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TELEPHONE NO

IN REPLY REFER TO:

December 16, 2002

Esteban Mujica Cotto, Esq
 Chairman
 Puerto Rico Environmental Quality Board
 National Plaza **Bldg.**, Office 225
 431 Ponce de Leon Avenue
 Hato Rey, PR 00917

Re: Response to EQB letter dated October 12, 2002

Dear Sr. Esteban Mujica Cotto:

This letter is in response to your letter dated October 21, 2002 requesting information regarding the nature and extent of all hazardous and non-hazardous substances found at the former NASD facilities. We understand you are especially concerned with unexploded ordnance and explosive (UXO) found in SWMU-4 & SWMU- 6.

Status updates and projected work for the Installation Restoration Program activities at the former NASD Facilities are provided at the CERCLA Technical Meetings, CERCLA Conference Calls, and Technical Review Committee Meetings. The most recent conference call was held on December 3rd, in which updates and projected work activities were discussed between DOI, EPA, and the Navy. The most current updates of the investigative field work at SWMU-4 were provided to Eugene Scott and Yarrisa Martinez of your office at the TRC Meeting on August 17, 2002. In addition, copies of the presentations and meeting minutes from this meeting were sent to Yarrisa Martinez on November 5, 2002. Currently, no Remedial Investigation or UXO investigation work has commenced at SWMU-6.

Since the August TRC Meeting we have been preparing an Interim Data Summary Report for the Phase I and Phase II Investigations at SWMU 4. The report is enclosed for your review and discussion at the next CERCLA Technical Committee Meeting scheduled for the week of Jan 13th, 2003 in San Juan. The objectives of this meeting are to discuss the Phase I and Phase II UXO Investigation work completed to date at SWMU 4 in the former NASD, present planned work for the continuation of the Phase III investigation, and discuss other administrative issues such as DSMOA, other Geld activities, and the projected schedule. A TRC meeting will also be held on January 18th. We are also requesting that your staff and consultants be present at that meeting in order to discuss EQB's involvement in the continuation of SWMU 4 Phase III UXO Investigation and other environmental site work.

The Navy looks forward to your active participation at the next meeting and the Installation Restoration efforts at the former NASD. If you have any questions, please don't hesitate in contacting me at 757-322-4815.

Sincerely,

A handwritten signature in black ink that reads "Christopher T. Penny" followed by a stylized flourish.

Christopher T. Penny, REM
Project Coordinator
Installation Restoration Section (South)
Environmental Programs Branch
Environmental Division
By direction of the Commander

Copy to:

PREQB (Ms. Yarissa Martinez)
USEPA (Ms. Helen Shannon, Mr. Bob Wing w/o enclosure)
NAVSTA Roosevelt Roads (Ms. Madeline Rivera Ruiz)
NOSSA (Mr. Rick Urbanski)
DOI (Mr. Oscar Diaz)
CH2MHILL (Messrs. John Tomik, Marty Clasen)

Encl:

Draft Interim Data Summary Report
Addendum to SWMU 4 Work Plan

Addendum to the Ordnance/Explosives Site Specific Work Plan for SWMU 04, Former NASD, Vieques Island, Puerto Rico

Addendum to Section 2.4 Intrusive Investigation

2.4.2.2 Recovered ORS Certification, Transport and Processing into the DRMO at NSRR

Metallic debris/scrap and ordnance related scrap generated from ordnance characterization site SWMU 04 at NASD, Vieques Island, Puerto Rico will be visually inspected and certified by a minimum of two technically qualified personnel. These qualified personnel include one Unexploded Ordnance (UXO) Technician III (contractor) and one active duty Explosive Ordnance Disposal (EOD) technician to ensure no energetic materials remain on or in the scrap metallic debris material.

Recovered ORS will be certified free of energetic material by the two qualified UXO/EOD personnel with the following certification statement on the 1348-1A, Issue Release document.

“We certify and verify that the AEDA residue, Range Residue and/or Explosive Contaminated property listed has been 100% properly inspected by us and to the best of my knowledge and belief, are inert and/or free of explosives or other dangerous materials.”

Ordnance related scrap and ordnance fragments, etc. would be transported to NSRR to process through DRMO as recycling scrap metal.

For this effort, personnel from the NSRR EOD office will be available to support the SUXOS in scrap certification procedures in a similar fashion as was completed during the Phase I & II mobilizations at SWMU 04.

ORS that can not be certified free of energetic material will be re-blown in the demolition pit during subsequent demolition operations to remove any remaining explosives residue and will be re-evaluated at that time by the appropriate personnel.

Once the ORS has been certified free of energetic material it will be containerized in 55-gallon drums and wooden boxes along with recovered scrap metal for the eventual transport to NSRR via the Navy ferry. The final ORS/scrap metal disposition task is to process the drums and wooden boxes into the DRMO at NSRR using the 1348-1A issue release documents that were signed by the SUXOS and NSRR EOD personnel.

Coordination efforts associated with ORS/scrap metal processing at the DRMO will be initiated long before the certification process and will be documented in the weekly summary reports that will be developed for this assignment.

2.4.2.3 Demilitarization of ORS Items

As required ordnance related scrap (ORS) recovered from SWMU 04, NASD, Vieques Island, Puerto Rico will be visually inspected and certified safe for demilitarization by a minimum of two technically qualified personnel before the final safe certification that is required prior to disposition to the DRMO at NSRR.

The demilitarization process includes a series of tasks designed to prepare the items for acceptance to the DRMO. These qualified personnel will be a minimum of two Unexploded Ordnance (UXO) Technician level III (contractors) to ensure no energetic materials remain on or in the scrap metallic debris that may require demilitarization.

“Explosive demilitarization is the preferred methods of demilitarization.”

This task includes the following:

1. Separation of like items in individual accumulation areas
2. Evaluation of each item by qualified UXO personnel (SUXOS and UXO Safety Officer) to determine demil procedure.
3. Demilitarization of all hard cased munitions items through the use of planned demolition charges to vent, cut and disfigure, to meet demil requirements.
4. Cutting ORS with metal cutting saws will only be conducted on empty aluminum, brass and thin cased metal items that are visibly clear, such as expended cartridge cases and flare tubes.
5. Only the large pieces of metal, derived from demolition activities that have not been adequately demilitarized will be considered for cutting with a torch.
6. All suspect items that are in questionable condition will be demilitarized with explosives.

An iron works vendor in Vieques has been identified to support demilitarization efforts of safe ORS items at SWMU 04. This vendor has the requisite equipment to perform supervised demilitarization tasks and has previously been used by the project team for this task at SWMU 04 during Phase II characterization efforts. The site UXO safety officer (UXOSO) and senior UXO supervisor (SUXOS) will be present during demilitarization activities to minimize the potential for working on items that may still contain energetic material or that may need additional demolition conducted on it prior to certification. Demilitarized items will be accumulated according to like items for the subsequent certification tasks.

Planning efforts will be coordinated with the DRMO and the Environmental Programs office's at NSRR prior to the demilitarization operations in an effort to minimize potential

delays in the ORS/scrap metal processing after ORS certification is completed. ORS demilitarization guidance documents will be available on-site to assist the field teams in meeting the DRMO acceptance criteria for these type items. Demilitarization of ORS will not be complete until the SUXOS and UXOSO both agree that the ORS has been adequately modified to meet the DRMO criteria.

Addendum to Section 3, Explosives Management Plan

3.1 Acquisition

The site management team will make a slight modification in the explosives management plan during Phase III efforts to better reflect the day to day needs of commercial explosives at the site. The proposed change involves the shipment of explosives to Vieques and the need to minimize risks associated with the temporary storage of these items without 24-hour on-site security.

During Phase I & II efforts, OE demolition was planned and executed only when sufficient OE had been accumulated to warrant demolition operations. Commercial explosives were transported to Vieques under appropriate manifestation prior to the start-up of both Phase I & II work and stored in the ATF Type II portable explosives magazine that is currently situated on the concrete apron to earth covered magazine (ECM) 239. Although this arrangement worked well for the two phases of investigation completed to date, project risks associated with storage of commercial explosives can be minimized by bringing in explosives only on the actual days of planned demolition. A total of 5 demolition days were executed during the approximately 16 weeks of field work to date at the site indicating that the storage of commercial explosives could have been reduced to these 5 days only.

OE/MEC items removed during investigation operations will be stored with other like items in the portable explosives magazine until such time that a planned demolition of OE/MEC items is scheduled.

3.2 Storage

The portable magazine will again be used for the temporary storage of commercial explosives. Since the use of explosives for Phase III efforts has changed as described above due to the day to day needs of explosives on-site, storage of these items becomes less of a risk concern as explosives are expected to only be stored for a maximum of one day in the portable explosives magazine prior to use during demolition operations.

Security checks on the portable explosives magazine will be conducted on several occasions daily by both the site management team and the SUXOS. Inventories will be conducted as explosives are shipped in and after demolition operations to complete the reconciliation schedule.

Explosives shipped to the island for demolition operations, along with OE/MEC items recovered and accumulated from the investigation process, will be detonated prior to the field teams leaving the site for periods longer than the weekend. Since Phase III efforts are not scheduled to commence until the New Year, it is not expected that field teams will be away from the study area and ECM No. 239 for periods longer than the weekend. Any commercial explosives that are not utilized during OE/MEC demolition operations will be blown up in the demolition pit using procedures similar to those used for disposition of OE/MEC.

Draft

**Interim Data Summary Report
Phase I and Phase II Investigations
SWMU 4, Former NASD
Vieques, Puerto Rico**



Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command
Norfolk, Virginia

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1.0 Introduction

This document presents a summary of the preliminary results from the Phase I & II ordnance explosives/ unexploded ordnance (OE/UXO) investigations at Solid Waste Management Unit (SWMU) 04 at the Former Naval Ammunition Support Detachment (NASD) on the western end of Vieques Island, Puerto Rico. A location Of SMWU 4 is shown on Figure 1. The document also presents the conceptual site model as it was understood prior to the site investigations and how it has been refined based on the results of the Phase I and Phase II Investigations. In addition, this document provides a brief description of the Phase III work that is proposed to further delineate the nature and extent of OE/UXO contamination at the site.

Results of the three phases of OE/UXO investigation at SWMU 04 will be presented in a comprehensive OE/UXO Investigation Report that will describe the objectives of the program, aspects on the implementation of field efforts associated with this assignment, and recommendations for the site moving forward in the CERCLA process.

2.0 Conceptual Site Model

2.1 Site Description

SWMU 4 was an inactive OB/OD site on the former NASD and encompasses approximately 40 acres located roughly 0.5 miles from the Caribbean Sea on the southwest corner of Vieques Island. The OB/OD unit was utilized for the thermal destruction of waste munitions, fuels, and propellants from 1969 to 1979. Records indicate that the site may have been used since the late 1940s.

The OB/OD site was also used for the disposal of excess and retrograde ammunition and, twice yearly, for disposal of unexploded munitions found around the targets on the Eastern Maneuver Area (EMA). The EMA is located in the eastern portion of Vieques Island and is not part of the former NASD. Other explosive materials disposed at SWMU 4 included material from the rework of munitions (e.g., loose powder and primers) and ordnance items from the torpedo shop. Materials disposed of at the site included flares and cartridge-activated devices. The range had a maximum blow limit of 4,000 pounds of TNT equivalent (Greenleaf/Telesca, 1984).

The material that was burned was placed in the open burn area and a squib or other detonator was placed in the waste material. The open burn was then initiated from a safe distance using electrical detonation.

2.2 Environmental History

2.2.1 Initial Assessment Study

An Initial Assessment Study (IAS) (Greenleaf/Telesca, 1984) was conducted for NASD in 1984 to identify and assess sites posing a potential threat to human health or the environment due to contamination from past hazardous waste operations. At the time of the IAS, the site was designated as Site 19, West EOD Range, Vieques.

Records indicated that the West EOD range was the primary disposal area for Vieques. Activities included the disposal of excess and retrograde ammunition and, on a twice-yearly basis, unexploded munitions found around the targets on the EMA. Material disposed of at the site include 8-inch rounds fired in the EMA, and 105 millimeter (mm), 106 mm, and 175 mm duds fired from Punta Cereja. Other sources of OE included the material from the rework of munitions (loose power, primers) and ordnance items from the Torpedo Shop. Materials disposed at the site also included flares and cartridge-activated devices. The IAS report contained inconsistencies, however, indicating either a maximum blow limit of 4,000 pounds of TNT equivalent, or a 40,000 pounds explosive limit.

According to record reviews, EOD range was determined to be in operation from at least 1969 to 1979. The range closed to most uses in 1976. It was swept and cleaned up for a 0.5-

mile radius by EOD personnel in 1976, and at least at two additional times by 1979. The range was fully closed in 1979.

2.2.2 Environmental Baseline Study

As a result of the property transfer of NASD to Puerto Rico, an Environmental Baseline Survey (EBS) (Program Management Company, 2000)EBS was conducted to disclose factual relevant information regarding the environmental condition of NASD. The EBS was prepared based on information obtained by record reviews, interviews, site reconnaissance, and aerial photographic review.

In general, the records search and interviews were consistent with the IAS. Additional investigations at the site included an aerial photographic review. The aerial photographic review involved evaluation of 12 aerial photographs dating from 1937/1938 to 1999 by a firm specialized in the analysis of aerial photography. The aerial photographic analysis was used to:

- Track the history of site operations from pre-Navy occupation to present
- Identify Photo Identified (PI) sites; (e.g. ground scars, cleared areas, debris piles, possible disposal areas, etc.) for further follow-up investigations

The aerial photograph survey of SWMU 4 indicated 10 PIs, including one potential trench and five ground scars.

2.3 Previous Investigations at SWMU 4

Although no hazardous releases from the OB/OD site were documented, the Navy decided to investigate the site as part of the Installation Restoration (IR) program. The site was designated SWMU 4 at this time.

Initial investigations at the site were conducted in April 2000, and included an Expanded Preliminary Assessment/Site Investigation (PA/SI). A second phase of the PA/SI was conducted in June 2000. During the PA/SI, surface and subsurface soil and groundwater samples were collected for laboratory analysis. Results of the PA/SI indicated that explosive-derived constituents were present in surface soils at concentrations above residential risk-based concentrations (RBCs) and soil leachability criteria. Results of the investigation were presented in the Phase I PA/SI Report for NASD (CH2M HILL, October 2000).

As part of the PA/SI at SWMU 4, a UXO avoidance geophysical survey was completed to clear the locations of soil borings and monitoring wells of potential UXO. In addition, the access roads to the sampling locations were cleared of UXO. A Schonstedt fluxgate magnetometer was used to identify potential UXO near the soil boring and monitoring well drilling sites to a depth of 2 feet. A down-hole magnetometer was used during the drilling process to check for potential UXO every 2 feet to a depth of 10 feet.

Additionally, transects were cut through the brush to identify the potential locations of the OB/OD pits. An EOD technician cleared the area in front of the bulldozer during the brush clearing for each transect. The technician performed a sweep with the Schonstedt

magnetometer and identified UXO items. After the transects were cut, a conventional magnetometry survey was conducted along the transects and pads to identify potential areas of buried metal. Figure 1-4 shows the locations of OE items found along the transects and roads, and also shows potential magnetic anomalies from the magnetometer survey. A total of 61 OE items were found, 37 20-mm high explosive (HE) projectiles, 16 MK-230 fuses, and a 60 mm mortar fuse. Several of the OE items were identified along a transect that extended along the center of the 40-acre area where the OB/OD area was suspected to be located. The OE items detected were removed by the EOD technicians and disposed of by Navy EOD personnel.

2.4 Conceptual Site Model Summary

Based on the description of the site and the results of the previous investigations at the site a conceptual site model has been developed. The conceptual site model is illustrated in Figure 2 and summarized in Table 1. The primary OE contamination source is OE from the OB/OD pits. The primary OE release mechanism is kickouts of unexploded ordnance and ordnance related scrap from the burn pits and detonation pits. Potential secondary sources include the ground surface, subsurface, near-coastal waters, and OE constituents. Potential transport and migration mechanisms included human activities, run-off, erosion, storm surge, tides/waves, and percolation. Potential exposure media include the ground surface, subsurface, inland surface water/sediments, coastal beaches or near-shore sediment, inland surface waters, groundwater, and subsurface soil. Potential exposure routes included direct contact, dermal exposure, and ingestion, however, these exposure routes have been restricted with the installation of the fence around the perimeter of SWMU 4. Potential receptors include , EOD/UXO workers, recreational users, fishermen, wildlife refuge workers, terrestrial wildlife, and aquatic wildlife.

TABLE 1
Conceptual Model of SWMU 4

Primary Source	Primary Release Mechanisms	Expected Ordnance Contamination	Secondary Sources
Open Burn/Open Detonation Site (OB/OD)	Kick-Out/Incomplete Detonation (OD)	UXO, UXO Components, OE	Surface
			Near Coastal Waters
			Subsurface
			Other Constituents
	Burning	Incompletely burned OE, OE contaminated scrap, OE residue	Surface
			Subsurface
Other Constituents			

3.0 Phase I & Phase II Investigation Objectives and Procedures

The primary objective of the first two phases of work at SWMU 04 were designed to identify the main areas of historical open burn/open detonation (OB/OD) activities and to provide a preliminary assessment of the extent of the UXO fragmentation arc that surrounds the main OB/OD areas. In addition, a number of other objectives were met during project implementation including:

- Completing a UXO investigation of approximately 35 acres of the OB/OD area that was identified in the IAS Report (20 acres during Phase I and 15 additional acres during Phase II)
- Coordinating with Fish and Wildlife Service (FWS) on vegetation clearing plan to avoid endangered species of interest
- Coordinating project oversight with personnel from the NSRR ROICC office and other Navy technical representatives (NTR)
- Documenting all definable features of work and project stages with digital still camera and digital video camera
- Approving all site visits through LANTDIV and NAVSOUTH
- Maintaining the proper line of communications through the site management and senior project management team
- Completing the project safely with in accordance with OSHA guidance

The Phase I & II OE/UXO investigation methods were presented the Site Specific OE Work Plan (CH2M HILL, November 2001) and Magazine Siting Plan (CH2M HILL, November 2001). The investigation was implemented in accordance with NAVSEA OP 5 Volume 1, Ammunition and Explosives Ashore, OPNAVINST 8020.14, Department of the Navy Explosives Safety Policy, and U.S. Army Engineering and Support Center, Huntsville (CEHNC) EP385-1-95a, *Basic Safety Concepts and Considerations for Ordnance and Explosive Operations*. The OE/UXO response action was also in compliance with Title 40, Code of Federal Regulations (CFR), Part 260 (40 CFR 260) et. al – *Military Munitions Rule*; OPNAVINST 8020.14; the OE requirements of DoD 6055.9-STD; Army Regulation (AR) 385-61; Department of the Army Pamphlet (DA Pam) 385-61; and other applicable publications presented in Table 1-1 of the *OE Master Work Plan for the Former NASD* (CH2M HILL, October 2001).

The Phase I and Phase II were also completed in accordance with the Comprehensive Environmental Resource Contingency Liability Act (CERCLA) to assess the potential presence of hazardous constituents at the site as part of the Navy's Installation Restoration Program (IRP). The OE/UXO response actions were consistent with and conducted in accordance with the provisions of CERCLA and the National Contingency Plan (NCP).

4.0 Phase I OE/UXO Investigation Results

The field efforts associated with Phase I of the OE/UXO investigation at SWMU 04 commenced during the first full week of January 2002 with the mobilization of equipment, supplies, and personnel to Vieques. Field operations were implemented the following week when initial anomaly avoidance surveys were completed in preparation for a digital global positioning system (DGPS) survey and vegetation removal efforts.

Fieldwork was executed in a pre-planned sequence to minimize the potential for breaching exclusion zones and to keep safe separation distances between the different subcontractors as follows:

1. Initial anomaly avoidance sweep (surface sweeps completed by UXO qualified teams)
2. DGPS survey work to establish quadrant corners
3. Vegetation removal and mulching (mechanical and hand grubbing)
4. Secondary anomaly surface sweep
5. Geophysical data acquisition, mapping, interpretation, and target selection
6. Data re-acquisition and flagging of selected targets
7. Intrusive operations on selected targets (approximately 100 per acre)
8. OE/UXO disposition including:
 - Temporary accumulation/storage
 - Demilitarization
 - Ordnance related scrap (ORS) certification
 - Containerize ORS and scrap metal in 55-gallon DOT drums and assembled wooden boxes
 - Transport drums and boxes to NSRR via Navy ferry
 - Process ORS and scrap metal drums into the DRMO at NSRR

Equipment QA/QC was conducted daily through the use of the geophysical prove-out area (GPO) set up in quadrant A25 to confirm that the data being collected met the data quality objectives (DQO) developed in the Master OE Work Plan. The geophysical survey included the use of an EM-61 electromagnetic instrumentation. All equipment and personnel were sent through the GPO prior to use of the equipment on-site.

Approximately 20 acres were investigated during the Phase I investigation. The locations of the magnetic anomalies identified by the geophysical surveys are shown on Figure 3. The figure illustrates that a high density of anomalies correlated well with five of the Photo Identified sites of potential OB/OD pit locations that were identified from the aerial photo survey. Figure 3 illustrates that a high density of electromagnetic anomalies, exceeding 400 anomalies per acre were identified in the vicinity of the OB/OD pits. In addition, there is a significant reduction in anomaly density at a distance of approximately 1000 feet from the pit locations. The Phase I work formed the basis of plans for expanding the investigation

outward from these OB/OD pits to assess the limits of the OE during the Phase II investigation.

Approximately 100 anomalies per acre were selected for reacquisition to provide a representation of the types and distribution of the ordnance items identified at the site. A total of 2,500 anomalies were selected for reacquisition, flagged and removed by the intrusive operation teams. In the vicinity of the OB/OD pits over 100 anomalies were identified per acre. As a result, several OE items were left in place.

Of the 2,500 anomalies investigated 456, or approximately 18 percent, were OE items. The location and type of OE items that were removed from the site are illustrated in Figure 4 and are summarized in Table 2. As illustrated on Figure 4 most of the OE items at a distance greater than 1000 feet from the pits were 20mm or 7.26 blank cartridges. The OE items that were removed from the site required detonation within the demolition pit that was constructed in quadrant C22 (Figure 3). Commercial explosives, purchased by USA Environmental and temporarily stored in the portable explosives magazine situated on the concrete apron to earth covered magazine (ECM) 239, were used in the OE demolition process. Table 2 provides a listing of the 456 items destroyed in the demolition pit.

TABLE 2
SWMU 04 Former NASD, Vieques
OE Items Identified and Destroyed During Phase I

OE Type	Number of items
20mm HE	259
7.62 blank cartridges	128
Fuze, bomb MK 230	16
Primer, 81mm tail boom	10
Photoflash cartridge, M123A1	7
Rocket warhead, MK2	6
Fuze, bomb MK 243	4
Booster Fuze	4
Projectile, MK 48	3
Fuze, time M25	3
Ballastite (propellant)	2
Pistol flare primer	2
Warhead piece, M2 mod 2	2
20mm incendiary	2
Hand illumination flare	1
CAD	1
Fuze, VT M517	1
20mm cartridge case	1
Photoflash cartridge, M112	1

TABLE 2
 SWMU 04 Former NASD, Vieques
 OE Items Identified and Destroyed During Phase I

OE Type	Number of items
Bomb, incendiary AN-M52	1
Rocket motor, 5" HVAR	1
Igniter, M23 WP	1
Total Items	456

Items destroyed in the demolition pit were accumulated in the ORS piles prior to being demilitarized and certified free of energetic material for the eventual disposal at the NSRR DRMO. The ORS pile was set up adjacent to the metal scrap pile with like items stored together for easier evaluation and processing. The ORS certification process was conducted by the senior UXO supervisor (SUXOS) and from a member of the NSRR EOD office. After the ORS was certified to be free of energetic material it was boxed or drummed and transported along with the scrap metal to the DRMO at NSRR.

Field teams demobilized from Vieques during the last week of March 2001 after final site cleanup and an inspection by the Navy Technical Representative (NTR) from the ROICC office at NSRR.

5.0 Phase II OE/UXO Investigation Results

The Phase II Investigation at SWMU 04 was within the scope of work for the OE Site Specific Work Plan for SWMU and therefore a separate work plan was not required to be submitted. The investigation was conducted based on the results of the Phase I work and focused on further identification of OB/OD pits and the characterizing the extent of OE/UXO away from the primary OB/OD pits identified during the Phase I Investigation. Field crews re-mobilized to Vieques during the last week of April 2002 and commenced work the following week. Procedures similar to those utilized during the Phase I Investigation were also conducted during Phase II work including OE accumulation and storage, demolition, demilitarization, certification, and disposal processes. Minor modifications from the Phase I scope included a change in the sequencing in of subcontractors and a change in the procurement and shipping to Vieques of the commercial explosives used in the OE demolition process.

Approximately 15 additional acres were investigated during the Phase II Investigation working away from the primary OB/OD pits in all accessible directions. The investigation identified an additional eleven OB/OD pits and demonstrated a similar distribution of the OE items as shown in the Phase I Investigation. At a distance greater than 1000 feet from the OB/OD pits the anomaly density generally decreased to less than 100 per acre and most of the OE items were 20mm or 7.62 blank cartridges. During the Phase II Investigation a total of 1,500 anomalies were selected for reacquisition, flagged, and removed by the intrusive operations team. The 1,500 targets selected for further investigation and removal provided a representative sampling (approximately 100 per acre) of OE/UXO contamination in the quadrants investigated. The geophysical anomaly map shown as Figure 3 illustrates the dispersion of the anomalies mapped during Phase II Investigation. Of the 1,500 items that were investigated during Phase II activities, 249 or approximately 17 percent were OE items that required demolition. The OE items encountered and destroyed during the Phase II Investigation are illustrated on Figure 4 and listed in Table 3.

Field crews demobilized from the site during the last week of June 2002.

TABLE 3
SWMU 04 Former NASD, Vieques
OE Items Destroyed During Phase II

OE Type	Number of items
20mm HE	152
7.62 blank cartridges	43
Photoflash cartridge, M123A1	19
5.56 blank cartridges	16
Primer, 81mm tail boom with primer	5

TABLE 3
SWMU 04 Former NASD, Vieques
OE Items Destroyed During Phase II

OE Type	Number of Items
20mm cartridge case	5
MK 244 Impact nose fuze	3
White phosphorous canister	2
MK 230 fuze with booster	2
Rocket motor, 5" HVAR	1
2.75 " rocket motor	1
Total Items	249

Conceptual Site Model Update

Based on the description of the site and the results of the Phase I and Phase II Investigations at the site the conceptual site model has been updated . The updated conceptual site model is illustrated in Figure 5 showing Mt. Pirata, quebradas, the OB/OD pit locations, surface water features, monitoring wells, groundwater flow direction, surface water flow, etc.. The primary OE contamination source is OE from the OB/OD pits. The Phase I and Phase II Investigations identified 16 pit locations which are shown on Figure 5. The primary OE release mechanism is kickouts of unexploded ordnance and ordnance related scrap from the burn pits and detonation pits. Potential secondary sources include the ground surface, subsurface, near-coastal waters, and OE constituents. Potential transport and migration mechanisms include human activities, run-off, erosion, storm surge, tides/waves, and percolation. Potential exposure media include the ground surface, subsurface, inland surface water/sediments, coastal beaches or near-shore sediment, inland surface waters, groundwater, and subsurface soil. The fence installed around the perimeter of the site restricts potential human exposure routes including direct contact, dermal exposure, and ingestion. Potential receptors include EOD/UXO workers, recreational users, fishermen, wildlife refuge workers , terrestrial wildlife, and aquatic wildlife.

6.0 Quality Assurance /Quality Control Summary

A three-phase quality control program was used during Phase I & II Investigations at SWMU 04, which includes a preparatory, initial and follow-up phase. These three phases of inspection were conducted daily for each of the definable features of work as they were implemented at the site. Daily QC reports were completed by the site management team that tracked the three inspection phases and provided site management with a planning tool for completing the project efficiently.

During the Phase I mobilization a geophysical prove out (GPO) area was established in order to verify that geophysical equipment met the project DQO's of a clearance to 1 foot for the most probable munitions (MPM's) at the site (20mm projectiles and 81 MM mortars). A test area was set up with 12 items buried at depths up to 12 inches and varying orientations. All geophysical instruments and instrument operators were required to process through the GPO to prove both their ability to operate the equipment and the equipment's ability to locate the known anomalies. For all the Phase I prove-outs 100% of the OE items were identified which exceeds the QA objective of 85%.

The Phase II Investigation expanded the prove-out to include 48 items buried within the quadrant at depths up to 48 inches below grade. All of the ordnance items used in the GPO were actual inert or certified safe ordnance items found on the SWMU 04 site during Phase I efforts. The geophysical instruments and teams were required to demonstrate an 85% Probability of Detection (PD) and a 90% Confidence Level (CL). Additionally, the geophysical instruments and personnel from phase I returned during phase II. For all the Phase II prove-outs 100% of the OE items were identified . Therefore all teams and equipment demonstrated successful completion of the GPO.

Another quality assurance measure of performance was that during the Phase I and Phase II investigations only 6 false positive readings were identified in the 4000 anomalies that were re-acquired, indicating greater than 99% Probability of Detection (PD) in the field. This exceeded the QA objective of 85%.

7.0 Proposed Phase III OE/UXO Investigation

Results of the Phase I & II OE/UXO Investigations at SWMU 04 indicate that additional investigation is necessary to further delineate OE/UXO contamination at the site. The proposed Phase III Investigation was developed from a review of the geophysical anomaly map that clearly illustrates the high density of anomalies around the OB/OD pits and a reduction in anomaly density approximately 1000 feet from the pits.

To fully delineate the fragmentation arc around the primary OB/OD pits and to further investigate the potential for additional OB/OD pits at SWMU 04, additional acreage is proposed for Phase III as follows:

- Select, reacquire, and investigate up to 300 additional anomalies per acre from 20 of the original 35 acres completed during Phase I & II Investigations.
- Investigate up to 20 additional acres further away from the OB/OD pits to further delineate the extent of OE/UXO impacts. A number of quadrants outside of the Phase I, II, and proposed Phase III Investigation contiguous area will be selected for investigation to evaluate potential OE/UXO contamination at distances away from the Phase I, II, and III study area.

Figure 6 illustrates the proposed Phase III areas of investigation based on the results of the first two phases of the investigation. An Addendum to the Site Specific OE Work Plan for SWMU 04 will be developed to identify the areas of investigation and describe any proposed changes in the field investigation procedures that have been modified from those defined in the Site Specific OE Work Plan for SWMU 04.

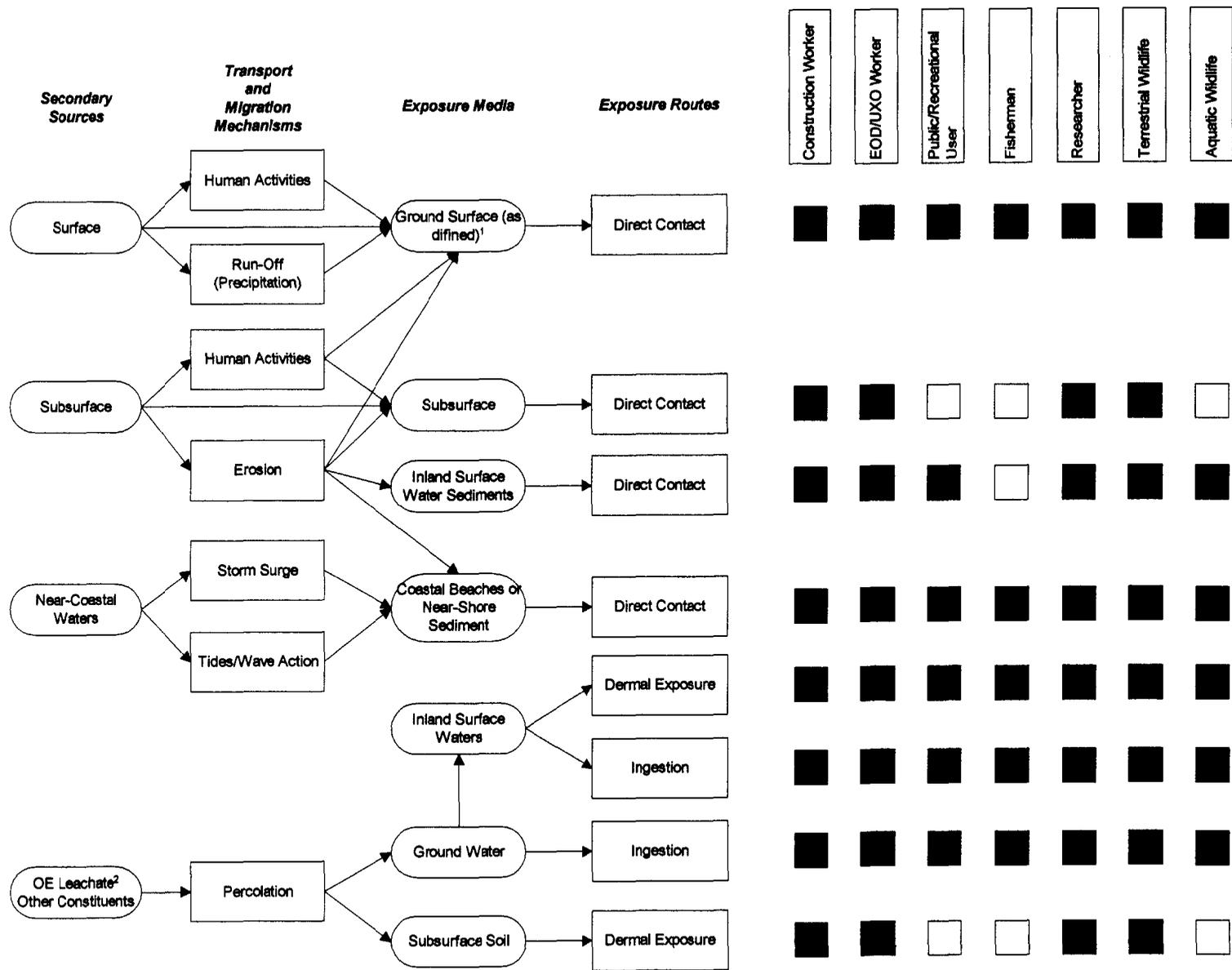
It is estimated that Phase III efforts will likely require 8 to 10 weeks to complete. Commercial explosives of OE items encountered during investigation actions will not be left behind in the portable explosives magazine but will instead be blown during a demolition day that will be planned prior to leaving the site for any reason. For Phase III efforts, commercial explosives will only be shipped in the day prior to the planned demolition in an effort to minimize the risk associated with storing explosives at the site in the portable magazine.

Results of the three phases of OE/UXO investigation at SWMU 04 will be presented in a comprehensive OE/UXO Investigation Report that will describe the objectives of the program, aspects on the implementation of field efforts associated with this assignment, and recommendations for the site moving forward in the CERCLA process.



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Figure 1
SWMU-04 Site Location Map
Former NASD, Vieques Island, Puerto Rico **CH2MHILL**



¹Ground Surface (as defined): For some users "Ground Surface" may include incidental subsurface intrusion (e.g., placing stakes or fence post)
²OE Residue on the surface or subsurface may give an exposure pathway to inland surface waters through Erosion and Run-Off.

Figure 2, Site Conceptual Model, SWMU 04, Vieques

Source: Level 1 OE Hazard Screening Methodology for Vieques, Puerto Rico

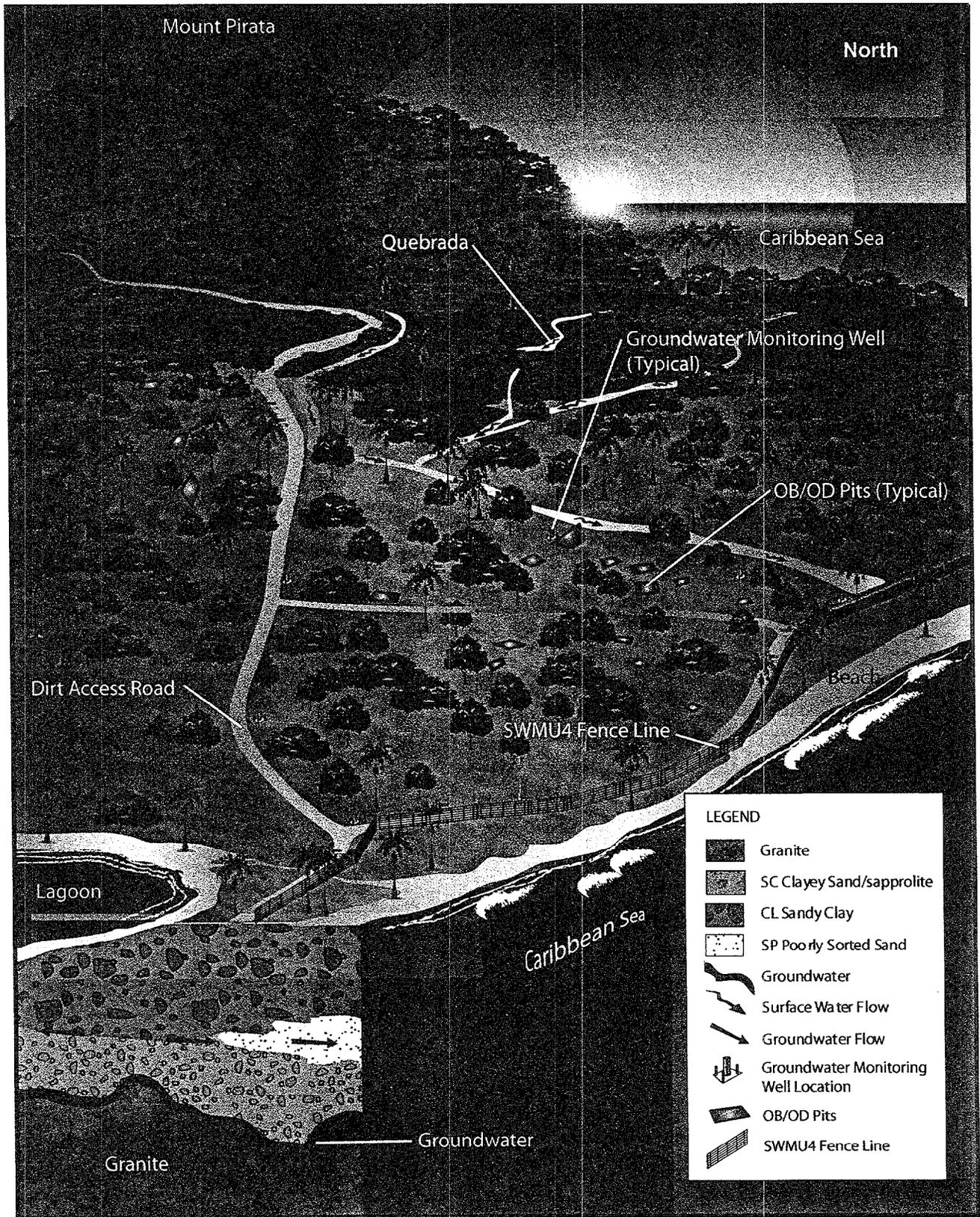
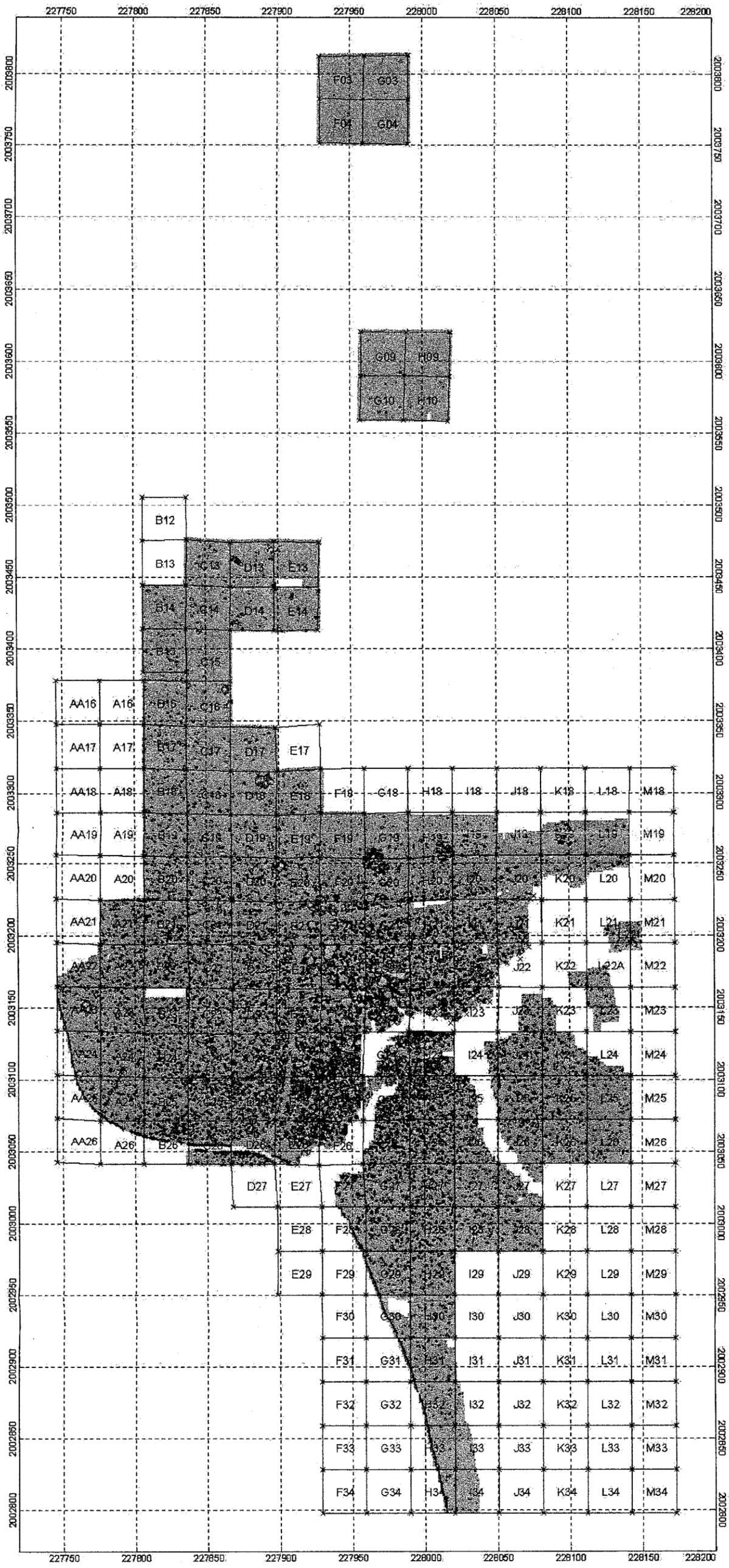
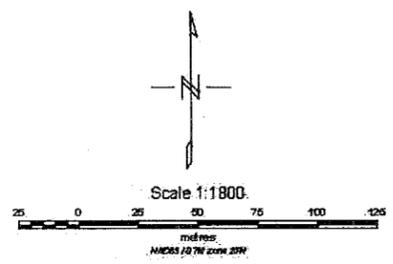


Figure 5. Conceptual Site Model, SWMU 04, Former NASD, Vieques



Legend

- A26 Phase 1 Grid
- × NAEVA Phase 1 GPS Survey Point
- A16 Proposed Phase 2 Grid
- × Proposed Phase 2 Survey Point



PRELIMINARY

CH2M Hill

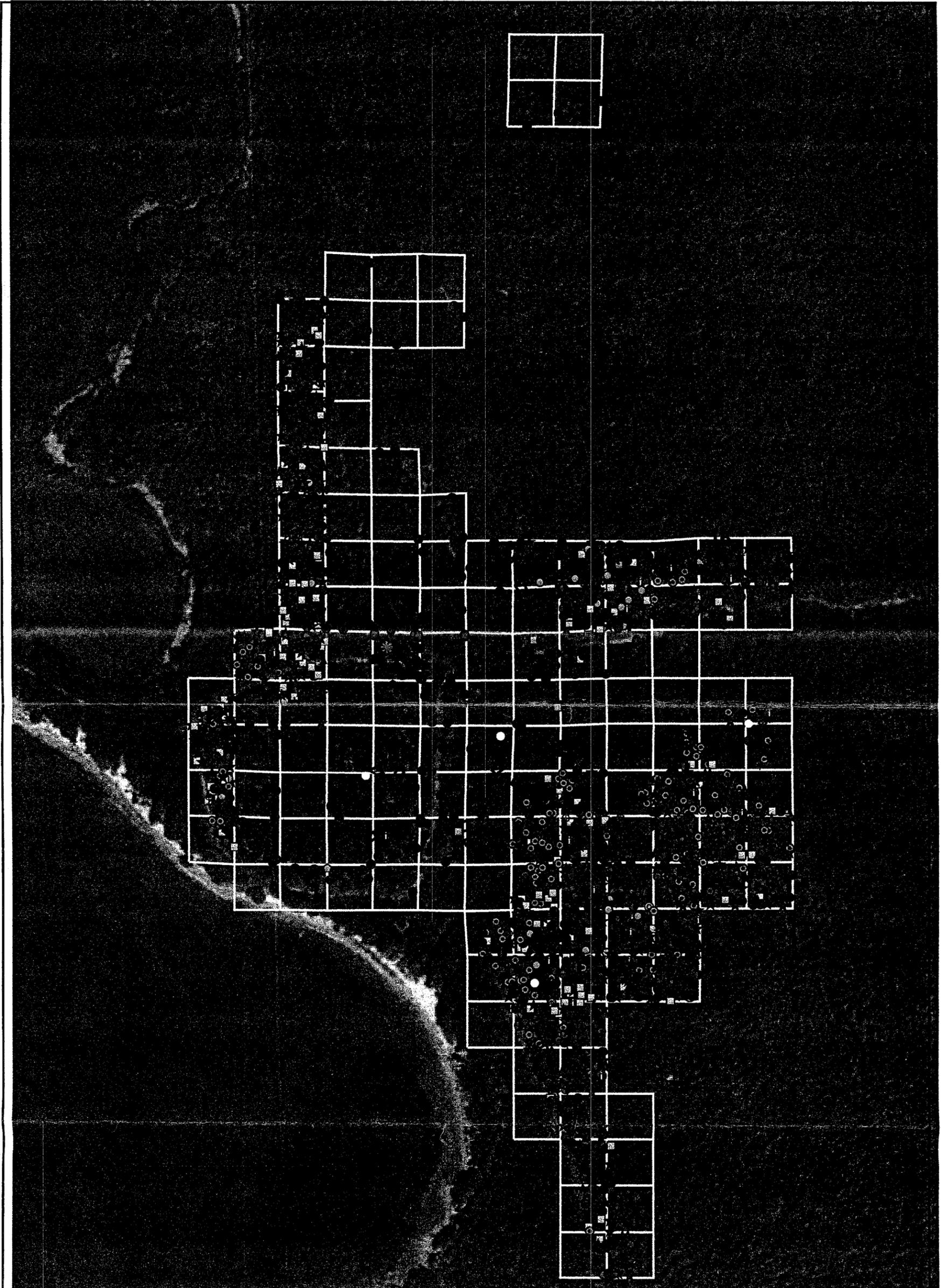
FIGURE 3

Phase I & II Mosaic Illustrating Mapped Anomalies

Former NASD, Vieques Island, Puerto Rico

Current to June 20, 2002

020AB12



LEGEND							FIGURE 4 OE Items Reaquired During Phase I and Phase II Investigation Former NASD, Vieques Island, Puerto Rico
● 20MM	● 7.62MM	● CART	⊕ HVAR	◆ MK230	■ RKT/MTR	◊ PITS	
⚡ 3"PROJO	■ 81MMTAIL	● CART CASE	★ LIGHTFRAG	⊕ MK243	■ SCRAP		
● 40MMCART	★ ALUMFRAG	⊙ DISK	■ M123	▲ MK244	↑ WIRE		
⚡ 5"PROJO	● ANM52	● FLARE	● MK18	▲ MK7	* WP		
* 5"RKT WH	★ BALLIST	⊙ FUZE	● M23 WP	● ORS			
● 5.56MM	⊕ BOOSTER	* GRENADE	⊙ MK24	● PISTOL FLARE			
● 50CAL	⊕ CAD	★ HEAVYFRAG	● M517	⚡ PRIMER			

0 100 200 Feet

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LEGEND

- ⊕ Center of Known OB/OD PITS
- Known OB/OD PITS
- ▭ Quadrants (100' x 100') Investigated During Phase I and II
- ▨ Phase III Expansion Quadrants on Land
- ▩ Quadrants Proposed for Additional Intrusive Investigation During Phase III Operation
- ▧ Quadrants Investigated During Phase I and II That Will Not Be Further Investigated During Phase III

FIGURE 6
Phase III OE/UXO Investigation SWMU 4
Former NASD, Vieques Island, Puerto Rico

0 100 200 Feet