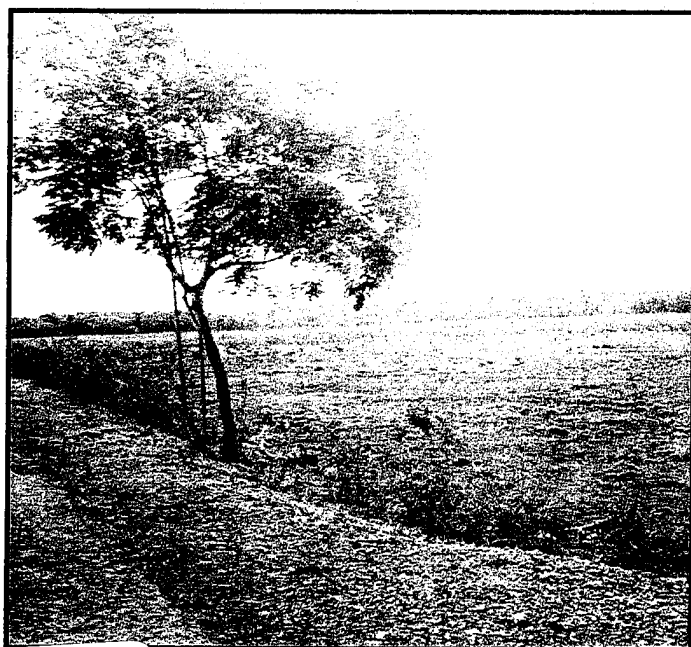


ENVIRONMENTAL ASSESSMENT FOR REDMAN ROAD IMPROVEMENTS

U.S. NAVAL SECURITY GROUP ACTIVITY

SABANA SECA, PUERTO RICO

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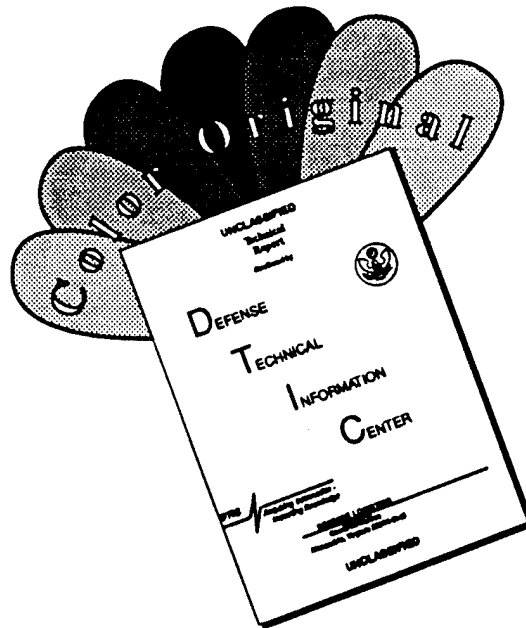
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**Environmental Assessment for
Redman Road Improvements
U.S. Naval Security
Group Activity
Sabana Seca, Puerto Rico**

March 1995

Prepared for:

**DEPARTMENT OF THE NAVY
U.S. Naval Security Group Activity
Sabana Seca, Puerto Rico**

Prepared by:

**DEPARTMENT OF THE NAVY
Atlantic Division
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Norfolk, Virginia 23511**

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Executive Summary

Type of Report

This document is an Environmental Assessment (EA) that discusses the primary environmental issues involved with upgrading Redman Road at the Naval Security Group Activity (NSGA), Sabana Seca and its use as an alternative route for personnel travelling to the Circularly Disposed Antenna Array (CDAA).

The EA has been prepared in accordance with the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) (40 CFR 1500-1508), and Naval Operations Instruction (OPNAVINST) 5090.1B. Its content is also consistent with the Puerto Rico Public Policy Environmental Act (Law No. 9).

Description of the Proposed Action

The proposed action involves upgrading the existing Redman Road so that dependable year-round access and an uncongested emergency vehicle route are available between the South Tract and the CDAA. Upgrading of the road would involve grading and paving approximately 1.5 miles of existing road in the South Tract thereby raising the road's elevation approximately 8 inches. The North Tract portion of Redman Road (approximately 3.0 miles) would be raised an average of 2 feet in height, graded and paved, and would require that an additional 4 to 20 feet on one side of the existing road be cleared and permanently maintained as the road shoulder. In addition, a 10-foot by 30-foot turnout area would be constructed every one-quarter mile to allow vehicles to pass on the single lane road.

Alternatives

Four alternative roadway alignments were evaluated in this EA. The alternatives consist of using the existing Redman Road on the South Tract and varying alignments on the North Tract. The alternatives differ in total length and the amount of excavating and filling of wetlands that would be required. The four identified alternatives (including the no-action

alternative) were evaluated based on a series of environmental and operational criteria. Alternative One uses the existing Redman Road in its entirety, requiring a minimum amount of excavating and filling of wetland areas, and was selected as the preferred route.

Environmental Impacts of the Proposed Action

Implementation of the proposed action would have no significant impact on geology, topography, socioeconomic conditions, or planned land use of the project area.

The long-term impacts associated with construction and operation of the preferred route are the loss of wetlands, mangrove trees, and potential habitat for threatened and/or endangered species. The roadway improvements would involve the excavation and filling of approximately 3 acres of wetlands including 2.9 acres of emergent wetland and 0.1 acre of black mangroves. Measures to mitigate these impacts include restoration of historic wetland areas and the creation of new wetland areas in upland areas. In addition, storm drainage piping and culverts would be installed to ensure that current drainage patterns are maintained.

Potential habitat for two species of concern, the Puerto Rican boa and white-crowned pigeon, occurs in the project area. The Puerto Rican boa may occur in the bamboo forest located adjacent to the preferred route between mileposts 0.00 and 0.61; however, no impacts to this area of potential habitat would be expected since the existing road is wide enough to accommodate emergency vehicles, and no additional land would be required. Potential habitat for the white-crowned pigeon was identified along the preferred route in the black mangrove forest located at milepost 3.21; a long-term reduction of 0.1 acre of black mangrove in this area would be expected. Informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act has been conducted; based on the results of this consultation, no further action is required.

The San Pedro Swamp Critical Wildlife area, a unique community, is traversed by the proposed route for approximately 1.36 miles in the North Tract and 1.1 miles in the South Tract. However, since the existing road in the South Tract does not require any expansion, impacts to this unique community would be limited to the North Tract. A long-term reduction of 1.42 acres of emergent wetland in this unique community would be expected. Measures to mitigate this loss would be the same as those used for the wetland impacts.

Short-term minor impacts to surface water quality resulting from sedimentation during construction may occur in the immediate vicinity of the construction site. However, because the project area is relatively flat, erosion potential during construction would be low. The use of erosion control measures would reduce any impacts to the surrounding wetlands.

Although the site is located within a 100-year floodplain, there would be no significant impact to the capability of the area's floodplains to moderate the impacts of floods because less than 3 acres of the North Tract would be converted to an impervious area (i.e., pavement).

The proposed action would not impact the existing land use in the NSGA Sabana Seca area. Although the project would result in a long-term change to the existing land use of approximately 3 acres of wetland area, the general use of the project area as a cattle pasture would not be adversely affected.

Short-term minor impacts to air quality would be expected during construction from the exhaust emissions from heavy equipment; however, these impacts would not be significant and would be temporary in duration.

It is not anticipated that the development of the proposed action, when combined with past, present, and proposed future development activities, would result in any significant cumulative adverse impacts to the affected area.

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List of Acronyms

AQCR	Air Quality Control Region
CAA	Clean Air Act
CDAAC	Circularly Disposed Antenna Array
CEQ	Council on Environmental Quality
CO	Carbon monoxide
CWA	Clean Water Act
CZMP	Coastal Zone Management Program
DNER	Puerto Rico Department of Natural and Environmental Resources
EA	Environmental Assessment
EPA	Environmental Protection Agency
EQB	Environmental Quality Board
MSL	Mean sea level
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO ₂	Nitrogen dioxide
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NSGA	Naval Security Group Activity
NWI	National Wetland Inventory

List of Acronyms (Cont.)

O ₃	Ozone
OPNAVINST	Naval Operations Instruction
Pb	Lead
PRASA	Puerto Rico Aqueduct and Sewer Authority
SHPO	Puerto Rico State Historic Preservation Office
SI	Site Inspection
SO ₂	Sulfur dioxide
UPR	University of Puerto Rico
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile organic compound

1.1 Location of the Proposed Action

The United States Naval Security Group Activity (NSGA), Sabana Seca is located on the northern coast of Puerto Rico within the municipality of Toa Baja (see Figure 1-1).

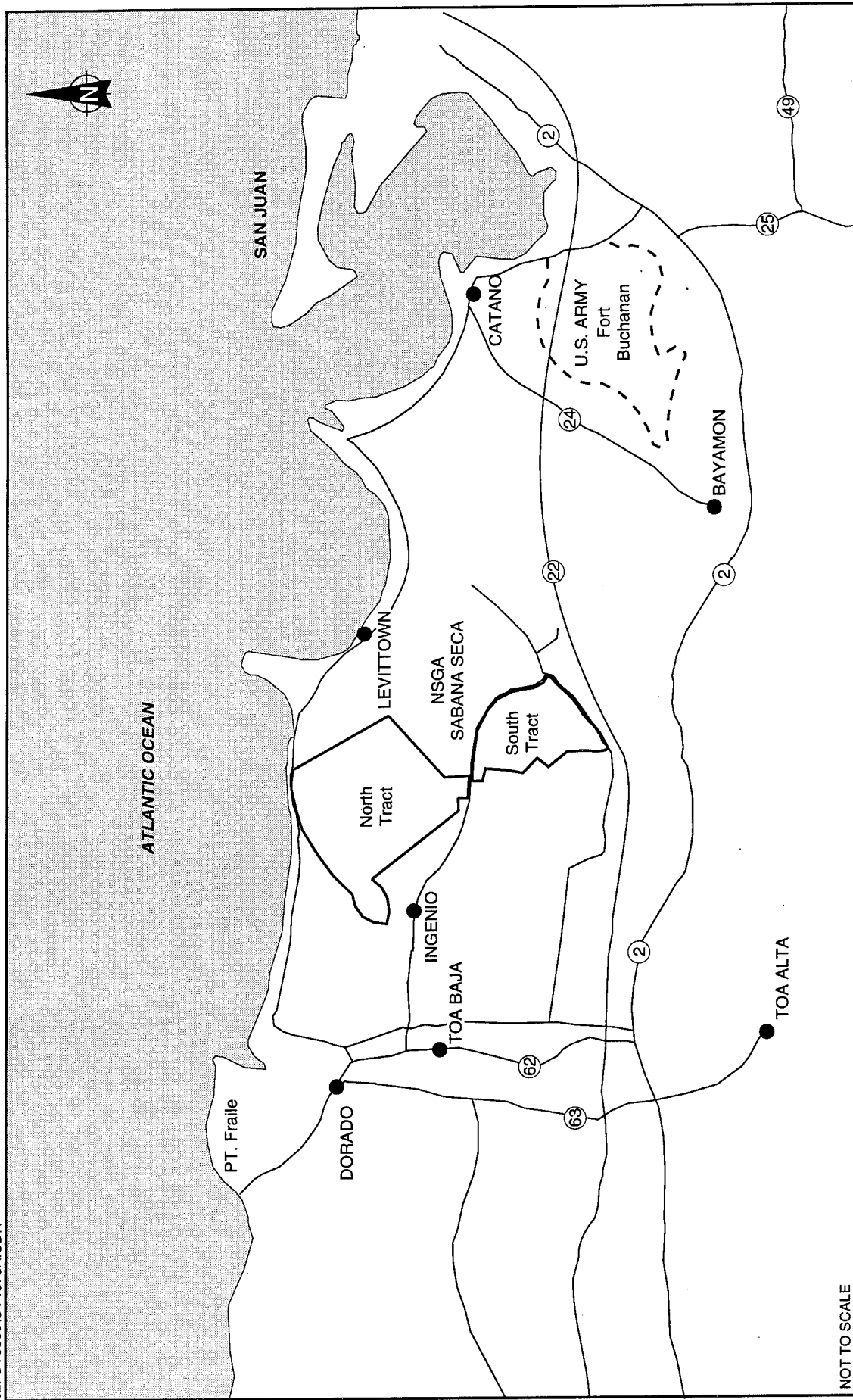
NSGA Sabana Seca is located approximately 10 miles west of San Juan and three miles east of the City of Toa Baja. Ingenio, Levittown, and Sabana Seca are other nearby villages.

NSGA Sabana Seca is approximately 2,250 acres in size and is divided into two major parcels: the North and South Tracts. The North Tract occupies approximately 1,330 acres and contains the Circularly Disposed Antenna Array (CDAA) and its associated operations facilities. The South Tract occupies 920 acres and includes the public works, administration, supply, health care services, recreational facilities, unaccompanied and accompanied personnel housing, and retail outlets.

1.2 Purpose and Need for Proposed Action

The mission of NSGA Sabana Seca is to operate a High-Frequency Direction Finding Facility and provide communications. NSGA's main receiver facility is located in the North Tract and includes Building 85, which houses the operational functions and performs the assigned receiving functions in conjunction with the facility's other component, the CDAA.

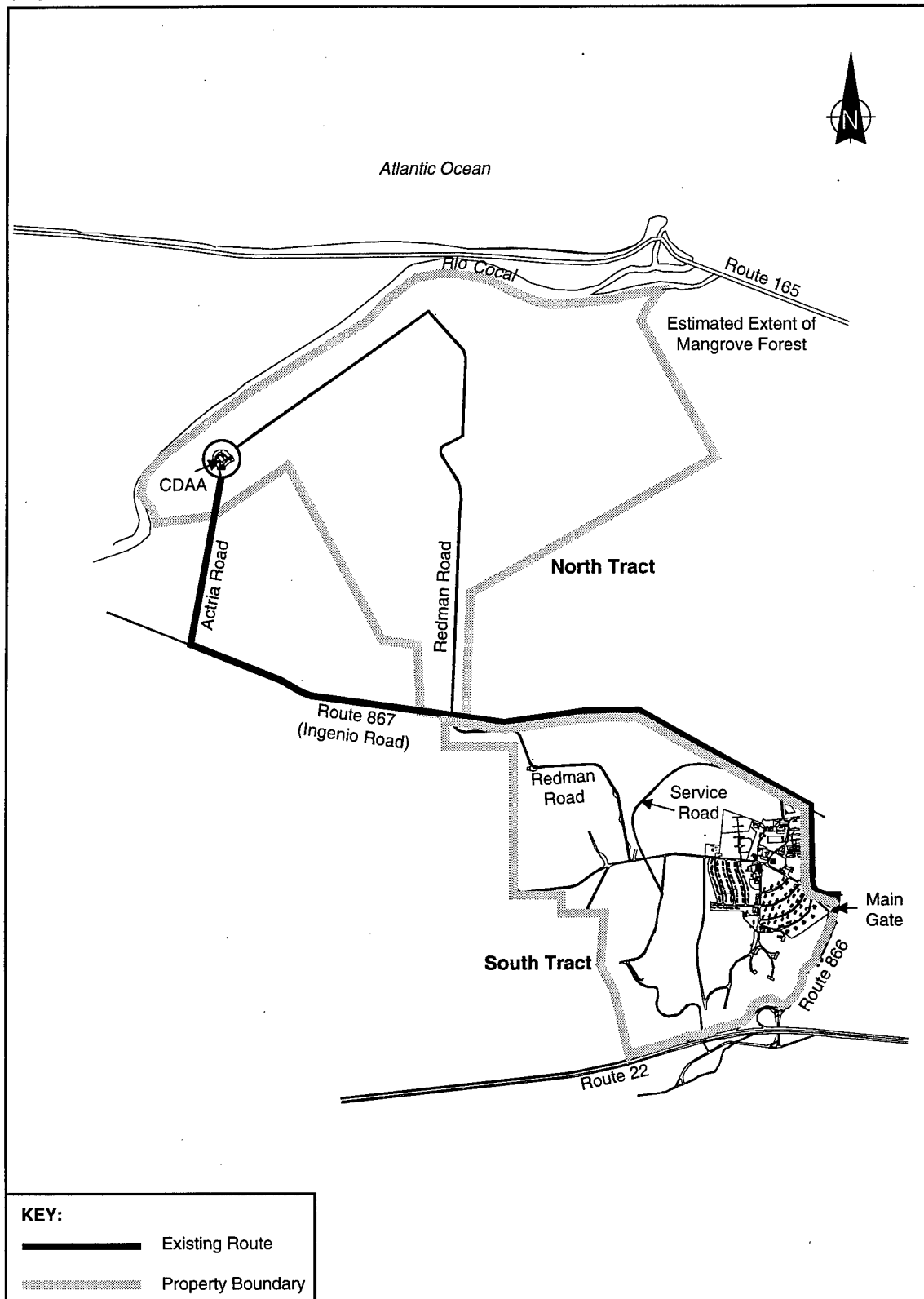
Personnel who maintain the receiver facility travel to the facility via the existing Commonwealth road system. From the main gate, personnel travel north on Route 866, west on Route 867 (Ingenio Road), and north on a public street (Actria Road) to the CDAA (see Figure 1-2). Because of frequent rainfalls and subsequent flooding, this roadway system is often impassable. Consequently, essential personnel cannot report for duty to perform the required maintenance and repair of mission-essential communications and electronic equipment. In addition, a secondary route for emergency vehicle access is needed.



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SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure 1-1 REGIONAL LOCATION OF U.S. NAVAL SECURITY GROUP ACTIVITY, SABANA SECA, PUERTO RICO



SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure 1-2

**EXISTING ROUTE TO CDAU
U.S. NAVAL SECURITY GROUP ACTIVITY
SABANA SECA, PUERTO RICO**

The purpose of the proposed action is to provide dependable, safe access to the CDAA. Redman Road is an existing, unimproved road extending through both tracts of NSGA. The portion of the road traversing the South Tract has been improved, though its condition has degraded over the years. The portion of the road traversing the North Tract has not been significantly improved since its original construction. In its current state, fire trucks cannot use Redman Road to access the North Tract.

1.3 Description of the Proposed Action

It is proposed to upgrade Redman Road so that dependable year-round access and an uncongested emergency vehicle route are available between the South Tract and the CDAA. The proposed action involves grading and paving approximately 1.5 miles of existing road in the South Tract thereby raising the road's elevation approximately 8 inches. No additional clearing of land would be required in the South Tract because the existing road is wide enough to accommodate emergency vehicles. The North Tract portion of Redman Road (approximately 3.0 miles) would be raised an average of 2 feet in height, graded and paved, and would require that an additional 4 to 20 feet along portions of the existing road be cleared and permanently maintained as the road shoulder. In addition, a 10-foot by 30-foot turnout area would be constructed every one-quarter mile to allow vehicles to pass on the single lane road. Appendix A provides the additional land requirements/impacts estimated for the proposed project.

In order to maintain the current drainage patterns throughout the project area, approximately 830 feet of storm drainage piping and 80 feet of box culvert would be installed where necessary in the North Tract.

1.4 Study Approach

This EA was prepared in accordance with the National Environmental Policy Act (NEPA) and the Navy's Environmental and Natural Resources Program Manual (OPNAVINST 5090.1B). Its content is also consistent with the Puerto Rico Public Policy Environmental Act (Law No. 9). It describes the existing environmental conditions in the vicinity of the proposed road improvements; identifies possible alternative routes; evaluates the immediate, short-term, and long-term impacts of construction, operation, and maintenance of the proposed project; and recommends mitigation measures to minimize potential adverse impacts. This EA is based on information obtained during field surveys conducted in June

1994, personal interviews, and the review of the documents listed in the reference section of this report. The following sections discuss alternatives, the affected environment, potential environmental consequences, permits and review processes, and mitigation measures associated with the proposed project.

This section presents the no-action alternative as well as three possible construction alternatives to the proposed action (see Figure 2-1). The following subsections describe the alternative routes considered, the operational and environmental criteria evaluated, and the rationale for selection of the preferred alternative. In addition, Appendix A provides an estimate of the additional land requirements/impacts for the three alternative routes.

2.1 Description of Alternatives

In addition to the no-action alternative, three alternative routes were considered for the proposed action of constructing/improving the existing 4.5-mile Redman Road. The three alternative routes differ from one another in their alignment and length only in the North Tract; the South Tract road only needs to be raised in height and does not require any additional width. Therefore, the discussion and evaluation of the alternatives only addresses the North Tract portion of each alternative route.

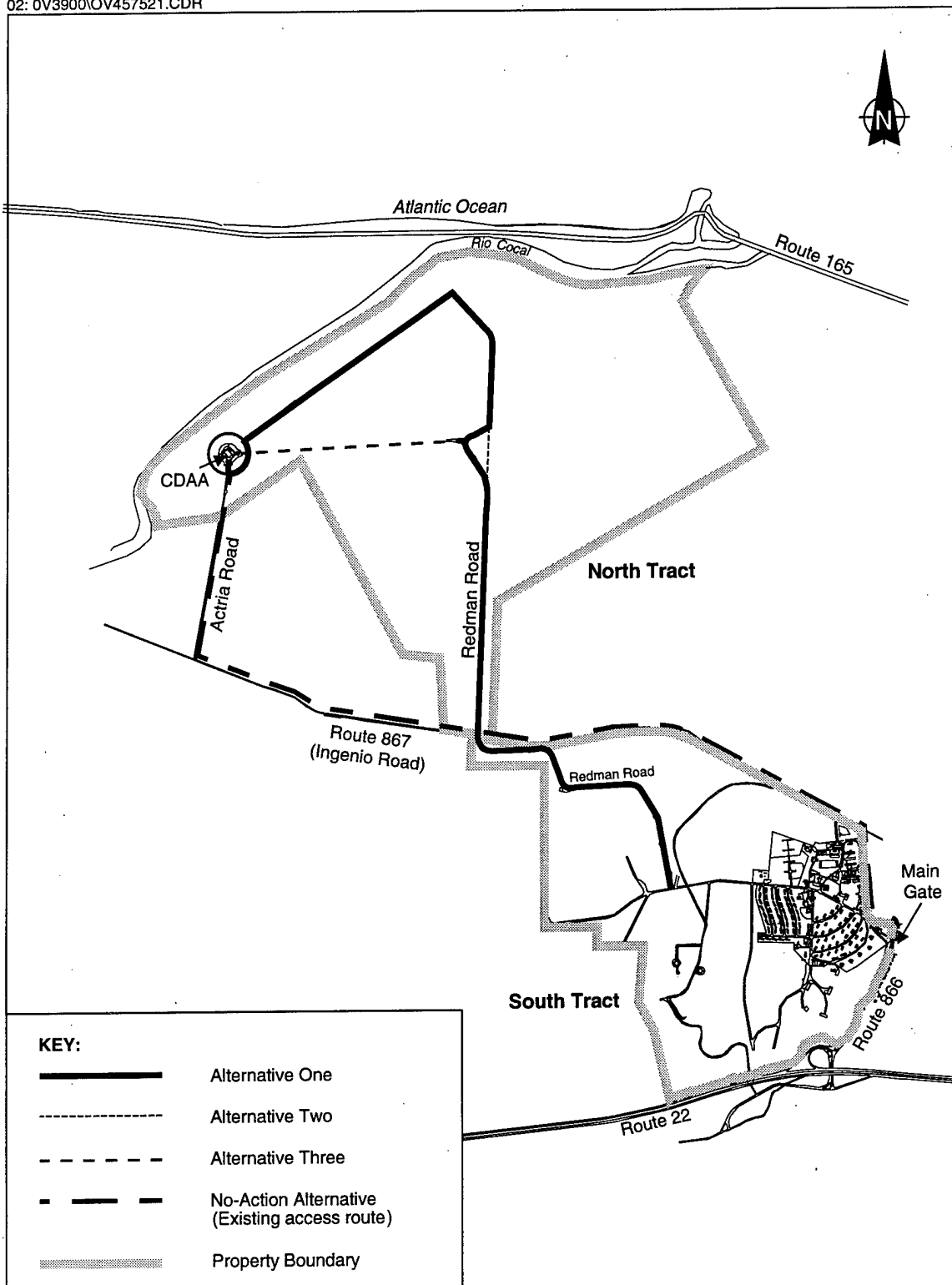
2.1.1 No-Action

Under the no-action alternative, the Navy would continue to use the existing route to the CDAA as described in Section 1.2. No secondary access would be available for emergency vehicles, and personnel would be unable to access the North Tract and CDAA during flooding events.

This alternative does not provide a safe and reliable emergency transportation route for Navy personnel. As such, the no-action alternative is not considered viable and will not be further evaluated.

2.1.2 Alternative One

This alternative would follow the existing Redman Road for its entirety, beginning in the South Tract and terminating at the CDAA in the North Tract. By using the existing



SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure 2-1 LOCATIONS OF THE ALTERNATIVE ROUTES FOR THE PROPOSED REDMAN ROAD PROJECT

roadway, Alternative One would limit new construction in the South Tract to raising the existing elevation of the road bed, grading, and paving; no widening of the road's footprint, including shoulders, would be required. In the North Tract, this alternative would require raising the elevation, grading, and paving of the roadway as well as widening it an additional 4 to 20 feet.

2.1.3 Alternative Two

This alternative would follow the existing Redman Road through the entire South Tract and most of the North Tract. It would deviate from Redman Road at a small, curved section in the North Tract at approximate milepost 2.70, continue for approximately 1,500 feet in a northerly direction along a straight path, and reconnect with Redman Road at approximate milepost 2.98.

2.1.4 Alternative Three

This alternative would follow the existing Redman Road through the entire South Tract and most of the North Tract. It would deviate from Redman Road in the North Tract at a curve in the road at approximate milepost 2.9, and then continue in a westerly direction to the CDAA. Implementation of this alternative would require the construction of a 4,300-foot segment of new road.

2.2 Comparison of Alternatives

Operational and environmental criteria were used to evaluate and compare the alternatives. This section describes the evaluation criteria and provides a brief comparison of the alternative routes. As previously mentioned, all three alternatives follow the same route in the South Tract; therefore, the three alternative routes were compared only on their different alignments in the North Tract. This comparison is summarized in Table 2-1.

2.2.1 Operational Criteria

For each alternative, the following technical considerations were compared:

- Distance required to reach the CDAA;
- Level of construction effort;
- Ability to assure a safe and passable route for personnel to the CDAA; and

Table 2-1

COMPARISON OF ALTERNATIVES^a

Alternatives	Operational Criteria - North Tract Only				Environmental Criteria - North Tract Only			
	Approximate Distance to CDAA (miles)	Construction Level of Effort ^b	Safe Passable Routes	Emergency Vehicle Access	Wetlands (acres disturbed) ^c	Potential Habitat of Threatened/Endangered Species ^d	Unique Communities (acres disturbed)	Cultural Resources
No Action	--	--	--	No	0	0	0	No impact
Alternative One	3.03	Low	Yes	Yes	3	1	1.42	No impact
Alternative Two	3.00	Medium	Yes	Yes	4	1	1.42	Low potential
Alternative Three	2.14	High	Yes	Yes	5	0	0	Low potential

^a Comparison of the alternative routes is limited to the North Tract only.

^b Level of effort is a relative scale for the amount of excavation and borrow that would be required to complete the respective alternative.

^c See Appendix A for the calculations used to estimate these impacts.

^d The number indicated represents the number of species' potential habitat that are traversed by the alternative in the North Tract only.

- Ability to ensure that emergency vehicles can reach the North Tract during flooding events.

Distance Required to Reach the CDAA

Alternative One has a total length of approximately 4.53 miles, with 3.03 miles located in the North Tract. Alternative Two is approximately 4.50 miles in total length, of which 3.00 miles are located in the North Tract. Alternative Three has a total length of 3.64 miles, with 2.14 miles located in the North Tract.

Level of Construction Effort

Construction of Alternative One involves clearing, filling, and grading along the existing Redman Road. However, in addition to the areas where Alternative Two and Three overlap with Alternative One, both Alternatives Two and Three would require more excavation and filling (i.e., road construction) in the areas of new right-of-way. Because Alternative Three has the greatest distance of new right-of-way (4,300 feet), it would require the most excavating and filling and is considered the alternative with the highest construction level of effort. Alternative Two has the second longest distance of new right-of-way (1,500 feet) and would require the second highest construction level of effort. Alternative One requires the lowest construction level of effort. With increased construction level of effort, it can be expected there will be a commensurate increase in the cost of the project.

Safe and Passable Route

Because Alternatives One, Two, and Three are entirely located on Navy property, they would all provide a safe transportation route to the CDAA.

Emergency Vehicle Access

The no-action alternative consists of the continued use of the Commonwealth road system (i.e., Routes 866, 867, and Actria Road). Since this roadway system is often impassable due to frequent rainfalls and subsequent flooding, the no-action alternative would not meet the objective of providing a safe and reliable emergency transportation route for Navy personnel. This alternative is not operationally viable and will be eliminated from further consideration.

Based on the construction/engineering design of the proposed project, Alternatives One, Two, and Three would provide access to the CDAA during flooding events.

2.2.2 Environmental Criteria

The following environmental criteria were used to compare Alternatives One, Two, and Three:

- Wetlands;
- Threatened or endangered species;
- Coastal zone management areas;
- Proximity of unique communities; and
- Archaeological sites.

Wetlands

Because the engineering design is not available, it was estimated that an additional 10 to 20 feet of new right-of-way would be required along those areas of the existing Redman Road in the North Tract that are lower than the design elevation of 6.5 feet above mean sea level (MSL). In areas of Redman Road that were at an elevation of 6.5 feet above MSL, only 4 feet of right-of-way were estimated to be required to facilitate regrading of roadbed side-slopes. In addition, for the alternatives that require an entirely new road right-of-way, a road base of 44 feet was used to calculate wetland impacts due to the extremely low elevation traversed through the center of the tract. No additional clearing or filling of land is required in the South Tract; therefore, no wetland impacts are expected for that portion of the route (see Appendix A).

Alternative One would require clearing and filling a total of approximately 3 acres of wetland (emergent and forested) for widening the existing road and construction of 12 proposed turn-out areas. Alternative Two would require clearing and filling a total of approximately 4 acres of wetland (emergent and forested) for widening the existing road and constructing the new road section and 12 proposed turn-out areas. Alternative Three would require clearing and filling a total of approximately 5 acres of wetland (emergent and scrub-shrub) for widening the existing road and constructing the new road section and nine proposed turn-out areas.

The wetland areas traversed by the three alternatives are located in an active cattle pasture and have been heavily degraded by grazing activities. In addition, the local residents burn the wetland vegetation so that they can locate land crab burrows more easily.

Threatened and Endangered Species

Alternatives One and Two both traverse a black mangrove forest located at milepost 3.21 in the North Tract. This forest community provides potential habitat for the white-crowned pigeon. Alternative Three does not traverse potential habitat for any species of concern in the North Tract.

All three alternatives are located adjacent to a bamboo forest, located between mileposts 0.00 and 0.61 in the South Tract, that provides potential habitat for the Puerto Rican boa. However, the existing road in this area is wide enough to accommodate emergency vehicles and will not require any additional land. Therefore, this area of potential habitat will not be impacted.

Coastal Zone Management Areas

The Coastal Zone extends 1,000 meters (3,283 feet) inland from the ocean shoreline and extends farther inland, as necessary, to include important natural coastal systems located landward of the zone's 1,000-meter boundary. The Coastal Zone includes islands, intertidal areas, salt marshes/saltwater wetlands, beaches, freshwater wetlands, and the San Pedro Swamp.

Federal property is excluded from the defined coastal zone.

Unique Communities

Both a *Pterocarpus* forest and black mangrove forest are located in the North Tract; the *Pterocarpus* forest is considered a unique community by the United States Fish and Wildlife Service (Silander 1994). Alternatives One and Two are located approximately 10 feet west of a narrow (50-foot-wide) portion of this *Pterocarpus* forest. However, because road construction would be restricted to the west side of the existing Redman Road, this unique community would be avoided. Alternative Three is not located near this *Pterocarpus* forest.

The San Pedro Swamp Critical Wildlife Area is located in both the North and South Tracts (see Figure 3-1). This swamp is a large emergent/forested wetland considered to be of primary importance to wildlife due to the degradation or disappearance of nearby similar areas

(Cardona and Rivera 1988). All three alternative routes traverse this area in the South Tract for approximately 1.1 miles, and Alternatives One and Two traverse this area in the North Tract for approximately 1.36 miles. Since the existing road in the South Tract does not require any expansion, impacts to the San Pedro Swamp will be limited to the North Tract. Consequently, construction of Alternative One or Two will disturb approximately 1.42 acres of emergent wetland in this unique community.

Cultural Resources

Alternative One parallels the existing Redman Road for its entire length and is considered a disturbed area. After consultation with the Puerto Rico State Historic Preservation Office (Pabón 1994), it has been determined that Alternative One would not have any effect on cultural resources. Alternatives Two and Three are located in areas of prior converted wetlands and are therefore considered to have a low potential for the presence of cultural resources (Larson 1994).

2.3 Selection of the Preferred Alternative

Initial analysis of the three alternative routes revealed that the routes are identical in the South Tract but are somewhat different with regard to several operational and environmental criteria in the North Tract.

Alternative One is the longest route but, because it follows the existing Redman Road for its entirety, it disturbs the least amount of wetland areas; has no impact on cultural resources; and has the lowest construction level of effort and project cost.

Alternatives Two and Three both require more excavation and filling than that required for Alternative One. Therefore, these two alternatives will have a higher level of effort for construction and will involve higher construction costs. In addition, these two alternatives disturb a greater amount of wetlands than Alternative One. Both have a low potential for impacts to cultural resources.

Alternative One was selected as the preferred route on the basis of wetland impacts and the construction level of effort and cost.

3.1 Topography, Geology, and Soils

3.1.1 Topography

Three major physiographic provinces occur in the area of San Juan, Puerto Rico, including the nearly level to sloping coastal plain, the knob-shaped limestone hills and karst topography formed by ancient coral reefs, and the extensive igneous uplands. The proposed project area is located primarily on the coastal plain just north of the limestone hills. The coastal plain in this area is nearly level and is characterized by extensive lagoons and mangrove swamps. Elevations along the proposed route range from approximately 3 to 10 feet above MSL in the North Tract, and rise to approximately 25 feet above MSL in the southern portion of the proposed route (USGS 1969; USDA 1978).

3.1.2 Geology

Geologic units in the proposed project area include quaternary swamp and marsh, alluvial deposits, and tertiary blanket deposits. Swamp and marsh deposits consist largely of organic swamp muck, which may be locally sandy and silty, and peat. Alluvial deposits consist of sand, silt, clay, and gravel on floodplains. Blanket deposits include quartz sand, clayey sand, sandy clay, and clay occurring in the northern coastal plain (Briggs 1964).

3.1.3 Soils

Soils along the proposed route consist of clayey sediments and organic matter on coastal plains, floodplains, and in low depressional and lagoon-like areas. Soil types traversed by the proposed route include Bajura clay, hydraquents (saline), Martin Pena muck, Almirante clay, Sabana Seca clay, and Torres loamy sand (USDA 1978).

Bajura clay is a nearly level, poorly drained soil typically found on river floodplains. Soil permeability is slow and available water capacity is high. This soil type is fertile and, if

properly drained and managed, is suitable for crops. However, it is difficult to cultivate because of its wetness and the stickiness and plasticity of the clay. Bajura clay is of limited use for most urban uses because of poor drainage, flood hazard, and high shrink-swell potential (USDA 1978). The proposed route traverses approximately 2.38 miles of this soil type.

Hydraquents (saline) are nearly level, very poorly drained soils that usually occur in lagoon-like areas. This soil type is typically covered with brackish water most of the year and is frequently flooded. Permeability is very slow and available water capacity is very high. These soils support mangroves and other hydrophytic vegetation. Hydraquents have severe limitations for most urban uses because they are very poorly drained and are subject to frequent overflow (USDA 1978). The proposed route traverses approximately 0.06 mile of this soil type.

Martin Pena muck is a nearly level, very poorly drained soil found in low depression-al areas of the coastal plain and river floodplains. The surface layer, approximately 8 inches thick, consists of black muck and is underlain by clay. Permeability is very slow, available water capacity is very high, and runoff is slow. This soil is difficult to work due to wetness. Typical natural vegetation includes cattails, sedges, papyrus, and other hydrophytic plants. Martin Pena muck is of limited use for most urban uses because of wetness, slow permeability, and flood hazard (USDA 1978). The proposed route traverses approximately 1.56 miles of this soil type.

Almirante clay is a gently sloping (2% to 5% slopes), well-drained soil found on the coastal plain. Permeability and available water capacity are moderate and runoff is medium. It has medium natural fertility, but is difficult to work due to the stickiness and plasticity of the clay. Controlling erosion is a major management concern. Almirante clay is moderately suited for most urban uses due to its clayey nature (USDA 1978). The proposed route traverses approximately 0.20 mile of this soil type.

Sabana Seca clay is a gently sloping (2% to 8%), poorly drained soil found on coastal plains. Permeability and runoff are very slow and available water capacity is high. The natural fertility of this soil is low, and it is difficult to work because of its wetness and the stickiness and plasticity of the clay. This soil generally maintains brush and brushy pastures. Sabana Seca clay is of limited urban use because it is wet and clayey (USDA 1978). The proposed route traverses approximately 0.13 mile of this soil type.

Torres loamy sand is a gently sloping (2% to 5%), excessively drained soil found on coastal plains. Permeability is rapid in the surface layer but moderate in the clayey subsoil. Available water capacity is low, and runoff is slow. It has a low natural fertility but is easily

worked. This soil usually maintains brush and brushy pasture. Torres loamy sand is suitable for most urban uses, but it has limitations for some uses due to its clayey subsoil (USDA 1978). The proposed route traverses approximately 0.22 mile of this soil type.

3.2 Hydrology and Water Quality

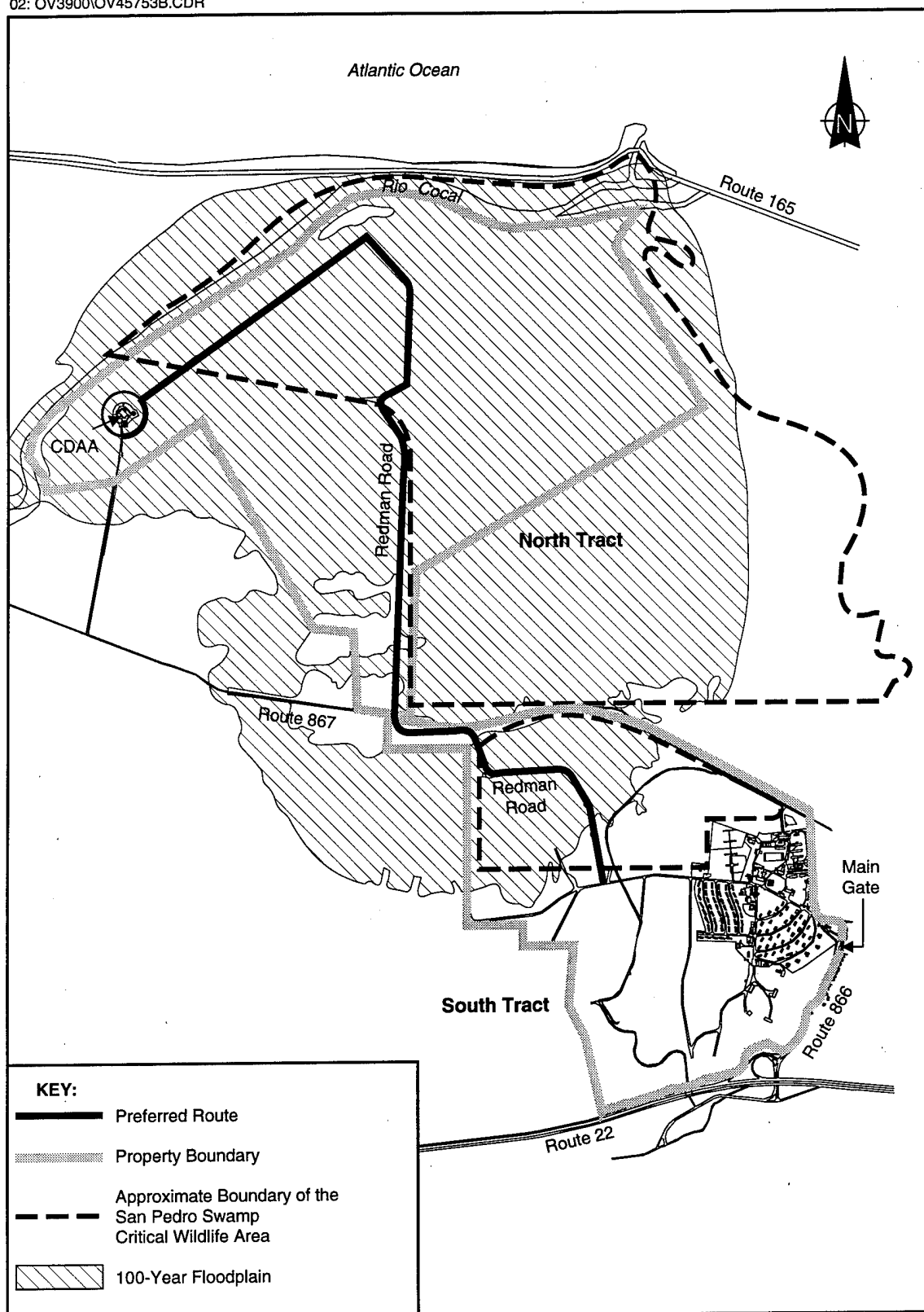
This section describes the local hydrologic conditions and important hydrologic features at NSGA Sabana Seca. Surface water features and groundwater features are both discussed.

3.2.1 Surface Water

The topographic conditions of the North Tract differ markedly from those of the South Tract. The majority of the North tract lies within the 100-year floodplain of the Cocal River (see Figure 3-1), and large areas of the North Tract are flooded regularly during the rainy season (April to September). The North Tract is characterized by very little slope and relatively impermeable soils (e.g., Martin Pena muck and Bajura clay) (USDA 1978). Large areas of the North Tract are swampy, and extensive ponding occurs during rainy periods. In general, surface drainage in this tract is quite poor, with most storm water remaining on the surface and moving very slowly. Most surface water flows to the north and west through a network of man-made drainage canals and an unnamed tributary that channel the water toward the Cocal River. The Cocal River drains into the Bahia de Toa a short distance north of NSGA Sabana Seca. The Environmental Quality Board (EQB), Water Quality Division has classified the Cocal River's water quality as SD (Perez 1994). This classification indicates that the river may be used as a raw source of public water supply, for the propagation and preservation of desirable species, and for primary and secondary contact recreation. In addition, the EQB stated that any canals and tributaries that discharge into this river must not exceed a turbidity of 50 NTU (Perez 1994).

Approximately 221 acres in the northwest section of the South Tract are also located in the 100-year floodplain. This area of the South Tract is underlain by relatively impermeable Martin Pena muck, and is subject to regular inundation (USDA 1978). Surface water from this portion of the South Tract also flows to the north and west, eventually reaching the Cocal River through a series of man-made ditches and canals.

In contrast, the central portion of the South Tract is flat with medium to highly permeable soils in the Matanza clay and Sabana Seca clay groups (USDA 1978). This portion



SOURCE: Ecology and Environment, Inc. 1994; adapted from Department of the Navy 1994; Cardona and River 1988; U. S. Department of Commerce 1978.

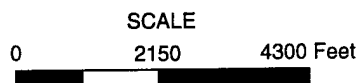


Figure 3-1

CRITICAL COASTAL FEATURES AT THE U.S. NAVAL SECURITY GROUP ACTIVITY, SABANA SECA, PUERTO RICO

of the South Tract is not within the 100-year floodplain, and drains to the northwest in open ditches and drainage swales.

Runoff can be very rapid in the steep mogotes region located in the extreme southern portion of the South Tract. Dense vegetation and permeable soil at the base of the hills attenuate the runoff, and any remaining flow is channeled into the man-made surface drainage system.

3.2.2 Groundwater

The North Tract does not currently have access to an aquifer that yields water suitable for human consumption; saltwater intrusion results in brackish water. Two wind-driven pumps in the area provide groundwater from a lens 15 to 25 feet below ground (U.S. Department of the Navy, Master Plan). However, this water is used only for watering of livestock. Potable water for human consumption is supplied by the Puerto Rico Aqueduct and Sewer Authority (PRASA) via a 4-inch water main (U.S. Department of the Navy 1988).

The South Tract is underlain by the Aguada Limestone, a productive water-bearing aquifer. This formation is an unconfined aquifer with storage coefficients ranging from 0.01 to 0.05 and an estimated flow in the Sabana Seca region of 212,250 ft³/day/mi (Torres-Gonzalez and Diaz 1984). The Navy operates two wells in this formation to supply the needs of the South Tract facilities. These wells draw water from depths of approximately 130 and 140 feet. The water is a calcium bicarbonate type; it is considered high quality, with acceptable levels of hardness and alkalinity. Water consumption at the South Tract facility averages approximately 64 million gallons per year (U.S. Department of the Navy, Master Plan).

3.3 Air Quality

The Clean Air Act (CAA) of 1970, 42 USC 7401 *et seq.*, amended 1977 and 1990, is the primary federal statute governing air pollution. The CAA designates the following six pollutants as criteria pollutants: respirable particulate matter smaller than 10 micrometers in diameter (PM₁₀); carbon monoxide (CO); sulfur dioxide (SO₂), nitrogen dioxide (NO₂), lead (Pb), and ozone (O₃). National Ambient Air Quality Standards (NAAQS) have been promulgated for these criteria pollutants to protect human health and welfare.

Federal law requires states and commonwealths to operate and maintain an air monitoring network to measure criteria pollutants. The Puerto Rico Environmental Quality Board is responsible for this activity. Measurement of concentrations of criteria pollutants in

ambient air aids in determining whether the NAAQS are being attained in a particular area. If an area has no more than one exceedance per year of a particular criteria pollutant, it is designated as attainment for that pollutant. Areas that have more than one exceedance per year of a particular criteria pollutant are designated as non-attainment for that pollutant. There are six classifications of ozone non-attainment status: transitional, marginal, moderate, serious, severe, and extreme. CO and PM₁₀ have non-attainment classifications of moderate and serious.

Puerto Rico is encompassed by a single air quality control region (AQCR). All areas of the Puerto Rico AQCR are designated as attainment or unclassifiable/attainment for all criteria pollutants, with the exception of Guaynabo Municipality. The proposed project is located in an attainment area.

3.4 Noise

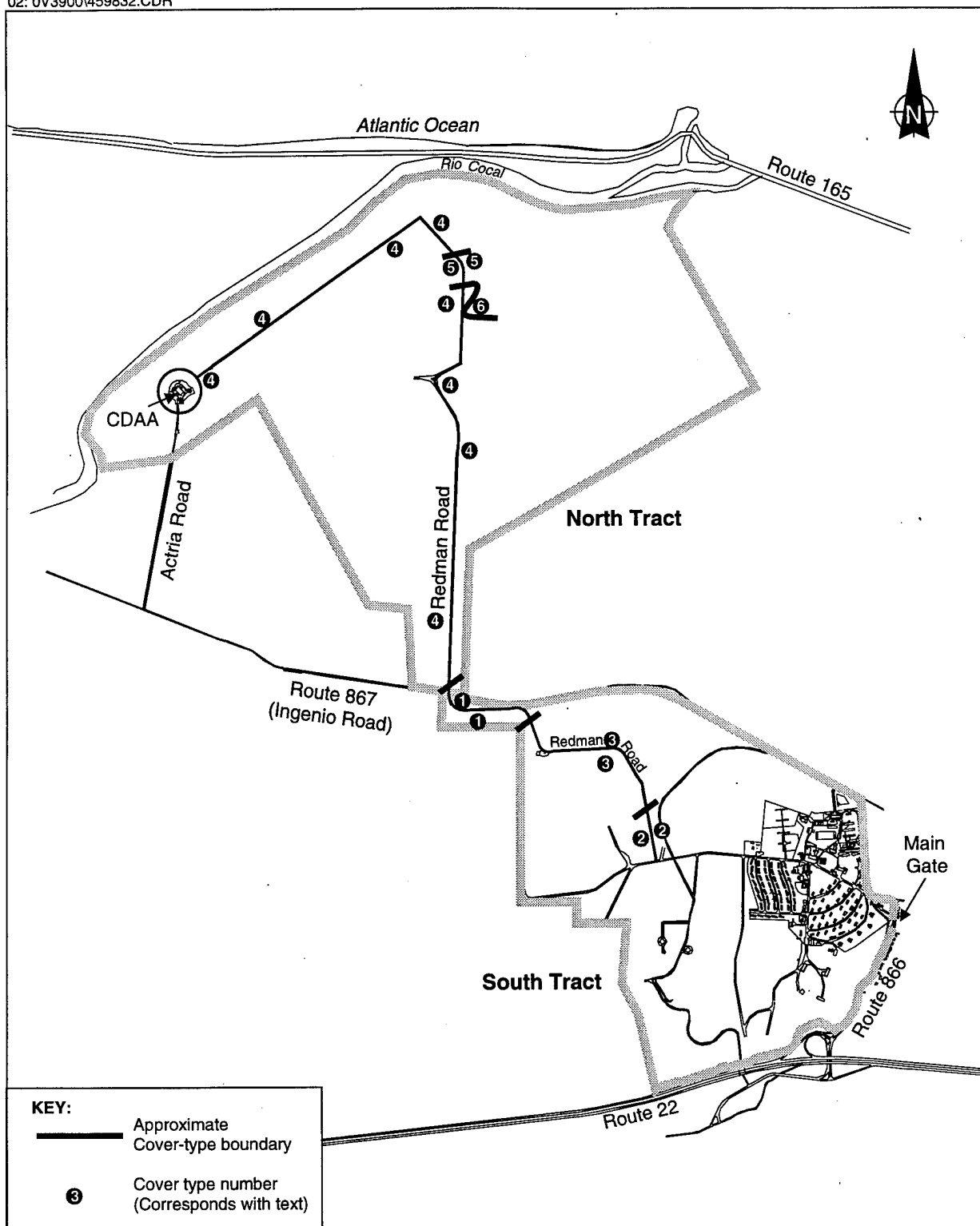
The project area is located in an undeveloped/open area that is primarily used for cattle grazing. Because there are no obtrusive noise sources in the immediate vicinity of the project area, existing background noise levels are relatively low.

3.5 Terrestrial and Aquatic Ecosystems

This section describes the terrestrial and aquatic ecosystems and the threatened and endangered species in the general vicinity of the proposed project. Species lists of the plants, birds, reptiles, and amphibians, and various invertebrates likely to occur at NSGA Sabana Seca are included as Appendix B. Figure 3-2 shows the different vegetation types traversed by the proposed project; Figure 3-3 shows the wetlands, as designated by the National Wetland Inventory, traversed by the proposed project; and Figure 3-4 shows the proposed route with mileposts.

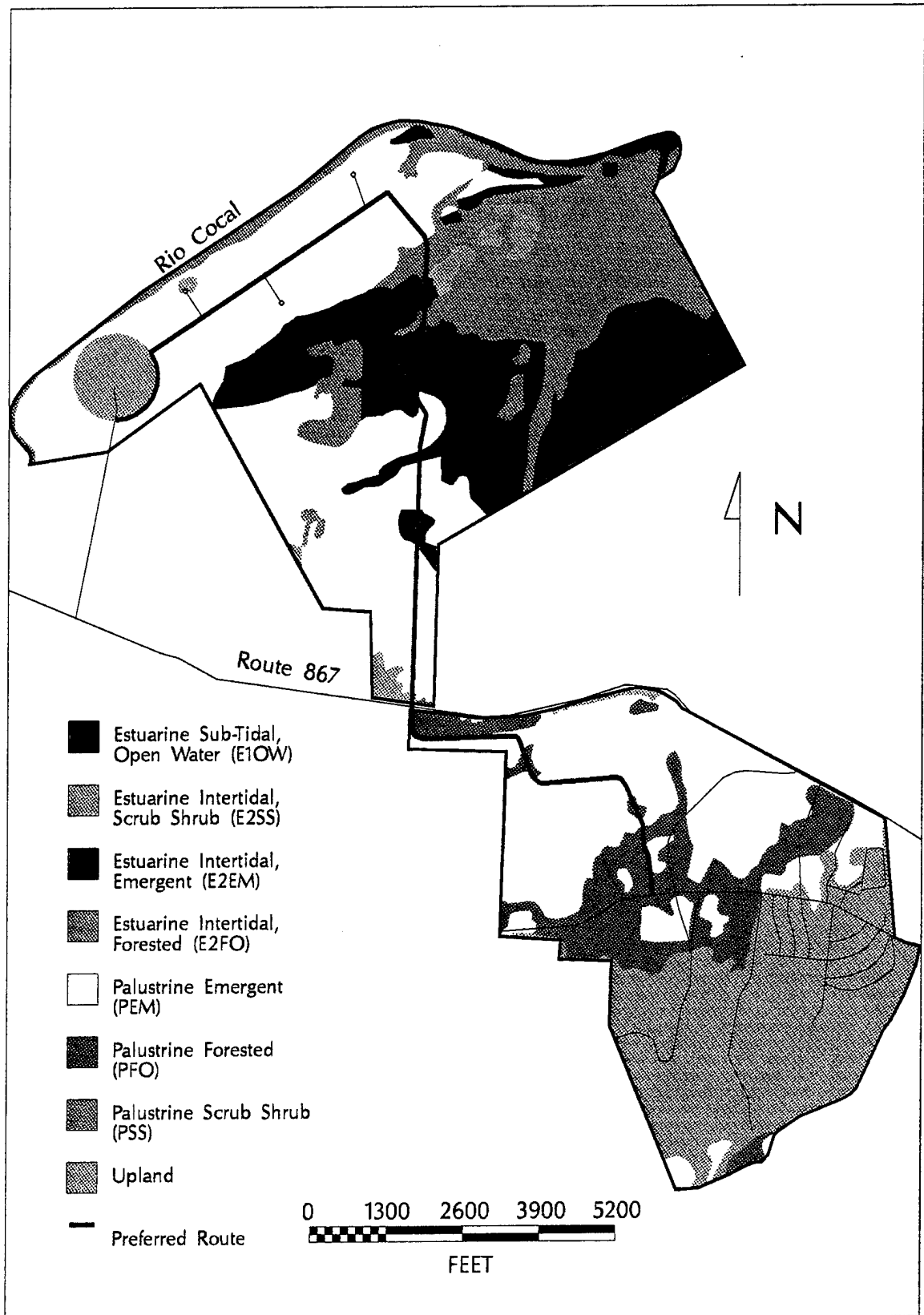
3.5.1 Terrestrial Ecosystems

During the June 1994 site walkover, six different terrestrial cover types were identified within the proposed project area: two upland cover types and four wetland cover types. This section describes each of these cover types in terms of their plant composition, vegetative structure, and land use. The value of each area for wildlife is also discussed.



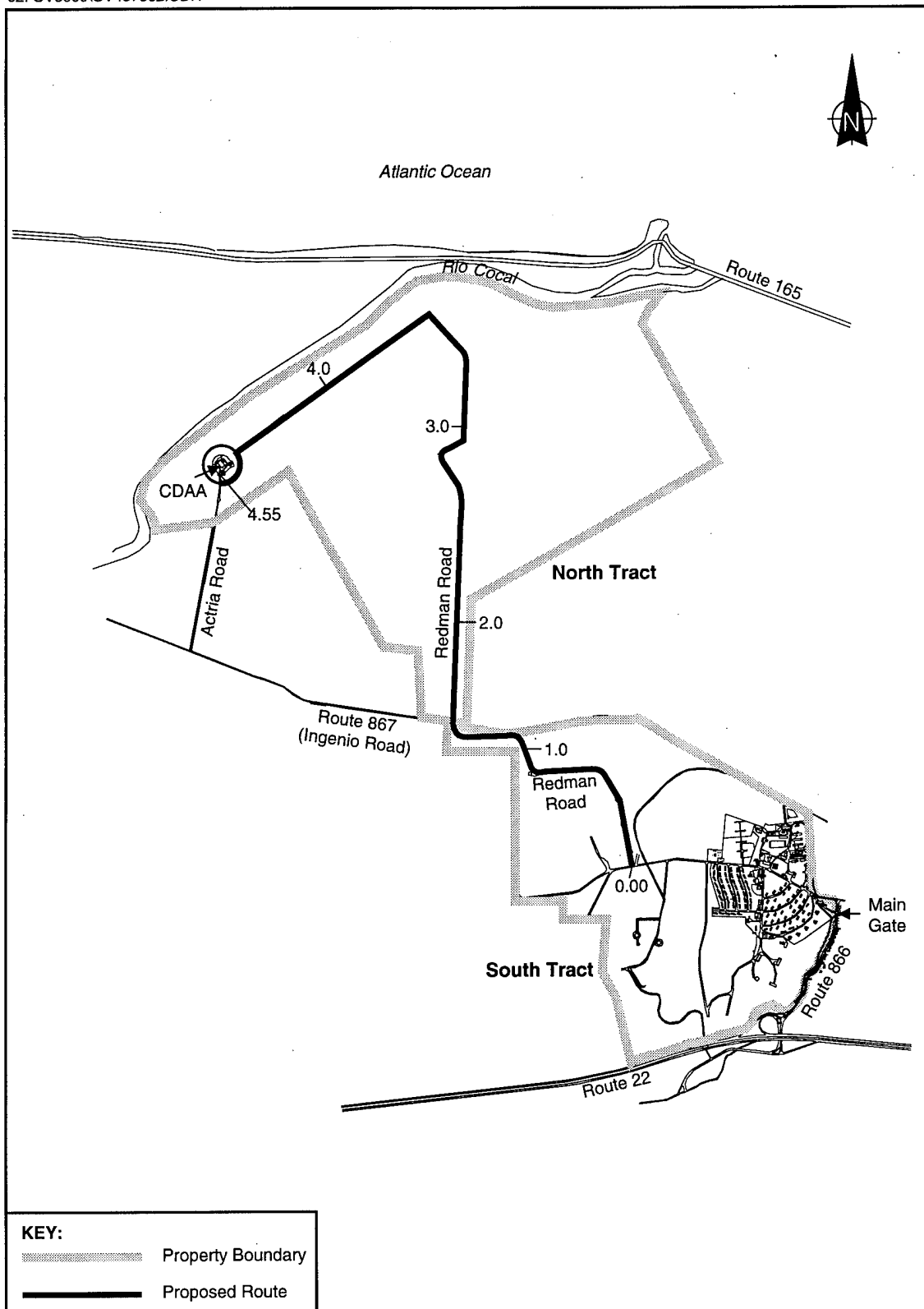
SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure 3-2 VEGETATION TYPES TRAVERSED BY THE PROPOSED REDMAN ROAD PROJECT



Source: U.S. Fish and Wildlife Service, National Wetland Inventory Map 1983.

**Figure 3-3 WETLANDS OF THE U.S. NAVAL SECURITY GROUP ACTIVITY
SABANA SECA, PUERTO RICO**



SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure 3-4

**APPROXIMATE MILEPOSTS OF PREFERRED ROUTE,
U.S. NAVAL SECURITY GROUP ACTIVITY
SABANA SECA, PUERTO RICO**

Cover Type 1—Mixed Upland Deciduous Forest

This cover type is generally found in association with disturbed areas located throughout the proposed project area in the South Tract. These areas include approximately 30-foot-wide strips along both sides of Redman Road between mileposts 1.17 and 1.61, a small upland site between mileposts 1.03 and 1.04, and all upland areas associated with the bunkers and abandoned housing at milepost 0.61.

In general, the moderately dense overstory is dominated by African tulip trees (*Spathodea camporlata*), flamboyant trees (*Delonix regia*), and various species of Cassia trees (*Cassia* spp). The moderately dense understory is dominated by saplings from the overstory and India-Almar (*Terminalia catappa* L.). The herbaceous layer is sparse and consists primarily of various species of grass.

Due to the small size of this cover type, it is considered to be of minimal wildlife value. This cover type is used primarily for roosting and nesting by various songbirds and as a travel corridor by various reptiles and amphibians, including the Puerto Rican boa (*Epicrates inornatus*). During the June 1994 site survey, saffron finches (*Scicalis flaveola*), spice finches (*Ionchura punctolata*), Puerto Rican woodpeckers (*Melanerpes portoricensis*), and gray kingbirds (*Tyrannus dominicensis*) were observed using this cover type.

Cover Type 2—Bamboo Forest

This cover type is located in the South Tract on both sides of Redman Road between mileposts 0.00 and 0.61. The dense overstory and understory are dominated by bamboo (*Bambusa vulgaris*); however, royal palm (*Roystonea borinquena*) and India-Almar are found in openings of the bamboo forest. There is no herbaceous layer except between the forest and roadside edge where a variety of grasses and vines occur.

This cover type is considered to be of moderate wildlife value. It provides roosting and nesting areas for various species of songbirds, and provides a travel corridor for the Puerto Rican boa, which requires a closed canopy for migration. Additionally, the area attracts small insectivorous reptiles, including anoles (*Anoles* spp.) and geckos that feed on the insects occurring throughout the area.

During the site survey, several species of anoles were observed feeding along the branches of the bamboo trees, and several finch nests were found along the road edges of the forest. In addition, unconfirmed sightings of rhesus monkeys have been reported in this area (Montalvo 1994), and a study of free-ranging squirrel monkeys has identified 43 squirrel monkeys in this area (Knezevich 1993).

Cover Type 3—Sawgrass-Giant Sedge Emergent Marsh

The cover type is located in the South Tract along both sides of Redman Road between mileposts 0.61 and 1.17. According to the National Wetland Inventory (NWI) map, this is a broad-leaved emergent marsh that is permanently flooded throughout the year under normal climatic conditions (USFWS 1983). The dominant vegetation of this wetland cover type includes sawgrass (*Mariscus jamaicensis*), giant sedge (*Cyperus giganteus*), and bull-tongue arrowhead (*Sagittaria lancifolia*).

The soil unit of this wetland area is mapped as Martin Pena muck in the *Soil Survey of San Juan Area of Puerto Rico* (USDA 1978). Soil analysis in this area revealed hydric soil characteristics, including some mottling and a low soil chroma matrix. The drainage classification for this soil is poorly drained (USDA 1978). During the June 1994 survey, approximately 1 inch of surface water was observed throughout this wetland area.

This wetland is considered to be of moderate to high wildlife value. Freshwater wetlands of this type provide habitat to a variety of wading birds such as the little blue heron (*Florida caerulea caerulea*), snowy egret (*Egretta thula thula*), and least bittern (*Ixobrychus exilis exilis*). Isolated ponds within this wetland provide habitat during part of the year for a variety of migrating waterfowl, including ducks, geese, coots, and swans. The wetland also provides suitable habitat for amphibians and reptiles, including turtles and snakes.

Cover Type 4—Cattail-Giant Sedge Emergent Marsh

This cover type is located along both sides of Redman Road between mileposts 1.61 and 3.21 and between mileposts 3.25 and 4.55. According to the NWI map, this area is a broad-leaved emergent marsh that is seasonally flooded under normal climatic conditions (USFWS 1983). The dominant vegetation includes cattails (*Typha spp.*), giant sedge, alternate-leaf flatsedge (*Cyperus alternifolius*) and various species of grass.

The soil units for this wetland area are primarily mapped as poorly drained clays (USDA 1978), including the Sabana Seca, Bajura, and Almirante clay units. However, between mileposts 2.47 and 3.25, the underlying soil unit is mapped as Martin Pena muck. Soil analysis conducted during the survey revealed a clay soil with hydric characteristics, including mottling and a low soil chroma matrix. During the June 1994 survey all areas within this wetland were dry except those areas directly associated with an unnamed tributary or man-made canals. This lack of moisture is most likely due to the drought conditions that are currently affecting the entire island.

This wetland is considered to be of minor to moderate wildlife value. Wildlife utilization of this wetland is similar to Cover Type 3. Wading birds, including the little blue heron, snowy egret, cattle egret (*Bubulcus ibis ibis*) and least bittern use the creek for roosting and foraging. Isolated areas within these wetlands that contain open water are used by a variety of migratory waterfowl. The wetland also provides suitable habitat for amphibians and reptiles. During the survey, a snowy egret, cattle egret, and little blue heron were observed utilizing this area, and coqui frogs (*Eleutherodactylus coqui*) were heard throughout the wetland. In addition, during the field survey cattle were seen grazing throughout this wetland. Most of the area was trampled, and vegetation was grazed to the point of removal in several areas. As a result, the cattle have degraded the value and use of the wetland for many species.

Cover Type 5—Black Mangrove Forested Wetland

This cover type is located along both sides of Redman Road between mileposts 3.21 and 3.25, and is located within the San Pedro Swamp, a critical coastal wildlife area of Puerto Rico (Commonwealth of Puerto Rico 1988). This entire wetland complex is classified as an estuarine broad-leaved evergreen forested wetland that is irregularly exposed (i.e., land surface is exposed by tides less than once a day) (Cowardin 1979; USFWS 1983). The dense overstory has a completely closed canopy and is dominated by black mangrove (*Avicennia germinans*). The understory in this area is dominated by black mangrove saplings, and leather fern (*Acrostichum sp.*) is the dominant species in the sparse herbaceous layer.

The soil unit for this wetland area is mapped as Martin Pena muck (USDA 1978). Soil analysis within this wetland revealed hydric soil characteristics, including a low soil chroma matrix. The drainage classification for this soil is poorly drained. During the June 1994 survey standing water was observed only within an unnamed tributary of the Cocal River. The soil, however, was saturated to the surface.

This wetland is considered to have a moderate to high wildlife value. Its primary value is its production of detritus and dissolved organics, which are a primary food source for many estuarine species (U.S. Department of the Navy 1988). Invertebrates known to directly consume mangrove leaves and twigs (e.g., mangrove crabs) are in turn preyed upon by various birds and other organisms of higher trophic levels (U.S. Department of the Navy 1988). During the field survey, a variety of unidentified land crabs and large termite nests were observed throughout the mangrove forest.

Cover Type 6—*Pterocarpus* Forest

This cover type is located along the east side of Redman Road at approximate milepost 2.99. This forest is located approximately 10 feet from the existing roadbed and is approximately 50 feet wide. This 25-acre forest is included in the black mangrove forest, and has a densely closed canopy dominated by Palo de pollo (*Pterocarpus officinalis*). The understory is sparse and consists of overstory saplings, and leather fern dominates the sparse herbaceous layer.

The soil unit for this wetland is the same as Cover Type 5: Martin Pena muck (USDA 1978). Soil analysis within this wetland revealed hydric soil characteristics including a low soil chroma matrix. The drainage classification for this soil is poorly drained. During the June 1994 survey, standing water was observed in small depressions scattered throughout the forest.

Similar to the black mangrove forest, the primary value of this forested wetland is the production of detritus and dissolved organics that are food sources for estuarine species (U.S. Department of the Navy 1989). Mature *Pterocarpus* forest are also important breeding habitat for cavity nesting species including the West Indian whistling duck (*Dendrocygna arborea*). However, this *Pterocarpus* forest was considered too young to attract cavity nesting species (Moreno 1993).

3.5.2 Aquatic Ecosystems

During the June 1994 field survey, three man-made canals and one perennial tributary to the Cocal River were identified as being traversed by the proposed project. The following sections describe each of these streams and their associated wildlife values.

Man-Made Canals

Three man-made canals are located north of Route 867. The first is located at approximate milepost 1.89, just beyond a cattle corral area. This canal is approximately 15 feet wide from bank to bank and 3 feet deep. The bottom and bank composite are primarily clay and muck, with little to no cobble, gravel, and/or sand substrate found within the canal. The water is turbid and flows in a westerly direction. The dense vegetation associated with this canal is primarily water lettuce (*Pistia stratiotes*), water hyacinth (*Eichornia crassipes*), and bull-tongue arrowhead. During the field survey, there was evidence that dredging activities are currently being conducted to keep the water flowing and to maintain open areas.

The wildlife value associated with this canal is moderate. Amphibians and reptiles within the area use this canal for foraging and breeding. In addition, many species of migrating waterfowl and wading birds use the open areas for foraging. During the June survey, coqui frogs were heard in the vicinity of the canal.

The two remaining canals identified within the project area are located at approximate mileposts 2.09 and 2.47. At the time of the survey, both of these canals were totally dry and were encroached upon completely by the surrounding vegetation. The culverts or pipes that are used to allow flow through the canals from east to west were completely filled. In addition, due to the cattle that are allowed to graze within these areas, the banks are rapidly deteriorating. Therefore, due to the present condition of these canals, the wildlife value is considered to be minimal.

Perennial Stream

A tidally influenced perennial stream is located north of Route 867 at approximate milepost 3.25. This stream, located in the black mangrove forest, is an unnamed tributary to the Cocal River. The stream is approximately 15 feet wide by the Redman Road bridge but narrows upstream and widens downstream. At the time of the survey the average depth of standing water was approximately 4 inches. However, the depth at Redman Road was approximately 2 feet. The stream bottom consists primarily of muck and silt; however, some cobble and pebble point bars were observed. The banks are fairly steep by the bridge and show evidence of erosion due to high water flow. The water, which flows in an easterly direction to the Cocal River, was slow moving, turbid, and deeply stained. The vegetation associated with this stream consists primarily of black mangroves (Cover Type 5) near the bridge, and cattail marsh (Cover Type 4) north and south of this point. This stream provides valuable wildlife habitat for various species of wildlife including reptiles and amphibians, fish, and invertebrates. During the field survey, several tadpoles were observed in one of the deep ponds of the stream, and several land crab burrows were seen along the stream banks.

3.5.3 Threatened and Endangered Species

Based on agency correspondence (see Appendix D), conversations with the base naturalist, and review of previous studies conducted within the area, four species of concern have been identified as likely to occur within the proposed project area: the Puerto Rican boa (*Epicrates inornata*), white-crowned pigeon (*Columba leucocephala*), brown pelican (*Pelecanus occidentalis*), and daphnopsis (*Daphnopsis hellerana*) (Moreno 1993; Silander

1994; Montalvo 1994). A brief description of each of these species' habitat, legal status, and occurrence in the project area are presented below.

Several other species of concern have been identified by the Nature Conservancy during its compilation of information about threatened/endangered species located on U.S. Navy bases throughout the United States (Nature Conservancy 1994). In addition, these species are included in the Puerto Rico Department of Natural and Environmental Resources (DNER) Natural Heritage Program data bank (Gelabert 1994). These species are identified in Table 3-1 and are briefly discussed below.

Puerto Rican Boa

The Puerto Rican boa is a large constrictor (6 to 7 feet in length) which is native to the rainforests in Puerto Rico (Moreno 1993). Although found in all types of rainforests, it is most abundant in areas of karst topography. In particular, the mogote, or "haystack hills," region of the South Tract seems to be a suitable habitat (U.S. Department of the Navy 1988). Primarily nocturnal, the boa generally sleeps in sheltered areas during the day and emerges at night to hunt in the tree canopy. Adult snakes consume a variety of prey including rats, mice, birds, and bats. Smaller snakes also include lizards, large insects, and amphibians in their diets.

The Puerto Rican boa has been listed by both the federal and Puerto Rican governments as endangered (Nature Conservancy 1994). This listing is the result of preferred habitat loss and human use of its oil for medicinal and spiritual purposes (U.S. Department of the Navy 1988). In addition, a large introduced mongoose (*Herpestes auropunctatus*) population on Puerto Rico may be contributing to its decline (U.S. Department of the Navy 1988).

During the June survey, no boas were found within the proposed project area. However, potential habitat was found between mileposts 0.00 and 0.61 in the bamboo forest and abandoned bunkers and buildings located adjacent to the road. Although the black mangrove forest located at milepost 3.21 may be considered suitable habitat; there are no travel corridors to this area, and there presently is no evidence of boas in the mangroves (Montalvo 1994). Therefore, the black mangrove forest is not considered potential habitat of the Puerto Rican boa for the proposed project.

Table 3-1 SPECIES OF CONCERN LIKELY TO OCCUR AT NAVAL SECURITY GROUP ACTIVITY, SABANA SECA, PUERTO RICO			
Common Name	Scientific Name	Federal Status	Puerto Rican Status
Animals			
Brown pelican	<i>Pelecanus occidentalis</i>	Endangered	Endangered
White-crowned pigeon	<i>Columba leucocephala</i>	Category 2	None
Puerto Rican boa	<i>Epicrates inornatus</i>	Endangered	Endangered
Puerto Rican screech-owl	<i>Otus nudipes</i>	Category 2	None
Manatee	<i>Trichechus manatus</i>	Endangered	Endangered
Loggerhead	<i>Caretta caretta</i>	Threatened	Threatened
Green turtle	<i>Chelonia mydas</i>	Threatened	Endangered
Hawksbill	<i>Eretmochelys imbricata</i>	Endangered	Endangered
Pacific Ridley	<i>Lepidochelys olivacea</i>	Threatened	Threatened
Leatherback	<i>Dermochelys coriacea</i>	Endangered	Endangered
West Indian whistling-duck	<i>Dendrocygna arborea</i>	Category 2	Threatened
Lesser white-cheeked pintail	<i>Anas bahamensis bahamensis</i>	Category 2	None
West Indian ruddy duck	<i>Oxyura jamaicensis jamaicensis</i>	Category 2	Threatened
Peregrine falcon	<i>Falco peregrinus</i>	Endangered	Endangered
Caribbean coot	<i>Fulica caribaea</i>	Category 2	Threatened
Plants			
Palo de rosa	<i>Otioschulzia rhodoxylon</i>	Endangered	Endangered
Ortegon	<i>Coccoloba rugosa</i>	Proposed threatened	None
Daphnopsis	<i>Daphnopsis hellerana</i>	Endangered	Endangered
Vahl's boxwood	<i>Buxus vahlII</i>	Endangered	Endangered
Cock's-spur	<i>Erythrina eggersii</i>	Category 1	None
Palo de ramon	<i>Banara vanderbiltii</i>	Endangered	Endangered
Kraenzlin's epidendrum	<i>Psychilis kraenzlinii</i>	Category 2	None

Key at end of table.

Table 3-1 (Cont.)

Key:

- Category 1 = A candidate species considered for listing as endangered or threatened for which there is substantial information on biological vulnerability and threats to support the appropriateness for proposing to list the species as endangered or threatened.
- Category 2 = A candidate species for which information indicates that proposing to list as endangered or threatened is possibly appropriate, but for which substantial data of biological vulnerability and threats are not currently known to support the immediate listing.
- Endangered = A species, including subspecies, in danger of extinction throughout all or a significant portion of its range.
- Threatened = A species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Proposed: threatened = A species proposed for listing as threatened.

Source: The Nature Conservancy 1994 and the Department of Natural and Environmental Resources 1994.

White-Crowned Pigeon

Approximately the size and build of the common rock dove or domestic pigeon, the white-crowned pigeon has a dark gray body with a white crown and light bars on the back of the neck. This pigeon is relatively abundant on the base, and has been observed in the mangroves in the North Tract (Moreno 1993). Although the pigeon is known to inhabit mangrove forest in some areas, all roosting on the base has been observed in a group of royal palms located in the mogote region of the South Tract (Moreno 1993). Food items primarily include seeds, fruits, and insects.

The white-crowned pigeon is not considered a species of concern by the Puerto Rican government, but is considered a candidate for federal listing as threatened (Nature Conservancy 1994). The only area of potential habitat identified along the proposed route is the black mangrove forest located at milepost 3.21.

Brown Pelican

This very large water bird is native to salt bays, beaches, and ocean areas along the coast of the Southern United States, Central and South America, and various Caribbean Islands (Peterson 1980). The brown pelican has a dark brown body with white around the head and neck, and a large, flat bill with a pouch underneath. Brown pelicans are present in coastal and mangrove regions of Puerto Rico, and they have been sighted flying over the mangrove area of the base. No roosting, however has been observed on the base (Moreno 1993). Feeding requires a relatively deep water habitat where the pelican can plunge bill-first into the water in pursuit of fish, which it catches in its pouch.

The brown pelican is listed by both the federal and Puerto Rican governments as an endangered species (Nature Conservancy 1994). During the June survey, no pelicans were observed utilizing or flying over the proposed project area. In addition, no areas of potential habitat were identified within the proposed project area.

Daphnopsis hellerana

Daphnopsis hellerana is a perennial shrub/tree native to the semi-evergreen forests of the karst region of northern Puerto Rico at elevations of 25 to 200 meters (U.S. Department of the Navy 1988). The plant exists exclusively in the mogote regions. Known populations of this species are limited to two locations: the Sabana Seca hill areas and in the Riolaja hills near the town of Vega Alta (U.S. Department of the Navy 1988). Seven individuals are

present at the Sabana Seca site near the Caribbean Primate Research Center in the mogote portion of the south tract (U.S. Department of the Navy 1988).

This species is listed as endangered by both the federal and Puerto Rican governments (Nature Conservancy 1994). During the June survey, no specimens of *Daphnopsis hellerana* were observed within the proposed project area.

Other Species of Concern

The five protected sea turtles and manatee (see Table 3-1) are aquatic species that do not occur in the project area. Similarly, the four waterfowl species of concern are not likely to occur in the project area because they prefer open-water lagoons, saltwater pools, and freshwater marshes (Raffaele 1970). The Puerto Rican screech-owl occurs in a variety of forested habitats but requires tree cavities for nesting (Raffaele 1970). Consequently, the project area is not considered potential habitat for this owl because the small mangrove forest located in the North Tract does not provide any cavity-nesting trees. The peregrine falcon is considered a transient species.

All the plant species of concern identified in Table 3-1, including *Daphnopsis hellerana*, occur in moist limestone hills. The mogote region at NSGA is not traversed by the proposed project.

Unique Communities

A Palo de pollo (*Pterocarpus officinalis*) community located in the North Tract at approximate milepost 2.99 is considered a unique community by the United States Fish and Wildlife Service (Silander 1994). This 25-acre forest is hydrologically connected to the black mangrove forest and is located 10 feet east of Redman Road. Construction activities would be restricted to the west side of the road in this area to avoid clearing in this unique community.

The San Pedro Swamp Critical Wildlife Area is located in both the North and South Tracts and is associated with the coastal zone area (see Figure 3-1). The San Pedro Swamp is a large emergent/forested wetland considered to be of primary importance to wildlife due to the degradation and disappearance of nearby similar areas (Cardona and Rivera 1988). When portions of the North Tract are flooded, this area provides excellent habitat for herons, egrets, and a variety of ducks. All three alternatives traverse this area in the South Tract, and Alternatives One and Two traverse approximately 1.36 miles of San Pedro Swamp in the North Tract.

3.6 Land Use

The North Tract comprises approximately 1,330 acres and is used primarily for operational and grazing purposes (see Figure 3-5). The northeast section of this tract sustains mangrove and *Pterocarpus* forested communities.

Approximately 30 acres in the northwest portion are used for the CDAA, the Operations Building (Building 85), and associated operation facilities. Other historically used operational sites on the North Tract which were related to such operations have been abandoned and removed, except for a few remnant access roads and building foundation slabs.

Approximately 1,020 acres of the North Tract are used for cattle grazing under the Navy's agricultural outlease program, a multiple land use program designed to maximize federally owned real estate assets. The agricultural outlease lands in the North Tract provide quiet open space zones required for communication equipment.

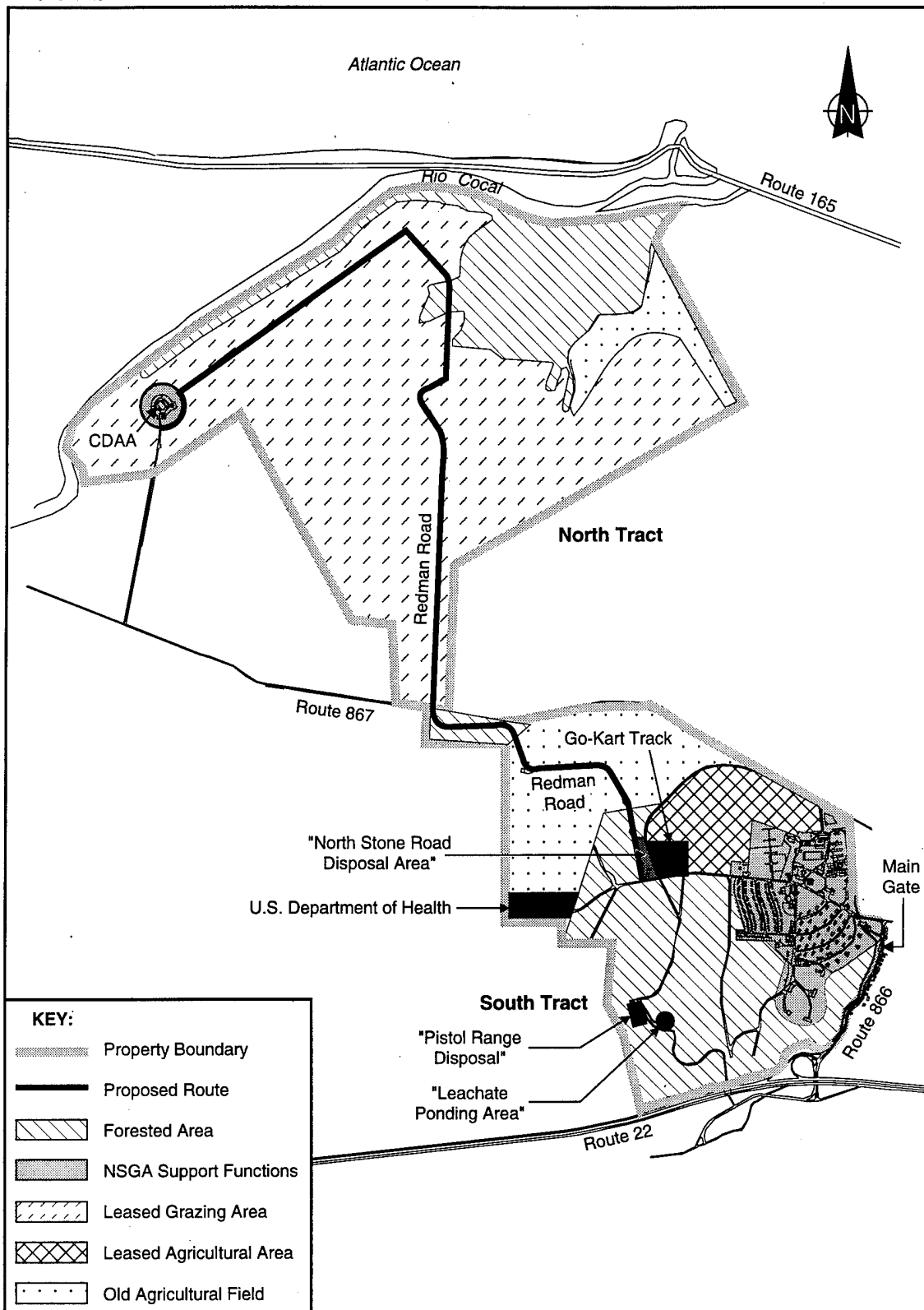
The remaining 195 acres of the North Tract are mostly forested areas consisting of black mangrove forested wetland areas, small freshwater wetlands, and a *Pterocarpus* forest (see Section 3.5 for a detailed discussion of these land cover types). These mangroves are protected under the Puerto Rico Coastal Management Program which is discussed further in Section 3.10.

A portion of the North Tract is in the San Pedro Swamp, a Critical Wildlife Area of Puerto Rico. This swamp was given primary status in 1988, principally due to the degradation or disappearance of similar areas nearby. Although there are no specific statutes protecting areas such as these, they are considered important natural coastal systems and as such are considered during review of projects within the coastal zone.

The South Tract consists of approximately 920 acres, a portion of which is used for activity support operations, recreation, and military housing. The remainder of the tract consists mostly of forested and former agricultural areas.

The South Tract contains all of the installation support functions at NSGA Sabana Seca, including administration and public works, supply, housing, health care services, recreational facilities, and retail outlets. This developed area is located in the eastern portion of the South Tract and occupies 174 of the tract's 920 acres. The remaining land area in the tract is either used by the U.S. Department of Health and Human Services for the operation of the Caribbean Primate Research Center (8 acres), is leased out under the agricultural outlease program (228 acres), or remains undeveloped (310 acres).

The southern region in the South Tract consists of the mogotes, or "haystack hills," which is an area of karst topography and dense forest vegetation. The mogotes contain



SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

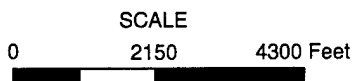


Figure 3-5 LAND USE/LAND COVER AT THE U.S. NAVAL SECURITY GROUP ACTIVITY, SABANA SECA, PUERTO RICO

features such as caves, canyons, sinkholes, subterranean rivers, and asymmetrical hills that deter development in this region. However, these same features provide excellent habitat for a number of threatened or endangered species (Creamer 1989). This area of the South Tract is not traversed by the proposed project.

Use permits are in effect on the South Tract for the private use of a go-kart track on Stone Road, and the public uses of a bus stop on Route 867 and an access road to the Bayamon Municipal Landfill.

The North Stone Road Disposal Area is located on the east side of Redman Road in the South Tract near the intersection of Stone Road (see Figure 3-5). This landfill extends northward along Redman Road for approximately 960 feet. This area was used from 1960 to 1965 for the disposal of approximately 1,800 tons of residential waste, construction debris, scrap metal, wood, and tree clippings. An Initial Assessment Study completed in 1984 concluded that this disposal area is not a hazardous waste site, and no remedial action was recommended. However, as a precaution, a Site Inspection (SI) effort was conducted. As part of the SI field effort, three monitoring wells were installed and sampled for two rounds. These wells are located a few feet from the road's edge. The draft SI report has confirmed this site requires no remedial action (U.S. Department of the Navy 1994). The SI report is expected to be finalized by early 1995.

In addition to the North Stone Road Disposal Area, the Pistol Range Disposal (Site 4) and Leachate Ponding Area (Site 7), collectively known as Site 4/7, are located south of Stone Road and east of the Bayamon Municipal Landfill (see Figure 3-5). These two areas are under further study to determine their potential threat to humans and the environment since they receive leachate from the nearby landfill. Leachate from the landfill has been observed entering the marshy areas of Site 4/7 as surface runoff and forming leachate ponds over the area. Although these sites are not located in the project area, they may be hydrologically connected to the wetland areas. However, test results from the monitoring wells associated with the North Stone Road Disposal Area located along Redman Road have confirmed that no remedial action is required (U.S. Department of the Navy 1994).

The area surrounding NSGA Sabana Seca comprises rural communities including the town of Sabana Seca and the villages of Ingenio and Levittown. The Bayamon Municipal Landfill is located outside the western boundary of the South Tract. Most of the land immediately adjacent to the installation is used for agriculture and grazing.

3.7 Transportation

Routes 866 and 867 provide access between the South and North Tracts. Route 866 is oriented in a north-south alignment, and is located on the east side of the South Tract. Route 867 is an east-west-trending road, and runs along the south and north boundaries of the North and South Tracts, respectively. Personnel travel from their residences on the South Tract to the CDAA by travelling north on Route 866, west on Route 867 (Ingenio Road), and finally north on Actria Road which terminates at the CDAA. Both Route 866 and Route 867 have recently been widened and are currently well-maintained. Traffic flows smoothly on these roads and there is minimal traffic backup. Existing construction on Route 866 causes traffic congestion at the Route 867 intersection.

3.8 Socioeconomics

3.8.1 Population

The estimated population at the NSGA Sabana Seca is 565 and includes military personnel, military dependents, and civilian personnel. Approximately 300 military personnel and their dependents live on the base, 90 military families live within the local communities, and 21 families live in government housing at Fort Buchanan. All civilian personnel live off of the base (U.S. Department of the Navy, Master Plan).

The municipalities located adjacent to the NSGA have increased in population during the 1970s and 1980s. Between 1970 and 1980 it is estimated that the municipality of Toa Alta to the southwest of NSGA, Sabana Seca and Toa Baja to the west, each experienced a population increase of over 68% (U.S. Department of the Navy, Master Plan). Information from the U.S. Census Bureau indicates that this growth trend has continued into the following decade, however, at a slower pace. Between 1980 and 1990, the municipality of Toa Alta had a 38% increase in population levels and the municipality of Toa Baja had a 14% increase in population levels (U.S. Bureau of the Census 1980, 1990).

3.8.2 Grazing Leases

The 1,020 acres of leased area on the North Tract consists of several soil types including Bajura clay. This soil has been used for sugar cane production in the past, and because of its suitability for paragrass production, these land areas are currently being used for cattle grazing. Over the past 23 years, this land has been leased by the Navy to four or five parties; each leasing the land for up to five years.

Conditions of the leasing are that the lessee will be responsible for testing, vaccinating, and treatment of cattle as necessary; ensure the protection of mangrove forest areas by erecting security fences; and submit a herd management, grazing, and crop plan which is in conformance with United States Department of Agriculture Soil Conservation Service practices. In addition, the lessee will agree not to have more than one head of cattle per acre at any point in time.

The current lessee has improved the drainage ditches. In addition, the pastures are properly maintained, and the cattle are rotated within the leased areas to avoid overgrazing.

3.9 Cultural Resources

Pursuant to Section 106 of the National Historic Preservation Act, representatives of the Puerto Rico State Historic Preservation Office (SHPO) and the Navy met on site on May 11, 1994. A field assessment of the South Tract demonstrated that no potentially eligible historic resources were within the project area. The North Tract was not visited by the SHPO; however, Mr. Bruce J. Larson, Navy archaeologist, observed the entire Alternative One (preferred) route. He concluded that the affected area has been disturbed by previous road construction.

3.10 Coastal Zone Management

Pursuant to the Coastal Zone Management Act of 1972, Puerto Rico has prepared a federally approved Coastal Zone Management Program (CZMP). The CZMP defines the Coastal Zone, identifies existing sensitive ecosystems within the zone, highlights potential threats resulting from development, and outlines programs designed to manage and protect this sensitive area.

The CZMP is administered by the Puerto Rico Planning Board, and in order for a determination of consistency to be made, an application must be filed with the planning board. In addition to general project information, this form requires a description of the type of work involved; identification of the natural, artificial, historic, or cultural systems likely to be affected by the project; description of potential impacts; and a listing of applicable permits and approvals required by other agencies. Lands owned by the federal government are exempt from these regulations. However, as required by Section 307(c) of the Coastal Zone Management Act, any federal activity that directly or indirectly affects the land or water or natural resources of the coastal zone must be consistent to the maximum extent practicable with the state/commonwealth-approved management program.

The Coastal Zone extends 1,000 meters (3,283 feet) inland from the ocean shoreline and extends farther inland, as necessary, to include important natural coastal systems located landward of the zone's 1,000-meter boundary. The Coastal Zone includes islands, intertidal areas, salt marshes/saltwater wetlands, beaches, freshwater wetlands, and the San Pedro Swamp.

4.1 Topography, Geology, and Soils

The construction, operation, and maintenance of the proposed road would have only minor impacts on local topography and soil erosion and sedimentation. Because the proposed project would not involve blasting of bedrock or major excavation activities, no impacts to the local geology in the project area are expected.

Adverse impacts to local topography would generally be minor and localized to roadbed construction: excavation and filling of the existing roadbed which would entail a build-up above natural grade.

Clearing of vegetation, excavation of existing soils, and filling of approximately 3 acres of wetland may result in erosion and sedimentation in the vicinity of the construction area. However, impacts due to soil erosion are expected to be minor and limited to the duration of construction. An erosion and sedimentation control plan will be prepared to minimize impacts to soils. Impacts resulting from construction activities will also be minimized by scheduling construction during the drier periods of the year.

Impacts to existing soils resulting from road improvement activities would also be short term and minor. Potential impacts to soils will be minimized with the use of clean gravel fill rather than soil to bring the roadway to specified grade. This activity should not cause soil erosion or result in the disturbance of existing soils. Storm drainage piping and culverts will also be installed at appropriate locations to maintain the existing surface water drainage in the area. Silt fences and other erosion control measures will be used to minimize sedimentation into adjacent wetlands. Appendix E presents a conceptual wetland mitigation plan that addresses the potential impacts to wetlands and presents mitigative measures to minimize adverse effects.

In addition to these general mitigation measures, the Navy will follow all conditions of the United States Army Corps of Engineers (USACE) Section 404 permit and specific

mitigation measures outlined in the Naval Facilities Engineering Command Guide NFGS-0156OC for Environmental Protection.

4.2 Hydrology and Water Quality

4.2.1 Surface Water

Construction and operation of the proposed project would have potential impacts on surface water hydrology, primarily associated with minor alterations of drainage and surface runoff patterns. Construction activities would not significantly affect surface water quality except if soil erosion and sedimentation were to occur in the adjacent wetland areas. These potential impacts, which are described in detail in Section 4.1, would be generally minor and can be adequately minimized by recommended mitigation measures (see Appendix E). Operation of the proposed project would not impact surface water quality in the area.

Beneficial long-term impacts to wetland hydrology would result from the installation of storm drainage piping and culverts during construction of the road. These will help to restore flow where existing roads are above grade and to maintain flow where the existing drains are blocked. As such, these drains and culverts will partially restore natural surface water drainage patterns and seasonal groundwater fluctuations to altered wetlands and ensure that existing hydrologically sensitive plant species and/or communities will be protected by maintaining current hydrologic regimes.

Construction and operation of the proposed facility would not have a significant effect on the natural functioning of the area's floodplains. The proposed project would reduce the amount of pervious surface within the floodplain by approximately 3 acres, and no drainage or flood-control structures are planned in association with the proposed project. Therefore, the proposed action would have very minor impacts on the capability of the area's floodplains to moderate the impacts of floods on inhabited areas by providing temporary storage of overflow and surface runoff and to improve water quality through the settlement of sediments and removal of pollutants by biological processes.

4.2.2 Groundwater

Construction and operation of the proposed project would not adversely affect either groundwater quality or quantity. Because construction and operation of the proposed project would not interfere with subsurface groundwater flow, require any groundwater withdrawals, or involve any activities that may disrupt the integrity of the confining layers of any of the regional aquifers, no adverse impacts to local groundwater would occur. In addition,

precautions would be taken to prevent the accidental spillage of fuels or lubricants from construction machinery. All construction equipment will be fueled and serviced in designated areas where the equipment necessary to safely handle these materials and rapidly clean up any spills or leaks is readily available. This will ensure that these substances do not have the opportunity to enter surface water or groundwater.

4.3 Air Quality

As a result of air pollutants emitted during the construction process, the proposed project would cause short-term air quality impacts. The emissions would be of three types:

- Exhaust and crankcase emissions from construction machinery;
- Fugitive dust emitted from the road bed during grading and preparation; and
- The emission of volatile organic compounds from the asphalt paving operations.

Both gasoline- and diesel-powered vehicles and machinery are expected to be involved in the construction. Pollutants emitted from gasoline powered vehicles (i.e., automobiles and light trucks) are primarily volatile organic compounds (VOCs), CO, and NO_x. Pollutants emitted from diesel-powered vehicles (i.e., trucks and machinery) are primarily NO_x, SO_x, and particulates.

Particulate matter would be emitted from the road bed as it is graded and as trucks and machinery drive over it.

The pollutants of concern emitted from asphalt paving operations are VOCs (EPA 1979). The quantity of VOCs emitted depends upon which type of asphalt is used: cutback, emulsified, or asphalt cement. VOC emissions from the latter two are minor. VOC emissions from cutback result from the evaporation of petroleum distillates during mixing, paving, and from the road surface itself.

Although there are air pollutant emissions associated with the grading and paving operation, they are expected to be localized, short-term and minor.

No long-term or cumulative impacts are expected from the proposed action since an increase in vehicular traffic from the South Tract to the North Tract is not anticipated.

The Clean Air Act (CAA) of 1970, 42 USC 7401 *et seq.* (amended 1977 and 1990), requires that the EPA promulgate rules to ensure that federal actions conform to the appropriate State Implementation Plan [section 176(c)]. These rules for CAA conformity

determination are set forth in 40 CFR Parts 6, 51, and 93. These rules are only applicable to nonattainment areas and are therefore not relevant to this proposed project.

4.4 Noise

Impacts due to construction and operation of the proposed project would be short-term, minor, and localized to the immediate area of construction. Construction activities would result in minor increases in local noise levels (i.e., construction equipment and traffic); however, these impacts would last only for the duration of construction and should not extend into civilian areas. Following construction of the road, traffic noise generated by use of the road would be negligible.

4.5 Terrestrial and Aquatic Ecosystems

This section describes the impacts of construction and operation on terrestrial and aquatic ecosystems traversed by the proposed project. In general, construction and maintenance of the road would result in both short- and long-term impacts on terrestrial and aquatic resources. Project construction would require clearing a maximum of 10 feet of vegetation on one side of the existing road in the North Tract. In addition, approximately 11 10-foot by 30-foot turn-out areas on alternating sides of the proposed road at 0.25-mile intervals would be added (see Appendix A).

4.5.1 Terrestrial Ecosystems

Based on the initial construction/engineering survey, no additional land would be required for road improvements in the South Tract. Therefore, no impacts to the vegetation in this area would be expected. However, an estimated 3 acres of North Tract wetlands, both forested and emergent, would be impacted by the proposed project. The emergent cattail-sedge (see Section 3.5.1) wetland would have approximately 2.9 acres filled to widen the road, causing a permanent long-term impact. The black mangrove forest, located at milepost 3.21 (see Section 3.5.1), would have approximately 0.1 acre of forest cleared along the western side of the existing Redman Road, resulting in a long-term impact to the black mangrove forest. However, the *Pterocarpus* forest located at milepost 2.99 would be avoided because construction is limited to the west side.

In general, this loss of wetland vegetation is considered to be a minor impact. All impacted wetland areas, including the black mangrove forest, are located in an active cattle pasture and have been heavily degraded by grazing activities. In addition, the local residents

have been known to burn the wetland vegetation so that they can locate land crab burrows more easily. During the field survey, a fire was burning on the edge of the black mangrove forest, and there was evidence of burning activities in the *Pterocarpus* forest. In addition, the amount of wetland vegetation that would be cleared is minimal when compared to the amount and availability of similar habitat/cover-types adjacent to the project area.

The San Pedro Swamp Critical Wildlife Area is traversed by the proposed route for approximately 1.36 miles. Therefore, based on the preliminary engineering design, approximately 1.4 acres of this swamp will be impacted by the proposed project: 1.3 acres of emergent wetland, and 0.1 acre of black mangrove forest. However, since this area is considered a terrestrial ecosystem the impacts to this area have already been accounted for in the wetlands discussion.

Construction of the proposed project would have minor short- and long-term impacts on wildlife habitat and local wildlife populations. During construction, the clearing and grading of Redman Road would result in a loss of vegetative cover and possible mortality to less mobile forms of wildlife. In addition, the general disturbance resulting from construction activity (i.e., noise and dust) would likely cause a temporary displacement of most wildlife from the immediate vicinity of the construction area and adjacent areas. Following construction, the displaced species would resume normal habits/activities within the project area.

4.5.2 Aquatic Ecosystems

The proposed project would traverse three man-made canals and a tributary to the Cocal River, none of which support significant fisheries: therefore, impacts are expected to be minor. Construction time for each stream crossing would be kept to a minimum, and when practical, construction would be conducted during periods of low flow. Short-term impacts such as increased turbidity, increased silt loads from in-stream activities, and increased erosion of the stream banks may occur during construction across the stream and canals. Section 6.4 identifies mitigative measures for construction across the canals and the tributary to the Cocal River.

4.5.3 Threatened and Endangered Species

During the June 1994 survey, no threatened or endangered species were observed within the project area. However, a few areas of potential habitat for the Puerto Rican boa and white-crowned pigeon were identified. The boa may occur in the bamboo forest located

between mileposts 0.00 and 0.61. The white-crowned pigeon may occur in the black mangrove forest located at milepost 3.21 (see Section 3.5.3).

No impact to the bamboo forest, potential habitat of the Puerto Rican boa, is expected since this area is located adjacent to the road and no vegetation would be cleared on the South Tract. However, the work crews would be required to notify the base naturalist if boas are sighted during construction and to arrange for their safe removal from the project area.

Impacts in the black mangrove area of potential habitat for the white-crowned pigeon are expected. These impacts would include long-term habitat reduction (i.e., removal of mangrove trees) and short-term impacts from general construction activities (i.e., noise, dust) along the road. Informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act has been conducted (see Appendix D); based on the results of this consultation, no further action is required.

4.6 Land Use

In general, construction, operation, and maintenance of the proposed project would have minor, short- and long-term impacts on existing and future land use at NSGA Sabana Seca. No road widening is proposed in the South Tract, therefore, no physical encroachment into existing land uses would occur. In the North Tract, the road would be widened and several vehicle turnouts would be added, which would occupy a total of approximately 3 acres of wetland: 2.9 acres of open-space marshlands and 0.1 acre of black mangrove forest.

The 2.9 acres of marshlands that would be affected by the project are currently leased for grazing and/or turf farming. In accordance with the procedures established in the Navy's agricultural outlease program, encroachment of the road into these currently leased areas would require the Navy to notify the lessee of the project, modify the existing lease prior to construction, and compensate the lessee for losses, if appropriate.

Areas outside of the project area would not be significantly impacted by the proposed action. Certain areas of NSGA Sabana Seca, particularly the developed areas on the South Tract and residences along Route 867 may be inconvenienced by noise, dust, and interruption of traffic caused by the intermittent flow of construction vehicles going to and from the construction site. However, these impacts would be minor and temporary, limited to the time of construction. The North Stone Road Disposal Area located on the east side of Redman Road and its monitoring wells would not be encroached upon, since the existing road would not be widened in this area. In addition, Site 4/7 would not be impacted by construction of the proposed project. The potential seepage of leachate into the wetland areas located in the

South Tract is monitored by wells located near Redman Road. No remedial action is required (U.S. Department of the Navy 1994).

No significant impact to the land uses and communities adjacent to the installation is anticipated, because the project is confined to the interior areas of NSGA Sabana Seca property, and Redman Road is an existing road.

4.7 Transportation

The proposed project would result in improved transportation of personnel and would also provide reliable emergency vehicle access. Traffic interruptions due to construction activities may result on Route 867 because Redman Road crosses this public roadway. These interruptions may occur in the form of temporary lane detours or short traffic flow delays. However, any impact that results would be temporary, and warning signs, flashing lights, and/or flag persons will be used to minimize these effects.

4.8 Socioeconomics

The proposed action would cost approximately \$2.2 million. The influx of this money would create positive impacts to the regional economy; however, they would be short term and limited to the construction phase of the project. In addition, because the project would be put out for bid, the direct impacts (i.e., the hiring of local contractors) may be small.

Regardless of whom the contractor is, there would be positive indirect impacts as a result of the proposed action to the regional economy, primarily in the form of money spent by construction personnel in hotels (or other temporary housing) and restaurants. Some of this money would be spent in local businesses around the activity (mainly in restaurants or small suppliers), however, the largest percentage of money is likely to be spent in the more developed areas in and around San Juan. Given the extensive amount of business activities in the San Juan area, the impacts would be diluted and less obvious than if the money was spent in the local economy around NSGA Sabana Seca.

The operation and maintenance of the proposed project would have no effect on the population, income, and employment in the local communities.

There may be slight impacts to ranchers who use the north tract for cattle grazing purposes as development of the road would encroach upon the land they currently use for cattle grazing. Where encroachment has occurred, an amendment to the lease would be

required to remove the area from that lease (Haddock 1994). In addition, there would be temporary impacts to grazing activities during the construction phase of the project.

Cattle would need to be contained in certain areas during construction in order to avoid contact with construction crews. Once the road is completed, cattle would be free to establish previous grazing patterns.

4.9 Cultural Resources

Based upon the May 11, 1994, field assessment, the Navy has determined that the proposed action will have no effect on historic resources (Larson 1994). Subsequent concurrence of "no effect" was obtained from the Puerto Rico SHPO (see Appendix D).

4.10 Coastal Zone Management

Although the land the project will be constructed on is federal property, which is technically exempt from the CZMP regulations, there is a potential for impacts in the coastal zone. The Navy has reviewed the project for consistency and has determined the proposed project is consistent with the Puerto Rico CZMP, and will submit this determination to the Puerto Rico Planning Board for concurrence.

Construction activities in the mangrove forest would comply with mangrove management guidelines required by the CZMP. These guidelines outline the measures that need to be taken to minimize the impacts of construction in mangrove forests. The USACE will establish 404 permit conditions that incorporate these mangrove management guidelines. In addition, the Planning Board would consider the impacts of the proposed project on the wetlands comprising the San Pedro Swamp and how these impacts may be mitigated, such as storm water control measures (see Appendix E).

4.11 Cumulative Impacts

Cumulative impacts are the sum of all impacts which can be anticipated from the development of the proposed project and any other proposed projects in the area. At this time, the only other projects scheduled in the area are a 3,000-square-foot addition to the existing CDAA, the replacement of underground water storage tanks at the CDAA with aboveground tanks, and the development of a new leachate field for the CDAA's sewage treatment plant. All of these projects are within the vicinity of the CDAA on the western side of the North Tract. In addition, one other project scheduled for construction is a fence and patrol road located in the South Tract along the Navy property boundary and Route 867.

These projects in combination with the proposed project would not create significant cumulative impacts to the area. The aforementioned projects are small in scale and, as is the case for the proposed project, are situated in areas which have previously been disturbed. In addition, because these projects are located on the western side of the North Tract and along Route 867 on the South Tract, they do not impact the *Pterocarpus* and black mangrove forests. However, approximately 6 acres of emergent wetland in the North Tract will be cumulatively impacted by these projects.

4.12 Unavoidable Adverse Impacts and Considerations That Offset These Impacts

Adverse long-term environmental effects of the proposed action would include the loss of wetlands, mangrove trees, and potential habitat for threatened and/or endangered species. Adverse environmental effects which would be evident during the construction of the proposed action include soil erosion, fugitive dust emissions, and noise associated with construction equipment.

Mitigative measures to minimize these effects will include using an existing roadway as a base for the new road, and creating wetlands to replace those lost because of the new road (see Appendix E). The establishment of a certified Pollution Prevention Plan will control the erosion and sedimentation that may occur because of the proposed action.

4.13 Relationship Between Short-Term Uses of the Environment and the Enhancement of Long-Term Productivity

The proposed action would result in the loss of wetland areas, mangrove trees, and potential habitat for threatened and/or endangered species. In addition, there would be an increased potential for soil erosion and sedimentation during the construction phase of the project.

However, these losses would allow for the construction of a structurally sound roadway. This, when completed, would provide a safe means of travel to the CDAA and allow easier access of emergency equipment, which is necessary to handle frequent fires in the mangrove and *Pterocarpus* forested areas.

4.14 Irreversible and Irretrievable Commitment of Resources

Implementation of the proposed action would involve the irreversible and irretrievable commitment of resources. These resources include a narrow line of wetlands adjacent to the

existing roadbed and several black mangrove trees. Construction of the road would also require the consumption of oil, gasoline, and diesel for construction equipment, petroleum-based paving material, and labor resources.

4.15 Environmental Justice in Minority Populations and Low-Income Populations

In accordance with Executive Order 12898, dated February 11, 1994, and Secretary of the Navy Notice 5090, dated May 27, 1994, the Navy is required to identify and address, as appropriate, the potential for disproportionately high and adverse human health or environmental effects of their actions on minority or low-income populations.

The Navy has not directly or indirectly used criteria, methods, or practices that discriminate on the basis of race, color, or national origin. In addition, the Navy has analyzed the economic and social impacts of the proposed project and determined that no economic or social impacts are anticipated on minority or low-income communities. No human health impacts are anticipated. No mitigation measures are necessary to address significant adverse environmental impacts on minority and low-income communities.

A variety of permits and review processes would be required before the proposed action can be implemented, and the following section provides a brief overview of the permitting and approval requirements. Table 5-1 presents a summary of the permits needed for the proposed project.

Federal, state, and local government agencies have permit or approval authority over portions of the proposed project. These include, at the federal level, compliance with regulations of the Clean Water Act (CWA), Rivers and Harbors Act, Endangered Species Act, and the Clean Air Act. The Commonwealth of Puerto Rico also reviews actions involving wetland and stream crossings, coordination of coastal zone management, cultural resources, and state-listed endangered species.

Federal requirements of the CWA include compliance under Sections 401, 402, and 404. Water quality certification (Section 401) has been delegated to the Commonwealth of Puerto Rico.

Section 402(p) of the Clean Water Act states that storm water discharges associated with industrial activity to waters of the United States must be authorized by a National Pollutant Discharge Elimination System (NPDES) permit. On November 16, 1990, the Environmental Protection Agency (EPA) defined the term "storm water discharge associated with industrial activity" to include storm water discharges from construction activities that result in disturbance of 5 acres or more. On September 9, 1992, final NPDES general permits requirements for storm water discharges from construction sites in Puerto Rico were published in the Federal Register. No NPDES permit will be issued until a General Water Quality Certificate has been issued by the Environmental Quality Board (EQB) as required by Section 401 of the Clean Water Act.

The Navy must submit a Notice of Intent (NOI) to EPA at least two days prior to the commencement of construction. In addition, a Pollution Prevention Plan which outlines sediment and erosion controls and storm water management measures that will be used must

Table 5-1 PERMITS AND REVIEW REQUIRED FOR THE PROPOSED REDMAN ROAD IMPROVEMENTS	
Agency	Permits and Review Required
U.S. Army Corps of Engineers	Section 10/Section 404 Permit Issuance
U.S. Fish and Wildlife	Compliance with Section 7 of the Endangered Species Act
Commonwealth of Puerto Rico State Historic Preservation Office	Opportunity to Comment, Section 106 of the National Historic Preservation Act
U.S. Environmental Protection Agency	NPDES General Permit for Stormwater Discharges from Construction Sites Issuance including an NOI for Stormwater Management and Pollution Prevention Plan Review
Commonwealth of Puerto Rico Planning Board	Puerto Rico Coastal Zone Management Program Consistency Review
Commonwealth of Puerto Rico, Environmental Quality Board, Air Quality Program	Sediment and Erosion Control Plan Review Construction Permit Issuance
Commonwealth of Puerto Rico, Environmental Quality Board, Industrial Permits Section	Water Quality Certificate (Section 401) Issuance DS-3 Solid Waste Permit Issuance
Puerto Rico Department of Natural and Environmental Resources	Opportunity to Comment on State-listed Species

Source: Compiled by Ecology and Environment, Inc.

be prepared. All such measures must conform to any local or state requirements including those provisions of the Sediment and Erosion Control Plan required by the Commonwealth of Puerto Rico EQB. EQB requires that the erosion control plan be certified by a licensed professional engineer in the Commonwealth of Puerto Rico. In addition, the Navy will apply to the EQB for a DS-3 permit for disposal of nonhazardous solid wastes if wastes are in excess of 15 cubic yards per week.

The Navy will obtain a dredge and fill permit from the USACE for excavating and filling in wetlands as required by Section 404 of the Clean Water Act. A General Water Quality Certificate from the EQB will be required before such a permit is issued. Section 10 of the Rivers and Harbors Act is also administered by USACE. Individual Section 10 permits are required for construction activities that occur in navigable waterways. The tributary to the Cocal River is considered navigable by USACE. Before issuing Section 404/10 permits, the CWA requires that a Section 404(b)(1) guidelines analysis be completed. This EA presents a similar analysis as required by 404(b)(1) including an evaluation of the natural and cultural resources affected by the project and an analysis of alternatives that would minimize or eliminate the discharge of fill materials in the waters of the United States.

In accordance with the requirements of Section 7 of the Endangered Species Act, the Navy has notified the U.S. Fish and Wildlife Service (USFWS), Caribbean Office, of the proposed project (see Appendix D). The Navy will follow USFWS recommendations regarding mitigative measures that will protect any federally listed threatened or endangered species identified in the project area.

Lands owned by the federal government are excluded from the defined coastal zone. However, as required by Section 307(c) of the Coastal Zone Management Act, any federal activity that directly or indirectly affects the land or water or natural resources of the coastal zone must be consistent to the maximum extent practicable with the state/commonwealth-approved management program. A coastal consistency determination is prepared for these actions. In Puerto Rico, coastal consistency determinations are reviewed by the Planning Board. The Navy has made a determination that this project is consistent with the Puerto Rico CZMP and will submit this determination to the Puerto Rico Planning Board for concurrence. It is expected that the Planning Board will require the Navy to establish procedures to minimize impacts on the mangrove forest to ensure the protection of remaining mangrove stands.

Section 106 of the National Historic Preservation Act (NHPA) requires the Navy to consider the effects of its actions on any prehistoric or historic sites, districts, or objects listed on or eligible for listing on the National Register of Historic Places and to afford the

Advisory Council on Historic Preservation an opportunity to comment on actions which may have an adverse effect on these resources. The Puerto Rico State Historic Preservation Office was consulted regarding eligibility of cultural resources and recommendations (see Appendix D). An archaeological field assessment was performed, and it was concluded that the proposed action would have no effect on cultural resources.

The Clean Air Act (CAA) of 1970, 42 USC 7401 *et seq.*, amended 1977 and 1990 requires that Federal actions conform to the appropriate State Implementation Plan (Section 175[c]). These rules for CAA Conformity Determination are set forth in 40 CFR Parts 6, 51, and 93. These rules are only applicable to nonattainment areas and are therefore not relevant to the proposed project.

6

Summary of Mitigation Measures

This section summarizes mitigation measures intended to eliminate or reduce the severity of adverse effects resulting from the proposed action. These mitigation measures are listed in the order that corresponds to the discussion of environmental consequences in Section 4.

6.1 Topography, Geology, and Soils

In order to mitigate potential soil erosion impacts from construction activities under the proposed action, the Navy will:

- Prepare a Pollution Prevention Plan that will outline the soil erosion and sediment control measures which will be used, in accordance with specifications outlined in the Naval Facilities Engineering Command Guide NFGS-0156OC for Environmental Protection;
- Restore as nearly as possible, the natural drainage conditions by placing storm drainage piping and culverts in strategic locations along the road; and
- Re-establish vegetative cover in areas of exposed soil at the construction site.

6.2 Hydrology and Water Quality

In order to mitigate impacts to surface water resources related to construction and operation of the proposed action, the Navy will:

- Include storm water management features such as flow attenuation devices and/or velocity dissipation devices in their Pollution Prevention Plan, in accordance with EPA guidelines; and
- Promote natural drainage patterns by placing storm drainage piping and culverts in locations along the road.

6.3 Air Quality

In order to mitigate potential short-term impacts to air quality resulting from construction activities, the Navy will:

- Utilize standard construction procedures to reduce particulate emissions at construction sites, such as the use of water to reduce dust emissions and the use of covered vehicles for transporting construction materials; and
- Maintain emissions from construction equipment in accordance with federal regulations.

6.4 Noise

In order to mitigate potential short-term noise impacts resulting from construction activities, the Navy will:

- Limit construction to daytime hours, when noise sensitivity is lowest; and
- Require contractors to maintain noise control devices on construction equipment, such as mufflers, and comply with federal noise emission standards for construction.

6.5 Terrestrial and Aquatic Systems

In order to mitigate potential impacts to terrestrial and aquatic ecosystems resulting from the proposed action, the Navy will:

- Restore approximately 2.2 acres of filled upland area to wetland and 41.0 acres of grazed emergent wetland to historic *Pterocarpus* forest, and/or create approximately 6.0 acres of wetland from an existing upland area (see Appendix E);
- Avoid the *Pterocarpus* forest and limit construction to the west side of Redman Road in this area;
- Promote natural drainage patterns by placing storm drainage piping and culverts in the wetland areas where necessary;
- Install temporary soil erosion and sediment control measures to prevent degradation of stream water quality;
- Construct during periods of low flow; and
- Contact the base naturalist/biologist if a Puerto Rican boa is encountered during construction.

6.6 Transportation

In order to mitigate the potential short-term impacts to traffic, the Navy will provide warning signs, flashing lights, and/or flag persons to direct traffic safely around the construction area.

6.7 Land Use

In order to mitigate the potential land use impacts resulting from the proposed action, the Navy would amend the cattle ranchers' lease to exclude the 3 acres of land required for the road improvement project.

6.8 Socioeconomics

In order to mitigate the potential socioeconomic impacts resulting from the proposed action, the Navy will amend the cattle ranchers' lease.

6.9 Cultural Resources

No adverse impacts to archaeological sites would occur as a result of the proposed action, therefore, no mitigative measures are necessary.

6.10 Coastal Zone Management

In conformance with established policies of the Puerto Rico Coastal Zone Management Program, the Navy has determined the proposed project is consistent with Puerto Rico's CZMP and will submit this determination to the Puerto Rico Planning Board for concurrence.

- Biblioni, Carlos Padin, August 10, 1994, personal communication, Commonwealth of Puerto Rico, Department of Natural Resources, conversation with S. Lare of Ecology and Environment, Inc., Lancaster, New York.
- Briggs, Reginald P., 1964, Provisional Geologic Map of Puerto Rico and Adjacent Islands, Department of the Interior, United States Geological Survey, Miscellaneous Geologic Investigations Map I-392.
- Bureau of National Affairs, 1994, *Environmental Reporter*, Washington, D.C.
- Cardona, J.E., and H. Rivera, 1988, *Critical Coastal Wildlife Areas of Puerto Rico*, Commonwealth of Puerto Rico, Department of Natural Resources, San Juan, Puerto Rico.
- Commonwealth of Puerto Rico, Department of Natural Resources - Puerto Rico Coastal Zone Management Program, 1988, *Critical Coastal Wildlife Areas of Puerto Rico*, San Juan, Puerto Rico.
- Cowardin, Lewis M., 1979, *Classification of Wetlands and Deepwater Habitats of the United States*, U.S.F.W.S. 103 p. FWS/OBS-79/31.
- Creamer, Dennis F., 1989-1993, *Natural Resource Management, Fish and Wildlife Management Section, Naval Security Group Activity, Sabana Seca*, Puerto Rico, U.S. Fish and Wildlife Service, Panama City, Florida.
- Gelabert, Pedro A., 1994, Puerto Rico Department of Natural and Environmental Resources, San Juan, Puerto Rico.
- Guzman-Rios, S., and F. Quinones-Marquez, 1984, *Groundwater Quality at Selected Sites Throughout Puerto Rico*, U.S. Geological Survey, Water Resources Division, Open-File Data Report 84-058.
- Haddock, Jose, 1994, personal communication, Naval Security Group Activity, Environmental Division, Sabana Seca, Puerto Rico.
- Knezevich, Mary L., D.V.M., 1993, *A Study of the Free-Ranging Squirrel Monkeys (Sainoir Sciureus) of Sabana Seca, Puerto Rico*, University of Puerto Rico, San Juan.
- Larson, Bruce, 1994, personal communication, Navy Archaeologist, Norfolk, Virginia.

- Little, Elbert L. Jr., Frank H. Wadsworth, *Common Trees of Puerto Rico and the Virgin Islands*, Agriculture Handbook No. 249 U.S. Department of Agriculture Forest Service, 548 p.
- Montalvo, José, 1994, Base Naturalist/Biologist, Public Works Department, U.S. Naval Security Group Activity, Sabana Seca, Puerto Rico.
- Moreno, Jorge A., 1993, *Survey of Sensitive/Rare/Endangered/Threatened species at the Sabana Seca Naval Station, Puerto Rico*.
- Munsell Color, 1990, *Munsell Soil Color Chart*, MacBeth Division of Kollmerger Instruments Corporation, Baltimore, Maryland.
- Nature Conservancy, 1994, *Endangered, Threatened and Candidate Species on Navy and Marine Corps Lands: A Base-Specific Handbook*.
- Pabón, Arleen, 1994, personal communication/correspondence, State Preservation Officer, State Historic Preservation Office, San Juan, Puerto Rico.
- Perez, Anger, 1994, Environmental Quality Board, Water Quality Division, San Juan, Puerto Rico.
- Peterson, R.T., 1980, *Field Guide to Birds of East of the Rockies*, Houghton-Mifflin, Boston.
- Raffaele, Herbert A., 1970, *Birds of Puerto Rico and the Virgin Islands*, Princeton University Press, 266 p.
- Silander, Susan, 1994, Acting Field Supervisor, U.S. Fish and Wildlife Office, Boqueron, Puerto Rico.
- Torres-Gonzalez, A., and J. Diaz, 1984, *Water Resources of the Sabana Seca to Vega Baja Area, Puerto Rico*, U.S. Geological Survey, Water-Resources Investigations Report 82-4115.
- United States Bureau of the Census, 1982, *1980 Census of Population and Housing*, Washington, D.C.
- _____, 1992, *1990 Census of Population and Housing*, Washington, D.C.
- United States Department of Agriculture, (USDA) Soil Conservation Service, 1978, *Soil Survey of San Juan Area of Puerto Rico*, University of Puerto Rico, Agricultural Experiment Station, San Juan, Puerto Rico.
- _____, 1975, *Rare and Endangered Plants of Puerto Rico: A Committee Report*, Soil Conservation Service and Department of Natural Resources, San Juan, Puerto Rico.
- United States Department of Commerce, National Oceanic and Atmospheric Administration (NOAA), 1978, *Puerto Rico Coastal Management Program and Final Environmental Impact Statement*, prepared with the Commonwealth of Puerto Rico Department of Natural Resources and Planning Board, San Juan, Puerto Rico, Washington, D.C.

United States Department of the Navy, Atlantic Division, Naval Facilities Engineering Command, undated, *Master Plan, U.S. Naval Security Group Activity, Sabana Seca*, Puerto Rico.

_____, Atlantic Division, Naval Facilities Engineering Command, 1988, *Natural Resource Management Plan Land Management, Naval Security Group Activity, Sabana Seca*, Puerto Rico.

United States Environmental Protection Agency (USEPA), 1979, Office of Air Quality Planning and Standards Compilation of Air Pollutant Emission Factors (AP-42), Volume I: Stationary Point and Area Sources, Research Triangle Park, North Carolina.

United States Fish and Wildlife Service (USFWS), 1983, National Wetland Inventory Map, Bayamon Quadrangle, Puerto Rico.

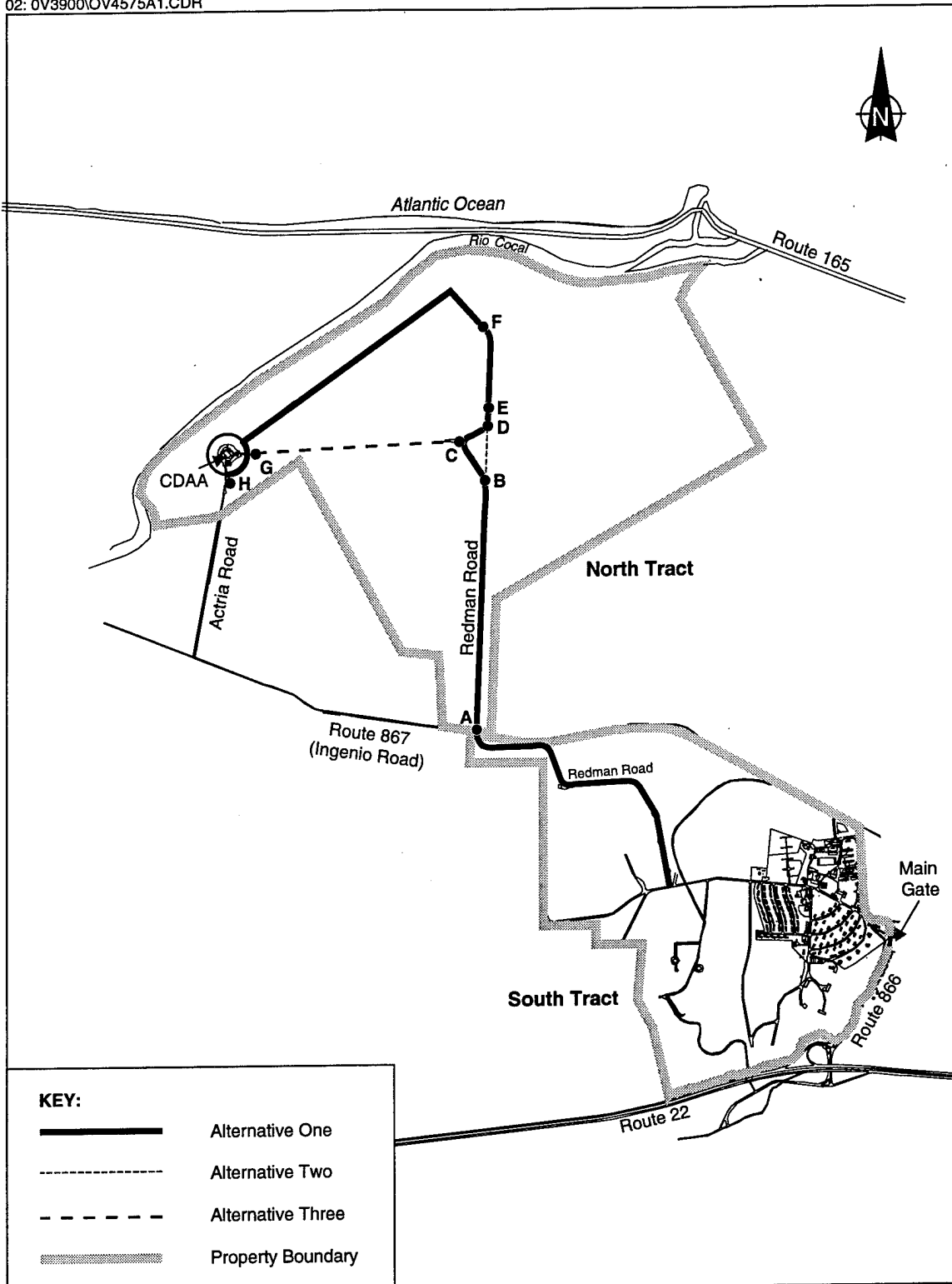
United States Geological Survey (USGS), 1969, Bayamon Quadrangle, Puerto Rico, 7.5 minute series (topographic) Department of the Interior.

A

Land Requirement Estimates

Land Requirement Estimates

This appendix provides an estimate of the land requirements for the proposed project. Figure A-1 shows the various points/lengths for which the additional land requirement widths change along the proposed alternatives, and the computation sheet provides the actual calculations for all three alternatives.



SOURCE: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994.

Figure A-1 LAND REQUIREMENT ESTIMATES FOR THE PROPOSED REDMAN ROAD PROJECT

General Computation Sheet

Preliminary	☐
Final	☒
Void	☐
Sheet <u>1</u> of <u>1</u>	Project No. <u>013000</u>
Rev.	Completed By
1	Initials: <u>RK</u> 12/14/94
	Initials: <u>AT</u> 12/14/94
	Initials: <u>11</u>

Name of Project Redman Road EA System NA
 Subject Road improvements/expansion

Alternative One:

Point A to C = 6000 ft. distance x 4 ft. expansion = 24000 sq. ft. impact
 Point C to E = 1000 ft. distance x 20 ft. expansion = 20000 sq. ft. impact
 Point E to F = 2000 ft. distance x 0 ft. expansion = 0 sq. ft. impact
 Point F to H = 7000 ft. distance x 10 ft. expansion = 70000 sq. ft. impact
 Turnout Areas = (16000 ft. distance ÷ 1320 ft. spacing) x (10 ft. x 30 ft. area) = 3636 sq. ft. impact

Total impact = 117636 sq. ft. = 2.7 acres

Alternative Two:

Point A to B = 5000 ft. distance x 4 ft. expansion = 20000 sq. ft. impact
 Point B to D = 1500 ft. distance x 44 ft. expansion = 66000 sq. ft. impact
 Point D to E = 350 ft. distance x 20 ft. expansion = 7000 sq. ft. impact
 Point E to F = 2000 ft. distance x 0 ft. expansion = 0 sq. ft. impact
 Point F to H = 7000 ft. distance x 10 ft. expansion = 70000 sq. ft. impact
 Turnout Areas = (15850 ft. distance ÷ 1320 ft. spacing) x (10 ft. x 30 ft. area) = 3602 sq. ft. impact

Total impact = 166602 sq. ft. = 3.8 acres

Alternative Three:

Point A to C = 6000 ft. distance x 4 ft. expansion = 24000 sq. ft. impact
 Point C to G = 4300 ft. distance x 44 ft. expansion = 189200 sq. ft. impact
 Point G to H = 1000 ft. distance x 10 ft. expansion = 10000 sq. ft. impact
 Turnout Areas = (11300 ft. distance ÷ 1320 spacing) x (10 ft. x 30 ft. area) = 2568 sq. ft. impact

Total impact = 225768 sq. ft. = 5.2 acres

B

**Lists of Plant and Animal Species
Expected to Occur in the Naval Security
Group Activity (NSGA), Sabana Seca**

Table B-1 LIST OF PLANT SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Leather fern	<i>Acrostichum sp.</i>
Palma de coyer	<i>Aiphanes acanthophylla</i>
Angelton grass	<i>Andropogon annulatus</i>
Carpet grass	<i>Anoxus compressus</i>
Black mangrove	<i>Avicennia germinans</i>
Bamboo	<i>Bambusa vulgaris</i>
Palo de Ramon ^b	<i>Banara vanderbiltii</i>
Saltwort	<i>Batis maritima</i>
Aquatic fern	<i>Bechum indicum</i>
Ucar	<i>Bucida buceras</i>
Almacigo	<i>Bursera simiruba</i>
Vahl's boxwood ^b	<i>Buxus vahlII</i>
Cassia	<i>Cassia spp.</i>
Spanish cedar	<i>Cederela odorata</i>
Sandspur	<i>Chenchrum sp.</i>
Cupey	<i>Clusia rosea</i>
Doveplum	<i>Coccoloba diversifolia</i>
Uverillo	<i>Coccoloba microstachya</i>
Moralon	<i>Coccoloba pubescens</i>
Ortegon ^a	<i>Coccoloba rugosa</i>
Sea grape	<i>Coccoloba uvifera</i>
Teyer palm	<i>Coccothrinax alta</i>
Fan palm	<i>Coccothrinax sp.</i>
Bermuda grass	<i>Cynodon dactylon</i>
Sedge	<i>Cyperus giganteus</i>
Daphnopsis ^a	<i>Daphnopsis hellerana</i>
Flamboyant tree	<i>Delonix regia</i>
Sanguinaria	<i>Dipholis salicifolia</i>
Rivergrass	<i>Echinochloa polystachya</i>

Table B-1 LIST OF PLANT SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Water hyacinth	<i>Eichornia crassipes</i>
Cock's-spur ^b	<i>Erythrina eggersii</i>
Grajo	<i>Eugenia axillaris</i>
Hoja menuda	<i>Eugenia biflora</i>
Anguila	<i>Eugenia foetida</i>
Palma de lluvia	<i>Gaussia attenuata</i>
Lignumvitae	<i>Guaiacum officinale</i>
Guayacan blanco	<i>Guaiacum sanctum</i>
Greenheart	<i>Guettarda scabra</i>
Hibiscus	<i>Hibiscus sp.</i>
Cedro macho	<i>Hyeronima clusioides</i>
Trumpetgrass	<i>Hymenachne amplexicaulis</i>
Railroad vine	<i>Ipomoea pes-caprae</i>
White mangrove	<i>Laguncularia racemosa</i>
Canelilla	<i>Licaria salicifolia</i>
Sawgrass	<i>Mariscus jamaicensis</i>
Maga	<i>Montezuma speciosissima</i>
Water lilies	<i>Nymphaea sp.</i>
Balsa	<i>Ochroma pyramidalis</i>
Prickly pear	<i>Opuntia dillenii</i>
Palo de rosa ^a	<i>Ottoschulzia rhodoxylon</i>
Aquatic grass	<i>Panicum aquaticum</i>
Paragrass	<i>Panicum purpurascens</i>
Paspalum	<i>Paspalum sp.</i>
Yellow poinciana	<i>Peltophorum pterocarpum</i>
Water lettuce	<i>Pistia stratiotes</i>
Kraenzlin's epidendrum ^b	<i>Psychilis kraenzlinii</i>
Palo de pollo	<i>Pterocarpus officinalis</i>
Box-briar	<i>Randia aculeata</i>
Red mangrove	<i>Rhizophora mangle</i>

Table B-1 LIST OF PLANT SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Red mangrove	<i>Rhizophora mangle</i>
Royal palm	<i>Roystonea borinquena</i>
Bull-tongue arrowhead	<i>Sagittaria lancifolia</i>
Tabiaba	<i>Sapium laurocerasus</i>
Sea purslane	<i>Sesuvium portulacastrum</i>
False-mastic	<i>Sideroxylon foetidissium</i>
African tulip tree	<i>Spathodea camporlata</i>
St. Augustine grass	<i>Stenotaphrum secundatum</i>
Roble blanco	<i>Tabebuia heterophylla</i>
India-almar	<i>Terminalia catappa</i>
Aquilon	<i>Terebraria resinosa</i>
Verdiseco	<i>Tetrazygia elaeagnoides</i>
Ceboruquillo	<i>Thouinia striata</i>
Cattails	<i>Typha sp.</i>
Spanish bayonet	<i>Yucca aliofolia</i>
Espino rubial	<i>Zanthoxylum martinicense</i>

^a Species of concern known to occur at NSGA, Sabana Seca.

^b Species of concern that are potentially present at NSGA, Sabana Seca.

Source: Creamer 1989.

Table B-2 LIST OF ANIMAL SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Birds	
Spotted sandpiper	<i>Actitis macularia</i>
Roseate spoonbill	<i>Ajaia ajaia</i>
West Indian whistling-duck ^b	<i>Dendrocygna arborea</i>
Lesser white-cheeked pintail ^b	<i>Anas bahamensis bahamensis</i>
West Indian ruddy duck ^b	<i>Oxyura jamaicensis jamaicensis</i>
Brown noddy tern	<i>Anous stolidus stolidus</i>
Mango hummingbird	<i>Anthracothorax dominicus</i>
West Indian great blue heron	<i>Ardea herodias adoxa</i>
Ruddy turnstone	<i>Arenaria interpes morinella</i>
Puerto Rican short-eared owl	<i>Asio flammeus portoricensis</i>
American bittern	<i>Botaurus lentiginosus</i>
Cattle egret	<i>Bubulcus ibis ibis</i>
West Indian green heron	<i>Butorides virescens maculatus</i>
Semipalmated sandpiper	<i>Calidris pusilla</i>
Least sandpiper	<i>Calidris minutilla</i>
Belted kingfisher	<i>Ceryle alcyon alcyon</i>
Thick-billed plover	<i>Charadrius wilsonia wilsonia</i>
Semipalmated plover	<i>Charadrius semipalmatus</i>
Antillean killdeer	<i>Charadrius vociferus</i>
Black tern	<i>Chlidonias niger suranamensis</i>
Puerto Rico emerald hummingbird	<i>Chlorostilbon maugaeus</i>
West Indian nighthawk	<i>Chordeiles gundlachii</i>
Antillean mangrove cuckoo	<i>Coccyzus minor nesiotes</i>
Puerto Rican bananaquit	<i>Coereba flaveola portoricensis</i>
Puerto Rican plain pigeon	<i>Columba inornata wetmorei</i>
Red-necked pigeon	<i>Columba squamosa</i>
White-crowned pigeon ^a	<i>Columba leucocephala</i>
Rock dove	<i>Columba livia</i>

Table B-2 LIST OF ANIMAL SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Puerto Rican common ground dove	<i>Columbina passerina</i>
Sanderling	<i>Crocethia alba</i>
Smooth-billed ani	<i>Crotophaga ani</i>
Yellow warbler	<i>Dendroica petechia</i>
Prairie warbler	<i>Dendroica discolor discolor</i>
Yellow warbler	<i>Dendroica petechia cruciana</i>
Reddish egret	<i>Dichromanassa rufescens colorata</i>
Snowy egret	<i>Egretta thula thula</i>
Great egret	<i>Egretta alba egretta</i>
Orange-cheeked waxbill	<i>Estrilda melpoda melpoda</i>
Red bishop	<i>Euplectes orix</i>
Peregrin falcon ^b	<i>Falco peregrinus</i>
American kestrel	<i>Falco sparverius</i>
Little blue heron	<i>Florida caerula caerula</i>
Caribbean coot ^b	<i>Fulica caribaea</i>
West Indian common gallinule	<i>Gallinula chloropus cerceris</i>
Black-necked stilt	<i>Himantopus himantopus</i>
Barn swallow	<i>Hirundo rustica erythrogaster</i>
Tricolor heron	<i>Hydranassa tricolor ruficolis</i>
Puerto Rican black-cowled oriole	<i>Icterus dominicensis</i>
Least bittern	<i>Ixobrychus exilis exilis</i>
Black-headed nun	<i>Lonchara malacca</i>
Laughing gull	<i>Larus atricilla</i>
Antillean pearly-eyed thrasher	<i>Margarops fuscatus fuscatus</i>
Puerto Rican woodpecker	<i>Melanerpes portoricensis</i>
Red-legged thrush	<i>Mimochicla plumbea ardosiaacea</i>
Antillean mockingbird	<i>Mimus polyglottus orpheus</i>
Black-and-white warbler	<i>Mniotilta varia</i>
Glossy cowbird	<i>Molothrus bonariensis minimus</i>

Table B-2 LIST OF ANIMAL SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Monk parakeet	<i>Myiopsitta monachus</i>
Yellow-crowned night heron	<i>Nyctanassa violacea violacea</i>
Bancroft's yellow-crowned night heron	<i>Nyctanassa violacea bancrofti</i>
Black-crowned night heron	<i>Nycticorax nycticorax hoactli</i>
Puerto Rican screech owl ^a	<i>Otus nudipes nudipes</i>
Parula warbler	<i>Parula americana</i>
Brown pelican ^a	<i>Pelecanus occidentalis</i>
Antillean cave swallow	<i>Petrochelidon fulva fulva</i>
Pied-billed grebe	<i>Podilymbus podiceps</i>
Glossy ibis	<i>Plegadis falcinellus</i>
Purple gallinule	<i>Porphyryula martinica</i>
Sora crake	<i>Porzana carolina</i>
Caribbean martin	<i>Progne dominicensis dominicensis</i>
Puerto Rican grackle	<i>Quiscalis niger brachypterus</i>
Greater antillean clapper rail	<i>Rallus longirostris caribaeus</i>
Bank swallow	<i>Riparia riparia</i>
Puerto Rican lizard cuckoo	<i>Saurothera vieilotti</i>
Northern waterthrush	<i>Seiurus noveboracensis</i>
American redstart	<i>Setophaga ruticilla ruticilla</i>
Puerto Rican stripe-headed tanager	<i>Spindalis zena portoricensis</i>
Bridled tern	<i>Sterna anaethetus recognita</i>
Sooty tern	<i>Sterna fuscata fuscata</i>
Roseate tern	<i>Sterna dougallii dougallii</i>
Least tern	<i>Sterna antillarum</i>
Common tern	<i>Sterna hirundo hirundo</i>
Sandwich tern	<i>Thalasseus sandvicensis</i>
Royal tern	<i>Thalasseus maximus maximus</i>
Puerto Rican yellow-faced grassquit	<i>Tiaris olivacea bryanti</i>
Lesser yellowlegs	<i>Tringa flavipes</i>

Table B-2	
LIST OF ANIMAL SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Greater yellowlegs	<i>Tringa melanoleuca</i>
Gray kingbird	<i>Tyrannus dominicensis</i>
Puerto Rican loggerhead	<i>Tyrannus caudifasciatus</i>
Zenaida Dove	<i>Zenaida aurita zenaida</i>
Crustaceans	
Beach hopper	<i>Emerita portoricensis</i>
Beach crab	<i>Hippia cubensis</i>
Ghost crab	<i>Ocypode quadrata</i>
Gray land crab	<i>Cardisoma guanhumi</i>
Fiddler crab	<i>Uca spp.</i>
Freshwater shrimp	<i>Macrobrachium carcinus</i>
Red mangrove crab	<i>Goniopsis cruentata</i>
Reptiles	
Slider	<i>Pseuemyss stejnegeri</i>
Puerto Rican boa ^a	<i>Epicrates inornatus</i>
Loggerhead ^a	<i>Caretta caretta</i>
Green turtle ^a	<i>Chelonia mydas</i>
Hawksbill ^a	<i>Eretmochelys imbricata</i>
Pacific Ridley ^a	<i>Lepidochelys olivacea</i>
Leatherback ^a	<i>Dermochelys coriacea</i>
Amphibians	
Sapo	<i>Bufo marinus</i>
Puerto Rican frog	<i>Leptodactylus albilabrus</i>
Coqui	<i>Eleutherodactylus coqui</i>

Table B-2	
LIST OF ANIMAL SPECIES EXPECTED TO OCCUR AT NSGA, SABANA SECA	
Common Name	Scientific Name
Mammals	
Mongoose	<i>Herpestes auropunctatus</i>
Manatee ^a	<i>Trichechus manatus</i>

^a Species of concern known to occur at NSGA, Sabana Seca.

^b Species of concern that are potentially present at NSGA, Sabana Seca.

Source: Creamer 1989.

C

List of Preparers

This EA was prepared for the Department of the Navy, Atlantic Division, Naval Facilities Engineering Command, Norfolk, Virginia, by Ecology and Environment, Inc. A list of the principal participants in the preparation of the EA is presented below.

LIST OF PREPARERS			
Name	Role	Degrees/ Date	Project Responsibility
Nancy Aungst	Technical Advisor	BS/1979	Quality control (QC); Quality assurance (QA)
Margaret J. Farrell, CHMM	Project Director	MS/1990 BA/1979	Project coordinator; review
Robin Kim	Project Manager	BS/1988	Project management; proposed action; alternatives; ecology
Sean Myers	Community Planner	MS/1992 BS/1986	Land use, coastal zone management, socioeconomics
Paul Azzopardi	Ecologist	BS/1985	Water resources; terrestrial environment
Matthew Kim	Air Specialist	BA/1985	Climate, air quality and noise
Ralinda Miller	Geologist	BS/1987	Topography, geology, and soils

D

Agency Correspondence



ecology and environment, inc.

International Specialists in the Environment

BUFFALO CORPORATE CENTER
368 Pleasantview Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

June 7, 1994

**Mr. James P. Olave
Field Supervisor
Caribbean Fish and Wildlife
P.O. Box 491
Boqueron, PR 00622**

Dear Mr. Olave:

Ecology and Environment, Inc., (E & E) has been contracted by the United States Naval Security Group Activity (NSGA), located in Sabana Seca, Puerto Rico, to prepare an environmental assessment for the proposed Redman Road improvements project. Enclosed is a copy of the Bayamon, Puerto Rico USGS 7.5' x 15' topographic map showing the proposed location.

An integral part of the environmental assessment involves the identification of threatened, endangered or other species of concern, wildlife refuges, significant habitats and other natural landscape features which may be directly or indirectly impacted by the construction and operation of this proposed project. Therefore, E & E would appreciate any information you have concerning the occurrence of the above mentioned items within the proposed project area.

We greatly appreciate your assistance in this matter. If you have any questions concerning this data request, please do not hesitate to call me at 716-684-8060.

Sincerely,

**Paul J. Azzopardi Jr.
Wildlife Biologist**

Enclosure

sv/OV3020
ENV 6229



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Caribbean Field Office
P.O. Box 491
Boqueron, Puerto Rico 00622



July 13, 1994

Mr. Paul J. Azzopardi Jr.
Wildlife Biologist
Ecology and Environment, Inc.
Buffalo Corporate Center
368 Pleasantview Drive
Lancaster, New York 14086

Re: US Naval Security Group
Redman Road improvements
Sabana Seca, P.R.

Dear Mr. Azzopardi:

This is in response to your request for environmental information on the above mentioned proposed project site. We have some concerns about this project, since the modification and increase of this road footprint would adversely impact critical resources in the area.

According to the National Wetlands Inventory Maps (enclosed), the project site lies mostly within wetlands that include mangroves, Pterocarpus forest, and herbaceous swamp areas. The Sabana Seca Naval Facilities is within the San Pedro Swamp area, which is a large fresh and brackish-water system divided by Road 867. This system is included in the 1988 Critical Coastal Wildlife Areas of Puerto Rico, a document from PR Department of Natural and Environmental Resources (Cardona and Rivera, 1988). Migratory and resident waterfowl are reported for this area. The status of San Pedro Swamp is presently considered to be a primary critical coastal wildlife area, principally due to the degradation or disappearance of similar nearby areas.

We recommend that you contact the US Army Corps of Engineers for a jurisdictional determination of wetlands, and Mr. Peter Ortíz from the Natural Heritage Program Office from the PR Department of Natural and Environmental Resources, (809) 724-8774. If you have any questions, please contact Ana Roman from our office. Our telephone number is (809) 851-7297.

Sincerely,

Susan Silander

Susan Silander
Acting Field Supervisor



ecology and environment, inc.

International Specialists in the Environment

BUFFALO CORPORATE CENTER
368 Pleasantview Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

June 7, 1994

**Mr. Pedro Gelabert
Department of Natural and Environmental Resource
P.O. Box 5887
San Juan, PR 00906**

Dear Mr. Gelabert:

Ecology and Environment, Inc., (E & E) has been contracted by the United States Naval Security Group Activity (NSGA), located in Sabana Seca, Puerto Rico, to prepare an environmental assessment for the proposed Redman Road improvements project. Enclosed is a copy of the Bayamon, Puerto Rico USGS 7.5' x 15' topographic map showing the proposed location.

An integral part of the environmental assessment involves the identification of threatened, endangered or other species of concern, wildlife refuges, significant habitats and other natural landscape features which may be directly or indirectly impacted by the construction and operation of this proposed project. Therefore, E & E would appreciate any information you have concerning the occurrence of the above mentioned items within the proposed project area.

We greatly appreciate your assistance in this matter. If you have any questions concerning this data request, please do not hesitate to call me at 716-684-8060.

Sincerely,

**Paul J. Azzopardi Jr.
Wildlife Biologist**

Enclosure

sv/OV3020
ENV 6228



DEPARTMENT OF NATURAL AND ENVIRONMENTAL RESOURCES

Paul J. Azzopardi Jr.
Wildlife Biologist
Ecology and Environmental, Inc.
Buffalo Corporate Center
3680 Pleasantview Drive
Lancaster, New York 14086

Dear Mr. Azzopardi:

The information enclosed corresponds to data extracted from files within the Puerto Rico Natural Heritage Program Data Bank. It is part of a package developed for the US Navy by our Heritage Program through a contract with The Nature Conservancy. We have compiled the information regarding threatened, endangered, and candidates for federal listing within that property. We hope this will assist you in the process of developing the environmental assessment.

Please do not hesitate to contact us if additional information is needed.

Cordially,

Pedro A. Gelabert
Secretary

PROR/log

**List of Threatened, Endangered and
Candidates for Federal Listing Species
in Sabana Seca**

Species	Status
<u>Epicrates inornatus</u>	E, EF
<u>Caretta caretta</u> [°]	V, TF
<u>Chelonia mydas</u> [°]	E, EF
<u>Dermochelys coriacea</u> [°]	E, EF
<u>Eretmochelys imbricata</u> [°]	E, EF
<u>Lepidochelys olivacea</u> [°]	T
<u>Pelecanus occidentalis</u>	E, EF
<u>Columba leucocephala</u>	CF2
<u>Otus nudipes</u>	CF2
<u>Trichechus manatus</u>	E, EF
<u>Falco peregrinus</u> ¹	E, EF
<u>Dendrocygna arborea</u> ¹	V, CF2
<u>Fulica caribaea</u> ¹	V, CF2
<u>Anas bahamensis bahamensis</u> ¹	CF2
<u>Oxyura jamaicensis jamaicensis</u> ¹	V, CF2
<u>Daphnopsis hellerana</u>	E, EF
<u>Ottoschulzia rhodoxylon</u>	E, EF
<u>Coccoloba rugosa</u>	TF (proposed)
<u>Erythrina eggersii</u> ¹	TF (proposed)
<u>Buxus vahliei</u> ¹	E, EF
<u>Banara vanderbiltii</u> ¹	E, EF
<u>Psychilis kraenzlinii</u> ¹	CF2
Pterocarpus forest	Critical Plant Community

Legend:

- [°] - present/imprecise locality info.
- ¹ - potential occurrence

Status Legend:

- E - Endangered, Commonwealth List
- EF - Endangered, Federal List
- V - Threatened, Commonwealth List
- TF - Threatened, Federal List
- CF2 - Candidate to Federal List, Category 2



DEPARTMENT OF THE NAVY

U S NAVAL SECURITY GROUP ACTIVITY SABANA SECA

FPO AA 34053

5090

Ser 331/

00795

22 JUL 1994

Dr. Arleen Pabón
State Preservation Officer (SHPO)
Office of the Governor
La Fortaleza
Box 82
San Juan, Puerto Rico 00901

Dear Doctor Pabón:

The Navy is proposing improvements to Redmon Road, located on Naval Security Group Activity Sabana Seca (NSGASS). Improvements include grading, paving, and filling (where necessary), approximately 15,400 linear feet of the northern tract, and approximately 8,500 feet in the southern tract (see attached maps). All construction activities will be confined to previously disturbed areas along the existing road. Fill activities associated with this project are designed to level the existing road bed prior to paving. The proposed road width in the northern tract is 12 feet; currently it is a gravel road approximately 10 feet wide. For the southern tract, the proposed road width is 20 feet; currently it is about 18 feet wide and paved.

Dr. Karen Anderson Córdova, Carlos A. Rubio, Bruce J. Larson (archaeologist for the Navy) and José Montalvo of NSGASS visited the southern tract on May 11, 1994. The site visit demonstrated that no potentially eligible historic resources would be affected. The northern tract was not visited by SHPO staff, however, Bruce Larson did drive through the entire portion of the project. He verified that the land is prior converted wetlands and that the area adjacent to the existing Redmon Road has been previously impacted by road construction activities.

Based on the fact that this project is an enhancement of an existing road, with very minimal associated construction impacts, and combined with the May 11 field visit of SHPO representatives, the Navy has determined that this proposed project will have no effect on historic resources.

It is our hope that your office will concur with this determination of no effect regarding this project. Should you or your staff have any questions please contact Mr. José Montalvo at 795-2255 extension 223.

Thank you in advance for your assistance.

Sincerely,

Ferdinand Feliciano
Ferdinand Feliciano, PE, REM
By direction of the
Commanding Officer

Enclosures:
Location maps (5)

Copy to:
COMNAVSECGRU (G435)
LANTNAVAFACENGCOM (Code 2031)



OFFICE OF THE GOVERNOR
LA FORTALEZA

Control 94-2646

August 18, 1994

Eng. Ferdinand Feliciano, PE, REM
Department of the Army
U.S. Naval Security Group Activity
Sabana Seca
FPO AA 34053

RE: SHEPO #97-21-94-01 IMPROVEMENTS TO REDMON ROAD, NAVAL SECURITY GROUP
ACTIVITY, SABANA SECA, TOA RAJA, PUERTO RICO

Dear Mr. Feliciano:

Our Office has received and reviewed the above referenced project in accordance with the Advisory Council on Historic Preservation's "Procedures for the Protection of Historic or Cultural Properties (36 CFR, Part 800)". The State Historic Preservation Officer has been requested by the Advisory Council to comment on the impact which federally funded, licensed or assisted projects may have on historic or archaeological sites. The authorities for these procedures are the National Historic Preservation Act of 1966 (Public Law 102-575) as amended in 1992 and Presidential Executive Order 11593 ("Protection and Enhancement of the Cultural Environment").

A review of islandwide files does not indicate any archaeological or historical sites, nor any properties listed or eligible for listing in the National Register of Historic Places in the area of the proposed project.

Based on the information submitted, it is our determination that, based on the information submitted, this project will have no effect upon historic properties, and recommend it proceed as planned. However, since the level of research is very low you should be advised that potential resources are unknown. We recommend that caution be exercised during the early stages of earthmovement. Should any cultural resources (historic or prehistoric) be encountered you must notify our Office immediately so that we may take the appropriate steps under 36 CFR, Part 800.11.

D-11

Eng. Ferdinand Feliciano, PE, REM
August 18, 1994
Page 2

If you have any questions concerning our comments, please do not hesitate to contact us. Your interest and cooperation in helping to protect Puerto Rico's archaeological and historical resources are appreciated.

Sincerely yours,



Aileen Pabón PhD
Historic Preservation Officer

AP/NM/mzo



DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1510 GILBERT ST
NORFOLK VA 23511-2699

TELEPHONE NO.

(804) 445-8603

IN REPLY REFER TO:

11000
2031SJ
25 August 1994

Ms. Susan Silander
Acting Field Supervisor
Caribbean Fish and Wildlife
P.O. Box 491
Boqueron, PR 00622

Dear Ms. Silander:

The Department of the Navy, Atlantic Division, Naval Facilities Engineering Command, is in the process of preparing an Environmental Assessment (EA) for Redman Road improvements at the Naval Security Group Activity (NAVSECGRUACT) Sabana Seca, Puerto Rico. An integral part of the EA involves the identification of potential impacts on federally-listed species and compliance with Section 7 of the Endangered Species Act (ESA) of 1973. This proposed road improvements will involve upgrading approximately 2.92 miles of the existing road at the North Tract, and minor grading and paving of approximately 1.61 miles at the South Tract (see attached figure).

Based on a threatened and endangered species survey of the Sabana Seca installation, the Puerto Rico Department of Natural Resources (DNR) identified four federally-listed species that may occur in the general vicinity of the proposed project. The brown pelican (*Pelicanus occidentalis*) and white-crowned pigeon (*Columba leucocephala*) were observed flying over the North Tract; and the Puerto Rican boa (*Epicrates inornatus*), white-crowned pigeon and *Daphnopsis hellerana* (no common name) were observed on the South Tract (Moreno 1993). In addition, the survey identified a rare *Pterocarpus officinalis* (forested fresh-water mangroves) wetland located on the North Tract (Moreno 1993).

The brown pelican occurs in the coastal habitats of Puerto Rico. Nesting is usually carried out on islands without mammalian predators. There is little potential that brown pelicans would nest in the North Tract mangrove areas traversed by the road, due to their inland location and the high incident of mongoose predation. Also, the improvements would not be impacting any pelican feeding areas. Therefore, no impacts to the brown pelican are anticipated.

The white-crowned pigeon has been observed in the mangrove areas at the North Tract, but all roosting on the installation has been restricted to the royal palms located in the South Tract (Moreno 1993). It is unlikely that the proposed work would disrupt the pigeon's feeding behavior, since it is on the fringe of the mangrove areas and the individuals at the South Tract appear to be well habituated to noise and traffic. In addition, Ecology and Environment, Inc. (E&E), the Navy's environmental consultant for the EA, did not observe any nests in the mangroves adjacent to the road during a field survey conducted June 13 through 17, 1994. Therefore, no adverse impacts to the white-crowned pigeon are anticipated.

The Puerto Rican boa occurs in all types of rain forest but is most abundant in areas of karst topography, such as the "haystack hills" in the southern portion of the South Tract. Due to the lack of travel corridors, the isolated mangrove areas of the North

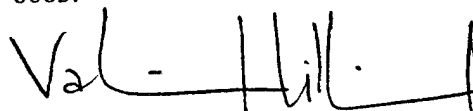
Tract are not considered suitable habitat. However, the forested areas and abandoned bunkers of the South Tract provide adequate shelter and food for the boa, and are considered suitable habitat. Hoggard-Eure, the engineering consultant for the proposed road improvements, has determined that no additional land and/or clearing (including access and staging areas) will be required for the minor upgrading of Redman Road in the South Tract. Therefore, no impacts to the Puerto Rican boa's habitat are anticipated. Because the boa is nocturnal, it is not expected that any individuals will be encountered during working hours. However, if a boa is encountered during construction, the base naturalist/biologist will be contacted immediately so that it may be removed from the project area without harm.

The *Daphnopsis hellerana* is a perennial shrub/tree native to the semi-evergreen forests of the karst regions in the northern Puerto Rico. During a 1989 survey conducted by D. Creamer of the U.S. Fish and Wildlife Service, seven individual plants were located on the South Tract, near the Caribbean Primate Research Center. However, since the *Daphnopsis hellerana* is restricted to the South Tract, and no clearing of vegetation will be required for road improvements in this area, no impacts to this plant are anticipated.

The mature *Pterocarpus officinalis* forest is located on the North Tract, on the east side of the existing Redman Road. The road passes through a 50 foot wide portion of the forest. The improvements will require clearing approximately 10 feet from the east side of the existing road. Therefore only 0.01 of an acre out of the 25-30 acre *Pterocarpus* forest will be permanently impacted by the project.

Based on the above, this Command is seeking your concurrence that the proposed road improvement is "not likely to adversely affect" any federally- listed species at NSGA Sabana Seca. With your concurrence, informal Section 7 consultation will be terminated and will not be re-initiated unless the proposed project is modified.

If you require additional information about the project, my point of contact is Ms. Sharon Jones. She may be reached at (804) 445-8603.



Valerie W. Hilliard, RLA
Natural/Cultural Resources
By direction of the Commander

Encl

Copy to:
COMNAVSECGRU (G-43)
NAVSECGRUACT Sabana Seca



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Caribbean Field Office

P.O. Box 491

Boqueron, Puerto Rico 00622

September 23, 1994

Ms. Valerie W. Hilliard, RLA
Natural/Cultural Resources
Department of the Navy
Naval Facilities Engineering Command
1510 Gilbert St.
Norfolk, Virginia 23511-2699

Dear Ms. Hilliard:

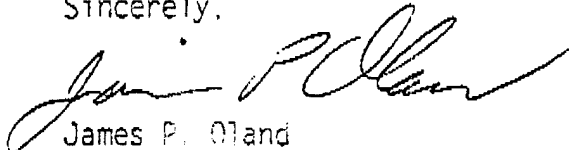
We have the following comments concerning your request for concurrence on the proposed improvement of 2.02 miles of existing road at the North Tract, and 1.61 miles of road at South Tract in the Sabana Seca Naval Facility, Sabana Seca, Puerto Rico.

Based on the information provided, we were unable to evaluate possible impacts of the proposed activity on candidate and listed species, or wetlands. As stated on your August 25, 1994 letter, the area where this project is proposed falls within the range of several species of special concern to the Service and the Department of Natural and Environmental Resources. Also, part of the area for this project is classified as wetland. Pterocarpus and mangrove forests within the proposed area would be impacted by the proposed activity. This office does not favorably endorse any activities that may affect wetlands. Alternatives should be considered to minimize impacts to wetlands, and mitigation for unavoidable impacts. If the road is likely to affect the hydrology of adjacent wetlands, measures should be included to reduce hydrology alterations. Since wetlands and associated habitats may be impacted, a jurisdictional determination from the Corps of Engineers should be made.

More detailed information on the proposed road alignment (e.g. road design, location map, mitigation plan) should be submitted before this office is in a position to endorse the proposed project. Please contact Mr. Jorge E. Saliva from my staff at 851-7297, to coordinate a visit to the proposed project site.

We have assigned log # 4-4-94-225 to the proposed project, and would appreciate it if you refer to this number in any future correspondence.

Sincerely,


James P. Oland
Field Supervisor

jes

cc: Director, Cultural Heritage Program, San Juan
Cultural Heritage Program, San Juan



United States Department of the Interior



FISH AND WILDLIFE SERVICE
Caribbean Field Office
P.O. Box 491
Boqueron, Puerto Rico 00622

January 26, 1995

Ms. Valerie W. Hilliard, RLA
Natural/Cultural Resources
Department of the Navy
Naval Facilities Engineering Command
1510 Gilbert St.
Norfolk, VA. 23511-2699

Dear Ms. Hilliard:

Since talking with you yesterday, I have reviewed our files and discussed the proposed Sebaná Seca road improvement project with the staff from this office. I understand your frustration with the delays that have occurred and assure you that we too would like to complete the evaluation of this project. As both Ms. Silander and I have stated, we do not believe there should be any great problems associated with the review of this project. I regret very much that Mr. Saliva was unable to make the field inspections that were previously scheduled. Had he been on site perhaps he could have clarified some of our information needs and been able to determine if there are potential problem areas.

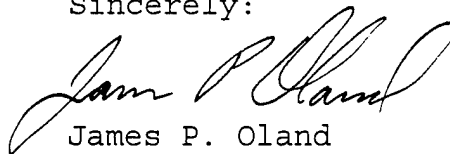
During our evaluation of projects and associated activities for potential impacts on endangered species, we generally provide an independent review of detailed site information and construction plans, in addition to making site inspections. This ensures that we understand the nature of the project being proposed and the limits of any potential impacts prior to making a determination. Based on the information provided in your letter dated 25 August 1994, it seems that you have considered the same factors we would normally look at during a Section 7 evaluation (e.g. the needs for roadside clearing and access or staging areas). While there is little doubt that all aspects of your assessment are correct, in order to comply with our endangered species oversight responsibilities, our evaluation needs to be independent and based on the project specific information.

Since we understood that a draft EA had been prepared or is being prepared for this project, we thought this document would be a logical source of information about the proposal. If you could provide us with this document or the project design information used in making your evaluation of the project impacts, I believe we could provide a rapid review, conduct a site visit with a

local representative and finalize the endangered species consultation process. If the EA also considers alternative routes and proposed mitigation for wetland impacts, having it available for review of those issues would facilitate our comments on those activities.

Again, I regret any unnecessary delays that may have occurred. As you know, we will still be working on the issues related to Corps permits, wetland impacts of the project and the review of mitigation proposals. In addition, we are very pleased to be assisting the Navy with a project to restore and enhance some of the base wetlands that are not associated with this project.

Sincerely:

A handwritten signature in cursive script, appearing to read "James P. Oland".

James P. Oland
Field Supervisor



DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
1510 GILBERT ST
NORFOLK VA 23511-2699

TELEPHONE NO:

(804) 322-4884
IN REPLY REFER TO:

January 27, 1995

Mr. James P. Oland
Field Supervisor
Caribbean Field Office
U.S. Fish and Wildlife Service
P.O. Box 491
Boqueron, PR 00622

Dear Mr. Oland:

We have received your letter, dated January 26, 1995, requesting additional information concerning a project to upgrade the existing Redman Road at Naval Security Group Activity (NSGA) Sabana Seca. In order for you to complete your independent review, we are providing you excerpts relevant to protected species from the project's **Draft** Environmental Assessment (EA). No detailed construction plans are available, since we are still in the very early stages of the design process. Design will not be completed until after the preferred alternative is chosen and the National Environmental Policy Act (NEPA) process is concluded.

We request that your representative, Mr. Jorge Saliva, schedule a site visit with Mr. Jose Montalvo, the Natural Resources Manager, at NSGA Sabana Seca as soon as possible. Our first letter informing you of this project and requesting concurrence on a "not likely to adversely affect" any federally listed species determination was dated August 25, 1994. We would prefer to complete our consultation requirements under Section 7 of the Endangered Species Act (ESA) prior to finalizing our EA. Any wetland issues which need to be addressed in accordance with the Clean Water Act are a separate issue and will be handled via separate correspondence.

We hope that your review of the enclosed information, will clarify any doubts that you may have about our determination on the potential affects of this project on federally listed species at NSGA Sabana Seca. If your office cannot respond based on the provided information, please inform us by February 08, 1995, so that we may terminate informal consultation. My point of contact regarding this matter is Ms. Sharon Jones at (804) 322-4884.

Sincerely,

CHARLES W. WALKER
Environmental Planning/
Natural Resources
By direction of the Commander

Encl

(1) Exerpts from the Draft Environmental Assessment

Copy to (w/o encl):
Mr. Ferdinand Feliciano, P.E.

Quality Performance . . . Quality Results



United States Department of the Interior



FISH AND WILDLIFE SERVICE

Caribbean Field Office

P.O. Box 491

Boqueron, Puerto Rico 00622

March 6, 1995

Mr. Charles W. Walker
Environmental Planning/Natural Resources
Department of the Navy
Naval Facilities Engineering Command
1510 Gilbert St.
Norfolk, Virginia 23511-2699

Dear Mr. Walker:

After evaluating the draft Environmental Assessment (D-EA) for the upgrade of existing Reedman Road in the Sabana Seca Naval Station, and a site visit to the proposed project with Mr. José Montalvo, from your staff, we believe that the proposed activity, as described in the D-EA, is not likely to have an impact on candidate, threatened, or endangered species. Although the endangered Puerto Rican boa (Epicrates inornatus) has been observed near the vicinity of the proposed project location, we believe that, given the on-site explanation by Mr. Montalvo, these areas would not be affected by the project. However, since wetlands would be impacted by the proposed activity, consultation under the Fish and Wildlife Coordination Act with our office should continue.

This does not constitute a Biological Opinion as described under Section 7 of the Endangered Species Act, however, it does fulfill the requirements of the Act and no further action is required. If additional modifications are made to the project, or if additional information indicating potential impacts to listed species becomes available, consultation should be reinitiated.

Please contact Mr. Jorge E. Saliva from my staff at 851-7297, if you have any questions regarding our comments.

Sincerely,

James P. Oland
Field Supervisor

jes

cc: DNER, Natural Heritage Program, San Juan
COE, San Juan

E

Conceptual Wetland Mitigation Plan

Conceptual Wetlands Mitigation Plan for the Redman Road Improvements Project, U.S. Naval Security Group Activity, Sabana Seca, Puerto Rico

Based on the project description and construction activities discussed in the environmental assessment, approximately 3.0 acres of wetlands will be impacted: 2.9 acres of grazed marshland and 0.1 acre of black mangrove forest. The following mitigative measures are being considered to offset the wetland impacts of the planned project.

1. Replacing all existing bridges with large concrete box culverts so that the existing flow will not be interrupted or impeded by construction activities. In addition, replacing all existing storm drainage pipes/culverts during construction activities, and installing new pipes/culverts at the natural ground contour where the raised road grade impedes the natural flow of surface water between wetland areas. Placing culverts at 100- and 300-foot intervals throughout the project area. These culverts would be adequately sized and placed at proper invert elevations to maintain identical groundwater hydrology on both sides of the proposed road. The current proposal is to place dual 24-inch diameter culverts at each location. These culverts will be installed in compliance with the standards and specifications for storm drain outlet protection (i.e., rock riprap) as defined by the U.S. Department of Agriculture Soil Conservation Service for the Caribbean Area.
2. A detailed mitigation plan following district guidelines will be submitted to the Puerto Rico District, U.S. Army Corps of Engineers (USACE) concurrent with a Section 404 permit application. Proposed mitigation areas located within the Naval Security Group Activity (NSGA) may include Areas A, B, C and D (see attached Figure E-1) and are as follows:
 - In Area A, excavating old fill materials to the pre-existing ground contour. The removal of this old gravel roadbed and pad material would restore approximately 2.0 acres of historic wetlands.
 - In Area B, excavating old fill materials to the pre-existing ground contour. The removal of this old gravel roadbed and pad material would restore approximately 0.2 acre of historic wetlands.
 - In Area C, excavating approximately 7.5 acres of a forested upland area to create wetland habitat. The creation of this wetland would require lowering

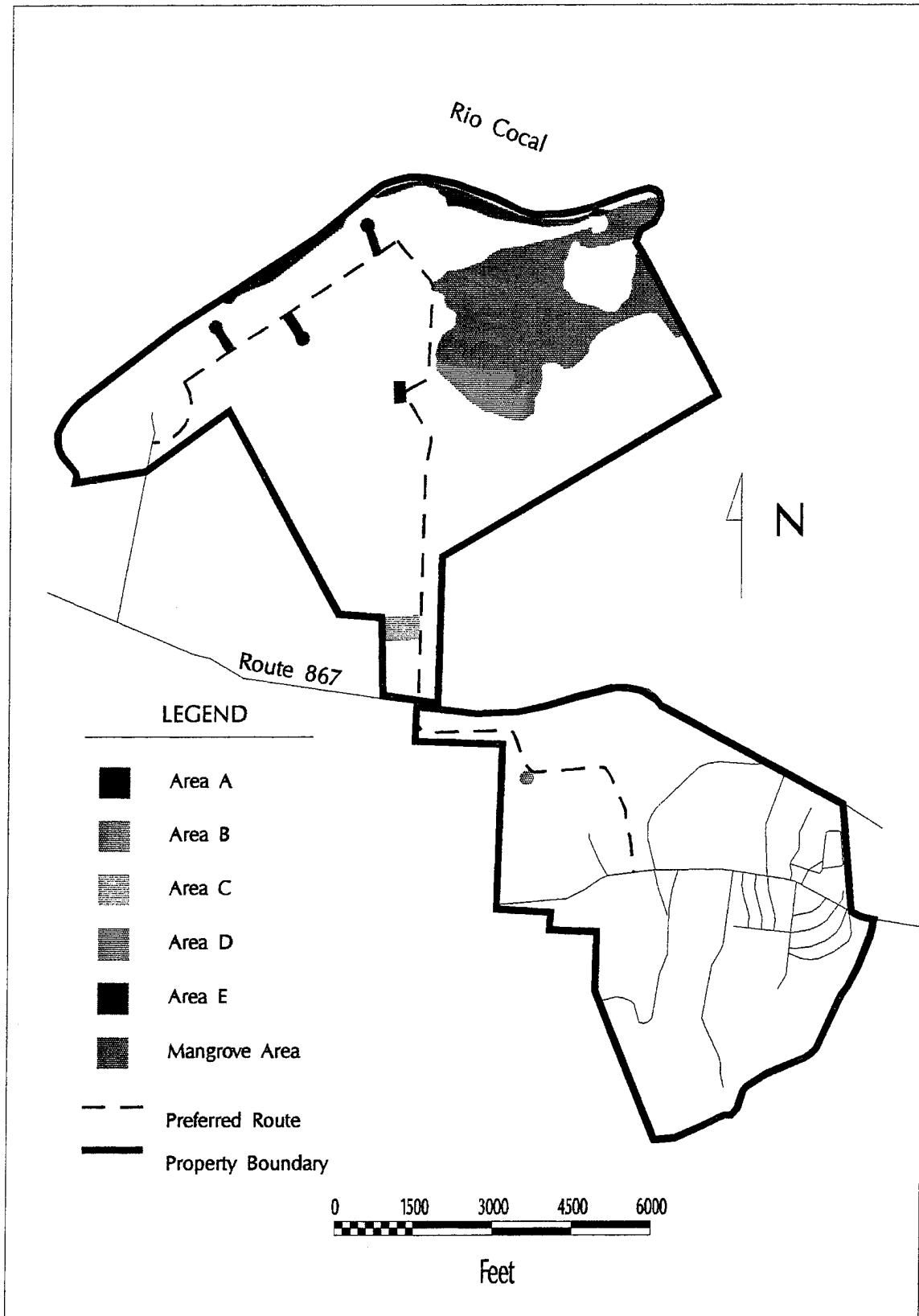
the elevation of the existing site approximately 3 feet to the depth of the seasonal high water table. Mitigation Area C is not a preferred mitigation type since it does not involve restoration of a previously disturbed wetland. In addition, since this is an upland area it is considered to be potentially sensitive for cultural resources; an archaeological survey is under way to determine this area's cultural resource potential.

- In Area D, enhancing approximately 28.0 acres of grazed emergent wetlands to restore historic *Pterocarpus* forest. Initially, a cattle exclusion fence would be installed to separate the proposed 28.0-acre mitigation/restoration compartment from intensive grazing pressure of the surrounding area under agricultural out-lease. This proposal would entail expanding an existing Memorandum of Agreement between NSGA Sabana Seca and the University of Puerto Rico (UPR) to study and restore the *Pterocarpus* forest. UPR personnel would collect *Pterocarpus* seeds from the existing forest to establish a nursery. When the seedlings reach a height of approximately one meter and obtain a diameter of one centimeter, they would be transplanted to the mitigation site. Moderate controlled grazing pressure may then be applied to maintain a relative open canopy until the young *Pterocarpus* trees grow above the surrounding emergent vegetation. The proposed ratio for this enhancement mitigation would be 4:1, which is consistent with standard EPA Guidelines for mitigation ratios. Under the Memorandum of Agreement the UPR would monitor the mitigation site for a five-year period. This mitigation proposal is the preferred alternative since it would restore an historic critical habitat using minimal earth-disturbing activities. Regulatory interagency support for this mitigation proposal was ascertained during a January 17, 1995, meeting among USACE, U.S. Fish and Wildlife Service (USFWS), UPR, and Navy personnel.
- In addition, NSGA Sabana Seca is planning to construct approximately 20,000 feet of exclusionary cattle fencing (Area E) to enhance and preserve approximately 28 acres of mangrove wetlands and subsequently improve water quality. However, this activity is not associated with the proposed project.

The excavated materials from Areas A and B are proposed to be reused as road subgrade material for the Redman Road improvement project. However, the excavated materials from Area C would require off-site disposal in a USACE-approved upland disposal site, since this material is not suitable for use as highway subgrade. No site work within wetlands will be conducted until the detailed mitigation plan is approved by the USACE and a Section 404 permit is granted. The Puerto Rico District, USACE will be notified in writing prior to commencing initial road work.

3. The USACE final approved mitigation plan would be constructed concurrently with initial road work, and would be completed within one year after the start of construction. Areas A, B, C and D would be temporarily fenced to allow adequate time for the re-establishment of native vegetation.
4. A detailed monitoring program/plan will be developed in accordance with the Jacksonville District, USACE's mitigation guidelines to measure the success and/or failure of the mitigation areas. The monitoring plan will define the

measurable goals of each mitigation area; percent survival, stem density counts, and aerial cover measurements are standard criteria for determining success. Quarterly monitoring reports, including color slide documentation, will be provided to USACE for two years after completion of the mitigation areas. The reports will provide a brief analysis of the degree that the mitigation area is functioning as a wetland. Vegetation and hydrology of the mitigation areas will be compared to the wetlands criteria as specified in the 1987 USACE *Manual for Identifying and Delineating Wetlands*. Each monitoring report will include 35-mm color slides photographed from the ground (at the same position and angle), that best illustrate the success and/or failure of the mitigation efforts.



Source: Ecology and Environment, Inc. 1994, adapted from U.S. Department of the Navy 1994 and U.S. Fish and Wildlife Service, 1983.

**Figure E-1 PROPOSED WETLAND MITIGATION AREAS
NSGA SABANA SECA, PUERTO RICO**