



DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC
6506 HAMPTON BLVD
NORFOLK VA 23508-1278

TELEPHONE NO

(757) 322-4736

IN REPLY REFER TO

6250
EV31KRC:lfm
September 11, 2008

United States Fish and Wildlife Service
Vieques National Wildlife Refuge
Attn: Mr. Matt Connolly, Refuge Manager
Vieques Office Park
Carr. 200, Km 0.4
Vieques, PR 00765-1537

**Re: VEGETATION CLEARANCE ECOLOGICAL FIELD SURVEY METHODOLOGY
COMPREHENSIVE LIABILITY ENVIRONMENTAL ACTION NAVY (CLEAN)
PROGRAM SITE INSPECTION /EXPANDED SITE INSPECTION 7 CONSENT
ORDER AND 15 PI / PAOC SITES**

Dear Matt:

As part of the Comprehensive Long-term Environmental Action Navy (CLEAN) Program, the United States Navy is continuing efforts to investigate and remediate, as necessary, areas at the former Vieques Naval Training Range (VNTR) on east Vieques, Puerto Rico. The investigation and cleanup work is being accomplished under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulation.

Twenty-two locations have been identified for Site Inspection (SI) or Expanded SI (i.e., follow-on work based on previous SI) activities which comprise 7 Consent Order sites and 15 photo-identified and potential area of concern (PI/PAOC) sites. Figure 1 shows the locations of the 22 sites to be investigated. Figure 2 shows the 21 sites that are in and around Camp Garcia. The 22 sites to be investigated are listed below. The list identifies which sites require no vegetation clearance in order to conduct the planned investigation.

- SWMU 1 – Camp Garcia Landfill
- SWMU 2 – Fuels Offloading Site
- SWMUs 6 and 7 – Waste Oil and Paint Accumulation Areas (NO VEGETATION CLEARANCE NECESSARY)
- SWMU 10 – Sewage Treatment Lagoons (NO VEGETATION CLEARANCE NECESSARY)
- AOC A – Diesel Fuel Fill Pipe Area (NO VEGETATION CLEARANCE NECESSARY)
- AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons
- PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area

- PI 5 – Former Airfield and Associated Ditches
- PI 6 – Former PCB Storage Pad and Vehicle Wash Pad
- PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area
- PI 8 – Former Motor Pool Maintenance Area
- PI 10 – Former Wastewater Leach Field
- PAOC I – Former Power Plant and Mechanics Shop
- PAOC L – Former Paint and Transformer Storage Area (NO VEGETATION CLEARANCE NECESSARY)
- PAOC M – Former Fuel Facility (NO VEGETATION CLEARANCE NECESSARY)
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- PAOC O – Former Boiler Room in Heat Plant Building 238 (NO VEGETATION CLEARANCE NECESSARY)
- PAOC P – Former Water Treatment Pump house
- PAOC Q – Former Boiler Room in Heat Plant Building 607
- PAOC S – Former Power Plant
- PAOC X – Debris Area in Ephemeral Stream

While many of these locations are adjacent to existing roads or structures, some locations are in vegetated areas that will require vegetation clearing to facilitate sampling equipment and personnel access. Vegetation clearing activities are scheduled to commence on or about November 10, 2008 and continue through about December 19, 2008, with SI activities beginning around January 2009 and lasting until approximately April 2009.

This letter provides preliminary vegetation clearance maps and site summary tables, summarizes the proposed methodology for ecological surveys of the vegetation clearance routes, and includes a proposed timeline for tasks to be completed prior to the vegetation clearing activities. A review of the enclosed material by the USFWS is requested in order to ensure a mutual understanding of the protocol to be followed and to identify any information requests United States Fish and Wildlife Service (USFWS) may have regarding the proposed activities or schedule.

Vegetation Clearance Standard Operating Procedure for Environmental Investigations

To ensure that vegetation clearing associated with environmental investigations is performed in a manner that minimizes damage to plants, wildlife, and habitats while still permitting the environmental investigation objectives to be met, the process leading up to and including the vegetation clearance will be conducted in accordance with the Vegetation Clearance Standard Operating Procedure for Environmental Investigations (hereafter referred to as the Vegetation Clearance SOP) that was concurred upon by USFWS in June 2007. A copy of this SOP is attached to this letter as Appendix A.

In accordance with the Vegetation Clearance SOP, preliminary vegetation clearance maps for each SI/Expanded SI location (that requires vegetation clearance) were developed using available aerial photographs and topographic maps. Preliminary site summary tables were also produced summarizing planned site investigations for each SI/Expanded location. The preliminary mapping and tables are included as Appendix B and Appendix C, respectively.

Proposed Ecological Field Survey Methodology

Ecological field surveys will be conducted at 15 of the 22 SI/Expanded SI sites (sites where vegetation is planned to be cleared) in September 2008 following the detailed methodology provided in the Vegetation Clearance SOP (Appendix A). The objective of these field surveys will be to establish safe and effective routes to each SI location through which vegetative clearing and equipment maneuvering will minimize damage to vegetation, habitat, and wildlife, while enabling the SI/Expanded SI objectives to be met. Specific attention will be provided to avoiding occurrences or preferred habitat for any federally listed plant or animal species, minimizing disturbance to ephemeral streams, lagoons, and wetlands, and avoiding large trees where practicable.

Twelve plant and animal species that occur on or around Vieques are listed as protected by the USFWS. A list of these species and environmental sensitivity index maps provided through the USFWS are included as Appendix D. Prior to conducting the field activities, ecologists will complete a thorough desktop and literature review for each of these federally protected species. The ecological field surveys will include pedestrian surveys within the proposed clearing routes to identify individual occurrences or preferred habitat for these federally listed species or other sensitive habitats. Proposed vegetation clearing routes will be revised in the field as needed in order to avoid or minimize disturbance of sensitive ecological features.

Projected Vegetation Clearing Tasks and Schedule

A projected task list and schedule was established to provide adequate review and consultation periods in advance of final clearing activities. A summary of tasks and projected dates of completion are provided in Table 1. Substantive findings, revised vegetation clearance maps, and revised site summary tables will be provided in a survey results letter to the USFWS upon completion of the ecological field surveys. In accordance with the Vegetation Clearing SOP, a subsequent site visit with the USFWS will be scheduled for field verification of proposed clearance route conditions. Agreed upon revisions will then be incorporated into a final vegetation clearance maps and final site summary tables. Within five days of the final vegetation clearance routes being concurred upon in the field by the Navy and USFWS, the concurrence will be documented in a letter provided to the Navy by the USFWS Refuge Manager or designee in accordance with the Vegetation Clearance SOP.

Table 1 - Projected Vegetation Clearing Tasks and Schedule

	Task	Status	Projected Completion Date	Description
1	Develop Preliminary (desktop) Vegetation Clearing Documentation	Complete	Complete	Prepare Preliminary Vegetation Clearance Mapping and Preliminary Site Summary Tables for sites.
2	Submit Survey Methodology Letter to USFWS	Complete	September 9, 2008	Prepare Survey Methodology Letter to USFWS summarizing project tasks, survey methodology, site locations, and schedule.

Table 1 - Projected Vegetation Clearing Tasks and Schedule

Task	Status	Projected Completion Date	Description
3 Receive Survey Methodology Comments from USFWS ¹	Pending	September 19, 2008	USFWS to comment on proposed survey methodology and schedule.
4 Conduct Initial Site Verification Field Surveys	Scheduled	Week of September 22, 2008	Conduct field surveys following approved methodology; use preliminary vegetation clearance mapping and GPS coordinates to navigate along proposed clearing paths; revise clearing paths in the field and collect new GPS routes as needed; develop photograph documentation.
5 Submit Field Survey Verification Results Letter to USFWS	None	Week of September 29, 2008	Finalize vegetation clearance mapping and site summary tables for sites; summarize results of field surveys including habitats crossed and site photographs.
6 Conduct Site Visit with USFWS ¹	None	Week of October 20, 2008	Visit each SI location (as necessary) with USFWS and field revise vegetation clearance mapping and site summary tables as needed.
7 Submit Field Concurrence Results Letter to USFWS	None	Week of October 27, 2008	Finalize and submit vegetation clearance mapping and site summary tables for sites based on field revisions made in conjunction with USFWS.
8 Final Agreement and Concurrence Letter from USFWS ¹	None	November 3, 2008	USFWS to provide vegetation clearing approval.
9 Oversight of Clearing Activities	None	November 10, 2008	Provide clearing supervision through end of vegetation clearing activities. Projected completion date of December 19, 2008.

¹ Tasks that include USFWS responses or site visit

Summary

It is respectfully requested that the USFWS review the enclosed Preliminary Vegetation Clearance Mapping, Preliminary Site Summary Tables, and USFWS species list to identify any issues or concerns prior to the scheduled ecological field surveys. In addition, please provide any comments regarding the projected vegetation clearing tasks or schedule in order to ensure that the process is completed in advance of the November 10, 2008 vegetation clearing date.

Your input in this process is very much appreciated. If you have any questions, please do not hesitate in contacting me at 757-322-4736.

Sincerely,



KEVIN CLOE
Remedial Project Manager
Vicques Restoration Section
Environmental Restoration Branch

Attachments

- A – Vegetation Clearance SOP for Environmental Investigations**
- B – SI/Expanded SI Preliminary Vegetation Clearance Mapping**
- C - SI/Expanded SI Preliminary Site Summary Tables**
- D – USFWS Threatened and Endangered Species List and Environmental Sensitivity Index Maps**

Copy to:

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- USEPA (Mr. Daniel Rodriguez)**
- PREQB (Ms. Wilmarie Rivera)**
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Appendix A

Vegetation Clearance SOP for Environmental Investigations

Vegetation Clearance SOP for Environmental Investigations

The purpose of the Vegetation Clearance SOP is to minimize damage to plants, wildlife, and habitats (especially threatened, endangered, or otherwise sensitive) while enabling efficient and effective environmental investigations. This SOP contains some general guidance that will be followed, to the extent possible, when developing and implementing a vegetation clearance process for each site-specific investigation. Additionally, this SOP enumerates the process that will be implemented to facilitate US Navy (Navy) and US Fish and Wildlife Service (USFWS) concurrence on specific vegetation clearance activities at each environmental site prior to initiation of those activities.

This vegetation clearance SOP applies to only environmental investigation activities. The different objectives associated with other activities such as removal or remedial actions, or munitions response activities, may necessitate a different approach to vegetation clearance. Therefore, this SOP is not applicable to activities other than environmental investigations, unless concurred upon by USFWS and Navy personnel on a case-by-case basis.

General Guidance

Where technically practical and economically feasible, hand clearing of vegetation using hand or power tools (e.g., machetes, chainsaws, etc.) will be considered during evaluation of vegetation clearance routes. Whether clearing by hand or with mechanized equipment, large trees (3 inches in diameter or larger) will be avoided, if possible, while the thicker underbrush is cleared to make the investigation and site access easier. Because all vegetation clearance routes will be reviewed in the field by USFWS personnel prior to implementing the clearance activities, any large tree proposed for removal in order to meet the investigation objectives will be evaluated by USFWS.

Mechanized land clearing will be used judiciously, if possible, avoiding areas with old growth trees and favoring areas that have been previously cleared or disturbed, if present. The use of large wheeled or tracked vehicles makes selective vegetation clearance difficult, but its use may be necessary when clearing large areas or wide paths for access by large sampling equipment. The type of vegetation present will also be considered when developing the site-specific vegetation clearance process. Large-vehicle mechanized vegetation clearance may not pose a concern in previously cleared areas, or areas with heavy mesquite infestations, but will be carefully evaluated in other mature forested or otherwise sensitive areas.

If mechanized land clearing is to be used, the smallest piece of equipment available will be favored. Equipment that can maneuver around certain trees and selectively cut according to the clearance criteria is preferable to that which needs to clear cut a wide access path for itself. The preferred method of mechanized clearing will be a brush hog type tractor where the cutting mechanism is attached to a tractor and can be lifted and lowered onto the vegetation. This machinery is sometimes referred to as a hydro ax. However, if not

available, or not technically or economically practical, other types of machinery will be considered.

Areas such as the banks of ephemeral streams will be avoided if possible, and proposed for selective hand clearing if not. Maintaining the vegetative cover of the ephemeral stream banks to the extent possible helps assure that there is minimal bank failure and erosion. Fording of ephemeral streams with mechanized equipment will be avoided unless necessary to meet project objectives. As with vegetation clearance routes, any proposed ephemeral stream crossings and/or vegetation clearance will be discussed with USFWS personnel prior to the activity. Further, collection of samples within ephemeral streams will be conducted by hand equipment as long as the objectives of the investigation can still be met. Of note is that there are several ephemeral streams on the northeast side of Vieques that have been previously designated as conservation zones.

The primary wetland type on Vieques is mangrove wetlands and associated saltflats. Extensive mangrove wetlands are found on west Vieques associated with the Laguna Kiani/Boca Quebrada complex, and Laguna Grande. On east Vieques, there are numerous mangrove lagoons along the coastal areas and in the Live Impact Area (LIA). Like ephemeral streams, mangrove areas will be avoided if possible, and proposed for selective hand clearing if not. Further, soil sampling and placement of monitoring wells in the soft soils associated with mangrove areas will be made by hand, if possible and if the objectives of the investigation can still be met.

Because the type and size of the necessary sample collection equipment dictates, in part, the type of vegetation clearance equipment to be used, the type and size of drilling equipment will be considered when selecting sample types and associated locations. Where possible, sample collection by hand will be considered as long as the investigation objectives can still be met. Because of the limited number of drill rigs available for mobilization to Vieques, control over the size and type of rigs used for site-specific investigations may not be possible.

During identification of proposed vegetation clearance routes and during vegetation clearance, if threatened or endangered plant species are identified, they will be flagged and reported to USFWS personnel. If during vegetation clearance a snake is accidentally killed by the mechanized equipment, it will be brought to USFWS personnel. Reasonable effort will be made to avoid cutting or damaging threat and endangered plant species, as well as snakes and other wildlife. Attached to this SOP is a list of threatened and endangered plant species (with pictures, where available) and a list of snakes on Vieques (with pictures).

Steps for Developing Site-specific Vegetation Clearance Process

Step 1 - Develop Study Area Map(s) Showing Proposed Sampling Locations, and Associated Tables Listing Sampling Methodology for Each Location

As part of site-specific work plan development and upon regulatory agency approval of the site-specific work plan, the following information will be provided to the Navy contractor site reconnaissance field team that will investigate routes of access to each sampling location.

1. Sampling Station Maps - Study area map(s) illustrating all sampling stations proposed for investigation.
2. Supplemental Maps - Aerial, topographic, or other maps of the study area that clearly show environmental features (e.g., roads, ephemeral streams), if available, will be compiled. Maps showing known locations of protected plants and animals and sensitive habitats (e.g., wetlands, salt flats, conservation zones), and identification guides (e.g., snake species flyer) will also be compiled, if available.
3. Information Tables - Tables will be produced summarizing investigation details for each station and provided to the field reconnaissance team. The tables will contain the following information:

Table 1

- Station ID
- Station coordinates
- Investigation activity (e.g., well installation; existing well sampling; or surface soil, subsurface soil, surface water, sediment sampling)
- Mandatory equipment or acceptable alternatives needed on station to collect the samples (e.g., drill rig, 4 wheel drive truck, gear carried in by hand), excluding vegetation clearance equipment
- Notes - Additional information for the field team to consider during the access route evaluation, as applicable.

Table 2

- A reference table will be produced outlining minimum surface clearances, maximum grades, and other limit information required for the transport and operation of each type of sampling equipment. This will allow the reconnaissance team to understand what characteristics of the route need to be achieved. Similarly, vegetation clearing equipment characteristics (e.g., minimum width and maximum height of clearance that can be achieved) will be outlined so that the reconnaissance team can better identify appropriate method(s) for clearing the route.

Step 2 - Initial Site Visit to Delineate Access Routes

A Navy contractor biologist and UXO technician (if required) will visit each proposed location and evaluate access conditions. The objective will be to ground truth and flag safe and effective routes of access to each target station through which vegetative clearing and equipment maneuvering will minimize damage to vegetation, habitat, and wildlife, while still enabling the investigation objectives to be met. In addition, the biologist will identify issues that may limit the types of investigative equipment or clearing methods to be used, or that may prevent investigation of the proposed station altogether.

The following steps will be conducted for each sampling location:

1. Have in hand the study area maps and information described in Step 1.
2. Ground truth a route from the nearest drivable roadway to the station, noting or conducting the following:

- a. Along the route use orange flagging to mark the proposed width of the path to be cleared of vegetation. The width will be based on the minimum distance required for the proposed investigative equipment type.
 - b. Routes that can follow previously cleared areas will be given preference over older growth areas.
 - c. Trees greater than 3 inches in diameter that fall within the route because they cannot be avoided will be tagged with white flagging to indicate that they should be left standing, if possible, which will be later evaluated by the USFWS personnel for any concerns regarding potential removal.
 - d. Vegetation that should not be damaged or removed (e.g., a protected species or sensitive habitat) that is located within or adjacent to the route will be clearly flagged with red and white flagging. The dual-color flagging is intended to emphasize the vegetation not to be damaged or removed and to avoid confusion with other flag types/configurations.
 - e. Ephemeral streams will be avoided, if possible, since clearing of vegetation in the ephemeral stream and movement of machinery across the ephemeral stream may increase the potential for erosion. If ephemeral stream crossing is unavoidable, preference will be given to identifying a route that will minimize damage to the ephemeral stream and associated vegetation.
 - f. Wetlands (typically mangrove communities) will be avoided, if possible. If routes or stations necessarily occur in or near wetlands, minimal clearing will be proposed, ideally conducted by hand, as long as this enables the objectives of the environmental investigation to be met.
 - g. GPS coordinates will be gathered along the centerline of the flagged route(s).
 - h. Any observations of protected plant and animal species on or near the route will be documented.
 - i. Photographs will be taken as deemed helpful
3. Complete a Draft - Route Documentation Form for each route while in the field. This form documents important characteristics of the proposed route, recommendations for and against certain equipment types to be used for investigation and vegetation clearing, and any other information that should be brought up for review with the Navy and USFWS personnel.

Step 3 -Documentation of Proposed Route and Clearing Methods

The station map from Step 1 will be updated to add the proposed routes to each station using the field GPS coordinates. The Draft - Route Documentation Form for each location will be modified to include a close-up map view of the proposed route and type-written documentation of key information. The station map and route documentation forms will be sent to the USFWS Refuge Manager, or his/her designee(s), prior to conducting a site reconnaissance with USFWS personnel.

If the USFWS Refuge Manager or his/her designee determine, based on the Draft Route Documentation Form and associated supporting documentation, that a coordinated site visit is not necessary in order to concur with the proposed vegetation clearance approach and route(s), skip to Step 5. If the USFWS Refuge Manager or his/her designee determines a

coordinated site visit is necessary, he/she will notify the Navy RPM within 5 days of the receipt of the documentation from the Navy.

Step 4 - Conduct Site Visit with USFWS

The Navy contractor biologist (or other Navy contractor personnel, if appropriate) and UXO technician (if required) will escort the USFWS Refuge Manager and/or his/her designee(s) along each flagged route to determine if proposed plans regarding location, clearing equipment, investigation equipment, and vegetation to be cleared or protected are acceptable, and to document any recommended changes to the proposed plan. The Route Documentation Form will be used in the field to support review of the proposed route and record recommended changes by USFWS. If feasible, recommended adjustments along the route will be made during this visit. If no changes are made to proposed vegetation clearance procedures or routes alter the associated sample collection methods or sample locations, the Navy contractor will present the revised Route Documentation Form(s) to the Navy for concurrence.

If the USFWS personnel recommendations regarding vegetation clearance along any particular route alter the method of sample collection, ability to collect the sample as intended, or sample location, the Navy will set up a call or meeting with the Environmental Technical Subcommittee to discuss the proposed sample collection changes. If the changes are agreed upon, the updated Route Documentation Forms will be finalized. If the proposed sample collection changes are not acceptable to the regulatory agencies, additional discussions among the agencies will be required before vegetation clearance and the field investigation can commence.

Step 5 - USFWS Concurrence Letter

Within 5 days of the final site-specific vegetation clearance process being concurred upon by the Navy and USFWS, the concurrence will be documented in a letter provided to the Navy by the USFWS Refuge Manager or his/her designee.

Step 6 - Oversight of Actual Clearing Activities

The Navy contractor biologist involved with the field reconnaissance and USFWS site review (or other Navy contractor personnel, if appropriate) will be present during implementation of clearing activities. Using the final, concurred upon Route Documentation Forms, the contractor biologist will ensure that final decisions regarding route layout, clearing machinery, plants to avoid, and any other documented issues are maintained during vegetation clearance.

Appendix B

SI/Expanded SI Preliminary Vegetation Clearance Mapping

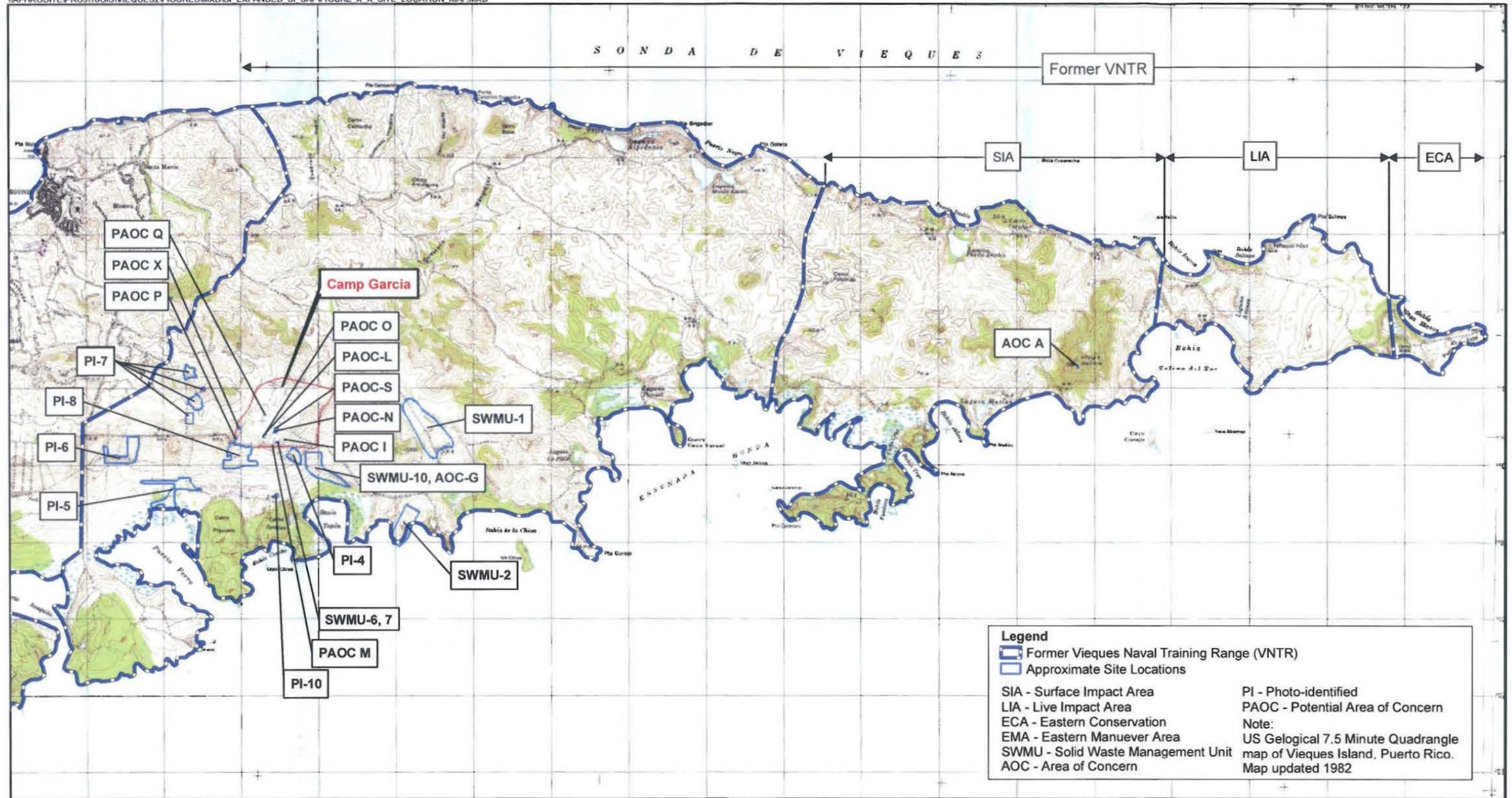
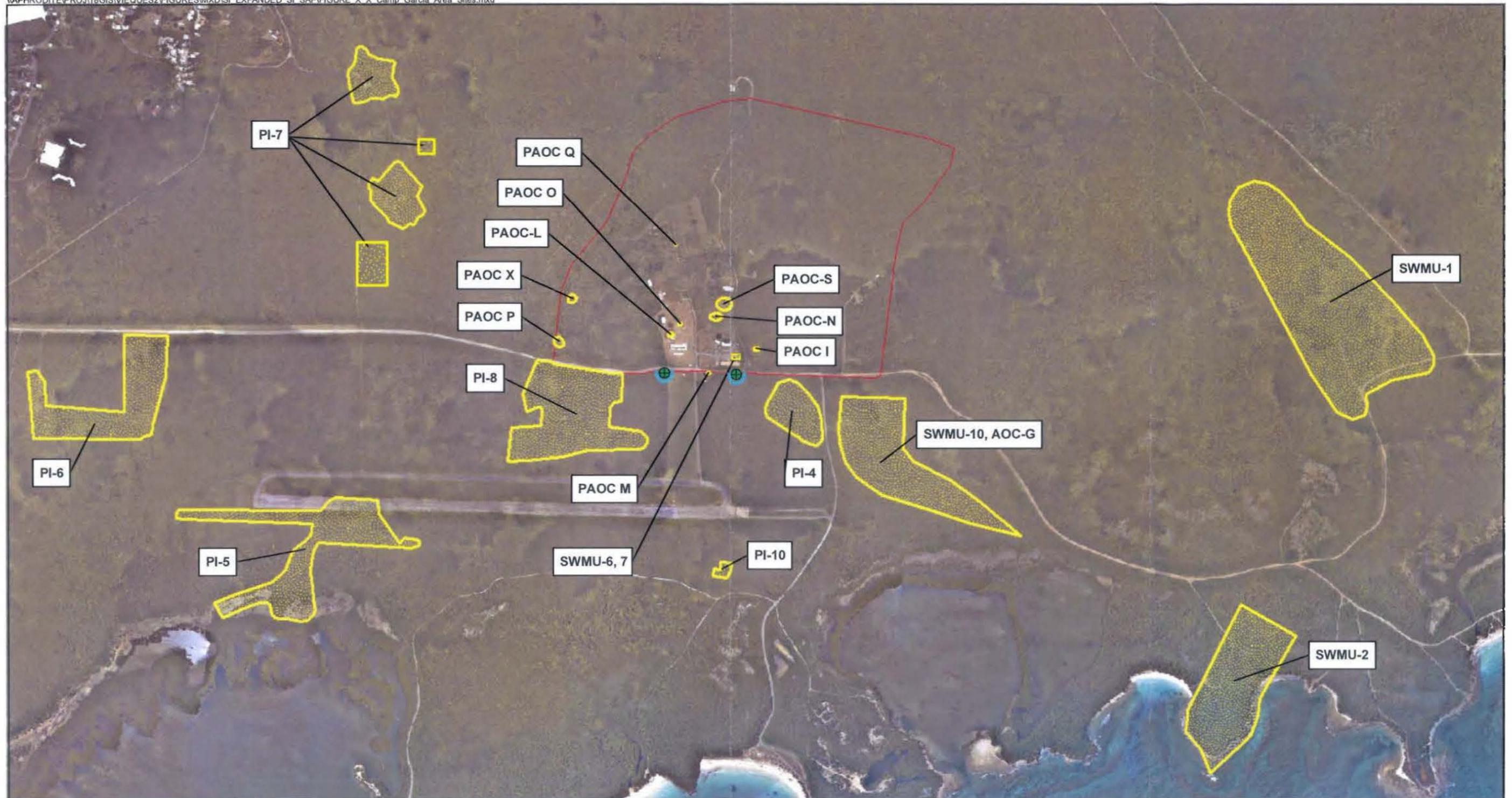


FIGURE 1
Site Location Map
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



- Legend**
- Proposed Monitoring Well Location
 - Approximate Site Locations
 - Camp Garcia
 - Limits of Vegetation Clearing



FIGURE 2
Camp Garcia Area Sites
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

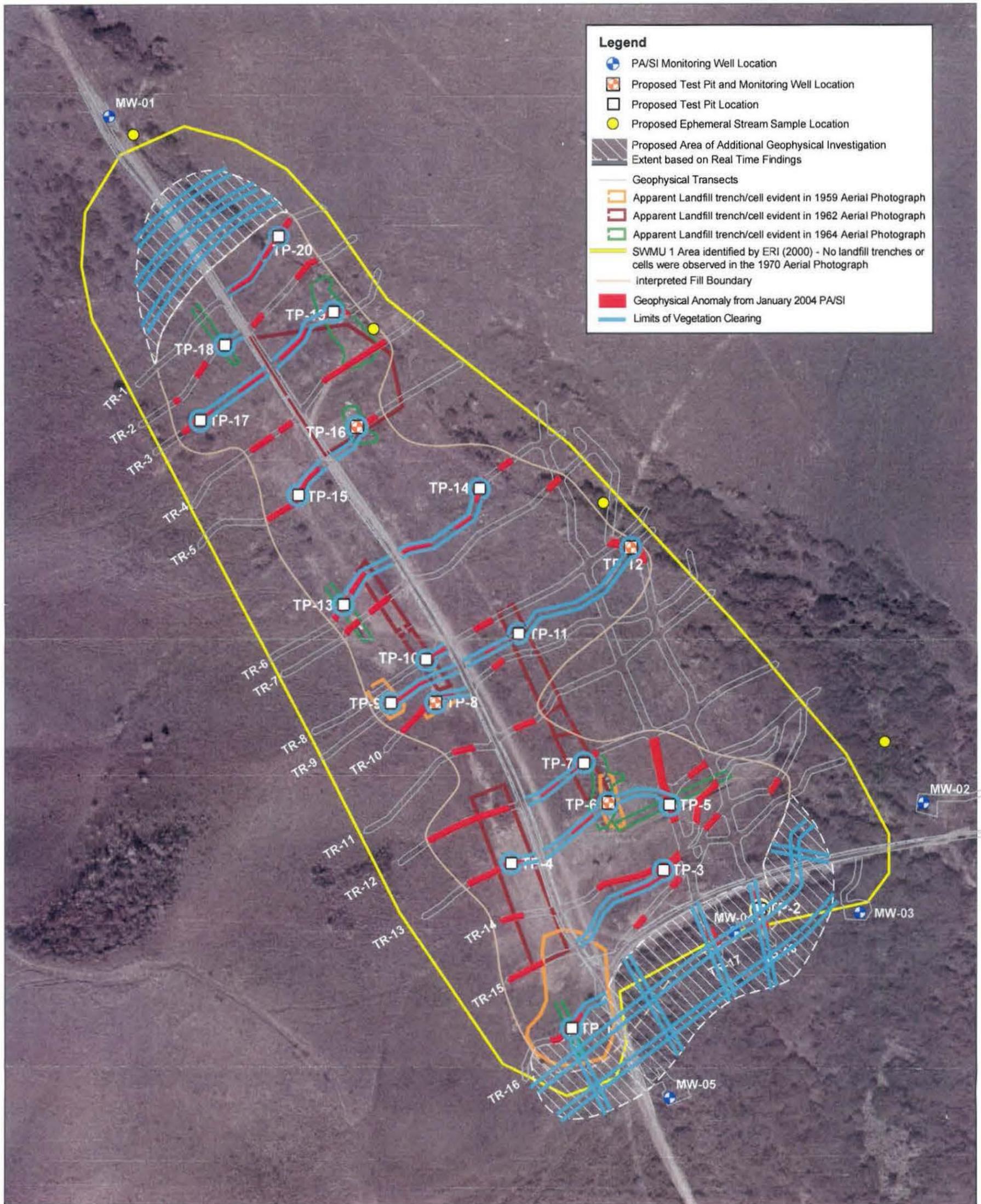
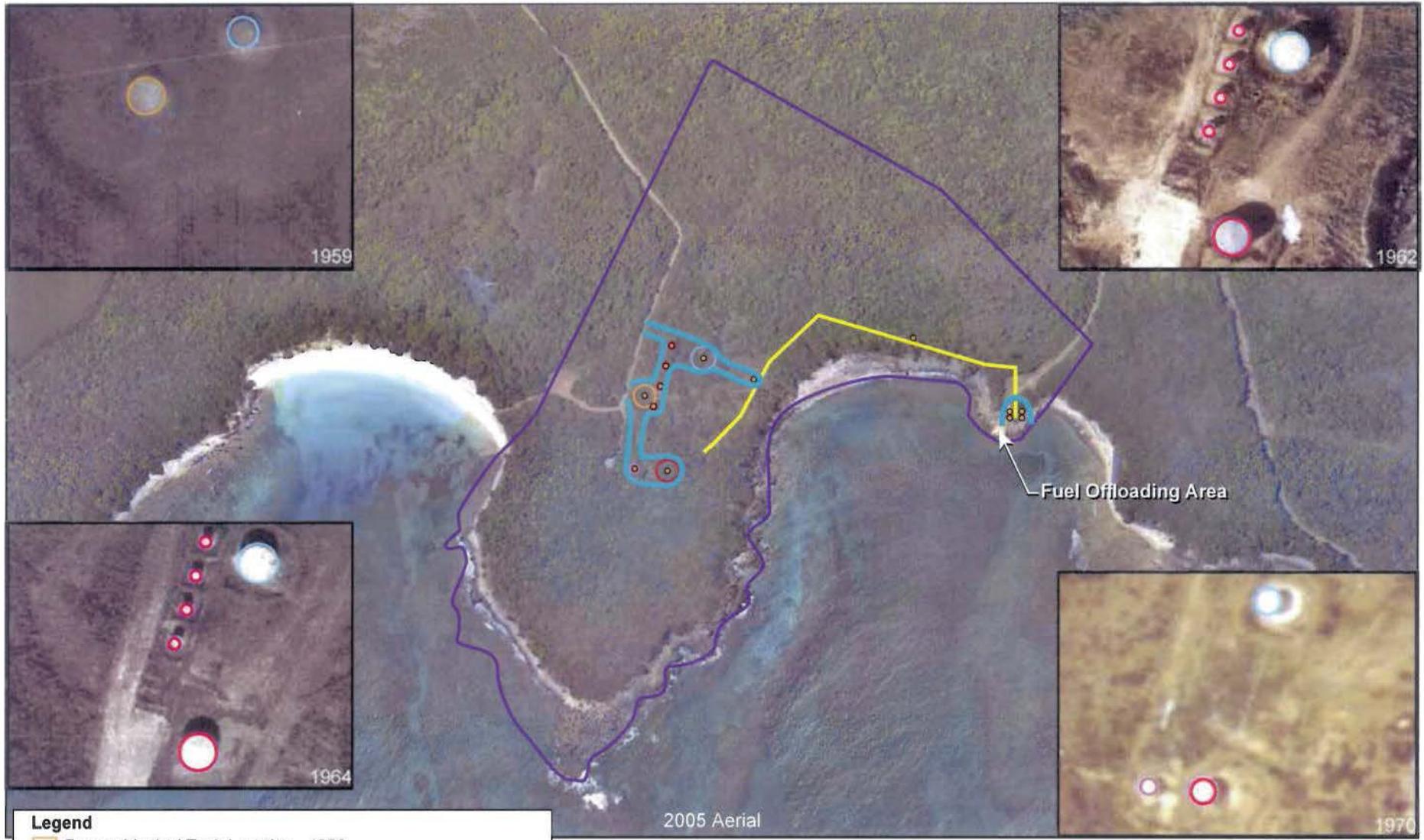


FIGURE 3
Proposed Additional Investigation (SWMU 1)
 Preliminary Assessment/Site Inspection Report
 12 Consent Order Sites and 8 PI/PAOC Sites
 Vieques, Puerto Rico



- Legend**
- Former Vertical Tank Location - 1959
 - Former Vertical Tank Location - 1970
 - Former Vertical Tank Location - 1959, 1962, 1964, and 1970
 - Former Vertical Tank Location - 1962, 1964, and 1970
 - SWMU, AOC Sites
 - Estimated Location of Buried Pipeline
 - Proposed Surface and Subsurface Soil Sample Location
 - Limits of Vegetation Clearing

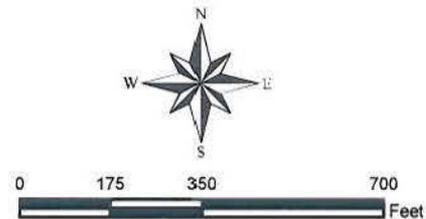


FIGURE 4
Composite Figure of Historical Tank Locations
and Proposed Sampling Locations, SWMU 2
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

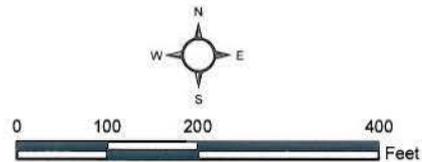
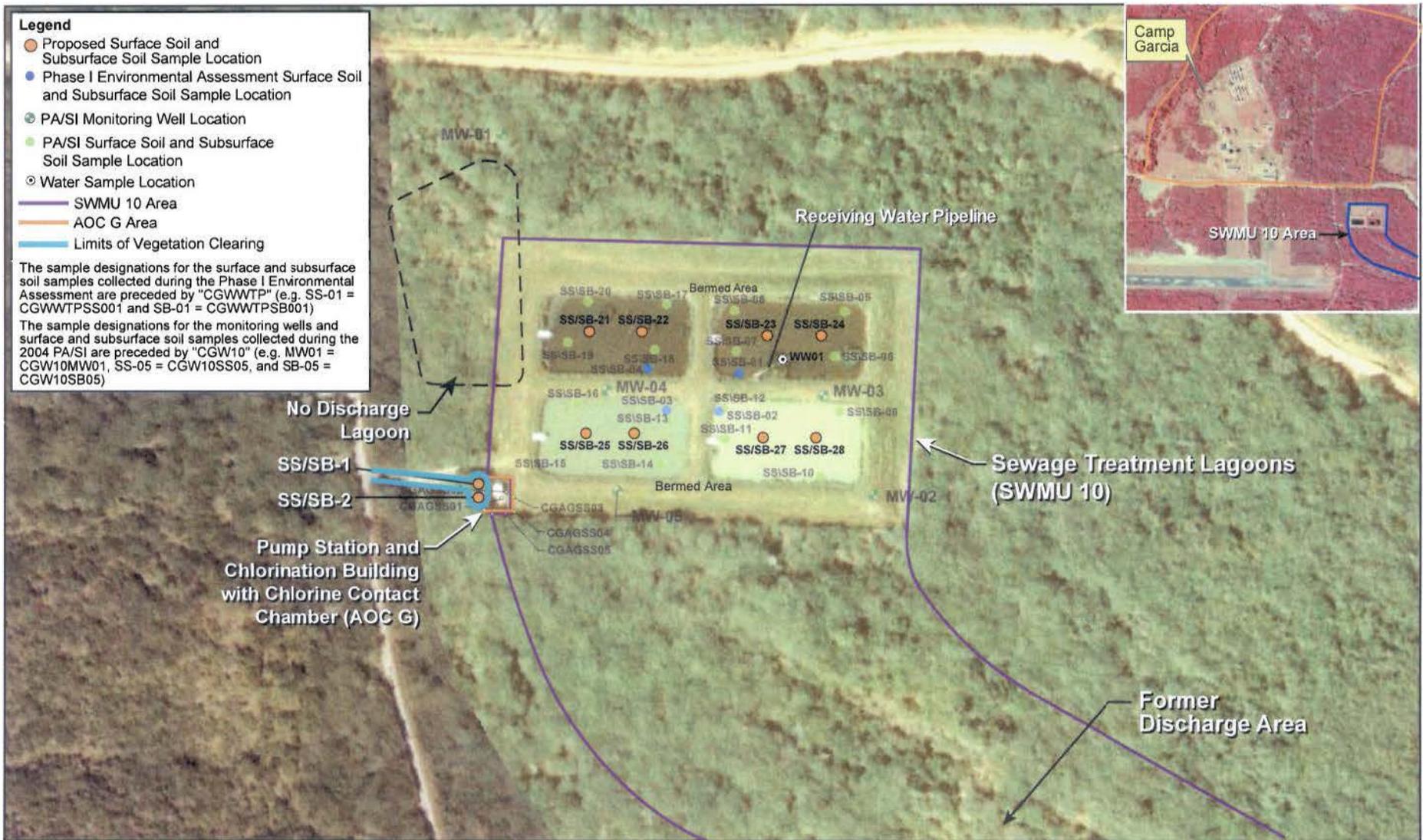
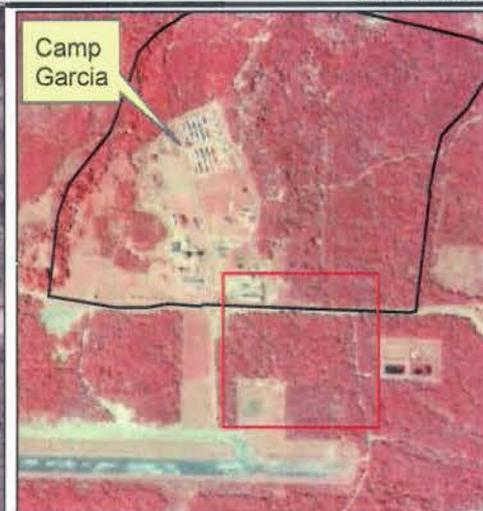


FIGURE 5
SWMU 10 and AOC G Sample Locations,
1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



LEGEND

- PA/SI Monitoring Well Location With Water Elevation Feet Above Mean Sea Level
- Proposed Monitoring Well Location
- PA/SI Surface and Subsurface Soil Sample Location
- ▲ PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location
- PA/SI Surface and Subsurface Soil Sample Location Co-located with EBS Surface Soil Sample Location
- PA/SI Surface Water Sample Location
- Concrete Pipes/Foundation Slab/Vault Box
- - - Estimated Peizometric Contours (dashed where inferred)
- Feature visible in 1964 Aerial Photograph
- Limits of Vegetation Clearing

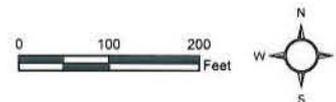
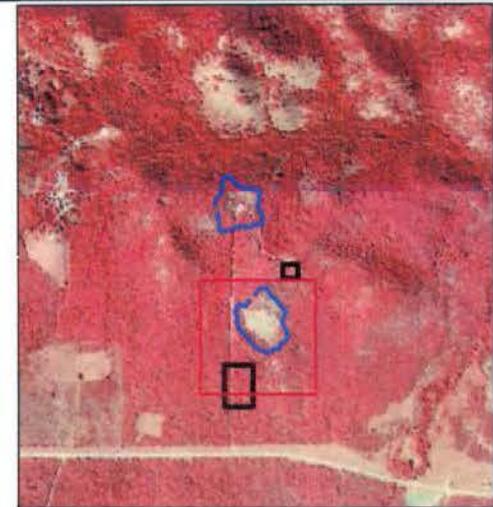
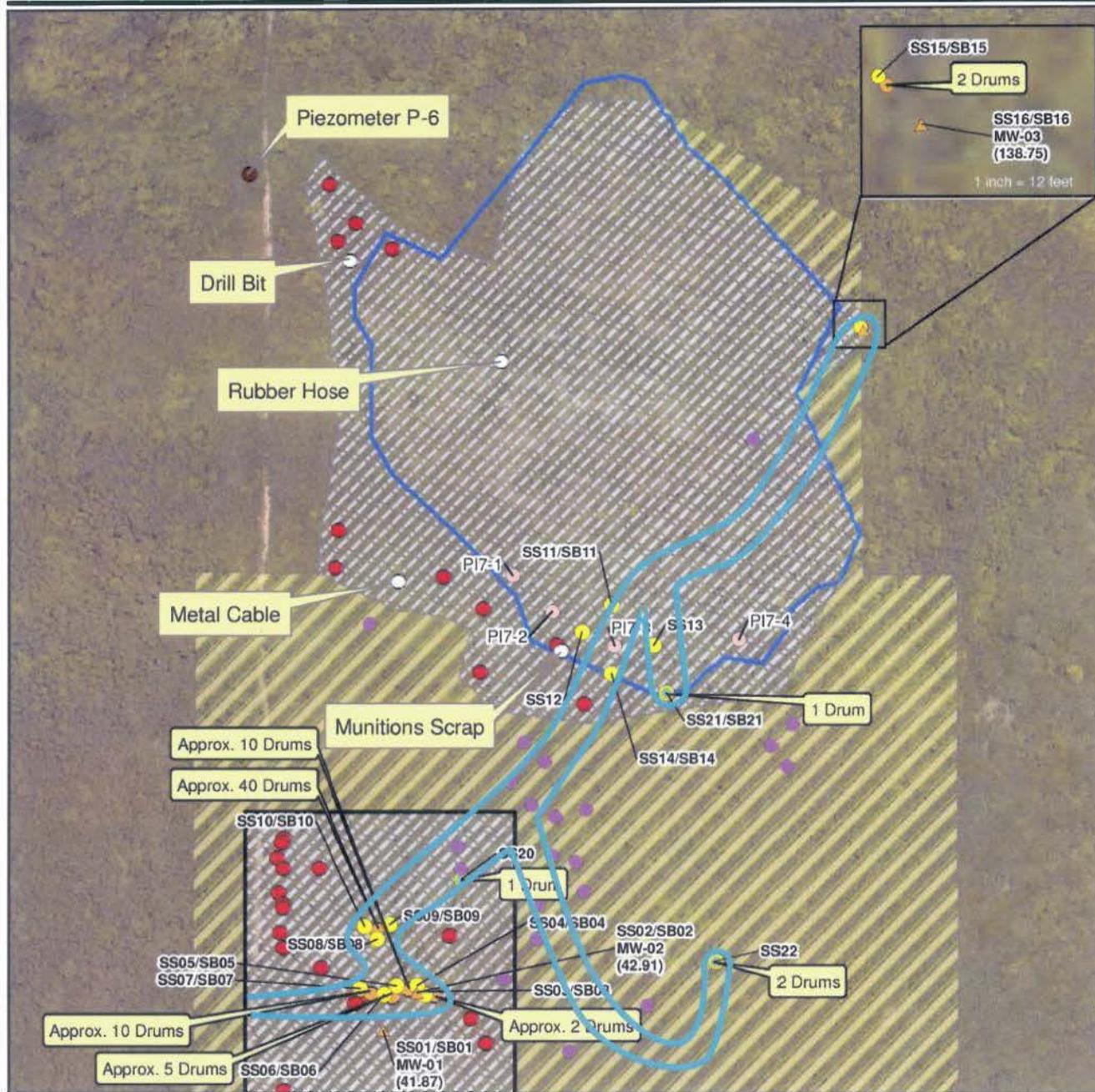


FIGURE 6
PI 4 Proposed Monitoring Well
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



LEGEND

- ▲ PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location With Water Elevation, Feet Above Mean Sea Level
- PA/SI Subsurface and/or Surface Soil Sample Location
- Previously Installed Piezometer
- EBS Surface Soil Sample Location
- Drums Identified During 2005 Reconnaissance
- Drums Identified During 2006 Reconnaissance
- Metallic Sub-surface Anomalies Identified During 2005 Reconnaissance
- Surface Debris Identified During 2005 Reconnaissance
- Surface Debris Identified During 2006 Reconnaissance
- ▨ Area of August 2005 PA/SI Reconnaissance
- ▨ Area of March 2006 PA/SI Reconnaissance
- ▭ ERI Aerial Photo Analysis Area
- Limits of Vegetation Clearing

Note:

Each sampling location shown is preceded by "EPI07" (e.g. SS02/SB02 = EPI07-SS02 and EPI07-SB02, and MW-1 = EPI07-MW01)

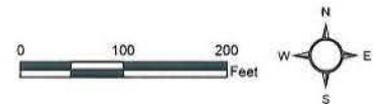
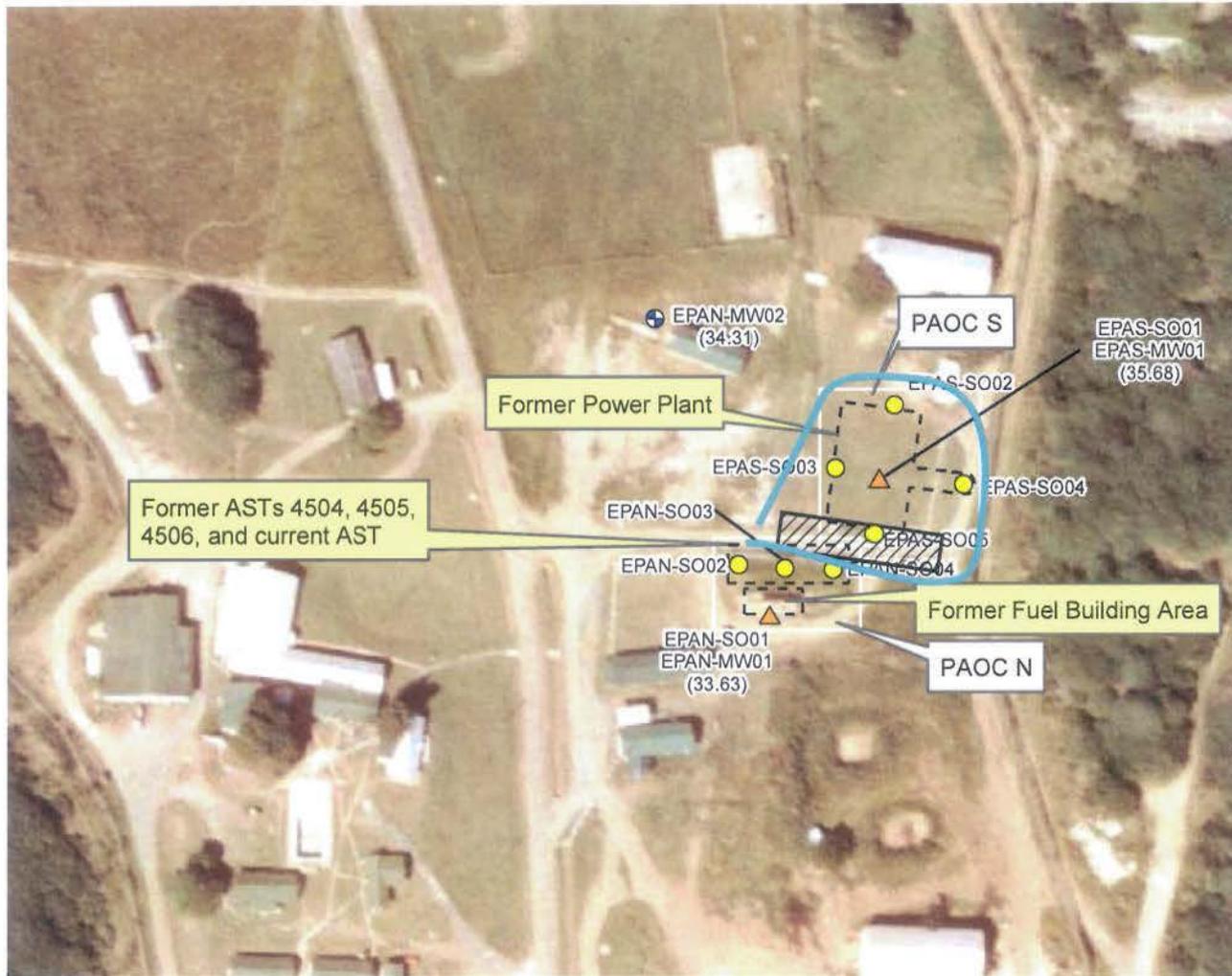


FIGURE 7
PI 7 Central Subsection -
Former Quarry
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



LEGEND

- ⊕ PA/SI Monitoring Well Location with Water Level Elevation, Feet Above Mean Sea Level
- PA/SI Surface and Subsurface Soil Sample Location
- ▲ PA/SI Surface and Subsurface Soil Sample and Monitoring Well Location with Water Level Elevation, Feet Above Mean Sea Level
- ▨ Proposed Area of Geophysical Investigation
- Limits of Vegetation Clearing

Note: Water Level Elevations collected 4/3/06-4/4/06



FIGURE 8
PAOCs N and S Geophysical Investigation,
1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

-  PI-5
-  Proposed Surface and Subsurface Sampling Locations
-  Limits of Vegetation Clearing



FIGURE 9
PI-5 Sample Locations,
1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

- PI-6
- Proposed Surface and Subsurface Sampling Locations
- EBS Surface Soil Sample Locations (PI6-1, 2, 3)
- EBS PCB Wipe Sample Locations (PBC1-6)
- Limits of Vegetation Clearing

Note: Approximate location of former wash pad, actual site to be identified during pre-sampling reconnaissance

CH2MHILL
ES062008008TPA

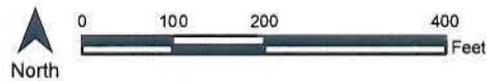


FIGURE 10
PI-6 1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

- PI-8
- EBS Surface Soil Sample Locations
- Proposed Surface and Subsurface Sampling Locations
- Limits of Vegetation Clearing

ERI Notes:

- Open storage of vehicles
- Equipment and multi-colored materials (some probably metallic)
- Heavy staining noted south of probable maintenance buildings

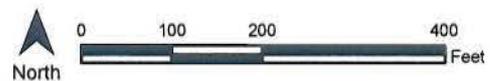


FIGURE 11
PI-8 Sample Locations,
1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

- PI-10
- EBS Surface Soil Sample Locations
- Proposed Surface and Subsurface Soil Sample Locations
- Limits of Vegetation Clearing



FIGURE 12
PI-10 Sample Locations,
1962 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

- Camp Garcia Area
- EBS Surface Soil Sample Location
- Proposed Surface and Subsurface Sampling Locations
- ◆ Monitoring Wells installed during the PA/SI
- ◆ Proposed Monitoring Well
- PAOC U Surface and Subsurface Sample Locations (PA/SI)
- Limits of Vegetation Clearing

CH2MHILL
ES062008008TPA

FIGURE 13
PAOCs I, M, O and Q Sample Locations,
1983 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico



Legend

- PAOC P and X and Camp Garcia Boundary
- EBS Surface Soil Sample Location
- Proposed Surface and Subsurface Soil Sampling Location
- Limits of Vegetation Clearing

Note: Location of PAOC P generator site approximate. Actual site to be located in the field.

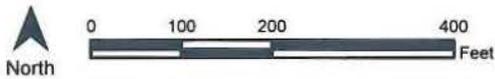


FIGURE 14
PAOCs P and X Sample Locations,
2005 Aerial Photograph
SI/Expanded SI Sampling and Analysis Plan
Vieques, Puerto Rico

Appendix C

SI/Expanded SI Preliminary Site Summary Tables

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	SWMU 1 – Camp Garcia Landfill			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Perform magnetic and electromagnetic surveys at the north and south ends of the landfill to confirm boundary; Perform test pitting and visual observation of debris at 20 locations; Collect a soil sample within the vertical debris profile and a subsurface soil sample directly below the waste in each test pit; Install four monitoring wells; Sample all existing and new monitoring wells. Collect samples from ephemeral stream adjacent to and upstream of landfill.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	SWMU 2 – Fuels Offloading Site				
Station Coordinates (DD.MM.SS)					
Initial Site Visit Date					
Agency Site Visit Date					
Planned Site Investigation	Collect co located surface/subsurface soil samples beneath each of the eight former ASTs, two along the former pipeline, and four in the fuel offloading area. If contamination is observed or suspected during soil sampling, collect additional samples laterally to delineate source area and confer with regulatory agencies on the need for groundwater sampling.				
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)				
Recommended Sampling Equipment					
Recommended Clearing Method/Equipment					
Potentially Unavoidable Environmental Issues					
Additional Notes					

SI/Expanded SI Sampling and Analysis Plan Site Summary



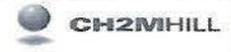
Station ID	AOC G – Pump Station and Chlorination Building at Sewage Treatment Lagoons			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect co-located surface/subsurface soil samples from two locations near the building door in an area where pump maintenance fluids would most likely have been spilled or otherwise discharged.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



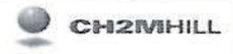
Station ID	PI 4 – Former Helicopter Maintenance Area, Trenched Area, Disturbed Area, and Bermed Areas used for Fuel Bladder Storage			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Confirm groundwater flow direction by measuring water levels in all existing wells. Install a monitoring well upgradient and downgradient of existing well with MCL exceedance and collect groundwater samples from existing and newly installed wells.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PI 7 – Former Quarry, Tar Drum Disposal Area, and Radar Communication Area			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Remove drums and collect confirmatory soil samples immediately beneath the drums.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PAOC N – Former Fuel Farm and Filling Station				
Station Coordinates (DD.MM.SS)					
Initial Site Visit Date					
Agency Site Visit Date					
Planned Site Investigation	Perform magnetic and electromagnetic surveys within area where underground pipeline would likely have traversed.				
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)				
Recommended Sampling Equipment					
Recommended Clearing Method/Equipment					
Potentially Unavoidable Environmental Issues					
Additional Notes					

SI/Expanded SI Sampling and Analysis Plan Site Summary



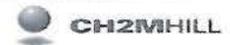
Station ID	PAOC S – Former Power Plant				
Station Coordinates (DD.MM.SS)					
Initial Site Visit Date					
Agency Site Visit Date					
Planned Site Investigation	Perform magnetic and electromagnetic surveys within area where underground pipeline would likely have traversed.				
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)				
Recommended Sampling Equipment					
Recommended Clearing Method/Equipment					
Potentially Unavoidable Environmental Issues					
Additional Notes					

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PI 5 – Former Airfield and Associated Ditches				
Station Coordinates (DD.MM.SS)					
Initial Site Visit Date					
Agency Site Visit Date					
Planned Site Investigation	Collect co-located surface/subsurface soil samples on airfield (one location) and within adjacent drainage ditches (seven locations).				
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)				
Recommended Sampling Equipment					
Recommended Clearing Method/Equipment					
Potentially Unavoidable Environmental Issues					
Additional Notes					

SI/Expanded SI Sampling and Analysis Plan Site Summary



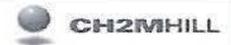
Station ID	PI 6 – Former PCB Storage Pad and Vehicle Wash Pad			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect co-located surface/subsurface soil samples from the sump (one location), adjacent to the PCB storage pad (two locations), and adjacent to the vehicle wash pad (one location).			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



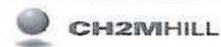
Station ID	PI 8 – Former Motor Pool Maintenance Area			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect co-located surface/subsurface soil samples from the motor pool maintenance area (five locations); asphalt emulsion drum storage area, if drums are found using a metal detector (one location); metallic, multi-colored material area (two locations); light-toned material area (two locations); and drainage ditch adjacent to the maintenance area (one location).			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PI 10 – Former Wastewater Leach Field			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect co-located surface/subsurface soil samples from approximately the same three locations sampled in 2002.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PAOC I – Former Power Plant and Mechanics Shop			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect co-located surface/subsurface soil samples around building (one set adjacent to each door and pipe penetration).			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PAOC P – Former Water Treatment Pumphouse				
Station Coordinates (DD.MM.SS)					
Initial Site Visit Date					
Agency Site Visit Date					
Planned Site Investigation	Collect a co-located surface/subsurface soil sample beneath the mobile generator.				
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)		Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)				
Recommended Sampling Equipment					
Recommended Clearing Method/Equipment					
Potentially Unavoidable Environmental Issues					
Additional Notes					

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PAOC Q – Former Boiler Room in Heat Plant Building 607			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Collect a co-located surface/subsurface soil sample from one location within former Building 607 footprint and at the former location of a similar structure just north of former Building 607 that may have been used for a similar purpose.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

SI/Expanded SI Sampling and Analysis Plan Site Summary



Station ID	PAOC X – Debris Area in Ephemeral Stream			
Station Coordinates (DD.MM.SS)				
Initial Site Visit Date				
Agency Site Visit Date				
Planned Site Investigation	Remove debris and collect confirmatory soil samples from four locations immediately beneath the debris.			
Mandatory Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Optional Equipment for Investigation	Equipment	Clearance Width (ft)	Equipment	Clearance Width (ft)
Important Environmental Elements Observed/Expected in Vicinity of Station	(Ephemeral Stream, Trees >3", Mangroves, Wetlands, Listed Species, Sale Flat, Lagoon)			
Recommended Sampling Equipment				
Recommended Clearing Method/Equipment				
Potentially Unavoidable Environmental Issues				
Additional Notes				

Appendix D

**USFWS Threatened and Endangered Species List and Environmental
Sensitivity Index Maps**

VIEQUES

SCIENTIFIC NAME	COMMON NAME	COMMON NAME SPANISH	GROUP	STATUS	DISTRIBUTION
<i>Agelaius xanthomus</i>	Yellow Shouldered Black Bird	Mariquita	Bird	E, CH	Coastal Forest
<i>Calypttranthes thomasiana</i>	No Common Name	No Tiene Nombre Comun	Plant	E	Monte Pirata
<i>Caretta caretta</i>	Loggerhead Sea Turtle	Cabezona	Reptile	T	Coastal Zones
<i>Chamaecrista glandulosa</i> var <i>mirabilis</i>	No Common Name	No Tiene Nombre Comun	Plant	E	Vieques National Wildlife Refuge
<i>Chelonia mydas</i>	Green Sea Turtle	Peje Blanco	Reptile	T, CH	Coastal Zones
<i>Dermochelys coriacea</i>	Leatherback Sea Turtle	Tinglar	Reptile	E, CH	Coastal Zones
<i>Eretmochelys imbricata</i>	Hawksbill Sea Turtle	Carey	Reptile	E, CH	Coastal Zones
<i>Goetzea elegans</i>	Beautiful Goetzea	Matabuey	Plant	E	Vieques National Wildlife Refuge (West)
<i>Pelecanus occidentalis</i>	Brown Pelican	Pelicano Pardo	Bird	E	Coastal Zones, Nesting
<i>Stahlia monosperma</i>	No Common Name	Cobana Negra	Plant	T	Vieques National Wildlife Refuge, Ensenada Honda
<i>Sterna dougallii</i>	Roseate Tern	Palometa	Bird	T	Coastal Areas and Offshore Cays, Nesting
<i>Trichechus manatus manatus</i>	Antillean Manatee	Manati Antillano	Mammal	E	Coastal Zones

Status

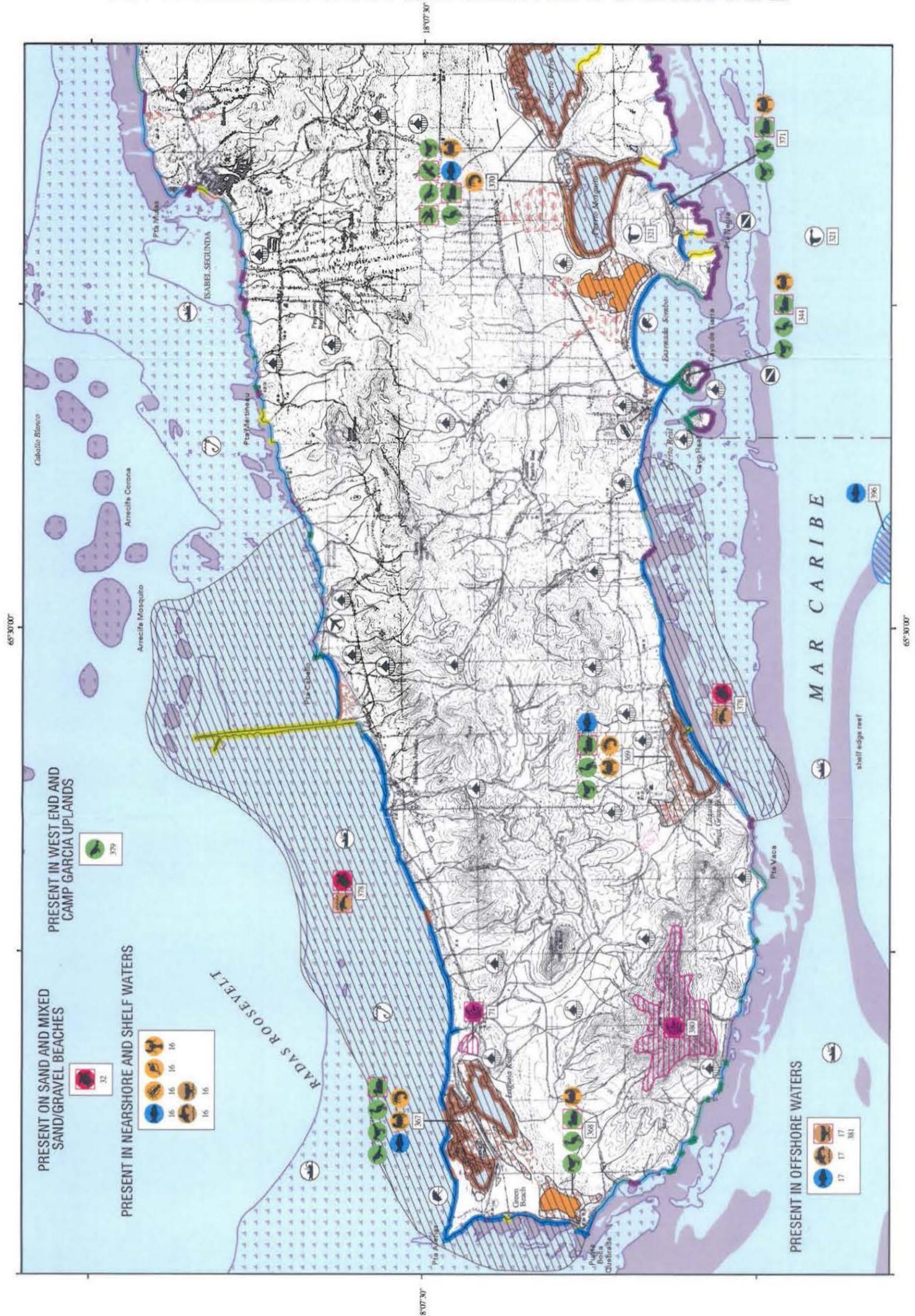
E=Endangered

T=Threatened

CH=Critical Habitat



ENVIRONMENTAL SENSITIVITY INDEX MAP

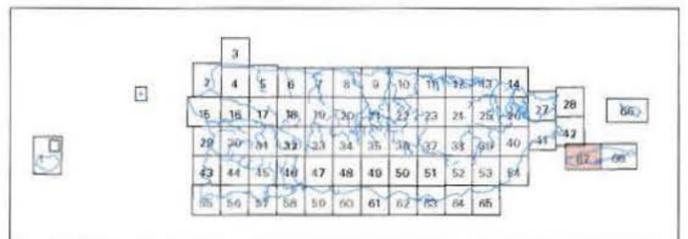


SHORELINE HABITATS (ESI)

- 1A EXPOSED ROCKY CLIFFS
- 1B EXPOSED, SOLID MAN-MADE STRUCTURES
- 2A EXPOSED WAVE-CUT PLATFORMS IN BEDROCK
- 2B SCARPS AND STEEP SLOPES IN MUDDY SEDIMENTS
- 3A FINE- TO MEDIUM-GRAINED SAND BEACHES
- 4 COARSE-GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN-MADE STRUCTURES
- 9A SHELTERED TIDAL FLATS
- 9B SHELTERED VEGETATED LOW BANKS
- 10D MANGROVES
- SALT- AND BRACKISH-WATER MARSHES
- FRESHWATER MARSHES
- FRESHWATER SWAMPS
- FRESHWATER SCRUB/SHRUB

STREAM REACHES (RSI)

- 1 QUIET POOL; LOW-SENSITIVE BANKS
- 2 STRAIGHT CHANNEL WITH CURRENTS; LOW-SENSITIVE BANKS (MUD DOMINANT)
- 3 MEANDERING CHANNEL; SAND POINT BARS
- 4 MEANDERING CHANNEL; VEGETATED POINT BARS
- 5 RAPIDS OVER BEDROCK
- 6 MEANDERING CHANNEL; SAND AND GRAVEL POINT BARS
- 7 SPLIT CHANNEL WITH COARSE GRAVEL; SOME RAPIDS
- 8 SMALL FALLS; BOULDERS IN CHANNEL
- 9 LARGE FALLS; BOULDERS IN CHANNEL
- 10 CHANNELS WITH ASSOCIATED VULNERABLE WETLANDS
- KARST



SCALE 1:55000



Not For Navigation
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National Ocean Service
Office of Response and Restoration
Hazardous Materials Response Division

ISLA DE VIEQUES, P.R. (1982) PR-67

PUERTO RICO - ESIMAP 67

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting
344	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
367	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Clapper rail				X	X	X	X	X	X	X	X	X	X	X	X	-
	Common moorhen				X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	West Indian whistling-duck	S	T		X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	White-crowned pigeon				X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
368	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Common moorhen				X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	West Indian whistling-duck	S	T		X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
369	Caribbean coot	S	T		X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
370	Black-necked stilt									X	X	X	X	X	X	X	APR-OCT
	Blue-winged teal			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Brown pelican	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Clapper rail				X	X	X	X	X	X	X	X	X	X	X	X	-
	Lesser scaup			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Peregrine falcon	S	E		X	X	X	X	X	X	X	X	X	X	X	X	-
	Ring-necked duck			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	White-crowned pigeon				X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
371	Blue-winged teal			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Lesser scaup			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ring-necked duck			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
379	Mourning dove			LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG
	Scaly-naped pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN
	White-crowned pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
	White-winged dove			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC
	Zenaida dove			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC

FISH:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
16	Pelagic fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
	Reef fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
17	Pelagic fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
367	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
369	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
370	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
396	Mutton snapper			HIGH					X	X	X	X	X	X	X	X	MAR-JUN	MAR-JUN	MAR-JUN	-	MAR-JUN
	Yellowtail snapper			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-MAR	JAN-MAR	JAN-MAR	-	JAN-MAR

PLANT:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D
71	Stahlia monosperma	S/F	T/T		X	X	X	X	X	X	X	X	X	X	X	X
380	Calyptanthus thomasiana	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X
	Eugenia woodburyana	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
16	Caribbean spiny lobster				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
	Octopus				X	X	X	X	X	X	X	X	X	X	X	X	DEC-MAR	DEC-APR	-	JAN-DEC	JAN-DEC
	Queen conch				X	X	X	X	X	X	X	X	X	X	X	X	APR-OCT	APR-OCT	APR-OCT	JAN-DEC	JAN-DEC
344	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
367	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
	Penaeid shrimp				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
368	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
369	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
	Penaeid shrimp				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
370	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
	Penaeid shrimp				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
371	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC

MARINE MAMMAL:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Mating	Calving
16	Dolphins				X	X	X	X	X	X	X	X	X	X	X	X	-	-
	Whales				X	X	X	X	X	X	X	X	X	X	X	X	-	-
17	Dolphins				X	X	X	X	X	X	X	X	X	X	X	X	-	-
	Whales				X	X	X	X	X	X	X	X	X	X	X	X	-	-
378	West Indian manatee	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC
381	Sperm whale	S/F	E/E	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC

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BIOLOGICAL RESOURCES: cont.

REPTILE:

RAR#	Species	S/F T/E Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting	Hatching	Interesting	Juveniles	Adults
32	Green sea turtle	S/F E/T	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	-	JAN-DEC	JAN-DEC
	Hawksbill sea turtle	S/F E/E	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	-	JAN-DEC	JAN-DEC	
	Leatherback sea turtle	S/F E/E	X	X	X	X	X	X	X	X	FEB-JUN	APR-SEP	-	-	APR-SEP	FEB-JUN	-	-	
378	Green sea turtle	S/F E/T	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC	
	Hawksbill sea turtle	S/F E/E	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	JAN-DEC	

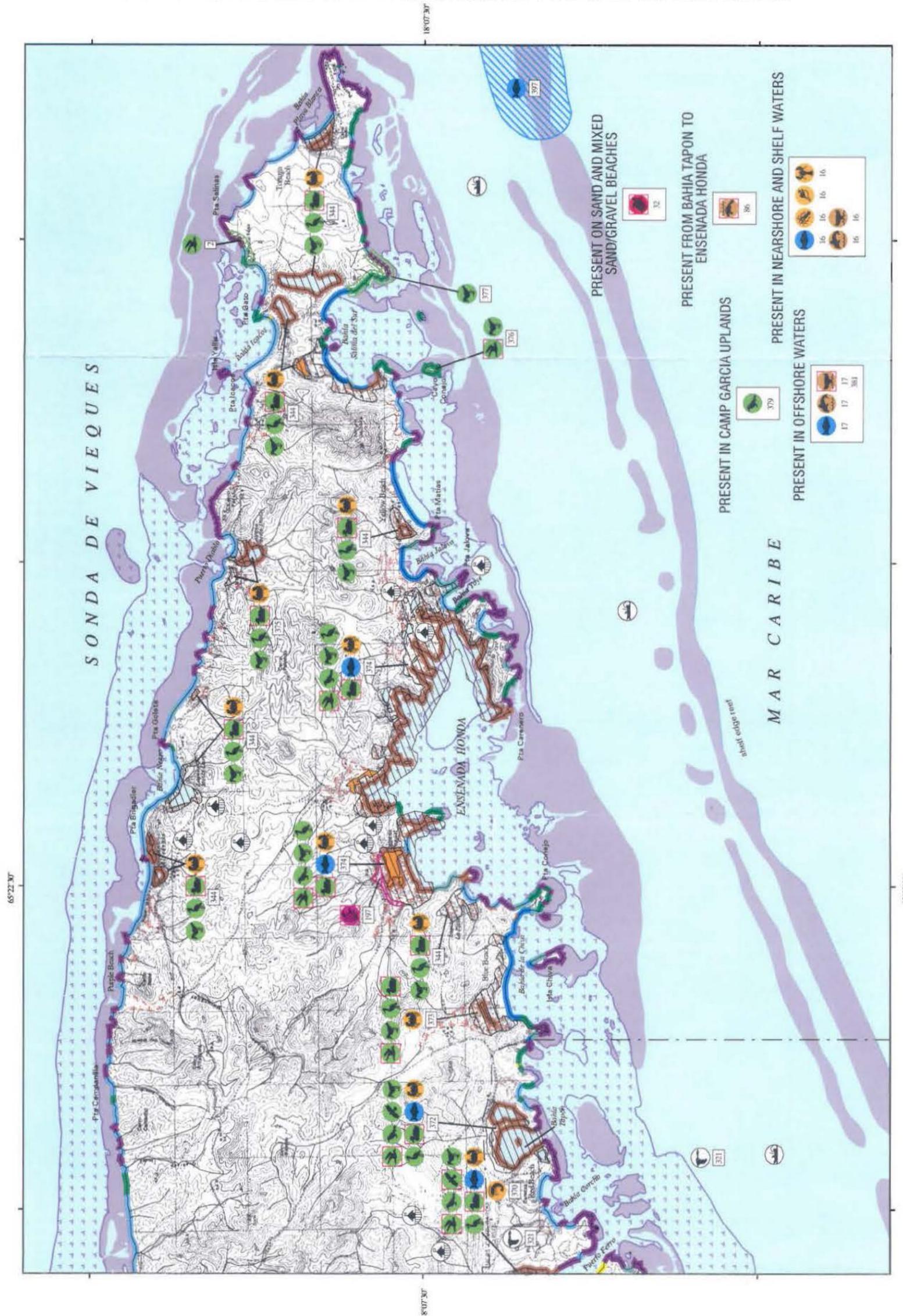
HUMAN USE RESOURCES:

WILDLIFE REFUGE:

HUN#	Name	Owner/Manager	Contact	Phone
321	RESERVA NATURAL BAHIAS DE VIEQUES	DRNA	DIVISION DE RESERVAS NATURALES Y REFUGIOS DE VIDA SILVESTRE	787/724-2816

Biological information shown on the maps represents known concentration areas or occurrences, but does not necessarily represent the full distribution or range of each species. This is particularly important to recognize when considering potential impacts to protected species.

ENVIRONMENTAL SENSITIVITY INDEX MAP

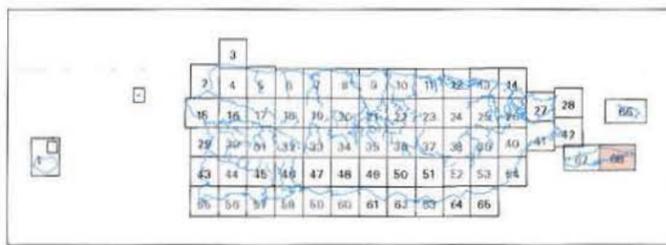


SHORELINE HABITATS (ESI)

- 1A EXPOSED ROCKY CLIFFS
- 1B EXPOSED, SOLID MAN-MADE STRUCTURES
- 2A EXPOSED WAVE-CUT PLATFORMS IN BEDROCK
- 2B SCARPS AND STEEP SLOPES IN MUDDY SEDIMENTS
- 3A FINE- TO MEDIUM-GRAINED SAND BEACHES
- 4 COARSE-GRAINED SAND BEACHES
- 5 MIXED SAND AND GRAVEL BEACHES
- 6A GRAVEL BEACHES
- 6B RIPRAP
- 7 EXPOSED TIDAL FLATS
- 8A SHELTERED ROCKY SHORES
- 8B SHELTERED, SOLID MAN-MADE STRUCTURES
- 9A SHELTERED TIDAL FLATS
- 9B SHELTERED VEGETATED LOW BANKS
- 10D MANGROVES
- SALT- AND BRACKISH-WATER MARSHES
- FRESHWATER MARSHES
- FRESHWATER SWAMPS
- FRESHWATER SCRUB/SHRUB

STREAM REACHES (RSI)

- 1 QUIET POOL, LOW-SENSITIVE BANKS
- 2 STRAIGHT CHANNEL WITH CURRENTS, LOW-SENSITIVE BANKS (MUD DOMINANT)
- 3 MEANDERING CHANNEL, SAND POINT BARS
- 4 MEANDERING CHANNEL, VEGETATED POINT BARS
- 5 RAPIDS OVER BEDROCK
- 6 MEANDERING CHANNEL, SAND AND GRAVEL POINT BARS
- 7 SPLIT CHANNEL WITH COARSE GRAVEL, SOME RAPIDS
- 8 SMALL FALLS, BOULDERS IN CHANNEL
- 9 LARGE FALLS, BOULDERS IN CHANNEL
- 10 CHANNELS WITH ASSOCIATED VULNERABLE WETLANDS
- KARST



SCALE 1:55000



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National Ocean Service
Office of Response and Restoration
Hazardous Materials Response Division

PUERTO RICO - ESIMAP 68

BIOLOGICAL RESOURCES:

BIRD:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Nesting
2	White-tailed tropicbird						X	X	X	X	X						MAR-JUL
344	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
370	Black-necked stilt				X	X	X	X	X	X	X	X					APR-OCT
	Blue-winged teal			HIGH	X	X	X	X					X	X	X		-
	Brown pelican	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Clapper rail				X	X	X	X	X	X	X	X	X	X	X	X	-
	Lesser scaup			HIGH	X	X	X						X	X			-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Peregrine falcon	S	E		X	X	X						X	X			-
	Ring-necked duck			HIGH	X	X	X						X	X			-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	White-crowned pigeon				X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
372	Black-necked stilt				X	X	X	X	X	X	X	X					APR-OCT
	Brown pelican	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Osprey				X	X	X	X					X	X	X		-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	White-crowned pigeon				X	X	X	X	X	X	X	X	X	X	X	X	-
373	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Common moorhen				X	X	X	X	X	X	X	X	X	X	X	X	-
	Least tern	S	T							X	X	X	X				-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	West Indian whistling-duck	S	T		X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
374	Brown pelican	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Common moorhen				X	X	X	X	X	X	X	X	X	X	X	X	-
	Least tern	S	T							X	X	X	X				-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	White-crowned pigeon				X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
375	Blue-winged teal			HIGH	X	X	X	X					X	X			-
	Caribbean coot	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Masked duck	S	T	LOW	X	X	X	X	X	X	X	X	X	X	X	X	-
	Ruddy duck	S	T	HIGH	X	X	X	X	X	X	X	X	X	X	X	X	-
	Shorebirds				X	X	X	X	X	X	X	X	X	X	X	X	-
	Wading birds				X	X	X	X	X	X	X	X	X	X	X	X	-
	White-cheeked pintail			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	FEB-JUN
376	American oystercatcher				X	X	X	X	X	X	X	X	X	X	X	X	MAY-JUL
	Brown pelican	S/F	E/E		X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC
	Roseate tern	S/F	E/T							X	X	X	X				MAY-JUL
	White-tailed tropicbird						X	X	X	X							MAR-JUL
377	American oystercatcher				X	X	X	X	X	X	X	X	X	X	X	X	-
379	Mourning dove			LOW	X	X	X	X	X	X	X	X	X	X	X	X	MAR-AUG
	Scaly-naped pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-JUN
	White-crowned pigeon			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	MAR-SEP
	White-winged dove			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC
	Zenaida dove			HIGH	X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC

FISH:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
16	Pelagic fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
	Reef fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
17	Pelagic fish				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
370	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
372	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
374	Nursery fish				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
	Snook				X	X	X	X	X	X	X	X	X	X	X	X	APR-FEB	APR-FEB	JAN-DEC	JAN-DEC	JAN-DEC
	Tarpon				X	X	X	X	X	X	X	X	X	X	X	X	-	-	MAY-DEC	JAN-DEC	JAN-DEC
397	Tiger grouper			HIGH	X	X	X	X									JAN-APR	JAN-APR	JAN-APR	-	JAN-APR

PLANT:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D
197	Stahlia monosperma	S/F	T/T		X	X	X	X	X	X	X	X	X	X	X	X

INVERTEBRATE:

RAR#	Species	S/F	T/E	Conc.	J	F	M	A	M	J	J	A	S	O	N	D	Spawning	Eggs	Larvae	Juveniles	Adults
16	Caribbean spiny lobster				X	X	X	X	X	X	X	X	X	X	X	X	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC	JAN-DEC
	Octopus				X	X	X	X	X	X	X	X	X	X	X	X	DEC-MAR	DEC-APR	-	JAN-DEC	JAN-DEC
	Queen conch				X	X	X	X	X	X	X	X	X	X	X	X	APR-OCT	APR-OCT	APR-OCT	JAN-DEC	JAN-DEC
344	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
370	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
	Penaeid shrimp				X	X	X	X	X	X	X	X	X	X	X	X	-	-	-	JAN-DEC	-
372	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
373	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
374	Blue land crab				X	X	X	X	X	X	X	X	X	X	X	X	JUL-AUG	JUL-AUG	JUL-SEP	JAN-DEC	JAN-DEC
375	Blue land crab				X	X	X	X	X												