINE FLAGELLIFERA	BITTER CRESS
PMCYP030L0	P	SC	G5	S?	CAREX AMPHIBOLA	NARROWLEAF SEDGE
PMCYP030P0	P	SC	G3	S?	CAREX AMPLISQUAMA	FORT MOUNTAIN SEDGE
PMCYP03E20	P	SC	G4	S?	CAREX APPALACHICA	APPALACHIAN SEDGE
PMCYP031E0	P	SC	G4	S?	CAREX AUSTROCAROLINIANA	A SEDGE
PMCYP031S0	P	NC	G3	S1	CAREX BILTMOREANA	BILTMORE SEDGE
PMCYP032F3	P	SC	G5T4?	S?	CAREX CANESCENS SSP DISJUNCTA	SILVERY SEDGE
PMCYP032R0	P	NC	G3	S1	CAREX CHAPMANII	CHAPMAN'S SEDGE
PMCYP032W0	P	SC	G4	S1	CAREX COLLINSII	COLLINS' SEDGE
PMCYP033K0	P	SC	G4	S?	CAREX DECOMPOSITA	CYPRESS-KNEE SEDGE
PMCYP03420	P	SC	G5	S?	CAREX EBURNEA	EBONY SEDGE
PMCYP03470	P	SC	G4?	S?	CAREX ELLIOTTII	ELLIOTT'S SEDGE
PMCYP034X0	P	SC	G4G5	S1	CAREX FOLLICULATA	LONG SEDGE
PMCYP035C0	P	SC	G5?	S?	CAREX GRACILESCENS	SLENDER SEDGE
PMCYP035E0	P	SC	G5	S?	CAREX GRACILLIMA	GRACEFUL SEDGE
PMCYP036P0	P	SC	G5	S?	CAREX JAMESII	NEBRASKA SEDGE
PMCYP03EY0	P	SC	G2?	S?	CAREX MANHARTII	MANHART SEDGE
PMCYP039P0	P	SC	G4	S?	CAREX OLIGOCARPA	EASTERN FEW-FRUIT SEDGE
PMCYP03AA0	P	SC	G5	S1	CAREX PEDUNCULATA	LONGSTALK SEDGE

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
PMCYP03AP0	P	SC	G5	S?	CAREX PLANTAGINEA	PLANTAIN-LEAVED SEDGE
PMCYP03B10	P	SC	G4	S?	CAREX PRASINA	DROOPING SEDGE
PMCYP03B50	P	SC	G5	S?	CAREX PROJECTA	NECKLACE SEDGE
PMCYP03C30	P	SC	G5	S?	CAREX SCABRATA	ROUGH SEDGE
PMCYP03D30	P	SC	G5	S?	CAREX STRICTA	TUSSOCK SEDGE
PMCYP03EVO	P	SC	G4Q	S?	CAREX WOODII	PRETTY SEDGE
PDJUG01080	P	RC	G4	S1	CARYA MYRISTICIFORMIS	NUTMEG HICKORY
PDSCROD0J0	P	RC	G5	S2	CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH
PDBER03010	P	SC	G5	S2	CAULOPHYLLUM THALICTROIDES	BLUE COHOSH
PDCUC05050	P	SC	G?	S?	CAYAPONIA BOYKINII	CAYAPONIA
PDERI08010	P	SC	G5	S?	CHAMAEDAPHNE CALYCVLATA	LEATHERLEAF
PMPOA1D030	P	SC	G3?	S?	CHASMANTHIUM NITIDUM	SHINY SPIKEGRASS
PDSCROF030	P	SC	G4	S?	CHELONE LYONII	PINK TURTLEHEAD
PDAST2A010	P	SC	G4G5	S1S2	CHRYSOMA PAUCIFLOSCULOSA	WOODY GOLDENROD
PDSAX07010	P	SC	G5	S1	CHRYSOSPLENIUM AMERICANUM	AMERICAN GOLDEN-SAXIFRAGE
PDRAN07010	P	SC	G5	S?	CIMICIFUGA AMERICANA	MOUNTAIN BUGBANE
PDONA04020	P	SC	G5	S?	CIRCAEA LUTETIANA	SOUTHERN BROADLEAF ENCHANTER'S NIGHTS
PDONA04021	P	SC	G5T5	S1	CIRCAEA LUTETIANA SSP CANADENSIS	INTERMEDIATE ENCHANTER'S NIGHTSHADE
PMCYP04050	P	SC	G5	S1	CLADIUM MARISCOIDES	TWIG RUSH
PDFAB0Y010	P	RC	G4	S1	CLADRASTIS KENTUKEA	YELLOWWOOD
PDCYR01010	P	SC	G4G5	S?	CLIFTONIA MONOPHYLLA	BUCKWHEAT-TREE
PDLAM0C040	P	SC	G3G4	S?	COLLINSONIA VERTICILLATA	WHORLED HORSE-BALM
PDMCC01010	P	SC	G5	S?	COMPTONIA PEREGRINA	SWEET FERN
PML1L0K020	P	SC	G4	S?	CONVALLARIA MONTANA	AMERICAN LILY-OF-THE-VALLEY
PDAST2L0A0	P	SC	G3G5	S?	COREOPSIS GLADIATA	SOUTHEASTERN TICKSEED
PDAST2L0G0	P	NC	G3	S1	COREOPSIS LATIFOLIA	BROAD-LEAVED TICKSEED
PDAST2L0T0	P	RC	G3	S2	COREOPSIS ROSEA	ROSE COREOPSIS
PDCOR010L0	P	SC	G5?	S1	CORNUS RACEMOSA	STIFF DOGWOOD
PDEUPOH0C0	P	SC	G2G3	S?	CROTON ELLIOTTII	ELLIOTT'S CROTON
PDEUPOJ020	P	SC	G5	S?	CROTONOPSIS LINEARIS	NARROWLEAF RUSHFOIL
PDRUB3M010	P	SC	G?	S?	CRUCIATA PEDEMONTANA	BEDSTRAW
PDCUS010B0	P	SC	G5	S?	CUSCUTA CEPHALANTHI	DODDER; LOVE-VINE
PDCUS010W0	P	SC	G5	S?	CUSCUTA INDECORA	DODDER; LOVE-VINE
PDASC050J0	P	SC	G4	S?	CYNANCHUM SCOPARIUM	LEAFLESS SWALLOW-WORT
PMCYP060U0	P	SC	G4	S1	CYPERUS DISTINCTUS	MARSHLAND FLATSEDGE
PMCYP061E0	P	SC	G3Q	S?	CYPERUS GRANITOPHILUS	GRANITE-LOVING FLATSEDGE
PMCYP063H0	P	SC	G4?	S1	CYPERUS TETRAGONUS	PIEDMONT FLATSEDGE
PMORC0Q0C0	P	SC	G5	S?	CYPRIPEDIUM PUBESCENS	LARGE YELLOW LADY'S-SLIPPER
PPDRY07010	P	SC	G5	S?	CYSTOPTERIS BULBIFERA	BULBLET FERN
PPDRY07060	P	SC	G5	S?	CYSTOPTERIS PROTRUSA	LOWLAND BRITTLE FERN
PMPOA200C0	P	SC	G3?	S?	DANTHONIA EPILIS	BOG OAT-GRASS
PDSCROLO10	P	SC	G4	S?	DASISTOMA MACROPHYLLA	MULLEIN FOXGLOVE
PDRAN080C0	P	SC	G5	S?	DELPHINIUM CAROLINIANUM	CAROLINA LARKSPUR
PMPOA22090	P	SC	G5	S?	DESCHAMPSIA FLEXUOSA	CRINKLED HAIRGRASS
PDFUM04030	P	SC	G5	S1	DICENTRA CUCULLARIA	DUTCHMAN'S BREECHES
PDFUM04040	P	SC	G4	S?	DICENTRA EXIMIA	WILD BLEEDING-HEART
PDLAM0F050	P	SC	G4G5	S1	DICERANDRA ODORATISSIMA	ROSE BALM
PMPOA24010	P	SC	G4G5	S?	DICHANTHELIUM ACICULARE	BROOMSEEDGE
PDDRO01010	P	RC	G3	S1	DIONAEA MUSCIPULA	VENUS' FLY-TRAP
PDBER04010	P	RC	G4	S1	DIPHYLLEIA CYMOSEA	UMBRELLA-LEAF
PPDRY090C0	P	SC	G5	S1	DIPLAZIUM PYCNOCARPON	GLADE FERN
POTHY03020	P	SC	G4	S?	DIRCA PALUSTRIS	EASTERN LEATHERWOOD
PDPRI030B0	P	SC	G5	S?	DODECATHEON MEDIA	SHOOTING-STAR
PDBRA11060	P	NC	G3	S1	DRABA APRICA	OPEN-GROUND WHITLOW-GRASS

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
PDBRA11270	P	SC	G5	S?	DRABA REPTANS	CAROLINA WHITLOW-GRASS
PPDRY0A0F0	P	SC	G4	S1	DRYOPTERIS GOLDIANA	GOLDIE'S WOODFERN
PPDRY0A0H0	P	SC	G5	S?	DRYOPTERIS INTERMEDIA	EVERGREEN WOODFERN
PPDRY0A170	P	SC	G5	S?	DRYOPTERIS SPINULOSA	SPINULOSE WOOD-FERN
PDACA09040	P	SC	G4G5	S?	DYSCHORISTE HUMISTRATA	SWAMP DYSCHORISTE
PDAST38030	P	FE	G2G3	S1	ECHINACEA LAEVIGATA	SMOOTH CONEFLOWER
PMAL102050	P	SC	G3	S2	ECHINODORUS PARVULUS	DWARF BURHEAD
PMCYP091E0	P	SC	G5	S?	ELEOCHARIS PALUSTRIS	SPIKE-RUSH
PMCYP091N0	P	SC	G4G5	S?	ELEOCHARIS ROBBINSII	ROBBINS SPIKERUSH
PMCYP091P0	P	SC	G5	S?	ELEOCHARIS ROSTELLATA	BEAKED SPIKERUSH
PMCYP091Y0	P	SC	G5	S?	ELEOCHARIS VIVIPARA	VIVIPAROUS SPIKE-RUSH
PDER10C010	P	SC	G2G3	SH	ELLIOTTIA RACEMOSA	GEORGIA PLUME
PMPOA2H0E0	P	SC	G5	S?	ELYMUS RIPARIUS	WILD-RYE
PDRANOG010	P	RC	G5	S1	ENEMION BTERNATUM	FALSE RUE-ANEMONE
PMORC10050	P	SC	G4	S?	EPIDENDRUM CONOPSEUM	GREEN-FLY ORCHID
PMER101080	P	SC	G2G4	S?	ERIOCAULON RAVENELII	RAVENEL'S PIPEWORT
PMER1010A0	P	SC	G4	S?	ERIOCAULON TEXENSE	PIPEWORT
PMPOA2Q040	P	SC	G2?	S?	ERIOCHLOA MICHAUXII	CUPGRASS
PDAPI0Z032	P	SC	G4TUQ	S?	ERYNGIUM AQUATICUM VAR RAVENELII	MARSH ERYNGO
PDCEL05030	P	SC	G5	S1	EUONYMUS ATROPURPUREUS	Wahoo
PDAST3P0M0	P	SC	G5?	S?	EUPATORIUM FISTULOSUM	HOLLOW JOE-PYE WEED
PDAST3P1L0	P	SC	G3	S?	EUPATORIUM RESINOSUM	PINE BARRENS BONESET
PDAST3P1T3	P	SC	G5T?	S?	EUPATORIUM SESSILIFOLIUM VAR VASEYI	THOROUGHWORT
PMCYP080F0	P	NC	G2G3	S2	FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS
PMCYP080Q0	P	SC	G5	S?	FIMBRISTYLIS VAHLII	VAHL FIMBRY
PDOLE020C0	P	SC	G3	S?	FORESTIERA GODFREYI	
PDOLE02040	P	SC	G4G5	S1	FORESTIERA LIGUSTRINA	UPLAND SWAMP PRIVET
PDOLE02080	P	SC	G4?	S1	FORESTIERA SEGREGATA	SOUTHERN PRIVET
PDHAM01020	P	RC	G3	S1	FOTHERGILLA MAJOR	MOUNTAIN WITCH-ALDER
PDGEN05030	P	RC	G5	S1	FRASERA CAROLINIENSIS	CAROLINA GENTIAN
PMORC16010	P	SC	G5	S?	GALEARIS SPECTABILIS	SHOWY ORCHIS
PDER10F050	P	SC	G5	S1	GAULTHERIA PROCUMBENS	TEABERRY
PDONA08020	P	SC	G5	S?	GAURA BIENNIS	BIENNIAL GAURA
PDER10G010	P	SC	G5	S?	GAYLUSSACIA BACCATA	BLACK HUCKLEBERRY
PDER10G050	P	SC	G4	S?	GAYLUSSACIA MOSIERI	WOOLLY-BERRY
PDGEN06070	P	SC	G3	S2	GENTIANA AUTUMMALIS	PINE BARREN GENTIAN
PMORC1A070	P	SC	G4G5	S?	HABENARIA QUINQUESETA	LONG-HORN ORCHID
PDBOR0G0U0	P	SC	G5	S?	HACKELIA VIRGINIANA	VIRGINIA STICKSEED
PDSTY01020	P	SC	G5	S1	HALESIA DIPTERA	TWO-WING SILVERBELL
PDSTY01040	P	SC	G?	S?	HALESIA PARVIFLORA	SMALL-FLOWERED SILVERBELL-TREE
PDAST4L070	P	RC	G3G4	S1	HELENIUM BREVIFOLIUM	SHORTLEAF SNEEZEWEEED
PDAST4L0E0	P	SC	G4	S?	HELENIUM PINNATIFIDUM	SOUTHEASTERN SNEEZEWEEED
PDCIS02070	P	SC	G4	S?	HELIANTHEMUM GEORGIANUM	GEORGIA FROSTWEEED
PDAST4N0M0	P	NC	G3	S?	HELIANTHUS GLAUCOPHYLLUS	WHITE-LEAVED SUNFLOWER
PDAST4N0T0	P	SC	G4	S?	HELIANTHUS LAEVIGATUS	SMOOTH SUNFLOWER
PDAST4N1R0	P	SC	G4	S1	HELIANTHUS PORTERI	PORTER'S GOLDENEYE
PDAST4N1C0	P	FE	G2	S1	HELIANTHUS SCHWEINITZII	SCHWEINITZ'S SUNFLOWER
PML1L10010	P	FT	G3	S1	HELONIAS BULLATA	SWAMP-PINK
PDRAN0E020	P	SC	G5	S?	HEPATICACUTILOBA	LIVERLEAF
PMPOW03040	P	SC	G5	S?	HETERANTHERA RENIFORMIS	KIDNEYLEAF MUD-PLANTAIN
PDSAX0E0T0	P	SC	G4	S?	HEUCHERA PARVIFLORA	LITTLE-LEAVED ALLUMROOT
PDARI03060	P	FT	G3	S2	HEXASTYLIS NANIFLORA	DWARF-FLOWERED HEARTLEAF
PDPRI06010	P	SC	G4	S?	HOTTONIA INFLATA	FEATHERFOIL
PDCIS03010	P	RC	G4	S1	HUDSONIA ERICOIDES	GOLDEN-HEATHER

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....ELCLASS...STATUS...GRANK...SRANK...NAME.....COMNAME.....

PDHRO1080	P	SC	G4	S7	HYDRANGEA CINEREA	
PDAP116010	P	SC	G5	S7	HYDROCOTYLE AMERICANA	AMERICAN WATER-PENNYWORT
PDHYD07010	P	SC	G5	S1	HYDROLEA CORYMBOSA	CORYMB FIDDLELEAF
PDHYD08020	P	SC	G5	S1	HYDROPHYLLUM CANADENSE	BLUNT-LEAF WATERLEAF
PMLIL15040	P	NC	G2Q	S2	HYMENOCALLIS CORONARIA	SHOALS SPIDER-LILY
PPHYM010P0	P	SC	G1G2	S7	HYMENOPHYLLUM TAYLORIAE	TUNBRIDGE FERN
PPHYM010H0	P	NC	G4G5	S1	HYMENOPHYLLUM TUNBRIGENSE	TUNBRIDGE FERN
PDCLU03010	P	RC	G2G3	S1	HYPERICUM ADPRESSUM	CREEPING ST. JOHN'S-WORT
PDCLU03050	P	SC	G37	S7	HYPERICUM BUCKLEYI	BLUE RIDGE ST. JOHN'S-WORT
PDCLU03170	P	SC	G4	S7	HYPERICUM NITIDUM	CAROLINA ST. JOHN'S-WORT
PDAQU01020	P	SC	G4	S3	ILEX AMELANCHIER	SARVIS HOLLY
PDBAL01090	P	SC	G5	S7	IMPATIENS PALLIDA	PALE JEWEL-WEED
PDCON0A0U0	P	SC	G3G5	S17	IPOMOEA MACRORHIZA	LARGE-STEM MORNING-GLORY
PDCON0A1G0	P	SC	G57	S7	IPOMOEA STOLONIFERA	BEACH MORNING-GLORY
PDPLM060G0	P	SC	G4G5	S7	IPOMOPSIS RUBRA	RED STANDING-CYPRESS
PMIR1090E0	P	SC	G4G5	S7	IRIS HEXAGONA	WALTER'S IRIS
PPISO01190	P	SC	G47	S7	ISOETES CAROLINIANA	ENGELMANN'S QUILLWORT
PPISO01180	P	SC	G2G3	SR	ISOETES HYEMALIS	
PPISO010E0	P	FE	G1	S1	ISOETES MELANOSPORA	BLACK-SPORED QUILLWORT
PPISO010H0	P	SC	G3	S2	ISOETES PIEDMONTANA	PIEDMONT QUILLWORT
PPISO010J0	P	SC	G4	S1	ISOETES RIPARIA	RIVER BANK QUILLWORT
PPISO010P0	P	SC	G3Q	S1	ISOETES VIRGINICA	VIRGINIA QUILLWORT
PMORC1F010	P	FT	G2G3	S1	ISOTRIA MEDEOLOIDES	SMALL WHORLED POGONIA
PDJUG02030	P	SC	G4	S7	JUGLANS CINEREA	BUTTERNUT
PMJUN01170	P	SC	G4	S7	JUNCUS GEORGIANUS	GEORGIA RUSH
PMJUN011C0	P	SC	G4	S7	JUNCUS GYMNOCARPUS	NAKED-FRUITED RUSH
PMJUN012P0	P	SC	G5	S7	JUNCUS SUBCAUDATUS	WOODS-RUSH
PGCUP05030	P	SC	G5	S7	JUNIPERUS COMMUNIS	GROUND JUNIPER
PDER10K020	P	NC	G3	S1	KALMIA CUNEATA	WHITE-WICKY
PDAST5D050	P	SC	G3	S7	KRIGIA MONTANA	FALSE DANDELION
PMER102020	P	SC	G2G3	S7	LACHNOCAULON BEYRICHIANUM	SOUTHERN BOG-BUTTON
PDCIS040F0	P	SC	G4G5	S7	LECHEA TORREYI	PIEDMONT PINWEED
PDSAX0L010	P	SC	G57	S7	LEPUROPETALON SPATHULATUM	SOUTHERN LEPUROPETALON
PDAST5X040	P	SC	G3G4	S7	LIATRIS MICROCEPHALA	
PDCHRO2010	P	SC	G4G5	S7	LICANIA MICHAUXII	GOPHER-APPLE
PDAP119010	P	NC	G3	S1	LILAEOPSIS CAROLINENSIS	CAROLINA LILAEOPSIS
PMLIL1A030	P	SC	G5	S17	LILIUM CANADENSE	CANADA LILY
PMLIL1A080	P	SC	G1G2		LILIUM IRIDOLLAE	PANHANDLE LILY
PDLAU07020	P	FE	G2	S1	LINDERA MELISSIFOLIA	PONDBERRY
PDLAU07030	P	RC	G2	S7	LINDERA SUBCORIACEA	BOG SPICEBUSH
PMORC1M030	P	SC	G5	S7	LIPARIS LILIIIFOLIA	LARGE TWAYBLADE
PMCYPOH040	P	SC	G4	S2	LIPOCARPHA MICRANTHA	DWARF BULRUSH
PMORC1N020	P	SC	G4	S7	LISTERA AUSTRALIS	SOUTHERN TWAYBLADE
PMORC1N080	P	SC	G4	S7	LISTERA SMALLII	KIDNEY-LEAF TWAYBLADE
PDBOR0L0F0	P	SC	G4	S1	LITHOSPERMUM TUBEROSUM	TUBEROUS GROMWELL
PDLAU08010	P	SC	G3	S3	LITSEA AESTIVALIS	PONDSPICE
PDCAM0E050	P	SC	G2G3	S7	LOBELIA BOYKINII	BOYKIN'S LOBELIA
PDCPR030A0	P	SC	G57	S2	LONICERA FLAVA	YELLOW HONEYSUCKLE
PDFAB2A1H2	P	SC	G573	S7	LOTUS UNIFOLIOLATUS VAR HELLERI	CAROLINA BIRDFOOT-TREFOIL
PDONA080Q0	P	SC	G2G3	S7	LUDWIGIA SPATHULATA	SPATULATE SEEDBOX
PPLYC010S0	P	SC	G4	S1	LYCOPODIUM POROPHYLLUM	ROCK CLUBMOSS
PPLYC01130	P	SC	G5	S1	LYCOPODIUM TRISTACHYUM	DEEP-ROOT CLUBMOSS
PDLAM0X050	P	SC	G3	S7	LYCOPUS COKERI	CAROLINA BUGLEWEED
PPSCH02030	P	SC	G4	S1S2	LYGODIUM PALMATUM	CLIMBING FERN

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
PDER10R010	P	SC	G5	S1	LYONIA FERRUGINEA	RUSTY LYONIA
PDPRI07010	P	FE	G3	S1	LYSIMACHIA ASPERULIFOLIA	ROUGH-LEAVED LOOSESTRIPE
PDPRI07070	P	RC	G3	S1	LYSIMACHIA FRASERI	FRASER LOOSESTRIPE
PDLAM0Y020	P	SC	G2G3	S?	MACBRIDEA CAROLINIANA	CAROLINA BIRD-IN-A-NEST
PDMAG02080	P	SC	G7Q	S?	MAGNOLIA CORDATA	PIEDMONT CUCUMBER TREE
PDMAG02050	P	SC	G5	S?	MAGNOLIA MACROPHYLLA	BIGLEAF MAGNOLIA
PDMAG02070	P	RC	G4	S1	MAGNOLIA PYRAMIDATA	PYRAMID MAGNOLIA
PMLIL1F020	P	SC	G5	S?	MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER
PDMNS05010	P	SC	G5	S?	MENISPERMUM CANADENSE	CANADA MOONSEED
PDCAROG000	P	NC	G1	SX	MINUARTIA GODFREYI	GODFREY'S STITCHWORT
PDCAROG0W0	P	SC	G4	S?	MINUARTIA UNIFLORA	ONE-FLOWER STITCHWORT
PDSAX0N030	P	SC	G5	S?	MITELLA DIPHYLLA	TWO-LEAF BISHOP'S-CAP
PDLAM17050	P	SC	G5	S?	MONARDA DIDYMA	OSWEGO TEA
PDMONQ4020	P	RC	G3	S1	MONOTROPSIS OORATA	SWEET PINESAP
PMPOA480P0	P	SC	G7Q	S?	MUHLENBERGIA FILIPES	BENTGRASS; HAIRGRASS
PDHAL04090	P	RC	G3	S2	MYRIOPHYLLUM LAXUM	PIEDMONT WATER-MILFOIL
PMNAJ01020	P	SC	G5	S?	NAJAS FLEXILIS	
PMLIL1L010	P	C/NC	G2	SH	NARTHECIUM AMERICANUM	BOG ASPHODEL
PDSAN05010	P	SC	G4	S2	NESTRONIA UMBELLULA	NESTRONIA
PMAGA08060	P	SC	G3G5	S?	NOLINA GEORGIANA	GEORGIA BEARGRASS
PDNYS01020	P	SC	G4G5	S?	NYSSA OGECHE	OGEECHEE TUPELO
PDONA0C0S0	P	SC	G5	S?	OENOTHERA LINIFOLIA	THREAD-LEAF SUNDROPS
PDQNA0C100	P	SC	G5	S?	OENOTHERA PERENNIS	SMALL SUNDROPS
PPOPH02090	P	SC	G5	S?	OPHIOGLOSSUM PETIOLATUM	LONGSTEM ADDER'S-TONGUE FERN
PPOPH02080	P	SC	G5	S?	OPHIOGLOSSUM VULGATUM	ADDER'S-TONGUE
PDFAB5K020	P	SC	G3G4	S?	ORBEXILUM LUPINELLUM	SAMPSON SNAKEROOT; SCURF PEA
PDOR0040F0	P	SC	G5	S?	OROBANCHE UNIFLORA	ONE-FLOWERED BROOMRAPE
PDAP11K040	P	SC	G5	S?	OSMORHIZA CLAYTONII	HAIRY SWEET-CICELY
PDAP11L010	P	FE	G2	S1	OXYPOLIS CANBYI	CANBY'S DROPWORT
PDAP11L070	P	SC	G3	S?	OXYPOLIS TERNATA	PIEDMONT COMBANE
PDBUX02010	P	RC	G4G5	S1	PACHYSANDRA PROCUMBENS	ALLEGHENY-SPURGE
PDARA09010	P	RC	G4	S2S3	PANAX QUINQUEFOLIUS	AMERICAN GINSENG
PDSAX0P010	P	RC	G4	S1	PARNASSIA ASARIFOLIA	KIDNEYLEAF GRASS-OF-PARNASSUS
PDSAX0P020	P	NC	G3	S1S2	PARNASSIA CAROLINIANA	CAROLINA GRASS-OF-PARNASSUS
PDSAX0P060	P	RC	G3G4	S2	PARNASSIA GRANDIFOLIA	LARGE-LEAVED GRASS-OF-PARNASSUS
PDCAR0L010	P	SC	G3	S?	PARONYCHIA AMERICANA	AMERICAN NAILWORT
PDAST6V080	P	SC	G3Q	S?	PARTHENIUM RADFORDII	RADFORD'S FEVER-FEW
PMPOA4PC30	P	SC	G5	S?	PASPALUM BIFIDUM	BEAD-GRASS
PPAD10H020	P	SC	G5	S1	PELLAEA ATROPURPUREA	PURPLE-STEM CLIFF-BRAKE
PPAD10H0E0	P	SC	G5	S?	PELLAEA WRIGHTIANA	CLIFF-BRAKE FERN
PMARA0E020	P	SC	G3G4	S?	PELTANDRA SAGITTIFOLIA	SPOON-FLOWER
PDHYD0C0F0	P	SC	G5	S1	PHACELIA BIPINNATIFIDA	FERNLEAF PHACELIA
PDHRO90C0	P	SC	G5	S1	PHILADELPHUS HIRSUTUS	STREAMBANK MOCK-ORANGE
PDLAM1G060	P	SC	G4G5	S?	PHYSOSTEGIA LEPTOPHYLLA	SLENDER-LEAVED DRAGON-HEAD
PDER110020	P	SC	G3	S?	PIERIS PHILLYREIFOLIA	CLIMBING FETTER-BUSH
PDURT07010	P	SC	G5	S?	PILEA FONTANA	SPRINGS CLEARWEED
PDRUB1E010	P	SC	G3G5	S1	PINCKNEYA PUBENS	HAIRY FEVER-TREE
PDAST7B070	P	SC	G4	S?	PITYOPSIS PINAFOLIA	PINE-LEAVED GOLDEN ASTER
PDPLN02140	P	SC	G2	S?	PLANTAGO SPARSIFLORA	PINELAND PLANTAIN
PMORC1Y0C0	P	SC	G4	S2	PLATANThERA INTEGRa	YELLOW FRINGELESS ORCHID
PMORC1Y0D0	P	NC	G2	S1	PLATANThERA INTEGRILABIA	WHITE FRINGELESS ORCHID
PMORC1Y0E0	P	SC	G5	S1	PLATANThERA LACERA	GREEN-FRIDGE ORCHIS
PMORC1Y0L0	P	RC	G5	S?	PLATANThERA PERAMOENA	PURPLE FRINGELESS ORCHID
PMLIL2E010	P	SC	G4	S?	PLEEA TENUIFOLIA	RUSH FALSE-ASPHODEL

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
PMPOA4Z040	P	SC	G47	S7	POA ALSODES	BLUE-GRASS
PDPGL020N0	P	SC	G3	S1	POLYGALA HOOKERI	MILKWORT
PDPGL02110	P	SC	G5	S1S2	POLYGALA NANA	DWARF MILKWORT
PDPGL02180	P	SC	G5	S1	POLYGALA PAUCIFOLIA	GAY-WING MILKWORT
PMORC24010	P	SC	G4G5	S7	PONTHIEVA RACEMOSA	SHADOW-WITCH ORCHID
PDPOR060H0	P	SC	G3	S7	PORTULACA SMALLII	SMALL'S PURSLANE
PDPOR060L0	P	SC	G5	S1	PORTULACA UMBRATICOLA	WING-POODED PURSLANE
PMPOT03050	P	SC	G3G4	S1	POTAMOGETON CONFEROIDES	ALGAE-LIKE PONDWEED
PMPOT03080	P	SC	G5	S7	POTAMOGETON FOLIOSUS	LEAFY PONDWEED
PPPSI01020	P	SC	G5	S1S2	PSILOTUM NUDUM	WHISK FERN
PMORC27010	P	SC	G2G3	S2	PTEROGLOSSASPIS ECRISTATA	CRESTED FRINGED ORCHID
PDAP11Y040	P	FE	G2	S1	PTILIMNIUM NODOSUM	HARPERELLA
PDLAM1N090	P	RC	G3G5	S1	PYCNANTHEMUM MONTANUM	SINGLE-HAIRED MOUNTAIN-MINT
PDDIA03010	P	NC	G4	S1	PYXIDANTHERA BARBULATA	FLOWERING PIXIE-MOSS
PDDIA03012	P	SC	G4T4	S7	PYXIDANTHERA BARBULATA VAR BARBULATA	WELL'S PYXIE MOSS
PDDIA03020	P	NC	G2Q	S2	PYXIDANTHERA BREVIFOLIA	WELL'S PIXIE-MOSS
PDFAG05060	P	SC	G5	S1	QUERCUS BICOLOR	SWAMP WHITE OAK
PDFAG050F0	P	SC	G5	S1	QUERCUS DURANDII	DURAND'S WHITE OAK
PDFAG050Q0	P	SX	G4	SX	QUERCUS GEORGIANA	GEORGIA OAK
PDFAG051H0	P	SC	G5	S7	QUERCUS MYRTIFOLIA	MYRTLE-LEAF OAK
PDFAG051M0	P	SC	G2G3	S3	QUERCUS OGLETHORPENSIS	OGLETHORPE'S OAK
PDRANOL0U0	P	SC	G5	S7	RANUNCULUS FASCICULARIS	EARLY BUTTERCUP
PDAST7Z030	P	SC	G5	S7	RATIBIDA PINNATA	GRAY-HEAD PRAIRIE CONEFLOWER
PMARE08010	P	SC	G4	S7	RHAPIDOPHYLLUM HYSTRIX	NEEDLE PALM
PDMLS0H020	P	SC	G3	S2	RHEXIA ARISTOSA	AWNED MEADOWBEAUTY
PDERI150C0	P	SC	G5	S7	RHOODENDRON CATAWBIENSE	CATAWBA RHOODENDRON
PDERI150F0	P	SC	G3	S2	RHOODENDRON FLAMMEUM	PIEDMONT AZALEA
PDANA08070	P	FE	G2	SX	RHUS MICHAUXII	MICHAUX'S SUMAC
PMCYPON010	P	SC	G5	S1	RHYNCHOSPORA ALBA	WHITE BEAKRUSH
PMCYPON0W2	P	SC	G5T3?	S7	RHYNCHOSPORA GLOBULARIS VAR PINETORUM	BEAKRUSH
PMCYPON100	P	SC	G3	S7	RHYNCHOSPORA HARPERI	HARPER BEAKRUSH
PMCYPON170	P	SC	G4	S7	RHYNCHOSPORA INUNDATA	DROWNED HORNEDRUSH
PMCYPON1C0	P	SC	G3G4	S7	RHYNCHOSPORA MACRA	BEAK RUSH
PMCYPON1N0	P	SC	G4	S7	RHYNCHOSPORA OLIGANTHA	FEW-FLOWERED BEAKED-RUSH
PMCYPON1P0	P	SC	G3	S7	RHYNCHOSPORA PALLIDA	PALE BEAKRUSH
PMCYPON280	P	SC	G4	S7	RHYNCHOSPORA STENOXYLLA	CHAPMAN BEAKRUSH
PMCYPON2D0	P	SC	G4	S7	RHYNCHOSPORA TRACYI	TRACY BEAKRUSH
PDGRO020G0	P	FT	G1	S1	RIBES ECHINELLUM	MICCOSUKEE GOOSEBERRY
PDBRA270J0	P	SC	G5	S7	RORIPPA SESSILIFLORA	STALKLESS YELLOWCRESS
PDAST85070	P	NC	G2	S1	RUDBECKIA HELIOPSISIDIS	SUN-FACING CONEFLOWER
PDAST850D0	P	SC	G3G5	S1	RUDBECKIA MOLLIS	SOFT-HAIR CONEFLOWER
PDACA0J025	P	SC	G5T7	S7	RUELLIA CAROLINIENSIS SSP CILIOSA	A PETUNIA
PDACA0J0G2	P	SC	G5T2	S7	RUELLIA PEDUNCULATA SSP PINETORUM	
PDACA0J0K0	P	SC	G4G5	S7	RUELLIA STREPENS	LIMESTONE PETUNIA
PDGENOF030	P	SC	G4G5	S7	SABATIA BARTRAMII	BARTRAM'S ROSE-GENTIAN
PDGENOF0E0	P	RC	G3	S1	SABATIA KENNEDYANA	PLYMOUTH GENTIAN
PDRHA00010	P	SC	G4	S2	SAGERETIA MINUTIFLORA	TINY-LEAVED BUCKTHORN
PMALI04090	P	FE	G1	S1	SAGITTARIA FASCICULATA	BUNCHED ARROWHEAD
PMALI040A4	P	SC	G5T7	S7	SAGITTARIA GRAMINEA VAR WEATHERBIANA	GRASSLEAF ARROWHEAD
PMALI040E0	P	SC	G3G4	S2	SAGITTARIA ISOETIFORMIS	SLENDER ARROW-HEAD
PDROS1L020	P	SC	G5	S7	SANGUISORBA CANADENSIS	CANADA BURNET
PDAP11Z0L0	P	SC	G4	S1	SANICULA TRIFOLIATA	LARGE-FRUITED SANICLE
PDSAR02080	P	SC	G3	S1	SARRACENIA RUBRA	SWEET PITCHER-PLANT
PDSAR02082	P	FE	G3T1	S7	SARRACENIA RUBRA SSP JONESII	MOUNTAIN SWEET PITCHER-PLANT

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS..	GRANK...	SRANK...	NAME.....	COMNAME.....
PDSAX0U090	P	SC	G3	S1	SAXIFRAGA CAREYANA	CAREY SAXIFRAGE
PDSAX0U100	P	SC	G5	S?	SAXIFRAGA MICRANTHIDIFOLIA	LETTUCE-LEAF SAXIFRAGE
PDSCH01020	P	SX	G4	SX	SCHISANDRA GLABRA	BAY STARVINE
PMLIL1S020	P	SC	G4	S1	SCHOENOLIRION CROCEUM	YELLOW SUNNYBELL
PDSCR1Q010	P	FE	G2	S2	SCHWALBEA AMERICANA	CHAFFSEED
PMCYPOQ061	P	SC	G5T?	S?	SCIRPUS CESPITOSUS VAR CALLOSUS	TUSSOCK BULRUSH
PMCYPOQ1P0	P	SC	G7	S?	SCIRPUS ERISMANAE	A BULRUSH
PMCYPOQ0L0	P	SC	G3G4	S?	SCIRPUS ETUBERCULATUS	CANBY BULRUSH
PMCYPOQ0R0	P		G2	S?	SCIRPUS HALLII	HALL'S BULRUSH
PMCYPOQ1G0	P	SC	G4G5	S?	SCIRPUS SUBTERMINALIS	WATER BULRUSH
PMCYPOR010	P	SC	G4	S1S2	SCLERIA BALDWINII	BALDWIN NUTRUSH
PDLAM1U110	P	SC	G4	S?	SCUTELLARIA PARVULA	SMALL SKULLCAP
PDCRA0A130	P	NC	G3	S2	SEDUM PUSILLUM	GRANITE ROCK STONECROP
PDAST8H220	P	RC	G2?	S2	SENECIO MILLEFOLIUM	PIEDMONT RAGWORT
PDDIA04010	P	NC	G2	S2	SHORTIA GALACIFOLIA	OCONEE-BELLS
PDSP0G040	P	SC	G4G5	S?	SIDEROXYLON LANUGINOSUM	GUM BUMELIA
PDCAR0U180	P	SC	G3	S?	SILENE OVATA	OVATE CATCHFLY
PDAST8L0G0	P	SC	G4G5	S1	SILPHIUM TEREBINTHINACEUM	PRAIRIE ROSINWEED
PMIRIOD1D0	P	FE	G2	S?	SISYRINCHIUM DICHOTOMUM	REFLEXED BLUE-EYED GRASS
PDAST8P050	P	SC	G4	S?	SOLIDAGO AURICULATA	EARED GOLDENROD
PDAST8P060	P	SC	G5	S1	SOLIDAGO BICOLOR	WHITE GOLDENROD
PDAST8P1F0	P	SC	G5	S?	SOLIDAGO PTARMICOIDES	PRAIRIE GOLDENROD
PDAST8P1M0	P	SC	G5	S1	SOLIDAGO RIGIDA	PRAIRIE GOLDENROD
PDAST8P1U0	P	SC	G7	S1	SOLIDAGO SIMULANS	
PDAST8P250	P	NC	G3	S1	SOLIDAGO VERNA	SPRING-FLOWERING GOLDENROD
PMORC2B0E0	P	SC	G4G5	S1	SPIRANTHES LACINIATA	LACE-LIP LADIES'-TRESSES
PMORC2B0G0	P	SC	G3	S?	SPIRANTHES LONGILABRIS	GIANT SPIRAL LADIES'-TRESSES
PMPOA5V140	P	SC	G3	SR	SPOROBOLUS SP 1	CAROLINA DROPSIED
PMPOA5V0U0	P	NC	G1G2	S?	SPOROBOLUS TRETIFOLIUS	WIRE-LEAVED DROPSIED
PDLAM1X0A0	P	SC	G3	S1	STACHYS CLINGMANII	CLINGMAN'S HEDGE-NETTLE
PDLAM1X0Z4	P	SC	G5TU	S1	STACHYS TENUIFOLIA VAR LATIDENS	BROAD-TOOTHED HEDGE-NETTLE
PDTHC06020	P	RC	G4	S2	STEWARTIA OVATA	MOUNTAIN CAMELLIA
PDEUP1B010	P	SC	G4G5	S1	STILLINGIA AQUATICA	CORKWOOD
PDCON0H052	P	SC	G4T2T3	S1	STYLISMA PICKERINGII VAR PICKERINGII	PICKERING'S MORNING-GLORY
PMERIO3010	P	SC	G5	SH	SYNGONANTHUS FLAVIDULUS	YELLOW PIPEWORT
PMMAR03010	P	SC	G3G5	S?	THALIA DEALBATA	POWDERY THALIA
PDRAN0M0M0	P	SC	G1G2	S?	THALICTRUM SUBROTUNDUM	RECLINED MEADOW-RUE
PDFAB3Z060	P	SC	G3G4	S?	THERMOPSIS MOLLIS	SOFT-HAIRED THERMOPSIS
PDSAX10013	P	SC	G5T5	S?	TIARELLA CORDIFOLIA VAR CORDIFOLIA	HEART-LEAVED FOAM FLOWER
PMLIL1Y020	P	SC	G3	S?	TOFIELDIA GLABRA	WHITE FALSE-ASPHODEL
PMPOA61030	P	SC	G5?	S?	TORREYOCHLOA PALLIDA	PALE MANNA GRASS
PMCOM0B0Q0	P	SC	G5	S?	TRADESCANTIA VIRGINIANA	VIRGINIA SPIDERWORT
PDRAN0N010	P	SC	G5	S?	TRAUTVETTERIA CAROLINIENSIS	CAROLINA TASSEL-RUE
PDAP12C010	P	SC	G4G5	S?	TREPOCARPUS AETHUSAE	AETHUSA-LIKE TREPOCARPUS
PPHYM02040	P	RC	G4	S1	TRICHOMANES BOSCHIANUM	BRISTLE-FERN
PPHYM020K0	P	RC	G4G5	S2	TRICHOMANES PETERSII	DWARF FILMY-FERN
PDLAM2Z0G0	P	SC	G2	S?	TRICHOSTEMA SP 1	DUNE BLUECURLS
PMPOA65040	P	SC	G3?	S?	TRIDENS CAROLINIANUS	CAROLINA FLUFF GRASS
PMLIL20090	P	SC	G3	S?	TRILLIUM DISCOLOR	FADED TRILLIUM
PMLIL200E0	P	SC	G5	S?	TRILLIUM GRANDIFLORUM	LARGE-FLOWER TRILLIUM
PMLIL200G0	P	NC	G3	S1	TRILLIUM LANCIFOLIUM	NARROW-LEAVED TRILLIUM
PMLIL200N0	P	FE	G1	S1	TRILLIUM PERSISTENS	PERSISTENT TRILLIUM
PMLIL200Q0	P	SC	G3	S?	TRILLIUM PUSILLUM	LEAST TRILLIUM
PMLIL200Q2	P	NC	G3T2	S1	TRILLIUM PUSILLUM VAR PUSILLUM	LEAST TRILLIUM

RARE, THREATENED, & ENDANGERED SPECIES OF SOUTH CAROLINA

ELCODE.....	ELCLASS..	STATUS...	GRANK...	SRANK...	NAME.....	COMNAME.....
PMLIL200S0	P	FE	G2	S1	TRILLIUM RELIQUUM	RELICT TRILLIUM
PMLIL20130	P	SC	G3	S?	TRILLIUM RUGELII	SOUTHERN NODDING TRILLIUM
PMLIL200V0	P	SC	G3	S?	TRILLIUM SIMILE	A TRILLIUM
PMLIL200Z0	P	SC	G5	S?	TRILLIUM UNDULATUM	PAINTED TRILLIUM
PMORC2F050	P	SC	G4	S2	TRIPHORA TRIANTHOPHORA	NODDING POGONIA
PDURT0D010	P	SC	G4G5	S?	URTICA CHAMAEDRYOIDES	WEAK NETTLE
PDLNT02050	P	SC	G3G5	S1	UTRICULARIA FLORIDANA	FLORIDA BLADDERWORT
PDLNT020F0	P	SC	G4	S1	UTRICULARIA OLIVACEA	PIEDMONT BLADDERWORT
PDERI180A2	P	NC	G4G5T1	S1	VACCINIUM CRASSIFOLIUM SSP SEMPERVIRENS	RAYNER'S BLUEBERRY
PMHYDOA010	P	SC	G5	S?	VALLISNERIA AMERICANA	EEL-GRASS
PDVERON0W0	P	SC	G5	S?	VERBENA SIMPLEX	NARROW-LEAVED VERVAIN
PDSCR21010	P	SC	G5	S?	VERONICASTRUM VIRGINICUM	CULVER'S-ROOT
PDVI0040E0	P	SC	G5	S?	VIOLA CONSPERSA	AMERICAN BOG VIOLET
PDVI0041R2	P	SC	G5TU	S?	VIOLA PUBESCENS VAR LEIOCARPON	YELLOW VIOLET
PDVI0042D0	P	SC	G5	S?	VIOLA TRIPARTITA	THREE-PARTED VIOLET
PDVI0042D2	P	SC	G5T?	S?	VIOLA TRIPARTITA VAR GLABERRIMA	THREE-PARTED VIOLET
PDVI0042D1	P	SC	G5T3?	S?	VIOLA TRIPARTITA VAR TRIPARTITA	THREE-PARTED VIOLET
PDR0S1S030	P	RC	G2?	S2	WALDSTEINIA LOBATA	PIEDMONT STRAWBERRY
PMLIL26010	P	SC	G4	S1	XEROPHYLLUM ASPHODELOIDES	EASTERN TURKEYBEARD
PMXYR01030	P	SC	G4G5	S?	XYRIS BREVIFOLIA	SHORT-LEAVED YELLOW-EYED GRASS
PMXYR010T0	P	SC	G3	S?	XYRIS CHAPMANII	CHAPMAN'S YELLOW-EYED GRASS
PMXYR010H0	P	SC	G3	S?	XYRIS SCABRIFOLIA	HARPER'S YELLOW-EYED GRASS
PMXYR010N0	P	SC	G5	S?	XYRIS TORTA	TWISTED YELLOW-EYED-GRASS

OTHER

OBPROPOSED	O	SC	G?	S?	CAROLINA BAY	COLONIAL WATERBIRD
ORXXX00001	O	SC	G?	S?	COLONIAL WATERBIRD	COLONIAL WATERBIRD
OOXXX01103	O	SC	G?	S?	OUTCROP	OUTCROP
OWXXX01101	O	SC	G?	S?	WATERFALL	WATERFALL