RECORD OF DECISION

PESTICIDE WAREHOUSE III – OPERABLE UNIT 1 (SOILS) SUPERFUND SITE

MANATÍ, PUERTO RICO

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

September 2015

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Pesticide Warehouse III – Operable Unit 1 (Soils)
Manatí, Puerto Rico
PRD987367299

STATEMENT OF BASIS AND PURPOSE

This Record of Decision (ROD) documents the selected remedial action for the Pesticide Warehouse III – Operable Unit 1 (Soils) Superfund Site (Site) located at the Municipality of Manatí, Puerto Rico, which is being selected in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. §§ 9601-9675, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedy for the Site. This decision is based on the Administrative Record file for this response action (refer to Appendix I of Part II - Decision Summary).

The Puerto Rico Environmental Quality Board (EQB) concurs with the selected remedy. Refer to Appendix II of the Decision Summary for a copy of the concurrence letter.

ASSESSMENT OF SITE

The United States Environmental Protection Agency (EPA), in consultation with EQB, has determined that actual or threatened releases of hazardous substances from the Site, if not addressed by the selected remedy, may present a current or potential threat to human health and the environment. Therefore, remediation is necessary. This determination is based on the conclusions set forth in the Remedial Investigation, Human Health Risk Assessment, and the Screening Level Ecological Risk Assessment.

The selected remedy complies with Federal and Commonwealth requirements that are legally applicable or relevant and appropriate requirements and is cost effective. As such, the selected remedy will be protective of human health and the environment. It is anticipated that risks to human health as a result of direct contact, ingestion and inhalation will be eliminated because contaminated soil will be treated, disposed of and/or covered, and the exposure pathways will be eliminated.

DESCRIPTION OF THE SELECTED REMEDY

Based upon an evaluation of various alternatives, EPA, in consultation with EQB, selects a remedy that will address the soil contamination detected at the Site. The selected remedy includes the following components:

- Excavation of contaminated soil to a depth of 10 feet below ground surface;

- On-site treatment of those soils, followed by proper off-site disposal;
- Backfilling with clean fill to cover deeper, residually contaminated soils;
- Institutional controls; and
- Monitoring.

The soil with hazardous characteristics will be treated using *ex-situ* thermal desorption treatment and properly disposed of at a Resource Conservation and Recovery Act Subtitle D landfill. *Ex-situ* thermal desorption uses heat and vacuum extraction to mobilize and remove contaminants from soil. Because deeper soils (below 10 feet) will remain present with contaminant levels that would not allow for unrestricted use (i.e., residential use), institutional controls will be implemented to help control and limit exposure to hazardous substances at the Site. The types of institutional controls which will be employed for the soil at the Site are: 1) proprietary controls (e.g., deed restriction) to prevent soil excavation, well installation or disturbance of the soil or other remedial measures; and 2) informational devices such as advisories published in newspapers, periodic letters sent to local government authorities informing them of the need to prevent soil excavation and changes in area zoning.

The environmental benefits of the selected remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2 Clean and Green Energy Policy. This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into re-vegetation plans, and consider beneficial reuse and/or recycling of materials, among others.

STATUTORY DETERMINATIONS

The selected remedy meets the requirements for remedial actions set forth in Section 121 of CERCLA, 42 U.S.C. § 9621. It is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

This remedy will result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that would otherwise allow for unlimited use and unrestricted exposure. Pursuant to Section 121(c) of CERCLA, reviews will be conducted every five years after the completion of the remedy to ensure that it is protective of human health and environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this remedy.

- Chemical of concern and their respective concentrations can be found in the "Site Characteristics" section of the ROD.

- Baseline risk represented by the chemical of concern may be found in the "Summary of Site Risks" section of the ROD.
- A discussion of cleanup levels for chemicals of concern and a discussion of principal threat waste may be found in the "Remedial Action Objectives" section of the ROD.
- A discussion of current and potential future site and resource uses can be found in the "Current and Potential Future Site and Resource Uses" section of the ROD.
- Estimated capital, annual operation and maintenance, and total present worth costs are discussed in the "Description of Alternatives" section of the ROD.
- Key factors that led to selecting the remedies (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Evaluation of Remedy Alternatives" and "Statutory Determinations" sections of the ROD.

CERTIFICATION

This decision document includes all the elements required to support the selected remedy in accordance with the *Guide to Preparing Superfund Proposed Plans, Record of Decision, and Other Remedy Selection Decision Documents* [EPA 540-R-98-031 OSWER 9200.1-23P (July 1999)]

AUTHORIZING SIGNATURE

In accordance with the requirements of CERCLA and, to the extent practicable, the NCP, EPA, in consultation with EQB, has determined that the selected remedy for the Pesticide Warehouse III-Operable Unit 1 (Soils) Superfund Site is required in order to protect human health and the environment.

Walter E. Mugdan, Director
Emergency and Remedial Response Division
EPA - Region 2

Sept. 30, 2015
Date

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

PART II – DECISION SUMMARY

RECORD OF DECISION
PESTICIDE WAREHOUSE III – OPERABLE UNIT 1 (SOILS) SUPERFUND SITE
MANATÍ, PUERTO RICO

September 2015

TABLE OF CONTENTS

SITE NAME, LOCATION, AND DESCRIPTION 3
SITE HISTORY AND ENFORCEMENT ACTIVITIES 3
EPA Potential Source Area Investigation 4
Remedial Investigation/Feasibility Study 4
HIGHLIGHTS OF COMMUNITY PARTICIPATION....................5
SCOPE AND ROLE OF RESPONSE ACTION....................6
SITE CHARACTERISTICS....................6
Conceptual Site Model.................... 6
Contamination Overview 6
Topography.................... 7
Regional Geology 7
Local Geology.................... 7
Local Hydrogeology 8
Cultural Resources.................... 8
Sampling Strategy.................... 9
Sampling Results 10
Sources of Contamination.................... 11
Distribution of Contamination 12
CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES....................12
SUMMARY OF SITE RISKS....................12
Human Health Risk Assessment.................... 12
_Toc431375895Ecological Risk Assessment 16
Risk Assessment Summary.................... 16
REMEDIAL ACTION OBJECTIVES 17
Remediation Goals for Soil.................... 18
DESCRIPTION OF THE ALTERNATIVES....................19
Common Elements.................... 19
Institutional Controls 19
EPA Region 2 Clean and Green Policy 19
Remedial Alternatives.................... 20
EVALUATION OF REMEDIAL ALTERNATIVES....................23

Overall protection of human health and the environment 23
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) 23
Long-Term Effectiveness and Permanence 24
Reduction of Toxicity, Mobility, or Volume through Treatment 24
Short-Term Effectiveness 25
Implementability 25
Cost 26
State/Support Agency Acceptance 26
Community Acceptance 26
SELECTED REMEDY 26
Description of the Selected Remedy 26
Basis For Remedy Preference 27
STATUTORY DETERMINATIONS 27
Protection of Human Health and the Environment 27
Compliance with ARARs 28
Cost Effectiveness 28
Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to Maximum Extent Practicable 28
Preference for Treatment as a Principal Element 28
Five Year Review Requirements 29
DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN 29

APPENDIX I Figures
APPENDIX II Administrative Record Index
APPENDIX III Public Notices
APPENDIX IV Proposed Plan and Fact Sheet (Spanish)
APPENDIX V Public Meeting Attendance Sheet
APPENDIX VI Transcript of the Public Meeting
APPENDIX VII List of the ARARs
APPENDIX VIII Puerto Rico Environmental Quality Board’s Concurrence Letter
APPENDIX IX Tables
APPENDIX X Responsiveness Summary

SITE NAME, LOCATION, AND DESCRIPTION

The Pesticide Warehouse III Superfund Site (the Site) is an inactive facility located at State Road PR 670, kilometer 3.7, in a rural/residential area within the municipality of Manatí, Puerto Rico (Appendix 1-Figure 1). The Site covers an area of approximately two acres that includes remnants of a former main warehouse (only a concrete floor remains), a small warehouse located north of the western end of the former main warehouse, a ruined building structure that was a northern extension of the eastern end of the former main warehouse, and an on-site groundwater well. The Site is bounded to the south by State Road PR 670, to the west and north by open fields, and to the east by an Adventist Church building, a private school (formerly a retirement home), and a mechanic shop. East-west chains of mogotes and conical limestone hills are present to the north and south of the Site.

The former main warehouse was a wood-frame structure used to store pesticides. In 2003, a fire at the Site destroyed the former main warehouse and ruined an adjacent building. The Site is partially fenced, allowing access to trespassers. A drainage ditch, approximately five feet in depth and 275 feet in length, collects storm water from the western portion of the Site and empties into a natural on-site depression on the northeastern corner of the Site (also referred to as a “leach pit”).

A former supply well is located on the Site. According to the United States Geological Survey (USGS), the groundwater level in this well was measured at 258 feet below the ground surface (bgs). This information is consistent with the water levels measured at several production wells in the vicinity and reported in the USGS database.

The nearest surface water bodies are the Laguna Tortuguero lagoon, located 2.2 miles north of the Site, the Atlantic Ocean, located 2.8 miles north of the Site, and the Rio Grande de Manatí River, located 2.3 miles west of the Site.

EPA is addressing the Site in two operable units (OUs). OU-1 addresses the contamination of the soil media. OU-2 addresses the Site-wide groundwater. This Record of Decision (ROD) addressed the OU-1- Soils of the Site. The groundwater will be evaluated in a separate OU-2 study.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Site was used for pineapple processing and canning from the 1930s to the early 1950s. The area has been used for pineapple crops since approximately the 1910s, and areas to the south of the Site are still being planted with pineapple crops. The Puerto Rico Land Authority (PRLA) currently owns the Site and conducted operations at the Site from approximately 1954 to 1994.

During PRLA’s operations at the Site, various chemicals were stored in their original containers (bags, boxes and drums) on the concrete slab floor of the warehouse building prior to use. PRLA prepared the chemicals by mixing the concentrated chemical products (typically in solid or aqueous form) with water drawn from the on-site supply well. Mixing occurred in tanker trucks at the on-site loading dock over bare soil. Excess chemicals were poured on the ground, and spills occurred during the mixing process, impacting surrounding soils. No institutional or engineering controls prevented spillage to the soils. Excess chemical spills also flowed from the chemical mixing area across the ground to a drainage ditch that runs around the periphery of the Site and discharges to a sinkhole in the northeastern portion of the Site. Empty drums and bags of chemicals were stacked behind the main warehouse building directly onto bare soil, exposed to the wind and rain.

From 1994 to 1997, PRLA leased the Site to Axel Gonzalez Fruit Packaging, Inc., which subsequently went out of business. From September 30, 1999 to October 31, 2002, PRLA leased the Site to Agrocampos, Inc., (Agrocampos), which used the Site to store and dilute pesticides and fertilizers for agricultural application in pineapple farming operations until October 31, 2002. Sometime after Agrocampos vacated the Site, the main wood-framed warehouse was gutted by fire, leaving only its concrete foundation.

EPA added the Site to the National Priorities List on April 30, 2003.

In 2006, a construction developer performed earth movement activities in anticipation of the development of a housing project on land immediately to the north and west of the Site, altering the landscape and covering former drainage ditches with fill material. By 2006, the housing project had been abandoned and the residential development never took place.

EPA Potential Source Area Investigation

In 1989, the Puerto Rico Environmental Quality Board (EQB) conducted a preliminary assessment for the Site. During its inspection of the Site, EQB observed the on-site spillage of concentrated pesticides and fertilizers directly onto Site soils. Stained surface soils and stressed or absent vegetation were observed, suggesting widespread contamination. Strong pesticide odors were noted inside and outside the warehouse. Several facility workers complained of "intoxication," presumably due to releases of pesticides to the air.

In 1996, EPA conducted a Site Investigation (SI) at the Site. During the SI, spilled materials were noted throughout the warehouse, and stained surface soils were observed throughout the Site. Unlined surface drainage areas sloped toward the west where they intercepted a drainage ditch that extended along the western and northern boundaries, ending at the leach pit. Surface soil sampling, conducted as part of the SI detected 16 different pesticides, including: aldrin, dieldrin and toxaphene.

In 2001, EPA conducted a site reconnaissance and soil field screening event. Pesticide mixing activities had continued in the loading platform area, and spillage was noted throughout the property. Stressed vegetation was observed along the length of the runoff pathway from the loading platform to the on-site drainage ditch.

Remedial Investigation/Feasibility Study

In 2005, because of the complexity of the karst terrain hydrogeology at the Site, EPA determined that the Site investigation and remediation should be addressed in two Operable Units. Operable OU-1 would evaluate the soil contamination, while OU-2 would determine the nature and extent of groundwater contamination at the Site.

On March 22, 2005, EPA issued notice letters to PRLA and Agrocampos as potentially responsible parties (PRPs) for the Site. Later that year, PRLA and Agrocampos agreed to voluntarily perform the Remedial Investigation/Feasibility Study (RI/FS) for both operable units at the Site and entered into two separate Administrative Orders on Consent with EPA.

The RI for OU-1 and data collection activities commenced on May 27, 2009 and concluded on August 11, 2009. The nature and extent of contamination in soil was assessed during the RI by collecting and analyzing soil samples and then comparing analytical results to federal, Commonwealth, and site-specific screening criteria. Screening criteria are values used in the RI process to conservatively screen potential areas of contamination. Refer to Appendix I-Figure 2 for the study area.

The majority of the field work for OU-1 was performed by the PRPs, under EPA oversight. However, because of financial difficulties, the PRPs were not able to complete the RI/FS work for OU-1. Therefore, in 2015, EPA assumed responsibility for completing the RI/FS through its environmental consultant, CDM Smith.

The RI Report was completed by EPA to document the nature and extent of the soil contamination at the Site. EPA also prepared a Baseline Human Health Risk Assessment (HHRA) Report to document the current and future effects of Site contaminants on human health and the environment associated with the contamination found at the Site. EPA also conducted a screening-level ecological risk assessment (SLERA) to evaluate any potential for ecological risks from the presence of Site contaminants in surface water and sediment. A description of the HHRA and SLERA for this Site is provided in the Summary of Risk Section of this ROD.

A Feasibility Study (FS) was prepared to present and analyze cleanup alternatives suitable for this OU at the Site. The purpose of the FS was to identify, develop, screen, and evaluate a range of remedial alternatives that protect human health and the environment from potential risks at the Site and enable EPA to select a remedy for the Site. A detailed description of the cleanup alternatives evaluated for this Site is provided in the Description of Alternatives Section of this ROD.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the RI, a Community Involvement Plan (CIP) was developed to assess any community concerns about the Site and encourage public participation. As part of the CIP and as required by Superfund regulations, EPA prepared a Proposed Plan for the Site. A Proposed Plan summarizes the remedial alternatives and identifies EPA's preferred alternative and the rationale for the preferred remedy. On August 12, 2015, EPA made available to the public the Proposed Plan, the RI Report, the HHRA and SLERA Reports, and the FS Report for the Site. All of these documents along with others are included in the Administrative Record for this remedy, which was made available to the public at the following locations: EPA's Docket Room in New York, New York; Manati Municipal Library; EQB's Superfund File Room in San Juan, Puerto Rico; and EPA's Caribbean Environmental Protection Division Office in Guaynabo, Puerto Rico. A copy of the Administrative Record Index for the Site is provided in Appendix II of this ROD.

A notice of the availability of the Proposed Plan and supporting documentation was published in the *Primera Hora* newspaper on August 12, 2015 (Appendix III). A public comment period was held from August 12, 2015 – September 11, 2015. In addition, a public meeting was held on August 18, 2015 at the Manati Municipal Library from 6:00 pm to 8:00 pm. The purpose of the public meeting was to present the Proposed Plan to the community and provide an opportunity for the public to ask questions or give comments on the proposed remedial alternatives described in the Proposed Plan and EPA's preferred alternative. At this meeting, representatives from EPA answered questions and received comments about the response activities conducted at the Site to date and the proposed clean-up plan for the Site. Refer to Appendix IV for copy of the Proposed Plan and a Proposed Plan fact sheet in Spanish. Copy of the attendance sheet for this meeting can be found in Appendix V of this ROD. Appendix VI of this ROD contains the official transcript of the public meeting. In addition, EPA's response to written comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD (Appendix X).

SCOPE AND ROLE OF RESPONSE ACTION

Site remedial activities are segregated into different operable units so that remediation of different environmental media or areas of the Site can proceed separately in an expeditious manner. EPA has designated two operable units for this Site.

- OU-1, which is the focus of this ROD, addresses soil contamination in the Site.

- OU-2, which will be focus on the groundwater. Studies of groundwater will be completed in a separate RI/FS, and a separate Proposed Plan for a as a second and final remedy is anticipated to be issued for the Site.

SITE CHARACTERISTICS

CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) in Appendix I- Figure 3 of this ROD, is based on data collected during the field work conducted by the PRPs. CSM integrates information on geology, contaminant observations, Site usage, fate and transport, and receptors.

CONTAMINATION OVERVIEW

The RI identified pesticides (aldrin, dieldrin, Toxaphene) and dioxins/furans as Site-related chemicals for this Site. The fate and transport of a chemical in the environment, they are a function of the physical and chemical properties of the Site-related chemicals and conditions at the Site, including the geological characteristics. The primary fate and transport aspect for the Site-related chemicals are summarized below.

- Aldrin undergoes photolysis and transforms to dieldrin. Dieldrin is practically insoluble in water and is considered hardly mobile to immobile. It has a strong affinity for organic matter and sorbs tightly to soil particulates. Dieldrin has a high potential to bioaccumulate.

- Toxaphene is more likely to volatilize to the atmosphere than dieldrin; however, it is persistent in soils and is strongly sorbed to soil particles. It is considered relatively immobile to leaching and is highly insoluble in water. Toxaphene has a high potential to bioaccumulate.

- Dioxins and furans are virtually insoluble in water, bind to soil, and do not leach into groundwater. Dioxins and furans have very low vapor pressures and do not volatilize. Dioxins and furans are known to bioaccumulate in the food chain.

The most likely transport for all of the Site-related chemicals is through transport of the soils to which they bind, including by overland flow, surface runoff, and as windblown dust. Transport as fugitive dust is expected to be minimal since most of the area is covered with vegetation. In addition, soil erosion potential would be reduced by the heavy tropical vegetation.

TOPOGRAPHY

The Site is situated within the North Coast Limestone Province (NLP) of Puerto Rico. Based on the USGS 7.5 minute topographic map of the Manatí Quadrangle. The Site is located at an elevation of approximately 80 meters (250 feet) above mean sea level (msl). The area immediately surrounding the Site is relatively flat. Beyond the Site to the north and northwest, the land slopes gently toward the edge of the coastal plain, located three kilometers (2 miles) further to the north. Isolated small mogotes are found within this moderately sloping area between the Site and the coastal plain. The elevations of the mogotes are up to 25 meters (82 feet) above the surrounding ground surface. The topography of the land farther to the south is dominated by rugged karst features. The topography to the west and east is generally flat. Approximately 500 meters (1,640 feet) north of the Site, the land gently rises toward an east-west chain of mogotes. The chain of mogotes, which defines the southern margin of the flat-lying Atlantic coastal plain further to the north, is over 100 meters (315 feet) above msl in places.

REGIONAL GEOLOGY

Puerto Rico is divided into three geologic provinces, an older Cretaceous-age central volcanic-plutonic province trending east to west and two younger Tertiary limestone provinces along its northern and southern coastal margins. The Site is located along the north-central coast of Puerto Rico and lies within the NLP.

The bedrock formations of the NLP are of late-middle Tertiary age (early Miocene). The Aymamón Limestone is a 600 to 700 feet-thick unit that consists of thick-bedded and massive dense limestone, calcarenite, and dolomite, and forms the rugged hills which border the coastal plain. The Aguada Limestone, which is encountered in the subsurface below the Aymamón Limestone, is about 300 feet thick and consists of a hard, thick-bedded to massive calcarenite and dense limestone interbedded with chalky limestone and marl. Beneath the Aguada Limestone is the Cibao Formation, the upper member of which likely acts as a lower confining unit, The limestone sequence has a general east-west strike and dips gently to the north at one to six degrees.

Overlying the limestone in some areas of the NLP are Quaternary clastic deposits consisting of reddish clays or sandy clays and sands. This unit, commonly termed "blanket deposits", ranges in thickness from 0 to 100 feet.

LOCAL GEOLOGY

The Site is underlain by an unconsolidated deposit that consists of sand, clay, and sandy clay that overlies the Aymamón Limestone. The thickness of the surface blanket sand deposits is unknown but is estimated to measure up to 100 feet thick in the vicinity of Manatí.

LOCAL HYDROGEOLOGY

Published test well data from the Manatí area suggest the water table is approximately five feet above msl at the Site. According to Conde-Costas and Gómez-Gómez (1999), the depth to the water table in the on-site supply well is 258 feet bgs. The measured depth at the time of the RI investigation conducted was 253 feet bgs. Approximately 30 to 50 feet of the overlying basal Aymamón Formation may be saturated in addition to the Aguada Formation.

The on-site surficial soils of unconsolidated clayey-sands may retard the infiltration of surface water runoff into the aquifer, effectively creating a semi-confining layer. However, surface runoff is collected by the on-site drainage ditch which discharges storm water to the on-site leach pit (sinkhole).

The groundwater flow gradient is relatively flat toward the north-northwest. The transmissivity estimate for the on-site well, based on well specific capacity data, was calculated at 900 square feet per day (Conde-Costas and Gomez-Gomez 1999).

Recharge to the water table aquifer at the Site may be limited due to the thickness of clay-rich soils that overlie the limestone. The path that storm water takes from the surface to the water table is most likely complex. The overburden thickness and elevation of the soil/bedrock interface in the NLP are highly irregular. As such, the infiltration rate across the site is likely to be variable.

CULTURAL RESOURCES

A Phase IA Cultural Resources Survey (Archaeological Evaluation) was performed by Archaeologist Maria Cashion, M.A. at the Site. The Phase IA evaluation consisted of an archival investigation of the historical and archeological resources of the Site, including surrounding areas, and a walkthrough at the property to determine if archeological or historical resources are present. A copy of the Archaeological Evaluation is included in Administrative Record. The entire area was surveyed in linear transects in a zigzag pattern in order to better cover and inspect the surface. Standing structures were photographed.

Results were negative in terms of the presence of surficial archaeological material. Modern trash deposits were observed throughout the project area, particularly at the northern boundary. Outside of the northern boundary of the Site, a small cave was located, inside of which were trash deposits. The adjacent parcel has been covered by engineered fill which is karstic in nature. The fill contains animal (possibly canine) bones. The natural soil of the area is reddish sandy/clay with fragments of limestone. These characteristics can be clearly observed near the Site area. No archeological materials were observed.

Structures associated with the Pesticide Warehouse complex were found completely deteriorated and abandoned. These structures have no integrity and should not be considered for preservation. They do not possess the necessary requirements to be included in the National Register of Historic Places under any category.

As a result of the Phase 1A Cultural Resource Survey/Archaeological Investigation, it was concluded that the Site area has a low sensitivity level in terms of archaeological significance. The study concluded that the project will not cause adverse effects to cultural resources within the Site.

SAMPLING STRATEGY

This section describes the activities conducted during the two sampling phases of the RI, the Initial Soil Screening Event (ISSE) where samples were analyzed in the field and the Definitive Level Sampling Event (DLSE) where samples were analyzed in a laboratory (refer to Appendix 1-Figures 4 and 5). All field activities including drilling, sampling, decontamination, and investigation-derived waste handling activities were conducted by the PRPs with EPA oversight. The ISSE Data collection activities commenced on May 27, 2009 and concluded on August 11, 2009, and the DLSE was conducted based on the ISSE results. Sample collection activities were conducted between June 8, 2011 and August 12, 2011.

Soil samples were screened in the field for organochlorine pesticides (OCPs) that included dieldrin, aldrin, isodrin, endrin, heptachlor, heptachlor epoxide, chlordane, endosulfan, isobenzan, toxaphene, and lindane. Field test results were used to select sample locations for confirmatory laboratory analysis. Confirmatory samples were analyzed for volatile organic compounds (VOCs), Semivolatile organic compounds (SVOCs), Total Analyte List (TAL) metals, cyanide, polychlorinated biphenyls, herbicides, OCPs, organophosphorus pesticides (OPPs), and oxamyl, total organic carbon and grain size.

The following samples were collected during this event:

- Grid Soil Screening and Confirmatory Samples: 263 soil samples were collected.
- Drainage Ditch Screening and Confirmatory Soil Samples: 37 soil samples were collected.
- Soil Piles 1 and 2 Confirmatory Soil Samples (No screening of samples was performed): four samples (SP-1 [0-1]), SP-1 [2-3], SP-2 (0-1) and SP- 2 [2-3]) were collected.
- Truck Scale Pit Confirmatory Soil Sample (No screening of samples was performed): one confirmatory sample for laboratory analysis, TSP-1, was collected.
- Sinkhole Screening and Confirmatory Soil Samples: one soil boring was completed to collect soil samples for stratigraphic evaluation and to investigate the vertical extent of soil contamination in the sinkhole.
- Dioxin Soil Samples: 14 samples were collected.
- Concrete Chip and Wipe Samples: chip and wipe samples were collected from the three on-site buildings.
- Background Soil Samples: three background soil samples were collected.
- Stratigraphic Soil Boring Samples: three soil borings were drilled to obtain lithologic descriptions below the Site.

The DLSE was conducted by the PRPs to address recommendations based on the ISSE results to further delineate site contamination. Samples were analyzed for OCPs and OPPs; some samples were also analyzed for VOCs, SVOCs, TAL metals, cyanide, and dioxin/furans.

The following samples were collected during this event:

- Grid Soil Screening and Soil Samples: 36 borings were drilled, 25 were used to collect the DLSE samples, while the remaining 11 borings were replicate borings located within less than one or two feet of the original boring.
- Drainage Pathways Soil Screening and Soil Samples:. At each of these sampling points (these locations were drainage areas), five drilling locations were selected.

- Soil Pile 1 and 2 Soil Screening and Soil Samples: soil samples from Soil Pile 1 and Soil Pile 2 were analyzed for dioxin.
- Former Truck Scale Pit Soil Screening and Soil Samples: four soil borings were drilled to a depth of 14 feet at or near the truck scale pit.
- Sinkhole Soil Screening and Soil Samples: Twelve soil samples were collected from one soil boring and two replicate borings in the sinkhole. .
- Dioxin Soil Samples: A total of 69 environmental samples were analyzed for dioxin congeners at 19 locations.
- Background Soil Samples: additional background samples were collected at locations where no pineapple farming was performed in the past.

Refer to Appendix1-Figure 4 for sampling locations.

SAMPLING RESULTS

Pesticides were mixed and used at the Pesticide Warehouse III facility; the mixing within and outside of the buildings resulted in spillage or disposal of excess pesticides to the unprotected ground surface. Surface runoff of liquid pesticides or from precipitation events transported pesticide- and/or dioxin-laden soils to additional areas of the Site; including the drainage ditches on the warehouse property and to the west and north, the leach pit (sinkhole). Runoff likely ponded in low areas of the drainage system, resulting in deposition of contaminated soil in the low areas, as suggested by the pattern of contamination in the drainage system. Contaminated runoff also reached the leach pit (sinkhole) where dieldrin exceeded its screening criteria as deep as 17 feet bgs. Dioxins may be related to the pesticides or to the fire at the warehouse. All of the dioxin and furan detections that exceeded the TEQ value were in the main warehouse area in samples from 0-1 foot bgs (Appendix I- Figure 4).

A total of 252 soil samples were collected and analyzed for pesticides and 88 samples for dioxins/furans during the RI. The samples also were analyzed for other constituents, including metals, VOCs and SVOCs. All detected contaminants were considered in the risk assessment process; however, several groups of contaminants were not considered Site-related. Metals were detected in all soil samples, but at levels that were consistent with levels found in background soils unrelated to the Site.

Arsenic, a metal that was once commonly used in pesticides, was found at levels commonly found in native soils. Polynuclear aromatic hydrocarbons (PAHs) were found to be elevated in one sample location. Because PAHs are commonly found in asphalt, it was concluded in the RI that asphalt was the likely source of this one elevated sample.

The term dioxin commonly refers to the compound in this group considered most toxic, tetrachlorodibenzodioxin (TCDD). Among the many different forms of dioxin and related furan compounds, toxicity can be addressed by considering their toxicity relative to TCDD. Because dioxins/furans refers to such a broad class of compounds that vary widely in toxicity, the concept of toxicity equivalence (TEQ) has been developed to facilitate risk assessment. The OU-1 FS Report contains a detailed information about dioxins.

Nine pesticides, or their transformation products, and dioxins/furans were detected in one or more soil samples. Dioxins/furans were commonly detected in soil in all 88 samples. Dieldrin was the most commonly detected and wide-spread pesticide; it was detected in almost all the samples collected. The maximum depth for a dieldrin detection was 40-42 feet bgs in the leach pit area. Toxaphene, a highly toxic pesticide, was detected in 115 samples; the maximum depth for a toxaphene detection was 50- 52 feet bgs in the leach pit area. Thus, dioxins/furans along with the dieldrin, toxaphene and a third pesticide, aldrin, were tracked as the primary contaminants of potential concern (COPCs). A range of other pesticides were also detected less frequently in soil samples, and these pesticides were carried forward in the risk assessment, as discussed below.

Dioxin/furan samples were converted to dioxin TEQs for comparison against the screening criterion for TCDD. Dioxins were detected in nearly every sample and dioxin TEQs were exceeded in 11 samples. The 10 of the 11 elevated samples were in surface samples from areas of heavy pesticide use when the facility was active. Dioxins/furans are commonly found in association with pesticides. The 2003 fire at the main warehouse could be a secondary source of this contaminant. The dioxin exceedances are generally located in areas with exceedances of dieldrin, which is the most widely distributed contaminant.

SOURCES OF CONTAMINATION

The primary areas of contaminated soils that were found at the former facility are associated with former pesticide handling and mixing operations, and the leach pit drainage located on the northern portion of the facility. Pesticides were found most frequently and at the highest concentrations in surface soils (within the first two feet of the ground surface) and then in lesser concentrations with depth. For example, dieldrin was detectable in a leach pit sample as deep as 47 feet below ground surface (bgs), but the deepest detection above a screening criterion was 17 feet bgs.

Drainage ditches carried runoff from the facility to areas north and west of the facility, onto the land where the residential development has begun and subsequently was abandoned. These drainage ditch soils that contained pesticides were buried under a layer of fill material as thick as 14 feet by the land developer. Subsequent testing of the imported fill material did not identify elevated levels of contamination (Site-related or otherwise), and there is no evidence that the imported fill was mixed with the underlying drainage ditch soils.

The only structures remaining at the facility are concrete building foundations. Concrete chip sampling revealed elevated levels of pesticides were consistently found in the building foundations, which are exposed to the elements.

Soon after the Site was vacant in 2002, the former main warehouse was gutted by fire, leaving only its concrete foundation. As a result of the fire, soils were sampled and dioxins and furans were found to be present in the soil, with the highest levels in surface soil samples. Dioxin exceedances were primarily located near the Site buildings and building remnants; however, elevated dioxin TEQs were present in samples at far end of the north-trending drainage ditch and in subsurface samples. Dioxins could be related to the fire or to the pesticides that were prepared and spilled.

By 2006, a developer placed fill material on lands to the west and north of the facility boundaries to level the ground surface for a proposed housing project, altering the landscape and covering the former drainage channels. The fill material was placed across the entire area, not just in the drainage channels. The project has been abandoned, and the residential development never took place.

DISTRIBUTION OF CONTAMINATION

Contamination was distributed at the Site as isolated spills related to the mixing of pesticides at various locations on the property and the disposal of excess or unused pesticides on the ground surface. Poor housekeeping practices also contributed to contaminant distribution and transport. Liquid pesticides infiltrated the subsurface, transporting contaminants to the lower soil zones. Pesticides and dioxins/furans strongly bind to soil and secondary transport as runoff during precipitation events also served to spread contaminants to additional areas around the main property, and to the drainage ditches and the leach pit (a sinkhole).

Once soil migrated to the drainage system as entrained particles with surface water runoff, it is likely that water ponded in lower areas of the drainage systems. These low areas are evident from the sample results along the identified drainage pathways, where elevated levels of pesticides are present, as compared to other parts of the drainage features. In addition, heavy tropical precipitation events likely caused the ditches to overflow, potentially spreading contaminated soil outside of the drainage ditch system.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Potential receptors who could be exposed to Site contamination include trespassers and workers or visitors to the Adventist Church Property. In the future, receptors could include residents, workers, trespassers, and construction workers at the Site and workers, visitors, summer campers, daycare children, and construction workers at the Adventist Church Property. Ecological receptors could be impacted by the soil contamination.

SUMMARY OF SITE RISKS

As part of the RI/FS, EPA conducted a baseline risk assessment to estimate the current and future effects of contaminants on human health and the environment. A baseline risk assessment is an analysis of the potential adverse human health and ecological effects of releases of hazardous substances from a site in the absence of any actions or controls to mitigate such releases, under current and future land uses. The baseline risk assessment includes a human health risk assessment and an ecological risk assessment. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by a remedial action. The remedial alternative that was chosen for the Site addresses contamination present at the Site. The risks and hazards for the Site that were presented in the baseline risk assessment will be summarized in this section.

HUMAN HEALTH RISK ASSESSMENT

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* – uses the analytical data collected to identify the contaminants of potential concern at a site for each medium, with consideration of a number of factors explained below; *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed; *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response); and *Risk Characterization* - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

The risk characterization also identifies contamination with concentrations which exceed acceptable levels, defined by the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as an excess lifetime cancer risk greater than 1 x 10^{-6} to 1 x 10^{-4}, an excess of lifetime cancer risk greater than 1 x 10^{-6} (i.e., point of departure) combined with site-specific circumstances, or a Hazard Index (HI) greater than 1.0; contaminants at these concentrations are considered chemicals of concern (COCs) and are typically those that will require remediation at a site. Also included in this section is a discussion of the uncertainties associated with these risks.

Hazard Identification

In this step, the COCs in each medium were identified based on such factors as toxicity, frequency of occurrence, fate, and transport of the contaminants in the environment, concentrations, mobility, persistence, and bioaccumulation. The risk assessment focused on surface soil and subsurface soil contaminants related to the Pesticide Warehouse III property and its potential impact on the adjoining Adventist Church property which may pose significant risk to human health. Analytical information that was collected to determine the nature and extent of contamination revealed the presence of pesticides and dioxin/furans in the surface and subsurface soil of Pesticide Warehouse III property at concentrations of potential concern.

A comprehensive list of all COCs can be found in the HHRA, entitled “Final Human Health Risk Assessment – Pesticide Warehouse III, OU1 (Soil)” – September 2014. This document is available in the Administrative Record file. This ROD focuses on the Pesticide Warehouse III property. The contaminated media, concentrations detected, and concentrations utilized to estimate potential risks and hazards for the COCs at the Site are presented in Table 1 (See Appendix IX).

Exposure Assessment

Consistent with Superfund policy and guidance, the HHRA is a baseline human health risk assessment and therefore assumes no remediation or institutional controls to mitigate or remove hazardous substance releases. Cancer risks and non-cancer hazard indices were calculated based on an estimate of the reasonable maximum exposure (RME) expected to occur under current and future conditions at the site. The RME is defined as the highest exposure that is reasonably expected to occur at a site. For those contaminants for which the risk or hazard exceeded the acceptable levels, the central tendency estimate (CTE), or the average exposure, was also evaluated.

The site currently is zoned for industrial use, however, future use could include mixed use, including industrial, residential and conservation. The HHRA evaluated potential risks to populations associated with both current and potential future land uses.

Exposure pathways were identified for each potentially exposed population and each potential exposure scenario for exposure to surface soil and subsurface soil. Exposure pathways assessed in the HHRA are presented in Table 2 and included current exposure to trespassers, workers, visitors and students and future exposure to workers, residents, trespassers, visitors, summer campers, daycare child and students through incidental ingestion, dermal contact, and inhalation from contaminated media on the Pesticide Warehouse III and/or Adventist Church properties. Typically, exposures are evaluated using a statistical estimate of the exposure point concentration, which is usually an upper-bound estimate of the average concentration for each contaminant, but in some cases it may be the maximum detected concentration. A summary of the exposure point concentrations for the COCs in surface and subsurface soil can be found in Table 1, while a comprehensive list of the exposure point concentrations for all COCs can be found in the HHRA.

Toxicity Assessment

Under current EPA guidelines, the likelihood of carcinogenic risks and non-cancer hazards as a result of exposure to Site chemicals are considered separately. Consistent with current EPA policy, it was assumed that the toxic effects of the Site-related chemicals would be additive. Thus, cancer and non-cancer risks associated with exposures to individual COCs were summed to indicate the potential risks and hazards associated with mixtures of potential carcinogens and non-carcinogens, respectively.

Toxicity data for the HHRA were provided by the Integrated Risk Information System (IRIS) database, the Provisional Peer Reviewed Toxicity Database, or another source that is identified as an appropriate reference for toxicity values consistent with EPA's directive on toxicity values. This information for the COCs is presented in Table 3 (non-cancer toxicity data summary) and Table 4 (cancer toxicity data summary). Additional toxicity information for all COCs is presented in the HHRA.

Risk Characterization

Noncarcinogenic risks were assessed using an HI approach, based on a comparison of expected contaminant intakes and benchmark comparison levels of intake (reference doses, reference concentrations). Reference doses (RfDs) and reference concentrations (RfCs) are estimates of daily exposure levels for humans (including sensitive individuals) which are thought to be safe over a lifetime of exposure. The estimated intake of chemicals identified in environmental media (*e.g.*, the amount of a chemical ingested from contaminated drinking water) is compared to the RfD or the RfC to derive the hazard quotient (HQ) for the contaminant in the particular medium. The HI is obtained by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

The HQ for oral and dermal exposures is calculated as below. The HQ for inhalation exposures is calculated using a similar model that incorporates the RfC, rather than the RfD.

HQ = Intake/RfD

Where: HQ = hazard quotient
Intake = estimated intake for a chemical (mg/kg-day)
RfD = reference dose (mg/kg-day)

The intake and the RfD will represent the same exposure period (i.e., chronic, subchronic, or acute).

As previously stated, the HI is calculated by summing the HQs for all chemicals for likely exposure scenarios for a specific population. An HI greater than 1.0 indicates that the potential exists for noncarcinogenic health effects to occur as a result of site-related exposures, with the potential for health effects increasing as the HI increases. When the HI calculated for all chemicals for a specific population exceeds 1.0, separate HI values are then calculated for those chemicals which are known to act on the same target organ. These discrete HI values are then compared to the acceptable limit of 1.0 to evaluate the potential for noncancer health effects on a specific target organ. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. A summary of the noncarcinogenic hazards associated with these chemicals for each exposure pathway is contained in Table 5.

It can be seen in Table 5 that the HI for noncancer effects is elevated for exposure to surface and subsurface soil because of concentrations of dieldrin and dioxin/furans for current and future trespassers and future workers, residents and construction workers.

For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen, using the cancer slope factor (SF) for oral and dermal exposures and the inhalation unit risk (IUR) for inhalation exposures. Excess lifetime cancer risk for oral and dermal exposures is calculated from the following equation, while the equation for inhalation exposures uses the IUR, rather than the SF:

Risk = LADD x SF

Where: Risk = a unitless probability (1×10^{-6}) of an individual developing cancer
LADD = lifetime average daily dose averaged over 70 years (mg/kg-day)
SF = cancer slope factor, expressed as [1/(mg/kg-day)]

These risks are probabilities that are usually expressed in scientific notation (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the conditions identified in the assessment. Again, as stated in the NCP, the point of departure is 10^{-6} and the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}.

A summary of the estimated cancer risks are presented in Table 6. The results indicated that there are elevated cancer risks for future residents and workers on the Pesticide Warehouse III property as a result of dieldrin, toxaphene, and dioxin/furans in surface soil.

<u>Uncertainties</u>

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental data;
- exposure parameter assumptions;
- toxicological data, and
- risk characterization.

Two of the primary sources of uncertainty identified in the HHRA were associated with exposure parameters and toxicological data. Uncertainty in exposure parameters was related to many of the parameters being associated with default values because site-specific values were not available. This would provide a conservative estimate of potential risk and hazards.

Another important source of uncertainty was toxicological data. The toxicity factors used in the quantitative evaluation of potential risks and hazards were primarily selected from the IRIS. For many chemicals, there is a lack of appropriate information on effects in humans (i.e., epidemiologic studies). Therefore, animal studies are generally used to develop toxicity values in human health risk assessments, which may under- or over-estimate potential risks and hazards.

More specific information concerning uncertainty in the health risks is presented in the baseline human health risk assessment report.

ECOLOGICAL RISK ASSESSMENT

A screening-level ecological risk assessment was conducted to evaluate the potential for ecological risks from the presence of contaminants in surface soil. The SLERA focused on evaluating the potential for impacts to sensitive ecological receptors to Site-related constituents of concern through exposure to soil on the Pesticide Warehouse III property. Surface soil concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the SLERA.

Surface Soil: There is a potential for adverse effects to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals) from exposure to contaminated surface soil. The surface soil screening criteria were exceeded for pesticides (4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, beta-BHC, dieldrin, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, gamma-chlordane, heptachlor, heptachlor epoxide, methoxychlor and toxaphene), semi-volatile organic compounds (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, butylbenzylphthalate, chrysene, dibenzo[a,h] anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, phenanthrene and pyrene), metals (antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, thallium, vanadium and zinc) and dioxin/furans, which resulted in HIs greater than the acceptable value of 1. The primary risk drivers were identified as pesticides and dioxin/furans, as the PAHs and metals were not considered to be Site-related.

The SLERA indicates that there is a potential for adverse ecological effects to wildlife receptors that use the Pesticide Warehouse III property. The habitat at the Site can be described as an overgrown industrial property, and it has the potential to be redeveloped in the future, which would result in the elimination of the current habitat. Given that there are unacceptable human health risks, and the selected remedy will address both human health and ecological exposures, EPA determined the most protective approach would be to include ecological remedial action objectives rather than spend additional resources and time on pursuing a baseline ecological risk assessment.

RISK ASSESSMENT SUMMARY

In summary, pesticides, specifically dieldrin and toxaphene, and dioxin/furans in surface and subsurface soil at the Pesticide Warehouse III property contribute to unacceptable risks and hazards to current trespassers and future residents, workers, trespassers, and construction workers. Additionally, the screening level ecological risk assessment indicated a potential for adverse ecological effects. Therefore, based on the results of the human health and ecological risk assessments, the response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of contaminants into the environment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

The goal of the remedy selection process is to select remedies that are protective of human health and the environment, maintain protection over time, and minimize untreated waste.

The current and anticipated future land uses for the Site are an important consideration for the development of RAOs and remediation goals to ensure remedial alternatives are protective of human health and the environment. The final condition of the Site after remediation must be considered in evaluating future land uses or activities and the related protection to human health that is provided.

RAOs are media-specific and source-specific goals to be achieved through completion of a remedy that is protective of human health and the environment. These objectives are typically expressed in terms of the contaminant, the concentration of the contaminant, and the exposure routes and receptors. RAOs are typically developed by evaluating several sources of information, including results of the risk assessments and tentatively identified ARARs. These inputs are the basis for determining whether protection of human health and the environment is achieved for a particular remedial alternative.

As part of the assessment of a site, EPA evaluates whether any contaminated materials should be considered principal threat waste because they may act as source material to the contamination of other media (e.g., contaminated soils acting as a source of groundwater contamination) or because they are highly toxic. For example, contaminated soil at the Site could be considered source material because it acts as a source for direct exposure at concentrations in excess of a worker 10^{-3} risk level for pesticides and dioxins/furans. Pesticides in soil samples were not observed at concentrations greater than the residential or worker scenario 10^{-3} risk levels. Dioxin/furan concentrations were also not observed above the worker scenario 10^{-3} risk level. While groundwater investigations have yet to be completed, the impact of contaminated soils on groundwater was also considered in the development of RAOs. Contaminated soils appear to have little impact on contaminated groundwater. Based on these factors, contaminated soils at the Site are not considered to be a principal threat waste, but rather a low-level threat waste.

While land use in the area is mixed, EPA consulted with local authorities and EQB and concluded that future unrestricted land use (e.g., residential use) need not be carried forward for either the facility itself or the northern property containing the buried drainage ditches. The development of the following RAOs is primarily focused on protection of the human health for the future Site worker and construction worker scenarios:

1. Mitigate the potential for inhalation and ingestion exposures to human receptors to pesticides and dioxins/furans in soil resulting in cancer and non-cancer health hazards in excess of EPA's acceptable risk range.

2. Minimize the release of contaminants from the unsaturated soils to groundwater at concentrations that would cause exceedances of the remediation goals for groundwater.

Based upon the SLERA, an ecological RAO to prevent direct contact with surface soils by ecological receptors would also be appropriate; however, EPA has concluded that by addressing surface soils to protect human health, the remedy would also adequately address exposure to ecological receptors.

REMEDIATION GOALS FOR SOIL

To meet the RAOs, remediation goals were developed to aid in defining the extent of contaminated soil requiring remedial action. Remediation goals are typically chemical-specific measures for each media and/or exposure route that are expected to be protective of human health and the environment. In this case, soil remediation goals were developed to address soils as a direct contact threat, including surface soils (within the first two feet of the ground surface), and to address exposures under the construction worker scenario, such as subsurface soils as deep as 10 feet. They are derived based on evaluating ARARs, risk-based levels, and background concentrations, with consideration also given to other requirements such as analytical detection limits, guidance values, and other pertinent information.

There are no promulgated federal or Commonwealth chemical-specific ARARs for soil. To meet the RAOs, risk-based soil remediation goals were developed based on a future worker scenario at a 10^{-6} cancer target risk level, expecting the future use of the Site, including the northern property, to be a commercial/industrial use and not a residential (unrestricted) use. These remediation goals will be applied to a depth as great as 10 feet bgs, to be protective for construction workers in addition to commercial/industrial future workers.

No unacceptable exposures were identified for the neighboring Adventist Church property. By addressing soils to as deep as 10 feet on the Site, these remediation goals will also be protective for inadvertent trespassing from neighboring properties. The remediation goals are shown in Appendix IX, Table 7.

The SLERA identified a number of additional Site-related compounds that exceed ecological screening levels, suggesting the potential for ecological impacts. Separate ecological remediation goals were not developed because the areas of ecological concern are collocated with the areas of surface soil contamination to be addressed.

The impact of COCs to groundwater was also considered in the development of the RAOs. There is limited evidence of groundwater contamination attributable to the Site. EPA has concluded that Site soils are not acting as an ongoing source of groundwater contamination, based upon a number of factors. The water table, at over 200 feet bgs, is separated from the areas of soil contamination by more than 150 feet of unsaturated (and uncontaminated) soils. Given that the soil contamination has been present at the Site for up to 60 years, there is little evidence of contaminant transport to deeper soils through rain percolation during that time. In addition, the pesticides and dioxin/furan compounds that have been identified as COCs have very low water solubility, adsorb strongly to soils and, as a consequence, are not very mobile. Although remediation goals for the protection of groundwater would also be protective of a direct contact scenario, EPA has determined that direct-contact soil remediation goals would be adequately protective for protection of groundwater. Furthermore, the bulk of the soil contamination is within the top 10 feet bgs, with few exceedances of these remediation goals deeper than 10 feet; EPA expects that, by addressing contaminated soils within the top 10 feet, the selected remedy would address the soils as a potential threat to groundwater.

DESCRIPTION OF THE ALTERNATIVES

Section 121(b)(1) of CERCLA, 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, and contaminants at a site. Section 121(d) further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to Section 121(d)(4), 42 U.S.C. § 9621(d)(4).

The timeframes presented below for each alternative reflect only the time required to construct or implement the remedy and do not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, design the remedy, or procure contracts for its design and construction.

The cost estimates, which are based on available information, are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost of the project.

Remedial alternatives were assembled by combining the retained remedial technologies and process options for the contaminated media and were evaluated in detail in the FS. The remedial alternatives are summarized below.

COMMON ELEMENTS

There are several common elements that are included in all the remedial alternatives. The common elements listed below do not apply to the No Action alternative because, as the name implies, under the No Action alternative no action would be taken.

Institutional Controls

Institutional controls (ICs) are non-engineered controls such as administrative and/or legal measures that minimize the potential for human exposure to contamination by limiting land or resource use. In this case, ICs would be used in conjunction with active control measures, such as capping or excavating and treating contaminated soils, to prevent direct contact. Different ICs would be applicable to different alternatives, as discussed below.

EPA Region 2 Clean and Green Policy

The environmental benefits of a remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into revegetation plans, and consider beneficial reuse and/or recycling of materials, among others.

Based on a screening of alternatives developed in the FS, several alternatives (FS Alternatives S2, S3 and S4) were not carried forward to the ROD. Please refer to the FS report for more information on these alternatives.

REMEDIAL ALTERNATIVES

It should be noted that for any remedy that results in contaminants remaining above levels that would otherwise allow for unrestricted use and unlimited exposure, CERCLA requires that the remedy be reviewed at least once every five years to assure that it remains protective. If justified by such a review, additional remedial actions may be considered in the future to remove, treat, or contain the contamination that remains in place. This statutorily required review, however, is not considered to be an element of a remedy.

The following alternatives were considered for the Site:

Alternative S1: No Action

Alternative S1 is required by the NCP to provide an environmental baseline against which impacts of various other remedial alternatives can be compared. Under this alternative, no remedial activities would be initiated at the Site. There would be no response to address contaminated soil above remediation goals or otherwise mitigate the associated risks to human health from exposure to soil contamination.

Alternative S5: Excavation of Contaminated Soil to 10 feet bgs, On-site Treatment and Off-site Disposal, Covering of Remaining Residual Subsurface Soil, Institutional Controls, and Monitoring

Under this alternative, contaminated soil in concentrations greater than remediation goals would be excavated to a depth of 10 feet bgs and properly disposed off-site. Contaminated concrete from building foundations would be transported off-site for disposal. Excavated areas would be covered with clean fill. On areas of the northern property where engineered fill was added, the fill, which has been determined to not be contaminated, would be excavated, stockpiled, and then backfilled in the excavated areas after removing the deeper, contaminated soils. Excavated contaminated soil containing Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste would be stockpiled on-site and thermally treated *ex situ* (i.e., material is excavated and treated at the Site) prior to disposal at a RCRA Subtitle D landfill. During excavation, in places where contaminant concentrations still exceed remediation goals at depths greater than 10 feet, a marker layer (e.g., an obvious wire mesh or permeable plastic barrier) would be installed as a warning that digging lower would result in possible exposure to contaminated soils. The total area to be covered under Alternative S5 is approximately 2,800 square feet. Clean fill and topsoil would be used to replace soil removed by excavation, returning the area to its original elevation and grade. The soil cover would be blended into the existing engineered fill areas on the northern property. After the topsoil has been replaced, the area would be seeded to establish vegetative cover to restore the area. Existing structural remnants and concrete slabs would be demolished to enable excavation and placement of the cover.

The total targeted volume of contaminated soil to be excavated under this alternative is approximately 8,800 cubic yards (CY). It is estimated that 3,500 CY of contaminated soil containing RCRA characteristic hazardous waste would be stockpiled on Site and thermally treated *ex-situ* prior to disposal at a RCRA Subtitle D landfill. The remaining 5,300 CY would be considered non-hazardous and disposed of at a RCRA Subtitle D landfill without treatment.

Ex-situ thermal desorption uses heat and vacuum extraction to mobilize and remove contaminants from soil. Soil treatment would be employed to treat the contaminated soils to levels that would allow for disposal at a RCRA Subtitle D landfill. Treatment to levels that would allow for on-site placement of the treated soil was also considered; however, combining on-site treatment and off-site disposal was considered more cost-effective. Thermal Conducting Heating (TCH) wells would be placed in a grid-like pattern within the soil stockpile. The TCH wells heat the soil to the target temperature as measured by thermocouples placed throughout the stockpile. As temperatures increase to the target level, the contaminant's vapor pressure and diffusivity increase, and its viscosity decreases. As a result, the evaporation rate and mobility of the contaminant is increased, and contaminants and water contained in the soil are vaporized. Soil vapor extraction wells placed in the stockpile would be used to remove the soil vapor steam. The extracted off-gas and water are treated through vapor and liquid treatment systems.

A long-term inspection and maintenance program would be developed to ensure the soil cover would provide continued protection to human health. Inspections may be scheduled annually. Because of the thickness of the cover (10 feet), little maintenance is required.

Alternative S6: On-site Consolidation with Engineered Cover, Institutional Controls, and Monitoring

Under Alternative S6, all contaminated soil in concentrations greater than remediation goals that are outside the boundaries of a designated consolidation area would be excavated for consolidation at the consolidation area and eventual covering. This alternative includes excavation, consolidation, multi-layer geosynthetic cover construction, and vegetative cover to limit exposure to contaminants, combined with institutional controls (administrative and access controls). The consolidation area would be at the former facility property. As with Alternative S5, engineered fill on the northern property would be removed and stockpiled to enable excavation of the contaminated soil underneath. Excavated areas would be backfilled with clean fill. The engineered fill would be replaced in the areas from which it was removed. The estimated total targeted volume of contaminated soil to be excavated and consolidated at the Site under Alternative S6 is approximately 3,500 CY.

The existing structures and concrete slabs at the Site would be demolished and removed to enable construction of the consolidation area. A multi-layer geosynthetic cover would be constructed over the consolidated material to mitigate unacceptable exposure risks to humans. The cover would result in some reduction in surface water infiltration (reducing the mobility of the underlying contamination), but the primary purpose of the cover would be to prevent direct contact. The cover material composition would be selected in remedial design, but it would typically be about 1.5 to 2 feet thick. The estimated extent for the consolidation area under Alternative S6 is approximately 50,700 square feet.

A long-term inspection and maintenance program would be developed to ensure the engineered cover would provide continued protection to human health. Inspections may be scheduled annually and following each severe storm event. Inspections would monitor the vegetation, erosion, and any damage by animals. If erosion or damage to the engineered cover is observed, actions would be taken to repair the damage and maintain the integrity of the engineered cover.

Alternative S7: Excavation of Contaminated Soil, Backfilling, and Off-site Treatment and Disposal

Alternative S7 would consist of excavation and off-site disposal of contaminated soil exceeding remediation goals to limit exposure to contaminants. While exposure assumptions considered in the human health risk assessment indicate that addressing soils to a depth of 10 feet bgs would be protective, this Alternative S7 would address contaminated soils in excess of the remediation goals to a depth of approximately 20 feet. Several isolated detections deeper than 20 feet would be left in place under this alternative.

As with Alternative S5, excavated areas would be backfilled with clean fill, and engineered fill on the northern property would be removed and stockpiled to enable excavation of the contaminated soil underneath. Excavated areas would be backfilled with clean fill. The engineered fill would be replaced in the areas from which it was removed.

The estimated total targeted volume of contaminated soil to be excavated under Alternative S7 is approximately 11,600 CY. It is estimated that 4,500 CY of the excavated material contains contaminant levels requiring treatment and disposal as a RCRA characteristic hazardous waste. Because no RCRA Subtitle C facility is located on the Island, this contaminated material would need to be transported to the Continental United States for treatment and disposal. The remaining 7,100 CY would be disposed of as non-hazardous at a RCRA Subtitle D landfill.

Clean fill and topsoil would be used to replace excavated material, returning the area to its original elevation and grade. The soil cover would be blended into the existing engineered fill areas. After the topsoil has been placed, the area would be seeded to establish vegetative cover both to restore the area and because the roots from plants hold the soil in place, preventing erosion and offsite transport by surface runoff or wind.

Alternative S8: Excavation of Contaminated Soil, On-site Treatment, and Off-site Disposal

Alternative S8 is similar to Alternative S7, as described above, with the exception that excavated contaminated soil considered RCRA characteristic hazardous waste would be stockpiled on-site and thermally treated prior to disposal at a RCRA Subtitle D landfill.

The estimated total targeted volume of contaminated soil to be excavated under Alternative S8 is approximately 11,600 CY. It is estimated that 4,500 CY of the excavated material contains contaminant levels requiring treatment prior to disposal at a RCRA Subtitle D landfill.

Alternative S9: *In-Situ* Thermal Remediation of Contaminated Soil

Alternative S9 would consist of conducting i*n-situ* thermal treatment of subsurface soils. *In-situ* thermal treatment would be conducted in areas with contaminant concentrations greater than remediation goals. This type of remediation is similar in many ways to ex-situ thermal remediation, but instead of excavating the material first, i*n-situ* thermal treatment would heat the subsurface soil in place. Soil would remain on Site. In order to implement Alternative S9, all the existing structure and remaining concrete foundation need to be removed. Contaminated concrete would be transported off-site for disposal. The total targeted volume of contaminated soil to be treated under Alternative S9 is approximately 11,600 CY (the same volume of the material to be excavated for Alternatives S7 and S8).

Site conditions play a large role in choosing the appropriate i*n-situ* thermal remediation method. The thermal remediation method to carry forward in remedial design would be determined after discussion with technology vendors.

It should be noted that, whereas *ex-situ* thermal treatment (Alternative S5) would only need to achieve levels sufficient to allow for disposal off-site in a RCRA Subtitle D landfill, *in-situ* treatment associated with Alternative S9 would need to achieve the considerably more stringent cleanup level of the Site remediation goals found in Table 7. Because of uncertainties related to the effectiveness of *in-situ* treatment (particularly for dioxins where the remediation goal is very low), Alternative S9 may need to be augmented with cover material similar to Alternative S6 to achieve protectiveness.

EVALUATION OF REMEDIAL ALTERNATIVES

Nine criteria are used to evaluate remedial alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each of the above-described alternatives against the nine criteria, noting how each compares to the other options under consideration. The nine evaluation criteria are discussed below. A detailed analysis of alternatives can be found in the FS Report.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Of the six retained alternatives, only the no action alternative (S1) would fail to provide protection for human health (future worker) and would not address the RAOs for contaminated soil.

Alternatives S5, S6, S7, S8, and S9 would be protective of human health and the environment and would achieve the RAOs. Alternative S5 achieves the RAOs through excavation of contaminated soil exceeding remediation goals to a depth of 10 feet, treatment of excavated soil as needed, and maintaining deeper residual soils in place under 10 feet of cover material. Alternative S6 achieves RAOs through consolidation and containment (capping) of contaminated soil. The cap would provide a barrier that would break the exposure pathway to human and ecological receptors. Alternatives S7 and S8 achieve RAOs through excavation, treatment as needed, and off-site disposal of contaminated soil exceeding remediation goals to a depth of approximately 20 feet. Alternative S9 would achieve RAOs through in-situ thermal remediation of contaminated soil exceeding remediation goals.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS)

There are no Federal or Commonwealth chemical-specific ARARs for soil. EPA developed risk-based remediation goals and protection of groundwater values for soil at the Site. The active remedial alternatives (Alternatives S5 through S9) would comply with location-specific and action-specific ARARs. Refer to Appendix VII for a complete list of ARARs.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Alternative S1 fails to provide long-term effectiveness and permanence since no remedial action is taken. Alternative S5 includes excavation of contaminated soil exceeding remediation goals to a depth of 10 feet, covering deeper residual soils. Because of the thickness of the cover material and the relatively small area of residual soil contamination, the likelihood of remedy failure (through failure of the 10-foot cover to remain in place) is considered remote, and this alternative is expected to offer a high degree of long-term effectiveness and permanence.

Alternative S6 provides protection by preventing human exposure to contaminated soil through an engineered cover. However, soil contamination is left in place relatively close to the ground surface, and the alternative would require the highest degree of long-term maintenance to ensure protectiveness.

Under Alternatives S7 and S8, long-term effectiveness and permanence would be achieved by excavation and off-site disposal, with either on-site or off-site treatment as necessary. Because these alternatives would address contaminated soils as deep as 20 feet bgs, leaving only relatively small, discrete areas exceeding remediation goals deeper than 20 feet, these alternatives offer some marginal degree of added long-term effectiveness and permanence over Alternate S5; however, by addressing soils within the first 10 feet, Alternative S5 fully addresses the exposure pathways identified in the human health risk assessment, and 10 feet of cover provides ample protection against remedy failure.

Alternative S9 uses an in-situ thermal remediation treatment and would offer a similar level of long-term effectiveness and permanence to Alternatives S7 and S8.

ICs would be implemented for all active alternatives to protect the covers as well as to restrict future land uses and provide awareness of risks from potential exposure to contaminated soil above site-specific levels of concern. Alternative S6 (and, potentially, Alternative S9, as discussed under implementability, below) would rely most heavily on ICs, because the likelihood of human exposure to contamination remaining close to the surface would be higher than for the other alternatives.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternative S1 fails to provide a reduction of toxicity, mobility, or volume through treatment because treatment is not a component of these alternatives.

Alternative S6 does not satisfy the statutory preference for treatment as a principal element of the remedial action, as no active treatment remedy would be performed. Alternative S6 would reduce mobility of the contaminants through capping.

Alternatives S5, S8 and S9 include on-site thermal treatment of contaminated soil and thus all perform comparably under this criterion. Under Alternative S7, RCRA characteristic hazardous waste would be containerized and shipped to the continental United States for treatment (assumed to be incineration) and disposal. While this alternative does include treatment prior to disposal, CERCLA generally endorses on-site treatment as preferable to off-site treatment under this criterion.

SHORT-TERM EFFECTIVENESS

Alternative S1 would not pose short-term risks to the community, and there would be no adverse environmental impacts; however, protection in a reasonable timeframe would not be achieved under this alternative.

Alternatives S5, S6, S7, and S8 would involve surface disturbance of contaminated soil and transport of clean soil for backfill and/or construction of covers. Alternatives S5, S7, and S8 would include transportation of excavated contamination for off-site disposal. Unlike Alternatives S6 and S7, Alternatives S5, S8 and S9 would require installation of power lines and high energy usage, which could pose additional short-term impacts to the community.

Alternative S9 requires surface preparation, including a temporary liner over the thermal treatment area. Contaminated soil would not be excavated or transported under Alternative S9 nor would this alternative require haul trucks to bring in clean fill, reducing short-term impacts to the community. Trucks would still be needed to remove concrete and other surface improvements to make way for the thermal treatment process.

IMPLEMENTABILITY

Alternative S1 is no action. Because no remedial action would be taken, this alternative would be the easiest to implement, both technically and administratively.

Alternative S6 uses standard construction techniques, practices, and materials for cap construction, would not require management of RCRA characteristic hazardous waste, and would not require installation and operation of a treatment system. It would, however, require the most long-term monitoring and maintenance, because it relies solely on the viability of the cover material to provide protectiveness.

Alternative S9 would require a number of thermal heating and vapor extraction wells to be installed. Also, mobilization of thermal remediation equipment would be needed, and the treatment system would have high energy demands, requiring that power be delivered to the Site. However, unlike Alternatives S5 and S8, contaminated soil would not be excavated.

Alternatives S5 and S8 would require mobilization of a thermal remediation treatment system to the island of Puerto Rico. These alternatives would include excavation, stockpiling, and treating hazardous waste, and disposal of treated and non-hazardous contaminated soil at a RCRA Subtitle D landfill.

Alternatives S5 and S8 would have similar implementability issues to Alternative S9 with regard to power needs and the availability of needed portable treatment equipment on the Island. Alternative S9 is considered less implementable because the treatment level required would be remediation goals for the Site, and there is some uncertainty as to whether *in-situ* treatment can achieve the remediation goal for dioxin (as opposed to treatment to disposal standards in Alternatives S5 and S8). Alternative S9 would be able to substantially reduce the residual concentrations of pesticides and dioxin, but it may require some level of capping, similar to Alternative S6, if the remediation goals cannot be met.

Alternative S7 would include excavation and disposal of non-hazardous contaminated soil at a

Subtitle D landfill. Contaminated soil considered RCRA characteristic hazardous waste would be containerized and shipped to hazardous waste to the Continental United States for treatment and disposal. Shipping would require extensive planning to assure safe and effective transportation to the mainland. Transport may be delayed by the availability of containers for loading of hazardous waste.

COST

Present value costs for all alternatives were evaluated over a 30-year period.

Alternative	**Capital Cost**	**Present-Worth Operation and Maintenance Cost**	**Total Present-Worth Cost**
S1	$0	$0	$0
S5	$ 4,377,000	$6,000	$4,450,000
S6	$1,762,000	$6,000	$1,840,000
S7	$28,035,000	$0	$28,040,000
S8	$5,664,000	$0	$5,660,000
S9	$6,383,000	$0	$6,380,000

The costs of Alternative S7 are driven by the costs of off-site shipment of RCRA characteristic waste to the mainland. Note that Alternative S9 does not include capping costs, nor is the cost of remedial design included in any of the alternatives.

STATE/SUPPORT AGENCY ACCEPTANCE

The EQB concurs with the selected remedy (Appendix VIII).

COMMUNITY ACCEPTANCE

All the alternatives were made available for the community to review and comment. The selected remedy was proposed as the preferred alternative to the community in the Proposed Plan. A public comment period (August12, 2015 to September 11, 2015) was established to allow the community to review and comment on all the alternatives, including the preferred alternative. In addition, a public meeting was held on August 18, 2015. EPA’s response to public comments received during the comment period is presented in the Responsiveness Summary of this ROD (see Appendix X).

SELECTED REMEDY

DESCRIPTION OF THE SELECTED REMEDY

EPA’s selected remedy is Alternative S5. The selected remedy includes the following components:

- Excavation of contaminated soil to a depth of 10 feet bgs;
- On-site treatment of those soils, followed by proper off-site disposal;
- Backfilling with clean fill to cover deeper, residually contaminated soils;
- Institutional controls; and

- Monitoring.

The soil with hazardous characteristics will be treated using *ex-situ* thermal desorption treatment and properly disposed of at a Resource Conservation and Recovery Act Subtitle D landfill. *Ex-situ* thermal desorption uses heat and vacuum extraction to mobilize and remove contaminants from soil. Because deeper soils (below 10 feet) will remain present with contaminant levels that would not allow for unrestricted use (i.e., residential use), institutional controls will be implemented to help control and limit exposure to hazardous substances at the Site. The types of institutional controls which will be employed for the soil at the Site are: 1) proprietary controls (e.g., deed restriction) to prevent soil excavation, well installation or disturbance of the soil or other remedial measures, and 2) informational devices such as advisories published in newspapers, periodic letters sent to local government authorities informing them of the need to prevent soil excavation and changes in area zoning.

The estimated present-worth cost of the selected remedy is $4,450,000.

Reviews of the remedy will be conducted every five years to assure the long-term protectiveness of the remedy.

BASIS FOR REMEDY PREFERENCE

The selected remedy is believed to provide the best balance of trade-offs based on the information available to EPA at this time. EPA and EQB expect the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b)(1); 121(d) and 121(d)(4): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element. EPA will assess the modifying criteria of community acceptance in the ROD following the close of the public comment period.

The environmental benefits of the selected remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This would include consideration of green remediation technologies and practices.

STATUTORY DETERMINATIONS

Section 121(b)(1) of CERCLA mandates that a remedial action must be protective to human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants, or contaminants at a site. Section 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to Section 121(d)(4). For the reasons discussed below, EPA has determined that the selected remedy meets the requirements of Section 121 of CERCLA.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment because it achieves the

RAOs through excavation of contaminated soil exceeding remediation goals to a depth of 10 feet, treatment of excavated soil, as needed, and maintaining deep, residually contaminated soils in place under 10 feet of cover material.

COMPLIANCE WITH ARARS

There are no Federal or Commonwealth chemical-specific ARARs for soil. EPA developed risk-based remediation goals and protection of groundwater values for soil at the Site. The selected remedy for soil at the Site will comply with location-specific and action-specific ARARs.

COST EFFECTIVENESS

A cost-effective remedy is one which has costs that are proportional to its overall effectiveness (NCP Section 300.430(f)(1)(ii)(D)). Overall, effectiveness is based on the evaluations of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume though treatment; and short-term effectiveness). Overall effectiveness was then compared to those alternatives' costs to determine cost-effectiveness.

Each of the alternatives underwent a detailed cost analysis. In that analysis, capital and operation and maintenance (O&M) costs were estimated and used to develop present-worth costs. In the present-worth cost analysis, O&M costs were calculated for the estimated life of each alternative. The total estimated present-worth cost for implementing the selected remedy is approximately $4.5 million. Based on the comparison of overall effectiveness to cost, the selected remedy meets the statutory requirement that Superfund remedies be cost-effective in that it is the least-costly alternative that achieves remediation goals and also satisfies CERCLA's preference for treatment as a principal element. While the total present worth of Alternative S6 is lower, because Alternative S6 leaves soil contamination in place relatively close to the ground surface, and this alternative would require the highest degree of long-term maintenance to ensure protectiveness.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT (OR RESOURCE RECOVERY) TECHNOLOGIES TO MAXIMUM EXTENT PRACTICABLE

The selected remedy provides the best balance of trade-offs among the alternatives with respect to the balancing criteria set forth in the NCP Section 300.430(f)(1)(i)(B), because they each represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. The combination of soil excavation at the soil source areas and *ex-situ thermal treatment* will permanently reduce the mass of contaminants in soil thereby reducing the toxicity, mobility, and volume of contamination.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

By using a combination of technologies, to the maximum extent practicable, the statutory preference for remedies that employ treatment as a principal element is satisfied through the use *ex-situ* thermal treatment to address contaminated soils at the Site.

FIVE YEAR REVIEW REQUIREMENTS

Because the remedy will result in hazardous substances, pollutants, or contaminants remaining at the Site above levels that would otherwise allow for unlimited use and unrestricted exposure, EPA must conduct a review at least every five years after initiation of the remedial action to ensure that the remedy is protective of human health and the environment.

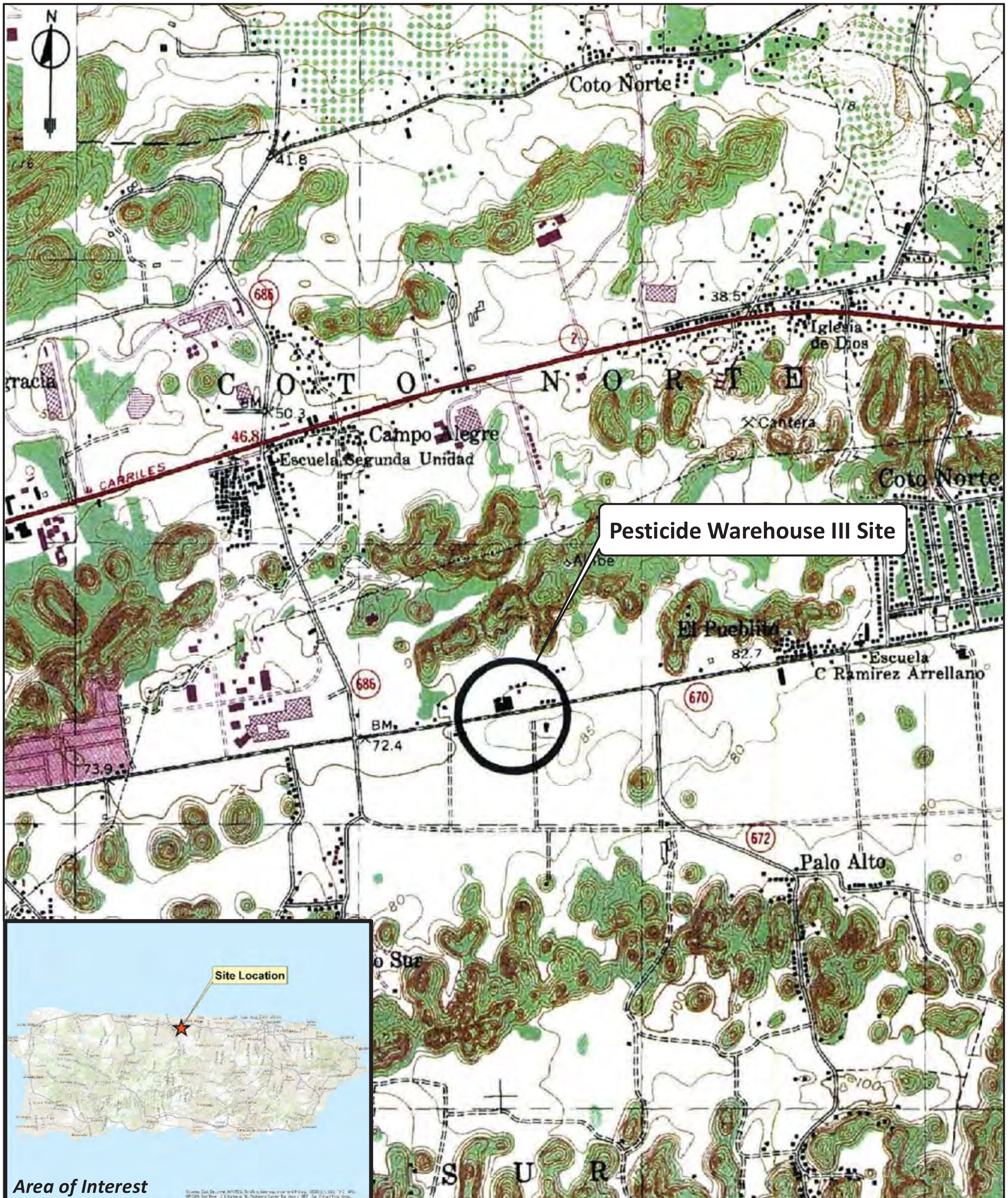
DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Proposed Plan for the Site was released for public comment on August 12, 2015, and the public comment period ran from that date through September 11, 2015. The Proposed Plan identified the selected remedy as the preferred alternative for the Site.

All written and verbal comments submitted during the public comment period were reviewed by EPA. Upon review of these comments, EPA has determined that no significant changes to the preferred alternative, as it was originally identified in the Proposed Plan, are necessary.

APPENDIX I

FIGURES



Source: Modified from Figure 1 of ERTEC Remedial Investigation Report (2013).

Figure 1
Site Location Map
Pesticide Warehouse III, OU1(Soil)
Manati, Puerto Rico

CDM Smith

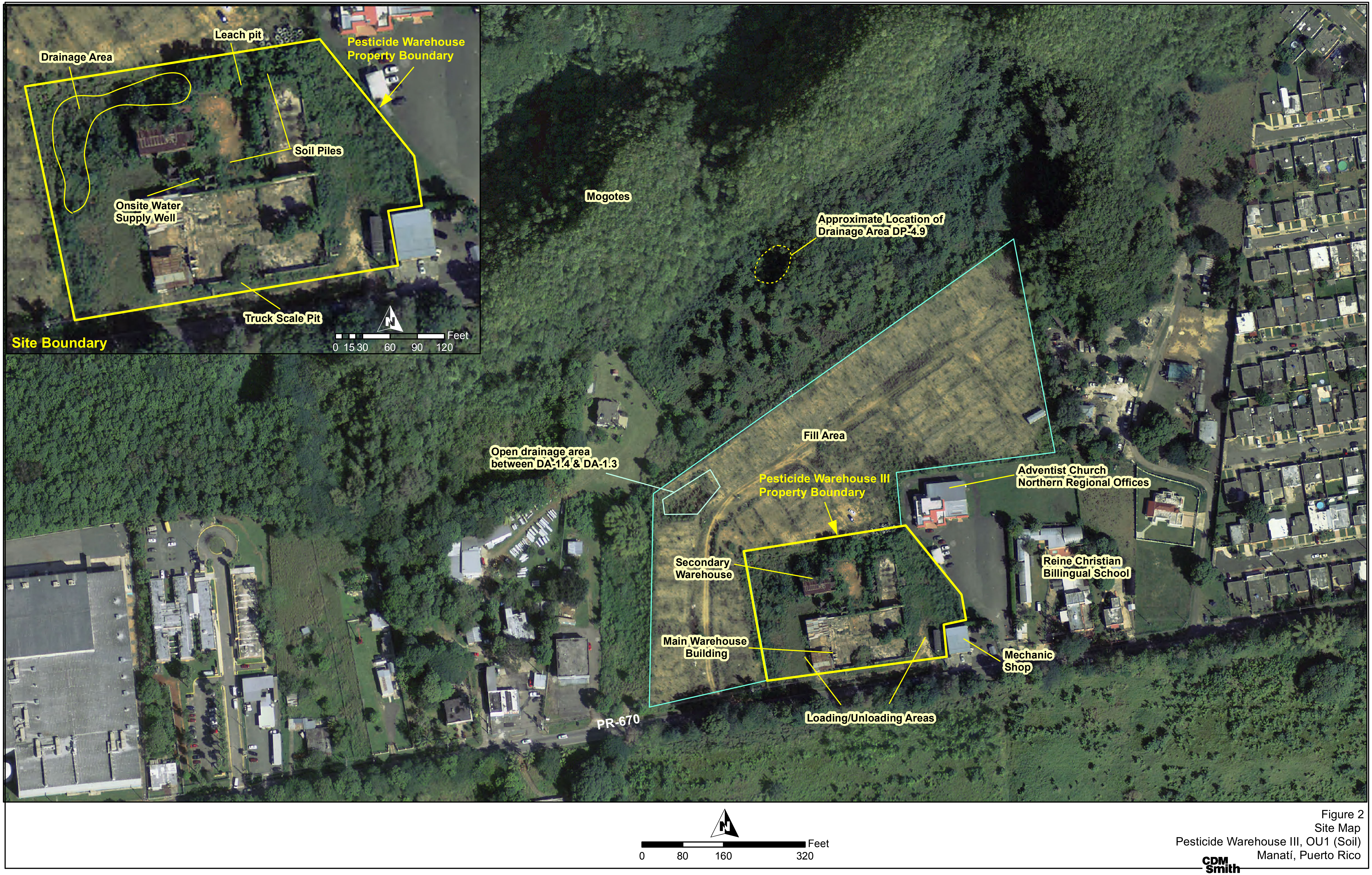


Figure 2
Site Map
Pesticide Warehouse III, OU1 (Soil)
Manatí, Puerto Rico
CDM Smith

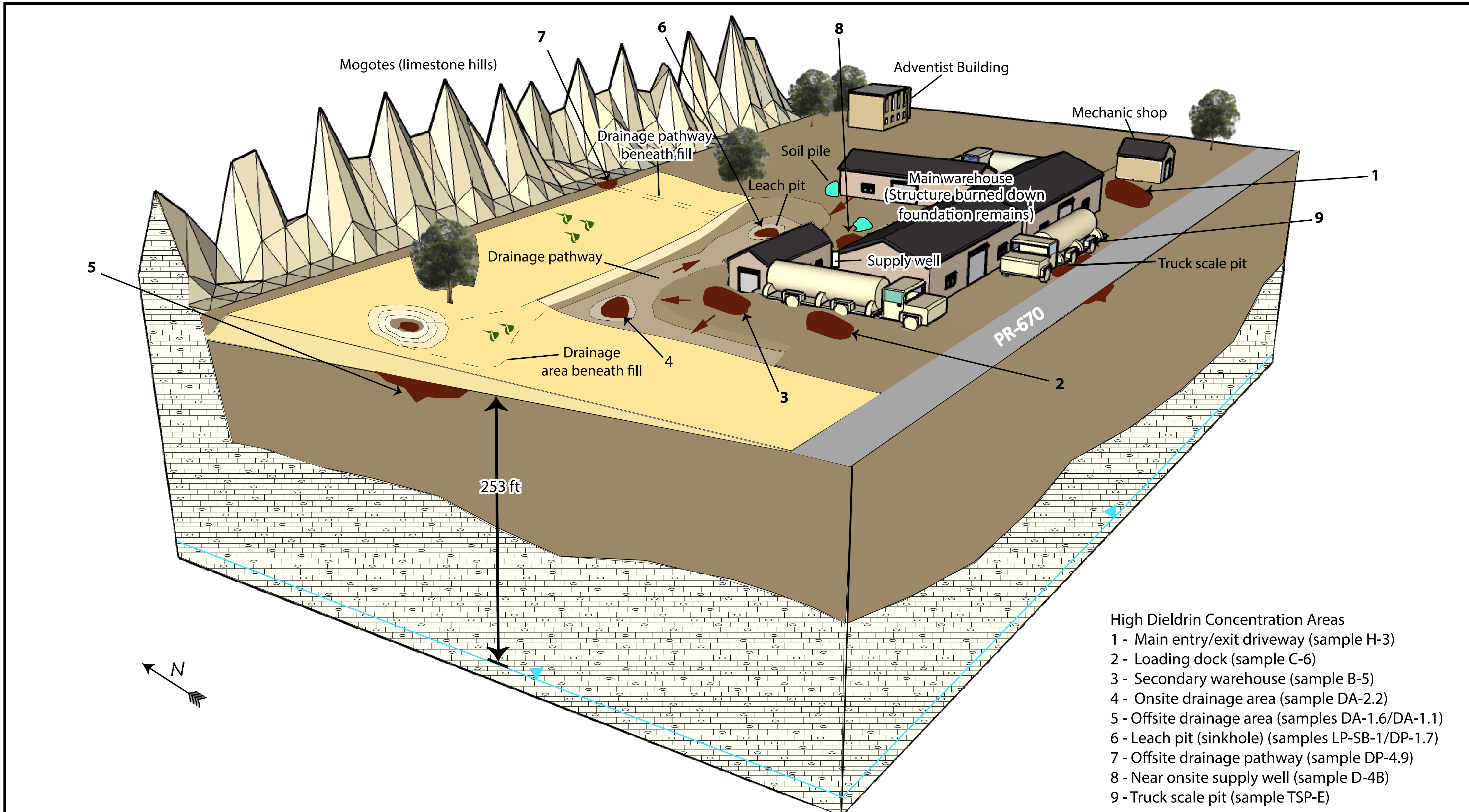
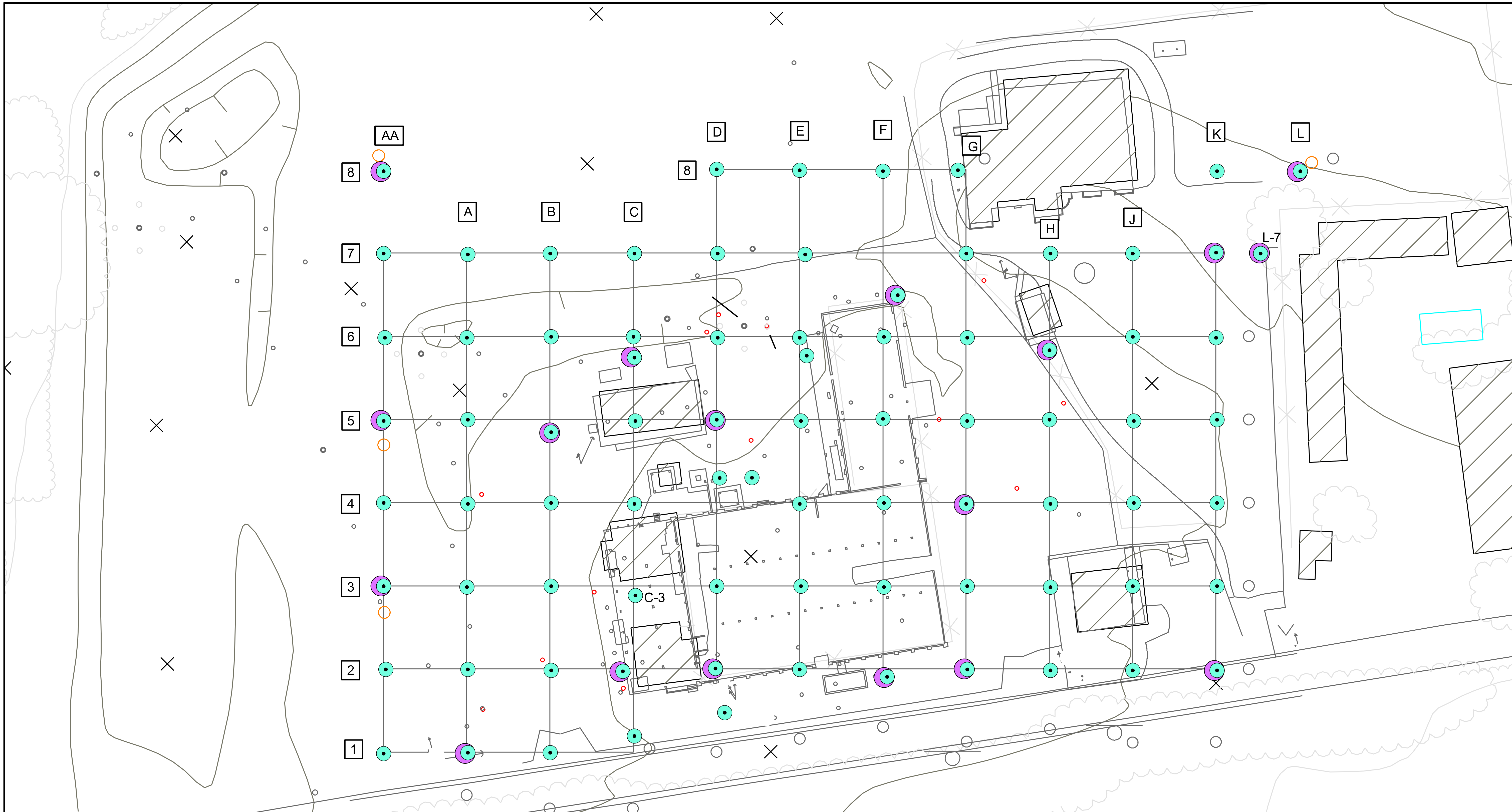


Figure 3
Conceptual Site Model
Pesticide Warehouse III, OU1 (Soil)
Manatí, Puerto Rico

CDM Smith



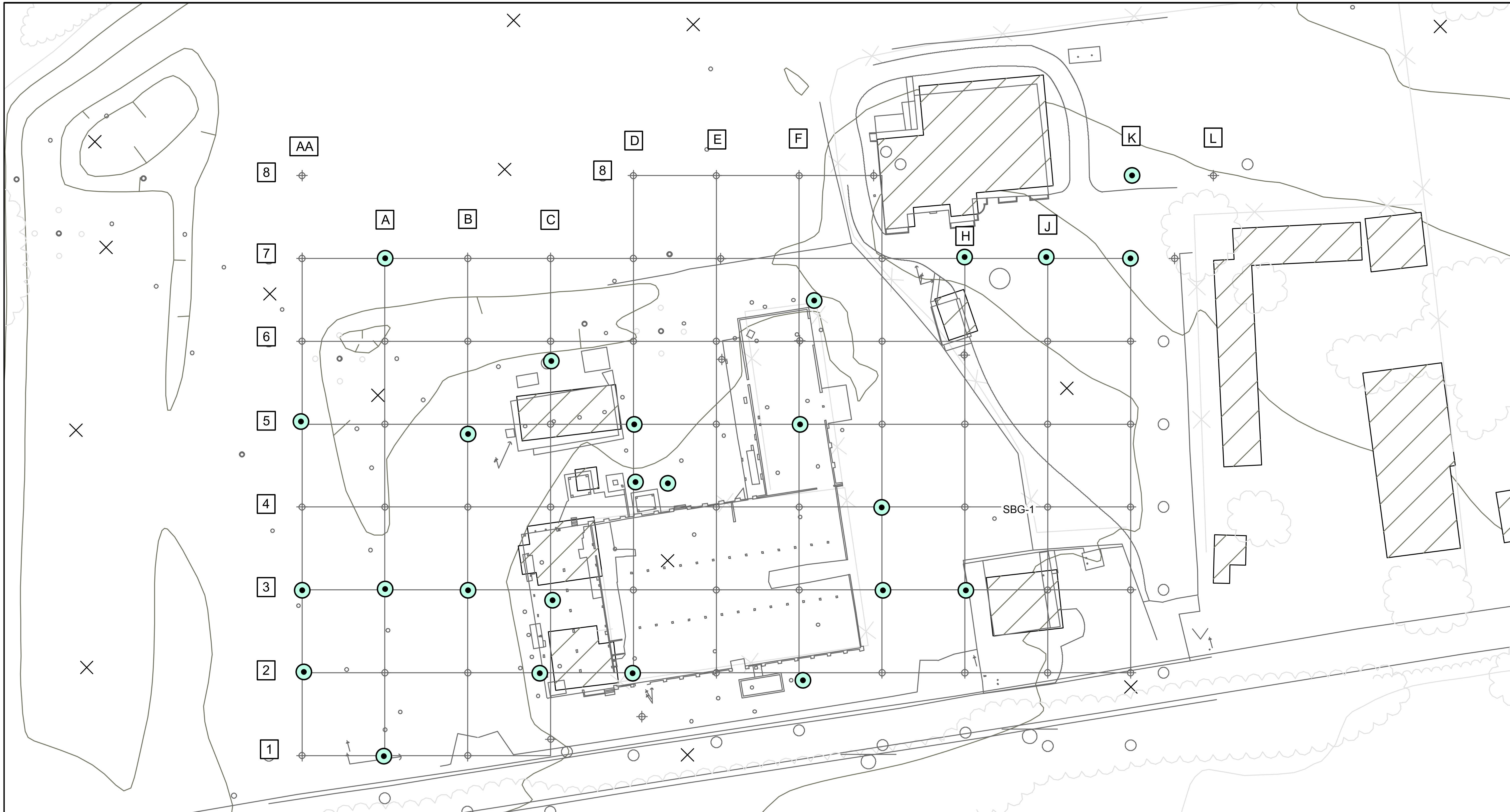
Legend

- Soil screening sampling location
- Confirmatory soil sampling location

0 *Approximate Scale* 100 feet

Figure 4
ISSE Screening and Confirmatory Soil Sampling Location Map
Pesticide Warehouse III, OU1-Soils
Manatí, Puerto Rico

CDM Smith



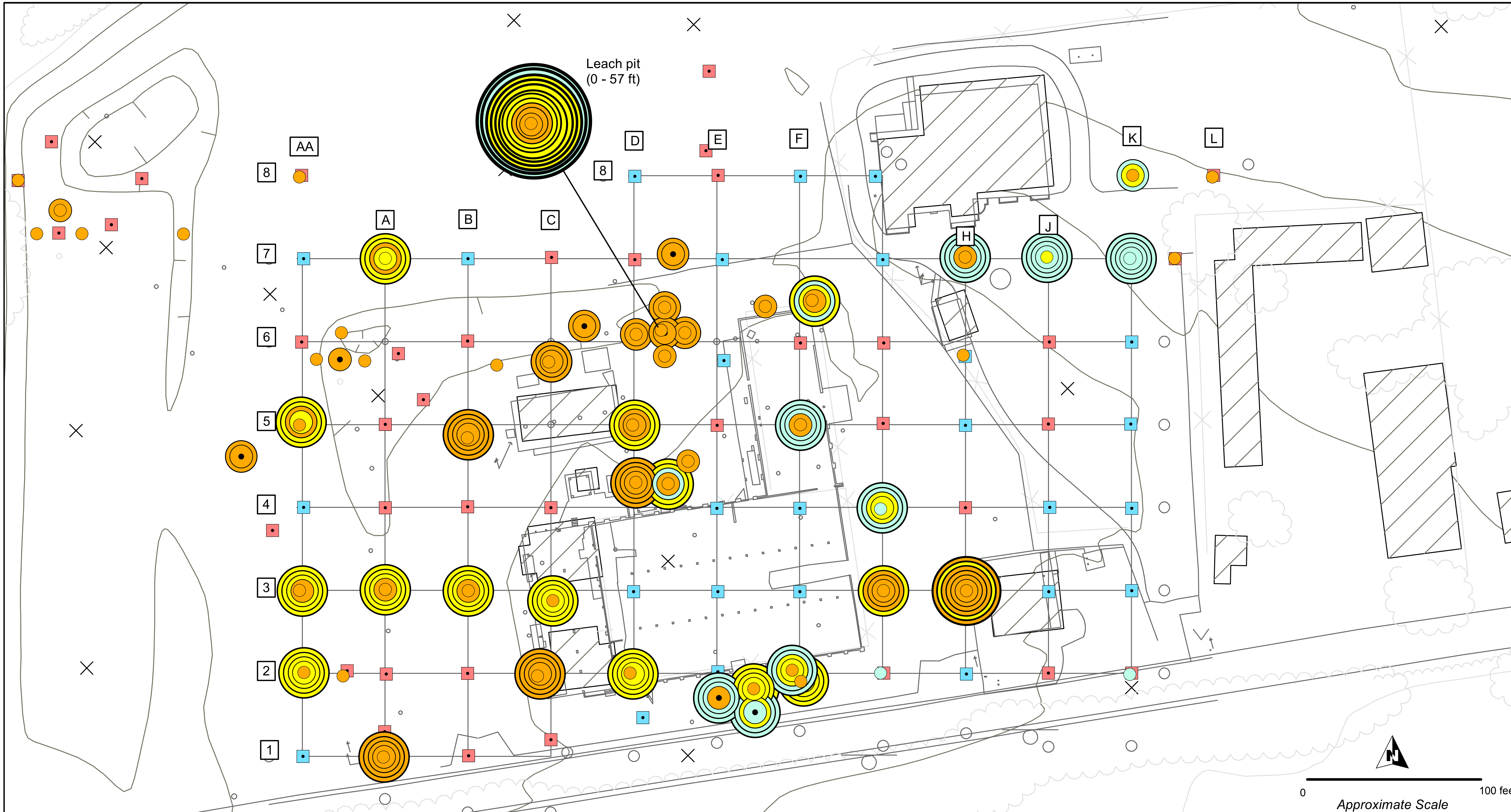
Legend

Definitive Level Soil Boring Location

0
100 feet
Approximate Scale

Figure 5
DLSE Definitive Level Sample Location Map
Pesticide Warehouse III, OU1-Soils
Manatí, Puerto Rico

CDM Smith



Legend

- Sampling location from 0-2 ft
- Sampling location from 2-4 ft
- Sampling location from 6-8 ft
- Sampling location from 10-12 ft
- Sampling location from 14-16 ft
- Sampling location from 18-20 ft
- Sampling location from 20-22 ft
- Dieldrin exceeded screening criteria
- Dieldrin detected below screening criteria
- Dieldrin not detected
- Screening sample with detections below 20 ppb
- Screening sample with detections above 20 ppb

Figure 6
Grid and Western Drainage Results
Pesticide Warehouse III, OU1-Soils
Manatí, Puerto Rico

CDM Smith

APPENDIX II

ADMINISTRATIVE RECORD INDEX

ADMINISTRATIVE RECORD INDEX OF DOCUMENTS

FINAL
08/13/2015 **REGION ID: 02**

Site Name: PESTICIDE WAREHOUSE III
CERCLIS ID: PRD987367299
OUID: 01
SSID: 02RP
Action:

DocID:	Doc Date:	Title:	Image Count:	Doc Type:	Addressee Name:	Addressee Organization:	Author Name:	Author Organization:
350414	08/13/2015	ADMINISTRATIVE RECORD INDEX FOR OU1 FOR THE PESTICISE WAREHOUSE III SITE	1	[AR INDEX]	[]	[]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]
319521	05/27/2004	FINAL WORK PLAN FOR OU1, VOLUME I FOR THE PESTICIDE WAREHOUSE III SITE	123	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORP]
319833	06/20/2014	FINAL COMMUNITY ENGAGEMENT PLAN FOR OU1 FOR THE PESTICIDE WAREHOUSE III SITE	47	[PLAN]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORPORATION]
319835	07/23/2014	FINAL SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT FOR OU1 FOR THE PESTICIDE WAREHOUSE III SITE	49	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORPORATION]
319837	09/19/2014	FINAL HUMAN HEALTH RISK ASSESSMENT FOR OU1 FOR THE PESTICIDE WAREHOUSE III SITE	390	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM FEDERAL PROGRAMS CORPORATION]
319517	06/01/2015	FINAL REMEDIAL INVESTIGATION REPORT FOR OU1 FOR THE PESTICIDE WAREHOUSE III SITE	7694	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM SMITH]
319519	07/10/2015	FINAL FEASIBILITY STUDY OU1 FOR THE PESTICIDE WAREHOUSE III SITE	393	[REPORT]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]	[,]	[CDM SMITH]
350436	08/12/2015	PROPOSED PLAN FOR OU1 FOR THE PESTICIDE WAREHOUSE III SITE	20	[PLAN]	[]	[]	[,]	[US ENVIRONMENTAL PROTECTION AGENCY]

350414

APPENDIX III

PUBLIC NOTICES

AVISO PÚBLICO

LA AGENCIA FEDERAL DE PROTECCIÓN AMBIENTAL ANUNCIA EL PLAN PROPUESTO Y PERIODO DE COMENTARIOS PARA EL LUGAR DE SUPERFONDO ALMACÉN DE PESTICIDAS III DE MANATÍ MANATÍ, PUERTO RICO

La Agencia Federal de Protección Ambiental (EPA por sus siglas en inglés) en colaboración con la Junta de Calidad Ambiental, anuncia el comienzo de un período de treinta (30) días de comentario público sobre el Plan Propuesto para la remediación del lugar conocido como Almacén de Pesticidas III, localizado en el sector Palo Alto en el municipio de Manatí, Puerto Rico. El Plan Propuesto describe las alternativas recomendadas y las razones para estas recomendaciones. Antes de seleccionar un remedio final, la EPA va a considerar los comentarios escritos y verbales recibidos durante este periodo de comentario público. Todos los comentarios (verbales y/o escritos) deberán ser recibidos en o antes del 11 de Septiembre de 2015. La EPA proveerá un resumen de todos los comentarios y sus respuestas en el Récord de Decisión para este lugar.

La EPA llevará a cabo una reunión pública el martes 18 de agosto del 2015, de 6:00 pm a 9:00 pm en el salón de conferencias de la Alcaldía de Manatí, Puerto Rico. El propósito de esta reunión es informarle a la comunidad sobre los hallazgos, conclusiones y recomendaciones de la investigación remedial realizada en el lugar. Además, se discutirá la alternativa de remediación recomendada. Durante esta reunión pública, la EPA contestará preguntas o comentarios que los participantes tengan con relación a la investigación realizada y sobre la alternativa de limpieza recomendada.

Copias del Plan Propuesto y otros documentos relacionados al lugar están disponibles en los siguientes repositorios de información:

Biblioteca Municipal
Paseo de las Atenas y Calle Mackinley
Manatí, Puerto Rico 00739
(787) 884-5494
Horario: Lunes – Viernes 7:00am a 11:00 pm

Junta de Calidad Ambiental de Puerto Rico
Programa de Respuestas de Emergencias y Superfondo
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787)767-8181 ext 3207
Horario: Lunes – Viernes 9:00am a 3:00 pm
Por cita

Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104 (787) 977-5869
Horario: Lunes.- Viernes, 9:00 a.m. a 4:30 p.m.
Por cita

U.S. Environmental Protection Agency, Region 2
290 Broadway, 18th floor
New York, New York 10007-1866
(212) 637-4308
Horario: Lunes.-Viernes, 9:00 a.m. a 3:30 p.m.
Por cita

Para más información, favor llamar al señor Luis E. Santos al (787) 977-5865. Comentarios escritos al Plan Propuesto deben ser enviados a:

Luis E. Santos
Gerente de Proyectos
Agencia Federal de Protección Ambiental, Región 2
División de Protección Ambiental del Caribe
City View Plaza II- Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Fax: (787) 289-7104
Email: santos.luis@epa.gov

NOTA ACLARATORIA

La Agencia Federal de Protección Ambiental
Para el Lugar de Superfondo Almacén de Pesticidas III de Manatí
Manatí, Puerto Rico
en su anuncio publicado el miércoles 12 de agosto de 2015 en el periódico Primera Hora, página 51 dice reunión pública será en el salón de conferencias de la Casa Alcaldía.

El lugar correcto de esta reunión publica será en el salón de conferencias de la Biblioteca Municipal de Manatí el martes 18 de agosto de 2015 de 6:00 p.m. a 9:00 p.m.

Lamentamos los inconvenientes esto pueda ocasionar.

APPENDIX IV

PROPOSED PLAN AND FACT SHEET

Pesticide Warehouse III, Operable Unit 1: Soils Superfund Site

Manati, Puerto Rico
August 2015

EPA Region 2

EPA ANNOUNCES PROPOSED CLEANUP PLAN

This Proposed Plan describes the remedial alternatives developed for the Pesticide Warehouse III Superfund Site, Operable Unit 1 (OU-1): Soils, located in Manatí, Puerto Rico, and identifies the preferred remedy for the Site with the rationale for this preference. This document was developed by the U.S. Environmental Protection Agency (EPA), the lead agency for Site activities, in consultation with the Puerto Rico Environmental Quality Board (PREQB), the support agency. EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. § 9617(a) (CERCLA, commonly known as Superfund) and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

The nature and extent of the contamination at the Site and the remedial alternatives summarized in this document are described in detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports. EPA is addressing the Site in two operable units (OUs). OU-1 addresses the contamination on the soil media. OU-2 addresses the site-wide groundwater, and will be addressed in a separate RI and FS.

EPA's preferred remedy for OU-1 is Alternative S5: excavation of contaminated soil as deep as 10 feet below ground surface; on-site treatment, as needed, followed by off-site disposal; covering of deeper residual soils; institutional controls; and monitoring. The preferred remedy would treat soil with hazardous characterstics using thermal treatment, using a temporary treatment

MARK YOUR CALENDAR

PUBLIC MEETING
August 18, 2015 at 6:00 pm
Manati Municipal Library

PUBLIC COMMENT PERIOD
August 12, 2015 – September 11, 2015

INFORMATION REPOSITORY
The Administrative Record file, which contains copies of the Proposed Plan and supporting documentation, is available at the following locations:

Manati Municipal Library
Hours: Monday – Friday 9:00 am to 3:00 pm

U.S. Environmental Protection Agency
City View Plaza II- Suite 7000
#48 PR-165 Km. 1.2
Guaynabo, PR 00968-8069
(787) 977-5865
Hours: Monday – Friday 9:00 am to 5:00 pm
By appointment.

Puerto Rico Environmental Quality Board
Emergency Response and Superfund Program
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787) 767-8181 ext 3207
Hours: Monday – Friday 9:00 am to 3:00 pm
By appointment.

U.S. EPA Records Center, Region 2
290 Broadway, 18th Floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday – 9:00 am to 5:00 pm
By appointment.

unit brought to the Site. Because deeper soils (below 10 feet) would remain covered at levels that would not allow for unrestricted (i.e., residential) use, institutional controls would restrict the future use of the soil at the Site to nonresidental uses.

COMMUNITY ROLE IN SELECTION PROCESS

EPA relies on public input to ensure that the concerns of the community are considered in selecting an effective remedy for each Superfund site. To this end, this Proposed Plan has been made available to the public for a 30-day public comment period which begins with the issuance of this Proposed Plan and concludes on September 11, 2015.

EPA is providing information regarding the investigation and cleanup of the Site to the public through a public meeting and the public repositories, which contain the administrative record file. EPA encourages the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

The public meeting held during the comment period is to provide information regarding the Site investigations, the alternatives considered and the preferred remedy, as well as to receive public comments. Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

Written comments on this Proposed Plan should be addressed to:

Luis E. Santos
Remedial Project Manager
U.S. Environmental Protection Agency
City View Plaza II - Suite 7000
48 RD, 165 Km. 1.2
Guaynabo, PR 00968-8069
Telephone: (787) 977-5869
E-mail: santos.luis@epa.gov

SCOPE AND ROLE OF ACTION

Site remedial activities are segregated into different operable units, so that remediation of different environmental media or areas of the Site can proceed separately in an expeditious manner. EPA has designated two operable units for this Site.

- OU-1, which is the focus of this Proposed Plan, addresses soil contamination in the industrial and conservation areas.
- OU-2, groundwater will be evaluated in a separate study.

EPA is completing studies of groundwater as a separate RI/FS, and will issue a separate Proposed Plan as a second and final remedy for the Site.

SITE BACKGROUND

Site Description

The Site is an inactive facility located at State Road PR 670, kilometer (km) 3.7, in a rural/residential area of Manatí, Puerto Rico. The Site covers approximately two acres and includes the concrete remains of an L-shaped warehouse and a smaller warehouse. The Site is bounded to the west and north by open fields, and to the east by an Adventist Church Property and a mechanic shop. Part of the Site, a warehouse used to store pesticides, was destroyed by a fire in 2003. A north-south drainage ditch, approximately five feet deep and 275 feet long, collects storm water from the western portion of the Site and empties into a natural leach pit or sinkhole.

The Adventist Church Property is approximately 1.7 acres, and is predominantly paved with a parking lot. An approximately half acre open field is located on the northeastern portion of the property. The Adventist Church Property consists of: administrative offices, bookstore, health food store, and cafeteria. East of the Adventist Church Property is the Reine Christian Bilingual School.

Site History

The Puerto Rico Land Authority (PRLA) owned and operated the Site from 1954 to 1996. Site operations included preparing pesticides/insecticides, herbicides, and fertilizers for soil preparation and planting of various crops. Chemicals were stored in bags, boxes, and drums on the concrete slab floor of the L-shaped warehouse building. PRLA prepared the chemicals by mixing the concentrated chemical products (typically in solid or aqueous form) with water from an on-Site supply well. Mixing occurred in tanker trucks at loading docks over bare soil. Excess chemicals and spills occurred during the mixing process, contaminating surrounding soils. Chemical spills also flowed from the mixing area across the ground to the drainage ditch around the periphery of the Site, with discharge to the leach pit. Empty drums and chemical bags were stacked behind the warehouse on bare soil.

The Site was operated by Agro-Campos, Inc. (Agro-Campos), from 1996 to 2002. In 2002, Agro-Campos vacated the Site. Soon after, the warehouse was gutted by fire, leaving only its concrete foundation.

In the early 2000s, a developer performed earth moving activities in anticipation of the development of a housing project on the properties immediately to the north and west of the facility, altering the landscape and covering former drainage ditches with fill. By 2006, the project had been abandoned, and the residential development never took place.

Geology

The Site is underlain by unconsolidated deposits consisting of sand, clay, and sandy clay that overlie the Aymamon Limestone Formation. The thickness of the surface deposit is unknown, but is estimated to be as much as 100 feet thick.

Hydrogeology

The measured depth of the water table during the RI was 253 feet below ground surface (bgs). The on-site upper aquifer is almost entirely found in the Aguada Formation. Approximately 30 to 50 feet of the overlying basal Aymamon Formation may be saturated at the Site in addition to the Aguada Formation.

Site surface soils of unconsolidated, fine-textured, clayey-sands may retard infiltration of surface water runoff into the aquifer, creating a semi-confining layer. Review of potentiometric surface data collected in the vicinity of the Site suggests that groundwater flow is toward the north-northwest.

Recharge to the aquifer may be limited due to the thickness of clay-rich soils that overlie the limestone. Overburden thickness and elevation of the soil/bedrock interface are highly irregular indicating that infiltration rates across the Site are likely variable.

Land Use

The Site is located in a sparsely-populated rural area along PR-670 in the Coto Norte Ward, 2.5 miles east of the municipality of Manatí. The Coto Norte Ward contains approximately 11,250 inhabitants as reported in the 2010 U.S. Census.

Land use in the region has primarily been agricultural, specifically pineapple cropping, for the past 100 years. Commercial and recreational uses are also noted. Specifically, offices, a bookstore, and health food store are present at the Adventist Church Property and a mechanic shop is located adjacent to the Site. A summer camp has been held at the Reine Bilingual School in the past. The zoned and previous land use of the Site is agricultural; however, residential developments are located east of the Site and industrial uses are located west of the Site.

Ecology

Vegetated areas of the Site and those which provide marginal/suitable habitats extend in a Northerly direction from the Site, toward and into the *mogotes*.

Information regarding threatened and endangered species and ecologically sensitive environments that may exist at or in the vicinity of the Site was obtained from different agencies.

The U.S. Fish and Wildlife Service reported that the Site is located within the habitat of the endangered Puerto Rican Boa (*Epicrates inornatus*). In addition, the endangered and plants Palo de Rosa (*Ottoschulzia rhodoxylon*) may also occur in the area.

The Puerto Rico Department of Natural and Environment Resources (PRDNER) reported that a review of their records for the Site and surrounding area indicated no known occurrences of Puerto Rico-listed rare, threatened and/or endangered species. However, *mogotes* located on Site and in the surrounding areas are part of PRDNER's Conservation Priority Karstic Areas of Puerto Rico, and are considered Special Planning Areas of the Karstic Zone of Puerto Rico.

EARLY SITE INVESTIGATIONS

PREQB Preliminary Assessment (1989): The PREQB observed and documented spills of concentrated pesticides and fertilizers directly onto site soils. Stained surface soils and stressed or absent vegetation were observed, suggesting widespread contamination. Strong pesticide odors were noted inside and outside the warehouse. The facility manager explained that workers suffered from "intoxication," presumably due to releases of pesticides.

Preliminary EPA Site Investigation (1996): EPA conducted a Site Investigation (SI) in 1996. During the SI, spilled materials were noted throughout the warehouse and stained surface soils were observed throughout the Site. Unlined surface drainage areas sloped toward the west where they intercepted a drainage ditch that extended along the western and northern boundaries, ending at the leach pit.

Surface soil sampling detected 16 different pesticides, including aldrin, dieldrin and toxaphene.

EPA Site Reconnaissance and Field Screening Event (2001); EPA conducted soil field screening to assess soil conditions in 2001. Pesticide mixing activities had continued in the loading platform area, and spillage was noted throughout the property. Stressed vegetation was observed along the length of the runoff pathway from the loading platform to the on-site drainage ditch.

The Site was added in the National Priority List (NPL) on April 30, 2003.

NATURE AND EXTENT OF CONTAMINATION

The PRLA and Agro□Campos, two potentially responsible parties (PRPs), signed Administrative Orders on Consent with EPA in June 2005. Under the Administrative Orders, the PRPs agreed to conduct RI/FS for the Site. The majority of the field work was performed by the PRPs, under EPA oversight. However, because of financial difficulties, the PRPs were not able to complete the RI/FS work. Therefore, EPA assumed responsibility for completing the RI/FS reports through its environmental consultant, CDM Smith. EPA will also assume responsibility for completing the OU-2 RI/FS.

The nature and extent of contamination in Site media was assessed during the RI by collecting and analyzing soil samples and then comparing analytical results to federal, commonwealth, and site-specific screening criteria. Screening criteria are values used in the RI to conservatively screen potential areas of contamination.

As part of the RI, 115 soil samples were collected and analyzed for 21 pesticides and dioxins/furans. The RI also analyzed for other constituents, including metals, volatile organic compounds, and semivolatile organic compounds (SVOCs). All detected contaminants were considered in the risk assessment process; however, several groups of contaminants were not considered Site-related. Metals were detected in all soil samples, but at levels that were consistent with levels found in surrounding soils.

Even arsenic, a metal that was once commonly used in pesticides, was found at levels commonly found in native soils. Polynuclear aromatic hydrocarbons (PAHs) were found to be elevated in one sample location. Because PAHs are commonly found in asphalt, it was concluded in the RI that asphalt was the likely source of this one elevated sample.

The term dioxin commonly refers to the compound in this group considered most toxic, tetrachlorodibenzodioxin (TCDD). Among the many different forms of dioxin and related furan compounds, toxicity can be addressed by considering their toxicity relative to TCDD. Because dioxins/furans refers to such a broad class of compounds that vary widely in toxicity, the concept of toxicity equivalence (TEQ) has been developed to facilitate risk assessment. Please refer to the OU-1 Feasibility Study report for further information about dioxins.

Nine pesticides, or their transformation products, and dioxins/furans were detected in one or more soil samples. Dioxins/furans were commonly detected in soil in all 115 samples. Dieldrin was the most commonly detected and wide-spread pesticide; it was detected in almost all the samples collected. The maximum depth for a dieldrin detection was 40-42 feet bgs in the leach pit area. Toxaphene, a highly toxic pesticide, was detected in all 115 samples; the maximum depth for a toxaphene detection was 50- 52 feet bgs in the leach pit area. Thus, dioxins/furans along with the dieldrin, toxaphene and a third pesticide, aldrin, were tracked as the primary contaminants of potential concern (COPCs). A range of other pesticides were also detected less frequently in soil samples, and these pesticides were carried forward in the risk assessment, as discussed below.

The primary areas of contaminated soils were found on the former facility are associated with former pesticide handling and mixing operations, and the leach pit drainage location on the northern portion of the facility. Pesticides were found most frequently and at the highest concentrations in surface soils (within the first two feet of the ground surface) and then in less concentrations with depth. For example, dieldrin was detectable in a leach pit sample as deep as 47 feet below ground surface (bgs), but the deepest detection above a screening criterion was 17 feet bgs.

Drainage ditches carried runoff from the facility to areas north and west of the facility, onto the land where the residential development was begun and subsequently abandoned. These drainage ditch soils that contained pesticides were buried under a layer of fill material as thick as 14 feet by the land developer. Subsequent testing of the imported fill material did not identify elevated levels of contamination (Site-related or otherwise), and there is no evidence that the imported fill was mixed with the underlying drainage ditch soils.

The only structures remaining at the facility are concrete building foundations. Concrete chip sampling revealed elevated levels of pesticides were commonly found in the building foundations.

Dioxin/furan samples were converted to dioxin TEQs for comparison against the screening criterion for TCDD. Dioxins were detected in nearly every sample and dioxin TEQs were exceeded in 11 samples. The 10 of the 11 elevated samples were in surface samples from areas of heavy pesticide use when the facility was active. Dioxins/furans are commonly found in association with pesticides. The 2003 fire at the main warehouse could be a secondary source of this contaminant. The dioxin exceedances are generally located in areas with exceedances of dieldrin, which is the most widely distributed contaminant.

Groundwater: While the groundwater will later be addressed in the OU-2 RI/FS, in order to select a remedy for soils, EPA assessed the potential that soil contamination could be acting as an ongoing source of groundwater contamination. In 1992, the United States Geological Survey first conducted a groundwater quality survey in the area within the Manati, Puerto Rico Quadrangle. This investigation consisted of the

WHAT IS RISK AND HOW IS IT CALCULATED?

Human Health Risk Assessment:
A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at the site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk;" or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 10^{-4} to 10^{-6}, corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk. For non-cancer health effects, a "hazard index" (HI) is calculated. The key concept for a non-cancer HI is that a ■threshold• (measured as an HI of less than or equal to 1) exists below which non-cancer health hazards are not expected to occur. The goal of protection is 10^{-6} for cancer risk and an HI of 1 for a non-cancer health hazard. Chemicals that exceed a 10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at the site and are referred to as Chemicals of Concern or COCs in the final remedial decision or Record of Decision.

collection of groundwater samples from wells located within area, including the well located on the Pesticide Warehouse III Site. Analytical results from this sampling effort indicated the presence of toxaphene in the well at a concentration of 6 micrograms per liter (ug/L). Toxaphene was not detected above minimum reporting level (MRLs) in wells located immediately upgradient of the on-site well. Dieldrin was also detected in the on-site well at a concentration of 0.24 ug/L. The dieldrin concentration was significantly above the concentrations detected in wells located immediately upgradient of the site.

While groundwater samples collected from the on-site water supply well (now abandoned) contained detectable levels of dieldrin and dioxins/furans, the levels are relatively low at an area that would be expected to be in closest proximity to the soil contamination, and would be expected to be most impacted if the soils were acting as a source of groundwater contamination. Further investigations will be conducted in the OU-2 RI/FS.

SUMMARY OF SITE RISKS

The purpose of the risk assessment is to identify potential cancer risks and non-cancer health hazards at the Site assuming that no further remedial action is taken. A baseline human health risk assessment was performed to evaluate current and future cancer risks and non-cancer health hazards based on the results of the RI.

A screening-level ecological risk assessment (SLERA) was also conducted to assess the risk posed to ecological receptors due to site-related contamination.

Human Health Risk Assessment

As part of the RI/FS, a baseline human health risk assessment was conducted to estimate the risks and hazards associated with the current and future effects of contaminants on human health and the environment. A baseline human health risk assessment is an analysis of the potential adverse human health effects caused by hazardous-substance exposure in the absence of any actions to control or mitigate these under current and future land uses.

A four-step human health risk assessment process was used for assessing site-related cancer risks and non-cancer health hazards. The four-step process is comprised of: Hazard Identification of Chemicals of Potential Concern, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see adjoining box "What is Risk and How is it Calculated"). The baseline human health risk assessment began with selecting COPCs in the various media (i.e., soil and subsurface soil) that could potentially cause adverse health effects in exposed populations. The current and future land use scenarios included the following exposure pathways and populations:

- Site Worker (adult): current ingestion, dermal contact and inhalation of soil particles and vapors for surface soil (the top two feet) from Pesticide Warehouse III Property and current/future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil from Adventist Property.
- Residents (adult/child): future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil from the Pesticide Warehouse III Property.
- Trespassers (adolescent): current/ future ingestion, dermal contact and inhalation of surface soil particles and vapors for surface soil from Pesticide Warehouse. III and Adventist properties
- Construction Workers (adult): future ingestion, dermal contact and inhalation of soil particles and vapors from both surface and subsurface soil (to as deep as 10 feet) for Pesticide Warehouse III and Adventist properties.
- Visitors (child and adult): current/future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil for the Adventist Property.
- Summer camper (child 6-10 years of age): future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil for the Adventist Property.
- Day camp (child 0-6 years of age): future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil for the Adventist Property.
- Students: future ingestion, dermal contact and inhalation of soil particles and vapors for surface soil were qualitatively evaluated for the Adventist Property.

In this assessment, exposure point concentrations were estimated using either the maximum detected concentration of a contaminant or the 95% upper-confidence limit of the average concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably anticipated to occur at the Site. The RME is intended to estimate a conservative exposure scenario that is still within the range of possible exposures. Central tendency exposure assumptions, which represent typical average exposures, were also developed. A complete summary of all exposure scenarios can be found in the baseline human health risk assessment.

Surface Soil

Risks and hazards were evaluated for current and future exposure to surface soil. The populations of interest included adult Site workers, child and adult residents, adolescent trespassers, adult construction workers, adult and child visitors, summer campers, day care children and students. The cancer risks for the receptor populations evaluated at the Site indicated that current and future trespasser were within or below the acceptable EPA risk range of 10^{-6} to 10^{-4} and the future site worker and adult/child resident were above the acceptable cancer risk range. The hazard indexes (HI) for all of the receptor populations evaluated were above the EPA acceptable value of 1, although the HI for the trespasser, both current and future, were only slightly above 1. The primary contaminants of concern for the Site were dioxin/furans and toxaphene.

The cancer risks for all of the receptor populations evaluated at the Adventist Property were within or below the acceptable EPA risk range of 10^{-6} to 10^{-4}. The HI for all of the receptor populations evaluated were below the EPA acceptable value of 1. There were no COPCs identified for surface soil at the Adventist Property (see Table 1).

Lead was evaluated at each of the properties and all detected lead concentrations were below the residential surface soil screening value of 400 micrograms per kilogram (mg/kg) and the industrial surface soil screening value of 800 mg/kg.

Table 1. Summary of hazards and risks associated with surface soil.

Receptor	Hazard Index	Cancer Risk
PW* III Property		
Site Worker – future	2.9	5.7×10^{-4}
Trespasser – current	1.4	6.3×10-5
Trespasser – future	1.3	5.5×10^{-5}
Resident adult/child – future	34.2	5.8×10^{-3}
Adventist Property		
Site Worker – current	0.2	3.0×10^{-5}
Site Worker – future	0.2	3.1×10^{-5}
Visitor adult – current	0.04	5.7×10^{-6}
Visitor child - current	0.4	1.3×10^{-5}
Visitor adult – future	0.05	5.8×10^{-6}
Visitor child – future	0.4	1.3×10^{-5}
Summer camper – future	0.1	3.0×10^{-6}
Day care - future	1.0	3.4×10^{-5}

The COPCs identified in the surface soil for the Pesticide Warehouse property were dioxin/furans and toxaphene. There were no COPCs identified for the Adventist property.
*PW= Pesticide Warehouse

Surface/Subsurface Soil

Risks and hazards were evaluated for the potential current and future exposure to surface and subsurface soil. The population of interest included adult construction workers. The cancer risks were below or within the EPA acceptable ranges. The non-cancer hazards were above the EPA acceptable value of 1 for the Pesticide Warehouse III Property and below the EPA acceptable value of 1 for the Adventist Property. The COPCs identified in the surface/subsurface soil were dioxin/furans (Table 2). Additionally, lead concentrations were below the industrial surface and subsurface screening value of 800 mg/kg.

Table 2. Summary of hazards and risks associated with surface and subsurface soil

Receptor	Hazard Index	Cancer Risk
PW III Property		
Construction Worker – future	4.0	1.0×10^{-5}
Adventist Property		
Construction Worker - future	0.3	1.5×10^{-6}

The COPCs identified in the surface/subsurface soil for the Pesticide Warehouse Property were dioxin/furans. There were no COPCs identified for surface/subsurface soil at the Adventist Property.
*PW= Pesticide Warehouse

Ecological Risk Assessment

A SLERA was conducted to evaluate the potential for ecological risks from the presence contaminants in surface soil. The SLERA focused on evaluating the potential for impacts to sensitive ecological receptors to Site-related constituents of concern through exposure to soil on the Pesticide Warehouse III Property. Surface soil concentrations were compared to ecological screening values as an indicator of the potential for adverse effects to ecological receptors. A complete summary of all exposure scenarios can be found in the screening level ecological risk assessment.

Based on a comparison of maximum concentrations of chemicals in Site soil to Ecological Screening Levels (ESLs), results of the SLERA indicate risk to ecological receptors (invertebrates, reptiles, amphibians, birds, and mammals). Specifically, hazard quotients (HQs) > 1.0 were calculated, which indicated potential risk from exposure to the following chemicals:

Pesticides: 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, aldrin, alpha-chlordane, beta-BHC, dieldrin, endosulfan I, endosulfan II, endosulfan sulfate, endrin, endrin aldehyde, gamma-chlordane, heptachlor, heptachlor epoxide, methoxychlor, and toxaphene.

SVOCs: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, butylbenzylphthalate, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene.

Inorganics: antimony, arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, selenium, thallium, vanadium, and zinc.

Dioxin/furans: dioxins and furans based on total dioxin TEQs.

Potential risks from exposure to the following chemicals could not be quantified as ESLs are not available:

Pesticides: endrin ketone, diuron, and paraquat.

VOCs: cyclohexane and methyl acetate.

SVOCs: caprolactum, carbazole, and dibenzofuran.

The SLERA results indicate risk to ecological receptors from exposure to Site soils. The results indicated pesticides are the primary risk drivers at the Site, followed by dioxin/furans. PAHs and metals were also retained as risk drivers; however, as previously discussed, the inclusion of PAHs was based upon in a single sample, and concentrations of detected metals were similar to those in background samples.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered (TBC) guidance and site-specific risk-based levels.

The goal of the remedy selection process is to select remedies that are protective of human health and the environment, maintain protection over time, and minimize untreated waste.

The current and anticipated future land uses for the Site are an important consideration for the development of RAOs and remediation goals to ensure remedial alternatives are protective of human health and the environment. The final condition of the Site after remediation must be considered in evaluating future land uses or activities and the related protection to human health that is provided.

Remediation Action Objectives

RAOs are media-specific and source-specific goals to be achieved through completion of a remedy that is protective of human health and the environment. These objectives are typically expressed in terms of the contaminant, the concentration of the contaminant, and the exposure routes and receptors. RAOs are typically developed by evaluating several sources of information, including results of the risk assessments and tentatively identified ARARs. These inputs are the basis for determining whether protection of human health and the environment is achieved for a particular remedial alternative.

As part of the assessment of the Site, EPA evaluates whether any contaminated materials should be considered principal threat waste because they may act as source material to the contamination of other media (e.g., contaminated soils acting as a source of groundwater contamination), or because they are highly toxic. For example, contaminated soil at the Site could be considered source material because it acts as a source for direct exposure at concentrations in excess of a worker 10^{-3} risk level for pesticides and dioxins/furans. Pesticides in soil samples were not observed at concentrations greater than the residential or worker scenario 10^{-3} risk levels. Dioxin/furan concentrations were also not observed above the worker scenario 10^{-3} risk level.

While groundwater investigations have yet to be completed, the impact of contaminated soils on groundwater was also considered in the development of RAOs. Contaminated soils appear to have little impact on contaminated groundwater.

Based on these factors, contaminated soils at the Site is not considered to be a principal threat waste, but rather a low-level threat waste.

While land use in the area is mixed, EPA consulted with local authorities and PREQB and concluded that future unrestricted land use (e.g., residential) need not be carried forward for either the facility itself or the northern property containing the buried drainage ditches. The development of RAOs is primarily focused on protection of the human health for the future Site worker and construction worker scenarios:

1. Mitigate the potential for inhalation and ingestion exposures to human receptors to pesticides and dioxins/furans in soil resulting in cancer and non-cancer health hazard in excess of EPA's acceptable risk range.
2. Minimize the release of contaminants from the unsaturated soils to groundwater at concentrations that would cause exceedances of the remediation goals for groundwater.

Based upon the SLERA, an ecological RAO to prevent direct contact with surface soils by ecological receptors would also be appropriate; however, EPA has concluded that by addressing surface soils to protect human health, a remedy would also address exposure to ecological receptors.

Remediation Goals for Soil

To meet the RAOs, remediation goals were developed to aid in defining the extent of contaminated soil requiring remedial action. Remediation goals are typically chemical-specific measures for each media and/or exposure route that are expected to be protective of human health and the environment. In this case, soil remediation goals were developed to address soils as a direct contact threat, including surface soils (within the first two feet of the ground surface) and, to address exposures under the construction worker scenario, subsurface soils as deep as 10 feet. They are derived based on comparison to ARARs, risk-based levels, and background concentrations, with consideration also given to other requirements such as analytical detection limits, guidance values, and other pertinent information.

There are no promulgated federal or commonwealth chemical-specific ARARs for soil. To meet the RAOs, risk-based soil remediation goals were developed based on a future worker scenario at a 10^{-6} cancer target risk level, expecting the future use of the Site, including the northern property, to be a commercial/industrial use and not a residential (unrestricted) use. These remediation goals would be applied as deep as 10 feet bgs, to be protective for construction workers.

No unacceptable exposures were identified for the neighboring Adventist Church property. By addressing Site soils to as deep as 10 feet on the Site, these remediation goals would also be protective for inadvertent trespassing from neighboring properties. The remediation goals are shown in Table 3.

The SLERA identified a number of additional Site-related compounds that exceed the ESLs, suggesting the potential for ecological impacts. Separate ecological remediation goals were not developed because the areas of ecological concern are collocated with the areas of surface soil contamination to be addressed.

The impact of COCs to groundwater was also considered in the development of the RAOs. As discussed earlier, there is only limited evidence of groundwater contamination attributable to the Site. There is insufficient evidence that Site soils are currently acting as an ongoing source of groundwater contamination. The water table, at over 200 feet bgs, is separated from the areas of soil contamination by more than 150 feet of unsaturated (and uncontaminated) soils. Given that the soil contamination has been present at the Site for as many as 60 years, there is little evidence of contaminant transport to deeper soils through rain percolation during that time. In addition, the pesticides and dioxin/furan compounds that have been identified as COCs have very low water solubility, adsorb strongly to soils and, as a consequence, are not very mobile. Although remediation goals for the protection of groundwater would also be protective of a direct contact scenario, EPA has determined that direct-contact soil remediation goals would be adequately protective for protection of groundwater. Furthermore, the bulk of the soil contamination is within the top 10 feet bgs, with few exceedances of these remediation goals deeper than 10 feet; EPA expects that, by addressing contaminated soils within the top 10 feet, the preferred remedy would address the soils as a potential threat to groundwater.

Table 3
Remediation Goals for Soil (all concentrations in μg/kg)

Contaminants of Concern	Remediation Goal
Aldrin	101
Dieldrin	108
Toxaphene	1,600
Dioxin Toxicity Equivalent (TEQ)	0.018

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA § 121(b)(1), 42 U.S.C. § 9621(b)(1), mandates that remedial actions must be protective of human health and the environment, be cost-effective, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the hazardous substances, pollutants and contaminants at a site. CERCLA § 121(d), 42 U.S.C. § 9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants, which at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4), 42 U.S.C. § 9621(d)(4).

The timeframes presented below for each alternative reflect only the time required to construct or implement the remedy and do not include the time required to design the remedy, negotiate the performance of the remedy with any potentially responsible parties, or procure contracts for design and construction.

The cost estimates, which are based on available information, are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual cost of the project.

Common Elements

Five-Year Reviews

Alternatives resulting in contaminants remaining above levels that allow for unrestricted use and unlimited exposure require that the Site be reviewed at least once every five years. If justified by the review, additional remedial actions may be considered to remove, treat, or contain the contamination.

Institutional Controls

Institutional controls (ICs) are non-engineered controls such as administrative and/or legal measures that minimize the potential for human exposure to contamination by limiting land or resource use. In this case, ICs would be used in conjunction with active control measures, such as capping or excavating and treating contaminated soils, to prevent direct contact. Different ICs would be applicable to different alternatives, as discussed below.

EPA Region 2 Clean and Green Policy

The environmental benefits of the preferred remedy may be enhanced by giving consideration, during the design, to technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy[1]. This will include consideration of green remediation technologies and practices. Some examples of practices that would be applicable are those that reduce emissions of air pollutants, minimize fresh water consumption, incorporate native vegetation into revegetation plans, and consider beneficial reuse and/or recycling of materials, among others.

Based on a screening of alternatives developed in the FS, several alternatives (FS Alternatives S2, S3 and S4) were not carried forward to the Proposed Plan. Please refer to the FS report for more information on these alternatives.

The following alternatives are considered in this Proposed Plan:

Alternative S1: No Action

Capital Cost	$ 0
Present Worth O&M Cost	$ 0
Total Present Worth Cost	$ 0
Construction Time Frame	N/A
Timeframe to meet RAOs	N/A

Alternative S1 is required by the NCP to provide an environmental baseline against which impacts of various other remedial alternatives can be compared. Under this alternative, no remedial activities would be initiated at the Site to address contaminated soil above remediation goals or otherwise mitigate the associated risks to human health from exposure to soil contamination.

Alternative S5: Excavation of Contaminated Soil to 10 feet bgs, On-site Treatment and Off-site Disposal, Covering of Remaining Residual Subsurface Soil, Institutional Controls, and Monitoring

Capital Cost	$4,377,000
Present Worth O&M Cost	$ 6,000
Total Present Worth Cost	$4,450,000
Construction Time Frame	One year
Timeframe to meet RAOs	One year

Under this alternative, contaminated soil in concentrations greater than remediation goals would be excavated to a depth of 10 feet bgs and disposed off Site. Excavated areas would be covered with clean fill. On areas of the northern property where engineered fill was added, the fill, which is not contaminated, would be excavated, stockpiled, and then backfilled in the excavated areas after removing the deeper contaminated soils. Excavated contaminated soil containing RCRA characteristic hazardous waste would be stockpiled on Site and thermally treated *ex-situ* (i.e., material is excavated and treated at the site) prior to disposal at a RCRA Subtitle D landfill on the Island.

Alternative S5 provides protection of human health through excavation, off-site soil treatment and disposal and placement of a soil cover over contaminated soil remaining at depth to reduce exposure to contaminants.

In places where contaminant concentrations still exceed remediation goals at depths greater than 10 feet, a marker layer (e.g., an obvious wire mesh or permeable plastic barrier) would be installed as a warning that digging lower would

[1] http://epa.gov/region2/superfund/green_remediation

result in possible exposure to contaminated soils. The total area to be covered under Alternative S5 is approximately 2,800 square feet.

Clean fill and topsoil would be used to replace soil removed by excavation, returning the area to its original elevation and grade. The soil cover would be blended into the existing engineered fill areas on the northern property. After the topsoil has been replaced, the area would be seeded to establish vegetative cover to restore the area.

Existing structures and concrete slabs would be demolished to enable excavation and placement of the cover.

The total targeted volume of contaminated soil to be excavated under this alternative is approximately 8,800 cubic yards (CY). An estimated 3,500 CY of contaminated soil containing RCRA characteristic hazardous waste would be stockpiled on Site and thermally treated *ex-situ* prior to disposal at a RCRA Subtitle D landfill on the Island. The remaining 5,300 CY would be considered non-hazardous and disposed of at a RCRA Subtitle D landfill on the Island without treatment.

Ex-situ thermal desorption uses heat and vacuum extraction to mobilize and remove contaminants from soil. Soil treatment would be employed to treat the contaminated soils to levels that would allow for disposal at a RCRA Subtitle D landfill. (Treatment to levels that would allow for on-site placement of the treated soil was also considered; however, combining on-site treatment and off-site disposal was considered more cost-effective.) Thermal Conducting Heating (TCH) wells would be placed in a grid-like pattern within the soil stockpile. The TCH wells heat the soil to the target temperature as measured by thermocouples placed throughout the stockpile. As temperatures increase to the target level, the contaminant's vapor pressure and diffusivity increase and its viscosity decreases. As a result, the evaporation rate and mobility of the contaminant is increased and contaminants and water contained in the soil are vaporized. Soil vapor extraction wells placed in the stockpile would be used to remove the soil vapor steam. The extracted off-gas and water are treated through vapor and liquid treatment systems.

A long-term inspection and maintenance program would be developed to ensure the soil cover would provide continued protection to human health. Inspections may be scheduled annually. Because of the thickness of the cover (10 feet), little maintenance is required.

Alternative S6: On-site Consolidation with Engineered Cover, Institutional Controls, and Monitoring

Capital Cost	$1,762,000
Present Worth O&M Cost	$6,000
Total Present Worth Cost	$1,840,000
Construction Time Frame	One year
Timeframe to meet RAOs	One year

Alternative S6 provides protection of human health through institutional controls (administrative and access controls) coupled with remedial action (excavation, consolidation, multi-layer geosynthetic cover construction, and vegetative cover) to limit exposure to contaminants. Under this alternative, all contaminated soil in concentrations greater than remediation goals outside the boundaries of the consolidation area would be excavated for consolidation and covering. The consolidation area would be centered on the former facility property.

As with Alternative S5, engineered fill on the northern property would be removed and stockpiled to enable excavation of the contaminated soil underneath. Excavated areas would be backfilled with clean fill. The engineered fill would be replaced in the areas from which it was removed. The total targeted volume of contaminated soil to be excavated and consolidated at the Site under Alternative S6 is approximately 3,500 CY.

The existing structures and concrete slabs at the Site would be demolished and removed to enable construction of the consolidation area. A multi-layer geosynthetic cover would be constructed over the consolidated material to mitigate unacceptable exposure risks to humans. The cover would result in some reduction in surface water infiltration (reducing the mobility of the underlying contamination), but the primary purpose of the cover would be to prevent direct contact. The cover material composition would be selected in remedial design, but it would typically be about 1.5 to 2 feet thick. The estimated extent for the consolidation area under Alternative S6 is approximately 50,700 square feet.

A long-term inspection and maintenance program would be developed to ensure the engineered cover would provide continued protection to human health. Inspections may be scheduled annually and following each severe storm event. Inspections would monitor the vegetation, erosion, and any damage by animals. If erosion or damage to the engineered cover is observed, actions would be taken to repair the damage and maintain the integrity of the engineered cover.

Alternative S7: Excavation of Contaminated Soil and Off-site Treatment and Disposal

Capital Cost	$28,035,000
Present Worth O&M Cost	$0
Total Present Worth Cost	$28,040,000
Construction Time Frame	One year
Timeframe to meet RAOs	One year

Alternative S7 provides protection of human health through excavation and off-site disposal of contaminated soil exceeding remediation goals to limit exposure to contaminants. While exposure assumptions considered in the human health risk assessment indicate that addressing soils to a depth of 10 feet bgs would be protective, this Alternative S7 assessed whether a deeper excavation would allow for a protective remedy that would offer more long-term effectiveness and permanence than a 10-foot excavation. Alternative S7 would address contaminated soils in excess of the remediation goals to a depth of approximately 20 feet. Several isolated detections deeper than 20 feet would be left in place under this alternative.

As with Alternative S5, excavated areas would be backfilled with clean fill, and engineered fill on the northern property would be removed and stockpiled to enable excavation of the contaminated soil underneath. Excavated areas would be backfilled with clean fill. The engineered fill would be replaced in the areas from which it was removed.

The total targeted volume of contaminated soil to be excavated under Alternative S7 is approximately 11,600 CY. An estimated 4,500 CY of the excavated material contains contaminant levels requiring treatment and disposal as a RCRA characteristic hazardous waste. Because no RCRA Subtitle C facility is located on the Island, this contaminated material would be transported to the Continental United States for treatment and disposal. The remaining 7,100 CY would be disposed of as non-hazardous at a RCRA Subtitle D landfill on the Island.

Clean fill and topsoil would be used to replace excavated material, returning the area to its original elevation and grade. The soil cover would be blended into the existing engineered fill areas. After the topsoil has been placed, the area would be seeded to establish vegetative cover both to restore the area and because the roots from plants hold the soil in place, preventing erosion and offsite transport by surface runoff or wind.

Alternative S8: Excavation of Contaminated Soil, On-site Treatment, and Off-site Disposal

Capital Cost	$5,664,000
Present Worth O&M Cost	$0
Total Present Worth Cost	$5,660,000
Construction Time Frame	One year
Timeframe to meet RAOs	One year

Alternative S8 is similar to Alternative S7, with the exception that excavated contaminated soil considered RCRA characteristic hazardous waste would be stockpiled on-site and thermally treated prior to disposal at a RCRA Subtitle D landfill on the Island.

The total targeted volume of contaminated soil to be excavated under Alternative S8 is approximately 11,600 CY. An estimated 4,500 CY of the excavated material contains contaminant levels requiring treatment prior to disposal at a RCRA Subtitle D landfill on the Island.

Alternative S9: *In-Situ* Thermal Remediation of Contaminated Soil

Capital Cost	$6,383,000
Present Worth O&M Cost	$0
Total Present Worth Cost	$6,380,000
Construction Time Frame	One year
Timeframe to meet RAOs	One year

Alternative S9 would consist of conducting *in-situ* thermal treatment of subsurface soils. *In-situ* thermal treatment would be conducted in areas with contaminant concentrations greater than remediation goals. The total targeted volume of contaminated soil to be treated under Alternative S9 is approximately 11,600 CY (the same volume of the material to be excavated for Alternatives S7 and S8).

In-situ thermal remediation is similar in many ways to *ex-situ* thermal remediation. Instead of excavating the material first, *in-situ* thermal treatment would heat the subsurface soil in place. Soil would remain on Site.

In-situ treatment would require the removal of structures and remaining concrete foundations. Contaminated concrete would be transported off Site for disposal.

Site conditions play a large role in choosing the appropriate *in-situ* thermal remediation method. The thermal remediation method to carry forward in remedial design would be determined after discussion with technology vendors.

Whereas *ex-situ* thermal treatment would only be needed to allow for placement in an off-site RCRA Subtitle D landfill, *in-situ* treatment would need to achieve the remediation goals. Due to uncertainties on the effectiveness of *in-situ* treatment, particularly for dioxins where the remediation goal is very low, Alternative S9 may need to be augmented with cover material similar to Alternative S6, to achieve protectiveness. This contingency was not included in the costs for Alternative S9.

NINE EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall protection of human health and the environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative would meet all of the applicable or relevant and appropriate requirements of federal and state environmental statutes and other requirements that pertain to the site, or provide grounds for invoking a waiver.
Long-term effectiveness and permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies an alternative may employ.
Short-term effectiveness considers the period of time needed to implement an alternative and the risks the alternative may pose to workers, residents, and the environment during implementation.
Implementability is the technical and administrative feasibility of implementing the alternative, including the availability of materials and services.
Cost includes estimated capital and annual operation and maintenance costs, as well as present-worth costs. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Commonwealth acceptance considers whether the Commonwealth (the support agency) concurs with, opposes, or has no comments on the preferred remedy.
Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the RI/FS reports. Comments received on the Proposed Plan are an important indicator of community acceptance.

EVALUATION OF REMEDIAL ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. A detailed analysis of alternatives can be found in the FS.

A comparative analysis of these alternatives based upon the evaluation criteria noted above is presented below.

Overall protection of human health and the environment

Of the six retained alternatives, only the no action alternative (i.e., Alternative S1) would fail to provide protection for human health (future worker) and would not address the RAOs for contaminated soil.

Alternatives S5, S6, S7, S8, and S9 would be protective of human health and the environment and would achieve the RAOs. Alternative S5 achieves the RAOs through excavation of contaminated soil exceeding remediation goals to a depth of 10 feet, treatment of excavated soil as needed, and maintaining deeper residual soils in place under 10 feet of cover material. Alternative S6 achieves RAOs through consolidation and containment (capping) of contaminated soil. The cap would provide a barrier that would break the exposure pathway to human receptors. Alternatives S7 and S8 achieve RAOs through excavation, treatment as needed, and off-site disposal of contaminated soil exceeding remediation goals to a depth of approximately 20 feet. Alternative S9 would achieve RAOs through *in- situ* thermal remediation of contaminated soil exceeding remediation goals.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Alternative S1 would not achieve the remediation goals since no remedial action would be taken to remove and/or treat the contaminated soil. The remaining alternatives, Alternatives S5 through S9, would achieve remediation goals by removal, containment, or treatment of contaminated soil. Alternatives S5 to S9 would be implemented to comply with action- and location-specific ARARs.

Long-Term Effectiveness and Permanence

Alternative S1 fails to provide long-term effectiveness and permanence since no remedial action is taken. Alternative S5 includes excavation of contaminated soil exceeding remediation goals to a depth of 10 feet, covering deeper residual soils. Because of the thickness of the cover material and the relatively small area of residual soil contamination, the likelihood of remedy failure (through failure of the 10-foot cover to remain in place) is considered remote, and this alternative is expected to offer a high degree of long-term effectiveness and permanence.

Alternative S6 provides protection by preventing human exposure to contaminated soil through an engineered cover. However, soil contamination is left in place relatively close to the ground surface, and the alternative would require the highest degree of long-term maintenance to ensure protectiveness.

Under Alternatives S7 and S8, long-term effectiveness and permanence would be achieved by excavation and off-site disposal, with either on-site or off-site treatment as necessary. Because these alternatives would address contaminated soils as deep as 20 feet bgs, leaving only relatively small, discrete areas exceeding remediation goals deeper than 20 feet, these alternatives offer some marginal degree of added long-term effectiveness and permanence over Alternate S5; however, by addressing soils within the first 10 feet, Alternative S5 fully addresses the exposure pathways identified in the human health risk assessment, and 10 feet of cover provides ample protection against remedy failure.

Alternative S9 uses an *in-situ* thermal remediation treatment and would offer a similar level of long-term effectiveness and permanence to Alternatives S7 and S8.

Institutional controls (ICs) would be implemented for all active alternatives to protect the covers as well as to restrict future land uses and provide awareness of risks from potential exposure to contaminated soil above site-specific levels of concern. Alternative S6 (and, potentially, Alternative S9, as discussed under implementability, below) would rely most heavily on ICs, because the likelihood of human exposure to contamination remaining close to the surface would be higher than for the other alternatives.

Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative S1 fails to provide a reduction of toxicity, mobility, or volume through treatment since treatment is not a component of these alternatives.

Alternative S6 does not satisfy the statutory preference for treatment as a principal element of the remedial action, as no active treatment remedy would be performed. Alternative S6 would reduce mobility of the contaminants through capping.

Alternatives S5, S8 and S9 include on-site thermal treatment of contaminated soil and thus all perform comparably under this criterion. Under Alternative S7, RCRA characteristic hazardous waste would be containerized and shipped to the continental United States for treatment (assumed to be incineration) and disposal. While this alternative does include treatment prior to disposal, CERCLA generally endorses on-site treatment as preferable to off-site treatment under this criterion.

Short-Term Effectiveness

Alternative S1 would not pose short-term risks to the community, and there would be no adverse environmental impacts; however, protection in a reasonable timeframe would not be achieved under this alternative.

Alternatives S5, S6, S7, and S8 would involve surface disturbance of contaminated soil and transport of clean soil for backfill and/or construction of covers. Alternatives S5, S7, and S8 would include transportation of excavated contamination for off-site disposal. Unlike Alternatives S6 and S7, Alternatives S5, S8 and S9 would require installation of power lines and high energy usage, which could pose additional short-term impacts to the community.

Alternative S9 requires surface preparation, including a temporary liner over the thermal treatment area. Contaminated soil would not be excavated or transported under Alternative S9 nor would this alternative require haul trucks to bring in clean fill, reducing short-term impacts to the community. Trucks would still be needed to remove concrete and other surface improvements to make way for the thermal treatment process.

Implementability

Alternative S1 has no further action taken other than five-year site reviews. Since no remedial action is taken, this alternative would be the easiest to implement, both technically and administratively.

Alternative S6 uses standard construction techniques, practices, and materials for cap construction, would not require management of

RCRA characteristic hazardous waste, and would not require installation and operation of a treatment system. It would, however, require the most long-term monitoring and maintenance, because it relies solely on the viability of the cover material to provide protectiveness.

Alternative S9 would require a number of thermal heating and vapor extraction wells to be installed. Also, mobilization of thermal remediation equipment would be needed, and the treatment system would have high energy demands, requiring that power be delivered to the Site. However, unlike Alternatives S5 and S8, contaminated soil would not be excavated.

Alternatives S5 and S8 would require mobilization of a thermal remediation treatment system to the island of Puerto Rico. These alternatives would include excavation, stockpiling and treating hazardous waste, and disposal of treated and non-hazardous contaminated soil at the RCRA Subtitle D landfill.

Alternatives S5 and S8 would have similar implementability issues to Alternative S9 with regard to power needs and the availability of needed portable treatment equipment on the Island. Alternative S9 is considered less implementable because the treatment level required would be remediation goals for the Site, and there is some uncertainty as to whether *in-situ* treatment can achieve the remediation goal for dioxin. Alternative S9 would be able to substantially reduce the residual concentrations of pesticides and dioxin, but may require some level of capping, similar to Alternative S6, if the remediation goals cannot be met.

Alternative S7 would include excavation and disposal of non-hazardous contaminated soil at the Subtitle D landfill. Contaminated soil considered RCRA characteristic hazardous waste would be containerized and shipped to hazardous waste to the continental United States for treatment and disposal. Shipping would require extensive planning to assure safe and effective transportation to the mainland. Construction may be delayed by the availability of containers for loading of hazardous waste.

Cost

Present value costs for all alternatives were evaluated over a 30-year period.

Soil Alternative	Capital Cost	Present Worth O&M Cost	Total Present Worth Cost
S1	0	0	0
S5	$4,377,000	$6,000	$4,450,000
S6	$1,762,000	$6,000	$1,840,000
S7	$28,035,000	0	$28,040,000
S8	$5,664,000	0	$5,660,000
S9	$6,383,000	0	$6,380,000

The costs of Alternative S7 are driven by the costs of off-site shipment of RCRA characteristic waste to the mainland. Note that Alternative S9 does not include capping costs, as discussed elsewhere in this Proposed Plan.

Commonwealth/Support Agency Acceptance

The PREQB agrees with the preferred remedy in this Proposed Plan.

Community Acceptance

Community acceptance of the preferred remedy will be evaluated after the public comment period ends and will be described in the Responsiveness Summary section of the ROD for this Site. The ROD is the document that formalizes the selection of the remedy for a site.

PREFERRED REMEDY

EPA's preferred alternative is Alternative S5, excavation of contaminated soil as deep as 10 feet bgs; on-site treatment, as needed, followed by off-site disposal; covering of deeper residual soils; institutional controls; and monitoring. The preferred remedy would treat soil with RCRA hazardous characterstics using thermal treatment, using a temporary treatment unit brought to the Site. Because soils below 10 feet bgs would remain covered at levels that would not allow for unrestricted (i.e., residential) use, institutional controls would restrict the future use of the soil at the Site to nonresidential uses. The estimated present-worth cost of the preferred alternative is $4,450,000.

This remedy also includes institutional controls that would restrict the future use of the soil at the Site, and reviews every five years to assure the long-term protectiveness of the remedy.

Basis For Remedy Preference

The Preferred Alternatives are believed to provide the best balance of tradeoffs among the alternatives based on the information available to EPA at this time. EPA and PREQB believe that the preferred remedy would treat principal threats, be protective of human health and the environment, comply with ARARs, be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The preferred remedy also would meet the statutory preference for the use of treatment as a principal element. The preferred alternative can change in response to public comment or new information.

The environmental benefits of the preferred remedy may be enhanced by consideration, during the design, of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy. This would include consideration of green remediation technologies and practices.

The EPA and NJDEP expect the preferred alternative to satisfy the following statutory requirements of CERCLA Section 121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment as a principal element. EPA will assess the modifying criteria of community acceptance in the ROD following the close of the public comment period.


Figure 2-2
Site Map
Pesticide Warehouse III, OU1 (Soil)
Manati, Puerto rico
Approximate Adventist Property Boundary
Open Field
Reine Christian Billingual School
Parking Lot
Adventist Church Northern Regional Offices
Open Air Structure
Mechanic Shop
PR-670
Truck Scale Pit
Former Warehouse Platform
On-site well
Leach pit (sinkhole area)
Secondary Warehouse
Pesticide Warehouse III Boundary
0
75
150
Feet
N
CDM Smith

Almacén de Plaguicidas III Superfund Site

Manatí, Puerto Rico
Agosto 2015

EPA Región 2

PARA OBTENER MÁS INFORMACIÓN

Participación de la Comunidad
Participación del público es esencial para el éxito del Programa de Superfondo de la EPA. Si usted tiene alguna pregunta acerca de las actividades en el Almacén de Plaguicidas III, póngase en contacto con:

Luis E. Santos, EPA Gerente de Proyectos, (787) 977-5865, santos.luis@epa.gov , o con Brenda Reyes, Coordinadora de Participación de la Comunidad de la EPA al (787) 977-5869, reyes.brenda@epa.gov .

Superfondo
Para obtener información sobre el proceso de Superfondo, visite el sitio web de la EPA en www.epa.gov/superfund.

Repositorio de información
El repositorio de información contiene documentos relacionados con el Lugar, disponibles para la revisión del público en las siguientes ubicaciones:

Biblioteca Municipal
Paseo de las Atenas y Calle Mackinley
Manatí, Puerto Rico 00739
(787) 884-5494
Horario: Lunes – Viernes 7:00am a 11:00 pm

USEPA Región II
Centro de Expedientes del Superfondo
290 Broadway, piso 18
Nueva York, NY 10007-1866
Lunes a viernes de 9:00 AM a 5:00 PM
(212) 637-4308

Agencia Federal de Protección Ambiental
División de Protección Ambiental del Caribe
City View Plaza II, Suite 7000
#48 PR-165 km 1.2
Guaynabo, Puerto Rico 00968-8069
Lunes a viernes de 9:00 AM a 4:30 PM
Brenda Reyes, (787) 977-5869

Reunión Pública
Biblioteca Municipal
Paseo de las Atenas y Calle Mackinley
Manatí, Puerto Rico 00739
Fecha: 18 de agosto de 2015
Hora: 6:00 PM

HOJA INFORMATIVA PROGRAMA DE SUPERFONDO

Almacén de Plaguicidas III

Manatí, Puerto Rico
Agosto 2015

Esta hoja informativa describe las alternativas correctivas desarrolladas para el Almacén de Plaguicidas III (PWIII, por sus siglas en inglés), Unidad Operacional 1-Suelos (OU1) para el Lugar de Superfondo (el Lugar) en Manatí, Puerto Rico, e identifica el remedio preferido para el Lugar con la justificación de esta preferencia. Este documento fue desarrollado por la Agencia de Protección Ambiental (EPA, por sus siglas en inglés), la agencia designada para coordinar las actividades del Lugar, en consulta con la Junta de Calidad Ambiental de Puerto Rico (JCA), la agencia de apoyo. La EPA publica este Plan Propuesto como parte de sus responsabilidades de participación pública bajo la Sección 117 (a) de Respuesta Ambiental Comprensiva, Ley de Compensación y Responsabilidad, 42 USC § 9617 (a) (CERCLA, comúnmente conocido como el programa de Superfondo) y las Secciones 300.430 (¬f) y 300.435 (c) del Plan de Contingencia Nacional por la Contaminación de Petróleo y las Sustancias Peligrosas (National Contingency Plan, NCP, por sus siglas en inglés).

La naturaleza y el alcance de la contaminación en el Lugar, y las alternativas de remediación que se resumen en este documento se describen en detalle en los reportes de Investigación de Remediación (RI, por sus siglas en inglés) y el Estudio de Viabilidad (FS, por sus siglas en inglés). La EPA está abordando el Lugar en dos unidades operacionales (OU) separadas. La OU- 1 va dirigida a la contaminación en el suelo. Mientras que la OU- 2 atiende el agua subterránea en todo el Lugar, y se abordará en un RI y FS independiente.

El remedio preferido de la EPA para la OU- 1 es la alternativa S5: excavación del suelo contaminado a una profundidad de 10 pies debajo de la superficie del suelo; tratamiento en el Lugar, según sea necesario, seguido por la eliminación fuera del Lugar;

revestimiento de suelos residuales más profundos; controles institucionales; y monitoreo. El remedio preferido tratará el suelo con características peligrosas mediante tratamiento térmico, utilizando para el tratamiento una unidad temporeramente transportada al Lugar. Debido a que los suelos más profundos (por debajo de 10 pies), quedarían cubiertos aunque en niveles que no permitirán su uso sin restricciones (es decir, residencial), los controles institucionales podrían restringir el uso futuro del suelo en el Lugar para usos no residencial.

ROL DE LA COMUNIDAD EN EL PROCESO DE SELECCIÓN

La EPA solicita el insumo del público para asegurar que las preocupaciones de la comunidad sean consideradas en la selección de una alternativa efectiva para cada Lugar de Superfondo. Para ello, este Plan Propuesto ha sido puesto a la disposición del público para un período de comentarios de 30 días que comienza con la emisión de este Plan Propuesto y concluye el 11 de septiembre de 2015.

La EPA estará proporcionando información sobre la investigación y limpieza del Lugar al público a través de una reunión pública y los depósitos de información, que contienen el expediente administrativo. La EPA anima al público a obtener una comprensión más completa sobre el lugar y sobre las actividades de Superfondo que se han realizado en el mismo.

La reunión pública a celebrarse durante el periodo de comentarios proporcionará información sobre las investigaciones completadas en el Lugar, las alternativas consideradas y el remedio preferido, así como para recibir comentarios del público. Los comentarios recibidos en la reunión pública, así como los comentarios escritos recibidos, serán documentados en la sección "Resumen de Respuestas" del Registro de Decisión (ROD, por sus siglas en inglés), el documento que formaliza la selección de la alternativa.

Los comentarios escritos sobre este Plan Propuesto deberán dirigirse a:

Luis E. Santos
Gerente de Proyectos Remediales
Agencia de Protección Ambiental de EE.UU.
City View Plaza II - Suite 7000
48 RD, a 165 Km. 1.2
Guaynabo, PR 00968-8069
Teléfono: (787) 977-5824
Fax: (787) 289-7104
E-mail: santos.luis@epa.gov

ALCANCE Y ROL DE LA ACCIÓN A TOMAR

Actividades de remediación del sitio están separados en diferentes unidades operacionales, por lo que la reparación de los diferentes medios ambientales o áreas del Lugar pueden proceder por separado en forma expedita. La EPA ha designado dos unidades operacionales para este Lugar.

- OU- 1, que es el foco de este Plan Propuesto, se dirige a la contaminación del suelo en las zonas industriales y de conservación.
- OU- 2, el agua subterránea será evaluada en un estudio por separado.

La EPA estará completando estudios sobre el agua subterránea por separados para los RI / FS, y emitirá un Plan Propuesto por separado como un segundo y último remedio para el Sitio.

ANTECEDENTES DEL LUGAR

Descripción Del Lugar

El Lugar es una instalación inactiva ubicada en la carretera estatal PR 670, kilómetro (km) 3.7, en una zona rural / residencial de Manatí, Puerto Rico. El Lugar cubre aproximadamente dos hectáreas e incluye los restos de hormigón de un almacén en forma de "L" y un almacén más pequeño. El Lugar está limitado al oeste y al norte por campos abiertos, y al este por una propiedad de la Iglesia Adventista y un taller mecánico. Parte del Lugar, un almacén utilizado para almacenar plaguicidas, fue destruido por un incendio en el año 2003. Una zanja de drenaje que corre de norte a sur, de aproximadamente cinco pies de profundidad y 275 pies de largo, recoge el agua de lluvia de la parte occidental del Lugar y se vacía en un fosa de lixiviación natural o sumidero.

La propiedad adventista cubre un área aproximada de 1.7 hectáreas, y consiste predominantemente de un área pavimentada con estacionamiento y un campo abierto al noreste de la propiedad de aproximadamente ½ hectárea. La estructura no sólo aloja las Oficinas Regionales de la Asociación Puertorriqueña del Norte de los Adventistas del Séptimo Día, sino que también incluye una librería, tienda de alimentos saludables, y una cafetería. Al este de la propiedad de la Iglesia Adventista se encuentra la Escuela Bilingüe cristiana Reiné.

Historia del Lugar

La Autoridad de Tierras de Puerto Rico (LAPR, por sus siglas en inglés) fue dueño de la propiedad y operó en el Lugar desde el 1954 a 1996. Las operaciones en el Lugar incluyeron la preparación de plaguicidas / insecticidas, herbicidas y fertilizantes para el cultivo y siembra de diversos cultivos. Estos productos químicos fueron almacenados en bolsas, cajas y drones en el piso de hormigón del edificio del almacén en forma de "L". La LAPR preparó los productos químicos mediante la mezcla de los productos químicos concentrados (típicamente en forma sólida o acuosa) con el agua de un pozo localizado en el Lugar. La mezcla ocurría en los camiones cisternas como en las áreas de carga sobre el suelo. El exceso de productos químicos y derrames ocurrieron durante el proceso de mezcla, contaminando los suelos circundantes. Derrames químicos también fluían de la zona de mezcla a través de la tierra a la zanja de drenaje alrededor de la periferia del Lugar, eventualmente descargando a la fosa de lixiviación. Los drones vacíos y bolsas de químicos estaban apilados detrás del almacén en suelo el desnudo.

El Lugar fue operado por Agro-Campos, Inc. (Agro-Campos), desde el 1996 al 2002. En el 2002, Agro-Campos dejó vacante el Lugar. Poco tiempo después, el almacén fue destruido por un fuego, dejando sólo su base de hormigón.

A principios del año 2000, un desarrollador realizó actividades de movimiento de tierra a la espera de construir un proyecto de vivienda en las propiedades inmediatamente al norte y al oeste de la instalación, alterando el paisaje y cubriendo los antiguos canales de drenaje con relleno. Para el año 2006, el proyecto había sido abandonado, y la construcción de viviendas nunca tuvo lugar.

Geología

En el Lugar subyacen depósitos no consolidados; estos consisten de arena, arcilla y arcilla arenosa. Estos suelos recubren la piedra caliza de la Formación Aymamón. El espesor de la superficie de depósito es desconocido, pero se estima pueda ser tanto como 100 pies de espesor.

Hidrogeología

Durante el RI la profundidad medida al nivel freático fue de 253 pies por debajo de la superficie (bgs, por sus siglas en inglés). En el Lugar, el acuífero superior se encuentra casi en su totalidad en la Formación Aguada la cual se encuentra debajo de la Formación Aymamón. Se espera que aproximadamente solo 30 a 50 pies de la Formación Aymamón pueden estar saturados en adición a la Formación Aguada.

En el Lugar, los suelos superficiales no consolidados que consisten de arenas arcillosas pueden retardar la infiltración de las aguas superficiales de escorrentía hacia el acuífero, creando una capa semi-confinada. La revisión de datos de la superficie potenciométrica tomados en las proximidades del Lugar sugieren que el flujo de las aguas subterráneas es hacia el norte –noroeste.

La recarga del acuífero puede estar limitada dado al espesor de los suelos ricos en arcilla que recubren la piedra caliza. En adición, como el espesor de los depósitos de manta y la elevación de la interface suelo / lecho de roca son muy irregulares, las tasas de infiltración a través del Lugar serán potencialmente variables.

Reconocimiento Ecológico

Las zonas vegetadas del Lugar y las que proporcionan hábitats marginales / adecuados se extienden hacia el norte, hacia y dentro de los mogotes.

La información con respecto a las especies amenazadas y en peligro de extinción y los entornos ecológicamente sensibles que puedan existir en o en las proximidades del Lugar fue obtenida de las distintas agencias gubernamentales.

La Agencia Federal de Pesca y Vida Silvestre informó que el Lugar se encuentra en el hábitat de la boa puertorriqueña (*Epicrates inornatus*) especie en peligro de extinción. En adición, podría existir en el área otra especie en peligro de extinción, el Palo de Rosa (*Ottoschulzia rhodoxylon*).

El Departamento de Recursos Naturales y Ambientales de Puerto Rico (DRNA) informó que una revisión de sus registros para el Lugar y los alrededores no resulta con reportes de apariciones de especies raras, amenazadas y / o en peligro de extinción. Sin embargo, los mogotes que se encuentran al norte del Lugar y en las áreas circundantes son parte de las Áreas Prioritarias de Conservación kársticas del DRNA de Puerto Rico, y se consideran áreas de planificación especial de la zona kárstica de Puerto Rico.

INVESTIGACIONES INICIALES DEL LUGAR

Evaluación Preliminar de la JCA (1989): La JCA observo y documento derrames de plaguicidas concentrados y fertilizantes directamente sobre los suelos en el Lugar. Suelos superficiales manchados y estresados o vegetación ausente fueron observados, lo que sugiere una contaminación generalizada. Se percibieron olores fuertes a plaguicidas dentro y fuera del almacén. El gerente de la instalación, explicó que los trabajadores habían sufrido de "intoxicación", presumiblemente debido a la liberación de los plaguicidas.

Investigación Preliminar del Lugar por la EPA (1996): La EPA realizó una Investigación del Lugar (SI, por sus siglas en ingles) en el año 1996. Durante el SI, se observaron materiales derramados por todo el almacén y se observaron suelos superficiales manchados por todo el Lugar. Suelos descubiertos servían para el drenaje de superficie en pendiente hacia el oeste, donde interceptaban una zanja de drenaje que se extendía a lo largo de las fronteras norte y oeste, terminando en la fosa de lixiviación.

Muestreo de suelo superficial detectó 16 plaguicidas diferentes, incluyendo aldrín, dieldrín y toxafeno.

Reconocimiento del Lugar y Muestreo de Detección por la EPA (2001); la EPA realizó el muestreo de detección de suelo para evaluar las condiciones del Lugar en el 2001. Las actividades de mezcla de plaguicidas habían continuado en el área de la plataforma de carga, y el derrame se observó en toda la propiedad. Se observó vegetación estresada a lo largo de la de la vía entre la plataforma de carga y la zanja de drenaje.

El Lugar se añadió en la Lista de Prioridades Nacionales (NPL), el 30 de abril de 2003.

NATURALEZA Y ALCANCE DE LA CONTAMINACIÓN

La LAPR y Agro- Campos, las dos partes potencialmente responsables (PRP), firmaron Órdenes Administrativas de Consentimiento con la EPA en junio del 2005. Bajo las órdenes administrativas, los PRP acordaron realizar las investigaciones RI / FS para el Lugar. La mayor parte del trabajo de campo fue realizado por las PRP, bajo la supervisión de la EPA. Sin embargo, debido a dificultades financieras, las PRP no fueron capaces de completar el trabajo de RI / FS. Por lo tanto, la EPA asumió la responsabilidad de completar los informes de RI / FS a través de su consultor ambiental, CDM Smith. La EPA también asumirá la responsabilidad de completar bajo la OU-2 los RI / FS.

La naturaleza y el alcance de la contaminación se evaluaron mediante la comparación de los resultados analíticos de las muestras de suelo recogidas en el lugar a los criterios de detección en lugares específicos. Los criterios de evaluación son los valores utilizados en el RI para detectar de forma conservadora áreas potencialmente contaminadas.
Como parte del RI, se colectaron y analizaron 115 muestras de suelo para 21 plaguicidas y dioxinas / furanos. Para el RI también se analizó para otros constituyentes, incluyendo metales, compuestos orgánicos volátiles y compuestos orgánicos semivolátiles (SVOCs). Todos los contaminantes detectados fueron considerados en el proceso de evaluación de riesgos; Sin embargo, varios grupos de contaminantes no se consideraron relacionados al Lugar. Se detectaron metales en todas las muestras de suelo, pero a niveles que fueron consistentes con los niveles encontrados en los suelos circundantes.

Incluso arsénico, un metal que en el pasado se utilizó comúnmente en plaguicidas, fue encontrado en niveles que se encuentran comúnmente en los suelos nativos. Hidrocarburos aromáticos polinucleares (PAHs, por siglas en inglés) fueron encontrados en niveles elevados en un solo una muestra en el Lugar. Debido a que los PAHs se encuentran comúnmente en el asfalto, se concluyó en el RI que el asfalto era probablemente la fuente de la detección elevada en esta muestra.

El término dioxina comúnmente se refiere al compuesto en este grupo considerado más tóxico, tetraclorodibenzodioxina (TCDD). Entre las muchas formas diferentes de dioxinas y compuestos de furanos relacionados, la toxicidad puede abordarse teniendo en cuenta su toxicidad relativa a la TCDD. Debido a que las dioxinas / furanos se refieren a una amplia clase de compuestos que varían ampliamente en toxicidad, el concepto de equivalencia de toxicidad (TEQ, por sus siglas en inglés) se ha desarrollado para facilitar la evaluación de riesgos. Por favor, consulte el Estudio de Viabilidad del OU-1 para más información sobre las dioxinas.

Nueve plaguicidas, o sus productos derivados, y dioxinas / furanos fueron detectados en una o más muestras de suelo. Dioxinas / furanos se detectaron comúnmente en el suelo en todas las 115 muestras. Dieldrina fue el plaguicida de más amplia difusión y el más comúnmente detectado; se detectó en casi todas las muestras recogidas. La profundidad máxima en la que hubo una detección de dieldrina fue de 40 a 42 pies por debajo de la fosa de lixiviación. El toxafeno, un pesticida altamente tóxico, fue detectado en todas las 115 muestras; la profundidad máxima para una detección de toxafeno fue de 50 a 52 pies por debajo de la fosa de lixiviación. Por lo tanto, dioxinas / furanos en adición de dieldrín, toxafeno y una tercer plaguicida, aldrín, fueron identificados como los contaminantes primarios de preocupación potencial (COPCs, por sus siglas en ingles). También se detectaron en las muestras de suelo otros plaguicidas con menor frecuencia, y estos plaguicidas se llevaron consideraron en la evaluación de riesgos, como veremos a continuación.

Las principales áreas de suelos contaminados se encuentran en la antigua instalación y se asocian con el antiguo manejo y operaciones de mezcla de plaguicidas, y la ubicación de drenaje hacia la fosa de lixiviación en la porción norte de la instalación. Se encontraron plaguicidas más frecuentemente y en las más altas concentraciones en los suelos superficiales (dentro de los primeros dos pies de la superficie del suelo) y luego en menor concentración con el incremento de profundidad. Por ejemplo, la dieldrina fue detectada en una muestra en la fosa de lixiviación tan profundo como 47 pies por debajo de la superficie del suelo (BGS), pero la detección más profunda por encima del criterio de detección fue de 17 pies BGS.

Las zanjas de drenaje llevan la escorrentía de las instalaciones a las zonas norte y oeste de la instalación, en la propiedad donde se inició la construcción de viviendas y posteriormente fue abandonada. Estos suelos en las zanjas de drenaje que contenían plaguicidas fueron enterrados bajo una capa de material de relleno de un grosor de hasta 14 pies por encima del nivel de suelo. Subsecuentemente las muestras del material de relleno transportado no identificaron niveles elevados de contaminación (relacionado al Lugar o no), y no hay evidencia de que el relleno importado se haya mezclado con los suelos subyacentes en las zanjas de drenaje.

Las únicas estructuras que quedan en las instalaciones son los cimientos de los edificios de hormigón. Muestras tomadas de fragmentos de hormigón revelaron niveles elevados de plaguicidas encontrados en los cimientos de los edificios.

Los resultados de las muestras para Dioxinas / furanos fueron convertidos a TEQ para la comparación contra el criterio de detección para el TCDD. Se detectaron dioxinas en casi todas las muestras y superaron los TEQs para Dioxinas en 11 muestras. En 10 de las 11 muestras con resultados elevados fueron tomados en muestras de la superficie en las zonas de uso intensivo de plaguicidas cuando el almacén estaba activo. Dioxinas / furanos se encuentran comúnmente en asociación con plaguicidas. El incendio de 2003 en el almacén principal podría ser una fuente secundaria de este contaminante. Las superaciones de dioxinas se encuentran generalmente en zonas con superaciones de dieldrina, que es el contaminante más ampliamente distribuido.

Agua subterránea: Mientras que el agua subterránea se abordará más tarde en la OU-2 del RI / FS, con el fin de seleccionar un remedio para los suelos, la EPA evaluó el potencial de que la contaminación del suelo podría estar actuando como una fuente continua de contaminación del agua subterránea. En el 1992, el Servicio Geológico de Estados Unidos llevó a cabo una primera encuesta de calidad de las aguas subterráneas en la zona dentro del cuadrángulo de Manatí, Puerto Rico. Esta investigación consistió en la colección de muestras de agua subterránea de los pozos ubicados dentro de la zona, incluyendo el pozo ubicado en el Lugar Almacén Plaguicidas III. Los resultados analíticos de este esfuerzo de muestreo indicaron la presencia de toxafeno en el pozo a una concentración de 6 microgramos por litro (ug / L). El toxafeno no se detectó sobre el nivel mínimo de reporte (MRLs, por sus siglas en ingles) en los pozos situados inmediatamente pendientes arriba del pozo en el lugar. Dieldrina también se detectó en el pozo del Lugar a una concentración de 0.24 ug / L. La concentración de dieldrina fue significativamente por encima de las concentraciones detectadas en los pozos situados inmediatamente pendientes arriba del Lugar.

Mientras que las muestras de agua subterránea recogidas del pozo de suministro de agua del lugar (ahora abandonadas) aunque contenían niveles detectables de dieldrín y dioxinas / furanos, los niveles son relativamente bajos en un área que se espera que esté en la proximidad cercana a la contaminación del suelo, y se espera que sea más afectada si los suelos estaban actuando como una fuente de contaminación de las aguas subterráneas. Investigaciones adicionales se llevarán a cabo en la OU-2 RI / FS.

RESUMEN DE RIESGOS

El propósito de la evaluación del riesgo estándar es identificar riesgos cancerígenos potenciales y peligros a la salud no-cancerígenos en un lugar asumiendo que no se tome más ninguna acción remedial. Una evaluación de riesgo humano estándar se llevó a cabo en el Lugar para evaluar riesgos cancerígenos actuales y futuros y peligros de salud no cancerígenos basados en los resultados del RI.
Además, una Evaluación de Riesgo Ecológico por Detección se llevó a cabo también en el Lugar para evaluar el riesgo que se presenta a los receptores ecológicos debido a la contaminación relacionada con el Lugar.

Evaluación de Riesgos de Salud Humano

Como parte de los RI / FS, se llevó a cabo una evaluación inicial de riesgos de salud humana para estimar los riesgos y peligros asociados con los efectos actuales y futuros de los contaminantes sobre la salud humana y el medio ambiente. Una evaluación inicial de riesgos a la salud humana es un análisis de los posibles efectos adversos para la salud causados por la exposición de sustancias peligrosas en ausencia de cualquier acción para controlar o mitigar estas exposiciones en virtud de los usos actuales y futuros del terreno.

Una evaluación de cuatro pasos de riesgos a la salud humana fue usada para evaluar los riesgos de cáncer y peligros a la salud no cancerígenos. El proceso de cuatro pasos está compuesto por: Identificación de Peligro de los Químicos de Potencial Preocupación

(COPCs, por sus siglas en inglés), Evaluación de Exposición, Evaluación de Toxicidad y Caracterización de Riesgo.

La evaluación de referencia de los riesgos de salud humana comenzó seleccionando los COPCs en los suelos y en el subsuelo que pudieran causar efectos adversos a la salud en poblaciones expuestas. Los escenarios actuales y futuros de uso de la tierra incluyeron los siguientes medios de exposición y poblaciones:

- Trabajador del lugar (adulto): ingestión actual/futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo del PWIII e ingestión actual/futura, contacto dermal e inhalación de partículas del suelo y vapores para la superficie del suelo en la propiedad Adventista;
- Residentes (niño/adulto): ingestión futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie en el PWIII;
- Intrusos (adolescentes): ingestión actual/futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo en el PWIII y la propiedad Adventista;
- Trabajadores de la construcción (adulto): ingestión actual/futura, contacto dermal e inhalación de partículas del suelo y vapores para ambos la superficie del suelo (hasta una profundidad de 10 pies) y el subsuelo en el PWIII y la propiedad Adventista;
- Visitantes (niño/adulto): ingestión actual/futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo en la propiedad Adventista;
- Participantes de Campamento de Verano (niño 6-10 años de edad): ingestión futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo en la propiedad Adventista;
- Participantes de Cuido (niño 0-6 años de edad): ingestión futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo en la propiedad Adventista;
- Estudiantes: ingestión futura, contacto dermal e inhalación de partículas del suelo y vapores de la superficie del suelo en la propiedad Adventista;

En esta evaluación de riesgo a la salud humana, las concentraciones de los puntos de exposición fueron estimadas usando el máximo de concentración detectado de un contaminante o el 95% de límite de seguridad de la concentración promedio. Las ingestas diarias crónicas se calcularon basados en la exposición máxima razonable (RME, por sus siglas en inglés), el cual es la mayor exposición razonablemente anticipada que se espera que ocurra en el Lugar. El RME está diseñado para estimar un escenario conservador de exposición que esté aun en el rango de posibles exposiciones. Se desarrollaron además asunciones de exposición de tendencia central. Un resumen completo de todos los escenarios de exposición puede ser encontrado en el reporte de la evaluación de riesgos de salud del Lugar.

Suelo de la superficie

Los riesgos y peligros fueron evaluados para la exposición actual y futura al suelo de superficie. Las poblaciones de interés incluyeron trabajadores adultos del Lugar, niños y adultos residentes, intrusos adolescentes, trabajadores de la construcción adultos, adultos e infantiles visitantes, campistas de verano, niños de cuido y estudiantes. Los riesgos de cáncer para todas las poblaciones receptoras evaluadas en el PWIII para intrusos actuales y futuros se encuentran dentro de o por debajo del rango aceptable de riesgo de la EPA de 10^{-6} a 10^{-4}. Futuros trabajadores del Lugar y niños/adultos residentes resultaron sobre el rango aceptable de riesgo. Los índices de peligro (HI, por sus siglas en inglés) para todas las poblaciones de receptores evaluados fueron por encima del valor aceptable de la EPA de 1, aunque el HI para intrusos actuales como futuros, era sólo ligeramente por encima de 1. Los contaminantes primarios de preocupación (COPCs, por sus siglas en ingles) para la propiedad del PWIII son las dioxinas /furanos y el toxafeno.

Los riesgos de cáncer para todas las poblaciones de receptores evaluados en la propiedad Adventista estaban dentro o por debajo del rango aceptable de riesgo de la EPA de 10^{-6} a 10^{-4}. Los HI para todas las poblaciones de receptores evaluados estuvieron por debajo del valor aceptable de la EPA de 1. No hubo COPCs identificados para la superficie del suelo en la propiedad Adventista (Tabla 1).

Además, el contenido de plomo se evaluó en cada una de las propiedades y todas las concentraciones de plomo detectadas estaban por debajo del valor de detección de 400 microgramos por kilogramo (mg/kg) para la superficie del suelo para área residencial y para el valor de detección para la superficie del suelo de 800 mg/kg para área industrial.

Tabla 1. Resumen de riesgos asociados al suelo de superficie.

Receptor	Indice de Riesgo	Riesgo de Cancer
Propiedad PW* III		
Trabajador del lugar - futuro	2.9	$5.7{\times}10^{-4}$
Intruso – presente	1.4	6.3×10-5
Intruso – futuro	1.3	$5.5{\times}10^{-5}$
Residente adulto/niño – futuro	34.2	$5.8{\times}10^{-3}$
Propiedad Adventista		
Trabajador del lugar - presente	0.2	$3.0{\times}10^{-5}$
Trabajador del lugar - futuro	0.2	$3.1{\times}10^{-5}$
Visitante adulto – presente	0.04	$5.7{\times}10^{-6}$
Visitante niño – presente	0.4	$1.3{\times}10^{-5}$
Visitante adulto – futuro	0.05	$5.8{\times}10^{-6}$
Visitante niño – futuro	0.4	$1.3{\times}10^{-5}$
Participantes de Campamento de verano – futuro	0.1	$3.0{\times}10^{-6}$
Participantes de Cuido - futuro	1.0	$3.4{\times}10^{-5}$

Suelo de Superficie y Subsuelo

Los riesgos y peligros fueron evaluados para la exposición actual y futura al suelo de superficie y al subsuelo. La población de interés incluye a los trabajadores de la construcción adultos. Los riesgos de cáncer estaban por debajo o dentro de los rangos aceptables por la EPA. Los peligros no cancerígenos estaban por encima del valor aceptable de la EPA de 1 para la facilidad PWIII y por debajo del valor aceptable de la EPA de 1 para la propiedad Adventista.

Los COCs identificados en la superficie del suelo como en el subsuelo son dioxinas/furanos (Tabla 2). Además, las concentraciones de plomo estaban por debajo del valor de detección industrial de 800 mg/kg para suelos de superficie y subsuelo.

Tabla 2. Resumen de riesgos asociados al suelo de superficie y subsuelo.

Receptor	Indice de Riesgo	Riesgo de Cáncer
Propiedad PW* III		
Trabajador del lugar - futuro	4.0	$1.0{\times}10^{-5}$
Propiedad Adventista		
Trabajador del lugar - futuro	0.3	$1.5{\times}10^{-6}$

Evaluación de Riesgo Ecológico

Una Evaluación de Riesgo Ecológico (SLERA, por sus siglas en inglés) se llevó a cabo para evaluar el potencial de riesgos ecológicos de la presencia de contaminantes en el suelo de la superficie. La SLERA se enfocó en evaluar el potencial de impactos a receptores ecológicos sensibles de constituyentes de riesgo relacionados al lugar por medio de la exposición al suelo en la propiedad del PWIII. Las concentraciones fueron comparadas a los valores de revisión como un indicador del potencial para efectos adversos a receptores ecológicos. Un resumen completo de todos los escenarios de exposición puede encontrarse en el SLERA.

En base a una comparación de las concentraciones máximas de las sustancias químicas en el suelo del Lugar a los niveles de detección ecológica (ESLs, por sus siglas en inglés), los resultados del SLERA indican riesgo para los receptores ecológicos (invertebrados, reptiles, anfibios, aves y mamíferos). En específico, se calcularon HIs mayores de 1.0, lo que indica que existe riesgo potencial de exposición para las siguientes sustancias químicas:

Plaguicidas: 4,4-DDD, 4,4-DDE, 4,4-DDT, aldrín, alfa-clordano, beta-HCH, dieldrina, endosulfán I, endosulfán II, sulfato de endosulfán, endrina, endrina aldehído, gamma -chlordane, heptacloro, epóxido de heptacloro, metoxicloro, y toxafeno

SVOCs: benzo (a) antraceno, benzo (a) pireno, benzo (b) fluoranteno, benzo (g, h, i) perileno, benzo (k) fluoranteno, butilbencilftalato, criseno, dibenzo (a, h) antraceno, fluoranteno, indeno (1,2,3-cd) pireno, fenantreno y pireno

Inorgánicos: antimonio, arsénico, cadmio, cromo, cobalto, cobre, plomo, manganeso, mercurio, selenio, talio, vanadio y zinc

Dioxinas/furanos: dioxinas y furanos con base en el total de 2,3,7,8 tetraclorodibenzodioxina (TCDD) equivalentes tóxicos (TEQs por sus siglas en ingles)

Los riesgos potenciales a la exposición de las siguientes sustancias químicas no pueden ser cuantificados como ESLs por estos no estar disponibles:

Plaguicidas: cetona de endrina, diurón, y el paraquat

VOCs: ciclohexano y acetato de metilo

SVOCs: caprolactama, carbazol y dibenzofurano

Los resultados del SLERA indican riesgo para los receptores ecológicos a la exposición de los suelos del Lugar. Los resultados indicaron que los plaguicidas presentes en el Lugar son los causantes de riesgo primario, seguidos por dioxinas/furanos. PAHs y metales también fueron retenidos como conductores de riesgo; sin embargo, la inclusión de PAHs como productos químicos de potencial preocupación fue debido a los niveles elevados, identificados como valores atípicos, en una sola muestra, y porque las concentraciones de metales detectados fueron similares a los de las muestras de trasfondo.

OBJETIVOS DE ACCIÓN REMEDIAL

Los objetivos de acción remedial (RAOs, por sus siglas en inglés) son metas específicas para proteger la salud humana y el ambiente. Estos objetivos están basados en información disponible y estándares, tales como requisitos aplicables o relevante y apropiados (ARARs, por sus siglas en inglés), guías a ser consideradas (TBC, por sus siglas en inglés) y niveles basados en el lugar específico.

El objetivo del proceso de selección del remedio es seleccionar alternativas que sirvan para la protección a la salud humana y el medio ambiente, mantener la protección a través del tiempo, y reducir al mínimo los residuos sin tratar.

El uso del terreno actual y futuro utiliza para el Lugar son una consideración importante para el desarrollo de RAO y las metas preliminares de remediación para garantizar alternativas de remediación que protejan la salud humana y el medio ambiente. La condición final del Lugar después de la remediación debe ser considerada en la evaluación de usos o actividades futuras del terreno en relación con la protección de la salud humana que se proporciona.

Objetivos de Acción Remedial

Los RAO son medio específicos y fuente específicos que se logran a través de la determinación de un remedio que protege la salud humana y el medio ambiente. Estos objetivos se expresan normalmente en términos del contaminante, la concentración del mismo, y las vías de exposición y los receptores. Los RAO se desarrollan típicamente mediante la evaluación de varias fuentes de información, incluyendo los resultados de las evaluaciones de riesgos y ARARs identificados tentativamente. Estos elementos son la base para determinar si se logra la protección a la salud humana y el medio ambiente para una alternativa de remediación en particular.

Como parte de la evaluación del Lugar, la EPA evalúa si los materiales contaminados deben ser considerados como residuos de principal amenaza ya que pueden actuar como fuente de material a la contaminación de otros medios (por ejemplo, suelos contaminados que actúan como una fuente de contaminación del agua subterránea), o porque son altamente tóxicos. Por ejemplo, el suelo contaminado en el Lugar pudiera ser considerado material de origen, ya que actúa como una fuente para la exposición directa. Las concentraciones de contaminantes en el suelo fueron comparadas con los niveles de riesgo de 10^{-3} para trabajadores expuestos a plaguicidas y dioxinas/furanos. Los plaguicidas en muestras de suelo no se detectaron en concentraciones superiores a los niveles de 10^{-3} riesgos para los escenarios de residentes o trabajadores. Las concentraciones de Dioxinas / furanos tampoco se detectaron por encima del nivel de riesgo de 10-3 para el escenario de trabajadores.

Si bien las investigaciones de aguas subterráneas aún no se han completado, el impacto de los suelos contaminados en las aguas subterráneas también se consideró en el desarrollo de RAO. Suelos contaminados parecen tener poco impacto en las aguas subterráneas contaminadas.

A base a estos factores, los suelos contaminados en el Lugar no se consideran principalmente como amenaza de residuos peligrosos, sino más bien como una amenaza de bajo nivel.
Mientras que el uso de suelo en la zona es mezclado, la EPA ha consultado a las autoridades locales y la JCA, y se concluyó que el uso futuro de la tierra será sin restricciones (por ejemplo, residencial), ya sea para el almacén en sí o la propiedad norte donde existen las zanjas de drenaje enterradas.

Los siguientes RAO preliminarmente se enfocan en la protección de la salud humana para los escenarios de trabajadores futuros del Lugar y los trabajadores de la construcción:

1. Mitigar el potencial de exposiciones por inhalación e ingestión a los receptores humanos a plaguicidas y dioxinas/furanos de

suelos que sean peligrosos a la salud por cancerígeno y no cancerígenos que excedan el rango aceptable de riesgo de la EPA.

2. Reducir al mínimo la liberación de contaminantes de los suelos no saturados a las aguas subterráneas en concentraciones que pudieran exceder los objetivos de remediación de aguas subterráneas.

En base a el SLERA, un RAO ecológico para evitar el contacto directo con suelos superficiales por receptores ecológicos también serían apropiados; Sin embargo, la EPA ha concluido que al abordar los suelos superficiales para proteger la salud humana, el remedio también abordaría la exposición a los receptores ecológicos.

METAS PRELIMINARES DE REMEDIACIÓN

Para satisfacer los RAO, se desarrollaron las metas de remediación para ayudar a definir la extensión del suelo contaminado que requiere medidas correctivas. Las metas de remediación son típicamente medidas químico- específicas para cada uno de los medios y / o vía de exposición que se espera que sean de protección a la salud humana y al medio ambiente. En este caso, las metas de remediación de suelo se desarrollaron para atender los suelos como una amenaza al contacto directo, incluyendo suelos superficiales (dentro de los primeros dos pies de la superficie del suelo) y, para hacer frente a las exposiciones bajo el escenario de trabajador de la construcción, el subsuelo a una profundidad de 10 pies. Se derivan basado en la comparación con los ARARs, niveles basados en el riesgo, y las concentraciones de trasfondo, teniendo en cuenta también dado a otros requisitos como límites analíticos de detección, los valores de orientación, y otra información pertinente.

No se han promulgado ARARs quimico-especificos para suelos ya sean federales o del Estado Libre Asociado. Para satisfacer los RAO, las metas de remediación para riesgo de suelo se desarrollaron en base a un escenario de trabajador futuro para un objetivo de riesgo de cáncer para 10^{-6}, esperando que el uso futuro del Lugar, incluyendo la propiedad del norte, sea uso comercial / industrial y no sea utilizado como residencial (sin restricciones). Estas metas de remediación se implementarán hasta una profundidad de 10 pies por debajo de la superficie del terreno, para proteger los trabajadores de la construcción.

No se identificaron riesgos inaceptables para la propiedad de la Iglesia Adventista. Al abordar los suelos del Lugar hasta una profundidad de 10 pies, estos objetivos de remediación también serían de protección intrusos de las propiedades vecinas. Los objetivos de remediación se muestran en la Tabla 3.

Tabla 3
Metas de Remediación para Suelos (concentraciones en μg/kg)

Contaminantes de Interés	Metas de Remediación
Aldrin	101
Dieldrín	108
Toxafeno	1,600
Dioxin Equivalencia de	0.018

El SLERA identificó una serie de compuestos adicionales relacionados con el Lugar que superan los ESLs, lo que sugiere la posibilidad de impactos ecológicos. No se desarrollaron metas de remediación ecológica por separado debido a que las áreas de interés ecológico están colocadas con las áreas de contaminación del suelo de superficie que será tratada.

El impacto de los contaminantes de interés (COC, por sus siglas en inglés) para agua subterránea también se consideró en el desarrollo de las RAO. Como se señaló anteriormente, sólo hay evidencia limitada de la contaminación de las aguas subterráneas atribuibles al Lugar. No hay pruebas suficientes de que los suelos del Lugar están actuando al presente como una fuente continua de contaminación al agua subterránea. El nivel freático, se encuentra a más de 200 pies BGS, está separada de las áreas de contaminación de suelo por más de 150 pies de suelos no saturados (y no contaminados). Dado que la contaminación del suelo ha estado presente en el Lugar por un máximo de 60 años, hay poca evidencia de transporte de contaminantes a los suelos más profundos a través de la percolación de lluvia durante ese tiempo. Además, los plaguicidas y compuestos de furanos de dioxinas / que han sido identificados como los COC tienen muy baja solubilidad en el agua, se adhieren fuertemente a los suelos y, como consecuencia, no son muy móviles. Además los objetivos de remediación para la protección del agua subterránea también serían de protección de un escenario de contacto directo, la EPA ha determinado metas de remediación de suelos para el contacto directo son adecuadas para la protección del agua subterránea. Además, la mayor parte de la contaminación del suelo se encuentra dentro de los primeros 10 pies suelo por debajo de la superficie, con pocos casos que exceden estos objetivos de remediación a profundidades mayores de 10 pies; La EPA espera que, al abordar los suelos contaminados dentro de los primeros 10 pies, el remedio preferido abordaría los suelos como una amenaza potencial para el agua subterránea.

RESUMEN DE LAS ALTERNATIVAS REMEDIALES

La ley de CERCLA § 121 (b) (1), 42 U.S.C. § 9621 (b) (1), exige que las medidas correctivas sean de protección a la salud humana y el medio ambiente, sean costo efectivas, y utilicen soluciones permanentes y tecnologías alternativas de tratamiento y alternativas de recuperación de recursos en la mayor medida posible. La Sección 121 (b) (1) también establece una preferencia por las medidas remediales que emplean, como elemento principal, el tratamiento para reducir de forma permanente y significativamente el volumen, toxicidad, o la movilidad de las sustancias peligrosas, y contaminantes en un Lugar. CERCLA § 121 (d), 42 USC § 9621 (d), especifica además que una acción remedial debe alcanzar un nivel o un estándar de control en las sustancias peligrosas y contaminantes, que al menos alcance los ARARs bajo las leyes federales y estatales, a menos que una dimisión puede justificarse en virtud de CERCLA § 121 (d) (4), 42 USC § 9621 (d) (4).

Los plazos que se presentan a continuación para cada alternativa sólo reflejan el tiempo necesario para construir o implementar el remedio y no incluyen el tiempo requerido para diseñar el remedio, negociar de haber partes potencialmente responsables, o procurar contratos para el diseño y construcción.

Los estimados de gastos, que se basan en la información disponible, son estimaciones de orden de magnitud de costos de ingeniería que se espera que estén dentro de +50 a -30 por ciento del costo real del proyecto.

Elementos comunes

Evaluación de cada Cinco Años

Las alternativas que resultan de contaminantes por encima de los niveles que permiten el uso ilimitado y la exposición ilimitada requieren que el Lugar sea evaluado al menos una vez cada cinco años. Si lo justifica la revisión, medidas correctivas adicionales pueden ser consideradas para eliminar, tratar o contener la contaminación.

Controles Institucionales

Controles Institucionales (CI) son controles no diseñados como medidas administrativas y / o legales que minimizan la posibilidad de exposición humana a la contaminación mediante la limitación de uso de la tierra o los recursos. En este caso, los ICs serían utilizados en conjunción con medidas de control activos, tales como la limitación o la excavación y el tratamiento de suelos contaminados, para evitar el contacto directo. Diferentes ICs serían aplicables a diferentes alternativas, como se discute a continuación.

EPA Región 2 Política de Eficiencia Energética (Clean and Green Policy)

Los beneficios ambientales del remedio preferido pueden mejorarse tomando en consideración, durante el diseño, las tecnologías y prácticas que sean sostenibles, de acuerdo con la Política Energética de la EPA en la Región 2. Esto incluirá la consideración de tecnologías y prácticas de remediación verdes. Algunos ejemplos de prácticas que serían aplicables son las que reducen las emisiones de contaminantes al aire, minimizar el consumo de agua potable, incorporar vegetación nativa en los planes de revegetación, y considerar la reutilización y / o reciclaje de materiales beneficiosos, entre otros.

En base a la evaluación de alternativas desarrolladas para el FS, varias alternativas (FS Alternativas S2, S3 y S4) no se utilizaron para el Plan Propuesto. Por favor, consulte el informe de FS para más información sobre estas alternativas.

Las siguientes alternativas se consideran en este Plan Propuesto:

Alternativas de Remediación para Suelos

Alternativa S1: No requiere Acción

Costo Capital Total	$ 0
Costo de Operación y Mantenimiento	$ 0
Total del Valor Neto Presente	$ 0
Tiempo Estimado de Construcción	0 meses
Tiempo Estimado para lograr RAOs	0 años

La Alternativa S1 de “no acción” es requerida por el NCP para proporcionar una base de comparación ambiental cuyo impacto puede ser comparado con otras alternativas remediales. Ninguna acción de remediación o remoción iniciara en el Lugar para abordar los suelos contaminados por encima de los PRGs o de otra manera mitigar los riesgos asociados a la salud humana por la exposición a suelos contaminados por encima de los PRGs.

Alternativa S5: Excavación de Suelos Contaminados hasta 10 pies bgs, Tratamiento en el Lugar y Disposición fuera del Lugar, Cubierta

del restante subsuelo contaminado, Controles Institucionales y Monitoreo

Costo Capital Total	$ 4,377,000
Costo de Operación y Mantenimiento	$ 6,000
Total del Valor Neto Presente	$ 4,450,000
Tiempo Estimado de Construcción	1 año
Tiempo Estimado para lograr RAOs	1 año

Bajo esta alternativa, el suelo contaminado en concentraciones mayores del PRGs hasta 10 pies BGS sería excavado y dispuesto fuera del Lugar. Áreas excavadas serían cubiertas con relleno limpio.

En áreas de la propiedad norte, donde se añadió relleno de ingeniería, el relleno, que no está contaminado, se excavará, almacenará, y luego se rellenará en las áreas excavadas después de retirar el suelo contaminada. El suelo contaminado excavado que contiene residuos caracterizados como peligrosos bajo RCRA serán almacenados en el Lugar y tratados térmicamente ex-situ (es decir, el material se excava y se trata en el lugar) antes de su disposición en un vertedero RCRA Subtítulo D en la isla.

La alternativa S5 ofrece protección a la salud humana a través de la excavación, tratamiento del suelo y disposición fuera de las instalaciones y la colocación de una cubierta de suelo limpio sobre el suelo contaminado restante para reducir la exposición a los contaminantes.

En los lugares donde aún las concentraciones de contaminantes excedan las metas de remediación a profundidades mayores de 10 pies, una capa de marcador (por ejemplo, una malla de alambre obvia o barrera de plástico permeable) se instalará como una advertencia de que la excavación por debajo en este lugar presenta una posible exposición a suelos contaminados. El área total a cubrir en la Alternativa S5 es de aproximadamente 2,800 pies cuadrados.

Relleno limpio y la cubierta vegetal se utilizaran para reemplazar el terreno eliminado por la excavación, devolviendo el área a su elevación y la calificación original. La cobertura del suelo se mezclará en las áreas de relleno de ingeniería existentes en la propiedad del norte. Después de la capa superior del suelo ha sido reemplazado, el área se sembrará para establecer una cubierta vegetal y restaurar la zona.

Las estructuras existentes y losas de hormigón serían demolidas para permitir la excavación y colocación de la cubierta.

El volumen total específico de suelo contaminado por excavar bajo esta alternativa es de aproximadamente 8,800 yardas cúbicas (CY, por sus siglas en inglés). Se estima que 3,500 CY de suelo contaminado que contenga residuos caracterizados como peligrosos bajo RCRA serán almacenados en el Lugar y tratados térmicamente ex-situ antes de su disposición en un vertedero RCRA Subtítulo D en la isla. Las 5,300 CY restante serían considerados no peligroso y podrán disponerse en un vertedero RCRA Subtítulo D en la isla sin tratamiento.

La desorción térmica ex situ utiliza la extracción con calor y vacío para movilizar y eliminar los contaminantes del suelo. El tratamiento del suelo se emplea para tratar los suelos contaminados a niveles que permitan su eliminación en un vertedero RCRA Subtítulo D. (También se consideró la colocación de los suelos tratados en el Lugar, sin embargo, la combinación de tratamiento en el Lugar y disposición fuera del Lugar fue más rentable.) Los pozos de calentamiento de conducción térmica (TCH por sus siglas en inglés) serían colocados en un patrón de rejilla dentro del montículo de suelo. Los pozos TCH calientan el suelo a la temperatura deseada, medida por los termopares colocados por todo el montículo. A la temperatura objetivo, la presión de vapor del contaminante y la difusividad aumentan, y su viscosidad disminuye. Como resultado, la velocidad de evaporación y la movilidad del contaminante se incrementa y los contaminantes y el agua contenida en el suelo se vaporizan. Pozos de extracción de vapor de suelo son instalados en el montículo de suelo para eliminar el vapor del suelo. El gas y el agua extraída son tratados a través de sistemas de tratamiento de líquidos y vapores.

Un programa de inspección y mantenimiento a largo plazo podría será desarrollado para asegurar que la cobertura de suelo proporcione una protección continua a la salud humana. Las inspecciones pueden ser programadas anualmente. Dado a que la cubierta es de 10 pies, poco mantenimiento será necesario.

Alternativa S6: Consolidación en el Lugar con Cubierta Multicapa “Engineered Cover”, Controles Institucionales y Monitoreo

Costo Capital Total	$ 1,762,000
Costo de Operación y Mantenimiento	$ 6,000
Total del Valor Neto Presente	$ 1,840,000

Tiempo Estimado de Construcción	1 año
Tiempo Estimado para lograr RAOs	1 año

Alternativa S6 ofrece protección de la salud humana a través de controles institucionales (controles administrativos y de acceso), junto con las medidas remediativas (excavación, consolidación, cubierta multicapas de geosintéticos y cubierta vegetal en la construcción) para limitar la exposición a los contaminantes. Bajo esta alternativa, todos los suelos contaminados en concentraciones mayores de las metas de remediación fuera de los límites de la zona de consolidación se excavaran para la consolidación y la cubierta. El área de consolidación se establecerá en la antigua facilidad del almacén de plaguicidas.

Como la Alternativa S5, el relleno compactado sería eliminado y amontonado para permitir la excavación del suelo contaminado que se encuentra debajo. Las áreas excavadas serán rellenadas con relleno limpio. El relleno compactado sería reemplazado en las áreas de las que se eliminó. Se estima que 3,500 CY de relleno compactado se excavará y se sustituirá en la Alternativa S6. El volumen total de suelo contaminado que se excavará y consolidará en el Lugar en la Alternativa S6 es de aproximadamente 3,500 CY.

Las estructuras existentes y las losas de hormigón en el Lugar serán demolidas y removidas para permitir la construcción de la zona de consolidación. Una cubierta de geosintéticos multicapa se construiría sobre el material consolidado para mitigar los riesgos inaceptables de exposición a seres humanos. La cubierta resultaría en una reducción en la infiltración de agua de la superficie (reduciendo la movilidad de la contaminación subyacente), pero el propósito principal de la cubierta sería la de evitar el contacto directo. La composición del material de cubierta sería seleccionado durante el diseño remedial, pero sería típicamente de aproximadamente 1.5 a 2 pies de espesor. La extensión estimada para el área de consolidación en la Alternativa S6 es de aproximadamente 50,700 pies cuadrados.

Un programa de inspección y mantenimiento a largo plazo podría será desarrollado para asegurar que la cubierta de suelo proporcione una protección continua a la salud humana. Las inspecciones pueden ser programadas anualmente y después de cada evento de tormenta severa. Las inspecciones monitorearan la vegetación, la erosión y los daños por animales. Si se observa erosión o daños a la cubierta del suelo, se tomarían medidas para reparar el daño y mantener la integridad de la cobertura del suelo.

Alternativa S7: La excavación del suelo contaminado, Tratamiento y Disposición fuera del Lugar

Costo Capital Total	$ 28,035,000
Costo de Operación y Mantenimiento	$ 0
Total del Valor Neto Presente	$ 28,040,000
Tiempo Estimado de Construcción	1 año
Tiempo Estimado para lograr RAOs	1 año

La alternativa S7 ofrece protección a la salud humana a través de la excavación y disposición fuera del Lugar de suelos contaminados que exceden los objetivos de remediación para limitar la exposición a los contaminantes. Si bien la hipótesis de exposición considerada en la evaluación de riesgo a la salud humana indican que el tratamiento de los suelos hasta una profundidad de 10 pies BGS sería protectora, esta S7 Alternativa evaluó si una excavación más profunda permitiría una medida preventiva que ofrezca mayor protección a largo plazo y la permanencia que una excavación hasta 10 pies. La alternativa S7 abordaría suelos contaminados por encima de los objetivos de remediación a una profundidad de aproximadamente 20 pies. Varias detecciones aisladas en suelos más profundos de 20 pies se dejarían en el Lugar bajo esta alternativa.

Al igual que con la Alternativa S5, áreas excavadas se rellenarán con relleno limpio, y el relleno de ingeniería de la propiedad norte serían removido y almacenado para permitir la excavación del suelo contaminado que se encuentra debajo. Áreas excavadas serán rellenadas con relleno limpio. El relleno de ingeniería sería reemplazado en las áreas de las que se eliminó.

El volumen total de suelo contaminado por excavar bajo la Alternativa S7 es de aproximadamente 11,600 CY. Se estima que 4,500 CY del material excavado contenga niveles de contaminantes que requieran tratamiento y su disposición como material peligroso bajo RCRA requiera sea transportado a una facilidad RCRA Subtitulo C en Estados Unidos. Las 7,100 CY restantes serían dispuestas como materiales no peligrosos en un vertedero RCRA Subtítulo D de la isla.

Relleno limpio y cubierta superficial se utilizaran para reemplazar el material excavado, devolver el área a su elevación y calificación original. La cobertura del suelo superficial se mezclará con las áreas de relleno compactado existente. Después de que la capa de suelo superficial sea instalada, el área se sembrará para establecer una cubierta vegetal tanto para restaurar la zona y porque las raíces de las plantas mantienen el suelo en su lugar, como para la prevención de erosión y transporte fuera del Lugar por escorrentía superficial o viento.

Alternativa S8: Excavación de Suelos Contaminados, Tratamiento en el Lugar y Disposición fuera del Lugar

Costo Capital Total	$ 5,664,000
Costo de Operación y Mantenimiento	$ 0
Total del Valor Neto Presente	$ 5,660,000
Tiempo Estimado de Construcción	1 año
Tiempo Estimado para lograr RAOs	1 año

La Alternativa S8 es similar a la Alternativa S7 , con la excepción de que se excavará el suelo contaminado considerado bajo RCRA como material peligroso sea almacenado en el Lugar y tratado térmicamente para ser "descaracterizado" antes de su disposición a un vertedero RCRA Subtítulo D de la isla.

El volumen total de suelo contaminado por excavar bajo la Alternativa S8 es de aproximadamente 11,600 CY. Se estima que 4,500 CY del material excavado contenga niveles de contaminantes que requieran tratamiento antes de su eliminación en un vertedero RCRA Subtítulo D de la isla.

Alternativa S9: In Situ térmica

Costo Capital Total	$ 6,383,000
Costo de Operación y Mantenimiento	$ 0
Total del Valor Neto Presente	$ 6,380,000
Tiempo Estimado de Construcción	1 año
Tiempo Estimado para lograr RAOs	1 año

La Alternativa S9 consistiría en llevar a cabo el tratamiento térmico in situ en suelos subterráneos. El tratamiento térmico in situ se llevará a cabo principalmente en áreas con concentraciones de contaminantes mayores a las metas de remediación. El volumen total de suelo contaminado a tratar en la Alternativa S9 es de aproximadamente 11,600 CY (el mismo volumen a ser excavado bajo las alternativas S7 y S8).

La remediación térmica in situ es similar en muchos aspectos a la remediación térmica ex situ. En lugar de excavar el material primero, en el tratamiento térmico in situ se calentaría el subsuelo en su lugar. El suelo permanece en su lugar.

El tratamiento in- situ requiere la remoción de estructuras y cimientos de hormigón remanentes. El hormigón contaminado sería transportado fuera del Lugar para su disposición.

Las condiciones del lugar juegan un papel importante en la elección del método apropiado para la remediación térmica in situ. El método de remediación térmica para llevar adelante el análisis de detección sería determinado después de la discusión con los proveedores de la tecnología.

Considerando que sólo se necesitaría tratamiento térmico ex-situ para permitir la disposición fuera de las instalaciones en un vertedero RCRA Subtítulo D, se necesitaría el tratamiento in situ para lograr los objetivos de remediación. Debido a la incertidumbre sobre la efectividad del tratamiento in-situ, en particular para las dioxinas, donde el objetivo de remediación es muy baja, la Alternativa S9 puede necesitar ser aumentada con material de cobertura similar a la Alternativa S6, para lograr protección. Esta contingencia no fue incluida en los costos para la Alternativa S9.

EVALUACIÓN DE ALTERNATIVAS CORRECTIVAS

Se utilizan nueve criterios para evaluar las diferentes alternativas de remediación individualmente y uno contra el otro a fin de seleccionar un remedio. Esta sección del Plan Propuesto perfila el rendimiento relativo de cada alternativa contra los nueve criterios, teniendo en cuenta cómo se compara con las otras opciones consideradas. A continuación se analizan los nueve criterios de evaluación. Un análisis detallado de las alternativas se puede encontrar en el FS.

Un análisis comparativo de estas alternativas basadas en los criterios de evaluación mencionados anteriormente se presenta a continuación.

Protección General de Salud Humana y el Medio Ambiente

De las seis alternativas retenidas, sólo la alternativa de no acción (es decir, Alternativa S1) dejaría de brindar protección a la salud humana (futuro trabajador) y no abordaría los RAO para suelos contaminados.

Alternativas S5, S6, S7, S8 y S9 serían de protección a la salud humana y al medio ambiente y alcanzarían los RAO. La Alternativa S5 logra los RAO a través de la excavación de suelos contaminados que exceden las metas de remediación hasta una profundidad de 10 pies, tratamiento del suelo excavado, según sea necesario, y el mantenimiento de suelos residuales más profundos por debajo de 10 pies del material de cubierta. Alternativa S6 logra los RAO a través de la consolidación y contención (cubierta) de suelo contaminado. La cubierta proporcionaría una barrera que rompería la vía de exposición a los receptores humanos.

Las Alternativas S7 y S8 lograrán los RAO a través de la excavación, el tratamiento según sea necesario, y disposición fuera del Lugar de suelos contaminados que excedan las metas de remediación hasta una profundidad de aproximadamente 20 pies. La Alternativa S9 lograría los RAO a través de remediación térmica in situ de suelos contaminados que superen los objetivos de remediación.

El cumplimiento de los requisitos aplicables o relevantes y apropiados (ARARs)

La Alternativa S1 no lograría los objetivos de remediación ya que no se tomarían medidas remediativas para eliminar y / o tratar el suelo contaminado. Las alternativas restantes, Alternativas S5 hasta S9, lograrían los objetivos de remediación por la eliminación, contención, o el tratamiento de suelos contaminados. Las Alternativas S5 a S9 se implementarían para cumplir con los ARARs específicos para este lugar.

Efectividad a Largo Plazo y la Permanencia

La Alternativa S1 no proporciona efectividad y permanencia a largo plazo, ya que no se toman medidas correctivas. La Alternativa S5 incluye excavación de suelos contaminados que excedan las metas de remediación hasta una profundidad de 10 pies, cubriendo suelos residuales más profundos. Debido al espesor del material de cubierta y el área relativamente pequeña de la contaminación del suelo residual, la probabilidad de fallo remedio (a través de fracaso de la cubierta 10 pies para permanecer en su lugar) se considera remota, y se espera que esta alternativa ofrezca un alto grado de efectividad y permanencia a largo plazo.

La Alternativa S6 ofrece una protección mediante la prevención de la exposición humana a la tierra contaminada a través de una cubierta de ingeniería. Sin embargo, la contaminación del suelo se deja en su lugar relativamente cerca de la superficie del suelo, y la alternativa requeriría el más alto grado de mantenimiento a largo plazo para garantizar su protección.

Bajo las Alternativas S7 y S8, se lograrían efectividad y permanencia a largo plazo por la excavación y disposición fuera del Lugar, ya sea en el Lugar o fuera de las instalaciones de tratamiento que sea necesario. Debido a que estas alternativas abordarían suelos contaminados hasta una profundidad de 20 pies por debajo de la superficie, dejando sólo áreas relativamente pequeñas, discretas que excedan las metas de remediación más profundas de 20 pies, estas alternativas ofrecen algún grado marginal de eficacia a largo plazo y permanencia sobre la alternativa S5; sin embargo, al abordar los suelos dentro de los primeros 10 pies, la Alternativa S5 atiende de manera integral las vías de exposición identificadas en la evaluación de riesgo a la salud humana, y los 10 pies de cubierta proporciona una amplia protección contra el fracaso del remedio.

La Alternativa S9 utiliza un tratamiento de remediación térmica in situ y ofrecería un nivel similar de efectividad y permanencia a largo plazo que las Alternativas S7 y S8.

Los Controles Institucionales (CI) se aplicarían a todas las alternativas activas para proteger las cubiertas, así como para restringir futuros usos del terreno y proporcionar conciencia sobre los riesgos a la exposición con suelos contaminados por encima de los niveles específicos al lugar. La Alternativa S6 (y, potencialmente, la Alternativa S9, como se explica en implementación, a continuación) se basaría más en gran medida a los CI, ya que la probabilidad de exposición humana a la contaminación restante cerca de la superficie sería mayor que el de las otras alternativas.

Reducción de la Toxicidad, Movilidad o Volumen por Medio de Tratamiento

La Alternativa S1 no proporcionará una reducción de la toxicidad, movilidad, o volumen a través del tratamiento ya que el tratamiento no es un componente de esta alternativa.

La Alternativa S6 no satisface la preferencia legal para el tratamiento como elemento principal de las medidas correctivas, ya que no se realizaría activamente ningún remedio. La alternativa S6 reduciría la movilidad de los contaminantes a través de la nivelación del terreno.

Las Alternativas S5, S8 y S9 incluyen el tratamiento térmico in-sitio en el suelo contaminado y por lo tanto todos cumplirán bajo este criterio. Bajo la Alternativa S7, los residuos peligrosos caracterizados bajo RCRA serían empacados y enviados a los Estados Unidos para tratamiento (supone que la incineración) y disposición. Si bien esta alternativa incluye el tratamiento antes de su disposición, la ley de CERCLA en general respalda tratamiento in-situ sobre tratamiento fuera del sitio bajo este criterio.

Efectividad a Corto Plazo

La alternativa S1 no plantea riesgos a corto plazo a la comunidad, y no habría impactos ambientales adversos; sin embargo, la protección en un plazo razonable no se lograría bajo esta alternativa.

Las Alternativas S5, S6, S7 y S8 implicarían perturbación superficial del suelo contaminado y el transporte de suelo limpio para el relleno y / o construcción de cubiertas. Las Alternativas S5, S7 y S8 incluirían el transporte de suelo contaminación excavado para su eliminación fuera del Lugar. A diferencia de las Alternativas S6 y S7, las Alternativas S5, S8 y S9 requerirían la instalación de líneas eléctricas y el uso de alta energía, lo que podría suponer impactos adicionales a corto plazo a la comunidad.

La Alternativa S9 requiere preparación de la superficie, incluyendo una capa temporal sobre el área de tratamiento térmico. El suelo contaminado no se excavará o transportará en la Alternativa S9 ni tampoco esta alternativa requeriría camiones de transporte para traer relleno limpio, reduciendo los impactos a corto plazo a la comunidad. El uso de camiones aun será necesario para remover hormigón y mejoras para otras superficies para dar paso al proceso de tratamiento térmico.

Implementación

La Alternativa S1 no tiene ninguna otra medida que no sea una revisión del Lugar cada cinco años. Dado que no se han tomado medidas correctivas, esta alternativa sería la más fácil de implementar, tanto técnica como administrativamente.

La Alternativa S6 utiliza técnicas estándar de construcción, prácticas y materiales para la construcción de la cubierta, la gestión no requeriría el manejo de residuos caracterizados como peligrosos bajo RCRA, y no requeriría la instalación y operación de un sistema de tratamiento. Sería, sin embargo, la alternativa que requeriría más supervisión y mantenimiento a largo plazo, porque se basa exclusivamente en la viabilidad del material de cubierta para proporcionar protección.

La alternativa S9 requeriría la instalación de una serie de pozos de extracción de vapor y térmicos. Además, sería necesaria la movilización de equipos de remediación térmica y el sistema de tratamiento tendría altas demandas de energía, lo que requiere que la corriente sea conectada al Lugar. Sin embargo, a diferencia de las alternativas S5 y S8, el suelo contaminado no sería excavado.

Las Alternativas S5 y S8 requerirían la movilización de un sistema de tratamiento de remediación térmica a Puerto Rico. Estas alternativas podrían incluir la excavación, el almacenamiento y tratamiento de residuos peligrosos, y la disposición de suelo tratado y suelo contaminado clasificado como no peligroso en un vertedero RCRA Subtítulo D.

Alternativas S5 y S8 tendrían problemas de aplicabilidad similares a la Alternativa S9 con respecto a las necesidades de energía y la disponibilidad de equipos de tratamiento portátiles necesarios en la isla. La alternativa S9 se considera menos realizable por el nivel de tratamiento requerido para alcanzar las metas de remediación para el Lugar, y hay una cierta incertidumbre en cuanto a si el tratamiento in- situ puede alcanzar la meta de remediación para dioxinas. La alternativa S9 sería capaz de reducir sustancialmente las concentraciones residuales de plaguicidas y dioxinas, pero puede requerir un cierto nivel de cubierta, similar a la Alternativa S6, si no se pueden cumplir los objetivos de remediación.

La Alternativa S7 incluiría la excavación y eliminación del suelo contaminado no peligrosos en un vertedero Subtítulo D. El suelo contaminado caracterizado como residuo peligroso bajo RCRA característico sería almacenado y enviado para el tratamiento y disposición de residuos peligrosos a los Estados Unidos. Este envío requeriría una amplia planificación para garantizar un transporte seguro y eficaz para los Estados Unidos. La construcción puede ser retrasada por la disponibilidad de los contenedores para la carga de los residuos peligrosos.

Costo

El valor actual de todas las alternativas fue evaluado para un periodo de 30 años.

Alternativa para Suelo	Costo Capital	Costo Presente O&M	Total del Valor Neto Presente
S1	0	0	0
S5	$4,377,000	$6,000	$4,450,000
S6	$1,762,000	$6,000	$1,840,000
S7	$28,035,000	0	$28,040,000
S8	$5,664,000	0	$5,660,000
S9	$6,383,000	0	$6,380,000

Los costos de la alternativa S7 son impactados por los costos de envío a Estados Unidos de residuos caracterizados bajo RCRA. Tenga en cuenta que la Alternativa S9 no incluye los costos de cubierta, como se discute en otra parte de este Plan Propuesto.

Estado Libre Asociado/ Aceptación de Agencia de Apoyo

La JCA está de acuerdo con el remedio preferido en este Plan Propuesto.

Aceptación de la Comunidad

La aceptación de la comunidad del remedio preferido será evaluada después de que termine el periodo público de comentarios y se describa en la sección Resumen de Respuesta del ROD para este Lugar. El ROD es el documento que formaliza la selección de un remedio para un Lugar.

REMEDIO PREFERIDO

La Alternativa preferida de la EPA es la alternativa S5, la excavación del suelo contaminado hasta una profundidad de 10 pies por debajo de la superficie; en el lugar de tratamiento, según sea necesario, seguido de la eliminación fuera del Lugar; revestimiento de suelos residuales más profundos; controles institucionales; y monitoreo. El remedio preferido sería tratar el suelo caracterizado como residuo peligroso bajo RCRA utilizando un tratamiento térmico, utilizando una unidad de tratamiento temporal traído al Lugar. Debido a que los suelos por debajo de 10 pies quedarían cubiertos pero a niveles que no permitirían (es decir, residencial) sin restricciones, los controles institucionales limitar el uso futuro del terreno en el Lugar para usos no residenciales. El costo estimado valor presente de la alternativa preferida es $ 4,450,000.

Este remedio también incluye controles institucionales que restringirán el uso futuro del terreno en el Lugar, y monitoreo cada cinco años para asegurar la protección a largo plazo del recurso.

Bases Para Preferencia Remedio

Las alternativas preferidas se entiende proporcionan el mejor equilibrio de las compensaciones entre las alternativas basadas en la información disponible a la EPA en este momento. La EPA y la JCA creen que el remedio preferido sería el tratamiento de las amenazas principales, ya sea de protección de la salud humana y el medio ambiente, siga ARARs, sea rentable y utilice soluciones permanentes y tecnologías de tratamiento alternativas o tecnologías de recuperación de recursos en la mayor medida posible. El remedio preferido también debe satisfacer la preferencia legal para el uso del tratamiento como elemento principal. La alternativa preferida puede cambiar en respuesta a los comentarios del público y nueva información.

Los beneficios ambientales del remedio preferido pueden ser potenciados por la consideración, durante el diseño, de tecnologías y prácticas que sean sostenibles, de acuerdo con la Política Energética Verde de la EPA Región 2. Esto incluiría la consideración de tecnologías y prácticas de remediación verdes.

La EPA y NJDEP esperan que la alternativa preferida pueda satisfacer los siguientes requisitos reglamentarios de la sección de CERCLA 121 (b): 1) ser de protección de la salud humana y el medio ambiente;
2) cumplir con ARARs; 3) ser rentable; 4) utilizar soluciones permanentes y tecnologías de tratamiento alternativas o tecnologías de recuperación de recursos a la medida posible; y 5) satisfacer la preferencia por el tratamiento como elemento principal. La EPA evaluará la modificación de criterios de aceptación de la comunidad en el ROD al cierre del período de comentarios públicos.

.

APPENDIX V

PUBLIC MEETING ATTENDANCE SHEET

Pesticide Warehouse III

Public Meeting – August 18, 2015 6 to 9 p.m.

Name	Address	Phone	Email
Carlos Villam[illegible]	EC waste	787-552-4444 939-969-4878	cvillanueva@ecwaste.com
Gilda Irizarry	Clean Harbors Caribe	787-413-1943	irizarry.gilda@cleanharbors.com
Jose C. Agnelot	EMTEC Consulting	787-792-8902	JCAgnelot@EMTECPR.com
Gabriel Gracia	Induchem Services	787-620-8787	ggracia@induchemservices.net
Jack L. Foster	INDUCHEM SERVICES INC.	7875677222 620 8787	jfoster@INDUCHEMSERVICES.NET
Benigno Ayala	Veolia/Resourcing The world	787-392-7320 787-392-7311	benny.ayala@veolia.com ~~veolia@~~
Jose Reyes	[redacted]		
[illegible]	ICC	787-2210436	ccalderon@iccorppr.com
[illegible]	[redacted]		
Salvador Rosario	Vecino	787-245-9949	[illegible]
William Garzila Ali	[redacted]		

Pesticide Warehouse III

Public Meeting – August 18, 2015 6 to 9 p.m.

Name	Address	Phone	Email
Ramón Vázquez Montañez	(b) (6) [redacted]		

APPENDIX VI

TRANSCRIPT OF THE PUBLIC MEETING

[CERTIFIED TRANSLATION]

PUBLIC MEETING
PESTICIDES WAREHOUSE III
SUPERFUND SITE (OU-1)
MANATÍ, PUERTO RICO

Date: August 18, 2015
Time: 6:00pm
Place: Manatí Municipal Library

Brenda Reyes: Good evening, my name is Brenda Reyes, Public Affairs Officer, Environmental Protection Agency, Caribbean Office. This evening we are presenting the proposed plan for the Pesticides III case located here in Manatí. I am accompanied today by my colleague Luis Santos, the project manager; Henry Guzmán, the attorney for Region 2, New York; Chuck Nace, the risk assessor; and my CDM colleagues, Frances (Frances Delano), Mike (Michael Valentino), Susan (Susan Schofield), and José (José Reyes), the EPA contractors for this case. Also with us is Daniel Rodríguez, a colleague, and another project manager, he is in charge of the Vieques case; and we now have a new case in Corozal which we will also be working on. So, without any further ado, I will leave you with Luis Santos. Luis will make a brief presentation, at the end of which you may ask him any questions you may have.

Luis Santos: Thank you Brenda. Good evening, my name is Luis Santos. I am the Superfund Site project manager, for the Pesticides Warehouse III Superfund Program, Operational Unit I: Soils, and I represent the Environmental Protection Agency. Brenda has already introduced us, and since there are so few of us, I would like all those who were not introduced to state their name, and who they work for, so you become familiar with them.

Carlos Calderón: Good afternoon, my name is Carlos Calderón I work for the Industrial Chemical Corporation.

Luis Santos: Thank you.

José Carlos Agrelot: My name is José Carlos Agrelot I work for Ertech Consulting; I am a consultant for part of the Pesticide Warehouse III project.

Luis Santos: Thank you.

Carlos Villanueva: Carlos Villanueva, I represent EC Waste.

Luis Santos: Thank you.

Gilda Irizarry: Gilda Irizarry I represent Clean Harbors Caribe.

Luis Santos: Thank you.

Benigno Ayala: Good afternoon to all, I represent Veolia Environmental Services.

Luis Santos: Thank you.

Jack Foster: Good evening, my name is Jack Foster and I represent Induchem Services, we are a chemical and mechanical cleaning company.

Luis Santos: Thank you.

Gabriel Gracia: Good evening, Gabriel Gracia, Induchem Services.

Luis Santos: Ok, let us now talk in detail about the Project. Ok, the Project has several objectives. The principal objective will be to define the nature, extent, and sources of soil contamination. Note there is an operational unit, water, that we will not be working with during this process. We will assess the risk to human health and the environment. This map here shows the site with respect to the island of Puerto Rico. *(See slide number 3 of the presentation: Site map)*. Ok. In what part of the process are we? *(See slide number 4 of the presentation: Superfund Process)* Ok. The site was identified, a first assessment was carried out, it was included in the national priorities list, a site investigation was carried out, a human risk assessment was performed, it was included in the national priorities list, and it was subsequently included in the national priorities list, it is an NPL Site, a remedial investigation feasibility study was performed, which is what we are seeing in the picture below. The star shows where we are. A Proposed Plan was prepared through a Record of Decision that must be completed by September 30 of this fiscal year. The next step will be to design the remedy and the remedial action, followed by operation and maintenance, depending on the case.

The study area *(see slide number 5 of the presentation: Study Areas)*, we are in the haystack mountains to the north of the island. The closest neighbors are the Adventist Academy …or Adventist school…the Adventist church, whose headquarters are located there. There is a Christian school including all levels from preschool to fourth year of high school and we have the mechanical repair shop. The section in red defines the location of the site. This part we see here is where a development was begun, land filling was performed to level the area, but the project, basically, was never completed and the fill left in place with the infrastructure component, pipes, for water supply, sewer, but that has been there…that was in 2006, it has been practically six years and we believe that for the time being nothing will be done there preventing us from having closer neighbors. Ok. All the contaminants were studied. These included metals, volatile organic compounds, and semi-volatile organic compounds, practically everything. (*See slide number 6 of the presentation: Contaminants.)* The only results found above the standard were for pesticides, that would be aldrin, dieldrin and toxaphene. Dioxin is not a pesticide, but it can be a byproduct of some pesticides. Ok. We had already seen the neighboring facilities Ok, where are we? *(See slide number 7 of the presentation: Risks)* There is no risk in the Adventist facilities. It passed, once we received the results, we performed an ecological and human risk assessment, but there is none, so we don’t have to worry about that. In the Christian school, preschool to high school, there are no risks, so we don’t need to invest time there. The mechanical repair shop was sampled through the cement slab and the paved slab in front and there is no risk. Where is the risk to be found? In the Pesticides Warehouse, which consists of two acres more or less; there is risk inside the fenced area and in the northwestern section which is the part I had previously mentioned where a development was begun and was never completed. It is this section here in the chart *(see slide number 8 of the presentation: Sampling Network).* The Adventist facilities, the school, and the repair shops, that is the area with risk, and we have risk here too, but the risk has been filled over, it is almost 8 to 12 feet underground. Ok. We see here, we said it was aldrin, dieldrin and toxaphene, plus the dioxins *(see slide number 9 of the presentation: Pesticide Detection).* Here we are taking the contaminant as indicator. Wherever there is dieldrin you will find the others. When I clean up for dieldrin, I clean up for all the others. So I am using dieldrin as indicator for the remedy. Here we see the principal marks, both the red area and the paved area, which have been filled. Here in the church area, it is found under the pavement, so it is not exposed, and the sampling was performed here where it borders with the school, to see if we found a hit or danger, in which case I would move to the school, but since I didn't find anything I stayed in the border areas. The alternatives were assessed *(see slide number 10 of the presentation: Alternatives Assessed for Remediation).* More detail regarding the alternatives may be found in the documents you all have in English and Spanish, the official document is the English version. The document in Spanish is an information sheet. Alternative 1 is No Action, which always has to be assessed; alternatives 2, 3 and 4 do not meet project and cleaning objectives. Alternative 5 is the correct and preferred alternative. I also have alternatives 6, 7, 8 and 9 that meet the objectives, they were considered, but EPA believes that the most feasible alternative, the one that meets all criteria, is alternative number 5. *(See slide number 11 of the presentation).* This alternative consists of excavating the contaminated areas to a depth of 10 feet. These 10 feet of material will be stored in the facility, the site will be cleaned, and toxicity will be reduced such that the material can be disposed of in a non-hazardous industrial landfill. The top cover that was removed will be replaced, because anything above a depth of 10 feet is contaminated. That is those 10 feet of fill will cover the material below; I will touch nothing below the ten feet, I will leave it as is. This would require institutional controls, and it would have to be monitored every 5 years. The important thing here is that we are not using the same…S3...we are using the zoning…the zoning in place there, that is we have not altered the zoning in any way. The current zoning is S3 agricultural industrial, and the remedy we are implementing is for agricultural industrial. The only thing that will not be met is that S3 allows residences and we must explain to the Planning Department that such residential permit cannot be allowed; but the S3 zoning classification will be maintained. This is basically the presentation. This is me *(see slide number 12 of the presentation)*. The Environmental Quality Board agrees with the remedy or the alternative being proposed by EPA.

Now we can go to the questions. I am available to answer any questions. This person here is my risk assessor, who will help us as necessary.

Gabriel Gracia: Santos…

Frances Delano: Please ask your questions here using the microphone, for the record.

Widy Figueroa: And please identify yourself.

Gabriel Gracia: Santos… Gabriel Gracia from Induchem Services. What is the contingency plan? Because S6, 5…

Luis Santos: S3

Gabriel Gracia: No the one to be used is S5

Frances Delano: The alternative.

Gabriel Gracia: Yes, the alternative.

Luis Santos: Right, 5, 5, ok.

Gabriel Gracia: That is basically soil removal, that is, they use the same soil as fill.

Luis Santos: No, the soil will be set aside; it will be treated, and disposed of in a non-hazardous industrial landfill.

Gabriel Gracia: It is a closed area, what I worry about is…you have soil contamination, when it rains you will have liquid too.

Luis Santos: Ok. During the design process, which is the next phase, there we will explore this alternative, and all institutional controls will be implemented to comply with, to safeguard the health of the neighborhood, and make sure we don't spread the contamination off site. In addition, during the design phase we may explore other feasible on-site treatment alternatives. Because the idea is to treat the soil removed on-site, to reduce contamination and then be able to dispose of it off-site, we are not disposing of it on-site. Among other things we could…the alternative could be to verify during the design process if we can use it and leave it there. But there is a lot of uncertainty regarding this, and what the alternative proposes is to treat it-on site and dispose of it off-site.

Gabriel Gracia: Thank you.

José Carlos Agrelot: Good afternoon. From the point of view… As you have just mentioned only those 10 feet will be removed; and that at some point it will be either refilled with the same material, which has been cleaned or refilled…

Luis Santos: Well the alternative proposed states that it will be refilled with clean, new soil…so far.

José Carlos Agrelot: Whatever is underneath these 10 feet will keep that cover. Will it impact the groundwaters in any way? Has any modeling or prevention been done regarding that?

Luis Santos: Ok. The groundwater part, we will be working with this in operational unit 2. The evidence we have so far is that the contamination as it is now, subject to water movement, or land movements, has not gone deeper than 50 feet. And we have the water table which is at 250. That is, that right now we don't expect there will be contamination of what is there right now. And after implementing this remedy, well the contamination is less likely to migrate.

José Carlos Agrelot: Ok, thank you.

Benigno Ayala: Good afternoon again, Benigno Ayala, of Veolia Environmental. The factor...Perhaps it is stipulated here, but I have not checked it completely. How much time do you, as agency, estimate you will need to do the work?

Luis Santos: Ok. This will be done in stages; the Record of Decision is set for September 30. Once the Record of Decision is ready, we will proceed with the proposal design, and there is another plan, the implementation of the proposal. Based on our experience in other places, I believe that the second document should be ready in 18 months. And once it is designed and the work has begun, the work should be completed in 12 months; so we are talking of 2 years.

Carlos Villanueva: Carlos Villanueva of EC Waste. When you say 2 years, is this the time to complete the project, or do you mean you will begin the Project in 2 years?

Luis Santos: Two years for planning…one and one half years for planning, that is 18 months… once the design is completed and the implementation that will take 12 months. So we are talking of 24 and 24… 36, almost 3 years.

Carlos Villanueva: Thank you.

Luis Santos: Well we will be here all night until nine in the evening, if anybody want to continue talking one on one, well we can continue talking. Thank you.

For the record, session was closed. All the persons present remained in the room discussing the subject. At 7:00pm several persons who identified themselves as area residents arrived and they had several questions. Their authorization was requested to tape their question for the record. Upon approval the record was opened and their questions were answered.

Below the conversation:

Salvador Rosario: My name is Salvador Rosario and I ask the following question for the record. I understand that based on what the representative has stated here, the contamination is apparently under the fill cover placed there; if this is the case I believe it will continue to seep down and at some point, perhaps not so soon, but it will reach the aquifers. That is my question, will it or will it not reach the aquifers? Because if it reaches the aquifers it will harm us as a people and as a city.

Luis Santos: Well in the area…This Project has been divided into two operational units. Operational unit number one, which is the one we are presenting this evening, will work only and exclusively with the contaminated soils. We have already begun to work with the groundwater and we hope to see some results in the coming year. We will have an answer to that, whether these aquifers have been contaminated by the material detected in the area, the pesticides, the Pesticides III.

Salvador Rosario: We know, I do in particular, that in the past the remnants of these chemical products were disposed on…without giving it any thought…on the pavement, and occasionally, they were buried in 55 gallon drums. Possibly if we were to excavate the area we would find, perhaps, the remains of those drums, whatever may be left, because logically, after many years they must have deteriorated, but there were many products. And according to the statistics, just one drop of oil is capable of contaminating up to 35,000 gallons of water. So that, given that here we are talking about many gallons of this product, my concern is the same, the aquifers; to take the relevant actions, as soon as possible, to see if this contamination can be contained, which will affect us significantly as a people.

Luis Santos: The soil area has been defined, we have several mitigation alternatives to ensure the contamination does not continue to seep more. We are now in the process of working on operational unit number two, which is groundwater to define if there is any contamination, and whether the contamination migrated to the groundwater. So far there is no evidence of that from the well in the property; the samples taken in the well have shown no trace of pesticides. But anyway, the groundwater study will be extended to the whole area and we should be able to answer that question in at least, in no more than one year.

Salvador Rosario: Well, I understand you have been working with this problem for several years. As a resident of the area, well, every time I see the mobile temporary facilities you set up, the movement, and it is no wonder that we are worried. I have several properties near there, I have an apartment building, and as a Christian, well, I am worried about the health of the persons who may rent an apartment, a house there, and this good friend of mine, his house is there and his parents and that is why we came here.

Luis Santos: As regards the soil, we understand you should be fine, because we have already determined that the soil contamination did not spread out from the land belonging to the Puerto Rico Land Authority. As regards groundwater you are served by the aqueduct and sewer authority and the PRASA wells, and the water is not from this area. Therefore any contamination from that source is collected by PRASA and we will be working with that. But the water you use is not contaminated, because it comes from another place.

Salvador Rosario: From another aquifer? A Little further up from the area we are discussing, and pointing to the document, a little further up there is a well that is already contaminated.

Luis Santos: Well right now we have…5 wells have been installed, and of these 5 wells, we are setting up a network to monitor at least 18, taking all those in the zone, to include them in a network to be sampled two different times to obtain results. But, right now it is somewhat early for me to give you any results. Yes, I can give you the number of wells to be sampled in the design, but right now they have not been sampled.

Salvador Rosario: Very good, very good…I am satisfied with the conversation; we hope God grants you the capacity and the wisdom to continue.

Luis Santos: In a year's time, I hope this year, by this time next year, we may be making the presentation regarding the groundwater part to complete this loop.

Salvador Rosario: Very good, I am satisfied, thank you.

Frances Delano: Do you have a question?

William González Alicea: Well, my only question is that, since I arrived a Little late, I would like to know...

Frances Delano: Your name please.

William González Alicea: William González Alicea, the owner of González Auto Repair located on Rd 670 kilometer 3.3 in Manatí. The question is…I heard part of what the gentleman just said here…I wanted to know what the monitoring had revealed; because I was one of the persons working there in security during the time *Ertec* had the wells, the company that had them. I provided them the power and water so they could be there, and I also provided security service. From what I have heard I believe there is no contamination and we will see.

Luis Santos: Regarding what was presented today, in the soils part, both in the shop area and the school area, as well as the Adventist property are contamination-free. All the contamination is concentrated in just two acres which are, which were part of the shops or warehouses belonging to the Land Authority.

William González Alicea: All right, thank you. I am very satisfied with what you have just stated.

Salvador Rosario: I have one question, that does not necessarily have to be for the record, but I will ask it. The land that began to be developed in this same area, is the development supposed to be closed, regarding the development, for this reason or not?

Luis Santos: I, myself, don't know right now what the status of those residences is, I know they were approved and the developer for all practical purposes stopped construction. Regarding any intention to develop the area, well the agency is aware, and would enter into conversations with them to make sure that whatever they may do there will not alter in any way the remedy we propose to carry out in the area.

Salvador Rosario: Thank you, I too am satisfied.

Ramón Vázquez Martínez: There is still one year of research to go?

Luis Santos: For the groundwater. Not for the soils, we know what is on the soils, and we have the alternative, and we will be working on the design phase to proceed with the implementation.

In terms of the soil, all the work has been completed and we are in the process of deciding and making the final decision to begin with the design and implementation phase. Regarding the groundwater we still have some work to do to define the magnitude and concentration, if the groundwater is contaminated.

Salvador Rosario: Ok, understood.

Widy Figueroa: Could you please give us your name?

Ramón Vázquez Martínez: Ramón Vázquez Martínez, also a resident of the area.

Luis Santos: Thank you.

Salvador Rosario: Thank you, you are very kind.

Luis Santos: I am sorry you could not be here at 6.

CERTIFICADO DE TRADUCCIÓN AL INGLÉS	**CERTIFICATE OF TRANSLATION INTO ENGLISH**
VISTA PÚBLICA: MANATÍ	**PUBLIC HEARING: MANATI**
Yo, Mercedes Solís, traductora profesional y miembro de la *American Translators Association*, por la presente certifico que a mi mejor entender el documento anterior es una traducción fiel y exacta al inglés del texto en español, realizada a petición de la parte interesada.	I, Mercedes Solís, professional translator and member of the American Translators Association, hereby certify that, to the best of my knowledge and abilities, the foregoing is a faithful rendering into English of the Spanish text, made at the request of interested party.
En San Juan, Puerto, hoy 3 de septiembre de 2015.	In San Juan, Puerto Rico, today, September 3, 2015.
Mercedes Solís	Mercedes Solís
Mercedes Solís ATABEX TRANSLATION SPECIALISTS P.O. Box 195044, San Juan, PR 00919-5044 20219	Mercedes Solís ATABEX TRANSLATION SPECIALISTS P.O. Box 195044, San Juan, PR 00919-5044 20219

REUNIÓN PÚBLICA MANATÍ
ALMACÉN DE PLAGUICIDAS III
LUGAR DE SUPERFONDO
MANATÍ, PUERTO RICO

Fecha: 18 de agosto de 2015
Hora: 6:00pm
Lugar: Biblioteca Municipal de Manatí

Brenda Reyes: Buenas noches, mi nombre es Brenda Reyes, oficial de Asuntos Públicos de la Agencia Federal de Protección Ambiental, Oficina del Caribe. En la noche de hoy estamos presentando el plan propuesto para el caso de Plaguicidas III, Almacén de Plaguicidas III, ubicado aquí en Manatí. Conmigo se encuentran hoy mi compañero Luis Santos, que es el gerente de proyecto, Henry Guzmán, que es el abogado, que pertenece a la Región 2 de Nueva York, está Chuck Nace, que es el asesor de riesgo y los compañeros de CDM, Frances (Frances Delano), Mike (Michael Valentino), Susan (Susan Schofield), y José (José Reyes) que son los contratistas que EPA tiene para este caso. También está Daniel Rodríguez mi compañero de trabajo, otro gerente de proyecto, él tiene el caso de Vieques y ahora tenemos uno nuevo en Corozal que vamos a estar trabajando. Así que sin más preámbulos les voy a dejar aquí con Luis Santos. Luis va a hacer una breve presentación. Al final cualquier duda o pregunta se dirigen con el compañero.

Luis Santos: Gracias Brenda. Buenas noches, mi nombre es Luis Santos. Yo soy el gerente de proyecto del Superfund Site, del Programa Superfondo Pesticidas Warehose III, Unidad Operacional I: Suelos, y represento a la Agencia Federal de Protección Ambiental. Ya Brenda nos presentó, y como somos tan poquitos a mí me gustaría que aquellos que no fueron presentados dijeran su nombre y a quién pertenecen para entrar en familia.

Carlos Calderón: Buenas tardes mi nombre es Carlos Calderón de Industrial Chemical Corporation.

Luis Santos: Gracias

José Carlos Agrelot: Mi nombre es José Carlos Agrelot de Ertech Consulting, consultor de parte del proyecto de esta Pesticide Warehouse III.

Luis Santos: Gracias

Carlos Villanueva: Carlos Villanueva, represento a EC Waste.

Luis Santos: Gracias

Gilda Irizarry: Gilda Irizarry represento a Clean Harbors Caribe.

Luis Santos: Gracias

Benigno Ayala: Buenas tardes a todos, represento a la Compañía Veolia Enviromental Services.

Luis Santos: Muchas gracias

Jack Foster: Buenas noches, mi nombre es Jack Foster y represento a Induchem Services, somos una compañía de limpieza química y mecánica.

Luis Santos: Gracias

Gabriel Gracia: Buenas noches, Gabriel Gracia, Induchem Services

Luis Santos: Ok, vamos a entrar en detalle con el proyecto. Ok, el enfoque del proyecto tiene varios objetivos. El objetivo primordial va a ser definir la naturaleza, el alcance y las fuentes de contaminación en el suelo, entendiendo que hay una unidad operacional que es agua, que no vamos a estarla trabajando en este proceso. Vamos a evaluar el riesgo a la salud humana y al ambiente. Aquí este mapa nos localiza dónde está el lugar versus la isla de Puerto Rico *(ver diapositiva número 3 de la presentación: Mapa de localización)*. Ok, ¿En qué parte del proceso estamos? *(ver diapositiva número 4 de la presentación: Proceso superfondo)* Ok. Se descubrió el lugar, se hizo un primer "assessment", se entró en la lista nacional de prioridad, se hizo un "site investigation", se hizo un riesgo humano, entró en la lista nacional de prioridad, y posteriormente entró a la lista nacional de prioridad, es un NPL Site, y se hizo un "remedial investigation feasibility study", que es lo que estamos viendo en el cuadro de abajo. La estrella nos dice dónde estamos. Se hizo un "Proposed Plan", vía a un Record de Decisión que debe ser completado para septiembre 30 de este año fiscal. Luego vendrá el diseño del remedio, y la acción remedial, y luego vendrá operación y mantenimiento, dependiendo, según sea el caso.

El área de estudio *(ver diapositiva número 5 de la presentación: Áreas de Estudio)*, estamos en los mogotes de la parte norte de la isla. Los vecinos más circundantes son la Academia Adventista… o la escuela adventista… la Iglesia Adventista, que tiene sus oficinas centrales allí. Tenemos aquí una escuela cristiana de todos los niveles de preescolar hasta cuarto año y tenemos el taller de mecánica. La parte roja nos define dónde está el Lugar. Esta parte que vemos aquí, es un lugar donde se intentó hacer un desarrollo, se llegaron a hacer unos rellenos para nivelar la zona, pero básicamente el proyecto no completó y se quedó el proceso de relleno, y la parte de infraestructura de tubería, de suministros de agua, de alcantarillado pero eso lleva ya…eso fue para el 2006, que prácticamente lleva seis años y ya entendemos que no va a haber nada por el momento que nos impida tener vecinos más cerca. Ok. Se estudiaron todos los contaminantes. Aquí estamos hablando de metales, de orgánicos volátiles, orgánicos semi-volátiles, prácticamente todo (*ver diapositiva número 6 de la presentación: Contaminantes.)* Lo único que dio resultados sobre los estándares fueron los plaguicidas, que serían aldrin, dieldrin y toxafeno. La dioxina no es un plaguicida pero puede ser un producto secundario de algunos de los plaguicidas. Ok. Ya habíamos visto las facilidades vecinas. Ok, ¿dónde estamos? *(ver diapositiva número 7 de la presentación: Riesgos)* En la facilidad adventista no hay riesgo. Ya pasó, una vez tenemos los resultados la pasamos por análisis de riesgo, tanto ecológico como humano, no hay riesgo, o sea que ahí no tenemos que preocuparnos. En el colegio cristiano, que es desde preescolar hasta los grados superiores, no hay riesgos, por lo tanto no tenemos que invertir allí tiempo. El taller de mecánica se muestreo a través de la losa de cemento, y en la losa de al frente de pavimento y no hay riesgo. ¿Dónde hay riesgo? En el Almacén de Plaguicidas, que son dos acres más o menos, hay riesgo dentro del área verjada y en el área noroeste, que es la parte que yo había mencionado que se intentó hacer un desarrollo y ese desarrollo no culminó. Aquí lo vemos en gráfica *(ver diapositiva número 8 de la presentación: Red de Muestreo).* La facilidad adventista, la escuela, el taller, donde tenemos el riesgo, y tenemos riesgo aquí también, pero el riesgo está bajo relleno, a casi de 8 a 12 pies de profundidad. Ok. Aquí vemos, dijimos que era aldrin, dieldrin y toxafeno, más las dioxinas *(ver* *diapositiva número 9 de la presentación: Detección de Plaguicidas).* Aquí estamos tomando como el contaminante que es el indicador. Donde quiera que hay dieldrin hay los demás. Si yo limpio para dieldrin, limpio para todos. Por lo tanto estoy tomando dieldrin como el indicador para el remedio. Y aquí vemos donde se dan las marcas más predominantes, tanto en el área roja, como en el área pavimentada, que está de relleno. Aquí en el área de la iglesia, esto está bajo el pavimento, o sea que no está expuesto, y los muestreos se hicieron aquí en el borde de la escuela, buscando que si se encontraba algún lugar "hit" o peligroso, entonces me movía a la escuela, como no encontré nada entonces me quedé en el borde. Las alternativas que se evaluaron *(ver diapositiva número 10 de la presentación: Alternativas Evaluadas para Remediación).* Las alternativa para más detalles las pueden conseguir en los documentos que todos tienen en inglés y en español, el documento oficial es el de inglés. El documento en español es una hoja informativa. La alternativa 1 es la No Acción, que hay que evaluarla siempre, la alternativa 2, 3 y 4 no cumplen con los objetivos del proyecto y de la limpieza. La alternativa 5 es la correcta, es la preferida. Tengo la alternativa 6, 7, 8 y 9 que cumplen con los objetivos, fueron consideradas pero realmente la que EPA entiende que es la más factible, la que cumple con todo es la alternativa número 5. *(Ver diapositiva número 11 de la presentación).* La alternativa consta de en las áreas dónde hay la contaminación bajar, excavar 10 pies de profundidad. Esos 10 pies de profundidad se van a almacenar dentro de la facilidad, se van a limpiar en sitio para bajar la toxicidad de tal manera que puedan ser dispuestos en un vertedero industrial no peligroso. Se reemplazaría la cubierta que ya antes se removió porque sobre 10 pies de profundidad sigue habiendo contaminación. Lo que pasa es que estos diez pies van a lapidar esto otro que está abajo, de diez pies en adelante no he movido nada, lo dejé quieto. Esto tendría unos controles institucionales y habría que hacer unos monitoreos de cada 5 años. Aquí lo importante es que nosotros no estamos utilizando el mismo...S3...aquí estamos utilizando la zonificación…la zonificación que está allí, o sea no hemos alterado en nada la zonificación. La zonificación dice que es S3 agrícola industrial, y estamos haciendo el remedio para agrícola industrial. Lo único que no va a poder cumplir es que la S3 dice que podría haber una residencia y hay que hablar con el Departamento de Planificación para dejar saber que no se le puede dar permiso para construir una residencia. Pero se mantiene la zonificación S3. Básicamente esta es la presentación. Este soy yo *(ver diapositiva número 12 de la presentación)*. La Junta de Calidad Ambiental está de acuerdo con el remedio o con la alternativa que está proponiendo la EPA.

Y ya estamos para las preguntas. Estoy disponible para preguntas, respuestas. Aquí está mi asesor de riesgo que nos va a ayudar en caso de que fuera necesario.

Gabriel Gracia: Santos…

Frances Delano: Las preguntas acá en el micrófono, por favor, para record.

Widy Figueroa: Y se identifica por favor.

Gabriel Gracia: Santos… Gabriel Gracia de Induchem Services. ¿Cuál es el plan de contingencia? Porque S6, 5…

Luis Santos: S3

Gabriel Gracia: No, la que van a utilizar es S5

Frances Delano: La alternativa

Gabriel Gracia: Sí la alternativa.

Luis Santos: Ah, la 5, la 5, ok.

Gabriel Gracia: Eso es básicamente es remoción de terreno, o sea, que utilizan el mismo terreno de relleno.

Luis Santos: No, el terreno se va a poner en una paila, se va a tratar y ese terreno se va a disponer en un vertedero industrial no peligroso.

Gabriel Gracia: Es un área cerrada, mi preocupación persé es…tienes contaminación de terreno, en tiempo de lluvia vas a tener líquido también.

Luis Santos: Ok. Durante el proceso de diseño que es la fase que nos queda ahora, ahí se va a explorar esa alternativa y se van a poner todos los controles institucionales en el proceso para cumplir, para salvaguardar la salud del vecindario y que no saquemos la contaminación fuera del Lugar. Además de eso, durante el proceso de diseño podríamos explorar alguna otra alternativa que fuera factible para tratamiento en sitio. Porque la idea es tratar en sitio ese terreno que voy a remover, tratarlo allí, bajarle la contaminación y poderlo disponer fuera, no voy a disponer dentro. Entre otras cosas podríamos…la alternativa podría estar en el proceso de diseño de verificar si lo podemos utilizar y volverlo a tener allí. Pero eso realmente, todavía eso es mucha incertidumbre, y lo que está planteado es lo que se dice en la alternativa, tratarlo en sitio y disposición fuera.

Gabriel Gracia: Gracias

José Carlos Agrelot: Buenas tardes. Desde el punto de vista… Esos 10 pies nada mas que se van a remover, como tú mencionaste horita, y que en algún momento o se reponen con el mismo material ya limpio o se rellena…

Luis Santos: Bueno la alternativa dice que se va a rellenar con terreno limpio, nuevo…hasta ahora.

José Carlos Agrelot: Lo que queda ya debajo de esos 10 pies se va a quedar con esa capa. ¿Va a tener algún impacto con el agua subterránea? ¿Si se hizo algún tipo de modelaje o prevención con relación a eso?

Luis Santos: Ok. La parte de agua subterránea la vamos a estar trabajando en la unidad operacional 2. La evidencia que tenemos hasta el momento es que la contaminación así como está, sujeto a los movimientos de agua, a los movimientos de terreno, lo más que ha bajado no ha llegado a 50 pies. Y tenemos el *water table* que está a 250. O sea que ahora mismo no esperamos que haya contaminación de lo que hay ahora allí. Y luego de poner este remedio pues menos contaminación debe migrar.

José Carlos Agrelot: Ok, gracias.

Benigno Ayala: Buenas tardes nuevamente, Benigno Ayala, de Veolia Environmental. El factor...Quizás esté aquí estipulado pero no lo he ojeado en su totalidad. El tiempo estimado que ustedes proyectan como agencia para hacer el trabajo ¿cuánto es?

Luis Santos: Ok. Esto va por etapa para septiembre 30 tenemos el Record de Decisión. Una vez tenemos el Record de Decisión tenemos que entrar al diseño de la propuesta y hay otro plan que es la implementación de la propuesta. En base a otros lugares yo entiendo que debo tener el segundo documento para 18 meses. Y una vez ya diseñado y empezado a trabajar debe estar en 12 meses completado los trabajos, o sea que estamos hablando de 2 años.

Carlos Villanueva: Carlos Villanueva de EC Waste. Cuando usted se refiere a 2 años, ¿eso es que en dos años van a terminar el proyecto o que en dos años van a comenzar el proyecto?

Luis Santos: Dos años de planificación…un año y medio de planificación, que son 18 meses… una vez el diseño esté… y la implementación es lo que duraría 12 meses. O sea que estamos hablando de 24 y 24… 36, casi 3 años.

Carlos Villanueva: Gracias

Luis Santos: Pues vamos a seguir nosotros aquí toda la tarde hasta las nueve de la noche, cualquier persona que queramos uno a uno pues seguimos hablando. Muchas gracias.

Se cerró sesión para efectos de record. Todos los presentes se mantuvieron en el salón dialogando sobre el tema. A las 7:00pm llegaron varias personas que se identificaron como residentes del área y tenían varias preguntas. Se les solicitó autorización para grabar sus preguntas para efectos de record. Estando ellos de acuerdo se abrió record y se les contestaron sus preguntas.

A continuación la conversación:

Salvador Rosario: Mi nombre es Salvador Rosario y para efectos de record hago la siguiente pregunta. Entiendo que en base a lo que indica aquí el representante, que la contaminación aparentemente está bajo la capa de relleno que fue arrojado allí, ante esa situación, yo considero que va a seguir bajando y en algún momento dado, quizás no tan pronto, pero va a llegar a los acuíferos. Esa es mi pregunta ¿si va a los acuíferos o no va a los acuíferos? Porque de ir a los acuíferos nos va a perjudicar como pueblo, como ciudad.

Luis Santos: Bueno en el área…Este proyecto ha sido dividido en dos unidades operacionales. La unidad operacional número uno, que es la que estamos presentando esta noche, va a trabajar sólo y exclusivamente terreno contaminado. El área subterránea ya la empezamos a trabajar y esperamos tener resultados para este año que entra ahora. Esa respuesta la vamos a tener, si estos acuíferos han sido contaminados por el material que hay detectado ya en área de pesticida, de Plaguicidas III.

Salvador Rosario: Nos consta a nosotros, a este servidor en específico que en el pasado los sobrantes de estos productos químicos los arrojaban sin ninguna consideración hacia el pavimento, y en ocasiones, inclusive, los enterraban en drones de 55 galones. Posiblemente si fuéramos a socavar el área encontraríamos, quizás, huellas de esos drones de lo que pueda quedar, porque lógicamente después de muchos años pues deben estar deteriorados, pero era mucha la cantidad de productos. Y, de acuerdo a estadísticas, una sola gota de aceite tiene la capacidad de contaminar hasta 35,000 galones de agua. Así que si aquí estamos hablando de muchísimos galones de este producto, mi preocupación sigue siendo la misma, los acuíferos, que se tomen las acciones pertinentes lo más rápido posible para ver si de alguna forma se puede detener esa contaminación que nos va a afectar grandemente como pueblo.

Luis Santos: Ya definido el área de suelo, ya tenemos unas alternativas para poder mitigar y que esta contaminación no siga bajando. Ahora estamos en el proceso de trabajar la unidad operacional número dos que es agua subterránea y definir si hay alguna contaminación y si migró algo a las aguas subterráneas. Hasta el momento no tenemos evidencia con el pozo que hay en la propiedad, las muestras del pozo de la propiedad no arrojaron ningún rastro de pesticida, de plaguicida. Pero de todos modos el estudio de agua subterránea va a ser extendido a toda la zona y podremos contestar esa pregunta por lo menos a no más tardar de un año más.

Salvador Rosario: Bien, yo entiendo que llevan varios años trabajando con esta problemática. Al ser vecino de por allí pues cada vez veo las facilidades móviles provisionales que ustedes montan allí, el movimiento, y no es para menos que nos cause preocupación. Yo allí tengo varias propiedades cercanas, tengo un edificio de apartamentos allí, y como cristiano al fin pues me preocupa la salud de quienes puedan ir allí a rentar un apartamento, una vivienda, y este distinguido amigo pues tiene allí su residencia y sus padres y por eso nos hemos dado a la tarea de estar aquí.

Luis Santos: Desde el punto de vista de terreno, entendemos que ustedes deben estar tranquilos, porque ya definimos que la contaminación del terreno no salió de la propiedad que era propiedad de la autoridad de tierras. Desde el punto de vista de agua subterránea ustedes se sirven de acueductos, y acueductos, los pozos de acueductos, no son de esa zona. Por lo tanto cualquier contaminación que pueda haber, que venga de esa fuente, la recoge acueductos y la vamos a estar trabajando. Pero el agua que ustedes se sirven no está contaminada porque viene de otro lugar.

Salvador Rosario: ¿De otro acuífero? Más arribita de donde estamos hablando y señalando en el documento, un poquitito más arriba hay un pozo que ya está contaminado.

Luis Santos: Bueno ahora mismo nosotros tenemos…hay 5 pozos que se han instalado, y de esos 5 pozos vamos a hacer una red de monitorear por lo menos 18 de los cuales vamos a sacar todos los de la zona para incluirlos en una red que se va a muestrear en dos ocasiones diferentes para poder tener resultados. Pero en este momento es un poco prematuro yo decirte los resultados. Sí te puedo decir el número de pozos que se van a muestrear en el diseño, pero en este momento no se han muestreado.

Salvador Rosario: Muy bien, muy bien…Satisfecho con el dialogo, esperamos que Dios les dé capacidad y sabiduría para que puedan seguir.

Luis Santos: Ya en un año, yo espero que para este año, para esta época el año que viene, pueda estarle presentando la parte de agua subterránea para completar este *loop.*

Salvador Rosario: Muy bien. Satisfecho, muchas gracias.

Frances Delano: ¿Usted tiene preguntas?

William González Alicea: Bueno la única pregunta que yo tengo es que como llegué un poquito tarde quería saber...

Frances Delano: Su nombre por favor

William González Alicea: William González Alicea, el dueño del taller González Auto Repair que se encuentra en la carretera 670 kilómetro 3.3 en Manatí. La pregunta es…yo oí parte de lo que el compañero acaba de decir aquí…quería saber cómo estaba la situación del chequeo, porque yo fui uno de los que estuve trabajando allí en la seguridad por los pozos el tiempo que la tuvieron *Ertec,* que fue la compañía que lo tuvo. Yo fui el que le di luz y agua para que ellos estuvieran allí, mas le hice la seguridad. Y por lo que acabo de oír creo que no hay contaminación, y veremos a ver.

Luis Santos: En lo que se presentó hoy en la parte de suelos, tanto el área del taller como el área de la escuela, como el área de la propiedad adventista están libres de contaminación. La contaminación está totalmente concentrada en los dos acres que son, que eran parte de los talleres o de los almacenes de la Autoridad de Tierras.

William González Alicea: Está bien, muchas gracias. Satisfecho con lo que me acaba de contestar.

Salvador Rosario: Una pregunta, que no necesariamente tiene que ser a fines de record, pero la planteamos. Los terrenos que se comenzaron a desarrollar en esa misma área, ¿se supone que tengan un *stop* actualmente en cuanto al desarrollo por la razón o no?

Luis Santos: Yo ahora mismo no sé cuál es el estatus de esas residencias que fueron aprobadas y que el desarrollador detuvo prácticamente la construcción. De en este momento iniciarse algún tipo de intención de desarrollo pues ya la agencia está pendiente de esto, entraría en conversaciones con ellos asegurándose que lo que ellos hagan allí en nada altere el remedio que nosotros esperamos implementar en el lugar.

Salvador Rosario: Muchas gracias, satisfecho también.

Ramón Vázquez Martínez: ¿Todavía resta otro año de trabajo de investigación?

Luis Santos: Para aguas subterráneas. El terreno no, el terreno ya se sabe lo que hay y ya tenemos la alternativa y ya vamos a trabajar en la fase de diseño para empezar la implementación. Ya en términos de terreno están completadas las labores y estamos en la fase de decir y tomar la decisión final para empezar el diseño y la implementación. En cuanto al agua subterránea todavía nos quedan unos cuantos trabajos para definir la magnitud y la concentración si hay contaminación en las aguas subterráneas.

Salvador Rosario: Ok, entendido.

Widy Figueroa: ¿Podría identificar su nombre por favor?

Ramón Vázquez Martínez: Ramón Vázquez Martínez, vecino del lugar también.

Luis Santos: Gracias

Salvador Rosario: Muchas gracias, muy atentos.

Luis Santos: Lamento que no hayan podido llegar a las 6.

CERTIFICADO DE TRANSCRIPTORA

Yo, Aledawi Figueroa Martínez, transcriptora de Smile Again Learning Center, Corp. CERTIFICO:

Que la que antecede constituye la transcripción fiel y exacta de la grabación realizada durante la reunión celebrada en el sitio y la fecha que se indican en la página uno de esta transcripción.

Certifico además que no tengo interés en el resultado de ese asunto y que no tengo parentesco en ningún grado de consanguinidad con las partes involucradas en el mismo.

En Isabela, Puerto Rico, a 24 de agosto de 2015.

Aledawi Figueroa Martínez
Smile Again Learning Center, Corp.

APPENDIX VII

LIST OF THE ARARs

Statues, Regulations, Standard, Or Requirement	Citation Or Reference	ARAR Determination	Description		Chemical	Location	Action
Federal ARARs and TBCs							
Identification and Listing of Hazardous Waste	42 USC 82-I § 6901 et seq.; 40 CFR 261	Applicable	Specifies hazardous waste identification, management, and disposal requirements.	This regulation is applicable to the identification of hazardous wastes that are generated, treated, stored, or disposed during remedial activities.	✓		✓
Hazardous Waste Generation	42 USC §§ 6901, et. seq.; 40 CFR 262	Applicable	Specifies requirements for hazardous waste packaging, labeling, manifesting, and storage.	Standards will be followed if any hazardous wastes are generated on-site.			✓
Transportation of Hazardous Waste	42 USC §§ 6901, et. seq.; 40 CFR 263	Applicable	Specifies requirements for transporters of hazardous waste to obtain a EPA identification number, compliance with manifest procedures and spill response.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.			✓
Treatment, Storage, and Disposal of Hazardous Waste	42 USC §§ 6901, et. seq.; 40 CFR 264	Applicable	Specifies requirements for the operation of hazardous waste treatment, storage, and disposal facilities.	Facility will be designed, constructed, and operated in accordance with this requirement. All workers will be properly trained.			✓
Land Disposal Restrictions (LDRs)	42 USC 82-I § 6901 et seq.; 40 CFR 268	Applicable	Places specific restrictions (concentration or treatment) on RCRA hazardous wastes prior to their placement in a land disposal unit.	Hazardous wastes will be treated to meet disposal requirements.	✓		✓
Hazardous Waste Permit Program	42 USC §§ 6901 et seq.; 40 CFR 270	Applicable	Establishes basic EPA permitting requirements, such as application requirements, standard permit conditions, and monitoring and reporting requirements.	All permitting requirements of EPA must be complied with. Permits are not required, but substantive requirements of the permits would need to be met.			✓
Off-Site Rule	40 CFR 300.440	Applicable	The purpose of the Off-Site Rule is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound.	Contaminated soil sent to a TSD facility acceptable for the receipt of CERLCA wastes from response actions authorized or funded under CERCLA.			✓
National Ambient Air Quality Standards (NAAQs)	42 USC 85-I § 7401 et seq. 40 CFR 50	Applicable	Establishes limits for air emissions and air quality levels that protect public health. These provide air quality standards for particulate matter, lead, NO_2, SO_2, CO, and volatile organic matter.	During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.	✓		✓
National Emission Standards for Hazardous Air Pollutants (NESHAPS)	40 CFR 61	Applicable	These provide air quality standards for hazardous air pollutants.	During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.	✓		
U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) Soil from foreign countries or Territories or possessions	7 CFR 330.300	Applicable	Regulates the movement of soil from Puerto Rico into or through any other State, Territory, or District of the United States.	Soil exported to the continental United States for treatment, storage, and disposal will need to meet the container and substantive permit requirements. Treatment, storage and disposal facilities receiving contaminated soil will need to be an authorized and APHIS inspected facility.			✓
EPA Regional Screening Levels (RSLs)	http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/	To be Considered	Provides concentrations for compounds and analytes based on risk assessment data.	The RSL will be considered in the development of the PRGs if there are no applicable standards.	✓		
OSWER Guidance for Developing Ecological Soil Screening Levels (SSLs)	OSWER 9285.7.55	To be Considered	Guidance for deriving risk based eco-SSLs for soil contaminants of ecological concern.	The ecological SSLs will be considered in the development of the PRGs if there are no applicable standards.	✓		
National Historic Preservation Act (NHPA) and Implementing Regulations	16 United States Code (U.S.C.) 470 36 CFR Part 800	Applicable	This statute and implementing regulations require federal agencies to take into account the effect of this response action upon any district, site, building, structure, or object that is included in or eligible for the National Register of Historic Places (generally, 50 years old or older).	If cultural resources on or eligible for the national register are present, it will be necessary to determine if there will be an adverse effect and if so how the effect may be minimized or mitigated.		✓	
Archaeological and Historic Preservation Act and Implementing Regulations	16 U.S.C. 469 43 CFR 7	Applicable	This statute and implementing regulations establish requirements for the evaluation and preservation of historical and archaeological data, which may be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	The unauthorized removal of archaeological resources from public lands is prohibited without a permit, and any archaeological investigations at a site must be conducted by a professional archaeologist. To date, no such resources have been found at the site. If any are found, consultation with the State Historic Preservation Office (SHPO) and the NHPA will be addressed during remedial design.		✓	

Statues, Regulations, Standard, Or Requirement	Citation Or Reference	ARAR Determination	Description		Chemical	Location	Action
Federal ARARs and TBCs							
Historic Sites Act	16 USC §§ 461, et seq.	Applicable	Requires federal agencies to consider the existence and location of potential and existing National Natural Landmarks to avoid undesirable impacts on such landmarks.	No National Natural Landmarks have been identified at the site.		✓	
Fish and Wildlife Coordination Act and Implementing Regulations	16 U.S.C. 662, et seq., 50 CFR 83 33 CFR 320-330	Applicable	This statute and implementing regulations require coordination with federal and state agencies for federally funded projects to ensure that any modification of any stream or other water body affected by any action authorized or funded by the federal agency provides for adequate protection of fish and wildlife resources.	If the remedial action involves activities that affect wildlife and/or non-game fish, federal agencies must first consult with the U.S. Fish and Wildlife Service and the relevant state agency with jurisdiction over wildlife resources.		✓	
Endangered Species Act and Implementing Regulations	16 U.S.C. 1531 50 CFR 17 and 402	Applicable	This statute and implementing regulations provide that federal activities not jeopardize the continued existence of any threatened or endangered species. Endangered Species Act, Section 7 requires consultation with the U.S. Fish and Wildlife Service to identify the possible presence of protected species and mitigate potential impacts on such species.	If threatened or endangered species are identified within the remedial areas, activities must be designed to conserve the species and their habitat. To date no threatened or endangered species have been identified in the area of the site.		✓	
Migratory Bird Treaty Act and Implementing Regulations	16 U.S.C. 703, et seq. 50 CFR 10.13	Applicable	This requirement establishes a federal responsibility for the protection of the international migratory bird resources and requires continued consultation with the U.S. Fish and Wildlife Service during remedial design and remedial construction to ensure that the cleanup of the site does not unnecessarily impact migratory birds.	The selected remedial actions will be carried out in a manner to avoid adversely affecting migratory bird species, including individual birds or their nests.		✓	
Transportation of Hazardous Wastes	49 CFR 170-189	Not ARAR	Federal Highway Administration, Department of Transportation National Highway Traffic Safety Administration regulations are codified in 23 CFR Parts 1-1399.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.			✓
DOT Rules for Hazardous Materials Transport	49 CFR 107,171.1-171.500	Not ARAR	Establishes specific Department of Transportation (DOT) rules and technical guidelines for the off-site transport of hazardous materials.	Any company contracted to transport hazardous material from the site will be required to comply with this regulation.			✓
OSHA recording and Reporting Occupational Injuries and Illnesses	20 CFR 1904	Not ARAR	Outlines the record keeping and reporting requirements for an employer under OSHA.	These regulations apply to the companies contracted to implement the remedy.			✓
Occupational Safety and Health Act regulations	29 CFR § 1910	Not ARAR	Contains health and safety requirements that must be met during implementation of any remedial action. These standards are intended to protect construction and utility workers at the site. Contains health and safety training requirements for on-site workers and permissible exposure limits for conducting work at a site.	Proper respiratory equipment will be worn if it is not possible to maintain the work atmosphere below the 8-hour time-weighted average at these specified concentrations.			✓
OSHA Safety and Health Regulations for Construction	29 CFR § 1926	Not ARAR	Specifies the type of safety equipment and procedures to be followed during site remediation.	All appropriate safety equipment will be on-site, and appropriate procedures will be followed during remediation activities.			✓

Statues, Regulations, Standard, Or Requirement	Citation Or Reference	ARAR Determination	Description	Action to be Taken to Attain ARAR	Chemical	Location	Action
Commonwealth of Puerto Rico ARARs and TBCs							
Regulation for the Control of Hazardous and Non-Hazardous Solid Waste	Regulation #2863 Amended by Regulation #5807	Applicable	Establishes standards for management and disposal of hazardous wastes.	All remedial activities must adhere to these regulations while handling hazardous waste during remedial operations.	✓		✓
Regulation for the Management of Non-Hazardous Solid Waste	Regulation #5717	Applicable	Establishes the requirements for the handling, storage, transportation, processing and disposal of non-hazardous solid waste	Applies to all non-hazardous solid waste, including special waste generated, handled, transported, destroyed, or dumped within the jurisdiction of Puerto Rico. Control activities for the non-hazardous wastes must comply with the treatment and disposal standards.			✓
Water Quality Standards	Regulation #7837 Amended by Regulation #8512	Applicable	Designates the uses for which the quality of Puerto Rico's water bodies must be kept and protected; prescribes water quality standards to preserve designated uses of water; identifies other rules and regulations applicable to contamination sources that might affect the quality of water resources subject to these regulations; and prescribes other necessary measures to achieve and preserve the quality of Puerto Rico's waters.	Applies to any remediation activities performed at the site.			✓
Regulation for the Control of Atmospheric Pollution	Regulation #5300 Amended by Regulations #6302, #6303, #6630, #6824, #8484, and #8485	Applicable	Describes requirements and procedures for obtaining air permits and certificates; rules that govern the emission of contaminants into the ambient atmosphere.	Applies to any remediation activities performed at the site. Permits are not required, but substantive requirements of the permits would need to be met. During excavation, treatment, and/or stabilization, air emissions will be properly controlled and monitored to comply with these standards.	✓		✓
Regulation for the Control of Noise Pollution	Regulation #8019	Applicable	Establishes standards and requirements to control, reduce, or eliminate noise that might be harmful to health and disturb the public well-being.	Applies to any remediation activities performed at the site.			✓
Regulation for the Control of Erosion and Prevention of Sedimentation	Regulation #5754	Applicable	Establishes standards and requirements to control, reduce, or eliminate soil erosion during construction.	Applies to any activities that may cause or result in the erosion of the soil. Includes, but not limited to, clearing of trees; removal of the vegetative cover of the ground; the construction or demolition of structures; extraction, storage or disposal of soil; or any other activity that includes the alteration of the conditions of the ground or soil.			✓
Act for the Protection and Preservation of Puerto Rico's Karst Region	Regulation #292	Applicable	This regulation requires the protection and conservation of the karst regions physiography; and prevent the transportation and sale of natural materials without permits.	The requirement will be considered during the development of alternatives.		✓	

Acronyms:

ARAR	Applicable or Relevant and Appropriate Requirement
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
CWA	Clean Water Act
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
LDR	land disposal restriction
NO_2	Nitrogen dioxide
NWQC	National Recommended Water Quality Criteria
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
SO_2	Sulfur dioxide
SSL	soil screening level
SWDA	Safe Drinking Water Act
TSCA	Toxic Substances Control Act
UIC	underground injection control
USC	U.S. Code
WPCA	Water Pollution Control Act

APPENDIX VIII

PUERTO RICO ENVIRONMENTAL QUALITY BOARD’S CONCURRENCE LETTER

COMMONWEALTH OF
PUERTO RICO
Environmental Quality Board

August 26, 2015

Mr. Luis Santos
Remedial Project Manager (RPM)
Environmental Protection Agency (EPA) Region 2
Caribbean Environmental Protection Division (CEPD)
City View Plaza II – Suite 7000
48 Road 165 km 1.2 Guaynabo, PR 00968-8069

RE: PESTICIDE WAREHOUSE III SUPERFUND SITE, OPERABLE UNIT 1 (OU1) (SOIL) RI/FS PROPOSED PLAN CONCURRENCE LETTER MANATÍ, PUERTO RICO

The Puerto Rico Environmental Quality Board (PREQB) Emergency Response Program, Superfund Remedial Project Management (RPM) Division, received and completed the review of the "Response to PREQB Comments on the Proposed Plan…." document. This document was requested by PREQB in order to acknowledge some of the issues exposed by CDM Smith, USEPA contractor representatives through the following sources: "Final Remedial Investigation (RI) Report", "Final Revised Human Health Risk Assessment (HHRA)" conclusions and soil sample analysis results. Although some of the responses to our comments weren't address in order to clarify for the record what actions will be taken in consideration, most of them were addressed as requested. Therefore, PREQB doesn't have any problem in concurs with the EPA's Proposed Plan for the Pesticide Warehouse III (OU1) (Soil) Superfund Site based on the Feasibility Study.

If you have any questions, please do not hesitate to contact me at (787) 767-8181 extension 3234 or Ms. Amarilis Rodríguez Méndez, Environmental Compliance and Inspection Officer of my staff at the extension 3235 or by e-mail amarilisrodriguez@jca.pr.gov.

Cordially,

Mr. Juan J. Babá Peebles
Manager
PREQB Emergencies Response Program

c. Eng. Ramón Torres, USEPA, CEPD
Eng. Mel Hauptman, USEPA-Region 2

APPENDIX IX

TABLES

TABLE 1
Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Pesticide Warehouse III

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Surface Soil	Dieldrin	21	13,000	ug/kg	34/35	4,866	ug/kg	99% KM (Chebyshev) UCL
	Toxaphene	35	320,000	ug/kg	33/35	148,489	ug/kg	99% KM (Chebyshev) UCL
	Dioxins/Furans TEQs	7.582	8,455.8	ng/kg	23/23	1,505	ng/kg	95% Adjusted Gamma UCL

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Pesticide Warehouse III

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Surface Soil	Dieldrin	3.4	13,000	ug/kg	40/41	2,992	ug/kg	97.5% KM (Chebyshev) UCL
	Toxaphene	35	320,000	ug/kg	36/41	127,739	ug/kg	99% KM (Chebyshev) UCL
	Dioxins/Furans TEQs	2.975	8,455.8	ng/kg	36/41	1,400	ng/kg	95% Adjusted Gamma UCL

Scenario Timeframe: Future
Medium: Surface and Subsurface Soil
Exposure Medium: Pesticide Warehouse III

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Surface and Subsurface Soil	Dieldrin	0.035	13,000	ug/kg	155/176	919.2	ug/kg	97.5% KM (Chebyshev) UCL
	Toxaphene	9.7	320,000	ug/kg	90/176	25,587	ug/kg	97.5% KM (Chebyshev) UCL
	Dioxins/Furans TEQs	0.05117	12,192.4	ng/kg	78/81	1698	ng/kg	97.5% KM (Chebyshev) UCL

UCL – Upper-confidence limit

Summary of COCs and Medium-Specific Exposure Point Concentrations

This table presents the COCs and exposure point concentrations (EPCs) for each of the COCs in surface soil and subsurface soil. The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC and how it was derived.

TABLE 2. Selection of Exposure Scenarios

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis
Current	Soil	Surface Soil	PWIII	Trespasser	Adolescent	Ing/Der/Inh	Quantitative
			Adventist	Worker	Adult	Ing/Der/Inh	Quantitative
				Visitor	Adult and Child	Ing/Der/Inh	Quantitative
				Students	Child (4-18)	Ing/Der/Inh	Qualitative
Future	Soil	Surface Soil	PWIII	Worker	Adult	Ing/Der/Inh	Quantitative
				Resident	Adult/Child	Ing/Der/Inh	Quantitative
				Trespasser	Adolescent	Ing/Der/Inh	Quantitative
			Adventist	Worker	Adult	Ing/Der/Inh	Quantitative
				Visitor	Adult and Child	Ing/Der/Inh	Quantitative
				Summer Camper	Child (6-10)	Ing/Der/Inh	Quantitative
				Daycare Child	Child (0-6)	Ing/Der/Inh	Quantitative
				Students	Child (4-18)	Ing/Der/Inh	Qualitative
		Surface and Subsurface Soil	PWIII	Construction Worker	Adult	Ing/Der/Inh	Quantitative
			Adventist	Construction Worker	Adult	Ing/Der/Inh	Quantitative

Ing – Ingestion

Der – Dermal

Inh - Inhalation

Summary of Selection of Exposure Pathways

The table describes the exposure pathways that were evaluated for the risk assessment. Exposure media, exposure points, and characteristics of receptor populations are included.

TABLE 3

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Dieldrin	Chronic	5E-05	mg/kg-day	1	5E-05	mg/kg-day	Liver	100	IRIS	12/13/13
Toxaphene	-----	-----	-----	-----	-----	-----	-----	-----	IRIS	12/13/13
Dioxins/Furans TEQs	Chronic	7E-10	mg/kg-day	1	7E-10	mg/kg-day	Reproductive	30	IRIS	12/13/13

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates:
Dieldrin	-----	-----	-----	-----	-----	-----	-----	IRIS	12/13/13
Toxaphene	-----	-----	-----	-----	-----	-----	-----	IRIS	12/13/13
Dioxins/Furans TEQs	-----	-----	-----	-----	-----	-----	-----	IRIS	12/13/13

Key

-----: No information available
IRIS: Integrated Risk Information System, U.S. EPA

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in surface and subsurface soil. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 4

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Dieldrin	1.6E+01	$(mg/kg/day)^{-1}$	1.6E+01	$(mg/kg/day)^{-1}$	B2	IRIS	12/13/13
Toxaphene	1.1E+00	$(mg/kg/day)^{-1}$	1.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	12/13/13
Dioxins/Furans TEQs	1.3E+05	$(mg/kg/day)^{-1}$	1.3E+05	$(mg/kg/day)^{-1}$	B2	CalEPA	07/01/09

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Dieldrin	4.6E-03	$1(ug/m^3)$	-----	-----	B2	IRIS	12/13/13
Toxaphene	3.2E-04	$1(ug/m^3)$	-----	-----	B2	IRIS	12/13/13
Dioxins/Furans TEQs	3.8E+01	$1(ug/m^3)$	-----	-----	B2	CalEPA	07/01/09

Key: **EPA Weight of Evidence:**

IRIS: Integrated Risk Information System. U.S. EPA B2 – Probable human carcinogen
CalEPA: California EPA
-----: No information available

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in surface and subsurface soil. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 5

Risk Characterization Summary – Non-carcinogens

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	**Dermal**	**Inhalation**	**Exposure Routes Total**
Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	Liver	0.005	0.002	-----	0.006
			Toxaphene	-----	-----	-----	-----	-----
			Dioxins/Furans TEQ	Reproductive	**1**	0.1	-----	**1**
							Hazard Index Total =	**1**

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	**Dermal**	**Inhalation**	**Exposure Routes Total**
Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	Liver	0.8	0.2	-----	**1**
			Toxaphene	-----	-----	-----	-----	-----
			Dioxins/Furans TEQ	Reproductive	**30**	**2**	-----	**32**
							Hazard Index Total =	**33**

Scenario Timeframe: Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	**Dermal**	**Inhalation**	**Exposure Routes Total**
Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	Liver	0.06	0.04	-----	0.1
			Toxaphene	-----	-----	-----	-----	-----
			Dioxins/Furans TEQ	Reproductive	**2**	0.4	-----	**2**
							Hazard Index Total =	**2**

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	**Dermal**	**Inhalation**	**Exposure Routes Total**

Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	Liver	0.03	0.01	-----	0.04
			Toxaphene	-----	-----	-----	-----	-----
			Dioxins/Furans TEQ	Reproductive	0.9	0.1	-----	**1**
						Hazard Index Total =		**1**

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface and Subsurface Soil	Surface and Subsurface Soil	Pesticide Warehouse III	Dieldrin	Liver	-----	-----	-----	-----
			Toxaphene	-----	-----	-----	-----	-----
			Dioxins/Furans TEQ	Reproductive	**3**	0.3	-----	**3**
						HI Total =		**3**

----- – not available at this time due to no reference dose being available – non-cancer hazards are underestimated

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the HI (sum of hazard quotients) for exposure to surface and subsurface soil. The Risk Assessment Guidance for Superfund states that, generally, a HI greater than 1 indicates the potential for adverse non-cancer effects.

TABLE 6

Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult/Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	7 X 10^{-05}	2 X 10^{-05}	3 X 10^{-09}	**1 X 10^{-04}**
			Toxaphene	**2 X 10^{-04}**	7 X 10^{-05}	1 X 19^{-08}	**3 X 10^{-04}**
			Dioxins/Furans TEQ	**3 X 10^{-04}**	3 X 10^{-05}	1 X 10^{-08}	**3 X 10^{-04}**
						Total Risk =	**7 X 10^{-04}**

Scenario Timeframe: Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Dermal	Inhalation	Exposure Routes Total
Surface Soil	Surface Soil	Pesticide Warehouse III	Dieldrin	2 X 10^{-05}	1 X 10^{-05}	7 X 10^{-10}	3 X 10^{-05}
			Toxaphene	5 X 10^{-05}	3 X 10^{-05}	2 X 10^{-9}	8 X 10^{-05}
			Dioxins/Furans TEQ	6 X 10^{-05}	1 X 10^{-05}	3 X 10^{-9}	8 X 10^{-05}
						Total Risk =	**2 X 10^{-04}**

Summary of Risk Characterization – Carcinogens

The table presents cancer risks for surface and subsurface soil exposure. As stated in the National Contingency Plan, the point of departure is 10^{-6} and the acceptable risk range for site-related exposure is 10^{-6} to 10^{-4}.

Table 7: Remediation Goals for Soil

Contaminants of Concern	**Remediation Goal (µg/kg)**
Aldrin	101
Dieldrin	108
Toxaphene	1,600
Dioxin Toxicity Equivalent (TEQ)	0.018

APPENDIX X

RESPONSIVENESS SUMMARY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

Appendix X- RESPONSIVENESS SUMMARY

RECORD OF DECISION
PESTICIDE WAREHOUSE III – OPERABLE UNIT 1 (SOILS) SUPERFUND SITE
MANATÍ, PUERTO RICO

RESPONSIVENESS SUMMARY

On August 12, 2015, the U.S. Environmental Protection Agency (EPA) released for public comment the Proposed Plan for the Pesticide Warehouse III – Operable Unit 1 (Soils) Superfund Site. During the public comment period, EPA held a public meeting on August 18, 2015 to discuss and accept comments regarding the Proposed Plan. EPA received verbal comments at the public meeting as well as written comments during the public comment period, which lasted from August 12, 2015, through September 11, 2015. This document summarizes comments from the public at the public meeting on August 18, 2015 and those submitted via mail. EPA's responses are provided following each comment.

Results of Remedial Investigation

Comment 1: Did the contamination reach nearby residential properties and what is the potential effect on human health?

Response 1: No, soil contamination did not reach the residential areas. Contaminated soil was found on the former warehouse facility and drainage areas located north and northwest of the Pesticide Warehouse building; these areas are currently covered by fill. With regard to groundwater, the residential area is not served by supply wells located in the proximity of the Site.

Comment 2: Which environmental consulting firms have been supporting EPA's efforts with this Site?

Response 2: The consulting firm supporting EPA's activities is CDM Federal Programs Corporation and the Potential Responsible Party (PRP) consulting firm was Environmental Resources Technologies (ERTEC).

Comment 3: Do you know if detection limits for the pesticide analysis of any samples needed to be lower than what a standard method, such as 8081 or 8270, may provide?

Response 3: No. During the remedial investigation (RI), detection limits for the pesticide analysis did not need to be lower than what a standard method such as 8081 or 8270 may provide.

Comment 4: Have all of the analyses been done utilizing EPA's internal laboratories?

Response 4: No. The PRP consultant did not use EPA's internal laboratories for the analyses.

Comment 5: The property owner of González Auto Repairs inquired about contamination on his property.

Response 5: One surface soil sample was collected at this property and no pesticides were detected. This was the case for all the occupied properties near the Site that were tested during the remedial investigation.

Groundwater

Comment 6: Will the soil contamination reach the aquifers?

Response 6: The groundwater investigation will be addressed as Operable Unit 2. For Operable Unit 1, the RI evaluated whether the soil contamination had the potential to be an ongoing source of contamination to the groundwater. For reasons explained in the Proposed Plan and Decision Summary, EPA concluded that there was little interaction between the soil contamination and groundwater. Be that as it may, EPA expects that the preferred remedy for Operable Unit 1 (Soils) would address soils that are a potential threat to groundwater.

Comment 7: Will actions be taken as soon as possible to contain contamination from reaching groundwater?

Response 7: See response to Comment 14.

Alternative S5

Comment 8: Would EPA use excavated soil for backfill?

Response 8: Contaminated soil will be set aside, treated if containing RCRA characteristic hazardous waste, and disposed of in a non-hazardous waste industrial landfill. Clean soil will be used to backfill the excavated areas. The property north of the facility has as much as 14 feet of fill material that was brought to this property after the Pesticide Warehouse operation had ended. There is no evidence to suggest that this new fill is contaminated. In the preferred remedy, this fill would be excavated and stockpiled to be used as backfill after contaminated soils have been removed. Additional fill material will be brought in to the site to replace contaminated soils removed during the cleanup.

Comment 9: How would you address contaminated runoff from rainfall events?

Response 9: Erosion, sediment, and runoff control measures and requirements will be put in place during the Remedial Design phase to assure that the remedy is implemented without causing runoff from escaping from the Site during the Remedial Action.

Comment 10: **Since** 10 feet of soil will be removed, how will the excavated areas be backfilled? Will the same treated material be used as backfill for excavated areas?

Response 10: Excavated areas will be covered with clean fill. Contaminated soil will be disposed in an approved landfill. See the response to Comment 8.

Comment 11: Contamination deeper than 10 feet will not be removed. Will it impact the groundwater in any way? Has any modeling or prevention been done regarding the impact to groundwater?

Response 11: See the response to Comment 6. The groundwater investigation will be conducted as Operable Unit 2. EPA expects that remediating the top 10 feet of contaminated soil (which contains the bulk of the contamination at the highest concentrations found on the Site) will eliminate the soil that could act as a potential threat to groundwater.

Comment 12: How much time does EPA estimate it will take to do the work?

Response 12: Once the Record of Decision is finalized, EPA will proceed with the remedial design for the implementation of the selected alternative. Based on EPA's experience at other sites, EPA will need approximately 18 months to complete the remedial design phase prior to the 12-month construction phase of the selected alternative. The total time estimate is approximately 3 years.

Comment 13: Will future development of the fill area be allowed?

Response 13: Yes. But future land use of the property will be restricted to commercial/industrial and not residential. EPA will work with the Puerto Rico Planning Board to modify land use.

Request for information

Comment 14: Where can I access information about the Site?

Response 14: EPA has established an information repository at the Manatí Municipal Library. The administrative record file, which contains copies of the Proposed Plan and other supporting documentation, is available at the following locations:

Manatí Municipal Library,
Paseo de las Atenas y Calle Mackinley
Manatí, Puerto Rico 00739
(787) 884-5494
Hours: Monday – Friday 9:00 am to 3:00 pm

U.S. Environmental Protection Agency,
Region 2 Caribbean Environmental Protection Division
City View Plaza II - Suite 7000
#48 PR-165 Km. 1.2
Guaynabo, PR 00968-8069
(787) 977-5865
Hours: Monday – Friday 9:00 am to 5:00 pm
By appointment.

U.S. Environmental Protection Agency, Region 2
290 Broadway, 18th floor
New York, New York 10007-1866
(212) 637-4308
Hours: Monday - Friday, 9:00 a.m. a 3:30 p.m.
By appointment.

Puerto Rico Environmental Quality Board
Emergency Response and Superfund Program
Edificio de Agencias Ambientales Cruz A. Matos
Urbanización San José Industrial Park
1375 Avenida Ponce de León
San Juan, PR 00926-2604
(787) 767-8181 ext 3207
Hours: Monday – Friday 9:00 am to 3:00 pm
By appointment.