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FINAL

CORRECTIVE MEASURES STUDY WORK PLAN
ARMY CREMATOR DISPOSAL SITE - SWMU 1
LANGLEY DRIVE DISPOSAL AREA - SWMU 2

RCRA/HSWA Permit No. PR2170027203

NAVAL STATION ROOSEVELT ROADS
CEIBA, PUERTO RICO

CONTRACT TASK ORDER 0277

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1.0 INTRODUCTION

This work plan presents the technical approach for conducting a Corrective Measures Study (CMS) at the Army Cremator Disposal Site (SWMU 1) and the Langley Drive Disposal Area (SWMU 2) located at Naval Station Roosevelt Roads (NSRR), Ceiba, Puerto Rico (Figure 1-1). This CMS work plan has been prepared under contract to the Atlantic Division, Naval Facilities Engineering Command (LANTDIV), Contract Number N62470-89-4814.

1.1 Basis for the Work Plan

A RCRA Facility Investigation (RFI) was performed at SWMUs 1 and 2. The results of the investigations and subsequent human health risk assessment indicated that there were levels of inorganic and organic constituents present that posed potential risks to future residents and on-site construction workers. Based on the results of the risk assessment, a CMS for the sites is warranted.

The two SWMUs are being addressed together for a number of reasons most notably:

- The two SWMUs are separated only by a paved access road,
- The contaminants of concern are similar,
- The risks posed by the SWMUs is very similar, and
- The corrective measure for the two SWMUs is expected to be the same and will be implemented for both simultaneously.

These conditions allow the units to be included in one CMS, which will result in reduced costs and an accelerated schedule.

1.2 Site Status Summary

The RCRA Corrective Action portion of Roosevelt Road's permit contained specific requirements for investigations at SWMUs 1 and 2. A spatial display of all the samples collected at SWMU's 1 and 2 are provided on Figures 1-2 and 1-3, respectively. The RFI was performed in 1997 and 1998. Results of the RFI are provided in "Revised Draft RCRA Facility Investigation Report for Operable Unit 3/5, Naval Station Roosevelt Roads, Ceiba, Puerto Rico" which was submitted in April 1998. This document was revised based on EPA comments and submitted on April 1, 1999.

1.3 Organization of the CMS Work Plan

This CMS Work Plan is organized into six sections. The first section, the Introduction, is designed to introduce the reader to the basis for the work plan and a summary of the site status. Section 2.0 provides the objectives, goals, and the corrective measure standards being utilized for this project. The additional investigations to be performed are discussed in Section 3.0. The tasks to be accomplished as part of the Corrective Measure Study are described in Section 4.0. The project schedule is provided in Section 5.0. References cited in the work plan are provided in Section 6.0.

2.0 CMS OBJECTIVES AND GOALS

2.1 Objectives and Goals

The objective of this CMS Work Plan is to identify those tasks required to obtain additional data to assist in screening applicable remedial technologies for SWMU 1 and SWMU 2 at Naval Station Roosevelt Roads. This Work Plan also documents the scope and objectives of the full CMS, and the activities required to implement the program. The Work Plan serves as a tool for assigning responsibilities and establishing the project schedule and costs.

2.2 Corrective Measures Standards

Corrective measure standards which may be applicable to SWMUs 1 and 2 will be developed as part of the CMS "Task I" reporting effort which will include the results of the ecological evaluation to be performed.

The corrective measure standards will include the applicable Federal maximum contaminant levels (MCLs) established under the Safe Drinking Water Act and Toxic Substance Control Act (TSCA) regulations and the Puerto Rico Environmental Quality Board (PREQB) standards. The Code of Federal Regulations (40 CFR§264.100) will also be reviewed for applicability to the site.

3.0 ADDITIONAL INVESTIGATIONS

3.1 Introduction

Human Health risks have been calculated for the various possible exposure scenarios at the sites; however, potential ecological risks have not been evaluated in detail. This evaluation is required to provide the information needed to completely assess the applicability of various remedial alternatives. Ecological risk evaluation is particularly important to the analysis of an "institutional controls" scenario.

3.2 Ecological Evaluation

The evaluation of ecological risks at SWMUs 1 and 2 will be conducted in accordance with methodology contained in *Interim Final Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997), *Guidelines for Ecological Risk Assessment* (USEPA, 1998), and *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1990). The assessment will rely on a phased approach, with subsequent phases only made necessary by the finding of potential risks in earlier phases. At some point in the risk assessment process, additional data may need to be obtained to provide adequate information.

Given that ecological evaluations are iterative and dynamic processes, the entire scope of the ecological risk assessment can not be identified at this time. The description of ecological risk assessment activities presented in the sections that follow is limited to those activities that will be conducted as part of Phase 1 (Screening-Level Ecological Risk Assessment) and, if necessary, Phase 2 (Baseline Ecological Risk Assessment Problem Formulation). Any work conducted beyond Phase 2 will be identified and described in future ecological risk assessment reports, work plan updates, or task-specific work plans.

Critical habitats (i.e., mangroves) are known to exist adjacent to SWMUs 1 and 2. While it is acknowledged that a detailed CMS has not been conducted to date, if potential ecological effects are identified within these habitats, consideration must be given to the relative risks of no action compared to destruction of habitat from remediation. This is especially true if it is determined that chemicals driving the risk are not biologically available based on an evaluation of media-specific characteristics (i.e., total organic carbon, acid volatile sulfides, etc.).

3.2.1 Phase 1: Screening-Level Ecological Risk Assessment

An initial, conservative ecological risk screening assessment will be conducted at SWMUs 1 and 2 using existing analytical data for surface soil, sediment, and groundwater. The screening-level ecological risk assessment will consist of the of the following components (USEPA, 1997):

- Screening-level problem formulation
- Screening-level ecological effects evaluation
- Screening-level exposure estimate
- Screening-level risk calculation

Each component of the screening-level risk assessment is discussed in the sections that follow.

3.2.1.1 Screening-Level Problem Formulation

The screening-level problem formulation will involve the development of a preliminary conceptual site model that will address the environmental setting and the nature and extent of contamination, as well as chemical fate and transport mechanisms, toxicity mechanisms, potential ecological receptors, complete exposure pathways, and screening-level assessment endpoints.

As part of the screening-level problem formulation for SWMUs 1 and 2, a habitat assessment will be conducted. The objective of the habitat assessment will be the identification of:

- Potential fate and transport mechanisms that might exist at each SWMU

- Relevant habitat units, including ecologically sensitive habitats (i.e., mangroves), within and adjacent to each SWMU that may potentially be impacted by previous waste management activities

- Ecological receptors utilizing the SWMU habitat units

- Current land usage

- Reference sites that closely resemble the SWMU habitats with regard to their size and ecological traits

Parallel habitat assessments will be conducted for each SWMU habitat and corresponding reference site habitat. The assessment within terrestrial and semi-aquatic habitats (i.e., mangroves) will be conducted at a level of detail that will allow for a qualitative comparison of wildlife utilization between the SWMU habitats and associated reference habitats. The qualitative comparison will most likely focus on such parameters as similarities/differences in species composition, absence/presence of specific species, and relative abundance of individuals within a species.

As discussed in Section 3.2.1.4, observations and information from the parallel habitat assessments will be used in conjunction with the screening-level risk assessment to determine if the investigation at a given SWMU will proceed to Phase 2. For example, if the conservative screening-level risk assessment indicates the potential for minor ecological effects for specific exposure pathways but detectable impacts were not evident for those pathways based on observations and information obtained during the habitat assessment, the risk assessment process may end with Phase 1.

Field sampling activities will not be conducted as part of the habitat assessment; therefore, ecological receptors within those habitats where access or direct observation is restricted, such as deep-water habitats, will be identified by a literature review. The decision to proceed with a more thorough ecological risk assessment for these habitats and their associated exposure pathways will be based solely on conclusions drawn from the screening-level risk assessment.

The evaluation of potential exposure pathways and receptors will be a critical component of the screening-level problem formulation. Based on observations regarding wildlife utilization within site habitats, receptor species will be identified for evaluation by the screening-level ecological risk assessment. Factors that will be considered in the selection of receptor species include the physical and chemical properties of the chemicals that have been detected in the abiotic media. For example, if bioaccumulative chemicals or chemicals that tend to biomagnify through a food chain have been detected during previous sampling events, the receptor species selected for evaluation will include upper trophic level organisms. The selection of receptor species will also be based on the presence or absence of complete exposure pathways. Exposure pathways will be considered complete if the following four elements exist: (1) A source and mechanism of chemical release; (2) An environmental transport medium; (3) A receptor exposure route (i.e., inhalation, ingestion, dermal adsorption, etc.); and (4) A receptor exposure point. Only complete exposure pathways will be retained for evaluation.

3.2.1.2 Screening-Level Ecological Effects Evaluation

Ecological screening thresholds and toxicological benchmarks will be identified from the literature for all detected chemicals for which a complete exposure pathway exists. The ecological screening thresholds will consist of media-specific toxicological benchmarks, as well as chemical-specific exposure levels that have been shown to produce adverse effects. The media-specific toxicological benchmarks that may be utilized include benchmarks for surface soil (Efroymson, et. al., 1997a and 1997b), groundwater (USEPA, 1995, and USEPA, 1999), and sediment (Long, et. al., 1995 and Jones, et. al., 1997). If available, the chemical-specific exposure levels will consist of No Observed Adverse Effect Levels (NOAELs) for the receptor species selected for evaluation. In the absence of species-specific data, available NOAELs for similar species will be used. In those cases when only a Lowest Observed Adverse Effect Level (LOAEL) is available from the literature, the NOAEL will be estimated by multiplying the LOAEL by 0.1 (USEPA, 1997). The rational for selecting a given screening level will be discussed and documented in a screening-level ecological risk assessment report.

3.2.1.3 Screening-Level Exposure Estimate

The screening-level exposure estimate will be conservative in nature and involve a comparison of maximum detected surface soil, sediment, and/or groundwater concentrations to appropriate

toxicological benchmarks. Depending on the specific ecological receptors identified during the habitat assessment, as well as the physical and chemical properties of the chemicals under evaluation, the screening-level exposure estimate may also use terrestrial and aquatic exposure models that address the complete exposure pathways identified during the screening-level problem formulation. The specific exposure pathways that may be addressed by the exposure models include ingestion of soil, ingestion of water, and/or food chain exposures. The degree of uncertainty associated with the use of exposure models will depend on the availability of model input parameters for the receptors utilized in the evaluation of risks (i.e., ingestion rates for soil, water, and food, body weights, and dietary compositions). If these data are not available from the literature, the USEPA (Region 2) will be consulted for identification and selection of appropriate model input parameters for the receptors identified for evaluation. When possible, conservative assumptions will be used to fill any data gaps encountered during the screening-level ecological risk assessment.

Because the screening-level ecological risk assessment will rely on existing analytical data, derivation of screening-level exposure estimates and, therefore, screening-level risk estimates for one or more complete exposure pathways may not be feasible. For example, a preliminary review of site conditions indicates that surface waters within adjacent mangroves and the Ensenada Honda may represent a complete exposure pathway; however, surface water data have not been previously collected.

3.2.1.4 Screening-Level Risk Calculation

For the screening-level risk calculation, the Hazard Quotient (HQ) approach will be used to estimate risk (USEPA, 1997). For screening-level risk calculations based on direct exposures, the HQ can be expressed as a ratio of the maximum detected concentration in surface soil, sediment, or groundwater (mg/kg or mg/L) to the toxicological benchmark or NOAEL for surface soil, sediment, or groundwater (mg/kg or mg/L):

HQ = Maximum Detected Concentration/Toxicological Benchmark or NOAEL

For screening-level risk estimates based on modeled ingestion exposures (mg/kg/day), the HQ can be expressed as a ratio of the modeled dose (mg/kg/day) to the NOAEL (mg/kg/day):

HQ = Modeled Dose/NOAEL

A HQ less than unity (i.e., less than one) will indicate that the chemical is unlikely to cause adverse ecological effects. Conversely, a HQ greater than one will indicate that the chemical has the potential to cause adverse ecological effects. The significance of HQ values has previously been judged as follows (Menzie, et. al., 1993):

- HQ exceeds one but less than 10: some small potential for environmental effects
- HQ exceeds 10: significant potential that greater exposures could result in effects based on experimental evidence
- HQ exceeds 100: effects may be expected since this represents an exposure level at which effects have been observed in other species.

If detected chemical concentrations in the various abiotic media exceed media-specific toxicological benchmarks or chemical-specific NOAELs (i.e., the HQ is greater than one), those chemicals will be retained as ecological constituents of potential concern (COPCs). However, the decision to proceed with the ecological risk assessment will be based on an evaluation of the following:

- The degree that HQ values exceed unity
- Information obtained during the habitat assessment regarding wildlife utilization within site habitats and reference habitats
- The level of uncertainty associated with the screening-level risk assessment

A more thorough ecological risk assessment may not be warranted if the HQ values exceeding unity are less than 10 since the conservative exposure assumptions used in their derivation are unlikely to represent actual exposure conditions. If this situation is encountered, information from the habitat assessment will be used in conjunction with the screening-level ecological risk assessment to determine if the risk assessment process should proceed to Phase 2. The decision to proceed will also be based on a preliminary re-evaluation and refinement of the conservative exposure assumptions used in the screening-level exposure estimate and risk calculation. The refinement process will utilize existing data.

If one or more HQ values exceed 10, a more thorough ecological risk assessment may be warranted since significant potential for ecological effects may exist (Menzie et. al., 1993). Again, the decision to proceed under this situation will be based on information obtained from the habitat assessment and the re-evaluation and refinement of the conservative exposure assumptions.

If none of the screening-level exposure thresholds are exceeded and the available information (i.e., analytical data) is adequate to conclude that ecological risks are negligible for all complete exposure pathways identified by the screening-level problem formulation, the ecological risk assessment process will end with Phase 1. The decision to end or proceed with the ecological risk assessment will be documented in a screening-level ecological risk assessment report.

The screening-level risk calculation will include a detailed evaluation of uncertainties associated with the screening-level ecological risk assessment. The evaluation will include uncertainties associated with the available analytical data, media-specific toxicological benchmarks, chemical-specific NOAELs, and the screening-level exposure estimates.

3.2.2 Phase 2: Baseline Ecological Risk Assessment Problem Formulation

As described in Section 3.2.1.4, the baseline ecological risk assessment problem formulation will be performed if the screening-level ecological risk assessment (Phase 1) indicates the potential for adverse ecological effects. In Phase 2, the components of the preliminary conceptual site model developed during Phase 1 will be refined based on more realistic site-specific exposure assumptions and/or additional media-specific analytical data.

If significant data gaps are identified during the screening-level ecological risk assessment, the first step for Phase 2 will involve the development and implementation of a Sampling and Analysis Plan (SAP). The SAP will address abiotic media sampling activities that will provide data to better characterize the nature and extent of contamination and potential receptor exposures in the relevant habitat units. If additional sampling is necessary, the SAP will also address abiotic media sample collection activities within the reference sites identified during the habitat assessment. The reference samples will provide information regarding inorganics that occur naturally and organic constituents that are anthropogenic but not related to waste management activities at SWMUs 1 and 2. Analytes will include media-specific characteristics (i.e., total organic carbon and acid volatile sulfides for

sediments and total hardness and pH for surface waters) that can influence the bioavailability and toxicity of the COPCs identified in Phase 1.

If after refinement of the preliminary site conceptual model and re-evaluation of potential exposures potential risks to ecological receptors remain, a work plan for additional ecological investigations will be developed. The specific ecological investigations conducted will be contingent upon the measurement endpoints selected for SWMUs 1 and 2 during Phase 2 and may include biological field studies/surveys and acute or chronic media-specific toxicity tests. Any field sampling activities and studies conducted within site habitats will be duplicated within the appropriate reference sites.

4.0 POTENTIAL CORRECTIVE MEASURES

Following completion of the ecological evaluation, work will be started on the formal CMS. This section of the CMS work plan describes the stepwise approach to be taken in performing the CMS. The CMS consists of four tasks, which are described in the following sections.

4.1 Task I - Identification and Development of the Corrective Measure Alternative or Alternatives

This task will identify, screen, and develop the alternative or alternatives for removal, containment, treatment and/or other remediation of the contamination based on the objectives established for the corrective action. This will be based on the results of the RFI investigations at SWMUs 1 and 2 along with the ecological evaluations described within this document.

4.1.1 Description of the Current Situation

The current situation and the known nature and extent of contamination at SWMUs 1 and 2 will be described in this section. A statement of the purpose for the response, based on the results of the previous investigations will be provided as will the actual or potential exposure pathways that will be addressed by the corrective measures.

4.1.2 Establishment of Corrective Action Objectives

Site specific objectives for the corrective action will be established in conjunction with the EPA. These objectives will be based be based on public health and environmental criteria, information obtained from previous investigations, EPA guidance, and any applicable federal or Commonwealth of Puerto Rico statutes. The corrective action objectives will be consistent with 40 CFR §264.100 as applicable.

4.1.3 Screening of Corrective Measure Technologies

The preliminary corrective measure technologies screened in the Pre-Investigative Measures Screening Report (Baker, 1994), and any additional technologies which are applicable at the facility, will be reviewed based on all the available data and information. This screening process focuses on eliminating those technologies which have severe limitations for a given set of waste and site-specific conditions or due to inherent technology limitations. The screening of the technologies will look in detail at the site and waste characteristics as well as the technology limitations.

4.1.4 Identification of the Corrective Measure Alternative or Alternatives

The corrective measure alternative or alternatives will be developed based on the corrective action objectives and analysis of the corrective measure technologies. Those alternatives which appear most suitable for the site based on sound engineering shall be retained. Technologies can be combined to form the overall corrective action alternative or alternatives. The reasons for excluding any technology shall be documented.

4.2 Task II - Evaluation of the Corrective Measure Alternative or Alternatives

Task II will be combined with Task I as it is expected that some variation of "institutional controls" will be the appropriate corrective measure for these SWMUs. Should this situation change as a result of the ecological evaluation a full Task II will be performed including analysis of the technical/environmental/human health/institutional aspects of each potentially appropriate corrective measure and the preparation of a cost estimate.

4.3 Task III - Justification and Recommendation of the Corrective Measure or Measures

The corrective measure alternative will be recommended and justified using technical, human health, and environmental criteria. Tradeoffs among health risks, environmental effects, and other pertinent factors will be highlighted. The EPA will select the corrective measure alternative or alternatives to be implemented based on the results of Task II and III. At a minimum the criteria in the following sections will be used to justify the final corrective measure or measures.

4.3.1 Technical

4.3.1.1 Performance

Corrective measure or measures which are most effective at performing their intended functions and maintaining the performance over extended periods of time will be given preference.

4.3.1.2 Reliability

Corrective measure or measures which do not require frequent or complex operation and maintenance activities and that have proven effective under waste and facility conditions similar to those anticipated will be given preference.

4.3.1.3 Implementability

Corrective measure or measures which can be constructed and operated to reduce levels of contamination to attain or exceed applicable standards in the shortest period of time will be preferred.

4.3.1.4 Safety

Corrective measure or measures which pose the least threat to the safety of nearby residents and environments as well as workers during implementation will be preferred.

4.3.2 Human Health

The corrective measure or measures will comply with existing EPA criteria, standards, or guidelines for the protection of human health. Corrective measures which provide the minimum level of exposure to contaminants and the maximum reduction in exposure with time are preferred.

4.3.3 Environmental

The corrective measure or measures posing the least adverse impact (or greatest improvement) over the shortest period of time on the environment will be favored.

4.4 Task IV - Reports

4.4.1 Progress

The EPA will be provided with signed progress reports as required by Condition B.8.(a) of Module III of the Permit.

4.4.2 Corrective Measure Study (CMS) Final Report

A CMS Final Report will be developed which includes all the information gathered under the approved CMS Work Plan. At a minimum the report will include a description of the facility, a summary of the corrective measure or measures, a summary of the previous investigations impact on the selected corrective measure or measures, design and implementation precautions, and cost estimates and schedules.

5.0 SCHEDULE

The schedule for the CMS will be developed after the ecological evaluation is complete.

6.0 REFERENCES

Baker Environmental, Inc. (Baker). 1998. Draft RCRA Facility Investigation Report, for Operable Unit 3/5, Naval Station Roosevelt Roads, Ceiba, Puerto Rico. March 20, 1998. Coraopolis, Pennsylvania.

Baker. 1994. Draft Final, Pre-Investigation Corrective Measures Screening Report, Naval Station Roosevelt Roads, Puerto Rico. April 29, 1994. Coraopolis, Pennsylvania.

Baker. 1999. Revised Draft RCRA Facility Investigation Report, Operable Unit 3/5, Naval Station Roosevelt Roads, Ceiba, Puerto Rico. April 1, 1999. Coraopolis, Pennsylvania.

Efroymson, R.A., M.E. Will, G.W. Suter II, and A.C. Wooten. 1997a. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-85/R3. November 1997.

Chief of Naval Operations. 1999. Policy for Conducting Ecological Risk Assessments. Office of the Chief of Naval Operations, Washington, D.C. April 1999.

Efroymson, R.A., M.E. Will, and G.W. Suter II. 1997b. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision. Oak Ridge National Laboratory, Oak Ridge, Tennessee. ES/ER/TM-126/R2. November 1997.

Jones, D.S. and G.W. Suter II. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision. Oak Ridge National Laboratory. Oak Ridge, Tennessee. ES/ER/TM-95/R4. November 1997.

Long, E.R. D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments. Environmental Management 19(1), pp. 81-97.

Menzie, C.A., J. Cura, and J. Freshman. 1993. Evaluating Ecological Risks and Developing Remedial Objectives at Forested Wetland Systems in New England. In Application of Ecological Risk Assessment to Hazardous Waste Site Remediation. Water Environment Federation. January 1993.

U.S. Environmental Protection Agency. 1995. Final Water Quality Guidance for the Great Lakes System. Federal Register, March 23, 1995 (Volume 60, Number 56).

U.S Environmental Protection Agency. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final. Office of Solid Waste and Emergency Response. June 5, 1997.

U.S. Environmental Protection Agency. 1998. Guidelines for Ecological Risk Assessment. EOA/630/R-95/002f. April 1998.

U.S. Environmental Protection Agency. 1999. National Recommended Water Quality Criteria - Correction. Office of Water, Washington D.C. EPA 822-Z-99-001. April 1999.

FIGURES

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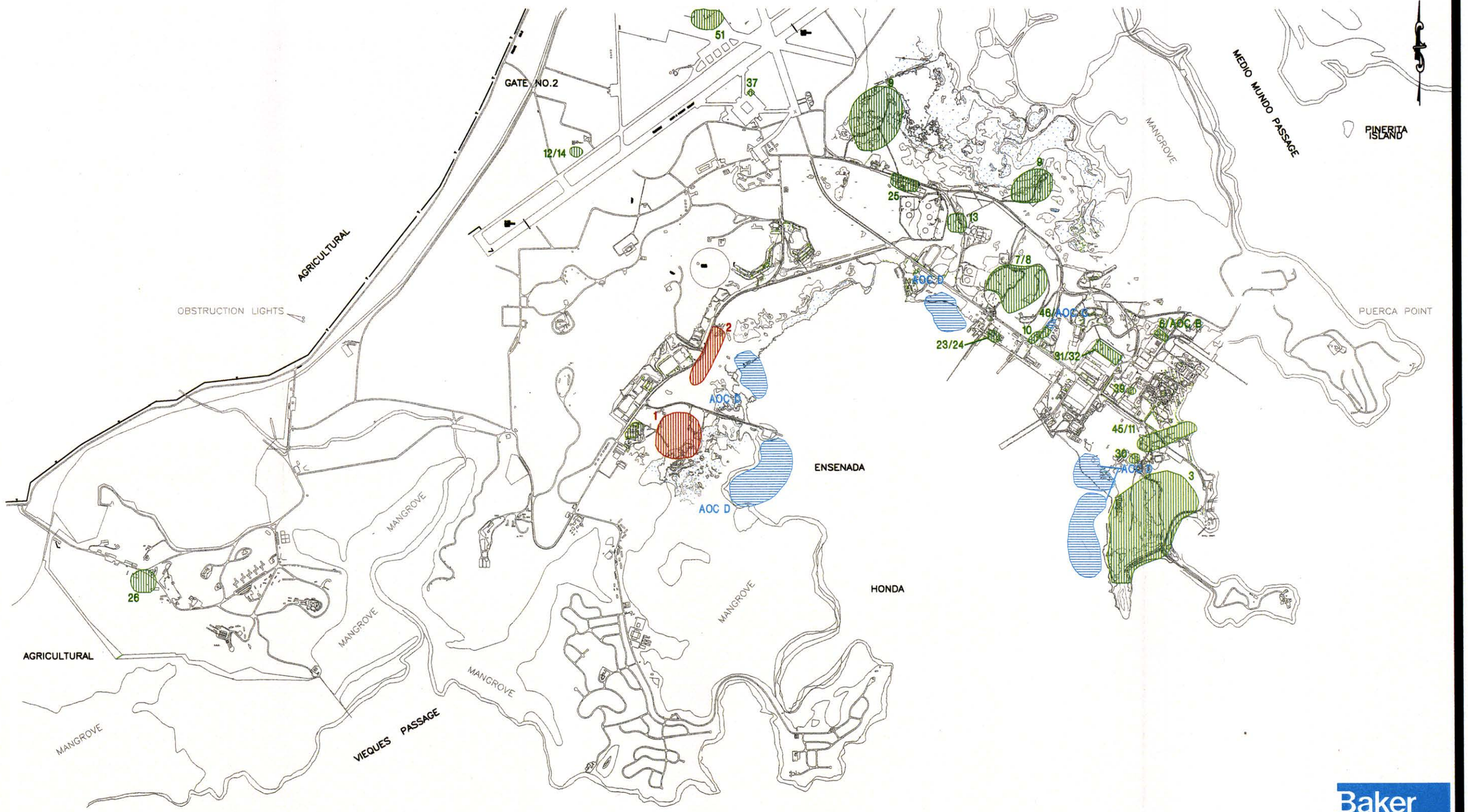

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LEGEND

13 – SWMUs

AOC D – AOCs

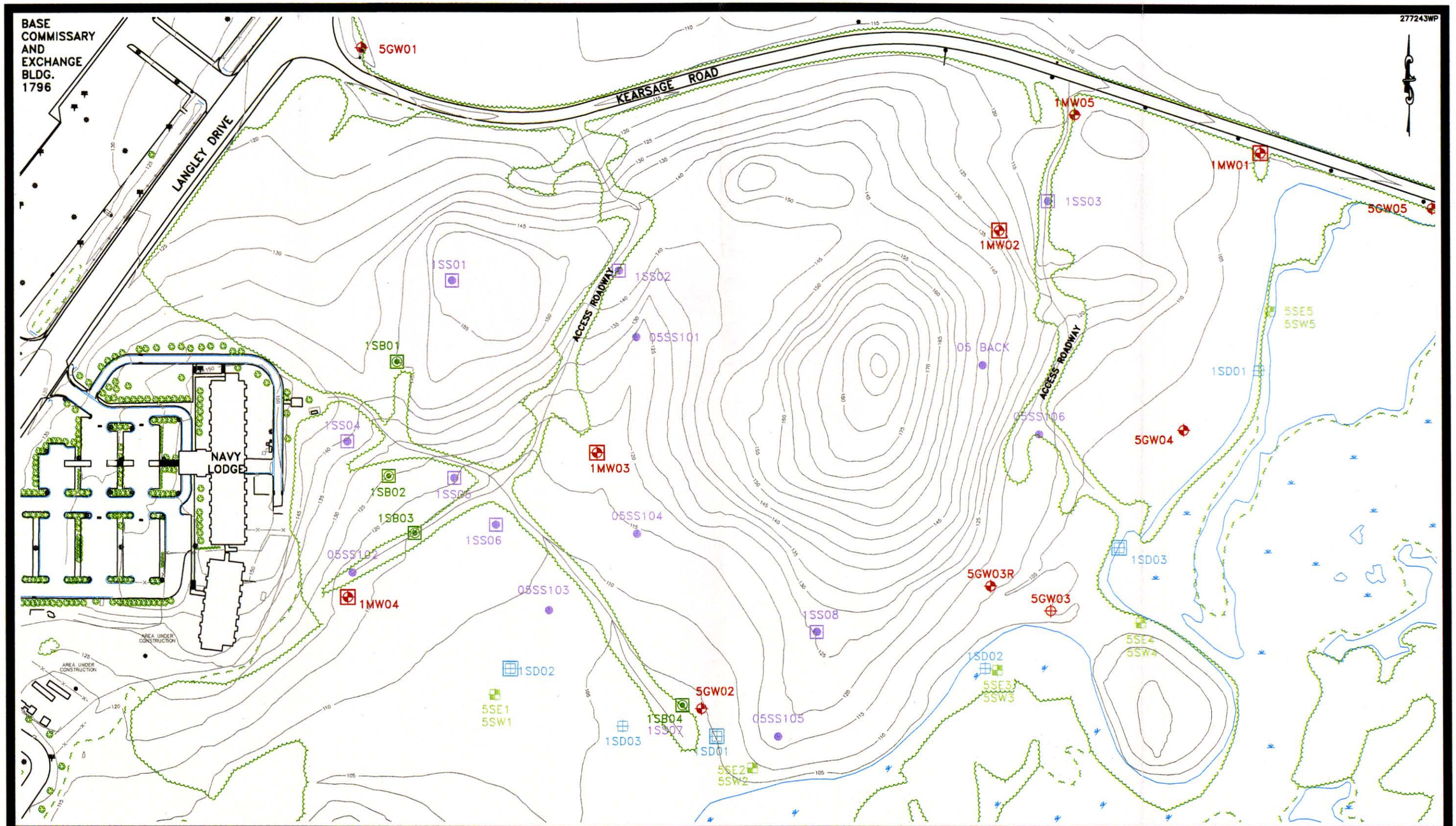
1 – AREA WHICH THIS INVESTIGATION PERTAINS TO

SOURCE: LANTDIV, FEB. 1992/1997

2500 0 1250 2500
1 inch = 2500 ft.

FIGURE 1–1
SWMU/AOC LOCATION MAP
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO

00761IBIY



LEGEND

- EXISTING MONITORING WELL LOCATION (CONFIRMATION STUDY)
- MONITORING WELL LOCATION (1996 RFI)
- SURFACE SOIL SAMPLE LOCATION (1996 RFI)
- SOILBORING LOCATION (1996 RFI)
- SEDIMENT SAMPLE LOCATION (1996 RFI)
- REPORTED LOCATION OF 5GW03 (NOT LOCATED DURING 1996 RFI FIELD WORK)
- 5SE1 5SW1 – SURFACE WATER/SEDIMENT SAMPLE LOCATION (CONFIRMATION STUDY)
- 05SS101 – SOIL SAMPLE LOCATION (SUPPLEMENTAL INVESTIGATION)
- 1SD02 – SEDIMENT SAMPLE LOCATION (RELATIVE RISK RANKING)

150 0 75 150

1 inch = 150 ft.

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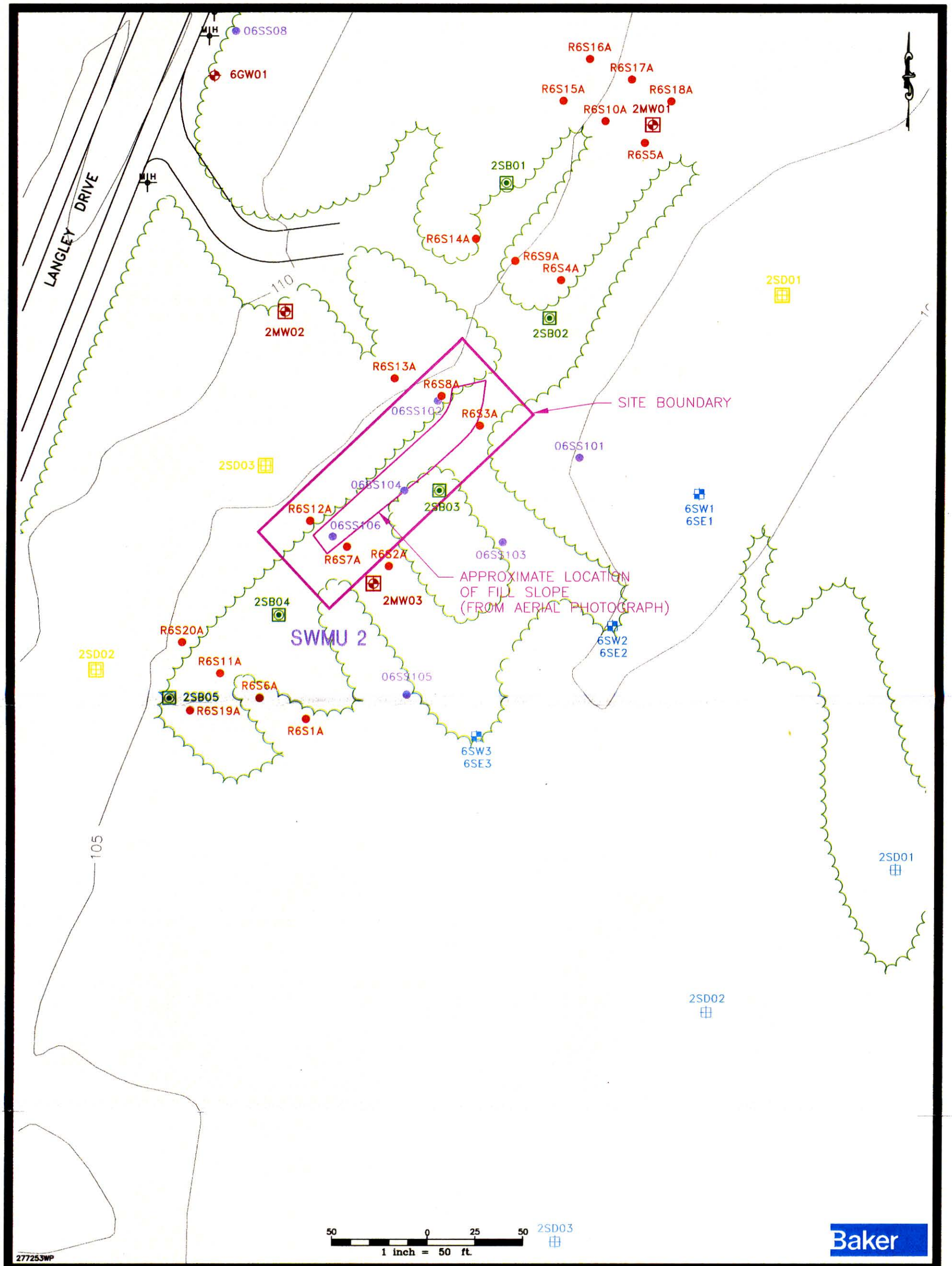
FIGURE 1-2
SWMU 1 SAMPLING LOCATIONS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO



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LEGEND

- MONITORING WELL LOCATION (1996 RFI)
- SOIL BORING LOCATION (1996 RFI)
- SEDIMENT SAMPLE LOCATION (1996 RFI)
- 6GW01 – EXISTING MONITORING WELL LOCATION (CONFIRMATION STUDY)
- SURFACE WATER/SEDIMENT SAMPLE LOCATION (CONFIRMATION STUDY)
- SOIL SAMPLE LOCATION (APPROXIMATE) (SUPPLEMENTAL INVESTIGATION)
- SOIL SAMPLE LOCATION (APPROXIMATE) (CONFIRMATION STUDY)
- SEDIMENT SAMPLE LOCATION (RELATIVE RISK RANKING)
- 110 – SURFACE ELEVATION CONTOUR

FIGURE 1–3
SWMU 2 SAMPLING LOCATIONS
NAVAL STATION ROOSEVELT ROADS
PUERTO RICO