

Final

# No Action Decision Document for 4 Consent Order Sites and 6 PI/PAOC Sites

Former Vieques Naval Training Range  
Vieques, Puerto Rico



Prepared for  
**Department of the Navy**  
**NAVFAC ATLANTIC**

Contract No. N62470-02-D-3052  
CTO-007

January 2009

Prepared by  
**CH2MHILL**

1/1/09-02769

Final

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**Former Vieques Naval Training Range  
Vieques, Puerto Rico**

Contract Task Order 007

January 2009

Prepared for

**Department of the Navy  
Naval Facilities Engineering Command  
Atlantic**

Under the

**LANTDIV CLEAN III Program  
Contract N62470-02-D-3052**

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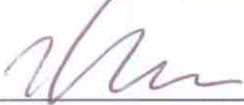
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# Declaration

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The United States Department of the Navy (US Navy), in partnership with the United States Environmental Protection Agency (USEPA), Puerto Rico Environmental Quality Board (PREQB), and United States Department of Interior Fish and Wildlife Service (USFWS), has determined, based on the information contained within this Decision Document, that no further investigative activities are warranted and that no action is necessary to be protective of human health and the environment at the following site screening areas:

- Solid Waste Management Unit (SWMU) 5 – Spent Battery Accumulation Area at OP-1
- SWMU 8 – Waste Oil Accumulation Area at OP-1
- SWMU 12 – Solid Waste Collection Unit Area near OP-1
- Area of Concern (AOC) F – Camp Garcia Rock Quarry
- Photo-Identified site (PI) 11 – Former Pump Station for Seawater and Sanitary Wastewater Outfall
- PI 20 – Former Observation Point and Potential Quarry
- PAOC T – Former Public Works Grounds Contractor Storage Shed and Mechanics Shop
- PAOC U – Former Vehicle Maintenance Area
- PAOC V – Former Leaking Transformer Storage Area
- PAOC W – Former Area of Stagnant, Discolored Water

  
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Kevin Cloe, US Navy Remedial Project Manager

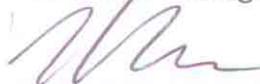
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- Unidad de Manejo de Desperdicios Sólidos (SWMU por sus siglas en inglés) 5 – Área de Almacenamiento de Baterías Usadas en OP-1 (Punto de Observación 1)
- SWMU 8 – Área de Almacenamiento de Aceite de Desecho en OP-1
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Kevin Cloe, Gerente de Proyectos de Remediación de la Marina

  
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Daniel Rodriguez, USEPA Remedial Project Manager

1/16/09

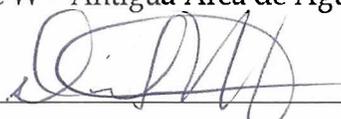
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Daniel Rodríguez, Gerente de Proyectos de Remediación de USEPA

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Wilmarie Rivera

Wilmarie Rivera, PREQB Remedial Project Manager

11/15/2009

Date

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Wilmarie Rivera

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11/15/2009

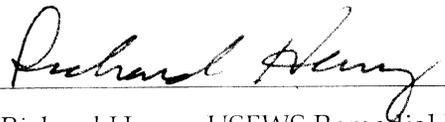
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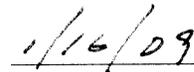
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Richard Henry, USFWS Remedial Project Manager



Date

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Richard Henry, Gerente de Proyectos de Remediación de USFWS

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# Acronyms and Abbreviations

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AOC	Area of Concern
AST	aboveground storage tank
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA Liability Act	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
DAF	dilution attenuation factor
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
EBS	Environmental Baseline Survey
ELCR	excess lifetime cancer risk
EMA	Eastern Maneuver Area
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERI	Environmental Research, Inc.
FID	flame ionization detector
HQ	hazard quotient
Kv	Geologic zone (sandstone, siltstone, conglomerate, lava, tuff, and <i>tuffaceous breccia</i> )
µg/kg	micrograms per kilogram
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
NAPR	Naval Activity Puerto Rico
NAVFACENGCOM	Naval Facilities Engineering Command
NAVY	United States Navy
NOAA	National Oceanic and Atmospheric Administration
NSRR	Naval Station Roosevelt Roads
OP	observation post
PA	Preliminary Assessment
PA/SI	Preliminary Assessment/Site Inspection
PAOC	Potential Area of Concern

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PCB	polychlorinated biphenyl
PI	Photo-Identified Site
ppt	parts per trillion
PREQB	Puerto Rico Environmental Quality Board
PRG	Preliminary Remediation Goal
Qa	Geologic zone (alluvial deposits (sand, silt, and clay))
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RSL	Regional Screening Level
SSL	Soil Screening Level
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCL	Target Compound List
TDS	total dissolved solids
TEQ	toxicity equivalence
TI	Geologic zone (marine sedimentary rocks (report indicated variable limestones))
TPH	total petroleum hydrocarbon
TPH-DRO	total petroleum hydrocarbon - diesel range organics
TPH-GRO	total petroleum hydrocarbon - gasoline range organics
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UCL	upper confidence limit
UTL	upper tolerance limit
VNTR	Vieques Naval Training Range
VOC	volatile organic compound
VSI	Visual Site Inspection

# Executive Summary

---

This Decision Document memorializes formal concurrence among the stakeholder agencies (United States Navy [Navy], United States Environmental Protection Agency [USEPA], Puerto Rico Environmental Quality Board [PREQB], and United States Fish and Wildlife Service [USFWS]) that no action is necessary at 10 site screening areas located within the former Vieques Naval Training Range (VNTR) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Figure ES-1 shows the geographic location of Vieques, including the former VNTR, in relation to mainland Puerto Rico and the surrounding islands. The locations of the sites contained within this Decision Document are shown in Figure ES-2. The sites included in this Decision Document are:

- Solid Waste Management Unit (SWMU) 5 - Spent Battery Accumulation Area at Observation Post (OP) - 1
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The no action determinations made for these sites is based on an understanding of historical site uses, potential contaminant sources, and potential CERCLA-related release mechanisms; site visit observations; and, where warranted, collection and evaluation of site-specific environmental media samples. Table ES-1 summarizes the information upon which the no action determinations have been made for each of the sites. More detailed discussion is presented in each of the site-specific sections contained in this Decision Document.

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**Table ES-1**  
 Summary of No Action Determinations  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

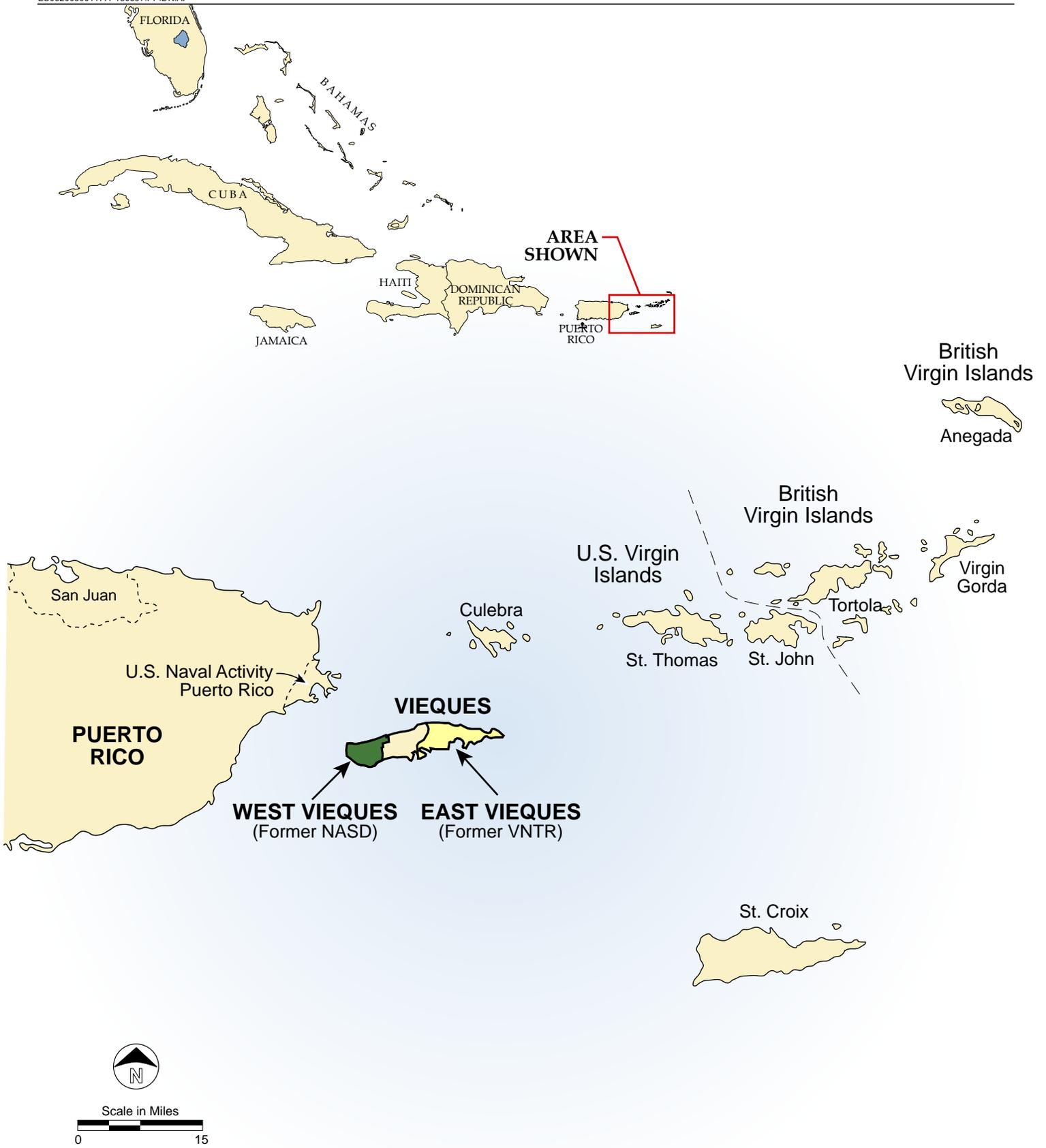
Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of PA/SI Decision Analysis	Rationale for No Action Determination
SWMU 5	Spent Battery Accumulation Area	Area where spent batteries and battery acid at OP-1 were temporarily staged.	Batteries and battery acid	Leaks to ground surface or concrete surface with runoff to ground surface	4 surface soil samples adjacent to concrete pad in area where battery staging was done	CERCLA-related release has not occurred or potential release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
SWMU 8	Waste Oil Accumulation Area	Area where waste lubricants and oil at OP-1 were temporarily staged.	Drums of waste lubricants and oil	Leaks or spills to ground surface or concrete surface with runoff to ground surface	5 surface soil samples adjacent to concrete pad in area where drum staging was done	Any potential CERCLA-related release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
SWMU 12	Solid Waste Collection Area	Area where domestic solid waste (i.e., trash) from OP-1 was temporarily staged.	None likely; staged domestic solid waste (trash)	Leaks or spills to ground surface	5 surface soil samples within staging area	CERCLA-related release has not likely occurred or potential release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Site was not used to store hazardous waste from OP-1 (other areas were); potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
AOC F	Rock Quarry	Source of gravel for road construction and other projects.	None likely; trash observed in one area of quarry during 1995 site visit	None likely; leaking from trash to ground surface assumed for purposes of evaluation	5 surface soil samples around area where trash was observed; 42 composite crushed rock samples from quarried material	CERCLA-related release has not likely occurred.	Site was a rock quarry; not intended for use to store or dispose of hazardous waste; potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
PI 11	Former Pump Station for Seawater and Sanitary Wastewater Outfall	Station used to pump seawater from natural lagoon to Camp Garcia and outfall for sanitary wastewater from Camp Garcia.	None likely; staining (likely rust) observed on ground next to building and diesel generator observed near building	None likely; releases from building and associated equipment (e.g., diesel generator) assumed for the purposes of evaluation	3 surface soil samples collected in vicinity of potential sources	CERCLA-related release has not likely occurred or potential release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Site was not intended for use to transfer hazardous waste; potential release area sufficiently characterized; no unacceptable risk.
PI 20	Former Observation Point and Potential Quarry	Site is currently a lagoon. Historically site was used as an observation point for landing exercises at PI 21. In addition, site may have been used as a quarry before becoming a lagoon under natural conditions.	None likely. No evidence of disposal or release observed during site visits.	None likely	No sampling necessary due to historic site use and observation of current conditions	Not applicable	Site was an observation point and potentially used as a quarry; has filled in naturally to become a lagoon.

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**Table ES-1**  
 Summary of No Action Determinations  
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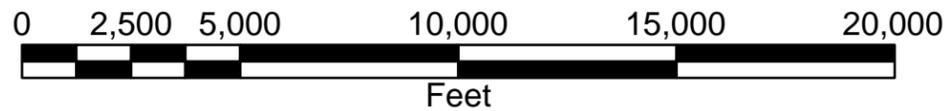
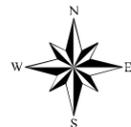
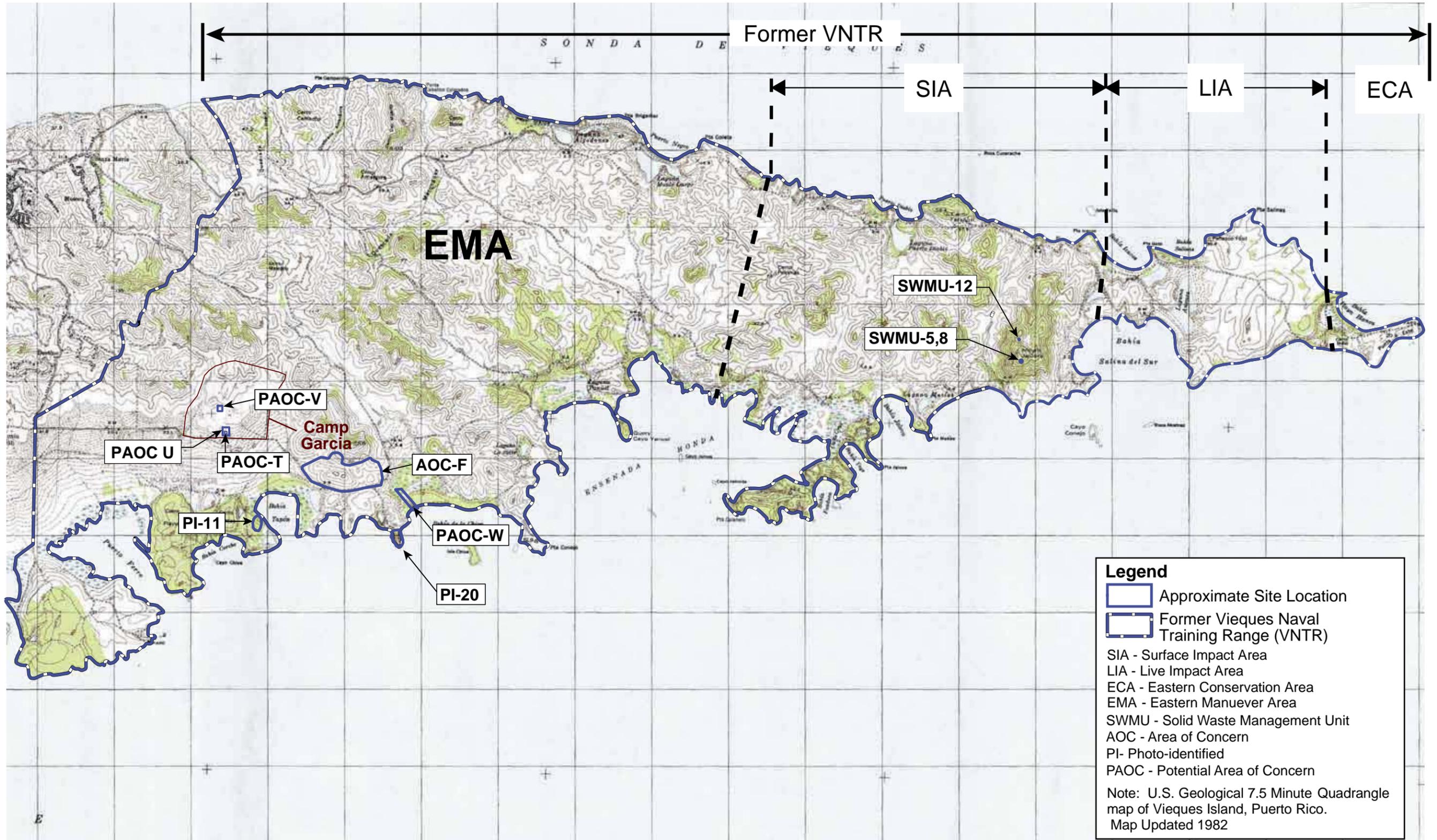
Site Name	Site Description	Site History	Potential Source(s)	Potential Release Mechanism(s)	Site-specific Data Collected	Results of PA/SI Decision Analysis	Rationale for No Action Determination
PAOC T	Former Public Works Grounds Contractor Storage Shed and Mechanics Shop (part of PAOC U)	Grounds contractor support facilities	Public works material storage and use	Spills or leaks from grounds contractor equipment to ground surface	2 co-located surface and subsurface soil samples within footprint of former storage shed and mechanics shop as part of PAOC U investigation	CERCLA-related release has not likely occurred or potential release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
PAOC U	Vehicle Maintenance Area	Vehicle maintenance; public works contractor storage shed; mechanics shop	Vehicle maintenance operations; materials storage	Spills or leaks to ground surface	4 surface soil samples, 9 co-located surface soil and subsurface soil samples, 1 monitoring well across vehicle maintenance area	CERCLA-related release has not occurred or potential release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Potential sources removed; potential release area sufficiently characterized; no unacceptable risk.
PAOC V	Former Leaking Tranformer Storage Area	One-time use for temporary storage of a leaking transformer	Leaking transformer	Leaks to ground surface	2 surface soil samples in area of former transformer	CERCLA-related release has not resulted in constituent levels that pose an unacceptable human health or ecological risk.	Potential source removed; potential release area sufficiently characterized; no unacceptable risk.
PAOC W	Former Area of Stagnant, Discolored Water	Lagoon cut off from normal circulation of seawater by road	None likely	None likely	No sampling necessary because no source of historic release	Not applicable	Site was a lagoon cut off from normal circulation of seawater which altered the existing conditions.

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**Figure ES-1**  
**Regional Location Map**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Figure ES-2**  
**Former VNTR Site Location Map**  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

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# Resumen Ejecutivo

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Este Record de Decisión registra la aceptación formal de las agencias interesadas (la Marina de los Estados Unidos [La Marina], la Agencia de Protección Ambiental de los Estados Unidos [EPA por sus siglas en inglés], la Junta de Calidad Ambiental de Puerto Rico [JCA], y el Servicio de Pesca y Vida Silvestre del Departamento del Interior de los Estados Unidos [USFWS por sus siglas]) para 10 áreas evaluadas en el Antiguo Campo de Adiestramiento Naval de (VNTR por sus siglas en inglés) según la Ley de Respuesta, Compensación y Responsabilidad Ambiental (CERCLA por sus siglas en inglés). La Figura ES-1 muestra la ubicación geográfica del VNTR en relación con la Isla de Puerto Rico e islas circundantes. La localización de los sitios que componen este Record de Decisión se muestra en la Figura ES-2. Los sitios que se incluyen en este Record de Decisión son:

- Unidad de Manejo de Desperdicios Sólidos (SWMU por sus siglas en inglés) 5 – Área de Almacenamiento de Baterías Usadas en OP-1 (Punto de Observación 1)
- SWMU 8 – Área de Almacenamiento de Aceite de Desecho en OP-1
- SWMU 12 – Área de Acumulación de Desperdicios Sólidos cerca de OP-1
- Área de Preocupación (AOC por sus siglas en inglés) F – Cantera del Campamento García
- Sitio Identificado con Fotografía Aérea (PI por sus siglas en inglés) 11 – Antigua Estación de Bombeo y Salida de Agua Sanitaria y Agua Salada
- PI 20 – Antiguo Punto de Observación y Potencial Cantera
- PAOC T -- Antiguo Cobertizo de Almacenamiento del contratista de mantenimiento de los terrenos y el Taller de Mecánica de Obras Públicas.
- PAOC U – Antigua Área de Mantenimiento de Vehículos
- PAOC V – Antigua Área de Almacenamiento de Transformadores con Fugas
- PAOC W – Antigua Área de Agua Estancada Descolorida

En base a la información que se conoce sobre los usos históricos de los sitios, las fuentes de contaminación potenciales, los mecanismos de escape de contaminantes potenciales regulados por CERCLA; observaciones hechas durante visitas al sitio; y donde fue necesario, la recopilación y evaluación de muestras de medios ambientales de sitios específicos, se determinó que no se es necesaria ninguna otra acción en estos sitios. La tabla ES-1 resume la información sobre la determinación de “no acción” para cada uno de los sitios. Información más detallada sobre cada una de los sitios específicos se encuentra por secciones en este Record de Decisión.

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**Tabla ES-1**

Resumen de la Resolución de No Acción

4 Sitios de la Orden de Consentimiento y 6 Sitios PI/PAOC

Vieques, Puerto Rico

Nombre del Sitio	Descripción del Sitio	Historia del Sitio	Fuente(s) Potenciales	Mecanismo(s) de Escape Potenciales	Datos de las Muestras que se Colectaron de los Sitios Específicos	Resultados del Análisis de la Decisión PA/SI	Desarrollo de la Determinación de No Acción
SWMU 5	Área de Almacenamiento de Baterías Usadas	Área donde se acumulaban provisionalmente baterías usadas y ácidos en OP1.	Baterías usadas y ácidos	Fugas sobre la superficie del terreno o sobre el concreto con escapes hacia la superficie del terreno	4 muestras de suelo superficial junto a la plataforma de concreto en el área donde se acumulaban las baterías	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable a la salud humana o un riesgo ecológico.	Se removieron las fuentes potenciales; se caracterizó suficientemente el área del escape potencial; no existe un riesgo inaceptable.
SWMU 8	Área de Almacenamiento de Aceite de Desecho	Área donde se acumulaban provisionalmente lubricantes y aceites en OP-1.	Drones de lubricantes y aceites de desecho	Fugas sobre la superficie del terreno o sobre el concreto con escapes hacia la superficie del terreno	5 muestras de suelo superficial junto a la plataforma de concreto en el área se acumulaban los drones	Cualquier escape potencial regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	Se removieron las fuentes potenciales; se caracterizó suficientemente el área del escape potencial; no existe un riesgo inaceptable.
SWMU 12	Área de Acumulación de Desperdicios Sólidos	Área donde se acumulaban provisionalmente los desperdicios sólidos (por ejemplo, basura) de OP1.	Poco probable; almacenamiento de desperdicios sólidos domésticos (basura)	Fugas o derrames sobre la superficie del terreno	5 muestras de suelo superficial dentro del área de almacenamiento	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	No se usó el sitio para almacenar desperdicios peligrosos de OP1 (otras áreas se usaron para eso); se removieron las fuentes potenciales; se caracterizó suficientemente el área del escape potencial; no existe un riesgo inaceptable
AOC F	Cantera de Roca	Fuente de abastecimiento de gravilla para la construcción de carreteras y otros proyectos.	Poco probable; se observó basura en una área de la cantera durante una visita al sitio en 1995	Poco probable; para llevar a cabo la evaluación se asumió que existieron derrames provenientes de la basura sobre las superficie de los terrenos	5 muestras de suelo superficial alrededor del área donde se observó basura; 42 muestras compuestas de roca en pedazos del material de la cantera	Es poco probable que haya ocurrido un escape regulado por CERCLA.	El sitio fue una cantera de roca; no fue usado par almacenar o disponer de materiales de desecho peligrosos; se removieron las fuentes potenciales; se caracterizó suficientemente el área del escape potencial; no existe un riesgo inaceptable
PI 11	Antigua Estación de Bombeo y Salida de Agua Sanitaria y Agua Salada	Estación que se usaba para bombear el agua salada desde la laguna natural al Campamento García y salida del agua de desecho proveniente del Campamento García.	Poco probable; se observó manchas (posiblemente óxido) sobre los terrenos junto al edificio donde se localizaba el generador diesel	Poco probable; para llevar a cabo la evaluación se asumió que existieron escapes de dentro del edificio o del equipo de apoyo (por ejemplo, del generador diesel)	3 muestras de suelo superficial se colectaron en las cercanías de las fuentes potenciales	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	El sitio no fue usado para transportar desperdicios peligrosos; se removieron las fuentes potenciales; se caracterizó lo suficiente el área del escape potencial; no existe un riesgo inaceptable.

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**Tabla ES-1**

Resumen de la Resolución de No Acción

4 Sitios de la Orden de Consentimiento y 6 Sitios PI/PAOC

Vieques, Puerto Rico

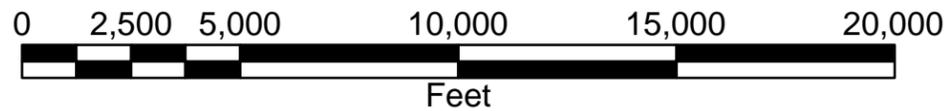
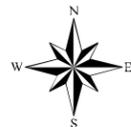
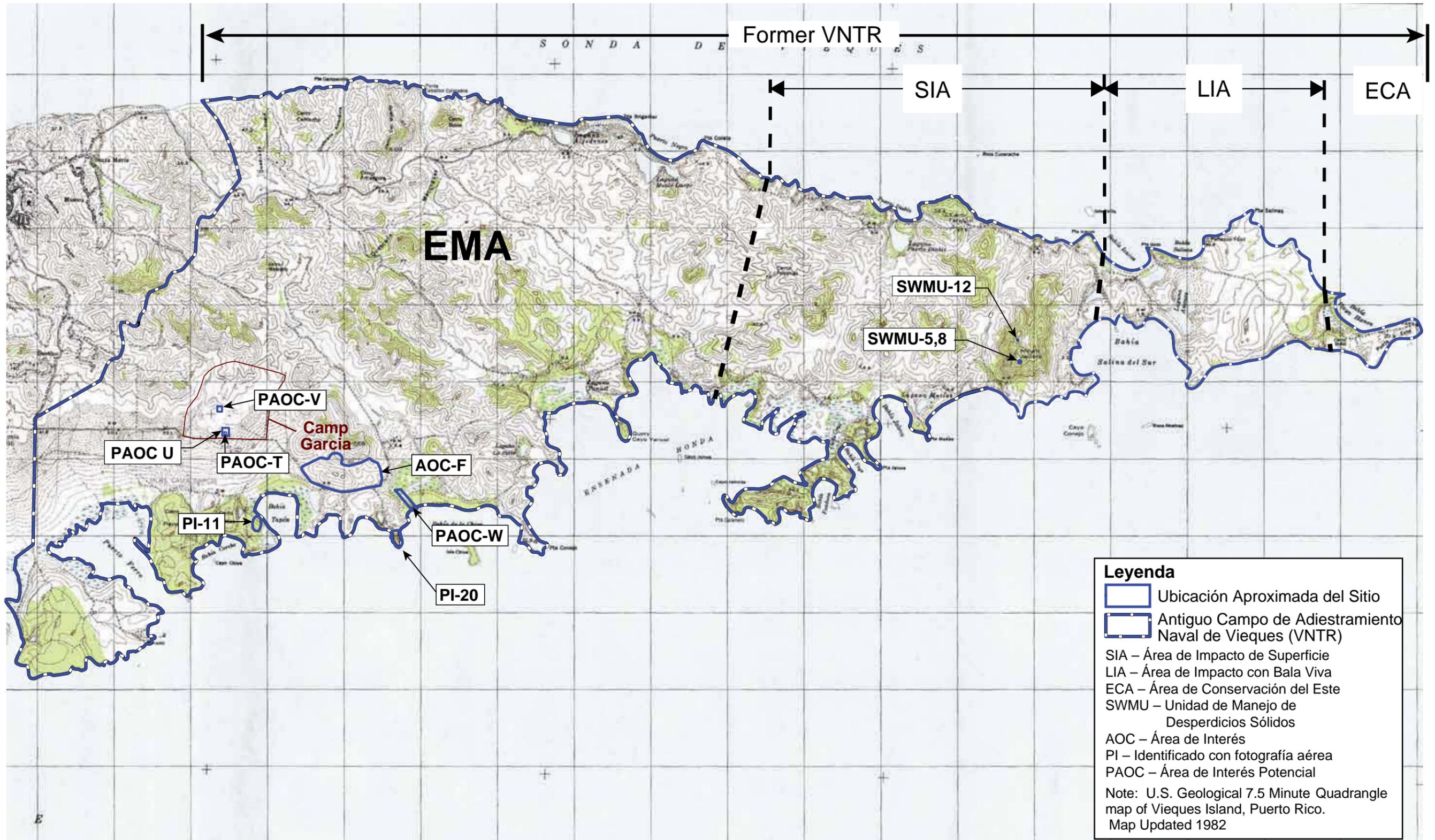
Nombre del Sitio	Descripción del Sitio	Historia del Sitio	Fuente(s) Potenciales	Mecanismo(s) de Escape Potenciales	Datos de las Muestras que se Colectaron de los Sitios Específicos	Resultados del Análisis de la Decisión PA/SI	Desarrollo de la Determinación de No Acción
PI 20	Antiguo Punto de Observación y Sitio potencial para la Cantera	El sitio es actualmente una laguna. Históricamente el sitio fue usado como un punto de observación para ejercicios de aterrizaje en PI 21. Además, el sitio pudo haber sido usado como una cantera antes de que bajo condiciones ambientales naturales se convirtiera en una laguna.	Poco probable. Durante las visitas al sitio no se observó evidencia de desperdicios o escapes.	Poco probable	El muestreo no fue necesario dado el uso histórico del sitio y la observación de sus condiciones actuales	No aplica	El sitio fue un punto de observación y fue posiblemente usado como una cantera; naturalmente se ha convertido en una laguna.
PAOC T	Sitio donde se encontraba el Antiguo Cobertizo para Almacenamiento del contratista de mantenimiento de terrenos y el Taller de Mecánica de Obras Públicas ( parte de PAOC U)	Instalaciones de apoyo para el mantenimiento de los terrenos	Almacenamiento del material usado para obras publicas.	Derrames o Fugas sobre la superficie del terreno provenientes del equipo de mantenimiento de terrenos	2 muestras de suelo superficial y de bajo la superficies co-localizadas dentro del perímetro dejado de la cobertizo de almacenamiento y el taller de mecánica como parte de la investigación de PAOC U	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	Se removieron las fuentes potenciales; se caracterizó lo suficiente el área del escape potencial; no existe un riesgo inaceptable.
PAOC U	Antigua Área de Mantenimiento de Vehículos	Mantenimiento de Vehículos; cobertizo de almacenamiento de obras publicas, taller de mecánica	Operaciones de mantenimiento de vehículos; almacenamiento de materiales.	Derrames o Fugas sobre la superficie del terreno	4 muestras de suelo superficial, 9 muestras de suelo superficial y de bajo la superficie co-localizadas, 1 pozo de monitoreo frente al área de mantenimiento de vehículos	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	Se removieron las fuentes potenciales; se caracterizó lo suficiente el área del escape potencial; no existe un riesgo inaceptable.
PAOC V	Antigua Área de Almacenamiento de Transformadores con Fugas	Se uso por una sola vez para el almacenamiento provisional de un transformador con fuga.	Transformador con fuga	Derrames sobre las superficie del terreno	2 muestras de suelo superficial en el área donde se ubicaba el antiguo transformador	Es poco probable que haya ocurrido un escape regulado por CERCLA o el escape potencial no produjo niveles de constituyentes que presenten un riesgo no aceptable la salud humana o un riesgo ecológico.	Se removieron las fuentes potenciales; se caracterizó lo suficiente el área del escape potencial; no existe un riesgo inaceptable.
PAOC W	Antigua Área de Agua Estancada Descolorida	Corte de circulación de agua salada de la laguna a la carretera.	Poco probable	Poco probable	No fue necesario un muestreo porque no existe fuente de contaminación de un escape histórico	No aplica	El sitio es una laguna que resultó del corte de circulación del agua salada lo que alteró las condiciones existentes.

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**Figura ES-1**  
**Mapa de Ubicación Regional**  
*Record de Decisión de No Acción*  
*4 Sitios dentro de la Orden de Consentimiento y 6 Sitios PI/PAOC*  
*Vieques, Puerto Rico*

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**Figura ES-2**  
**Ubicación del Antiguo VNTR**

Record de Decisión de No Acción  
4 Sitios dentro de la Orden de Consentimiento y 6 Sitios PI/PAOC  
Vieques, Puerto Rico

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## SECTION 1

# Introduction

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This Decision Document memorializes formal concurrence among the stakeholder agencies (United States Navy [Navy], United States Environmental Protection Agency [USEPA], Puerto Rico Environmental Quality Board [PREQB], and United States Fish and Wildlife Service [USFWS]) that no action is necessary at 10 site screening areas located within the former Vieques Naval Training Range (VNTR) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Figure 1-1 shows the geographic location of Vieques, including the former VNTR, in relation to mainland Puerto Rico and the surrounding islands. The locations of the sites contained within this Decision Document are shown in Figure 1-2. The sites included in this Decision Document are:

- Solid Waste Management Unit (SWMU) 5 - Spent Battery Accumulation Area at OP-1
- SWMU 8 - Waste Oil Accumulation Area at OP-1
- SWMU 12 - Solid Waste Collection Unit Area near OP-1
- Area of Concern (AOC) F - Camp Garcia Rock Quarry
- Photo-Identified site (PI) 11 - Former Pump Station for Seawater and Sanitary Wastewater Outfall
- PI 20 - Former Observation Point and Potential Quarry
- PAOC T - Former Public Works Grounds Contractor Storage Shed and Mechanics Shop
- PAOC U - Former Vehicle Maintenance Area
- PAOC V - Former Leaking Transformer Storage Area
- PAOC W - Former Area of Stagnant, Discolored Water

Five of the above sites (SWMU 5, SWMU 8, SWMU 12, AOC F, and PAOC U) were investigated as part of a Preliminary Assessment/Site Inspection (PA/SI). The rationale for no action at these sites is detailed in the *Final Preliminary Assessment/Site Inspection Report, 12 Consent Order Sites and 8 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2008), hereafter referred to as the Final PA/SI Report. The remaining five sites underwent an historical records evaluation, and a site visit and desktop review by the stakeholder agencies in October 2007 to observe current conditions and concur upon the appropriate path forward. For sites where analytical data were collected, the analytical data were evaluated via a decision analysis process that is depicted in Figure 1-3.

Since the evaluations were performed for the various sites, USEPA published Regional Screening Levels (RSLs) for soil and water that replace the Region IX Preliminary Remediation Goals (PRGs). Similarly, in some cases, the Region IX soil-to-groundwater Soil Screening Levels (SSLs) have been replaced by the Regional SSLs. For those sites in this Decision Document where analytical data exist, additional discussion has been added to the decision analysis process that summarizes any affect consideration of the RSLs and Regional SSLs in place of the Region IX PRGs and SSLs would have on the no action determinations.

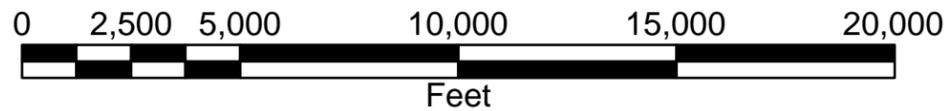
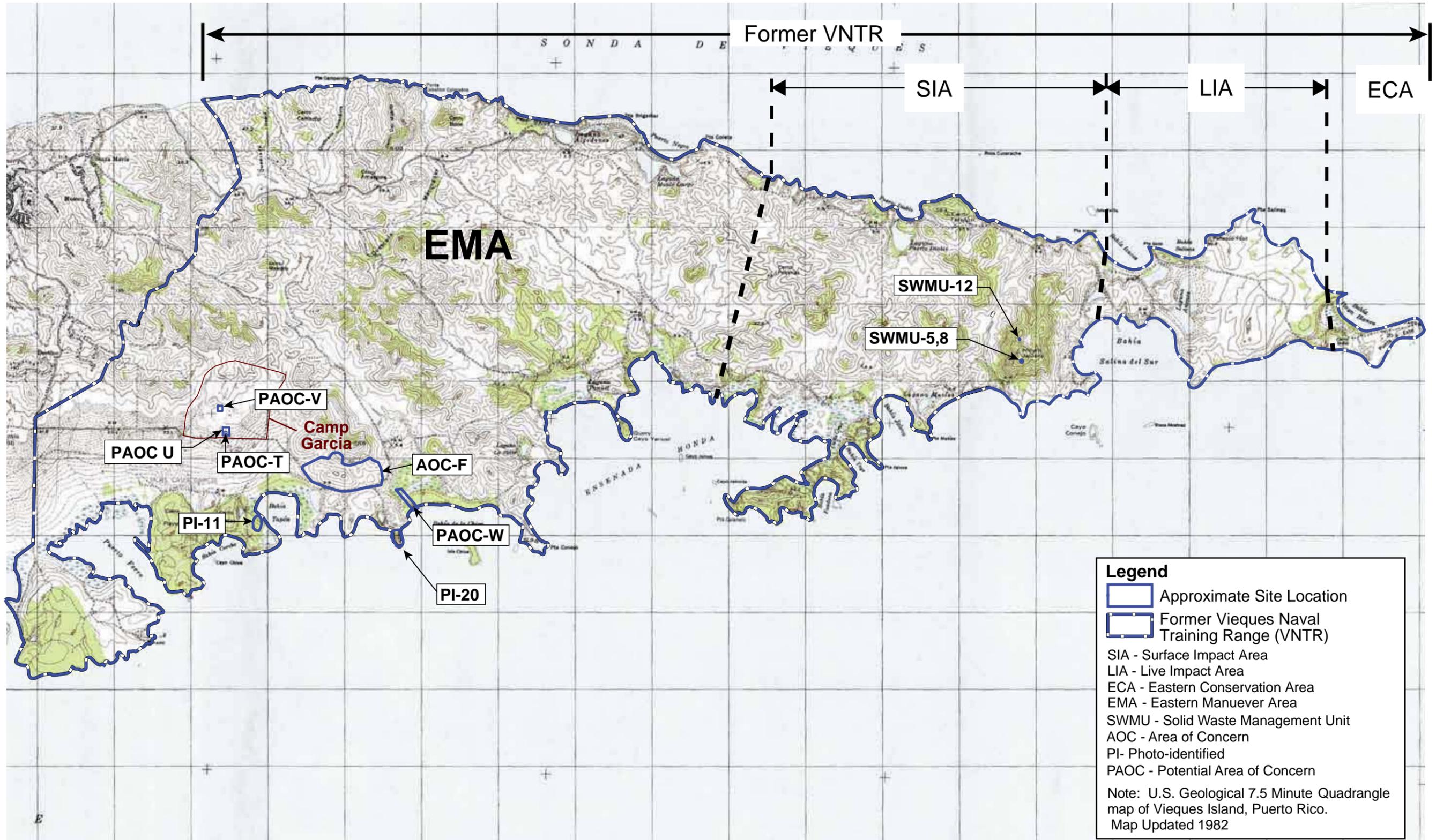
The remainder of this Decision Document presents site-specific sections for each of the 10 sites for which no action has been concurred upon by the stakeholder agencies. Each section summarizes pertinent historical information for a site, followed by the rationale upon which the no action determination is based.

This No Action Decision Document was prepared by CH2M HILL under Navy Contract N62470-02-D-3052, Comprehensive Long-term Environmental Action – Navy (CLEAN III).



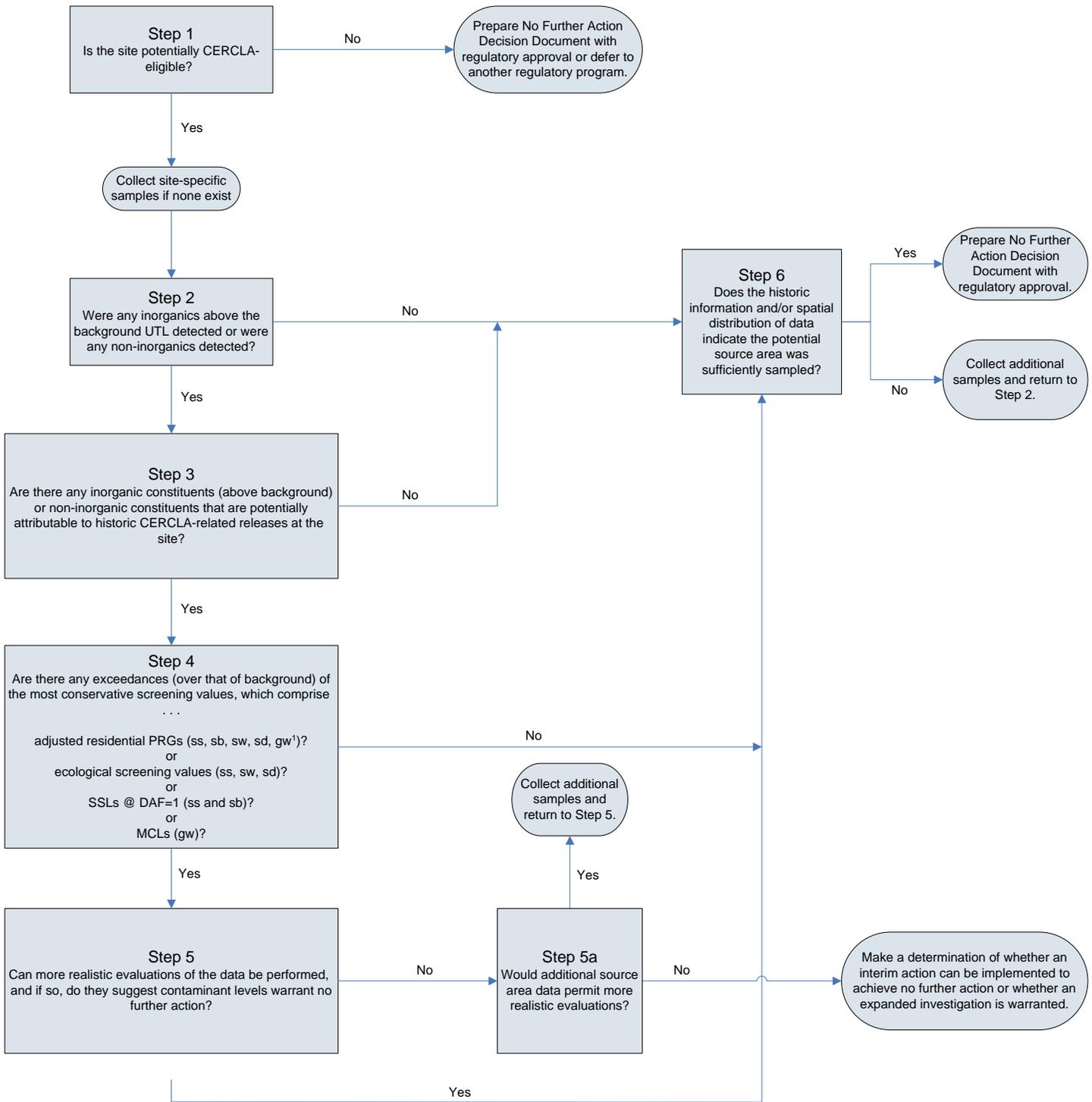
**Figure 1-1**  
**Regional Location Map**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Figure 1-2**  
**Former VNTR Site Location Map**  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

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<sup>1</sup> ss = surface soil; sb = subsurface soil; sw = surface water; sd = sediment; gw = groundwater

**Figure 1-3**  
**PA/SI Evaluation Decision Tree**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 2

# SWMU 5—Spent Battery Accumulation Area, OP-1, Inner Range, Former VNTR

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This section presents a summary of the pertinent historical information and rationale for the no action determination for SWMU 5. A more detailed discussion of the SWMU 5 evaluation is presented in the Final PA/SI Report (CH2M HILL, 2008). SWMU 5 is a former spent battery accumulation area located in the vicinity of OP-1 at the former VNTR (Figures 1-2 and 2-1). According to the 1988 RCRA Facility Assessment (RFA) Report (Kearney, 1988), batteries and battery acid were stored outside on a gravel driveway and the acid from the batteries typically was emptied into plastic containers and shipped to Navy Activity Puerto Rico (NAPR; the former Naval Station Roosevelt Roads [NSRR]). The 1988 and 1995 RFA reports stated that no staining or other signs of release were observed at the unit during the visual site inspection (VSI) and, therefore, sampling and analysis were not suggested at that time (Kearney, 1988; PREQB, 1995). However, establishment of an area with secondary containment for storage of the batteries and acid was recommended in the 1988 RFA Report.

Although the startup date for SWMU 5 is unknown, the SWMU remained active through May 2003. During the 1995 RFA, nine batteries were observed to be stored at this site on the gravel driveway. During the February 2000 site visit to all Consent Order sites, release controls (plastic storage trays) for battery storage were present, but no batteries were observed at the site. No signs of releases of battery acid were observed at that time. In addition, the storage containers were noted to be on concrete (Figure 2-2).

During the January 2004 PA/SI site visit, no signs of activity were evident at SWMU 5. No batteries were stored at the site. The plastic trays observed in 2000 had been removed as part of the closure of the former VNTR.

As presented in the Phase I RCRA Facility Investigation (RFI) Work Plan (CH2M HILL, 2003), four surface soil samples were collected immediately adjacent to the concrete pad on which the spent batteries were stored (Figure 2-3). Samples were analyzed for Appendix IX volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCS), inorganics, herbicides, pesticides, and polychlorinated biphenyls (PCBs); and explosives, including perchlorate. One surface soil sample, collected at station CGW5SS01, was additionally analyzed for cyanide, sulfide, and dioxins. Although historical information for SWMU 5 did not indicate munitions or explosives-related constituents would be related to potential releases at the site, explosives were included in the sample analyses because the site is located within the safety fan of the artillery firing positions in the Eastern Maneuver Area (EMA).

Table 2-1 summarizes the constituents detected in SWMU 5 surface soil samples collected during the PA/SI and identifies screening criteria exceedances.

## 2.1 SWMU 5 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 2-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was used to store spent batteries. Although there was no evidence of releases observed during the various site visits, no secondary containment was present during part of the operational period of the SWMU. Therefore, the potential presence of hazardous substances could not be confidently ruled out without sample collection. Sample collection took place during the 2004 PA/SI. Therefore, the decision analysis proceeds to Step 2.

### Step 2: Were any inorganics above the background upper tolerance level (UTL) detected or were any non-inorganics detected?

For the samples collected during the PA/SI, the following inorganics above the background UTLs and non-inorganics were detected:

#### Surface Soil

- VOCs: none detected
- SVOCs: acetophenone, dimethyl phthalate, di-n-butylphthalate
- Pesticides: none detected
- Herbicides: none detected
- PCBs: none detected
- Dioxins: 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin, 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-hexachlorodibenzo-p-dioxin, octachlorodibenzo-p-dioxin, total heptachlorodibenzo-p-dioxin, total hexachlorodibenzo-p-dioxin
- Explosives: none detected
- Inorganics above background UTLs: arsenic, lead, zinc

### Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?

There is no documented history or visual evidence of releases at SWMU 5. However, of the constituents listed in Step 1, arsenic, lead, and zinc are potentially associated with battery acid and are, therefore, potentially attributable to a CERCLA-related release. Conversely, it is unlikely that SVOCs are associated with the spent batteries; they are more likely associated with normal vehicular use at the site. However, they are conservatively evaluated as a potential CERCLA-related release.

Dioxins are not associated with battery acid. Further, the dioxin concentration at SWMU 5 (in toxicity equivalence (TEQ)) is approximately 2 parts per trillion (ppt), which is almost three orders of magnitude below the residential remediation level (i.e., 1,000 ppt) cited by

the Environmental Protection Agency (EPA) (EPA, 1998). Therefore, dioxins are not further considered in the decision analysis process.

**Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria (and background for inorganics) are listed below.

Surface Soil

- SVOCs: no exceedances
- Arsenic: four detections (samples SS01 through SS04) at concentrations (3.66 milligrams per kilogram (mg/kg) to 6.94 mg/kg) above the PRG (0.39 mg/kg), SSL at a dilution attenuation factor (DAF) 1 (1 mg/kg), and background UTL (1.6 mg/kg)
- Lead: two detections (samples SS02 and SS03) at concentrations (16.1 mg/kg and 16.1 mg/kg, respectively) above the SSL at a DAF 1 (14 mg/kg) and background UTL (5.4 mg/kg)

As shown above, there are exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 5.

**Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?**

At each location sampled, arsenic was detected in surface soil above background and its residential PRG (0.39 mg/kg based on  $1 \times 10^{-6}$  excess lifetime cancer risk (ELCR)). Based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) and acceptable non-cancer hazard quotient (HQ) (which is based on skin and vascular effects), acceptable risk-based concentrations for a residential scenario range from 0.39 mg/kg ( $1 \times 10^{-6}$  ELCR) to 22 mg/kg (HQ=1). Based on the relatively low maximum detected concentration (based on the acceptable risk range) and the relatively low exposure point concentration (EPC) that would be used in risk calculations (based on a calculated UCL of the mean concentration), risk estimates for arsenic would be within acceptable levels and arsenic would not be identified as a risk driver.

Although vanadium was detected in soil above the adjusted PRG, its PRG is based on increased mortality, so there is no concern about potential cumulative human health effects from multiple constituents in site soil. Further, all vanadium concentrations are below the background UTL.

Two inorganics (arsenic and lead) were detected above their respective SSLs at a DAF of 1 in surface soil. However, because the former battery storage area (i.e., potential source area) was relatively small, an SSL at a higher DAF is likely to be more realistic. This supposition is supported by data from SWMU 1 (also located in the Kv zone and discussed in the PA/SI Report), where SSLs at a DAF of 1 are shown to be unrealistic predictors of leaching to groundwater. At SWMU 1, arsenic and lead were detected in soil above the SSLs at a DAF of 1, but were not detected in groundwater. The presumed depth to groundwater of more than about 100 feet at SWMU 5 further supports a higher DAF. For the SWMU 5 data, none

of the arsenic concentrations exceeds the SSL at a DAF of 7, and none of the lead concentrations exceeds the SSL at a DAF of 2.

Table 2-2 presents a comparison of Region IX PRGs/SSLs to RSLs/Regional SSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 2-2, the screening values for three organics and six inorganics have been updated. The screening values for six of the nine constituents either increased or were eliminated. Further, the site concentrations for the three constituents where a new or lower screening value was published are all lower than the screening value. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

**Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

The historical information (aerial photographs, interviews, site inspections) indicates the most likely source of CERCLA-related releases is the former spent battery accumulation area. Soil samples were collected in the area where the battery storage area was formerly located. Based on the nature of potential releases (i.e., to the ground surface), the nature of the constituents potentially attributable to CERCLA-related releases (i.e., inorganics), and that arsenic was the only constituent detected in the surface soil above its PRG (albeit toward the low end of the acceptable risk range), the spatial distribution of samples and resulting data indicate the potential source area has been sufficiently characterized, especially considering the number and locations of samples (and resulting data) collected at adjacent SWMU 8 (see Section 3).

## 2.2 Conclusions and No Action Determination

The decision analysis process described above indicates there has not been a CERCLA-related release at SWMU 5 that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Although several constituents were detected in surface soil, their concentrations do not pose an unacceptable risk to human health and ecological receptors. Further, SVOC and dioxin detections at the site are not likely associated with potential CERCLA-related releases and are nevertheless below risk screening levels. Finally, the potential sources have been removed. Therefore, a no action determination is made for SWMU 5.

**TABLE 2-1**  
 SWMU 5 Surface Soil Detection and Exceedance Results  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques Eco SO	Vieques (East) Background Zone Kv SS	CGW5SS01	CGW5SS02	CGW5SS03	CGW5SS04
Sample ID					CGW5SS01-R01	CGW5SS02-R01	CGW5SS03-R01	CGW5SS04-R01
Sample Date					1/19/04	1/19/04	1/19/04	1/19/04
Chemical Name								
<b>Volatile Organic Compounds (µg/kg)</b>								
No Detections								
<b>Semivolatile Organic Compounds (µg/kg)</b>								
Acetophenone	--	780,000	--	--	54.4 J	363 U	357 U	352 U
Dimethyl phthalate	--	61,000,000	200,000	--	350 U	363 U	357 U	1,410 J
Di-n-butylphthalate	270,000	610,000	200,000	--	350 U	59.6 J	52.8 J	63.9 J
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b>								
No Detections								
<b>Herbicides (µg/kg)</b>								
No Detections								
<b>Dioxin/Furans (pg/g)</b>								
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	*	--	--	107	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	*	--	--	2.7	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	*	--	--	3.2	NA	NA	NA
Octachlorodibenzo-p-dioxin	--	*	--	--	856	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	--	*	--	--	209	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	--	*	--	--	33	NA	NA	NA
<b>Explosives (µg/kg)</b>								
No Detections								
<b>Total Metals (mg/kg)</b>								
Antimony	0.3	3.1	78	3.6	1.04 J	1.36 J	0.904 J	1.34 J
Arsenic	1	0.39	18	1.6	3.66	6.94	5.46	4.38
Barium	82	1,600	330	212	64.3	67.6	65.1	66.8
Beryllium	3	15	40	0.27	0.144 J	0.157 J	0.165 J	0.178 J
Cadmium	0.4	3.7	32	2.2	0.242 J	0.739	0.298 J	0.265 J
Chromium	2	210	0.4	72	36.2 J	54.2 J	38.9 J	47.8 J
Cobalt	33	140	13	26	14.6 J	15.5 J	11.5 J	14.8 J
Copper	46	310	70	94	43	67.1	50.5	48.7
Lead	14	400	120	5.4	11.8 J	16.1 J	16.1 J	11.3 J
Mercury	0.1	2.3	0.1	0.057	0.0128 J	0.0165 J	0.0122 J	0.0126 J
Nickel	7	160	38	41	15.5 J	23.9 J	15.2 J	20 J
Selenium	0.3	39	0.52	0.51	0.472 J	0.456 J	0.476 J	0.45 J
Silver	2	39	560	0.22	0.098 J	0.0936 J	0.0905 J	0.124 J
Tin	--	4,700	--	NA	0.326 J	0.384 J	0.362 J	0.469 J
Vanadium	300	7.8	2	144	79.1 J	83.4 J	76.9 J	96.7 J
Zinc	620	2,300	120	32	77 J	112 J	80.8 J	84 J
<b>Wet Chemistry (mg/kg)<sup>1</sup></b>								
No Detections								

Notes:

- mg/kg - milligrams per kilogram
- µg/kg - micrograms per kilogram
- pg/g - picograms/gram
- NA - Not Analyzed
- J - Analyte present; reported value may or may not be accurate or precise
- U - Analyte not detected

Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)

Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: User's Guide (EPA, 1996)

Vieques HHRA SO - Screening values from the October 2004 Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)

Vieques Eco SO - Screening values for compounds (dimethylphthalate, chromium, copper, mercury) (Efroymson, Will, and Suter, 1997)

Vieques Eco SO - Screening values for compounds (di-n-butylphthalate, nickel, selenium, silver, vanadium, zinc) (Efroymson et al., 1997)

Vieques Eco SO - Screening values for compounds (antimony, arsenic, barium, beryllium, cadmium, cobalt, lead) (EPA, 2005b)

<sup>1</sup> Wet Chemistry consists of sulfide and cyanide

\* See Section 1.1.1.2 for dioxin screening.

Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, DAF 1 Criteria

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Table 2-2  
 Comparison of Region IX and Regional Screening Levels for Soil  
 SWMU 5  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>2</sup>	Adjusted Residential Regional Screening Level <sup>2</sup>	Region IX SSL <sup>1</sup> (DAF=1)	Regional SSL <sup>1</sup> (DAF=1)	
Acetophenone			No Value	1,100	None. 55 µg/kg detected at the site.
Dimethyl phthalate	61,000,000	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Di-n-butyl phthalate			270,000	1,100	None. 70 µg/kg highest concentration detected at the site.
Barium	1,600	1,500			None. 68 mg/kg highest concentration detected at the site.
Beryllium	15	16			None. Screening value increased. There were no exceedances using the Region IX PRG.
Cadmium	3.7	7			None. Screening value increased. There were no exceedances using the Region IX PRG.
Chromium <sup>2</sup>	210	23			None. Exceedances of RSL, but all site concentrations below background.
Cobalt	140	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Vanadium	7.8	39			None. Current evaluation unchanged by increase in screening level.

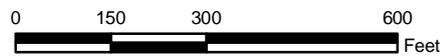
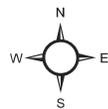
Notes:  
 Organics units are µg/kg; inorganics units are mg/kg  
<sup>1</sup> No Regional SSL values are provided for inorganics. The Region IX SSL values for inorganics are from the EPA Soil Screening Guidance and are therefore considered unchanged.  
<sup>2</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.

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**Legend**

□ SWMU 5 Area



**Figure 2-1**  
**2005 Aerial Photograph**  
**of the SWMU 5 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

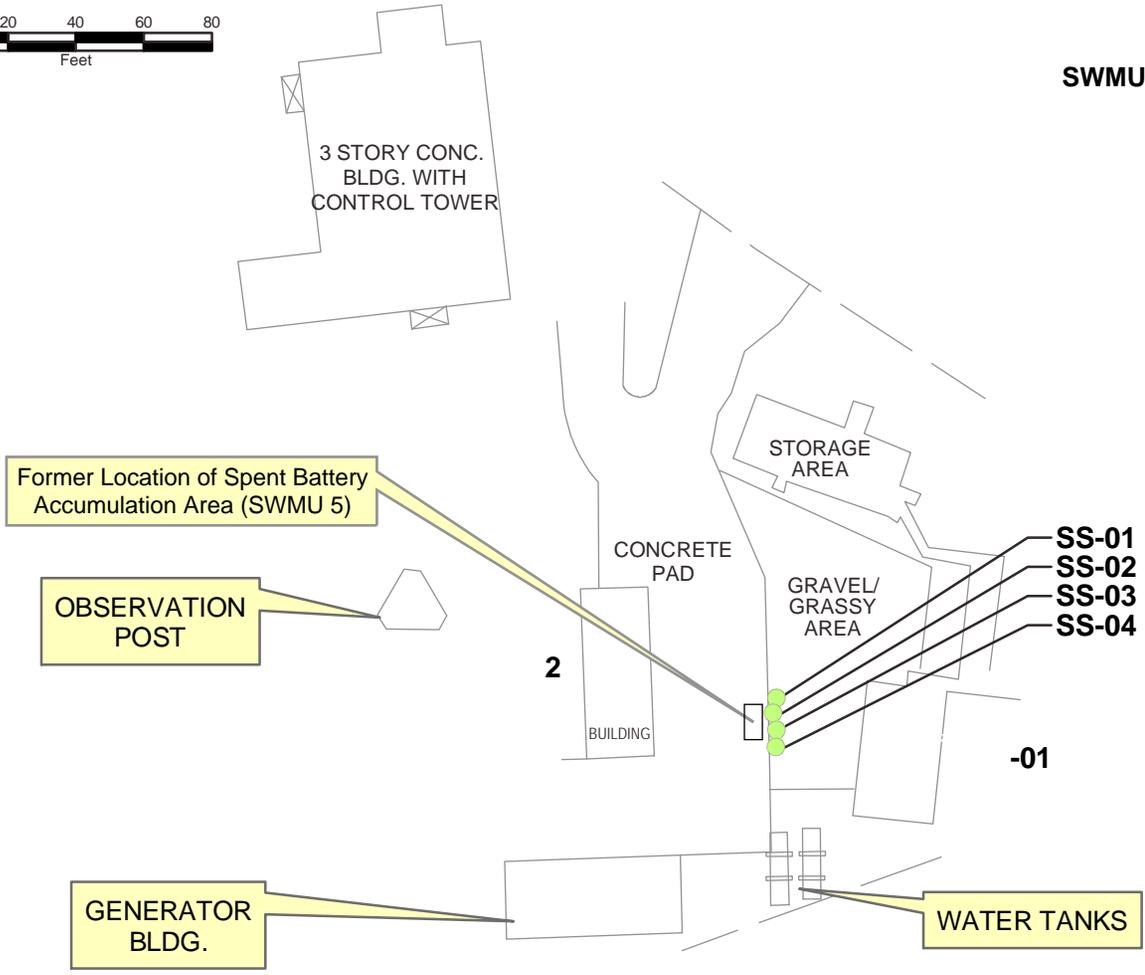
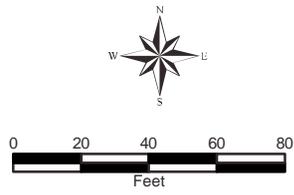
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Photograph taken February 3, 2000

**Figure 2-2**  
**SWMU 5 Spent Battery Accumulation Area**  
**(Observation Post 1, former VNTR)**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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SWMU 5 Area



**Legend**

- PA/SI Surface Soil Sample Location

Each sampling location shown is preceded by "CGW5" (e.g. SS-01 = CGW5SS01)

**Figure 2-3**  
**Surface Soil Sample Locations Map, SWMU 5**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 3

# SWMU 8—Waste Oil Accumulation Area (OP-1, Inner Range, Former VNTR)

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This section presents a summary of the pertinent historical information and rationale for the no action determination for SWMU 8. A more detailed discussion of the SWMU 8 evaluation is presented in the Final PA/SI Report (CH2M HILL, 2008). SWMU 8 is located outside the generator building at OP-1 of the former VNTR (Figures 1-2 and 3-1). According to the 1988 RFA Report, the former waste oil accumulation area contained drums of both waste lubricants and oils. The drums were stored on bare soil prior to being shipped offsite to NSRR. The accumulation area began operation in approximately 1978, and was still active at the time of the first RFA in 1988. During both the 1988 RFA and the 1995 Revised RFA, soil staining indicative of minor spills of lubricating oil onto the soil was present in the accumulation area, and no release controls were present (Kearney, 1988; PREQB, 1995).

During the February 2000 site inspection in which the EPA and Navy inspected the consent order sites, no soil staining was evident in the accumulation area, and the drums were stored on concrete in plastic secondary containment trays for release control (Figure 3-2). Neither the containment trays nor any waste was present at the time of the 2004 site visit, conducted as part of the PA/SI. They had been removed as part of the closure of the former VNTR.

As presented in the Phase I RFI Work Plan (CH2M HILL, 2003), five surface soil samples were collected immediately adjacent to the concrete pad where staining had been noted during the RFA (Figure 3-3). Samples were analyzed for Appendix IX VOCs, SVOCS, inorganics, herbicides, pesticides, and PCBs; and explosives, including perchlorate. One surface soil sample, collected at station CGW8SS02, was additionally analyzed for cyanide, sulfide, and dioxins. Although historical information for SWMU 8 did not indicate munitions or explosives-related constituents would be related to potential releases at the site, explosives were included in the sample analyses because the site is located within the safety fan of the artillery firing positions in the EMA.

Table 3-1 summarizes the constituents detected at SWMU 8 surface soil samples collected during the PA/SI and identifies screening criteria exceedances.

## 3.1 SWMU 8 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 3-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was used to store waste oil. Based on the nature of historical activities and the staining observed during a site visit, the potential presence of hazardous substances could not be confidently ruled out without sample collection. Sample

collection took place during the 2004 PA/SI. Therefore, the decision analysis proceeds to Step 2.

**Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?**

For the samples collected during the PA/SI, the following inorganics above the background UTLs and non-inorganics were detected:

Surface Soil

- VOCs: acetone
- SVOCs: acetophenone, butylbenzylphthalate, dimethyl phthalate, di-n-butylphthalate
- Pesticides: 4,4'-DDT
- Herbicides: none detected
- Dioxins: 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin, 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin, 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin, 1,2,3,7,8,9-hexachlorodibenzo-p-dioxin, 1,2,3,7,8-pentachlorodibenzo-p-dioxin, octachlorodibenzo-p-dioxin, total heptachlorodibenzo-p-dioxin, total hexachlorodibenzo-p-dioxin, total pentachlorodibenzo-p-dioxin
- PCBs: none detected
- Explosives: perchlorate
- Inorganics above background UTLs: arsenic, lead, selenium, thallium, tin, and zinc

**Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?**

As noted above, minor staining indicative of spills at the waste oil accumulation area were noted during the RFA. Therefore, the VOC, SVOCs, and inorganics detected at the site are assumed to be potentially attributable to CERCLA-related releases. These constituents are considered further in the decision analysis process.

Dioxins are not likely associated with waste oil. Further, the dioxin concentration at SWMU 8 (in TEQ) is approximately 8 ppt, which is more than two orders of magnitude below the residential remediation level (i.e., 1,000 ppt) cited by EPA (EPA, 1998). Therefore, dioxins are not considered further in the decision analysis process.

The concentration of 4,4'-DDT detected at this site is comparable to concentrations of 4,4'-DDT detected at other sites across east Vieques (see Table A-1 of Final PA/SI Report [CH2M HILL, 2008]). Consequently, the pesticide is likely attributable to normal pesticide use when the facility was active, not to a CERCLA-related release and is, therefore, not considered further in the decision analysis process.

Likewise, perchlorate is not likely site-related. In fact, its analysis was done because the site is within a safety fan, the activity at which is not site-related. Further, the perchlorate concentration is more than an order of magnitude below its screening level. Therefore, perchlorate is not considered further in the decision analysis process.

Acetone is not likely associated with waste oil; therefore, its detection is not likely site-related, especially considering that it was detected in only one sample, is highly volatile, that no other VOCs were detected, that it is a common laboratory artifact, and that the concentration detected (i.e., 4.2 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ )) was low. However, as a conservative measure, acetone is further considered in the decision analysis process.

**Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria (and background for inorganics) are listed below.

Surface Soil

- VOCs: no exceedances
- SVOCs: no exceedances
- Arsenic: five detections (samples SS01 through SS05) at concentrations (3.06 mg/kg to 19.9 mg/kg) above the PRG (0.39 mg/kg), ecological screening value (18 mg/kg; only by SS02), SSL at a DAF 1 (1 mg/kg), and background UTL (1.6 mg/kg)
- Lead: three detections (samples SS03, SS04, SS05) at concentrations (62.7 mg/kg, 22.1 mg/kg, and 20.9 mg/kg, respectively) above the SSL at a DAF 1 (14 mg/kg) and background UTL (5.4 mg/kg)
- Selenium: two detections (samples SS01 and SS03) at concentrations (0.72 mg/kg and 0.63 mg/kg, respectively) above the ecological screening value (0.52 mg/kg), the SSL at a DAF 1 (0.3 mg/kg) and background UTL (0.51 mg/kg)
- Thallium: two detections (samples SS01 and SS05) at concentrations (0.493 mg/kg and 0.398 mg/kg, respectively) above the SSL at a DAF 1 (0.036 mg/kg) and background UTL (0.13 mg/kg)
- Zinc: two detections (samples SS03 and SS05) at concentrations (135 mg/kg and 207 mg/kg) above the ecological screening value (120 mg/kg) and background UTL (32 mg/kg)

As shown above, there are exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 5.

**Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?**

Arsenic is the only constituent detected above its human health screening criterion and background. It was detected in the five surface soil samples above background and its screening level (0.39 mg/kg based on  $1 \times 10^{-6}$  ELCR), at a maximum concentration of 19.9 mg/kg. Based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) and acceptable non-cancer HQ (which is based on skin and vascular effects), acceptable risk-based concentrations for a residential scenario range from 0.39 mg/kg ( $1 \times 10^{-6}$  ELCR) to 22 mg/kg (HQ=1). Based on the maximum detected concentration, risk estimates for arsenic would be within acceptable levels and arsenic would not be identified as a risk driver.

Although vanadium was detected in soil above the adjusted PRG, its PRG is based on increased mortality, so there is no concern about potential cumulative human health effects from multiple constituents in site soil. Further, all vanadium concentrations are below the background UTL.

The concentrations of three inorganics (arsenic, selenium, and zinc) exceed ecological screening values and background (arsenic in one surface soil sample, selenium in two surface soil samples, and zinc in two surface soil samples). None of these constituents likely poses an unacceptable risk to ecological receptors based upon the following:

- The area evaluated is immediately adjacent to buildings and concrete pads, is very small, and provides very limited habitat (gravel areas with weeds). Thus, the potential exposures to ecological receptors are likely minimal.
- Arsenic exceeds the ecological screening value in only one of five samples, at a maximum HQ of 1.11. The screening value (18 mg/kg), however, is based on potential impacts to plants. The site consists of gravel areas with weeds, so plant endpoints are not likely representative of actual exposures. Maximum concentrations are less than ecological screening values based upon other receptors (e.g., 60 mg/kg for soil invertebrates). Further, the mean arsenic concentration (7.6 mg/kg) is less than the ecological screening value (18 mg/kg).
- Selenium exceeds the ecological screening value in two of five samples, at a maximum HQ of 1.38. The screening value (0.52 mg/kg), however, is based on potential impacts to plants. The site consists of gravel areas with weeds, so plant endpoints are not likely representative of actual exposures. Maximum concentrations are less than ecological screening values based upon other receptors (e.g., 4.10 mg/kg for soil invertebrates). Further, the mean selenium concentration (0.46 mg/kg) is less than the ecological screening value (0.52 mg/kg).
- Zinc concentrations exceed the ecological screening value in two samples, at a maximum HQ of 1.72. The mean zinc concentration (121 mg/kg) is comparable to the screening value (120 mg/kg). Thus, zinc has a low potential for unacceptable risks, especially given the low potential for exposures.

The concentrations of four inorganics (arsenic, lead, selenium, and thallium) exceed the SSL at a DAF 1. However, the waste oil accumulation area (i.e., potential source area) was relatively small. Therefore, an SSL at a higher DAF is likely to be more realistic. This supposition is supported by data from SWMU 1 (also located in the Kv zone and discussed in the PA/SI Report), where SSLs at a DAF of 1 are shown to be unrealistic predictors of leaching to groundwater. At SWMU 1, arsenic, lead, selenium, and thallium were detected in soil above the SSLs at a DAF of 1; however, arsenic and lead were not detected in groundwater and selenium was detected in groundwater below screening criteria. As discussed previously, the thallium data are suspect. The presumed depth to groundwater of more than about 100 feet at SWMU 8 further supports a higher DAF. For the SWMU 8 data, none of the four constituents' concentrations exceeds the SSL at a DAF of 20; in fact, none of the lead or selenium concentrations exceeds the SSL at a DAF of 3.

Table 3-2 presents a comparison of Region IX PRGs/SSLs to RSLs/Regional SSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 3-2, the screening values

for five organics and seven inorganics have been updated. The screening values for 6 of the 12 constituents either increased or were eliminated. Further, the site concentrations for five of the six constituents where a new or lower screening value was published are all lower than the screening value. For chromium, the lower screening value would result in exceedances, but none of the site concentrations is above the background value. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

**Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

The historical information (aerial photographs, interviews, site inspections) indicates the most likely source of CERCLA-related releases is the former waste oil accumulation area. Soil samples were collected in the former waste oil accumulation area, specifically targeting areas of staining. Based on the nature of potential releases (i.e., to the ground surface), the nature of the constituents potentially attributable to CERCLA-related releases (i.e., SVOCs and inorganics), and that arsenic was the only constituent detected in the surface soil above its residential PRG, subsurface soil sampling is not necessary. Therefore, the spatial distribution of samples and resulting data indicate the potential source area has been sufficiently characterized, especially considering the number and locations of samples (and resulting data) collected at adjacent SWMU 5 (see Section 2).

## 3.2 Conclusions and No Action Determination

The decision analysis process described above indicates there has not been a CERCLA-related release at SWMU 8 that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Although several constituents were detected in surface soil, their concentrations do not pose an unacceptable risk to human health or ecological receptors. Further, acetone, pesticide, dioxin, and perchlorate detections at the site are not likely associated with potential CERCLA-related releases and are nevertheless below risk-based screening levels. Finally, the potential sources have been removed. Therefore, a no action determination is made for SWMU 8.

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**TABLE 3-1**  
 SWMU 8 Surface Soil Detection and Exceedance Results  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID Sample ID Sample Date Chemical Name	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques Eco SO	Vieques (East) Background Zone Kv SS	CGW8SS01		CGW8SS02	CGW8SS03	CGW8SS04	CGW8SS05
					CGW8SS01-R01	CGW8FD01P-R01	CGW8SS02-R01	CGW8SS03-R01	CGW8SS04-R01	CGW8SS05-R01
					1/19/04	1/19/04	1/19/04	1/19/04	1/19/04	1/19/04
<b>Volatile Organic Compounds (µg/kg)</b>										
Acetone	800	1,400,000	--	--	9.4 U	9.9 U	10.7 U	9.2 U	4.2 J	9.5 U
<b>Semivolatile Organic Compounds (µg/kg)</b>										
Acetophenone	--	780,000	--	--	145 J	341 J	393 U	351 U	204 U	207 U
Butylbenzylphthalate	810,000	1,200,000	--	--	363 U	360 U	393 U	351 U	204 U	47.5 J
Dimethyl phthalate	--	61,000,000	200,000	--	363 U	360 U	1,430	351 U	204 U	207 U
Di-n-butylphthalate	270,000	610,000	200,000	--	45.2 J	57.2 J	62.8 J	73.4 J	27.9 J	35.5 J
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b>										
4,4'-DDT	2,000	1,700	10	--	3.6 U	3.6 U	0.46 J	0.31 J	3.4 U	3.4 U
<b>Herbicides (µg/kg)</b>										
No Detections										
<b>Dioxin/Furans (pg/g)</b>										
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	267	NA	NA	NA
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	3.5	NA	NA	NA
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	8.3	NA	NA	NA
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	13.3	NA	NA	NA
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	2	NA	NA	NA
Octachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	2,840	NA	NA	NA
Total heptachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	582	NA	NA	NA
Total hexachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	113	NA	NA	NA
Total pentachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	13.2	NA	NA	NA
<b>Explosives (µg/kg)</b>										
Perchlorate	--	55,000	--	--	98.2 U	99.5 U	100 U	22.1 J	92.9 U	95.2 U
<b>Total Metals (mg/kg)</b>										
Antimony	0.3	3.1	78	3.6	0.715 J	1.11 J	1.65 J	1.3 J	0.97 J	1.09 J
Arsenic	1	0.39	18	1.6	3.06	3.67	19.9	5.59	3.55	5.47
Barium	82	1,600	330	212	80.9	93	63.5	65.9	36.5	54.5
Beryllium	3	15	40	0.27	0.173 J	0.221 J	0.191 J	0.223 J	0.115 J	0.15 J
Cadmium	0.4	3.7	32	2.2	0.358 J	0.328 J	1.25	1.14	0.178 J	0.221 J
Chromium	2	210	0.4	72	31.7 J	42.9 J	45.9 J	27.3 J	18.2 J	32.1 J
Cobalt	33	140	13	26	13.2 J	16.8 J	14.1 J	11.2 J	10.4 J	15 J
Copper	46	310	70	94	68	63.8	59.8	78.8	49	62
Lead	14	400	120	5.4	12.4 J	11.5 J	12.3 J	62.7 J	22.1 J	20.9 J
Mercury	0.1	2.3	0.1	0.057	0.00872 J	0.011 J	0.0288 J	0.0392	0.0149 J	0.0145 J
Nickel	7	160	38	41	12.6 J	16.4 J	18.6 J	10.3 J	8.62 J	14.6 J
Selenium	0.3	39	0.52	0.51	0.72 J	0.436 J	0.295 J	0.633 J	0.378 J	0.258 J
Silver	2	39	560	0.22	0.148 J	0.111 J	0.124 J	0.083 J	0.0693 J	0.115 J
Thallium	0.036	0.52	1	0.13	0.104 U	0.493 J	0.112 U	0.102 U	0.109 U	0.398 J
Tin	--	4,700	--	NA	0.525 J	0.596 J	0.622 J	1.3 J	0.339 J	1.62 J
Vanadium	300	7.8	2	144	79.4	100	85.2	62.9	60.5	82.4
Zinc	620	2,300	120	32	67.5	80.7	98.3	207	82	135
<b>Wet Chemistry (mg/kg)<sup>1</sup></b>										
Sulfide	--	--	--	--	NA	NA	9.34 J	NA	NA	NA

Notes:  
 mg/kg - milligrams per kilogram  
 µg/kg - micrograms per kilogram  
 pg/g - picograms/gram  
 NA - Not Analyzed  
 J - Analyte present; reported value may or may not be accurate or precise  
 U - Analyte not detected  
 Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)  
 Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: Users Guide (EPA, 1996)  
 Vieques HHRA SO - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)  
 Vieques Eco SO - Screening values for compounds (4,4'-DDT) (MHSPE, 2000)  
 Vieques Eco SO - Screening values for compounds (dimethylphthalate, chromium, copper, mercury) (Efroymsen, Will, and Suter, 1997)  
 Vieques Eco SO - Screening values for compounds (di-n-butylphthalate, nickel, selenium, silver, thallium, vanadium, zinc) (Efroymsen, et al., 1997)  
 Vieques Eco SO - Screening values for compounds (antimony, arsenic, barium, beryllium, cadmium, cobalt, lead) (EPA, 2005b)  
<sup>1</sup> Wet Chemistry consists of sulfide and cyanide  
 \* See Section 1.1.1.2 for dioxin screening.

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria

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**Table 3-2**

Comparison of Region IX and Regional Screening Levels for Soil  
SWMU 8

No Action Decision Document

4 Consent Order Sites and 6 PI/PAOC Sites Decision Document

Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>2</sup>	Adjusted Residential Regional Screening Level <sup>2</sup>	Region IX SSL <sup>1</sup> (DAF=1)	Regional SSL <sup>1</sup> (DAF=1)	
Acetone	1,400,000	6,100,000	800	4,400	None. Screening value increased. There were no exceedances using the Region IX PRG and SSL.
Acetophenone			No Value	1,100	None. 341 µg/kg highest concentration detected at the site.
Butylbenzylphthalate			810,000	140,000	None. 48 µg/kg detected at the site.
Dimethyl phthalate	61,000,000	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Di-n-butyl phthalate			270,000	1,100	None. 73 µg/kg highest concentration detected at the site.
Barium	1,600	1,500			None. 93 mg/kg highest concentration detected at the site.
Beryllium	15	16			None. Screening value increased. There were no exceedances using the Region IX PRG.
Cadmium	3.7	7			None. Screening value increased. There were no exceedances using the Region IX PRG.
Chromium <sup>2</sup>	210	23			None. Exceedances of RSL, but all site concentrations below background.
Cobalt	140	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Thallium	0.52	0.51			None. 0.49 mg/kg highest concentration detected at the site.
Vanadium	7.8	39			None. Current evaluation unchanged by increase in screening level.

Notes:

Organics units are µg/kg; inorganics units are mg/kg

<sup>1</sup> No Regional SSL values are provided for inorganics. The Region IX SSL values for inorganics are from the EPA Soil Screening Guidance and are therefore considered unchanged.

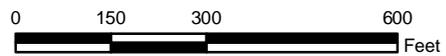
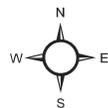
<sup>2</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.

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**Legend**

□ SWMU 8 Area



**Figure 3-1**  
**2005 Aerial Photograph**  
**of the SWMU 8 Area**

*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

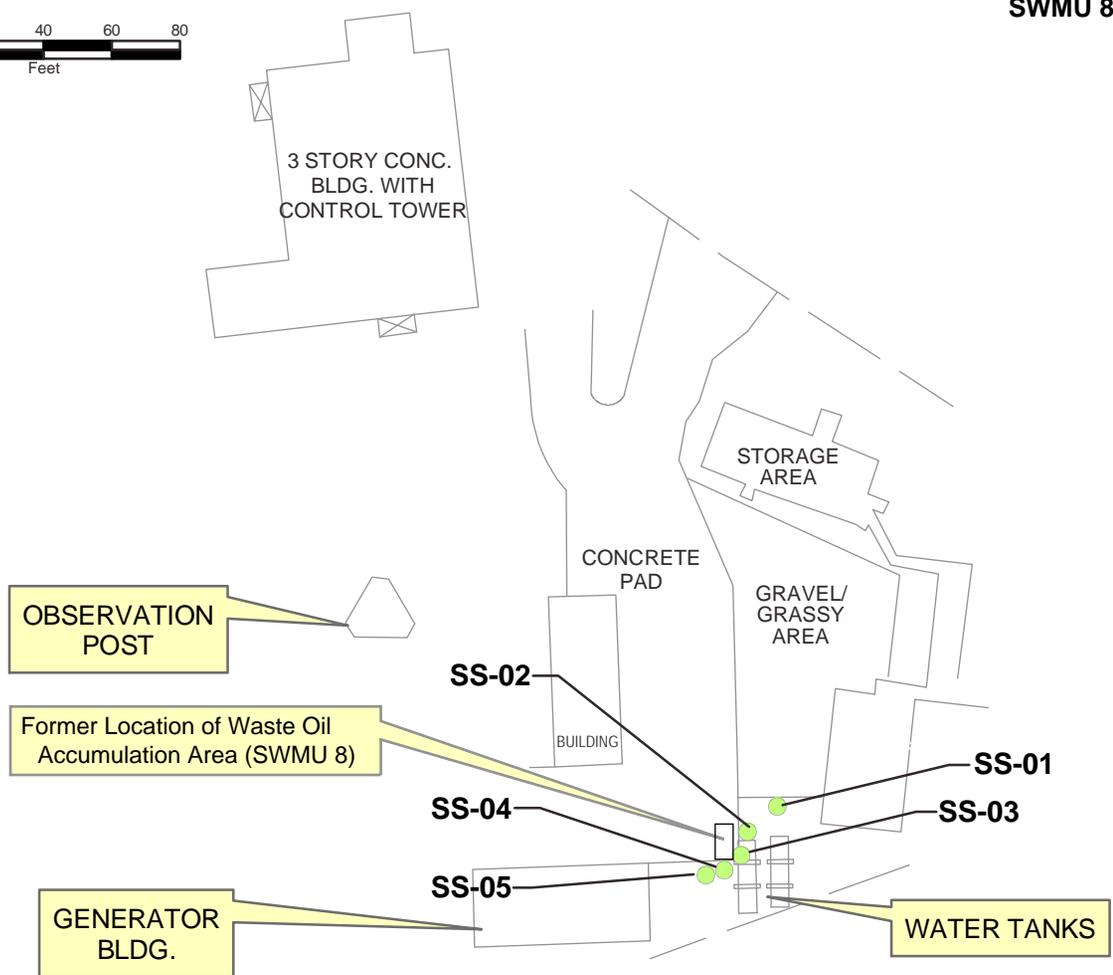
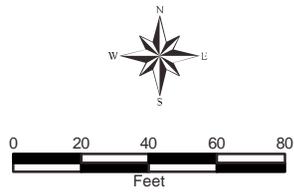
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Photograph taken February 3, 2000

**Figure 3-2**  
**Waste Oil Accumulation Area, SWMU 8**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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SWMU 8 Area



**Legend**

- PA/SI Surface Soil Sample Location

Each sampling location shown is preceded by "CGW8" (e.g. SS-01 = CGW8SS01)

**Figure 3-3**  
**Surface Soil Sample Locations Map, SWMU 8**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 4

# SWMU 12—Solid Waste Collection Unit Area

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This section presents a summary of the pertinent historical information and rationale for the no action determination for SWMU 12. A more detailed discussion of the SWMU 12 evaluation is presented in the Final PA/SI Report (CH2M HILL, 2008). SWMU 12 was located on an access road that leads to OP-1 (Figures 1-2 and 4-1). This area was referred to as AOC B in the 1988 RFA (Kearney, 1988), but in accordance with the Consent Order, this area was designated a waste management unit and identified as SWMU 12.

The solid waste collection unit area served as a solid waste staging area, prior to pickup of the domestic solid waste (indicative of galley or barracks waste) for disposal at the Vieques Island landfill. Containers used to store solid wastes collected at the site included wooden boxes, wooden trailers, metal dumpsters, and metal cans. The two RFA reports (Kearney, 1988; PREQB, 1995) suggested no further action for this site was necessary because no known hazardous constituents were staged there, which is why the material could be disposed of at the Vieques Island landfill. The visual inspection in February 2000, when the EPA and Navy representatives visited the consent order sites, identified two trailers potentially used for staging of domestic waste from OP-1 prior to transport to the Vieques Island landfill. Figure 4-2 presents a photograph of SWMU 12 taken during the 2000 visual inspection. During the 2004 PA/SI sampling event, no trailers or any signs of waste were present at SWMU 12. The trailers had previously been removed as part of the Navy's closure of VNTR in 2003.

In accordance with the Phase I RFI Work Plan (CH2M HILL, 2003), five surface soil samples around the waste collection units were collected in the former waste staging area (Figure 4-3). The samples were analyzed for Appendix IX VOCs, SVOCS, pesticides, herbicides, and inorganics; and explosives, including perchlorate. One surface soil sample, collected at station CGW12SS05, was also analyzed for cyanide, sulfide, and dioxins. Although historical information for SWMU 12 did not indicate munitions or explosives-related constituents would be related to potential releases at the site, explosives were included in the sample analyses because the site is located within the safety fan of the artillery firing positions in the EMA.

Table 4-1 summarizes the constituents detected in SWMU 12 surface soil samples collected during the PA/SI and identifies screening criteria exceedances.

## 4.1 SWMU 12 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 4-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was used to stage domestic waste prior to disposal at the Vieques landfill. Although both RFAs recommended no further action because no known or likely hazardous waste or hazardous constituents were staged at the site,

sampling was required during the 2004 PA/SI because the site was a Consent Order site. Therefore, the decision analysis proceeds to Step 2.

**Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?**

For the samples collected during the PA/SI, the following inorganics above the background UTLs and non-inorganics were detected:

Surface Soil

- VOCs: none detected
- SVOCs: di-n-butylphthalate
- Pesticides: none detected
- Herbicides: none detected
- Dioxins: octachlorodibenzo-p-dioxin
- PCBs: none detected
- Explosives: none detected
- Inorganics: arsenic, beryllium, selenium, thallium, zinc

**Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?**

As noted above, the site was used to stage non-hazardous domestic waste on portable trailers and no evidence of releases was observed during the visual inspection or sampling event. However, the site was identified in the Consent Order and, therefore, required sampling. Therefore, it is conservatively assumed that the one SVOC and inorganics detected above the background UTLs are potentially attributable to a CERCLA-related release. These constituents are considered further in the decision analysis process. Conversely, dioxins are not likely associated with the material stored at this site. Further, the dioxin concentration at SWMU 12 (in TEQ) is approximately 0.002 ppt, which is almost six orders of magnitude less than the residential remediation level (i.e., 1,000 ppt) cited by EPA (EPA, 1998). Therefore, dioxins are not considered further in the decision analysis process.

**Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria (and background for inorganics) are listed below.

Surface Soil

- SVOCs: no exceedances

- Arsenic: five detections (samples SS01 through SS05) at concentrations (5.23 mg/kg to 14.6 mg/kg) above the PRG (0.39 mg/kg), SSL at a DAF of 1 (1 mg/kg), and background UTL (1.6 mg/kg)
- Selenium: five detections (samples SS01 through SS05) at concentrations (0.529 mg/kg to 1.39 mg/kg) above the ecological screening value (0.52 mg/kg), the SSL at a DAF 1 (0.3 mg/kg), and background UTL (0.51 mg/kg)
- Thallium: five detections (samples SS01 through SS05) at concentrations (0.438 mg/kg to 1.57 mg/kg) above the adjusted PRG (0.52 mg/kg; only by samples SS01 through SS04), ecological screening value (1 mg/kg; only by samples SS02 through SS04), SSL at a DAF 1 (0.036 mg/kg), and background UTL (0.13 mg/kg)

As shown above, there are exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 5.

**Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?**

At the five locations sampled, arsenic was detected in surface soil above background and its human health screening level (0.39 mg/kg based on  $1 \times 10^{-6}$  ELCR), at a maximum concentration of 14.6 mg/kg. Based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) and acceptable non-cancer HQ, acceptable risk-based concentrations for a residential scenario range from 0.39 mg/kg ( $1 \times 10^{-6}$  ELCR) to 22 mg/kg (HQ=1). Based on the maximum detected concentration, risk estimates for arsenic would be within acceptable levels and arsenic would not be identified as a risk driver.

Thallium was detected in surface soil at four of the five locations sampled above background and its human health screening level (0.52 mg/kg based on an HQ=0.1), at a maximum concentration of 1.57 mg/kg. Based on the acceptable non-cancer HQ, the acceptable risk-based concentration for a residential scenario is 5.2 mg/kg (HQ=1). Based on the low maximum detected concentration (relative to the acceptable risk-based concentration) that would be used in risk calculations, risk estimates for thallium would be acceptable and thallium would not be identified as a risk driver. Further, the thallium concentrations in the samples collected at SWMU 12 are suspect because the analytical method utilized was prone to providing falsely elevated results. This supposition is supported by the fact that at several PI/PAOC sites where samples were analyzed for thallium using both the older method and the newer method (e.g., PAOC U), the thallium concentrations of the samples analyzed with the newer method are lower.

As noted above, there are only two constituents (arsenic and thallium) detected in soil at concentrations above human health screening levels and background UTLs. Vanadium was also detected above the adjusted PRG, but concentrations do not exceed the background UTL. Only the soil PRG for arsenic is based on potential carcinogenic effects. A second PRG is available for arsenic based on non-cancer skin and vascular effects, while the PRGs for thallium and vanadium are based on liver effects and increased mortality, respectively. Therefore, there is no concern for cumulative human health effects from multiple constituents in soil.

Two inorganics (selenium and thallium) exceed ecological screening values and background in at least one surface soil sample. Neither one of these constituents likely poses an unacceptable risk to ecological receptors on a site-wide basis based upon the following:

- The site is very small, is adjacent to a road, and has gravel at the ground surface. Therefore, the habitat is limited, especially compared to the surroundings, and potential exposures are not likely significant ecologically.
- Selenium exceeds the ecological screening value (0.52 mg/kg) in all five samples, at a maximum HQ of 2.67. Although the background UTL for selenium in this soil type is 0.51 mg/kg, selenium concentrations up to 1.3 mg/kg were detected during the east Vieques background soil inorganics investigation in nearby soil types (CH2M HILL, 2007). This suggests that the selenium concentrations detected at SWMU 12 (maximum of 1.39 mg/kg; 0.9 mg/kg in the field duplicate of this sample) may be within the range of background, especially considering that other data collected for the site do not suggest a CERCLA-related release has occurred. Further, all selenium concentrations are less than ecological screening values based upon other receptors (e.g., 4.10 mg/kg for soil invertebrates). Thus, selenium has a low potential for unacceptable risks, especially given the very low potential for exposure.
- Thallium exceeds the ecological screening value (1 mg/kg) in three of five samples, at a maximum HQ of 1.47 (note that the field duplicate concentration for this sample is less than the screening value). Further, the mean thallium soil concentration (0.95 mg/kg) is less than the ecological screening value. Also, as stated above, the thallium concentrations are suspected of being falsely elevated.

The concentrations of three inorganics (arsenic, selenium, and thallium) exceeded the SSL at a DAF 1. However, the former solid waste collection area (i.e., potential source area) was relatively small. Therefore, an SSL at a higher DAF is likely to be more realistic. This supposition is supported by data from site SWMU 1 (also located in the Kv zone and discussed in the PA/SI Report), where SSLs at a DAF of 1 were shown to be unrealistic predictors of leaching to groundwater. At SWMU 1, arsenic, selenium, and thallium were all detected above the SSL at a DAF of 1; however, arsenic was not detected in groundwater and selenium was detected in groundwater below screening criteria. Further, as noted previously, the thallium results are suspected of being falsely elevated. The presumed depth to groundwater of more than about 100 feet at SWMU 12 further supports a higher DAF. At SWMU 12, none of the concentrations of arsenic exceeds the SSL at a DAF of 15 and none of the selenium concentrations exceeds the SSL at a DAF of 5.

Table 4-2 presents a comparison of Region IX PRGs/SSLs to RSLs/Regional SSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 4-2, the screening values for one organic and seven inorganics have been updated. The screening values for four of the eight constituents either increased or were eliminated. Further, the site concentrations for three of the four constituents where a lower screening value was published are all lower than the screening value. For thallium, the 0.01 mg/kg lower screening value would not alter the existing evaluation. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

**Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

The historical information (aerial photographs, photographs, interviews, site inspections) indicates a CERCLA-related release has not likely occurred at SWMU 12 due to the nature of the waste staged (i.e., non-hazardous), the fact that it was staged in containers, the fact that no evidence of releases was observed, and that constituents other than inorganics were generally not detected. Based on this information, the spatial distribution of samples and resulting data indicate the site has been sufficiently characterized.

## 4.2 Conclusions and No Action Determination

The decision analysis process described above indicates there has not been a CERCLA-related release at SWMU 12 that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Further, the dioxin concentration detected at the site is not likely associated with potential CERCLA-related releases and is nevertheless below risk-based screening levels. The site was used to temporarily stage domestic waste from OP-1 prior to transfer to the Vieques Island landfill. There is no information (including the analytical data) to suggest SWMU 12 was used to stage anything other than non-hazardous domestic waste. In fact, other areas were used specifically for staging of waste that was not domestic in nature and potentially hazardous (e.g., SWMU 5 and SWMU 8) at OP-1. Finally, the potential sources have been removed. Therefore, a no action determination is made for SWMU 12.

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**TABLE 4-1**  
 SWMU 12 Surface Soil No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques Eco SO	Vieques (East) Background	CGW12SS01	CGW12SS02	CGW12SS03		CGW12SS04	CGW12SS05
Sample ID					CGW12SS01-R01	CGW12SS02-R01	CGW12SS03-R01	CGW12FD01P-R01	CGW12SS04-R01	CGW12SS05-R01
Sample Date					1/19/04	1/19/04	1/19/04	1/19/04	1/19/04	1/19/04
<b>Chemical Name</b>										
<b>Volatile Organic Compounds (µg/kg)</b>										
No Detections										
<b>Semivolatile Organic Compounds (µg/kg)</b>										
Di-n-butylphthalate	270,000	610,000	200,000	--	352 U	83.7 J	346 U	337 U	57.5 J	349 U
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b>										
No Detections										
<b>Herbicides (µg/kg)</b>										
No Detections										
<b>Dioxin/Furans (pg/g)</b>										
Octachlorodibenzo-p-dioxin	--	*	--	--	NA	NA	NA	NA	NA	8
<b>Explosives (µg/kg)</b>										
No Detections										
<b>Total Metals (mg/kg)</b>										
Antimony	0.3	3.1	78	3.6	0.532 J	0.425 J	0.39 J	0.378 J	0.375 J	1.01 J
Arsenic	1	0.39	18	1.6	7.11	5.23	10.9	14.6	10.6	9.2
Barium	82	1600	330	212	86.7	107	148	139	153	102
Beryllium	3	15	40	0.27	0.275 J	0.388 J	0.285 J	0.28 J	0.27 J	0.304 J
Chromium	2	210	0.4	72	11.5 J	5.12 J	14.4 J	21.9 J	12 J	9.17 J
Cobalt	33	140	13	26	10.7 J	11 J	15.5 J	14.1 J	15.4 J	13.1 J
Copper	46	310	70	94	22.8	15.6	50.7	47.7	53.8	23.3
Lead	14	400	120	5.4	2.17 J	0.53 J	2.19 J	2.03 J	0.945 J	0.173 U
Mercury	0.1	2.3	0.1	0.057	0.0236 J	0.0227 J	0.0206 J	0.0238 J	0.0181 J	0.0569
Nickel	7	160	38	41	5.1 J	3.92 J	8 J	15.4 J	7.97 J	6.6 J
Selenium	0.3	39	0.52	0.51	0.818 J	0.632 J	1.39	0.9	0.575 J	0.529 J
Silver	2	39	560	0.22	0.149 J	0.122 J	0.166 J	0.151 J	0.14 J	0.118 J
Thallium	0.036	0.52	1	0.13	0.802 J	1.24 J	0.438 J	1.57 J	1.2 J	0.516 J
Vanadium	300	7.8	2	144	53	52.5	76.1	76.2	91.1	69.6
Zinc	620	2,300	120	32	67.9	91.4	82.8	81.1	93.9	89
<b>Wet Chemistry (mg/kg)<sup>1</sup></b>										
No Detections										

Notes:

- mg/kg - Milligrams per kilogram
- µg/kg - Micrograms per kilogram
- pg/g - picograms/gram
- NA - Not Analyzed
- J - Analyte present; reported value may or may not be accurate or precise
- U - Analyte not detected
- Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)
- Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: Users Guide (EPA, 1996)
- Vieques HHRA SO - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)
- Vieques Eco SO - Screening values for compounds (chromium, copper, mercury) (Efroymson, Will, and Suter, 1997)
- Vieques Eco SO - Screening values for compounds (di-n-butylphthalate, nickel, selenium, silver, thallium, vanadium, zinc) (Efroymson, et al., 1997)
- Vieques Eco SO - Screening values for compounds (antimony, arsenic, barium, beryllium, cadmium, cobalt, lead) (EPA, 2005b)

<sup>1</sup> Wet Chemistry consists of sulfide and cyanide

\* See Section 1.1.1.2 for dioxin screening.

Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, and DAF Criteria

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Table 4-2  
 Comparison of Region IX and Regional Screening Levels for Soil  
 SWMU 12  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>2</sup>	Adjusted Residential Regional Screening Level <sup>2</sup>	Region IX SSL <sup>1</sup> (DAF=1)	Regional SSL <sup>1</sup> (DAF=1)	
Di-n-butyl phthalate			270,000	1,100	None. 84 µg/kg highest concentration detected at the site.
Barium	1,600	1,500			None. 153 mg/kg highest concentration detected at the site.
Beryllium	15	16			None. Screening value increased. There were no exceedances using the Region IX PRG.
Cadmium	3.7	7			None. Screening value increased. There were no exceedances using the Region IX PRG.
Chromium <sup>2</sup>	210	23			None. 22 mg/kg highest concentration detected at the site.
Cobalt	140	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Thallium	0.52	0.51			None. Current evaluation unchanged by 0.01 mg/kg change in screening level.
Vanadium	7.8	39			None. Current evaluation unchanged by increase in screening level.

Notes:  
 Organics units are µg/kg; inorganics units are mg/kg  
<sup>1</sup> No Regional SSL values are provided for inorganics. The Region IX SSL values for inorganics are from the EPA Soil Screening Guidance and are therefore considered unchanged.  
<sup>2</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.

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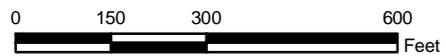
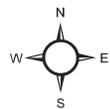


Solid Waste Collection Area (SWMU 12)

SWMU-12

**Legend**

□ SWMU 12 Area



**Figure 4-1**  
**2005 Aerial Photograph**  
**of the SWMU 12 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

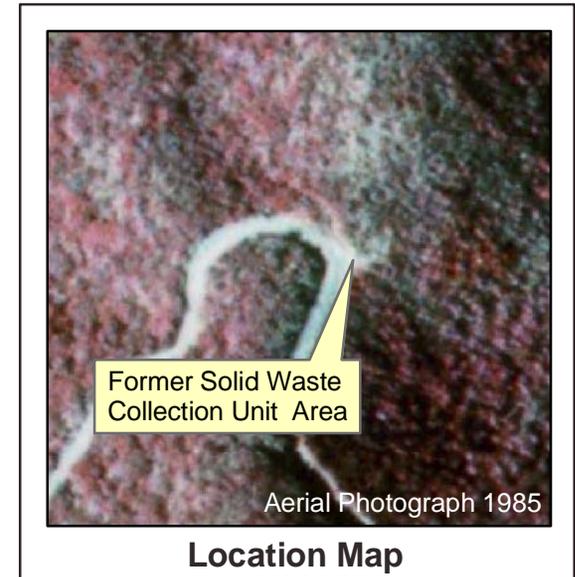
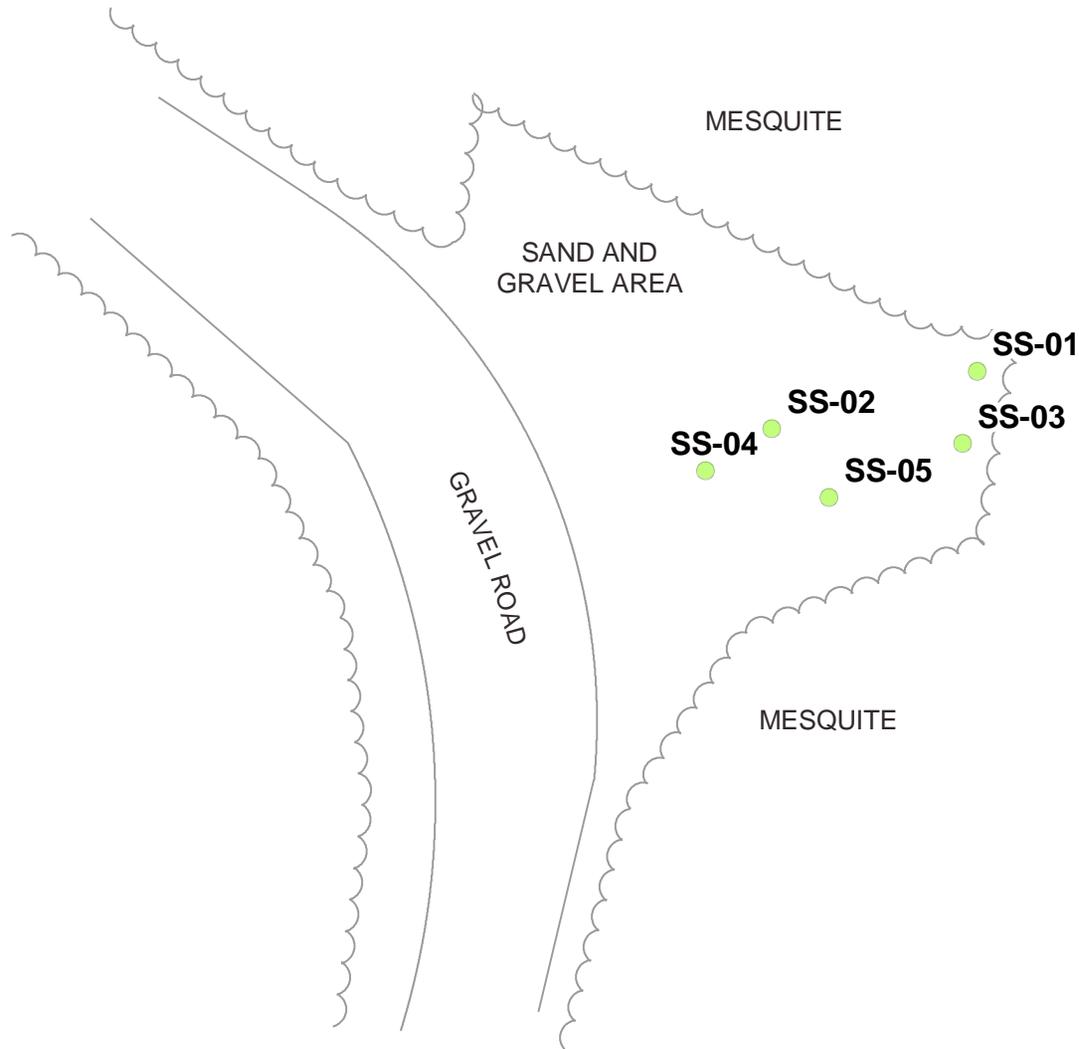
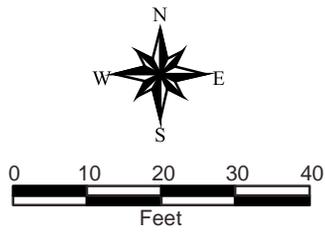
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Photograph taken February 3, 2000

**Figure 4-2**  
**SWMU 12 Solid Waste Collection Unit Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Legend**

- Surface Soil Sample Location

Each sampling location shown is preceded by "CGW12" (e.g. SS-01 = CGW12SS01)

**Figure 4-3**  
**Surface Soil Sample Location Map, SWMU 12**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 5

# AOC F—Rock Quarry (Camp García)

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This section presents a summary of the pertinent historical information and rationale for the no action determination for AOC F. A more detailed discussion of the AOC F evaluation is presented in the Final PA/SI Report (CH2M HILL, 2008). The AOC F rock quarry is located southwest of the former Camp Garcia landfill (Figures 1-2 and 5-1). This site was historically used by the Navy as a source of gravel for road construction and other projects, and is still being used as a gravel source for road construction activities. The 1995 RFA Report noted that used tires and some paper waste were visible at this location (PREQB, 1995). The two RFA reports prepared for this site recommended no further action (Kearney, 1988; PREQB, 1995).

During the February 2000 site inspection in which the EPA and Navy visited the Consent Order sites, no tires or other waste were observed at the quarry, and the quarry was not active. No additional historical usage information is known for this AOC.

Based on the information above, there is no known or suspected source of CERCLA-related releases at the rock quarry.

A surface soil sampling investigation referred to as the Phase I Environmental Assessment was conducted in June 2000 as part of the transfer of Navy Public Works operations from west Vieques to east Vieques. Following this transfer, the rock quarry was used for road maintenance activities. Five surface soil samples were collected from the portion of the quarry within the Kv formation at sampling locations illustrated in Figure 5-2. The samples were analyzed for Appendix IX VOCs, SVOCS, pesticides, herbicides, PCBs, and inorganics.

Table 5-1 summarizes the constituents detected in AOC F surface soil samples collected during the 2000 Phase I Environmental Assessment and identifies screening criteria exceedances.

Composite samples of the rock material to be used for road repair were collected in 2007 at the request of EPA. The results of these samples are discussed in Step 4 of the decision analysis below.

## 5.1 AOC F Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 5-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was used as a quarry. There is no evidence or historical data that suggests hazardous waste or materials were disposed of at the site. However, the site was identified in the Consent Order and subsequently sampled as part of the Environmental Assessment. Therefore, the decision analysis proceeds to Step 2.

**Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?**

For samples collected during the 2000 Environmental Assessment, the following inorganics above background UTLs and non-inorganics were detected by medium:

Surface Soil

- VOCs: none detected
- SVOCs: none detected
- Pesticides: delta-BHC
- Herbicides: 2,4,5-T
- PCBs: none detected
- Inorganics above background UTLs: arsenic, barium, beryllium, cobalt, selenium

**Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?**

Although there are no known or suspected CERCLA-related activities at the rock quarry that could have released hazardous constituents or waste, the inorganics are conservatively considered further in the decision analysis process.

The concentrations of the pesticide and herbicide detected at AOC F are similar to the concentrations detected at other sites across east Vieques (see Table A-1 of Final PA/SI Report [CH2M HILL, 2008]). Consequently, the pesticide and herbicide are likely attributable to normal pesticide use, not to a CERCLA-related release and are, therefore, not considered further in the decision analysis process.

**Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria (and background for inorganics) are listed below.

Surface Soil

- Arsenic: five detections (samples SS01 through SS05) at concentrations (2.1 mg/kg to 4.2 mg/kg) above the PRG (0.39 mg/kg), SSL at a DAF of 1 (1 mg/kg), and background UTL (1.6 mg/kg)
- Barium: three detections (samples SS02, SS03, SS05) at concentrations (218 mg/kg to 268 mg/kg) above the SSL at a DAF 1 (82 mg/kg) and background UTL (212 mg/kg)
- Cobalt: one detection (sample SS03) at a concentration (25.9 mg/kg) above the ecological screening value (13 mg/kg) and background UTL (25.5 mg/kg)
- Selenium: five detections (samples SS01 through SS05) at concentrations (0.84 mg/kg to 1.4 mg/kg) above the ecological screening value (0.52 mg/kg), the SSL at a DAF 1 (0.3 mg/kg), and background UTL (0.51 mg/kg)

### Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?

Arsenic was detected above background and its human health screening level (0.39 mg/kg based on  $1 \times 10^{-6}$  ELCR), at a maximum concentration of 4.2 mg/kg. Based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) and acceptable non-cancer HQ (which is based on skin and vascular effects), acceptable risk-based concentrations for a residential scenario range from 0.39 mg/kg ( $1 \times 10^{-6}$  ELCR) to 22 mg/kg (HQ=1). Based on the relatively low maximum detected concentration (relative to the acceptable risk-based range) that would be used in risk calculations, risk estimates for arsenic would be within acceptable levels and arsenic would not be identified as a risk driver.

Although vanadium was detected in soil above the adjusted residential PRG, its PRG is based on increased mortality, so there is no concern about potential cumulative human health effects from multiple constituents in site soil. Further, all vanadium concentrations are below the background UTL.

In addition to the above, although the arsenic UTL is 1.6 mg/kg, arsenic concentrations up to 5 mg/kg were detected during the east Vieques background soil inorganics investigation (CH2M HILL, 2007). Although concentrations above 1.6 mg/kg were considered outliers for the purposes of establishing a background UTL, those concentrations may very well be representative of true background arsenic concentrations. This information, together with the above information, indicates the arsenic concentrations detected at AOC F (i.e., maximum of 4.2 mg/kg) may be representative of background.

Cobalt and selenium concentrations exceed ecological screening values and background in at least one surface soil sample collected at the site. These constituents do not likely pose an unacceptable risk to ecological receptors based upon the following:

- The area is an active quarry, with surficial material being periodically reworked and removed. Thus, the quarry provides limited habitat and, therefore, potential exposures to ecological receptors are likely minimal.
- Only one cobalt concentration exceeds the ecological screening value and background UTL. However, the concentration (25.9 mg/kg) is only slightly above the background UTL (25.5 mg/kg).
- Although selenium exceeds the background UTL of 0.51 mg/kg, the relative uniformity of the concentrations (0.84 to 1.4 mg/kg) suggests that selenium may be present at background concentrations. Although the background UTL for selenium in this soil type is 0.51 mg/kg, selenium concentrations up to 1.3 mg/kg were detected during the east Vieques background soil inorganics investigation in nearby soil types (CH2M HILL, 2007). This suggests that the selenium concentrations detected at AOC F (maximum of 1.4 mg/kg) may be within the range of background, especially considering that other data collected for the site do not suggest a CERCLA-related release has occurred. Further, all selenium concentrations are less than ecological screening values based upon other receptors (e.g., 4.10 mg/kg for soil invertebrates). Given these factors, and the low quality habitat (bare dirt and rock with sparse vegetation), no unacceptable risks to ecological receptors are likely for exposure to selenium.

The concentrations of three constituents (arsenic, barium, and selenium) exceed the SSL at a DAF of 1 and background UTL. However, data from other sites suggest SSLs at a DAF of 1 are not realistic predictors of leaching to groundwater. For example, at SWMU 1, arsenic and selenium were detected in soil above the SSL at a DAF of 1; however, arsenic was not detected in groundwater and selenium was detected in groundwater below screening criteria. At AOC F, none of the arsenic, barium, or selenium concentrations exceeds the SSL at a DAF of 5.

As noted above, the arsenic concentrations may be representative of background, especially considering the arsenic concentrations detected in the crushed rock samples collected at the quarry (see Table 5-2 and the discussion below regarding the quarry rock samples). In addition, although three barium concentrations exceed the background UTL and SSL at a DAF of 1, the magnitude of background exceedances is relatively low. Similar to arsenic, barium concentrations up to 292 mg/kg were detected during the background soil inorganics investigation. Therefore, it is possible that the barium concentrations detected in the quarry soil samples are representative of background (maximum concentration of 268 mg/kg). In addition, there is no likely CERCLA-related source of barium at AOC F. Barium is most commonly used in drilling muds, and can be a component in bricks, ceramics, glass, and rubber.

In addition to the above information, crushed rock samples were collected from the rock quarry in 2007 at the request of EPA to support use of the rock quarry material for road repair. The results of the comparison of the rock quarry sample data to typical screening criteria (i.e., east Vieques soil background data and risk-based screening criteria) provide not only the rationale for why the data support that the material should be acceptable for use as road repair material, but that the material has not likely been affected by a release. The Technical Memorandum summarizing this information is provided in the PA/SI Report (CH2M HILL, 2008).

In accordance with the *Operational Plan for Removal of Rock Material from AOC F to be Used as Roadbed Materials* (CH2M HILL, 2005), composite rock quarry samples were collected at a rate of 1 grab sample per 100 cubic yards of material removed from the rock quarry. At the request of EPA (EPA, 2005), the samples were analyzed for target analyte list (TAL) inorganics to assess the use of the material as roadbed material. The analytical results of the samples are provided in Table 5-2.

The samples collected at AOC F were crushed stone collected from piles created by a bulldozer scraping up rock and weathered rock from the quarry. The photographs taken during sample collection suggest the piles were primarily rock, with some weathered rock interspersed. The samples were pulverized by the laboratory in order to perform the required analyses. Therefore, while comparison to east Vieques soil background data is a logical first step in evaluation of the quarry sample data, it is reasonable that this comparison alone may not be sufficient to make a determination of whether the quarry samples are representative of background because constituent concentrations in soil may differ from those in rock due to their different physical forms and chemical characteristics.

Table 5-2 shows the screening criteria comparison performed for the rock quarry samples. Because the rock quarry lies within the Kv and Qa geologic zones, the rock quarry data were initially screened against the background soil UTLs for these two zones. Any constituent concentration that exceeded the higher of the two background soil UTLs was then compared

to the residential PRG. Results of this screening show that only three constituents from the rock quarry samples had concentrations above both the background soil UTLs and the residential PRGs (noting that calcium does not have a PRG, but its background UTL was exceeded). These three constituents are arsenic, calcium, and iron. There is no known anthropogenic source of arsenic, calcium, or iron contamination at the AOC.

The highest calcium concentration detected in the rock quarry samples was 30,800 mg/kg, which exceeds the background calcium UTL of 11,900 mg/kg. The presence of calcium above the background soil UTL is most likely due to the presence of limestone and calcite deposits in the rock fractures. Limestone is part of Kv (and surely Qa because of the nature of this formation) and white "veins" were observed in the quarry samples collected. In addition, the calcium concentrations detected in the AOC F quarry samples are within the range of calcium concentrations (2,000- 38,000 mg/kg) of the background bedrock samples collected on west Vieques (CH2M HILL, 2002). Based on this information, the presence of calcium in the AOC F samples is indicative of background rock concentrations and not a "calcium release."

The highest arsenic concentration detected in the rock quarry samples was 7.2 mg/kg, which was one of only two arsenic concentrations (the other being 5.7 mg/kg) detected in rock quarry samples above the range of arsenic concentrations detected during the east Vieques background study (including outliers, where arsenic concentrations up to 5 mg/kg were detected). For arsenic, the PRG of 0.39 mg/kg is based on a cancer risk of  $1 \times 10^{-6}$ . Given that EPA defines the acceptable risk range to be  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ , only 3 of the 41 arsenic concentrations exceed the PRG based on  $1 \times 10^{-5}$  (i.e., 3.9 mg/kg), and none exceed the PRG based on  $1 \times 10^{-4}$  (i.e., 39 mg/kg). The mean arsenic concentration (approximately 2.6 mg/kg) is less than the  $1 \times 10^{-5}$  PRG (i.e., 3.9 mg/kg). It is important to note that all arsenic concentrations detected in the quarry samples are at the lower end of the range of arsenic concentrations (i.e., 0.96 to 36 mg/kg) and below the mean of arsenic concentration (i.e., 8.91 mg/kg) reported by the Agency for Toxic Substances and Disease Registry (ATSDR) for Vieques (ATSDR, 2003). Arsenic is common in marine deposits, primarily associated with iron sulfides (in reducing depositional environments) and iron oxyhydroxides (in oxidizing depositional environments). Further, arsenic concentrations between 5 and 40 mg/kg have been measured in uncontaminated marine sediments (Neff, 1997).

The highest iron concentration detected in the AOC F rock quarry samples was 46,800 mg/kg, which exceeds the background UTL of 38,100 mg/kg. However, only 2 of the 41 iron concentrations within the rock quarry samples exceeded both the PRG and background screening values. Furthermore, none of the iron concentrations detected in the quarry samples exceeds the mean iron concentration (54,200 mg/kg) detected in samples from the Kv lithology analyzed by ATSDR (ATSDR, 2003).

Based on the information above, it is very likely that all quarry sample constituent concentrations are representative of background rock concentrations in that area. Furthermore, for those constituents above soil background UTLs and residential PRGs, a comparison of the data to acceptable screening criteria suggests the exceedances would not pose an unacceptable risk to human receptors over that of background.

Table 5-3 presents a comparison of Region IX PRGs to RSLs for those detected constituents considered in the decision analysis process whose values changed with the release of

regional values by USEPA. As shown in Table 5-3, the screening values for five inorganics have been updated. The screening values for three of the five constituents either increased or were eliminated. Further, the site concentrations for the two constituents where a lower screening value was published are all lower than the screening value. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

**Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

Historical information regarding the rock quarry indicates there is no likely CERCLA-related source of release at the site. In addition, because both the soil and rock data were collected and both sets of data suggest the constituent concentrations are likely attributable to background, the site has been sufficiently characterized.

## 5.2 Conclusions and Recommendations

The decision analysis process described above indicates inorganic constituent concentrations detected at AOC F are likely attributable to background and that there has not likely been a CERCLA-related release at the site. Further, the pesticide and herbicide detections at the site are likely associated with normal pesticide use, not a CERCLA-related release. Finally, the potential sources have been removed. Therefore, a no action determination is made for AOC F.

**TABLE 5-1**  
AOC F Surface Soil Detection and Exceedance Results  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques Eco SO	Vieques (East) Background Zone Kv SS	CGAOCFSS001	CGAOCFSS002	CGAOCFSS003	CGAOCFSS004	CGAOCFSS005	
Sample ID					NDD044	NDD045	NDD046	NDD047	NDD048	NDD049FD1
Sample Date					6/14/00	6/14/00	6/14/00	6/14/00	6/14/00	6/14/00
<b>Chemical Name</b>										
<b>Volatile Organic Compounds (µg/kg)</b> No Detections										
<b>Semivolatile Organic Compounds (µg/kg)</b> No Detections										
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b> delta-BHC	0.1	440	--	--	1.8 UJ	1.5 UJ	2.1 UJ	1.7 UJ	2 UJ	0.73 J
<b>Herbicides (µg/kg)</b> 2,4,5-T	--	61,000	--	--	79 UJ	67 UJ	5.2 J	75 UJ	86 UJ	73 UJ
<b>Total Metals (mg/kg)</b>										
Arsenic	1	0.39	18	1.6	2.1	2.9	4.2	3	3.1	4.2
Barium	82	1600	330	212	160	268	238	61.8	218	165
Beryllium	3	15	40	0.27	0.34	0.32	0.53	0.37	0.37	0.37
Chromium	2	210	0.4	72	8.1	9.8	21.5	10.4	20.2	14.9
Cobalt	33	140	13	25.5	16.7	20	25.9	15.2	22.7	20.5
Copper	46	310	70	94.2	9.2	19.2	34.7	29.4	30.7	27.7
Lead	14	400	120	5.4	1.6	2.2	3.2	2.7	2.4	2.6
Mercury	0.1	2.3	0.1	0.057	0.05 J	0.012 UJ	0.022 UJ	0.015 UJ	0.017 UJ	0.013 UJ
Nickel	7	160	38	41	4.9 J	4.5 J	10.9	3.7 J	9.7	7.4
Selenium	0.3	39	0.52	0.51	0.84 J	1.1 J	1.4 J	0.86 J	1.3 J	1.2 J
Vanadium	300	7.8	2	144	73.8	81.5	118	96.9	99.7	116
Zinc	620	2,300	120	32	18.1	15.3	17.7	10.5	13.9	14.5

Notes:  
mg/kg - milligrams per kilogram  
µg/kg - micrograms per kilogram  
J - Analyte present; reported value may or may not be accurate or precise  
U - Analyte not detected  
UJ - Analyte not detected; quantitation limit may be inaccurate or imprecise  
Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)  
Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: Users Guide (EPA, 1996)  
Vieques HHRA SO - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)  
Vieques Eco SO - Screening values for compounds (chromium, copper, mercury) (Efroymsen, Will and Suter, 1997)  
Vieques Eco SO - Screening values for compounds (nickel, selenium, vanadium, zinc) (Efroymsen, et al., 1997)  
Vieques Eco SO - Screening values for compounds (arsenic, barium, beryllium, cobalt, lead) (EPA, 2005b)

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria

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**Table 5-2**

AOC F Gravel Analytical Results, May 2007  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID Sample ID Sample Date	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2D3I4		VEAF-G2D3I5		
				VEAF-G2D3I4-08-0507	VEAF-G2D3I4-09-0507	VEAF-G2D3I5-10-0507	VEAF-G2D3I5-10P-0507	VEAF-G2D3I5-11-0507
				05/03/07	05/03/07	05/03/07	05/03/07	05/03/07
<b>Chemical Name</b>								
<b>Total Metals (mg/kg)</b>								
Aluminum	35,000	35,000	7600	14,700 D	15,900 D	16,200 D	18,600 D	24,300 D
Antimony	NA	NA	3.1	24.5 U	24.5 U	24.7 U	25 U	25.3 U
Arsenic	1.6	1.6	0.39	2.3 JD	3.8 JD	1.6 JD	2 JD	2.4 JD
Barium	212	212	1600	16.5 JD	21.4 JD	23.5 JD	27.4 JD	45.7 JD
Beryllium	0.27	0.27	15	0.26 JD	0.29 JD	2.1 U	0.29 JD	0.35 JD
Calcium	8,840	11,900		7,000 D	6,980 D	9,170 D	10,600 D	14,800 D
Chromium	72	72	210	4.1 U	4.8 D	5.2 D	3.6 JD	5.9 D
Cobalt	25.5	15.8	140	26.9 D	26 D	24 D	24.5 D	30.6 D
Copper	94.2	52.8	310	106 D	44.2 D	80.8 D	77.4 D	82.3 D
Iron	43,200	38,100	2400	31,400 D	35,600 D	31,400 D	36,100 D	39,100 D
Lead	5.4	5.4	400	0.97 JD	2.6 JD	0.71 JD	4.2 U	2.2 JD
Magnesium	22,200	22,200		9,310 D	10,200 D	12,500 D	14,500 D	14,800 D
Manganese	1,630	1,630	180	393 D	404 D	416 D	477 D	583 D
Mercury	0.057	0.057	2.3	0.1 U	0.1 U	0.1 U	0.1 U	0.013 J
Nickel	41	22.2	160	3.5 JD	3.6 JD	4.9 JD	4.6 JD	5.3 JD
Potassium	5,270	5,270		576 JD	718 JD	942 JD	930 JD	1,650 JD
Selenium	0.51	0.51	39	14.3 U	14.3 U	14.4 U	14.6 U	14.8 U
Silver	0.22	0.22	39	7 D	8.5 D	6.7 D	8 D	7.5 D
Sodium	1,590	1,590		2,040 U	2,040 U	2,060 U	2,080 U	2,110 U
Vanadium	144	144	7.8	74.9 D	84.7 D	84.4 D	85.4 D	98.3 D
Zinc	32	32	2300	13 JD	10.7 JD	9.5 JD	14.9 JD	20.7 JD
<b>Wet Chemistry (mg/kg)</b>								
Cyanide	0.33	0.33	120	0.068 J	0.071 J	2.6 U	2.6 U	2.6 U
% Solids	NA	NA	NA	98.1	97.8	97.2	96.1	94.9

Notes:

- mg/kg - milligrams per kilogram
- D - Diluted Result
- J - Below Detection Limit
- N - Spiked sample recovery not within control limits
- U - Analyte not detected
- NA - Not Applicable
- % - Percent

Exceeds background and HHRA

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**Table 5-2**  
AOC F Gravel Analytical Results, May 2007  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2D3J3						
				VEAF-G2D3J3-01-0507 05/03/07	VEAF-G2D3J3-03-0507 05/03/07	VEAF-G2D3J3 05/03/07	VEAF-G2D3J3-04-0507 05/03/07	VEAF-G2D3J3-05-0507 05/03/07	VEAF-G2D3J3-06-0507 05/03/07	
<b>Chemical Name</b>										
<b>Total Metals (mg/kg)</b>										
Aluminum	35,000	35,000	7600	12,900 D	17,900 D	15,400 D	15,900 D	16,200 D	9,850 D	
Antimony	NA	NA	3.1	25.4 U	25 U	25.5 U	25.2 U	24.9 U	24.8 U	
Arsenic	1.6	1.6	0.39	3.3 JD	3.1 JD	3 JD	2 JD	1.9 JD	1.7 JD	
Barium	212	212	1600	24.1 JD	27.2 JD	28.5 JD	27.4 JD	26.3 JD	20.5 JD	
Beryllium	0.27	0.27	15	2.1 U	2.1 U	0.24 JD	0.24 JD	2.1 U	2.1 U	
Calcium	8,840	11,900		5,320 D	5,740 D	6,800 D	6,850 D	7,730 D	5,020 D	
Chromium	72	72	210	3.8 JD	4.7 D	3.9 JD	4.6 D	3.9 JD	2.3 JD	
Cobalt	25.5	15.8	140	23.1 D	35.3 D	27.4 D	29.9 D	29.3 D	18.5 JD	
Copper	94.2	52.8	310	48.6 D	34.6 D	49.2 D	42.4 D	35.8 D	32.2 D	
Iron	43,200	38,100	2400	27,700 D	37,700 D	30,600 D	32,800 D	33,100 D	19,200 D	
Lead	5.4	5.4	400	1.4 JD	4.2 U	4.3 U	1.2 JD	4.2 U	4.1 U	
Magnesium	22,200	22,200		7,910 D	12,800 D	7,940 D	9,540 D	10,100 D	5,400 D	
Manganese	1,630	1,630	180	309 D	384 D	447 D	463 D	419 D	268 D	
Mercury	0.057	0.057	2.3	0.11 U	0.1 U	0.11 U	0.11 U	0.1 U	0.1 U	
Nickel	41	22.2	160	2.9 JD	3.2 JD	3.3 JD	3.3 JD	3.1 JD	1.6 JD	
Potassium	5,270	5,270		471 JD	1,850 JD	422 JD	564 JD	572 JD	344 JD	
Selenium	0.51	0.51	39	14.8 U	14.6 U	14.9 U	14.7 U	14.6 U	14.5 U	
Silver	0.22	0.22	39	6.1 D	9.1 D	6 D	7.2 D	7.3 D	4.1 U	
Sodium	1,590	1,590		2,120 U	2,090 U	2,130 U	2,100 U	2,080 U	2,070 U	
Vanadium	144	144	7.8	69.1 D	95.8 D	73.4 D	78.5 D	82.5 D	45.3 D	
Zinc	32	32	2300	7.1 JD	11.7 JD	16.7 JD	13.3 JD	22.5 JD	4.6 JD	
<b>Wet Chemistry (mg/kg)</b>										
Cyanide	0.33	0.33	120	0.12 J	2.6 U	2.7 U	2.6 U	2.6 U	2.6 U	
% Solids	NA	NA	NA	94.5	95.9	94	95.2	96.2	96.6	

Notes:  
mg/kg - milligrams per kilogram  
D - Diluted Result  
J - Below Detection Limit  
N - Spiked sample recovery not within control limits  
U - Analyte not detected  
NA - Not Applicable  
% - Percent

Exceeds background and HHRA

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**Table 5-2**

AOC F Gravel Analytical Results, May 2007  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2D3J4									
				VEAF-G2D3J4-07-0507 05/03/07	VEAF-G2D3J4-14-0507 05/03/07	VEAF-G2D3J4-15-0507 05/03/07	VEAF-G2D3J4-16-0507 05/03/07	VEAF-G2D3J4-17-0507 05/03/07	VEAF-G2D3J4-18-0507 05/03/07	VEAF-G2D3J4-19-0507 05/03/07	VEAF-G2D3J4-20-0507 05/03/07		
<b>Chemical Name</b>													
<b>Total Metals (mg/kg)</b>													
Aluminum	35,000	35,000	7600	13,000 D	16,100 D	15,000 D	16,400 D	12,500 D	9,970 D	6,720 D	15,700 D		
Antimony	NA	NA	3.1	24.8 U	24.4 U	24.7 U	24.2 U	24.1 U	24.1 U	12.1 U	24.2 U		
Arsenic	1.6	1.6	0.39	1.4 JD	1.8 JD	2 JD	2.3 JD	3.2 JD	2.2 JD	1.9 JD	3.3 JD		
Barium	212	212	1600	28.3 JD	23.3 JD	11.9 JD	69.7 JD	15.8 JD	10.8 JD	8.9 JD	22.3 JD		
Beryllium	0.27	0.27	15	2.1 U	0.26 JD	0.31 JD	0.27 JD	2 U	2 U	0.14 JD	0.43 JD		
Calcium	8,840	11,900		5,200 D	12,900 D	8,000 D	5,460 D	9,940 D	9,660 D	7,900 D	11,700 D		
Chromium	72	72	210	3.2 JD	3.1 JD	4.1 U	4.4 D	11.4 D	3.2 JD	4.6 D	5.7 D		
Cobalt	25.5	15.8	140	35.8 D	22.9 D	20.2 JD	21.5 D	18.6 JD	23.7 D	10.9 D	20.7 D		
Copper	94.2	52.8	310	30.9 D	50.4 D	295 D	34.1 D	23.5 D	142 D	12.2 D	30.3 D		
Iron	43,200	38,100	2400	25,900 D	31,200 D	36,100 D	31,600 D	33,200 D	22,600 D	18,200 D	35,300 D		
Lead	5.4	5.4	400	4.1 U	4.1 U	0.86 JD	4 U	0.97 JD	4 U	0.39 JD	1.2 JD		
Magnesium	22,200	22,200		8,270 D	11,800 D	10,300 D	10,400 D	8,750 D	9,280 D	5,860 D	13,800 D		
Manganese	1,630	1,630	180	413 D	457 D	263 D	741 D	358 D	257 D	229 D	460 D		
Mercury	0.057	0.057	2.3	0.1 U									
Nickel	41	22.2	160	2.4 JD	2.8 JD	4.5 JD	3.2 JD	12.3 JD	2.6 JD	2.5 JD	3.9 JD		
Potassium	5,270	5,270		346 JD	1,010 JD	424 JD	802 JD	642 JD	386 JD	272 JD	805 JD		
Selenium	0.51	0.51	39	14.4 U	14.2 U	14.4 U	14.1 U	14.1 U	14 U	7.1 U	14.1 U		
Silver	0.22	0.22	39	5.6 D	6.1 D	8.5 D	6.7 D	7.6 D	5 D	3.7 D	6.6 D		
Sodium	1,590	1,590		2,060 U	2,030 U	2,060 U	2,020 U	2,010 U	2,010 U	1,010 U	2,020 U		
Vanadium	144	144	7.8	63.5 D	74.7 D	85.6 D	75.4 D	70.9 D	49.7 D	39 D	73.9 D		
Zinc	32	32	2300	11.6 JD	21.6 JD	7.8 JD	8.3 JD	10 JD	7.6 JD	5.8 JD	11.9 JD		
<b>Wet Chemistry (mg/kg)</b>													
Cyanide	0.33	0.33	120	2.6 U	2.5 U	2.6 U	2.5 U						
% Solids	NA	NA	NA	96.9	98.4	97.2	99.2	99.6	99.7	99	99.1		

Notes:

- mg/kg - milligrams per kilogram
- D - Diluted Result
- J - Below Detection Limit
- N - Spiked sample recovery not within control limits
- U - Analyte not detected
- NA - Not Applicable
- % - Percent

Exceeds background and HHRA

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**Table 5-2**  
AOC F Gravel Analytical Results, May 2007  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2D3J4		VEAF-G2D3J5	
				VEAF-G2D3J4-20P-0507 05/03/07	VEAF-G2D3J4-21-0507 05/03/07	VEAF-G2D3J5-12-0507 05/03/07	VEAF-G2D3J5-13-0507 05/03/07
Sample ID							
Sample Date							
Chemical Name							
<b>Total Metals (mg/kg)</b>							
Aluminum	35,000	35,000	7600	20,300 D	14,700 D	15,200 D	13,100 D
Antimony	NA	NA	3.1	30.6 U	24.5 U	24.2 U	24.3 U
Arsenic	1.6	1.6	0.39	2.7 JD	2.3 JD	2.6 JD	1.3 JD
Barium	212	212	1600	20.2 JD	23.2 JD	26.9 JD	8.7 JD
Beryllium	0.27	0.27	15	0.33 JD	0.26 JD	0.32 JD	2 U
Calcium	8,840	11,900		10,600 D	11,400 D	18,000 D	4,240 D
Chromium	72	72	210	6.6 D	5.1 D	3.5 JD	2.6 JD
Cobalt	25.5	15.8	140	22.7 JD	17.4 JD	23 D	19.4 JD
Copper	94.2	52.8	310	43.1 D	14.1 D	18.5 D	71.7 D
Iron	43,200	38,100	2400	39,500 D	31,200 D	27,700 D	26,800 D
Lead	5.4	5.4	400	5.1 U	4.1 U	4 U	4.1 U
Magnesium	22,200	22,200		14,500 D	10,800 D	10,300 D	11,900 D
Manganese	1,630	1,630	180	464 D	420 D	476 D	289 D
Mercury	0.057	0.057	2.3	0.1 U	0.013 J	0.1 U	0.1 U
Nickel	41	22.2	160	4.1 JD	3.2 JD	2.8 JD	3.1 JD
Potassium	5,270	5,270		1,190 JD	664 JD	627 JD	479 JD
Selenium	0.51	0.51	39	17.9 U	14.3 U	14.1 U	14.2 U
Silver	0.22	0.22	39	8.1 D	5 D	4.7 D	6.2 D
Sodium	1,590	1,590		2,550 U	2,040 U	2,010 U	2,030 U
Vanadium	144	144	7.8	83.8 D	67.2 D	59.9 D	53.9 D
Zinc	32	32	2300	26.4 JD	20.3 JD	12.5 JD	9.4 JD
<b>Wet Chemistry (mg/kg)</b>							
Cyanide	0.33	0.33	120	2.6 U	2.6 U	2.5 U	2.5 U
% Solids	NA	NA	NA	97.9	97.8	99.3	98.7

Notes:  
mg/kg - milligrams per kilogram  
D - Diluted Result  
J - Below Detection Limit  
N - Spiked sample recovery not within control limits  
U - Analyte not detected  
NA - Not Applicable  
% - Percent

Exceeds background and HHRA

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**Table 5-2**  
AOC F Gravel Analytical Results, May 2007  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2E3A3									
				VEAF-G2E3A3-37-0507 05/03/07	VEAF-G2E3A3-38-0507 05/03/07	VEAF-G2E3A3-39-0507 05/03/07	VEAF-G2E3A3-40-0507 05/03/07	VEAF-G2E3A3-40P-0507 05/03/07	VEAF-G2E3A3-41-0507 05/03/07	VEAF-G2E3A3-42-0507 05/03/07	VEAF-G2E3A3-42P-0507 05/03/07		
<b>Chemical Name</b>													
<b>Total Metals (mg/kg)</b>													
Aluminum	35,000	35,000	7600	15,500 D	19,400 D	16,300 D	15,600 D	16,400 D	15,900 D	14,700 D	15,200 D		
Antimony	NA	NA	3.1	24.6 U	60.6 U	24.4 U	24.3 U	1.3 JD	24.6 U	1.4 JD	24.6 U		
Arsenic	1.6	1.6	0.39	5.7 D	7.2 JD	4.2 D	2.8 JD	2.5 JD	2 JD	2.5 JD	2.8 JD		
Barium	212	212	1600	58.5 JD	40.5 JD	31.5 JD	24.6 JD	28.9 JD	35.7 JD	26.1 JD	25.3 JD		
Beryllium	0.27	0.27	15	0.38 JD	0.62 JD	0.37 JD	0.32 JD	0.33 JD	0.32 JD	0.35 JD	0.35 JD		
Calcium	8,840	11,900		5,880 D	15,600 D	15,600 D	10,300 D	10,200 D	9,410 D	10,500 D	9,780 D		
Chromium	72	72	210	4 JD	5.8 JD	6.1 D	4.2 D	4.8 D	3.9 JD	5 D	4.3 D		
Cobalt	25.5	15.8	140	39.6 D	49.8 JD	33.6 D	41.7 D	31.4 D	33 D	29.2 D	27 D		
Copper	94.2	52.8	310	52.5 D	115 D	104 D	84 D	87.1 D	52.9 D	57.6 D	44.2 D		
Iron	43,200	38,100	2400	38,300 D	46,800 D	38,000 D	35,100 D	36,600 D	39,800 D	35,600 D	34,000 D		
Lead	5.4	5.4	400	2.1 JD	10.1 U	0.92 JD	0.94 JD	4.1 U	4.1 U	0.91 JD	4.1 U		
Magnesium	22,200	22,200		11,900 D	15,300 D	13,000 D	12,100 D	13,200 D	14,300 D	12,300 D	13,500 D		
Manganese	1,630	1,630	180	533 D	735 D	631 D	506 D	524 D	635 D	522 D	456 D		
Mercury	0.057	0.057	2.3	0.1 U	0.1 U	0.1 U	0.1 U						
Nickel	41	22.2	160	3.6 JD	4.8 JD	5.2 JD	3.8 JD	3.9 JD	4.3 JD	3.9 JD	4 JD		
Potassium	5,270	5,270		936 JD	933 JD	1,150 JD	877 JD	1,020 JD	1,050 JD	782 JD	827 JD		
Selenium	0.51	0.51	39	14.3 U	35.4 U	14.2 U	14.2 U	14.2 U	14.4 U	14.3 U	1.3 JD		
Silver	0.22	0.22	39	7.4 D	8.7 JD	5.9 D	6.5 D	6.8 D	7.4 D	6.2 D	6 D		
Sodium	1,590	1,590		695 JD	5,050 U	2,030 U	2,020 U	2,030 U	294 JD	2,050 U	2,050 U		
Vanadium	144	144	7.8	81.5 D	94 D	77.8 D	76.5 D	75.1 D	77.2 D	75.1 D	68.9 D		
Zinc	32	32	2300	22.6 JD	13.9 JD	19.3 JD	21 JD	22.6 JD	16 JD	12.7 JD	17.3 JD		
<b>Wet Chemistry (mg/kg)</b>													
Cyanide	0.33	0.33	120	2.6 U	2.5 U	2.5 U	2.5 U	2.5 U	2.6 U	2.6 U	2.6 U		
% Solids	NA	NA	NA	97.6	99	98.5	98.9	98.4	97.5	97.7	97.4		

Notes:  
mg/kg - milligrams per kilogram  
D - Diluted Result  
J - Below Detection Limit  
N - Spiked sample recovery not within control limits  
U - Analyte not detected  
NA - Not Applicable  
% - Percent  
Exceeds background and HHRA

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**Table 5-2**  
AOC F Gravel Analytical Results, May 2007  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2E3A4									
				VEAF-G2E3A4-22-0507 05/03/07	VEAF-G2E3A4-23-0507 05/03/07	VEAF-G2E3A4-24-0507 05/03/07	VEAF-G2E3A4-25-0507 05/03/07	VEAF-G2E3A4-26-0507 05/03/07	VEAF-G2E3A4-34-0507 05/03/07	VEAF-G2E3A4-35-0507 05/03/07	VEAF-G2E3A4-36-0507 05/03/07		
<b>Chemical Name</b>													
<b>Total Metals (mg/kg)</b>													
Aluminum	35,000	35,000	7600	13,300 D	17,300 D	20,600 D	20,800 D	18,200 D	13,100 D	14,500 D	17,300 D		
Antimony	NA	NA	3.1	24.4 U	24.1 U	24.3 U	30.3 U	1.2 JD	24.4 U	24.3 U	25.1 U		
Arsenic	1.6	1.6	0.39	2.9 JD	2 JD	2.3 JD	3.1 JD	2.7 JD	3.2 JD	2.8 JD	1.8 JD		
Barium	212	212	1600	13.7 JD	38.6 JD	41.3 JD	49.4 JD	57.4 JD	18.1 JD	19.8 JD	55.4 JD		
Beryllium	0.27	0.27	15	0.26 JD	0.32 JD	0.38 JD	0.33 JD	0.4 JD	0.31 JD	0.29 JD	0.29 JD		
Calcium	8,840	11,900		7,830 D	11,700 D	13,800 D	14,700 D	10,800 D	7,910 D	12,100 D	11,400 D		
Chromium	72	72	210	13.7 D	4.6 D	4.5 D	4 JD	4.4 D	3.9 JD	3.2 JD	3.4 JD		
Cobalt	25.5	15.8	140	40 D	35.7 D	39.8 D	42.2 D	26.4 D	42.2 D	33 D	30.4 D		
Copper	94.2	52.8	310	30.8 D	93.9 D	71.6 D	77.1 D	29.7 D	160 D	23.4 D	46.8 D		
Iron	43,200	38,100	2400	27,900 D	38,600 D	39,900 D	45,800 D	39,300 D	29,100 D	32,400 D	37,200 D		
Lead	5.4	5.4	400	1.3 JD	0.71 JD	1.4 JD	1.1 JD	4 U	0.74 JD	4.1 U	1.8 JD		
Magnesium	22,200	22,200		7,540 D	13,500 D	15,500 D	15,200 D	14,600 D	13,300 D	14,300 D	14,000 D		
Manganese	1,630	1,630	180	362 D	600 D	678 D	687 D	588 D	428 D	503 D	492 D		
Mercury	0.057	0.057	2.3	0.1 U									
Nickel	41	22.2	160	4.1 JD	4.2 JD	4.5 JD	4.5 JD	4.1 JD	3.8 JD	3.9 JD	4 JD		
Potassium	5,270	5,270		467 JD	1,090 JD	1,740 JD	1,580 JD	1,150 JD	532 JD	712 JD	1,240 JD		
Selenium	0.51	0.51	39	14.2 U	14.1 U	14.2 U	17.7 U	14.2 U	14.2 U	14.2 U	14.7 U		
Silver	0.22	0.22	39	5.3 D	6.2 D	6.7 D	7.6 D	6.8 D	5.2 D	5.4 D	6.4 D		
Sodium	1,590	1,590		2,030 U	2,010 U	179 JD	2,530 U	2,020 U	2,030 U	2,030 U	2,090 U		
Vanadium	144	144	7.8	69.6 D	74.1 D	79.5 D	86.5 D	87.3 D	60.3 D	60.4 D	66.6 D		
Zinc	32	32	2300	31.5 D	13.6 JD	27.9 D	29.2 JD	33.5 D	11 JD	25.3 D	21.5 JD		
<b>Wet Chemistry (mg/kg)</b>													
Cyanide	0.33	0.33	120	0.078 J	2.5 U	2.6 U							
% Solids	NA	NA	NA	98.5	99.4	98.8	98.9	98.8	98.3	98.6	95.5		

Notes:  
mg/kg - milligrams per kilogram  
D - Diluted Result  
J - Below Detection Limit  
N - Spiked sample recovery not within control limits  
U - Analyte not detected  
NA - Not Applicable  
% - Percent

Exceeds background and HHRA

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**Table 5-2**

AOC F Gravel Analytical Results, May 2007  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID	Soil Bkg Criteria - Zone Kv	Soil Bkg Criteria - Zone Qa	Vieques HHRA SO	VEAF-G2E3A5		VEAF-G2E3B4		VEAF-G2E3B5				
				VEAF-G2E3A5-27-0507 05/03/07	VEAF-G2E3A5-28-0507 05/03/07	VEAF-G2E3B4-32-0507 05/03/07	VEAF-G2E3B4-33-0507 05/03/07	VEAF-G2E3B5-29-0507 05/03/07	VEAF-G2E3B5-30-0507 05/03/07	VEAF-G2E3B5-30P-0507 05/03/07	VEAF-G2E3B5-31-0507 05/03/07	
<b>Chemical Name</b>												
<b>Total Metals (mg/kg)</b>												
Aluminum	35,000	35,000	7600	16,600 D	20,100 D	11,900 D	15,900 D	18,600 D	16,400 D	13,700 D	19,100 D	
Antimony	NA	NA	3.1	24.5 U	24.3 U	24.3 U	24.8 U	24.4 U	1.4 JD	24.3 U	24.6 U	
Arsenic	1.6	1.6	0.39	3.4 JD	2.2 JD	1.8 JD	3.2 JD	2.5 JD	2.3 JD	2.5 JD	2.4 JD	
Barium	212	212	1600	28.4 JD	70.3 JD	22.7 JD	30.3 JD	48.4 JD	17 JD	17.3 JD	18.3 JD	
Beryllium	0.27	0.27	15	0.42 JD	0.36 JD	0.25 JD	0.32 JD	0.3 JD	0.33 JD	0.3 JD	0.36 JD	
Calcium	8,840	11,900		30,800 D	18,100 D	5,400 D	9,710 D	13,600 D	7,530 D	6,080 D	7,990 D	
Chromium	72	72	210	4.8 D	4.5 D	3.5 JD	8 D	4.2 D	5.1 D	4.9 D	6.1 D	
Cobalt	25.5	15.8	140	37.3 D	43.9 D	17.4 JD	35.8 D	33.6 D	46.2 D	49 D	25.3 D	
Copper	94.2	52.8	310	17.7 D	78.2 D	18.5 D	84.5 D	89.9 D	136 D	153 D	15.2 D	
Iron	43,200	38,100	2400	38,900 D	39,100 D	26,100 D	37,900 D	37,500 D	39,900 D	36,200 D	39,100 D	
Lead	5.4	5.4	400	4.1 U	1.1 JD	2 JD	4.1 U	4.1 U	4 U	4 U	4.1 U	
Magnesium	22,200	22,200		14,500 D	14,800 D	10,400 D	14,000 D	15,600 D	15,700 D	13,800 D	16,400 D	
Manganese	1,630	1,630	180	577 D	917 D	317 D	523 D	551 D	382 D	384 D	473 D	
Mercury	0.057	0.057	2.3	0.1 U	0.1 U							
Nickel	41	22.2	160	4.3 JD	3.9 JD	3 JD	4 JD	4 JD	5 JD	4.5 JD	4.8 JD	
Potassium	5,270	5,270		853 JD	2,120 D	768 JD	1,010 JD	1,920 JD	777 JD	703 JD	1,420 JD	
Selenium	0.51	0.51	39	14.3 U	14.2 U	14.2 U	14.5 U	14.2 U	14.1 U	14.2 U	14.3 U	
Silver	0.22	0.22	39	4.9 D	5.2 D	4.7 D	7 D	6.7 D	7.7 D	7.2 D	7.5 D	
Sodium	1,590	1,590		2,040 U	2,030 U	340 JD	328 JD	2,030 U	350 JD	410 JD	1,070 JD	
Vanadium	144	144	7.8	84.1 D	73.6 D	54.6 D	70.1 D	65.4 D	80.3 D	69.9 D	87 D	
Zinc	32	32	2300	29.2 D	38.3 D	9.7 JD	11.7 JD	31 D	25.9 D	11.6 JD	21.8 JD	
<b>Wet Chemistry (mg/kg)</b>												
Cyanide	0.33	0.33	120	0.16 J	0.12 J	0.08 J	0.066 J	2.5 U	2.5 U	0.15 J	2.6 U	
% Solids	NA	NA	NA	97.9	98.6	98.9	96.8	98.5	99	98.9	97.6	

Notes:

- mg/kg - milligrams per kilogram
- D - Diluted Result
- J - Below Detection Limit
- N - Spiked sample recovery not within control limits
- U - Analyte not detected
- NA - Not Applicable
- % - Percent

Exceeds background and HHRA

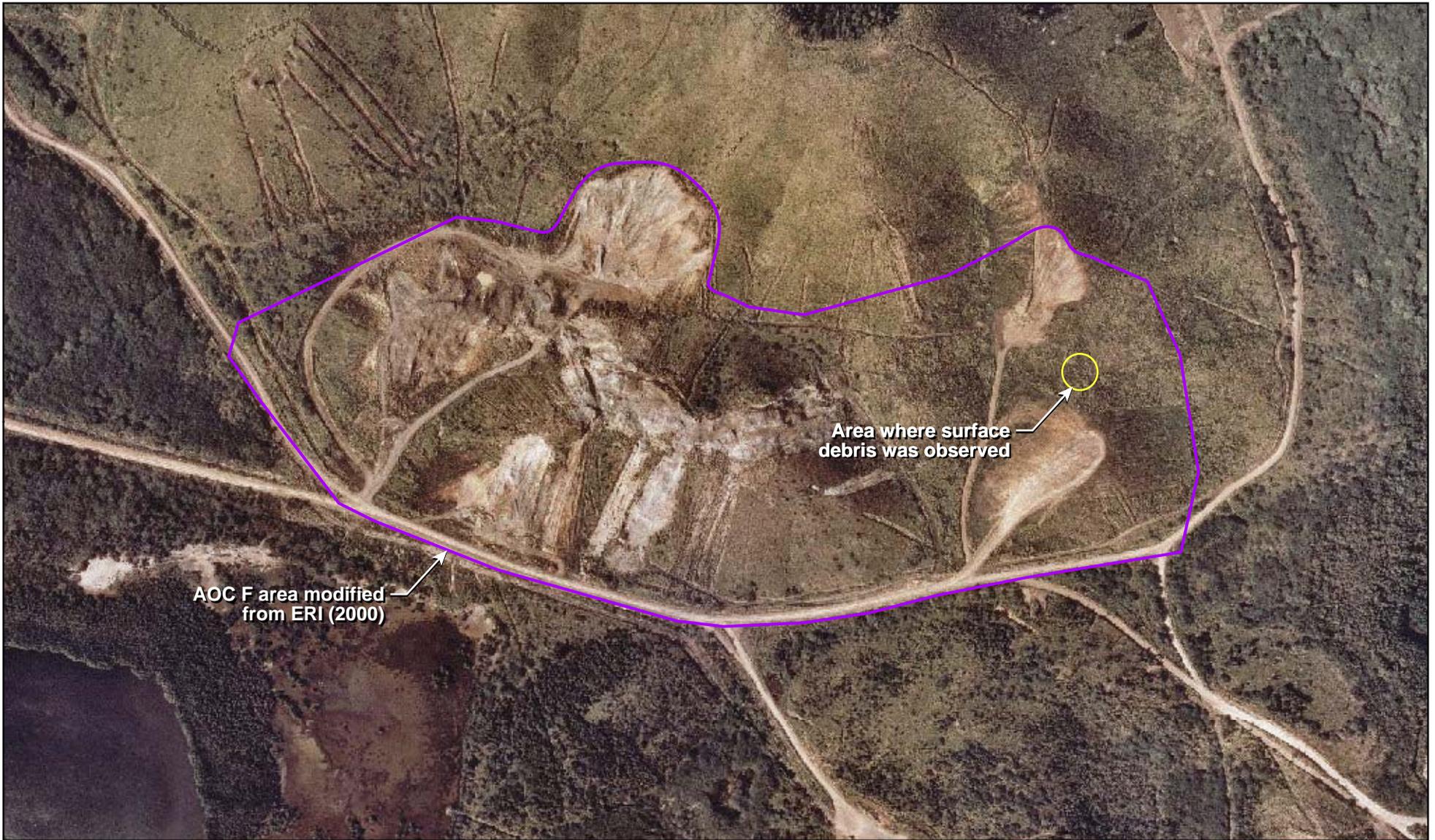
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**Table 5-3**

Comparison of Region IX and Regional Screening Levels for Soil  
 AOC F  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

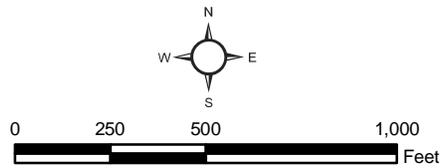
Detected Constituent	Human Health		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>1</sup>	Adjusted Residential Regional Screening Level <sup>1</sup>	
Barium	1,600	1,500	None. 268 mg/kg highest concentration detected at the site.
Beryllium	15	16	None. Screening value increased. There were no exceedances using the Region IX PRG.
Chromium <sup>2</sup>	210	23	None. 22 mg/kg highest concentration detected at the site.
Cobalt	140	No Value	None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Vanadium	7.8	39	None. Current evaluation unchanged by increase in screening level.
Notes: Organics units are µg/kg; inorganics units are mg/kg <sup>1</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.			

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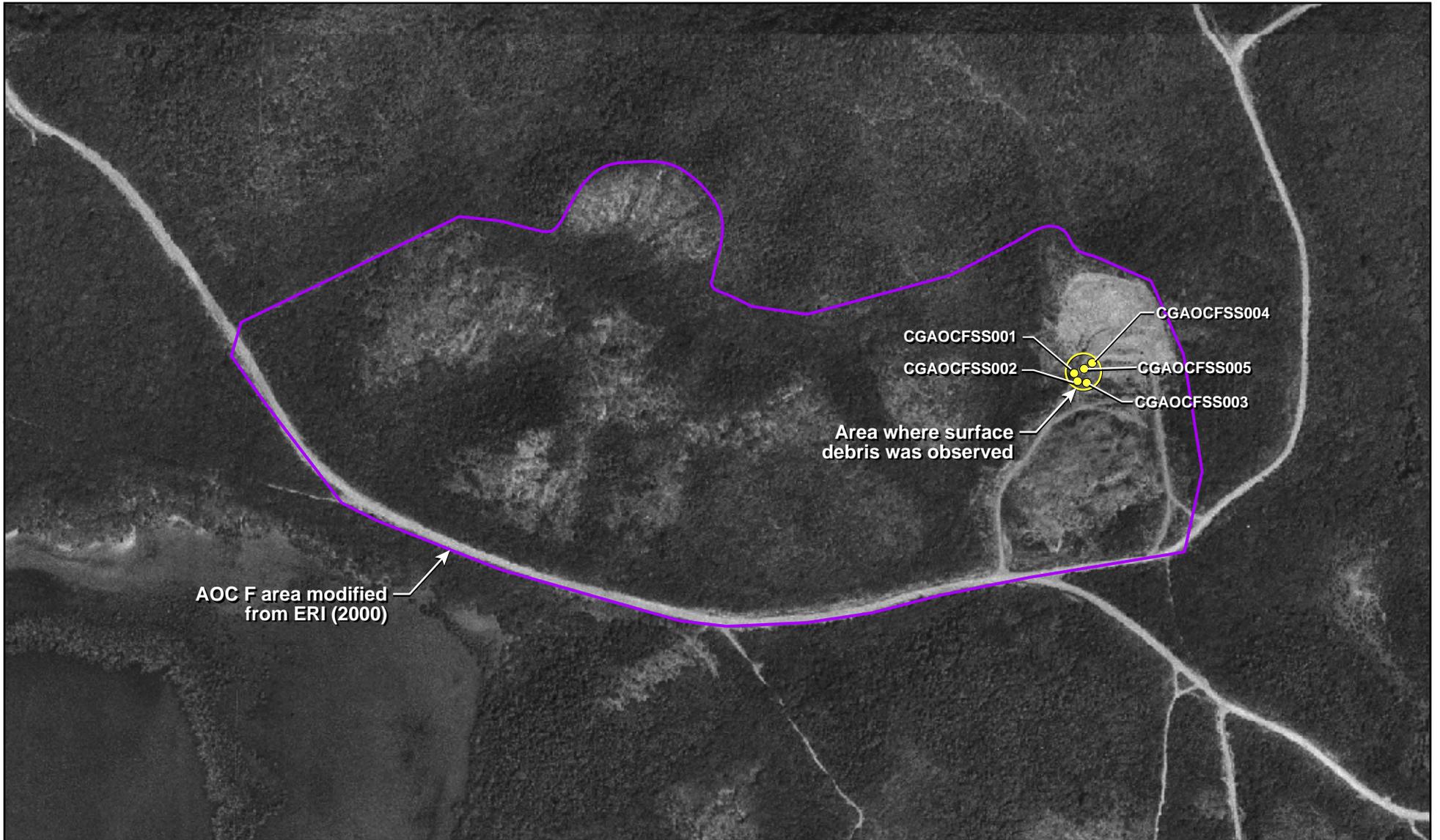
**Legend**

-  AOC F Area modified from the ERI (2000)
-  Area where surface debris was observed



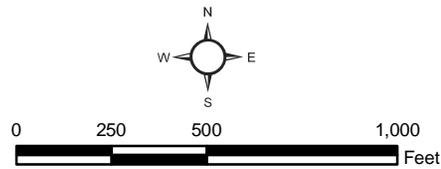
**Figure 5-1**  
**1962 Aerial Photograph of the AOC F Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Legend**

-  AOC F Area modified from the ERI (2000)
-  Area where surface debris was observed
-  Phase I Environmental Assessment Surface Soil Sample Locations



**Figure 5-2**  
**1994 Aerial Photograph of the AOC F Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 6

# PI 11 – Former Pump Station for Seawater and Sanitary Wastewater Outfall

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PI 11. Personnel interviews and records reviews conducted during the Environmental Baseline Survey (EBS) identified PI 11 as a pump station and pipeline for a saltwater supply system (pumped from a natural lagoon to Camp Garcia) and a wastewater treatment system (NAVFACENGCOM, 2003). The location of PI 11 is shown in Figure 1-2.

In 2000, Environmental Research, Inc. (ERI) performed an analysis of historical aerial photographs (ERI, 2000) during which the following observations were made:

- 1962: Disturbed ground/possible containers at the end of access road (Figure 6-1)

It should be noted that ERI did not field truth the observations made from the historical aerial photograph, although it is certainly possible that features observed in an historical aerial photograph may have no longer been present when the aerial photographic analysis was conducted. Nevertheless, observations made during site visits performed at various PIs, including PI 11, tend to refute some of the aerial photograph observations. For example, during an EBS site visit to PI 11, the location of the site was confirmed to be different from that noted by ERI (Figure 6-2). At PI 11, pipes were observed to go to the location of the pump station. At the pump station, a deteriorating building was observed along with a small area of staining (likely rust) right next to building under a pipe penetration in the building wall, and a rusted diesel engine next to building. During the EBS site visit, as well as a site visit performed in 2007, no disturbed area or containers were observed in the area noted by ERI in the 1962 aerial photograph.

Based on the EBS observations, three surface soil samples (PI11-1, -2, and -3) were collected in vicinity of pump station and piping (Figure 6-2) during the EBS. The samples were analyzed for Appendix IX VOCs, SVOCs, inorganics, herbicides, pesticides, and PCBs; and total petroleum hydrocarbons-diesel range organics (TPH-DRO) and gasoline range organics (TPH-GRO).

Table 6-1 summarizes the constituents detected in PI 11 surface soil samples collected during the EBS and identifies screening criteria exceedances.

## 6.1 PI 11 Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 6-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was a former pump station and pipeline for a saltwater supply system and a wastewater treatment system. During a site visit, minor

staining was noted adjacent to a pipe on the pump house. Based on this information, the potential for the presence of CERCLA hazardous substances could not be confidently ruled out without sample collection, which was conducted during the EBS. Therefore, the decision analysis proceeds to Step 2.

**Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?**

For the samples collected during the EBS, the following inorganics above the background UTLs and non-inorganics were detected:

Surface Soil

- VOCs: methylene chloride
- SVOCs: none detected
- TPH: none detected
- Explosives: none detected
- PCBs: none detected
- Pesticides: 4,4'- dichlorodiphenyldichloroethane (DDD), 4,4'- dichlorodiphenyldichloroethene (DDE), 4,4'- dichlorodiphenyltrichloroethane (DDT)
- Inorganics above background UTLs: copper, lead, selenium, thallium, zinc

**Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?**

Only one VOC, pesticides, and inorganics were detected in the surface soil samples collected at PI 11. The pesticides detected at this site are the same pesticides and of similar concentrations detected at other sites across east Vieques (see Table A-1 of Final PA/SI Report [CH2M HILL, 2008]). This information, coupled with the history of the site, suggests the pesticides are attributable to normal pesticide use when the facility was active, not to a CERCLA-related release. Therefore, pesticides are not considered further in the decision analysis process. Because inorganics may be associated with historical wastewater handled at this site, they are further considered in the decision analysis process. Although it is possible that the methylene chloride is present as a result of blank contamination in the samples, the methylene chloride data are conservatively considered further in the decision analysis process.

**Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria (and background for inorganics) are listed below.

### Surface Soil

- Methylene chloride: three detections (samples PI11-1, PI11-2, PI11-3) at concentrations (0.0074 mg/kg, 0.0076 mg/kg, and 0.0067 mg/kg, respectively) above the SSL at a DAF of 1 (0.001 mg/kg)
- Copper: one detection (sample PI11-3) at a concentration (68.8 mg/kg) above the SSL at a DAF of 1 (46 mg/kg) and background UTL (53 mg/kg)
- Lead: three detections (samples PI11-1, PI11-2, PI11-3) at concentrations (23.8 mg/kg, 108 mg/kg, and 21 mg/kg, respectively) above the SSL at a DAF of 1 (14 mg/kg), and background UTL (5.4 mg/kg)
- Selenium: three detections (samples PI11-1, PI11-2, and PI11-3) at concentrations (1.0 mg/kg, 2.0 mg/kg, and 1.2 mg/kg, respectively) above the ecological screening level (0.52 mg/kg), SSL at a DAF of 1 (0.3 mg/kg), and background UTL (0.51 mg/kg)
- Thallium: one detection (sample PI11-3) at a concentration (0.72 mg/kg) above the adjusted residential PRG (0.52 mg/kg), SSL at a DAF of 1 (0.04 mg/kg), and background UTL (0.13 mg/kg)

As shown above, there are exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 5.

#### **Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?**

Thallium was the only constituent detected in surface soil at a concentration above background (0.13 mg/kg) and its human health screening value (0.52 mg/kg based on an HQ=0.1). It was detected in one of three surface soil samples, at a concentration of 0.72 mg/kg. Based on the acceptable non-cancer HQ, the acceptable risk-based concentration for a residential scenario is 5.2 mg/kg (HQ=1). Based on the low detected concentration (relative to the acceptable risk-based concentration) that would be used in risk calculations, risk estimates for thallium would be at acceptable levels and thallium would not be identified as a risk driver. Further, the thallium concentration in the sample collected at PI 11 is suspect because the analytical method utilized was prone to providing falsely elevated results. This supposition is supported by the fact that at several PI/PAOC sites where samples were analyzed for thallium using both the older method and the newer method (e.g., PAOC U), the thallium concentrations of the samples analyzed with the newer method are lower.

As noted above, only one constituent (thallium) was detected in soil at a concentration above its human health screening level and background UTL. Two other constituents (arsenic and vanadium) were also detected above their human health screening levels. The human health screening level for each is based on skin and vascular effects (arsenic), liver effects (thallium), and increased mortality (vanadium). Therefore, there is no concern for cumulative health effects from multiple constituents in soil. In addition, the arsenic and vanadium concentrations detected in PI 11 surface soil are below their respective background UTLs.

One inorganic (selenium) exceeded the ecological soil screening value and background in the three surface soil samples collected at the site. The selenium does not likely pose an unacceptable risk to ecological receptors based upon the following:

- Although selenium exceeds the background UTL of 0.51 mg/kg, the relative uniformity of the concentrations (1.0 to 2.0 mg/kg) suggests that selenium may be present at background concentrations, especially considering the samples were collected as much as approximately 125 feet apart. Although the background UTL for selenium in this soil type (Qa) is 0.51 mg/kg, selenium concentrations up to 1.3 mg/kg were detected during the east Vieques background soil inorganics investigation in a soil type (TI) that is near PI 11 (CH2M HILL, 2007). The above information suggests the selenium concentrations detected at PI 11 (1.0, 1.2, and 2.0 mg/kg) are likely attributable to background.
- The area is abandoned and the vegetation shows no signs of stress.

In addition to the above, selenium is not a likely contaminant associated with historical activities at PI 11. Historically, selenium was primarily used in rectifiers and photoconductors. The most common use currently is in glass manufacturing. None of these uses corresponds to the historic activities at PI 11.

The concentrations of methylene chloride, copper, lead, selenium, and thallium in at least one sample exceeded the SSL at a DAF of 1. However, soil and groundwater data collected at various sites on the former VNTR suggest SSLs at a DAF of 1 are not realistic predictors of leaching to groundwater. For example, the data from SWMU 1 (also partially located in the Qa zone as discussed in the PA/SI Report) indicate the SSLs at a DAF of 1 are unrealistic predictors of leaching to groundwater. Further, the potential source area is very small (i.e., the size of the pump station), which warrants a higher DAF (USEPA guidance suggests a DAF of 20 for sites of 0.5 acre or less [EPA, 1996]). At a DAF of 10, only the single thallium concentration exceeds the SSL. However, the thallium concentration is less than the SSL at a DAF of 20. Further, the thallium concentration is suspect as falsely high due to the analytical method used at that time. Comparison of thallium data at sites where the analysis was done using the previous and newer methods tends to support this supposition (e.g., PAOC U).

Table 6-2 presents a comparison of Region IX PRGs to RSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 6-2, the screening values for one organic and five inorganics have been updated. The screening values for three of the six constituents either increased or were eliminated. Further, the site concentrations for two of the three constituents where a lower screening value was published are all lower than the screening value. For thallium, the 0.01 mg/kg lower screening value would not alter the existing evaluation. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

#### **Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

The historical information (aerial photograph, interviews, site visits) indicates the most likely sources of CERCLA-related releases at PI 11 are possible spills from wastewater operations in the pump station. The most likely area where releases could have occurred was sampled during the EBS (i.e., area of soil staining adjacent to pump station). Because of

the shallow nature of groundwater at the site (i.e., the pump station is immediately adjacent to the lagoon), the surface soil interval was sufficient to vertically characterize soil. Based on the above information and the data collected during the EBS, the potential source area was sufficiently characterized.

## 6.2 Conclusions and No Action Determination

The decision analysis process described above indicates there has not been a CERCLA-related release at PI 11 that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Therefore, a no action determination is made for PI 11.

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**Table 6-1**

PI-11 Surface Soil Detection and Exceedance Results  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Chemical Constituent	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques ECO SO	Vieques (East) Background Zone Qa SS	PI11-1	PI11-2	PI11-3
<b>Volatile Organic Compounds (µg/kg)</b>							
Methylene Chloride	1	9,100	--		7.4	7.5	6.7
<b>Semivolatile Organic Compounds</b>							
No Detections							
<b>Pesticides/Polychlorinated Biphenyls (µg/kg)</b>							
4,4'-DDD	800	2,400	10		3.3 U	3.8	3.3 U
4,4'-DDE	3,000	1,700	10		8.6	57.1	21.6
4,4'-DDT	2,000	1,700	10		3.3 U	81.6	10.2
<b>Herbicides</b>							
No Detections							
<b>Total Metals (mg/kg)</b>							
Arsenic	1	0.39	18	1.6	0.82 U	1.5	1.6
Barium	82	1600	330	212	31.2	20.1	34.7
Chromium	2	210	0.4	72	3.2	7.1	12.9
Cobalt	33	140	13	16	4.1 U	4.72 U	4.5
Copper	46	310	70	53	43.5	11.6	68.8
Lead	14	400	120	5.4	23.8	108	21
Nickel	7	160	38	22	3.28 U	3.77 U	8.3
Selenium	0.3	39	0.52	0.51	1	2	1.2
Silver	2	39	560	0.22	0.82 U	1.7	0.588 U
Thallium	0.04	0.52	1	0.13	0.82 U	0.943 U	0.72
Vanadium	300	7.8	2	144	23.5	12.1	24.5
Zinc	620	2300	120	32	29.5	34.6	64.4
<b>Wet Chemistry</b>							
No Detections							

Notes:

- U - Analyte not detected
- mg/kg - milligrams per kilogram
- µg/kg - micrograms per kilogram

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria

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**Table 6-2**

Comparison of Region IX and Regional Screening Levels for Soil  
 PI 11  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>1</sup>	Adjusted Residential Regional Screening Level <sup>1</sup>	Region IX SSL <sup>1</sup> (DAF=1)	Regional SSL <sup>1</sup> (DAF=1)	
Methylene chloride	9,100	11,000	1	1.2	None. Screening values increased. There were no exceedances using the Region IX PRG or SSL.
Barium	1,600	1,500			None. 35 mg/kg highest concentration detected at the site.
Chromium <sup>2</sup>	210	23			None. 13 mg/kg highest concentration detected at the site.
Cobalt	140	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Thallium	0.52	0.51			None. Current evaluation unchanged by 0.01 mg/kg change in screening level.
Vanadium	7.8	39			None. Screening value increased. Exceedances using Region IX PRG are no longer exceedances using RSL.

Notes:

Organics units are µg/kg; inorganics units are mg/kg

<sup>1</sup> No Regional SSL values are provided for inorganics. The Region IX SSL values for inorganics are from the EPA Soil Screening Guidance and are therefore considered unchanged.

<sup>2</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.

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Disturbed ground / possible containers at the end of access road

**Legend**

 ERI aerial identified site



**Figure 6-1**  
**Observations from ERI Aerial Photographic Analysis**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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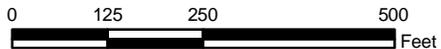


Disturbed ground / possible containers at the end of access road

PI11-2  
PI11-1  
Pump Station  
PI11-3

**Legend**

-  ERI aerial identified site
-  PI-11 (EBS sampling locations)



**Figure 6-2**  
**1962 Aerial Photograph of the PI-11 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 7

# PI 20 – Former Observation Point and Potential Quarry

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PI 20. Personnel interviews and records reviews conducted during the EBS identified PI 20 as an observation point used during landing exercises at PI 21, and that it may have been used as a quarry (NAVFACENGCOM, 2003). The location of PI 20 is shown in Figure 1-2.

In 2000, ERI performed an analysis of historical aerial photographs (ERI, 2000) during which the following observations were made:

- 1964: Possible fill area containing possible debris (Figure 7-1)
- 1970: Possible fill area (Figure 7-2)
- 1985: Possible fill area (Figure 7-3)
- 1994: Fill area re-vegetating (Figure 7-4)

It should be noted that ERI did not field truth the observations made from the historical aerial photographs, although it is certainly possible that features observed in an historical aerial photograph may have no longer been present when the aerial photographic analysis was conducted. Nevertheless, observations made during site visits performed at various PIs, including PI 20, tend to refute some of the aerial photograph observations. For example, site visits to PI 20 in 2001 and 2007 showed no evidence of prior disposal or filling and instead showed the area to be a lagoon, which is consistent with its reported use as an observation point and potential quarry. Figure 7-5 shows a recent aerial photograph of PI 20. This aerial photograph, as well as a photograph taken during a 2001 site visit (Figure 7-6), show the site to be a lagoon.

As noted above, historical information suggests the site was used as an observation point and potential quarry. Aerial photographic analysis incorrectly identified the site as a potential fill area. The site visits conducted in 2001 and 2007 observed the area identified in the aerial photographs to have become a lagoon, further supporting the historical information that suggested the site was used as a quarry, not as a fill area. The site visits observed no evidence of prior disposal or a release. Based on this information, the potential for the release of CERCLA hazardous substances can be confidently ruled out. Therefore, a no action determination is made for PI 20.

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**Legend**  
□ PI-20



0 75 150 300 Feet

**Figure 7-1**  
**1964 Aerial Photograph**  
**of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Legend**

 PI-20



**CH2MHILL**

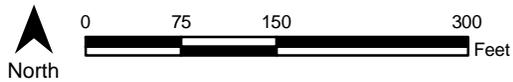
ES082008001TPA 180357.PP.DF.AI

**Figure 7-2**  
**1970 Aerial Photograph**  
**of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Legend**  
□ PI-20



**CH2MHILL**

ES082008001TPA 180357.PP.DF.AI

**Figure 7-3**  
**1985 Aerial Photograph**  
**of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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Legend  
□ PI-20



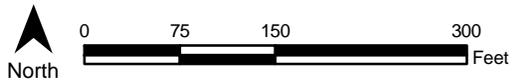
0 75 150 300  
Feet

**Figure 7-4**  
**1994 Aerial Photograph**  
**of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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**Legend**  
PI-20



**Figure 7-5**  
**2005 Aerial Photograph**  
**of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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Photograph taken during 2001 site visit

**Figure 7-6**  
**Photograph of the PI-20 Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 8

# PAOC T – Former Public Works Grounds Contractor Storage Shed and Mechanics Shop

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PAOC T. Personnel interviews and records reviews conducted during the EBS identified PAOC T as a former public works grounds contractor storage shed/mechanics shop (Building 305) built in 1975 and demolished in 1991 (NAVFACENGCOM, 2003). The location of PAOC T is shown in Figures 1-2 and 8-1.

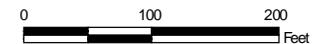
A site visit performed during the EBS observed no evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal at this site. Soil samples at PAOC T were collected as part of PAOC U in accordance with the PA/SI Work Plan (CH2M HILL, 2006). Two co-located surface and subsurface soil samples were collected at PAOC T and analyzed for Target Compound List (TCL) VOCs, SVOCs, pesticides, and PCBs; and Target Analyte List (TAL) inorganics. The data were included with PAOC U as part of the release assessment decision analysis in the PA/SI Report (CH2M HILL, 2008). Therefore, the rationale for the no action determination for PAOC T is contained with PAOC U (see Section 10) of this Decision Document. Based on the discussion and data evaluation in Section 9, a no action determination is made for PAOC T.

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**LEGEND**

- PA/S Surface and Subsurface Soil Sample Location
- ▲ PA/S Surface and Subsurface Soil Sample and Monitoring Well Location with Water Level
- Elevation, Feet Above Mean Sea Level
- EBSSurface Soil Sample Location



**Figure 8-1**  
**1983 Aerial Photograph**  
**of the PAOC T and U Areas**

*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 9

# PAOC U—Vehicle Maintenance Area

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PAOC U. A more detailed discussion of the PAOC U evaluation is presented in the Final PA/SI Report (CH2M HILL, 2008). PAOC U is a former vehicle maintenance area, in the south-central portion of Camp Garcia, in the area surrounding Building 302 at the location shown on Figures 1-2 and 9-1. An automotive repair/maintenance shop, located in a former cargo transport box was sited on the location identified in Figure 9-1 as the “Former Automotive Shop.” Historical maps also refer to former Building 305 as a “vehicle maintenance building” and Building 302 as a “maintenance building” (Figure 9-1). Building 305 was also identified in the EBS as PAOC T, the former public works grounds contractor storage shed and mechanics shop. As noted in Section 8, PAOC T was investigated as part of PAOC U during the PA/SI. Hazardous waste, hazardous materials, and petroleum products were historically stored at PAOC U. Some minor staining of soil was observed outside of the former automotive shop in the vicinity of the used oil aboveground storage tank (AST) and container storage pallets on the south side of the former building (Figure 9-1) (NAVFACENGCOCM, 2003).

The AST located on the south side of the former automotive shop was a 500-gallon used oil tank. It was installed in 2000 and was constructed of vaulted steel (NAVFACENGCOCM, 2003). The drums and batteries shown in Figure 9-2 and the AST have been removed from the site, and the former automotive shop was moved to Building 302, which is an open air warehouse with a concrete floor and steel beams supporting a steel roof (Ruiz, 2004).

Four soil samples were collected from PAOC U in December 2002 as part of the EBS, as shown in Figure 9-1. Two surface soil samples (U-1 and U-2) were collected from the soil staining area near the container storage pallets, one surface soil sample (U-3) was collected north of the Former Automotive Shop location, and one surface soil sample (U-4) was collected near the southeast corner of maintenance building 302. The EBS samples were analyzed for Appendix IX VOCs, SVOCs, pesticides, herbicides, inorganics, and PCBs. These samples were also analyzed for sulfide, cyanide, and TPH-DRO and TPH-GRO.

As presented in the PA/SI Work Plan (CH2M HILL, 2006), nine soil borings were installed at the locations shown on Figure 9-1. At each of the soil borings, one surface soil sample and one subsurface soil sample were collected. Two of the soil borings were installed in the location of former Vehicle Maintenance Building 305 (i.e., PAOC T); three soil borings were installed adjacent to Former Maintenance Building 302; and four soil borings were installed around the Former Automotive Shop. As shown in Figure 9-1, five of the nine borings were installed in the general locations of the EBS samples to determine if concentrations changed over time. No flame ionization detector (FID) readings significantly above background were observed in the soil borings; therefore, subsurface soil samples were collected at default depths in accordance with the work plan (CH2M HILL, 2006). In addition, the boring on the south side of Building 302 was completed as a monitoring well. The surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, and pesticides/PCBs; TAL inorganics,

and pH. Groundwater samples were analyzed for the same parameters plus total dissolved solids (TDS).

Tables 9-1, 9-2, and 9-3 summarize the constituents detected in PAOC U (and PAOC T) surface soil samples, subsurface soil samples, and groundwater samples, respectively, collected during the EBS and PA/SI. The tables also identify screening criteria exceedances. Note that the groundwater data from the upgradient well at PAOC N (EPAN-MW02), which is also upgradient of PAOC U, was used for initial background comparison for the groundwater data collected at PAOC U.

## 9.1 PAOC U Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection tables (Tables 9-1 through 9-3).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was a former vehicle maintenance area where hazardous waste and materials were historically stored and minor staining of soil was observed. Sampling also included PAOC T, a former public works grounds contractor storage shed and mechanics shop. Based on this information, the potential for the presence of CERCLA hazardous substances could not be confidently ruled out without sample collection, which was conducted during the 2002 EBS and 2006 PA/SI. Therefore, the decision analysis proceeds to Step 2.

### Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?

For the samples collected during the EBS and PA/SI, the following inorganics above the background UTLs and non-inorganics were detected by medium:

#### Surface Soil

- VOCs: acetone, methylene chloride
- SVOCs: bis(2-ethylhexyl)phthalate
- Pesticides: 4,4'-DDE, 4,4'-DDT, endrin ketone, gamma-chlordane, methoxychlor
- Herbicides: none detected
- PCBs: none detected
- Inorganics above background UTLs: arsenic, calcium, cobalt, copper, lead, magnesium, mercury, selenium, thallium, and zinc
- TPH GRO: none detected
- TPH DRO: none detected

#### Subsurface Soil

- VOCs: none detected
- SVOCs: none detected

- Pesticides: beta-BHC
- PCBs: none detected
- Inorganics above background UTLs: mercury and selenium

#### Groundwater

- VOCs: chloroform
- SVOCs: none detected
- Pesticides: none detected
- PCBs: none detected
- Total inorganics above background (EPAN MW-02): aluminum, cobalt, copper, iron, manganese, mercury, potassium, selenium, vanadium
- Dissolved inorganics above background (EPAN MW-02): barium, cadmium, cobalt, manganese, nickel, potassium selenium, vanadium

#### **Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?**

Based on the potential source areas at PAOC U (i.e., vehicle maintenance facilities and hazardous waste/materials storage) and PAOC T (i.e., public works grounds contractor storage shed and mechanics shop), it is assumed that the constituent groups detected in site media, except for pesticides, are potentially attributable to CERCLA-related releases. The pesticides detected at this site are the same pesticides and of similar concentrations detected at other sites across Vieques (see Table A-1 of Final PA/SI Report [CH2M HILL, 2008]). This information, coupled with the history of the site, suggests the pesticides are present due to normal pesticide use, not a CERCLA-related release. Therefore, pesticides are not considered further in the decision analysis process. All other detected constituents are further considered in the decision analysis process.

#### **Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?**

In this step of the decision analysis, the data for the CERCLA-related constituents identified in Step 3 are compared to the screening criteria shown on the detection tables. Those constituents that exceed one or more criteria (and background for inorganics) are listed below by medium.

#### Surface Soil

- Methylene chloride: three detections (samples EBS U-1, EBS U-2, and EBS U-4) at concentrations (5.4 µg/kg to 7.1 µg/kg) above the SSL at a DAF of 1 (1 µg/kg)
- SVOCs: no exceedances
- Arsenic: three detections (samples SS07, SS08, and EBS U-1) at concentrations (1.7 mg/kg to 2.9 mg/kg) above the PRG (0.39 mg/kg), SSL at a DAF of 1 (1 mg/kg), and the background UTL (1.6 mg/kg)

- Cobalt: one detection (sample EBS U-3) at a concentration (18 mg/kg) above the ecological screening value (13 mg/kg) and the background UTL (15.8 mg/kg)
- Copper: one detection (sample EBS U-1) at a concentration (81.2 mg/kg) above the ecological screening value (70 mg/kg), the SSL at a DAF of 1 (46 mg/kg) and the background UTL (65.5 mg/kg)
- Lead: one detection (sample EBS U-2) at a concentration (15.1 mg/kg) above the SSL at a DAF of 1 (14 mg/kg) and the background UTL (5.4 mg/kg)
- Selenium: eight detections (samples SS03, SS04, SS05, SS06, EBS U-1, EBS U-2, EBS U-3, and EBS U-4) at concentrations (0.63 mg/kg to 1.4 mg/kg) above the ecological screening value (0.52 mg/kg), the SSL at a DAF of 1 (0.3 mg/kg) and the background UTL (0.51 mg/kg)
- Thallium: three detections (samples EBS U-2, EBS U-3, EBS U-4) at concentrations (0.98 mg/kg to 1.4 mg/kg) above the adjusted PRG (0.52 mg/kg), the SSL at a DAF of 1 (0.036 mg/kg), the background UTL (0.13 mg/kg), and in the case of EBS U-2, above the ecological screening value (1 mg/kg).
- Zinc: one detection (sample EBS U-3) at a concentration (121 mg/kg) above the ecological screening value (120 mg/kg), and the background UTL (32 mg/kg).

#### Subsurface Soil

- Mercury: one detection (sample SB 02) at a concentration (0.4 mg/kg) above the SSL at a DAF of 1 (0.1 mg/kg) and the background UTL (0.057 mg/kg)
- Selenium: three detections (samples SB02, SB06, SB07) at concentrations (0.54 mg/kg to 0.77 mg/kg) above the SSL at a DAF of 1 (0.3 mg/kg) and the background UTL (0.51 mg/kg)

#### Groundwater

- Chloroform: detected at a concentration (0.31 µg/L) above the tap water PRG (0.17 µg/L)
- Iron (total): detected at a concentration (1,270 µg/L) above the adjusted tap water PRG (1,100 µg/L)
- Vanadium (total and dissolved): detected at a concentration (23.2 µg/L dissolved and 26.8 µg/L total) above the adjusted tap water PRG (3.6 µg/L)

As shown above, there are exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 5.

**Step 5: Can more realistic evaluations of the data be performed, and if so, do they suggest contaminant levels warrant no action?**

#### Soil

Arsenic was detected in 3 of 13 surface soil samples above its background UTL and human health screening level (0.39 mg/kg based on  $1 \times 10^{-6}$  ELCR), at a maximum concentration of 2.9 mg/kg. Based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ) and the acceptable non-cancer HQ, acceptable risk-based concentrations for a residential scenario range from

0.39 mg/kg ( $1 \times 10^{-6}$  ELCR) to 22 mg/kg (HQ=1). Based on the low maximum detected concentration and the low EPC that would be used in risk calculations (based on a calculated UCL of the mean concentration), risk estimates for arsenic would be within acceptable levels and arsenic would not be identified as a risk driver. No other carcinogenic constituents were detected in soil above PRGs.

Thallium was detected in only 3 of 13 surface soil samples at concentrations (1.4 mg/kg maximum detected concentration) above its human health screening level (0.52 mg/kg based on an HQ=0.1) and background UTL. Based on the acceptable non-cancer HQ, the acceptable risk-based concentration for a residential scenario is 5.2 mg/kg (HQ=1); all thallium concentrations are below this level. Further, all three of the thallium exceedances are for samples collected during the EBS. These thallium concentrations are suspect because the analytical method utilized tended to give falsely elevated results. This supposition is supported by the fact that none of the samples collected at PAOC U during the PA/SI contained thallium at elevated concentrations with respect to the various screening criteria.

As noted above, only arsenic and thallium were detected in soil at concentrations above human health screening criteria and background UTLs. The non-cancer PRGs for these constituents are based on skin and vascular effects (arsenic) and liver effects (thallium). Although aluminum, iron, manganese, and vanadium were detected in soil above the adjusted PRGs, their PRGs are based on neurotoxicity in offspring (aluminum), gastrointestinal effects (iron), central nervous system effects (manganese), and increased mortality (vanadium), so there is no concern about potential cumulative human health effects from multiple constituents in site soil. Further, all aluminum, iron, manganese, and vanadium concentrations are below the background UTLs.

Five inorganics (cobalt, copper, selenium, thallium, and zinc) exceed ecological screening values and background UTLs in at least one surface soil sample. Cobalt, copper, thallium, and zinc each exceed in only 1 of 13 samples. The HQs based on the maximum concentrations of these three inorganics are 1.38 (cobalt), 1.62 (copper), 1.4 (thallium), and 1.01 (zinc). Selenium concentrations exceed the ecological screening value in 8 of 13 samples with a maximum HQ of 2.69. However, the mean concentrations of each of these inorganics, except for selenium, are below the ecological screening values. Although the background UTL for selenium in this soil type is 0.51 mg/kg, selenium concentrations up to 1.3 mg/kg were detected during the east Vieques background soil inorganics investigation in nearby soil types (CH2M HILL, 2007). This suggests that the selenium concentrations detected at PAOC U (maximum of 1.4 mg/kg) may be within the range of background. Further, all selenium concentrations are less than ecological screening values based upon other receptors (e.g., 4.10 mg/kg for soil invertebrates). This information suggests that potential risks to ecological receptors from these inorganics are likely acceptable, especially given the low magnitude of exceedances and their spatially restricted nature. In addition, the site is very small and provides very limited habitat, especially considering the area is maintained by periodic mowing. Thus, the potential exposures to ecological receptors are minimal.

Methylene chloride was detected in three surface soil samples collected during the EBS above the SSL at a DAF of 1. However, it was not detected in the surface or subsurface soil samples collected from the same locations during the PA/SI, nor was it detected in groundwater. This suggests that methylene chloride may have been a sampling or laboratory artifact during the EBS or that it is no longer present in site soils.

Six inorganics (arsenic, copper, lead, mercury, selenium, and thallium) were detected at concentrations above the SSLs at a DAF of 1. However, arsenic was not detected in subsurface soil nor in groundwater. Further, thallium was not detected above the SSL at a DAF of 1 and background UTL in samples collected from the same areas during the PA/SI. In addition, thallium was not detected in groundwater at the sites. None of the remaining four inorganics were detected in groundwater above an maximum contaminant level (MCL) or tap water PRG. In fact, lead was not detected in groundwater, and dissolved copper and mercury were not detected in groundwater. The above information suggests the SSLs at a DAF of 1 are not representative predictors of inorganics leaching through soil to groundwater at PAOC U. Other than thallium, none of the inorganics were detected in soil above an SSL at a DAF of 5.

It is also noted that the pH of surface and subsurface soils was measured to search for signs of spilled acids. pH results were all above 7, showing the soil samples were not acidic.

Table 9-4 presents a comparison of Region IX PRGs/SSLs to RSLs/Regional SSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 9-4, the screening values for three organics and nine inorganics have been updated. The screening values for 8 of the 12 constituents either increased or were eliminated. Further, the site concentrations for one of the four constituents where a new or lower screening value was published are all lower than the screening value. For bis(2-ethylhexyl)phthalate, use of the Regional SSL would result in a single exceedance in an EBS sample. However, a sample was collected from the same location during the PA/SI in which no bis(2-ethylhexyl)phthalate was detected. In addition, no bis(2-ethylhexyl)phthalate was detected in groundwater and there is no Regional SSL exceedance at a DAF of 2. For chromium, the lower screening value would result in one exceedance, but none of the site concentrations is above the background value. For thallium, the 0.01 mg/kg lower screening value would not alter the existing evaluation. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

### Groundwater

Chloroform was detected in groundwater at a concentration (0.31 µg/L) just above the tap water PRG (0.17 µg/L based on  $1 \times 10^{-6}$  ELCR); however, it was detected more than two orders of magnitude below the MCL. Further, based on the acceptable ELCR range ( $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ), the acceptable risk-based concentrations range from 0.17 µg/L ( $1 \times 10^{-6}$  ELCR) to 17 µg/L ( $1 \times 10^{-4}$  ELCR). The detected concentration is near the lower end of this range.

Iron (total) was detected in groundwater at a concentration (1,270 µg/L) above its human health screening level (1,100 µg/L based on an HQ=0.1). Based on the acceptable target non-cancer HQ, the acceptable risk-based concentration for a residential scenario is 11,000 µg/L (HQ=1), which is an order of magnitude higher than the detected concentration. Most importantly, the iron concentrations in site soil are below the background UTL, which indicates the iron in groundwater is attributable to background.

Vanadium (total and dissolved) was detected in groundwater above its human health screening level (3.6 µg/L based on an HQ=0.1). The detected concentrations are 26.8 µg/L (total) and 23.2 µg/L (dissolved). Based on the acceptable non-cancer HQ, the acceptable risk-based concentration for a residential scenario is 36 µg/L (HQ=1), which is higher than

the detected vanadium concentrations. Similar to iron, the vanadium concentrations in site soil are below the background UTL, which indicates the vanadium in groundwater are attributable to background.

The PRG for chloroform is based on potential carcinogenic effects. Because the PRGs for iron and vanadium are based on gastrointestinal effects (iron) and increased mortality (vanadium), there is no concern about potential cumulative human health effects from multiple non-carcinogenic constituents in site groundwater.

Table 9-5 presents a comparison of Region IX PRGs to RSLs for those detected constituents considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 9-5, the screening values for one organic and four inorganics have been updated. The screening values for all five constituents either increased or were eliminated. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

**Step 6: Does the historic information and/or spatial distribution of data indicate the potential source area was sufficiently sampled?**

The historical information (aerial photographs, interviews, site inspections) indicates the most likely sources of CERCLA-related releases are the stained soil areas and the areas associated with former vehicle maintenance. Based on this information, multiple soil samples and a groundwater sample were collected within these areas, the spatial distribution and resulting data of which indicate the potential source area has been sufficiently characterized.

## 9.2 Conclusions and No Action Determination

The decision analysis process described above indicates there has not been a CERCLA-related release at PAOC U (or PAOC T) that has resulted in contamination of soil or groundwater at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Further, pesticide detections at the site are consistent with normal pesticide application associated with maintenance of the historical facilities present at the site. Finally, the potential sources have been removed. Therefore, a no action determination is made for PAOC U.

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**TABLE 9-1**  
 PAOC U Surface Soil Detection and Exceedance Results  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques Eco SO	Vieques (East) Background Zone KTd SS	EPAU-SO01	EPAU-SO02	EPAU-SO03	EPAU-SO04		EPAU-SO05	EPAU-SO06	EPAU-SO07	EPAU-SO08	EPAU-SO09	VNTR-U-1	VNTR-U-2	VNTR-U-3	VNTR-U-4
					EPAU-SS01-0001 03/01/06	EPAU-SS02-0001 03/03/06	EPAU-SS03-0001 03/03/06	EPAU-SS04-0001 03/03/06	EPAU-SS04P-0001 03/03/06	EPAU-SS05-0001 03/03/06	EPAU-SS06-0001 03/03/06	EPAU-SS07-0001 03/03/06	EPAU-SS08-0001 03/01/06	EPAU-SS09-0001 03/03/06	EBS U-1 12/12/02	EBS U-2 12/12/02	EBS U-3 12/12/02	EBS U-4 12/12/02
<b>Chemical Name</b>																		
<b>Volatile Organic Compounds (µg/kg)</b>																		
Acetone	800	1,400,000	--	--	10 UJ	11 UJ	11 UJ	10 UJ	10 UJ	7 J	10 U	10 U	10 U	10 U				
Methylene Chloride	1	9,100	--	--	10 U	11 U	11 U	10 U	10 U	10 U	7.1	6	5 U	5.4				
<b>Semi-volatile Organic Compounds (µg/kg)</b>																		
bis(2-Ethylhexyl)phthalate	--	35,000	--	--	360 U	340 U	360 U	350 U	350 U	350 U	350 U	350 U	340 U	380 U	333 U	574	2020	333 U
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b>																		
4,4'-DDE	3,000	1,700	10	--	23	54	82	4.5 J	4.7	51	3.5 U	53	37	3.8 U	3.3 U	52.7	3.3 U	21.5
4,4'-DDT	2,000	1,700	10	--	31	8	10	1.7 J	2.1 J	3.7	3.5 U	18	2.9 J	3.8 U	3.3 U	16.1	3.3 U	14.5
Endrin ketone	50	1,800	100	--	3.6 U	3.4 U	3.6 U	3.5 U	3.5 U	3.5 U	3.5 U	3.5 U	1.3 J	3.8 U	NA	NA	NA	NA
gamma-Chlordane	500	1,600	--	--	1.8 U	1.8 U	1.8 U	0.52 J	1.8 U	1.9 U	16.7* U	16.7* U	16.7* U	16.7* U				
Methoxychlor	8,000	31,000	--	--	18 U	18 U	18 U	18 U	18 U	19 U	18.9	16.7 U	16.7 U	16.7 U				
<b>Organophosphate Pesticides (µg/kg)</b>																		
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
<b>Herbicides</b>																		
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
<b>Total Metals (mg/kg)</b>																		
Aluminum	55,000	7,600	--	35,000	7,160	12,000	7,750	7,760	7,230	9,900	18,300	7,220	11,900	19,500	NA	NA	NA	NA
Antimony	0.3	3.1	78	3.6	0.6 J	0.78 J	0.83 J	0.77 J	0.84 J	0.56 J	0.61 J	0.22 J	0.53 J	0.56 J	5.45 U	5.2 U	4.1 U	5.9 U
Arsenic	1	0.39	18	1.6	1.1 U	1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.7	2.3	1.1 U	2.9	1.1	1.4	1.4
Barium	82	1,600	330	147	63.8	65.5	67.3	61.1	56.9	64.7	84.5	61.7	43.1	71.7	32.7	46.3	60	38
Cadmium	0.4	3.7	32	2.24	0.27 J	0.52 U	0.54 U	0.16 J	0.14 J	0.54 U	0.54 U	0.53 U	0.25 J	0.12 J	0.66	0.43 U	1.4	0.49
Calcium	--	--	--	8,840	23,400	9,580	12,300	3,620	3,180	5,770	3,620	99,100	25,900	3,140	NA	NA	NA	NA
Chromium	2	210	0.4	72	10.8	14.7	11.3	10.9	10.7	11.4	15.2	13.4	17	14.2	27.4	13.9	9	10.5
Cobalt	33	140	13	15.8	9.1	15.6	10.2	10.8	9.6	10.3	11.5	8.8	13.2	11	15.5	9	18	5.7
Copper	46	310	70	65.5	33.4	50.5	40.4	42.6	38.9	50	56.7	25.4	45.8	60	81.2	42.5	52	22
Cyanide	--	120	1	0.89	0.23 J	2.6 U	0.21 J	0.2 J	2.6 U	0.18 J	0.19 J	0.52 J	2.6 U	2.8 U	1 U	1 U	1 U	1 U
Iron	276	2,300	--	38,100	14,900	23,400	17,900	17,400	16,400	18,200	25,000	14,000	19,400	23,200	NA	NA	NA	NA
Lead	14	400	120	5.4	4.8	2.8	4.7	2.8	4.3	5.1	1.7	8.1	3.7	1.6	8.6	15.1	4.6	2.4
Magnesium	--	--	--	3,710	3,550	7,470	2,460	1,840	1,710	2,610	3,370	16,100	9,890	3,390	NA	NA	NA	NA
Manganese	57	180	220	1,630	598	763	676	701	591	592	677	365	429	549	NA	NA	NA	NA
Mercury	0.1	2.3	0.1	0.057	0.11 U	0.1 U	0.11 U	0.1 U	0.11 U	0.11 U	0.11 U	0.11 U	0.1 U	0.11 U	0.068	0.0769 U	0.0833 U	0.0357 U
Nickel	7	160	38	22.2	4.6	7.7	4.3 U	4.8	4.2 J	4.9	7.4	5.6	10.6	7.3	15.3	5.6	5.5	3.9 U
Potassium	--	--	--	5,270	692	1,090	763	867	843	796	1,320	861	689	1,370	NA	NA	NA	NA
Selenium	0.3	39	0.52	0.51	3.8 UJ	0.46 J	0.63 J	0.83 J	0.46 J	0.63 J	1.2 J	0.5 J	0.5 J	0.41 J	1.3	1.1	1.1	1.4
Thallium	0.036	0.52	1	0.13	0.018 J	0.52 U	0.54 U	0.014 J	0.013 J	0.54 U	0.027 J	0.027 J	0.52 U	0.013 J	0.909 U	1.4	1	0.98
Vanadium	300	7.8	2	144	57.7	71.3	69.7	66.7	63	66.9	78.8	44.9	70.6	69.2	72	71	66	60
Zinc	620	2,300	120	32	42.2	30.5	18.4	16.1	14.2	27.3	21.5	27.2	25.5	22.8	88.1	57	121	14
<b>Total Petroleum Hydrocarbons (mg/kg)</b>																		
<b>TPH GRO</b>																		
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
<b>TPH DRO</b>																		
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
<b>Wet Chemistry</b>																		
<b>Sulfide</b>																		
No Detections					NA	NA	NA	NA	NA	NA	NA	NA	NA	NA				
<b>pH</b>																		
		--	--	--	7.95	8	8.02	8.14	8.22	7.95	8.25	8.1	8.27	7.65	NA	NA	NA	NA

Notes:  
 mg/kg - milligrams per kilogram  
 µg/kg - micrograms per kilogram  
 J - Analyte present; reported value may or may not be accurate or precise  
 U - Analyte not detected  
 UJ - Analyte not detected; quantitation limit may be inaccurate or imprecise  
 \* EBS sample analyzed for technical chlordane, consisting of alpha and gamma chlordane, heptachlor, and other hydrocarbons.  
 Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)  
 Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: Users Guide (EPA, 1996)  
 Vieques HHRA SO - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)  
 Vieques Eco SO - Screening values for compounds (4,4'-DDE, 4,4'-DDT, cyanide) (MHSPE, 2000)  
 Vieques Eco SO - Screening values for compounds (chromium, copper) (Efroymson, Will, and Suter, 1997)  
 Vieques Eco SO - Screening values for compounds (endrin ketone) (Beyer, 1990)  
 Vieques Eco SO - Screening values for compounds (nickel, selenium, thallium, vanadium, zinc) (Efroymson, et al., 1997)  
 Vieques Eco SO - Screening values for compounds (antimony, arsenic, barium, cadmium, cobalt, lead) (EPA, 2005b)  
 EBS surface samples collected from 0 to 0.5 feet bgs.  
 NA - Not Analyzed  
 -- Not part of background data set  
 -- Regulatory standard not promulgated

Exceeds Background and Eco Criteria
Exceeds Background and DAF 1 Criteria
Exceeds Background, HHRA, and DAF 1 Criteria
Exceeds Background, Eco, and DAF 1 Criteria
Exceeds Background, HHRA, Eco, DAF 1 Criteria

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**TABLE 9-2**  
PAOC U Subsurface Soil Detection and Exceedance Results  
No Action Decision Document  
4 Consent Order Sites and 6 PI/PAOC Sites  
Vieques, Puerto Rico

Station ID	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques (East) Background Zone KTd SB	EPAU-SO01	EPAU-SO02	EPAU-SO03	EPAU-SO04	EPAU-SO05	EPAU-SO06	EPAU-SO07	EPAU-SO08	EPAU-SO09	
Sample ID				EPAU-SB01-0406	EPAU-SB02-0406	EPAU-SB03-0406	EPAU-SB04-0406	EPAU-SB05-0406	EPAU-SB06-0406	EPAU-SB07-0406	EPAU-SB08-0406	EPAU-SB09-0406	EPAU-SB09P-0406
Sample Date				03/01/06	03/03/06	03/03/06	03/03/06	03/03/06	03/03/06	03/03/06	03/01/06	03/03/06	03/03/06
<b>Chemical Name</b>													
<b>Volatile Organic Compounds (µg/kg)</b>													
No Detections													
<b>Semi-volatile Organic Compounds (µg/kg)</b>													
No Detections													
<b>Pesticide/Polychlorinated Biphenyls (µg/kg)</b>													
beta-BHC	0.1	320	--	1.8 U	0.77 J	1.8 U	1.8 U	1.8 U	2 U	1.8 U	1.8 U	1.8 U	1.8 U
<b>Total Metals (mg/kg)</b>													
Aluminum	55,000	7,600	35,000	6,260	5,790	5,700	7,100	5,530	7,220	6,990	5,020	6,380	5,810
Antimony	0.3	3.1	3.3	0.44 J	0.36 J	0.35 J	0.22 J	0.22 J	0.48 J	6.4 UJ	0.48 J	0.44 J	0.43 J
Barium	82	1,600	147	43.6	46.7	37	49.2	37.5	54.8	55.6	42	48.7	45.6
Cadmium	0.4	3.7	2.24	0.036 J	0.053 J	0.52 U	0.06 J	0.53 U	0.58 U	0.54 U	0.028 J	0.53 U	0.53 U
Calcium	--	--	8,840	2,000	1,980	2,010	2,340	1,980	3,300	2,210	1,680	2,060	1,980
Chromium	2	210	72	5.9	5.8	6.9	6.4	5.7	9.1	6.4	5.8	7.1	6.5
Cobalt	33	140	15.8	6.4	6.3	6.1	7.4	6.3	7.4	8.2	6.1	7.5	8
Copper	46	310	65.5	40.6	49.5	42	49.6	48	50.1	48.3	39.1	40.8	41.8
Iron	276	2,300	38,100	11,300	12,400	12,700	13,800	12,700	17,100	13,600	10,400	12,400	11,900
Lead	14	400	3.34	1.1 U	1.1 U	1 U	1.1 U	1.1 U	1.2	1.1 U	1 U	1.1 U	1.1 U
Magnesium	--	--	3,710	1,980	2,340	2,070	2,620	2,220	2,860	2,380	1,960	2,210	2,160
Manganese	57	180	1,630	301	323	281	365	268	337	552	305	362	341
Mercury	0.1	2.3	0.057	0.11 U	0.4	0.1 U	0.11 U	0.1 U	0.12 U	0.11 U	0.1 U	0.11 U	0.11 U
Nickel	7	160	22.2	3.6 J	2.9 J	4.2 U	4 J	4.2 U	3.7 J	4.3 U	3 J	4.3 U	4.3 U
Potassium	--	--	2,000	541 U	529 U	524 U	528 U	526 U	577 U	597	513 U	564	531 U
Selenium	0.3	39	0.51	3.8 UJ	0.54 J	3.7 UJ	3.7 UJ	3.7 UJ	0.77 J	0.68 J	0.5 J	3.7 UJ	0.46 J
Thallium	0.036	0.52	0.13	0.54 U	0.53 U	0.024 J	0.017 J	0.53 U	0.55 U	0.54 U	0.51 U	0.53 U	0.53 U
Vanadium	300	7.8	144	43.5	43.1	45.6	46.1	43.8	63.4	46.8	39.8	45.8	43.7
Zinc	620	2,300	32	11	12.8	11.2	15	12.6	16.7	14.5	10.6	12.8	12.4
<b>Wet Chemistry</b>													
pH	--	--	--	8.34	7.97	8	8.12	7.91	7.91	7.87	7.65	7.85	8.05

Notes:

- mg/kg - milligrams per kilogram
- µg/kg - micrograms per kilogram
- J - Analyte present; reported value may or may not be accurate or precise
- U - Analyte not detected
- UJ - Analyte not detected; quantitation limit may be inaccurate or imprecise
- Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)
- Region IX SSL - DAF 1 values from EPA Soil Screening Guidance: Users Guide (EPA, 1996)
- Vieques HHRA SO - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)
- Not part of background data set
- Regulatory standard not promulgated

Exceeds Background and DAF 1 Criteria

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**TABLE 9-3**

PAOC U Groundwater Detection and Exceedance Results  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites  
 Vieques, Puerto Rico

Station ID Sample ID Sample Date	Vieques HHRA GW	MCL - GW	PAOC-N EPAN- MW02	EPAU-MW01	
				EPAU-GW01-06B	EPAU-GW01P-06B
				04/03/06	04/03/06
<b>Chemical Name</b>					
<b>Volatile Organic Compounds (µg/L)</b>					
Chloroform	0.17	80	NA	0.25 J	0.31 J
<b>Semi-volatile Organic Compounds (µg/L)</b>					
No Detections					
<b>Pesticide/Polychlorinated Biphenyls (µg/L)</b>					
No Detections					
<b>Total Metals (µg/L)</b>					
Aluminum	3,600	--	263	1,020	430 R
Calcium	--	--	144,000	82,400	81,100
Chromium	11	100	3.6 J	1.7 J	0.59 J
Cobalt	73	--	--	1.8 J	1.5 J
Copper	150	1,300	--	4.4 J	25 U
Iron	1,100	--	198	1,270	390 R
Magnesium	--	--	75,600	55,200	54,700
Manganese	88	--	8 J	76.1	45.2
Mercury	1.1	2	--	0.04 J	0.04 J
Nickel	73	--	2.4 J	1.3 J	0.9 J
Potassium	--	--	1780 J	1,940 J	5,000 U
Selenium	18	50	--	3.5 J	3.2 J
Sodium	--	--	323,000	262,000	264,000
Vanadium	3.6	--	--	26.8 J	50 U
<b>Dissolved Metals (µg/L)</b>					
Barium	730	2,000	--	94.7 J	96.5 J
Cadmium	1.8	5	--	0.28 J	5 U
Calcium	--	--	139,000	82,400	80,900
Chromium	11	100	--	0.48 J	10 U
Cobalt	73	--	--	1.4 J	1 J
Magnesium	--	--	73,400	54,700	54,800
Manganese	88	--	--	0.98 J	0.92 J
Nickel	73	--	--	0.89 J	0.99 J
Potassium	--	--	1,710 J	1,860 J	1,930 J
Selenium	18	50	--	2.6 J	4.3 J
Sodium	--	--	311,000	258,000	262,000
Vanadium	3.6	--	--	23.2 J	22.9 J
<b>Wet Chemistry (mg/L)</b>					
Total dissolved solids (TDS)	--	--	NA	1,130	1,150

Notes:

- mg/L - milligrams per Liter
- µg/L - micrograms per Liter
- J - Analyte present; reported value may or may not be accurate or precise
- R - Unreliable result
- U - Analyte not detected
- NA - Not Applicable
- Human health, ecological, and leaching screening values are those provided in the Master QAPP (CH2M HILL, 2007a), and listed below (as modified by Table 1-1)
- Vieques HHRA GW - Screening values from the October 2004 EPA Region IX Preliminary Remediation Goals (PRGs) (EPA, 2004)
- GW-MCLs from EPA Regulations Title 40 Protection of Environment, CFR Part 141 National Drinking Water Standards (40 Code of Federal Regulations [CFR] 141)
- Not detected in background well
- Regulatory standard not promulgated

Exceeds Background and HHRA criteria

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**Table 9-4**

Comparison of Region IX and Regional Screening Levels for Soil  
 PAOC U  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG <sup>2</sup>	Adjusted Residential Regional Screening Level <sup>2</sup>	Region IX SSL <sup>1</sup> (DAF=1)	Regional SSL <sup>1</sup> (DAF=1)	
Acetone	1,400,000	6,100,000	800	4,400	None. Screening value increased. There were no exceedances using the Region IX PRG and SSL.
Methylene chloride	9,100	11,000	1	1.2	None. Screening values increased. There were no exceedances using the Region IX PRG. Current evaluation unchanged by increase in SSL.
bis(2-Ethylhexyl)phthalate			No Value	1,600	None. One Regional SSL exceedance at a DAF of 1 in EBS sample; no exceedances at a DAF of 2; no bis(2-ethylhexyl)phthalate detected in sample collected from same location during PA/SI; no bis(2-ethylhexyl)phthalate detected in groundwater.
Aluminum	7,600	7,700			None. Screening value increased. There were no exceedances using the Region IX PRG.
Barium	1,600	1,500			None. 85 mg/kg highest concentration detected at the site.
Cadmium	3.7	7			None. Screening value increased. There were no exceedances using the Region IX PRG.
Chromium <sup>2</sup>	210	23			None. One exceedance of RSL, but concentration below background.
Cobalt	140	No Value			None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Cyanide	120	160			None. Screening value increased. There were no exceedances using the Region IX PRG.
Iron	2,300	5,500			None. Screening value increased. Current evaluation unchanged by increase in screening level.
Thallium	0.52	0.51			None. Current evaluation unchanged by 0.01 mg/kg change in screening level.
Vanadium	7.8	39			None. Current evaluation unchanged by increase in screening level.

Notes:

Organics units are µg/kg; inorganics units are mg/kg

<sup>1</sup> No Regional SSL values are provided for inorganics. The Region IX SSL values for inorganics are from the EPA Soil Screening Guidance and are therefore considered unchanged.

<sup>2</sup> Region IX PRG was based on 1:6 ratio of Cr VI:Cr III; Regional SL conservatively uses Cr VI value.

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**Table 9-5**

Comparison of Region IX and Regional Screening Levels for Groundwater

PAOC U

No Action Decision Document

4 Consent Order Sites and 6 PI/PAOC Sites Decision Document

Vieques, Puerto Rico

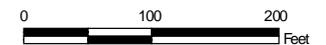
Detected Constituent	Human Health		Potential Effect on Site Determination
	Adjusted Tap Water Region IX PRG	Adjusted Tap Water Regional Screening Level	
Chloroform (µg/L)	0.17	0.19	None. Current evaluation unchanged by increase in screening level.
Aluminum (µg/L)	3,600	3,700	None. Screening value increased. There were no exceedances using the Region IX PRG.
Cobalt (µg/L)	73	No Value	None. Screening value eliminated. There were no exceedances using the Region IX PRG.
Iron (µg/L)	1,100	2,600	None. Screening value increased. Single exceedance using Region IX PRG eliminated using RSL.
Vanadium (µg/L)	3.6	18	None. Current evaluation unchanged by increase in screening level except site concentrations much closer to RSL.
Notes: µg/L - micrograms per liter			

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**LEGEND**

- PA/S Monitoring Well Location with Water Level Elevation, Feet Above Mean Sea Level
- PA/S Surface and Subsurface Soil Sample Location
- ▲ PA/S Surface and Subsurface Soil Sample and Monitoring Well Location with Water Level
- Elevation, Feet Above Mean Sea Level
- EBSSurface Soil Sample Location



**Figure 9-1**  
**1983 Aerial Photograph of the PAOC T and U Areas**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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Photo 1 - Stained area at drum and battery area adjacent to automotive shop



Photo 2 - AST adjacent to drum/battery storage

(photos included in EBS, April, 2003)

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## SECTION 10

# PAOC V – Former Leaking Transformer Storage Area

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PAOC V. Personnel interviews and records reviews conducted during the EBS identified PAOC V as the storage location of a leaking transformer (NAVFACENGCOM, 2003). The location of PAOC V is shown in Figure 1-2. A site visit performed in 2007 confirmed the transformer is no longer present, but a tent that formerly housed the transformer is still present, as shown in Figure 10-1.

Two surface soil samples were collected at PAOC V in 2002 as part of the EBS, as shown in Figure 10-1. The samples were analyzed for Appendix IX PCBs. Table 10-1 summarizes the constituent detected in PAOC V surface soil samples.

## 10.1 PAOC V Release Assessment Decision Analysis

This subsection discusses the sample results in the context of the Data Evaluation Decision Tree (Figure 1-3) with reference to the detection table (Table 10-1).

### Step 1: Is the site potentially CERCLA-eligible?

Historical information suggests the site was a former storage area for a leaking transformer. Based on the historical use of the site, the potential for the presence of CERCLA hazardous substances (i.e., PCBs) could not be confidently ruled out without sample collection, which was conducted in 2002. Therefore, the decision analysis proceeds to Step 2.

### Step 2: Were any inorganics above the background UTL detected or were any non-inorganics detected?

For the samples collected during the EBS, the following non-inorganics were detected:

#### Surface Soil

- PCBs: arochlor-1254

### Step 3: Are there any inorganic constituents above background or non-inorganic constituents that are potentially attributable to historic CERCLA-related releases at the site?

PAOC V is a former storage area for a leaking transformer, which is a potential source of PCBs. Therefore, the PCB detected at the site is attributable to the leaking transformer. This compound is therefore considered further in the decision analysis process.

### Step 4: For potentially complete exposure pathways, are there any exceedances (over that of background) of the most conservative screening values?

In this step of the decision analysis, the data for the CERCLA-related constituent identified in Step 3 are compared to the screening criteria shown on the detection table. Those constituents that exceed one or more criteria are listed below by medium.

## Surface Soil

- Arochlor-1254: no exceedances

As shown above, there are no exceedances of the most conservative screening values. Therefore, the decision analysis process continues to Step 6.

Table 10-2 presents a comparison of Region IX PRGs/SSLs to RSLs/Regional SSLs for the detected constituent considered in the decision analysis process whose values changed with the release of regional values by USEPA. As shown in Table 10-2, the screening values for arochlor-1254 have been updated. The human health screening value increased. A new soil-to-groundwater screening value was published which would result in a single exceedance at a DAF of 1. However, the site is very small (i.e., the size of the former transformer, which has been removed), which warrants a higher DAF (USEPA guidance suggests a DAF of 20 for sites of 0.5 acre or less [EPA, 1996]). At PAOC V, there are no exceedances of the Regional SSL at a DAF of 10. Therefore, none of the updates would alter the conclusions drawn based on the decision analysis process.

### **Step 6: Does the historic information and/or spatial distribution of data indicate the source area was sufficiently sampled?**

The historical information (interviews, records review, site inspections) indicates the most likely source of CERCLA-related releases at PAOC V was a leaking transformer, which was stored in the tent. The transformer is no longer present. Because releases would have been to the surface soil and because PCBs are relatively immobile, the two samples are representative of this area. Further, the potential source has been removed. Therefore, the source area was sufficiently characterized.

## **10.2 Conclusions and No Action Determination**

The decision analysis process described above indicates there has not been a CERCLA-related release at PAOC V that has resulted in contamination of soil at concentrations that would pose a potentially unacceptable risk to human or ecological receptors or leaching concern for groundwater. Further, the potential source has been removed. Therefore, a no action determination is made for PAOC V.

**Table 10-1**

PAOC V Surface Soil Detection and Exceedance Results

4 Consent Order Sites and 6 PI/PAOC Sites

No Action Decision Document

Vieques, Puerto Rico

Chemical Constituent	Region IX SSLs - DAF 1	Vieques HHRA SO	Vieques ECO SO	Vieques (East) Background Zone KTd SS	V-1	V-2
<b>Polychlorinated Biphenyls</b>						
Aroclor-1254 (µg/kg)	--	110	40,000		33.3 U	43.6
Notes: µg/kg - micrograms per kilogram U - Analyte not detected						

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**Table 10-2**

Comparison of Region IX and Regional Screening Levels for Soil  
 PAOC V  
 No Action Decision Document  
 4 Consent Order Sites and 6 PI/PAOC Sites Decision Document  
 Vieques, Puerto Rico

Detected Constituent	Human Health		Soil-to-Groundwater		Potential Effect on Site Determination
	Adjusted Residential Region IX PRG	Adjusted Residential Regional Screening Level	Region IX SSL (DAF=1)	Regional SSL (DAF=1)	
Aroclor-1254 (µg/kg)	110	220	No Value	5.1	None. Human health screening value increased. There were no exceedances using the Region IX PRG. Exceedance of Regional SSL at a DAF of 1 in one sample (44 µg/kg). However, no Regional SSL exceedances at a DAF of 10, which is reasonable for this site due to its small size (i.e., location of a former transformer).
Notes: µg/kg - micrograms per kilogram					

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**Legend**

-  Camp Garcia Area
-  EBS Surface Soil Sample Location



**Figure 10-1**  
**2004 Aerial Photograph**  
**of the PAOC V Area**

*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 11

# PAOC W – Former Area of Stagnant, Discolored Water

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This section presents a summary of the pertinent historical information and rationale for the no action determination for PAOC W. During the site visits conducted during the EBS, an area of pooled, discolored water was observed adjacent to the road from Camp Garcia to PI 21. However, the EBS noted that no evidence of hazardous material, hazardous waste, petroleum, or munitions storage or disposal was observed (NAVFACENGCOM, 2003). The location of PAOC W is shown in Figures 1-2 and 11-1.

The Mangrove Forest Health and Status Report (Geo-Marine, 2002) evaluated this area and attributed the mangrove decline to the area being cut off by the road from the natural circulation with the sea. The discolored water was likely caused by an increase in organic matter from the mangroves around the edge of the lagoon that died when the salinity changed because of the lagoon being cut off from normal sea water circulation.

Observations made during a site visit performed by representatives of the Navy, EPA, PREQB, FWS, and National Oceanic and Atmospheric Administration (NOAA) in 2007 supported these findings. Based on this information, the potential for the release of CERCLA hazardous substances can be confidently ruled out. Therefore, a no action determination is made for PAOC W.

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**Legend**

 PAOC W



**Figure 11-1**  
**2005 Aerial Photograph**  
**of the PAOC W Area**  
*No Action Decision Document*  
*4 Consent Order Sites and 6 PI/PAOC Sites*  
*Vieques, Puerto Rico*

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## SECTION 12

# References

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## Appendix A

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## Final Responses to

USEPA Review of the Draft No Action Decision Document, 4 Consent Order Sites and 7 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico

The U.S. Environmental Protection Agency (EPA) completed the review of the Draft No Action Decision Document, 4 Consent Order Sites and 7 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico, dated August 2008, and offer the following comment:

**Section 8, PAOC R - Former Boiler House in Heat Plant Building 617:** According to both the minutes from the October 18, 2007 ERP Technical Subcommittee meeting and the text in this section, PAOC R is likely a part of PAOC Q. Additional sampling was recommended for a building that is part of PAOC R or PAOC Q (figures not clear enough to specifically identify the building), and it will be conducted as part of the supplemental investigation for PAOC Q. Rather than state that this site is recommended for No Action, it will be more appropriate to state that PAOC R has been merged with the PAOC Q. Also, PAOC R could be removed from the No Action Decision document, and the description of the PAOC Q site in the SI/ESI Sampling and Analysis Plan be modified to include PAOC R as part of PAOC Q.

**Navy Response:** For the purposes of study and site determination, PAOC R will be merged with PAOC Q. Therefore, PAOC R has been removed from the No Action Decision Document and the description of the site incorporated into PAOC Q in the SI/Expanded SI SAP. "PAOC Q" will hereafter be referred to as "PAOC Q/R."

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**Final Responses to  
PREQB Technical Evaluation  
Draft No Action Decision Document 4 Consent Order Sites and 7 PI/PAOC  
Sites, Former Vieques Naval Training Range  
Vieques, Puerto Rico,  
August 2008**

**I. INTRODUCTION**

This evaluation is of the Draft No Action Decision Document, 4 Consent Order Sites and 7 PI/PAOC Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico. The Decision Document memorializes understandings and assumptions at 11 site screening areas: SWMU 5, SWMU 8, SWMU 12, AOC F, PI 11, PI 20, PAOC R, PAOC T, PAOC U, PAOC V, and PAOC W.

The Decision Document summarizes information upon which the no action determinations were proposed.

**II. PAGE-SPECIFIC COMMENTS**

- 1 **Page 3-2, Section 3, Step 3** Small typographical error: In the last line on this page, replace "no" with "not."

**Navy Response: The last sentence in the fourth paragraph of Step 3 on page 3-2 has been changed to read:**

**“Therefore, perchlorate is not considered further in the decision analysis process.”**

- 2 **Table 6-1, Section 6** Table 6-1 should be revised to note that TPH-DRO and TPH-GRO were analyzed for and there were no detections. Paragraph 4 on Page 6-1 indicates samples were analyzed for TPH-GRO and TPH-DRO.

**Navy Response: TPH-GRO and TPH-DRO have been added to Table 6-1 with “No Detections” indicated.**

- 3 **Page 10-3, Section 10.1, Step 4** It's unclear why the acetone detections are not discussed. Step 2 identifies acetone detected in surface soil. It would be helpful for the text to clarify the acetone detections.

**Navy Response: Step 4 discusses only detections above screening criteria (please see the title and first paragraph of Step 4 on page 10-3). Acetone was detected at an estimated concentration of 7 µg/kg. The lowest screening value for acetone is 800 µg/kg.**

- 4 **Figure 10-1.** Minor edit: In legend, shift green circle down one row so it is in line with "EBS Surface Soil Sample Location."

**Navy Response: Comment incorporated.**