FINAL Engineering Evaluation/Cost Analysis Report Addendum 1 Caneel Bay Resort

Prepared by VHB

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List of Abbreviations and Acronyms

ACM	asbestos-containing material
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
bgs	below ground surface
CBIA	CBI Acquisitions, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	conceptual site model
DPNR	Department of Planning and Natural Resources
EE/CA	Engineering Evaluation/Cost Analysis
EHI	EHI Acquisitions, LLC
EPC	exposure point concentration
ESV	NPS ecological screening value
HHRA	human health risk assessment
ISM	incremental sampling methodology
mg/kg	milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPS	National Park Service
PAH	polycyclic aromatic hydrocarbon
PAL	Project Action Level
PCOPC	preliminary contaminant of potential concern
PRG	preliminary removal goals
RAO	removal action objective
RBCG	risk-based cleanup goal
RG	removal goal
RSL	Regional Screening Level
RUE	Retained Use Estate
SAP	Sampling and Analysis Plan
SLERA	screening-level ecological risk assessment
USEPA	United States Environmental Protection Agency
UST	underground storage tank
USVI	United States Virgin Islands
VIIS	Virgin Islands National Park
VOC	volatile organic compound
WWTP	wastewater treatment plant

Executive Summary

ES 1. Introduction and Purpose

The purpose of this Engineering Evaluation/Cost Analysis Report Addendum (EE/CA Addendum) is to supplement the EE/CA report for the Caneel Bay Resort (the Resort), which the National Park Service (NPS) issued on September 16, 2021 (EE/CA Report). NPS is investigating the Resort pursuant to its delegated authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) because the Resort lies within the Virgin Islands National Park (VIIS), on the northwest side of the island of St. John, U.S. Virgin Islands. EHI Acquisitions, LLC and CBI Acquisitions, LLC (EHI/CBIA) currently operate the Resort pursuant to the Retained Use Estate (RUE), which will expire on September 30, 2023 (National Park Service, 2013).

During the EE/CA process, NPS identified several data gaps related to potential releases or threatened releases of hazardous substances. To evaluate these items and fill the data gaps, NPS completed an EE/CA Addendum investigation in November 2021, with supplementary sampling in January 2022. An EE/CA Addendum Investigation Summary Report, which describes the investigation in more detail, is provided in Appendix B.

This EE/CA Addendum relied on the results of the EE/CA Addendum Investigation to further evaluate the nature and extent of contamination at the Resort and to assess potentially unacceptable human health and ecological risks.

ES 2. Site Description

The EE/CA Investigation focused on Areas 1, 2, and 3 of the Resort (Figure 1) where contaminants were known or suspected to be present based on historical information. The EE/CA Addendum Investigation included additional sampling in these Areas, as well as other parts of the Resort. Not all investigated areas and concerns required further evaluation in the EE/CA Addendum. For items requiring further evaluation in the EE/CA Addendum, Text Table ES-2 briefly summarizes the investigation activities performed as part of the EE/CA Addendum Investigation, the investigation results, and the reason the results required further evaluation in this EE/CA Addendum.

Text Table ES-2 Summary of Investigated Areas Evaluated in the EE/CA Addendum Investigation

Area/Location	EE/CA Addendum Investigation Activities	EE/CA Addendum Investigation Results	Further Evaluation Required?
EE/CA Area 2 (Area 2): approximately 5.4 acres that encompass the engineering, maintenance, landscaping, generator, and fuel facilities, to the southwest of the wastewater treatment plant (WWTP)	Subsurface soil and groundwater sampling to characterize potential contamination around fuel storage and operations areas. Downgradient groundwater sampling for petroleum constituents and Area 2 contaminants of concern (COCs) identified in the EE/CA Report.	Concentrations of some study constituents exceeded project action levels (PALs).	**Yes.** Constituents that exceeded PALs were evaluated for risk to human health and the environment.
Building materials, debris, and piping exposed to the environment within the Resort: asbestos and lead survey	Suspected asbestos-containing materials (ACM) and lead-based paint (LBP) were identified in structures and hurricane debris where those materials were exposed the environment. Samples were collected to detect the presence of ACM and LBP.	ACM and LBP were identified and are exposed to the environment. Currently friable asbestos was not identified.	**Yes.** ACM and LBP were considered for potential removal actions.
Cottage 7 underground storage tank (UST), on the western-central side of the Resort	Excavation to identify the UST and evidence of potential releases. Subsurface soil sampling to identify potential contamination from the UST and to identify the potential for shallow groundwater impacts.	Concentrations of some study constituents exceeded PALs. Groundwater was not identified above bedrock suggesting it is not an exposure or migration pathway of concern in this area.	**Yes.** Constituents that exceeded PALs in soil were evaluated for risk to human health and the environment.
Background and clean fill surface soil arsenic concentrations	Surface soil sampling for arsenic in two additional background decision units (DUs) at the Resort. Surface soil sampling of a commercial clean fill stockpile for arsenic.	Arsenic concentrations in Resort background DUs and the clean fill stockpile exceeded the previously calculated EE/CA Report reference value.	**Yes.** Results were used to refine background comparisons.

ES 3. Investigation Results, Conceptual Site Model, and Risk Assessment Results

Brief discussions of the results, the risk assessment findings, and contaminant fate and transport, are provided below for each of the four items identified in Text Table ES-2 as requiring further evaluation.

Building Materials – Asbestos-Containing Materials (ACM) and Lead-Based Paint (LBP)

NPS evaluated building materials for the presence of ACM in scattered debris and structures, where the material was exposed to the environment. Of the suspected materials sampled during the EE/CA Addendum Investigation, 19 separate materials were confirmed, by sampling, to be ACM. The ACM, including roofing, window glazing, window and door caulk, joint compound, glue, tiles, and asbestos-cement pipes, were found in various buildings, in piping systems, and in hurricane-damaged roof debris on the ground at the Resort.

Asbestos generally does not present a health hazard unless asbestos fibers are released from a source material into the air, where they can then be inhaled or be deposited on soil. At the time of the EE/CA Addendum Investigation, the observed ACM was judged to be not friable, meaning that it could not be crushed by hand and did not present an immediate risk to human health or the environment. However, many of the ACM are exposed to wind, rain, and sunlight, which are likely to weather or deteriorate the materials with time, increasing the potential for asbestos fibers to be released to the environment and present an exposure risk. Additionally, destruction, disturbance, or improper handling of the structures or debris piles by untrained or unknowing personnel, visitors, or trespassers may cause a release of asbestos fibers to the air and expose those personnel and others to asbestos hazards.

NPS evaluated building materials at the Site for the presence of lead-based paint (LBP) that has the potential to peel and migrate into the environment. LBP was identified on a structural column in a Resort guest room. Similar columns are found in several units of guest rooms at Caneel Beach and Little Caneel Beach. The columns exposed to the exterior are in rooms that appear to have been in the midst of renovation at the time of the hurricane; the rooms were missing furniture, windows, doors, tiles, and wall board, and contained stacks of unused, but now weathered, steel framing and windows. The columns are partially sheltered by the remaining portion of the building. Additionally, the columns are installed on concrete slabs with low knee-walls, which may limit migration of LBP to the environment. As of the EE/CA Addendum Investigation, the paint on the columns was in generally fair condition with only a few observed areas of limited peeling. NPS collected a drip line surface soil sample from around these units during the EE/CA Investigation and did not find elevated lead in soil. While the columns are partially protected, the LBP is still likely to weather and deteriorate over time, increasing the potential for exposure and migration to the environment.

As explained below, NPS has concluded that a removal action is necessary to address ACM in hurricane debris that is subject to CERLCA but not other regulatory programs. To mitigate the possibility of a release and to prevent human exposure to lead and asbestos in the future, which

may require additional response action under CERCLA, the operator should consider what steps may be appropriate to address LBP and any remaining ACM at the Resort.

Cottage 7 UST

A small steel UST was discovered beneath a concrete pad near Cottage 7. The top of the UST was rusted away, and the UST was visually confirmed to be empty. Visual, olfactory, and vapor screening evidence of petroleum contamination was not observed in soil around the top of the tank, the fill piping, or in nearby soil cores. However, multiple polycyclic aromatic hydrocarbons (PAHs) were detected above PALs in two samples collected within several feet of the UST at depths near the bottom of the tank. Based on the investigation results and purported history of the UST (to fuel a bomb shelter emergency generator which pre-dated the Resort), potential historical releases are expected to have been relatively small. Residual contamination is likely highly weathered and is expected to continue to naturally attenuate by microbial biodegradation.

NPS evaluated the PAHs identified above PALs in subsurface soil at Cottage 7 in the Risk Assessment Addendum and concluded that they did not result in unacceptable risk to human health or the environment. Soil beneath the UST, which was not accessible, may also contain residual petroleum contamination.

Area 2 AST Release and Fuel Dispenser Pump Area

NPS identified evidence of residual contamination in subsurface soil at boring locations around and downhill of the aboveground storage tanks (ASTs) and fuel dispenser in Area 2. A diesel release was reported near the ASTs in 2010, and available documentation did not describe the extent of removal. Based on field observations, petroleum may have previously migrated through coarse-grained soils in utility trenches, which run downhill from the release location, and then spread into surrounding finer-grained native soils. It is likely the fine-grained native soils limited the potential for further downgradient migration. NPS did not identify evidence of residual free-phase petroleum product that would present a continuing migration risk.

Low concentrations of volatile organic compounds (VOCs) and PAHs were detected in numerous subsurface soil samples with higher concentrations corresponding to greater observed evidence of residual contamination. Only one PAH, acenaphthene, exceeded its PAL in one subsurface soil sample. Concentrations of hazardous substances are likely low due to the less toxic nature of diesel fuel and natural attenuation processes, including volatilization and biodegradation. Residual contamination is expected to continue to attenuate with time.

NPS evaluated acenaphthene in subsurface soil in the risk assessments and concluded that it does not result in unacceptable risk to human health or the environment. If soil is excavated from this area in the future, additional soil management considerations may be required.

Overburden (i.e., above bedrock) groundwater was discovered at monitoring wells installed downhill from the ASTs and fuel dispenser, and at wells installed farther downgradient, near the former gift shop. Two historical dug wells containing groundwater were also identified near the former gift shop. Based on groundwater elevation monitoring, groundwater is inferred to flow from the AST area to the northwest, towards the former gift shop and Caneel Bay. In November 2021, concentrations of multiple PAHs exceeded PALs at one well in the AST area. In January 2022, naphthalene was detected with estimated concentrations exceeding the PAL at three wells, including one of the historical dug wells (Dug Well 2). Naphthalene was not detected at the monitoring wells near Dug Well 2, which is open to surface runoff/infiltration and atmospheric deposition. Therefore, the detection of naphthalene in Dug Well 2 is not considered to represent groundwater conditions. NPS evaluated the PAHs detected above PALs in the risk assessments and concluded that naphthalene in groundwater could present an unacceptable cancer risk for a hypothetical resident who used overburden groundwater as a potable water supply. However, based on the recharge rates of sampled wells, overburden groundwater is not a viable source of potable water.

In November 2021, one VOC, chloroform, was detected above its PAL at one well in the AST area. Chloroform was not detected at the same well in January 2022. Chloroform is not expected to be related to the 2010 diesel release and does not pose an unacceptable risk to human health or the environment.

Arsenic was reported above its PAL in groundwater samples from both historical dug wells, but not in the nearby monitoring well samples. Barium was detected above the PAL in groundwater samples from the historical dug wells and nearby monitoring wells. NPS evaluated barium and arsenic in groundwater in the risk assessments and concluded that the presence of these constituents does not pose an unacceptable risk to human health or the environment.

Arsenic in Background Surface Soil

NPS previously detected arsenic in surface soil samples collected from locations across the Resort, including in background decision units, at concentrations above the tentative Removal Goal (RG) developed in the EE/CA Report. To supplement the existing arsenic dataset and evaluate the tentative RG, NPS identified and sampled two additional reference decision units. To evaluate arsenic concentrations in potential clean fill sources available in the USVI, NPS sampled a clean fill stockpile from a commercial supplier on St. Thomas.

Reported arsenic concentrations in five out of six replicate samples from the two additional reference DUs exceeded the EE/CA Report tentative RG of 2.0 milligrams per kilogram (mg/kg), indicating that the RG was lower than true background conditions at the Resort. Reported concentrations in all replicates collected from the commercial clean fill stockpile exceeded the tentative RG and the additional reference DU results. This suggests that locally available sources of clean fill contain concentrations of arsenic similar to those found at the Resort and that locating a source of backfill for remedial excavations with lower concentrations that will also support revegetation may not be possible.

Based on these results, NPS reviewed the potential historical uses of arsenic at the Resort and the distribution of arsenic in surface soil for evidence of possible releases. NPS did not identify documented use of arsenic-containing chemicals at the Resort. The distribution of arsenic in surface soil does not imply hot spots or significant areas of release and the arsenic presence is not correlated with other, possibly related contaminants (e.g., pesticides). Based on these lines of evidence, NPS concluded that the slightly elevated arsenic concentrations do not indicate a release of arsenic at the Resort.

ES 4. Removal Action Objectives (RAOs) and Preliminary Removal Goals (PRGs)

NPS identified three RAOs: eliminate unacceptable risks to human health and the environment; eliminate or minimize contaminant-related constraints on park resources and allow park resources to be used consistent with NPS mandates; and satisfy federal and territory ARARs and associated cleanup standards.

NPS has considered the RAOs in relation to the conceptual site model (CSM) and has determined that additional removal action is required for the reasons described below. All removal actions detailed in the EE/CA Report remain unchanged, although clarity is provided below on the issue of arsenic background levels.

Groundwater

Based on risk assessments, naphthalene in groundwater could present an unacceptable cancer risk for a hypothetical resident who relied on overburden groundwater as a potable water source. However, based on the low observed yields of monitoring wells within and downgradient of Area 2, overburden groundwater at the Resort is unlikely to be an adequate source of potable water. NPS confirmed that one bedrock water supply well was historically installed at the Resort; however, that well was reportedly closed shortly after installation due to its low yield. The Resort has historically relied on and continues to rely on other sources for potable water – including a rainwater catchment and an ocean water desalination plant. Based

on these factors, NPS concluded that groundwater is not a potential future source of potable water, and that further response action is not required for groundwater.

Arsenic in surface soil

Arsenic is present in surface soil across the Resort at concentrations exceeding the tentative RG developed in the EE/CA Report. However, based on the lines of evidence discussed in Section ES 3, NPS concluded that the data are not indicative of a release of arsenic at the Resort and an RG for arsenic will not be established.

Asbestos

NPS has determined that a CERCLA removal action is necessary for some, but not all, of the ACM observed at the Site based on the factors to be considered under the NCP in determining the appropriateness of a removal action. First, there is an actual or potential exposure of nearby human populations to ACM on the Site. *See* 40 C.F.R. § 300.415(b)(2)(i). Second, weather conditions at the Site may cause the asbestos fibers in the ACM to migrate or be released. *See* 40 C.F.R. § 300.415(b)(2)(v). Third, there are no other appropriate federal or State response mechanisms besides CERCLA to respond to the release of certain types of ACM at the Site. *See* 40 C.F.R. § 300.415(b)(2)(vii). The following NCP considerations are Site-specific:

- Hurricane debris has been abandoned on the ground since 2017. At the time of the EE/CA Addendum Investigation, the observed ACM was determined not to be friable. However, much of the ACM in hurricane debris present at the Site is exposed to the elements. These materials will weather or deteriorate with time, which will release asbestos fibers to the environment and present an exposure risk. Moreover, the hurricane debris poses the most significant threat to human health or welfare or the environment because it is located on the ground surface, in some instances concealed by tall grasses or other dense vegetation, where it is more likely to be inadvertently disturbed causing the release of harmful asbestos fibers into the air.
- CERCLA is the only appropriate federal or state response mechanism available to respond to the release or threatened release of ACM like the hurricane debris at the Site. The Clean Air Act National Emissions Standards for Hazardous Air Pollutants (NESHAP) does not apply to the hurricane debris because it did not result from human demolition or renovation activities.

The term "debris" is limited by the location and state of the ACM. Several segments of asbestos-cement piping were observed at the Site that are not attached to any building (i.e., loose

sections in Area 1), or were no longer being used for their intended purpose as piping (e.g., a pipe section being used as a guard for a valve). The origin of such piping is unknown. However, it is more like the ACM in on-Site debris than ACM attached to a facility subject to NESHAP and will be treated as such under the framework outlined above. Throughout the EE/CA Addendum, unless otherwise indicated, references to "debris" refer to these segments of asbestos-cement piping in addition to debris from the 2017 hurricanes.

Requirements under the NESHAP program mitigate the risk associated with other types of the ACM present at the Site not currently considered "debris." The NESHAP requirements are intended to protect the public from airborne contaminants that are known to be hazardous to human health, including asbestos, and apply to "facilities" (i.e., buildings, structures, and installations, including piping) undergoing "demolition" or "renovation." Much of the ACM identified at the Site is part of a "facility" and is subject to NESHAP in the event demolition or renovation occurs. This includes ACM attached to Site buildings that were damaged by the 2017 hurricanes and ACM associated with the piping system at the Site. Renovation and demolition represent the most likely means by which ACM associated with these facilities may be disturbed, and the asbestos NESHAP imposes specific requirements to ensure that ACM is treated appropriately in order to limit the risk of a release of asbestos fibers during such activities.

In short, the asbestos NESHAP provides a mechanism specifically tailored to addressing the risk of exposure to asbestos fibers from buildings and structures that constitute "facilities" under NESHAP. Based on current Site conditions, NPS has determined that such facilities need not be addressed by a CERCLA response action in the first instance. While a CERCLA response is not currently required to address ACM that is subject to NESHAP, an additional CERCLA response action may be necessary in the future if Site conditions change (e.g., if future storm events cause additional ACM to be detached from damaged buildings or if ACM at the Site becomes friable).

Lead-Based Paint

Where LBP was identified, it was generally in fair condition with only a few observed areas of limited peeling. Soil testing results did not indicate lead from peeling paint is being released to the environment. Therefore, NPS concluded that a response action for LBP under CERCLA is not currently required. While LBP does not currently require response actions under CERCLA, it should be removed or managed through other mechanisms. These items are discussed further in Section ES 7.1.

ES 5. Identification of Removal Action Alternatives

For the items, areas, and issues investigated as part of this EE/CA Addendum, an additional removal action is recommended under CERCLA to address ACM in debris that is not covered under other regulatory programs. The following removal action alternatives were identified to address this ACM:

1. Alternative 1 - No Action: Consistent with the NCP and CERCLA guidance, a "no action" alternative is considered as a baseline for comparison. Under this alternative, no additional monitoring or maintenance would be performed.

2. Alternative 2 - Removal and Off-Site Disposal: CERCLA applies to ACM in debris present at the Site, and such debris is not subject to the requirements of NESHAP or other regulatory programs. These materials are exposed to the elements and may become friable over time due to weathering or if they are disturbed. Alternative 2 includes removal and off-Site disposal to address the risk to human health and the environment posed by these materials.

With the exception of a removal action to address the ACM discussed above, NPS has determined that no additional removal actions are necessary for the items, areas, and issues investigated as part of this EE/CA Addendum.

ES 6. Comparative Analysis of Removal Action Alternatives

The no action alternative does not protect human or ecological health, nor does it comply with ARARs or reduce the toxicity, mobility, or volume of contamination. Taking no action is not acceptable to NPS, nor is it expected to be accepted by the Territory or community.

Alternative 2 will protect human health and the environment, comply with ARARs, and reduce the toxicity, mobility, and volume of contaminants at the Site. This alternative is expected to be accepted by both the Territory and community. Costs are projected to be approximately $500,000, which assumes that waste must be transported to the continental U.S. for disposal.

ES. 7 Recommended Removal Action Alternative

The recommended alternative is to remove ACM debris from the ground surface and transport it to an appropriately licensed facility for disposal. The ACM to be addressed under the recommended alternative is not currently attached to any building or other facility; therefore, demolition is not part of the recommended alternative.

NPS will include the planned removal action for ACM debris into the Action Memorandum, which substantiates the need for the removal action, identifies the selected action, provides the rationale, and provides responses to significant public comments.

Based on the background and clean fill sampling for arsenic in soil, NPS concluded that the data do not indicate a release of arsenic at the Resort. Therefore, NPS will remove the Removal Goal (RG) that was tentatively selected for arsenic in the EE/CA Report. For completeness, a revised list of recommended RGs for the Resort is provided in Text Table ES-2.

Text Table ES-2 Recommended RG Selection for Soil (mg/kg)

Contaminant of Concern	Background	Human Health RBCG	Ecological RBCG	ARAR-Based PRG	Basis for RG	Recommended RG
Barium	83	None	**185**	None	Ecological	185
Copper	85	None	**99**	None	Ecological	99
Zinc	57	None	**147**	None	Ecological	147
DDT-Total*	0.049	None	**0.17**	None	Ecological	0.17
Aldrin	0.014	0.039	**0.018**	None	Ecological	0.018
Chlordane	0.142	None	**1.20**	None	Ecological	1.20
Dieldrin	0.013	**0.034**	0.051	None	Human health	0.034

Notes:

* DDT-Total is dichlorodiphenyltrichloroethane (DDT) plus its metabolites Dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE)

RBCG = Risk-Based Cleanup Goal

PRG = Preliminary Removal Goal

RG = Removal Goal

ES 7.1. Separate Items Requiring Management

At the time of the EE/CA Addendum Investigation, the observed ACM was not friable. Because much of the ACM in debris is exposed to the environment and subject to weathering, NPS has determined that a CERCLA removal action is necessary to address ACM in debris at the Site. While NPS has concluded that ACM subject to NESHAP does not require a current response action under CERCLA, this material should be monitored going forward, and additional response actions may be necessary in the event Site conditions change (e.g., if future storm events cause

additional ACM to be detached from the partially intact buildings or if the ACM becomes friable).

Where LBP was identified, it was generally in fair condition and results did not indicate it was releasing lead to the environment. Therefore, NPS concluded that a response action for LBP is not currently required under CERCLA. However, if LBP continues to deteriorate in-place and lead is released to the environment, it will be regulated under CERCLA.

While LBP does not currently require a response action under CERCLA, it should be removed or managed through other mechanisms.

ES 7.2. Public Comments on the Recommended Alternative

For removal actions that are not time-critical, the public has a minimum 30-day comment period on the EE/CA and supporting documentation. In the summer of 2022, NPS plans to hold a public meeting to present the EE/CA preferred alternative and discuss the investigation findings. NPS requests all comments be made within 30 days, and one 15-day extension to the public comment period will be granted upon request. NPS will consider all public comments received before the deadline and make changes where appropriate.

1. Introduction

1.1. Purpose

The purpose of this Engineering Evaluation/Cost Analysis Report Addendum (EE/CA Addendum) is to supplement the EE/CA report for the Caneel Bay Resort (the Resort), which the National Park Service (NPS) issued on September 16, 2021 (EE/CA Report). The Resort lies within the Virgin Islands National Park (VIIS), on the northwest side of the island of St. John, U.S. Virgin Islands (USVI). NPS is performing this work because VIIS is owned by the United States and under the jurisdiction of NPS. EHI Acquisitions, LLC and CBI Acquisitions, LLC (EHI/CBIA) currently operate the Resort pursuant to the Retained Use Estate (RUE), which will expire on September 30, 2023 (National Park Service, 2013). The RUE was established in an Indenture Agreement, dated September 30, 1983. The Resort layout is shown in Figure 1.

NPS is investigating the Resort using its authority under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and its implementing regulations, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), which govern response actions at sites where hazardous substances present a potential risk to human health or the environment.

During the EE/CA process, NPS identified several data gaps related to potential releases or threatened releases of hazardous substances. To evaluate these items and fill the data gaps, NPS completed an EE/CA Addendum investigation in November 2021 with supplementary sampling in January 2022 (see EE/CA Addendum Investigation Summary Report provided in Appendix B).

This EE/CA Addendum relied on the results of the EE/CA Addendum Investigation to further evaluate the nature and extent of contamination at the Resort and to assess potentially unacceptable human health and ecological risks. NPS determined that the release or threatened release of asbestos in on-Site debris poses an unacceptable risk to human health or the environment. Therefore, NPS has identified a CERCLA response action to address ACM at the Site that is not likely to be addressed under other regulatory mechanisms besides CERCLA. In addition, NPS identified lead-based paint materials at the Resort that should be removed or managed through other mechanisms.

1.2. EE/CA Addendum Development and Organization

This EE/CA Addendum is organized by the following sections, which also represent the EE/CA's overall objectives:

- Characterize the nature and extent of contamination at the Site and conduct risk assessments (Sections 2 and 3)

- Identify applicable or relevant and appropriate requirements (ARARs) (Section 4)
- Develop and discuss removal action objectives (RAOs) and scope (Section 5)
- Identify and analyze potential removal action alternatives (Section 6)
- Conduct a comparative evaluation of the removal action alternatives (Section 7)
- Recommendations (Section 8)

2. Site Description, Investigation Results, and Conceptual Site Model

This section includes a summary of site features, operational history, historical sources and releases of contaminants, and factors that influence contaminant migration such as hydrogeology, hydrology, climate, extent of contaminants in site media, and contaminant transport pathways and behavior. All of these elements contribute to the development of the conceptual site model (CSM), which is presented verbally in Section 2.13 and graphically in Figure 2 for Area 2.

The information provided in the following sections is not intended to be comprehensive but rather to supplement background information presented in corresponding Sections 2.2 through 2.8 of the EE/CA Report.

2.1. Site Description

The Resort includes the entire 150 acres operated by EHI/CBIA, pursuant to the RUE plus additional parcels not subject to the RUE. Text Table 2.1 summarizes the areas and objects investigated in the EE/CA Addendum Investigation, investigation activities performed, the investigation results, and whether the results required further evaluation in this EE/CA Addendum. The Resort layout, including areas investigated during the EE/CA Investigation and EE/CA Addendum Investigation are shown on Figure 1.

Text Table 2.1 Summary of Investigated Areas

Area/Location	EE/CA Addendum Investigation Activities	EE/CA Addendum Investigation Results	Further Evaluation Required?
EE/CA Area 1 (Area 1): approximately 0.8 acres historically used for materials storage near the wastewater treatment plant (WWTP) structures, on the southeastern side of the Resort	Subsurface soil sampling to identify potential contamination based on reports of on-site waste disposal and burial activities and to identify whether shallow groundwater is present in the area.	Analytical results did not exceed risk-based levels developed in the EE/CA Report. Groundwater was not identified above bedrock.	No.

Area/Location	EE/CA Addendum Investigation Activities	EE/CA Addendum Investigation Results	Further Evaluation Required?
EE/CA Area 2 (Area 2): approximately 5.4 acres that encompass the engineering, maintenance, landscaping, generator, and fuel facilities, to the southwest of the WWTP	Subsurface soil and groundwater sampling to characterize potential contamination around fuel storage and operations areas. Downgradient groundwater sampling for petroleum constituents and Area 2 contaminants of concern (COCs) identified in the EE/CA Report.	Concentrations of some study constituents exceeded project action levels (PALs[1]).	**Yes.** Constituents that exceeded PALs were evaluated for risk to human health and the environment.
EE/CA Area 3 (Area 3): approximately 1.5 acres of land (undeveloped except for a donkey shelter) referred to as the landfill to reflect historical and current usage, located immediately east of Honeymoon Beach	Groundwater monitoring at a well previously installed during the EE/CA Investigation.	Consistent with the conditions during dry-season installation and prior monitoring, the well was dry. Considering the lack of groundwater during the wet season NPS concluded groundwater is not an exposure or migration pathway of concern in this area.	No.
Building materials, debris, and piping exposed to the environment within the Resort: asbestos and lead survey	Suspected asbestos-containing materials (ACM) and lead-based paint (LBP) were identified in structures and hurricane debris where those materials were exposed the environment. Samples were collected to detect the presence of ACM and LBP.	ACM and LBP were identified and are exposed to the environment. Currently friable asbestos was not identified.	**Yes.** ACM and LBP were considered for potential removal actions.
Cottage 7 underground storage tank (UST), on the western-central side of the Resort	Excavation to verify the presence of the UST and identify evidence of potential releases. Subsurface soil sampling to identify potential contamination from the UST	Concentrations of some study constituents exceeded PALs. Groundwater was not identified above bedrock suggesting it is	**Yes.** Constituents that exceeded PALs in soil were evaluated for risk to human health and the environment.

[1] The PAL is the lowest human health or ecological screening limit available for the analyte. It is not necessarily a cleanup standard but indicates potential risk that should be further assessed.

Area/Location	EE/CA Addendum Investigation Activities	EE/CA Addendum Investigation Results	Further Evaluation Required?
	and potential impacts to shallow groundwater.	not an exposure or migration pathway of concern in this area.	
Catchment Basin storage area on the hillside above the Resort and east of North Shore Road	Excavation to investigate a buried item identified during the EE/CA Investigation and identify evidence of a potential release. Surface soil sampling for pesticides.	Evidence of a release or potential release was not identified; the buried item appeared to be discarded concrete. Surface soil concentrations did not exceed PALs.	No.
Emergency Backup Water Supply Wells	Search conducted to find two deep water supply wells that were reported to be installed as emergency water supplies for the desalination plant.	One well was identified and confirmed to be closed. Evidence of a second well was not identified. Two historical dug wells were identified and sampled but are not used as emergency water supplies for the plant.	No.
Background and clean fill surface soil arsenic concentrations	Surface soil sampling for arsenic in two additional background decision units at the Resort. Surface soil sampling of a commercial clean fill stockpile for arsenic.	Arsenic concentrations in Resort background decision units (DUs) and the clean fill stockpile exceeded the tentative background value previously calculated in the EE/CA Report.	**Yes.** Results were used to refine background comparisons.

A more detailed discussion of EE/CA Addendum Investigation activities, methods, and results is provided in the EE/CA Addendum Investigation Summary Report (Appendix B).

2.1.1. General Historical Operations/Buildings and Sources/Releases

This section includes brief summaries of potential contaminant sources or releases relevant to the four specific concerns identified in Text Table 2.1 as requiring further evaluation. Additional historical detail is presented in Section 2 of the EE/CA Report (National Park Service, 2021a) and Section 2 of the EE/CA Addendum Sampling and Analysis Plan (SAP) (National Park Service, 2021b).

EE/CA Area 2 Aboveground Storage Tank Release

During work in 2010 to install a grounding rod near the former aboveground storage tanks (ASTs) in Area 2, a buried fiberglass diesel line was punctured, releasing an estimated 1,000 gallons of diesel below ground (ERTEC, 2010). Following discovery of the release in 2010, ERTEC

identified diesel range petroleum hydrocarbon contamination in soil and removed an unspecified volume of soil. In 2013, a report to the USVI Department of Planning and Natural Resources (DPNR) concluded that no further action was required related to the release, provided that land use did not change, and groundwater was not used for drinking water purposes (RAM Group, 2013).

During the EE/CA Investigation, NPS observed petroleum odors and elevated photoionization detector (PID) readings in soil at borings advanced near the former ASTs and the fuel dispenser.

Building Materials

NPS documentation indicates that buildings associated with the Resort were constructed between the 1950s and mid-1990s (National Park Service, 2012). The use of ACM and LBP was common when many of the Resort buildings were constructed. The age of each building, along with the dates of major renovations, are shown on Figure B-1 in Appendix B. In 2017, Hurricanes Irma and Maria caused significant damage to the Resort, exposing many building materials to the environment and scattering debris across the Resort.

Cottage 7 UST

Anecdotal evidence suggested the presence of a UST at Cottage 7 associated with a bomb shelter emergency generator which pre-dated the development of the Resort (Barksdale & Associates, 2014). During the EE/CA Investigation, NPS observed a fuel level gauge inside Cottage 7 and traced connected piping outside the building where it was lost beneath a concrete pad supporting multiple air conditioning units. An empty UST was confirmed to be present outside Cottage 7 during the EE/CA Addendum Investigation.

Arsenic

NPS identified no activities related to Resort operations that would result in a release of arsenic to surface soil. As potential Resort-related sources of arsenic contamination were not identified, NPS performed additional background sampling to refine background comparisons.

2.2. Historically and Culturally Significant Features

As stated in the EE/CA Report, Area 2 may be culturally significant based on NPS accessioned artifacts and archival documentation. The two existing wells, Dug Well 1 and Dug Well 2 (shown in photographs in Appendix A and in the general area marked on Figure 1), may be further assessed for historic significance.

2.3. Waste Characteristics

The EE/CA Report's description of waste characteristics includes the wastes discussed in this EE/CA Addendum.

2.4. Geology and Hydrogeology

2.4.1. Regional and Local Geology

Observations in soil borings completed in November 2021 do not result in changes to the EE/CA Report's description of regional and local geology.

2.4.2. Hydrogeology

The November 2021 investigation was performed during the end of the wet season. Overburden (i.e., above bedrock) groundwater was encountered in several borings in and downgradient from Area 2. Based on groundwater level monitoring, groundwater is inferred to flow from the Area 2 AST release area to the northwest, following the surface of buried bedrock, towards the dug wells and Caneel Bay. Between water level measurements in November 2021 and January 2022, groundwater levels in Area 2 declined by as much as 1 foot, presumably in response to less rainfall. The water levels at the dug wells were not significantly different.

2.5. Site Surface Water

Observations during the EE/CA Addendum Investigation did not result in changes to the EE/CA Report's description of site surface water.

2.6. Local Climate

Observations during the EE/CA Addendum Investigation did not result in changes to the EE/CA Report's description of local climate.

2.7. Sensitive Environments

Observations during the EE/CA Addendum Investigation did not result in changes to the EE/CA Report's description of sensitive environments.

2.8. Previous Investigations and Response Actions

There are no changes to the EE/CA Report's description of previous investigations and response actions.

2.9. Data Summary

NPS conducted the EE/CA Addendum Investigation in November 2021, with supplemental groundwater sampling in January 2022, to assess the nature and extent of preliminary contaminants of potential concern (PCOPCs) in surface soil, subsurface soil, and groundwater;

support risk assessments; and evaluate the potential for other releases related to building materials, hurricane debris, and a reported UST.

VHB compared analytical results to screening levels identified in the EE/CA SAP Addendum (National Park Service, 2021b). Because risk assessments were performed as part of the EE/CA Addendum, discussions of screening values are not required. The risk assessments use more site-specific information to draw conclusions about potential risks. Based on the investigation data and risk assessments, NPS concluded that the field investigation met the data quality objectives. A detailed discussion of how each principal investigation question was addressed is included in the conclusions of the EE/CA Investigation Report (Appendix B). As shown in Text Table 2.1, multiple areas and concerns were investigated; the four carried forward for additional evaluation in this EE/CA Addendum are summarized in Section 2.10.1.

2.10. Site Contaminants

The EE/CA Addendum Investigation identified contaminants in subsurface soil and groundwater that exceeded PALs. The investigation also included additional surface soil sampling to further evaluate arsenic background concentrations and arsenic concentrations in a potential local clean fill sample. A summary of contaminants identified during the EE/CA Addendum Investigation follows. The attached EE/CA Addendum tables include analytical results of:

- asbestos in building materials – EE/CA Add Table 1
- lead in building materials – EE/CA Add Table 2
- volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), and lead in subsurface soil – EE/CA Add Table 3
- VOCs, PAHs, barium and arsenic in groundwater – EE/CA Add Table 4

Building Materials

Asbestos

The EE/CA Addendum Investigation identified 19 separate ACMs in parts of buildings, hurricane debris, and pipes that are exposed to the environment, as summarized in Text Table 2.10. Photographs of ACM and the asbestos sampling results are included in EE/CA Add Table 1. In response to a request from NPS, CBIA provided maps and drawings showing building and utility layouts from 1954 to 1997. Asbestos and transite (asbestos-cement) was specified for some materials shown on the maps, including piping and roofing; some of these mapped items correlate with those identified during the investigation. Currently friable asbestos, which can be crushed by hand, was not identified in the observed materials. However, the ACM will deteriorate and become friable over time. Degradation of the ACM may be caused by ordinary

weathering as well as human disturbance. For example, Resort workers may unknowingly disturb the hurricane debris when engaged in routine activities such as driving through the Site or conducting landscape maintenance (e.g., mowing the grass). Moreover, some of the hurricane debris at the Site is concealed by tall grasses and dense vegetation and is therefore more likely to be inadvertently disturbed, resulting in increased risk of human exposure. Many factors can impact the rate at which non-friable asbestos becomes friable and it is impossible to predict exactly when non-friable ACM at the Site will become friable.

Text Table 2.10 Summary of ACM

Area	Roof	Window or Door	Other
Turtle Bay Buildings (Estate Restaurant, Units, Estate House), built or renovated 1960-1961	Type II (i.e., asphaltic roofing felt)	Window caulk, window screen caulk	Joint compound
Scott Beach Buildings (Units), built 1960	Type II	Window caulk	Buried pipe, estimated 300 feet
Hawksnest (Units), built 1967	Type II	Window glazing	None
Cottage Point (Units), built 1963	None	None	Glue at mirror
Caneel Beach (Units), built 1969	None	None	Glue on ceiling
Garden View (One unit), construction date unknown	None	Window caulk	None
Main Building, built 1957-1959	North Roofing	None	None
Maintenance Shop and Engineer Office in Area 2, construction date unknown	None	Window glazing	12" white vinyl composite tile; buried pipe network, estimated 1,100 feet
West of Resort Front Entrance	None	None	Partially buried pipe section, approximately 5 feet
Wastewater Treatment Area (Area 1)	None	None	Loose pipe section, approximately 5 feet

Area	Roof	Window or Door	Other
Upper Little Caneel Beach/Area 2 to Area 3	None	None	Aboveground pipe, estimated 1,500 feet; buried pipe, unknown length

To the extent hazardous substances are released from building materials and the release only results in exposure within a building, such releases cannot be addressed under CERCLA. *See* 42 U.S.C. 9604(a)(3)(B). Accordingly, the investigation was limited to building materials that have been or could be released to the environment, and NPS did not sample interiors of undamaged structures. Therefore, the total amount of asbestos in building materials cannot be estimated from existing data.

Lead-Based Paint (LBP)

Of the 21 samples of suspected LBP collected, one was identified as positive for LBP, meaning the detected concentration of lead exceeded the screening level of 0.5%. Lead was detected at a concentration of 1.9% in a sample of cream-colored paint collected from a structural column at Caneel Beach Unit 29 as shown in the photographs in EE/CA Add Table 2. Based on visual field observations, the columns and paint were common between Caneel Beach Units 14 through 25 and Little Caneel Beach Units 5 through 13. Assuming there are four columns in each room, approximately 80 columns may be coated in lead-based paint, but the paint is in fair condition on the majority of columns, especially those that are located in inside corners of the Units and sheltered by a roof. The columns are exposed to the exterior due to hurricane damage and apparent pre-hurricane renovation work; however, they are partially sheltered by the existing roofs. In addition, the columns are on a concrete slab surrounded by a low concrete knee wall, which limits the distribution of paint chips to the soil. A concrete patio between the knee wall and soil further buffers the soil. As of the EE/CA Addendum Investigation, the paint on the columns was generally in fair condition with only a few observed areas of limited peeling. NPS collected a drip line surface soil sample (SC-Bldg-09) from around Unit 29 during the EE/CA Investigation and did not find elevated lead in soil.

Cottage 7 UST

Subsurface Soil

A small steel UST was discovered buried beneath a concrete pad near Cottage 7 during the EE/CA Addendum Investigation. The top of the UST was rusted away, and the UST was visually confirmed to be empty. Visual, olfactory, and PID evidence of petroleum-contaminated soil was

not observed in soil around the top of tank, the fill piping, or in nearby soil cores. However, multiple PAHs were detected above PALs in two samples collected within several feet of the UST at depths near the bottom of the tank. Reported concentrations of benzo(a)pyrene exceeded PALs in SC-C7-01-5 and SC-C7-02-5. Additionally, reported concentrations of benz(a)anthracene and dibenz(a,h)anthracene exceeded PALs in SC-C7-02-5. PAHs were not detected above laboratory method detection limits at SC-C7-03-6.6, downhill of the UST. Benz(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene in subsurface soil were retained for further evaluation in the risk assessments.

Area 2 AST Release and Fuel Dispenser Pump Area

Subsurface Soil

During the EE/CA Addendum Investigation, NPS identified evidence of residual petroleum contamination in subsurface soil, including petroleum odors, soil staining, and/or high PID responses around and downhill from the site of the 2010 diesel release. Based on field observations and previous reports, petroleum is suspected to have migrated through coarse-grained soils in utility trenches which run downhill from the release location, and then spread into surrounding finer-grained native soils. The fine-grained native soils likely limited the potential for further downgradient migration. NPS did not identify evidence of residual free-phase petroleum product that would present a continuing migration risk.

Low concentrations of VOCs and PAHs were detected in numerous subsurface soil samples with higher concentrations corresponding to greater observed evidence of residual contamination. While samples were collected from the most apparently contaminated parts of the soil cores, the reported concentrations of VOCs at all locations and PAHs at all but one location were less than PALs. The reported concentration of acenaphthene only exceeded its PAL at SC-2-12-8. Acenaphthene in subsurface soil was retained for further evaluation in the risk assessments. Concentrations of hazardous substances are likely low due to the less toxic nature of diesel fuel and natural attenuation processes, including volatilization and biodegradation. Residual contamination is expected to continue to attenuate with time.

Surface soil sampling was conducted within the Area 2 AST release area during the EE/CA Investigation and was not repeated in the EE/CA Addendum Investigation. As reported in the EE/CA Report, PAHs and VOCs were not detected above respective PALs in surface soil.

Groundwater

Overburden groundwater was found during the EE/CA Addendum Investigation at monitoring wells installed in Area 2, downslope from the ASTs, and at monitoring wells installed farther downgradient, near the former gift shop. Two historical dug wells containing groundwater were

also identified near the former gift shop. Based on groundwater elevation monitoring, groundwater is inferred to flow from the AST area to the northwest, towards the former gift shop and Caneel Bay.

In November 2021, low concentrations of PAHs were detected at two Area 2 wells. Concentrations of anthracene, naphthalene, and pyrene exceeded PALs at only MW-2-07. Naphthalene was detected with estimated concentrations exceeding the PAL in three wells: MW-2-07, MW-2-09, and Dug Well 2. Naphthalene was not detected at the monitoring wells near Dug Well 2, which is open to surface runoff/infiltration and atmospheric deposition. Therefore, the detection of naphthalene in Dug Well 2 is not considered to represent groundwater conditions.

Low concentrations of VOCs were detected below PALs in all groundwater samples. The only PAL exceedance was reported for chloroform at MW-2-09 in November 2021. Chloroform was not detected at MW-2-09 in January 2022 and is not expected to be related to the 2010 diesel release.

Arsenic was detected at concentrations exceeding the PAL at Dug Well 1 and Dug Well 2. As arsenic was not detected above detection limits at nearby monitoring wells, MW-2-21 and MW-2-22, and both dug wells are cased with stone and open to the air, the presence of arsenic in the dug wells may be the result of surface runoff/infiltration and/or atmospheric deposition.

Barium was detected in all groundwater samples from MW-2-21, MW-2-22, Dug Well 1, and Dug Well 2 at concentrations above the PAL. Barium was previously detected at the historical monitoring well MW-01 (now closed) in February 2021; however, due to the poor condition and construction of this well, the sample was suspected to not represent groundwater conditions.

Naphthalene, chloroform, arsenic, and barium in groundwater were retained for further evaluation in the risk assessments.

Arsenic Background

Surface Soil

During the EE/CA Investigation, NPS detected arsenic in surface soil samples collected from across the Resort, including in background decision units, at concentrations above the risk-based cleanup goals developed in the EE/CA Report. Based on background results, NPS developed a tentative Removal Goal (RG) for arsenic of 2.0 mg/kg in the EE/CA Report. To further evaluate the tentative RG, NPS identified and sampled two additional decision units during the EE/CA Addendum Investigation where soil quality was considered representative of naturally occurring background conditions. Sampling was conducted in a similar manner as

during the EE/CA Investigation, using incremental sampling methodology (ISM) with three replicate samples, each comprised of 40 increments, collected from each decision unit. Reported arsenic concentrations in five out of six replicate samples from the two additional background decision units (IA-Ref-03 and IA-Ref-04) exceeded the tentative RG, indicating that the RG was lower than true background conditions at the Resort.

Due to the risk of importing non-native plants and insects to the USVI and VIIS, importation of fill material from outside of the USVI is not an option. To evaluate arsenic concentrations in potential clean fill sources available in the USVI, NPS sampled a clean fill stockpile from a commercial supplier, Sleepy's Trucking, on St. Thomas. Reported concentrations in all replicates collected from the commercial clean fill stockpile (IA-Ref-05) exceeded the tentative RG and the additional background sample results. The highest concentrations of arsenic were reported in surface soil at the former ASTs, which likely represented imported backfill placed after the petroleum-impacted soils were removed in 2010. Because arsenic is not a petroleum-related contaminant, the AST release is not a suspected source of elevated arsenic. Thus, when this arsenic concentration is viewed in the context of the clean fill DU samples collected in November 2021, there is some evidence that arsenic concentrations at all of the investigated areas at the Resort are lower than those found in soil from other parts of St. Thomas and St. John. This suggests that locally available sources of clean fill contain concentrations of arsenic similar to those found at the Resort and that locating a source of backfill for remedial excavations with lower concentrations that will also support revegetation may not be possible.

As discussed in detail in Section 5.2.4 of the EE/CA Report, naturally occurring background arsenic concentrations in volcanic areas, like the USVI, have been found to be between 10 mg/kg and 17 mg/kg (Casentini, 2010), and dust samples collected in a USVI study contained arsenic from 0.5 mg/kg to 44 mg/kg, with a mean value of 17 mg/kg (Holmes, n.d.). Arsenic concentrations in replicate samples collected during the EE/CA Investigation and EE/CA Addendum Investigation range from 0.7 mg/kg to 11 mg/kg, which is consistent with these ranges. By comparison, in NPS's experience, releases of arsenic at former agricultural sites, such as cattle dip tanks, can result in arsenic concentrations in the hundreds of mg/kg.

With the possible exception of pesticides and herbicides, NPS did not identify likely sources of arsenic at the Resort. The distribution of arsenic in surface soil does not imply hot spots or significant areas of release and it is not correlated with other, possibly related, contaminants (e.g., pesticides). As discussed in the EE/CA Report, organochlorine pesticides were identified as a contaminant of concern in portions of Area 2 near the maintenance buildings. However, arsenic concentrations in these areas were not disproportionately higher than in the other investigation areas. NPS compared surface soil arsenic concentrations within the investigation

areas to a revised background concentration established with data from four background/reference DUs. Statistical testing indicates that the concentrations in three DUs in Areas 1 and 2 slightly exceed those in the reference DUs. However, for each of those DUs, the probability of a Type II error (deciding that concentrations exceed background when they actually do not) exceeds the 20% threshold prescribed in the SAP. This means that there is a greater than 20% probability that a potential removal action would be conducted in these areas when it is not required.

Based on these lines of evidence, NPS concluded that the slightly elevated arsenic concentrations do not indicate a release of arsenic at the Resort.

2.10.1. Summary of EE/CA Addendum Site Contaminants

PCOPCs identified during the EE/CA Addendum Investigation are summarized in Text Table 2.10.1.

Text Table 2.10.1: Summary of Investigation Results: PCOPCs

Contaminant	Media	Area	General Results
Asbestos in building materials	Building materials, hurricane debris, and piping	Various locations around the Resort	A buried asbestos-cement pipe network was identified in Area 2. An aboveground asbestos-cement pipe leading from Area 3 to west of Area 2, where it went underground and could not be further traced, was identified. A section of asbestos-cement piping connected to a manhole near Scott Beach was identified; pipe materials to the north and south of the area were PVC or concrete. Two individual sections of asbestos-cement pipe were identified in Area 1 and near the Resort front entrance. ACM was also identified in roofing, caulk, glazing, glue, tiles, and joint compound that is currently exposed to the environment. Friable asbestos was not identified.
Lead in paints and coatings	Building materials	Columns at the Caneel Beach Units	Lead based paint was confirmed on a column inside the Caneel Beach Unit 29; because Units in this area are missing walls, columns in these buildings are exposed to the environment, although the paint on most columns is in good condition.
SVOCs – PAHs	Soil (subsurface)	Area 2 and Cottage 7	Various PAHs were reported above project action levels (PALs) in one soil boring near the historical AST release in Area 2 and in two soil borings near the UST at Cottage 7.

Contaminant	Media	Area	General Results
SVOCs – PAHs	Groundwater	Area 2	Three PAHs were reported above PALs at one well near the Area 2 fuel dispenser and the 2010 diesel release in November 2021. Estimated concentrations of naphthalene exceeded the PAL at three wells in January 2022, including Dug Well 2 downgradient of Area 2.
VOCs-chloroform	Groundwater	Area 2	Chloroform was detected at one well in November 2021. It was not detected at the same well in January 2022 and is not expected to be related to the 2010 diesel release.
Arsenic	Groundwater	Area 2	Arsenic was reported above the PAL at two dug wells downgradient of Area 2. Arsenic was not detected in nearby monitoring wells.
Arsenic	Soil (Surface)	Site Background	Surface soil sampling was conducted at two additional background DUs and a clean fill DU to refine the background comparison. The results indicate that arsenic concentrations are not related to a release at the Resort.
Barium	Groundwater	Area 2	Barium was reported above the PAL in the wells downgradient of Area 2.

2.11. Contaminant Fate and Transport

The EE/CA Report, Section 2.11, discussed the fate and transport of four general groups of contaminants (metals, pesticides/polychlorinated biphenyls, petroleum, and asbestos). Impacts to soil, groundwater, and surface water were included, although soil was the primary affected medium. The EE/CA Addendum Investigation findings helped to further evaluate the nature and extent of contamination at the Resort, including from potential releases or threatened releases of asbestos, lead, petroleum, and metals.

Soil

During the EE/CA Addendum Investigation, the presence of ACM was confirmed in structures and scattered debris at various locations across the Resort. At the time of the EE/CA Addendum Investigation, the observed ACM was judged to be not friable, meaning that it could not be crushed by hand. However, the observed ACM is exposed to the elements and will become friable over time. In addition, the current Resort operator has not taken steps to remove or otherwise address the hurricane debris, which has been abandoned at the Site since 2017. Accordingly, the ACM in debris at the Site constitutes a release or threatened release of hazardous substances under CERCLA. *See* 42 U.S.C. § 9601(22).

The presence of LBP was confirmed in one column in a Caneel Beach Unit and suspected in other columns in the Caneel Beach and Little Caneel Beach Units. At the time of the EE/CA Addendum Investigation, the paint was generally in fair condition with only a few observed

areas of limited peeling. As the paint deteriorates, it may flake off and contaminate the surface soil outside the building. Elevated lead concentrations were not detected in soil lead samples collected from the Caneel Beach building's dripline during the EE/CA Investigation.

NPS did not identify evidence of remaining petroleum product that may present a continuing migration risk. Based on observations of soil cores during the EE/CA Addendum Investigation, residual petroleum contamination remains in soil around coarse-grained preferential pathways; however, the presence of contaminants at concentrations exceeding PALs is limited. Residual petroleum in soil may be carried to groundwater by infiltration, but the EE/CA Addendum Investigation results indicate that the presence of contaminants in groundwater exceeding PALs is limited. Concentrations of hazardous substances are likely low due to natural attenuation processes, including volatilization and biodegradation. Residual contamination is expected to continue to attenuate with time.

The UST discovered at Cottage 7 reportedly predates the Resort and the type of fuel that was stored in the tank is unknown. Based on its understood use (to fuel a bomb shelter emergency generator) and its small size, potential historical releases from the tank are expected to have been relatively small. Similar to the AST release area, residual contamination appears to be present in soil near the bottom of the UST. Residual petroleum contamination is likely highly weathered with lighter components previously volatilized and/or biodegraded. PAHs in soil are expected to continue to naturally attenuate by microbial biodegradation over time.

Groundwater

The EE/CA Addendum Investigation identified overburden (i.e., above bedrock) groundwater in one portion of, and downgradient from, Area 2. Evidence of groundwater was not identified at Area 1, Area 3, or Cottage 7. Based on groundwater elevation monitoring, groundwater is inferred to flow from the AST area to the northwest, towards the former gift shop and Caneel Bay.

As discussed in the preceding section, a remaining significant source of potential groundwater contamination was not identified in the area of the 2010 diesel release. Detected concentrations of VOCs and PAHs in groundwater were low and not widely distributed. Concentrations of hazardous substances have likely declined since the initial release due to natural attenuation processes including volatilization and biodegradation. Residual contamination is expected to continue to attenuate with time.

Barium was detected at similar concentrations above the PAL at all four wells located downgradient of Area 2 (MW-2-21, MW-2-22, Dug Well 1, and Dug Well 2). Except for a February 2021 sample from MW-1 (located near the maintenance buildings in Area 2 and

believed not to represent groundwater), other groundwater samples have not been analyzed for barium. Results from one Area 2 surface soil decision unit sampled during the EE/CA Investigation (IA-2-01) in Area 2 suggested possible localized releases, as potential sources such as barium sulfate (possibly in paint) and barium carbonate (possibly in rodenticide) could not be ruled out. Both of these forms of barium have low solubility and are unlikely to be transported in groundwater. While the sampled wells are inferred to be downgradient from IA-2-01, they are more than 1,000 feet away. Based on the distance between the locations and the evidence suggesting only localized releases, the presence of barium in groundwater is considered attributable to naturally occurring elevated concentrations in soil at the Resort.

2.11.1. Chemical and Physical Properties of Site Contaminants

As presented in Section 3, only the concentrations of ACM, barium, and PAHs were identified as potentially posing an unacceptable risk to human health and the environment. Accordingly, this section is limited to discussing these contaminants.

Building materials that contain asbestos mineral concentrations greater than one percent (>1%) are considered ACM. Asbestos is a name given to a variety of naturally occurring minerals composed of hydrated, fibrous silicates that are crystalline in structure. Asbestos-cement pipes were commonly used for water distribution because they were lightweight and resisted corrosion. Asbestos fibers bond well to other materials, are extremely resistant to heat and chemicals, and will not break down into other compounds. When exposed to the elements, ACM will eventually become friable and may release asbestos fibers to the air where they present a risk to human health and ecological receptors. It is not possible to determine exactly when the ACM identified at the Site will become friable, but exposure to sunlight, wind, rain, etc. and human disturbance increase the likelihood of these materials becoming friable and such risks increase over time.

Barium is a naturally occurring metal often found in sedimentary rocks. Barium sulfate is used medically for taking x-rays of the digestive tract and is not toxic to humans, whereas barium carbonate dissolves in the stomach and is toxic, potentially causing kidney, nerve, and heart damage (Agency for Toxic Substances and Disease Registry, 2007). Barium sulfate, or barite, is commonly found where river water discharges to the ocean "because of the high sulfate content in the ocean" (Gad, 2014). In addition, barites can be detached from sediment particles by waves, and build up in deposits; hence, barite at a former freshwater/seawater interface may be enriched. According to Gad (2014), barium carbonate is only stable in alkaline (in this case, pH levels greater than 9.3) environments. Groundwater pH at the dug wells and monitoring wells MW-2-21 and MW-2-22 was neutral to slightly acidic; therefore, barium carbonate is less likely to be present.

PAHs are a group of chemicals that are often found in fuel sources, like petroleum and coal, and also in partially-burned or partially decomposed organic matter. PAHs have generally low solubilities in water and tend to adsorb to carbon, rather than dispersing in water. This tendency generally increases with increasing molecular weight and heavier PAHs (e.g., benzo(a)pyrene) are practically insoluble in water and will tend to remain adhered to carbon in soil (U.S. Environmental Protection Agency, 2020a). As a result, the potential for PAH transport in groundwater is relatively low compared to other contaminants, such as VOCs. PAHs may be transported by non-aqueous liquids or oils and by physical transport of soil materials (e.g., as dust or sediment). As organic contaminants, PAHs degrade slowly over time by natural reactions in the soil (Patel, Shaikh, Jain, Desai, & Madamwar, 2020).

2.11.2. Physical Site Characteristics Affecting Contaminant Migration

As discussed in Section 2.11, the following physical Site characteristics affect contaminant migration:

- The dense, fine-grained soils at Area 2 limit the potential migration of petroleum contaminants in soil, but petroleum can travel along layers of coarser-grained materials, especially in pipe bedding or sand and gravel layers.
- Overburden groundwater is likely present throughout the year in parts of Area 2 and is more likely to transport highly-water soluble contaminants than those with lower solubility.

2.11.3. Site-Specific Contaminant Transport

The following types of intermedia transfer of contamination are occurring or could occur at the Site:

- Asbestos fibers from ACM currently physically bound in building materials and hurricane debris can be released to air and soil as the materials degrade or are crushed. The ACM in hurricane debris constitutes a release or threatened release of a hazardous substance under CERCLA. As explained above, it is not possible to determine exactly when ACM will become friable. However, exposure to the elements and human disturbance shorten the timeframe in which these materials will become friable. Asbestos fibers in friable ACM will migrate or be released into the air. Wind and rain may then cause asbestos fibers to be transported.
- Petroleum releases at the AST and fuel dispenser pump in Area 2 have resulted in some impacts to groundwater close to the release area, but downgradient effects

to soil and groundwater were not found. Vapor intrusion into buildings is not a likely exposure pathway, based on the VOC results.

The EE/CA Addendum Investigation did not find groundwater in the monitoring well at Area 3. Although evidence of seeps was previously observed, groundwater does not appear to be a significant contaminant transport pathway in Area 3.

2.12. Current/Future Land Uses

Current and potential future land uses described in Section 2.12 of the EE/CA Report have not changed.

2.13. Conceptual Site Model (CSM)

Based on the information provided in this report, NPS developed an updated CSM for Area 2, shown in Figure 2. This CSM includes asbestos and lead-based paint, which were also identified at other parts of the Resort.

As described in Sections 2.9 and 2.10, the Site investigation results indicate that Site media impacted by contaminants include surface soil, subsurface soil, and groundwater. Migration pathways include soil carried by surface water runoff, and mobile contaminants in groundwater. Asbestos is present as ACM, including in materials on damaged buildings, piping, and hurricane debris, which has been abandoned throughout the Site, constituting a release or threatened release of a hazardous substance under CERCLA.

ACM in debris poses the most significant threat to human health or welfare or the environment because it is located on the ground surface, in some instances concealed by tall grasses or other dense vegetation. ACM on the ground is more likely to be inadvertently disturbed, shortening the timeframe in which it will become friable, causing the release of harmful asbestos fibers into the air where they present an inhalation risk. Notably, of all the materials sampled, roofing debris contained the highest percentage of asbestos. *See* EE/CA Add Table 1.

Requirements under the NESHAP program limit the exposure risk associated with ACM that is part of a "facility" in the event demolition or renovation occurs. Renovation and demolition represent the most likely means by which these materials (e.g., building materials in damaged buildings and intact piping) may be disturbed, and the asbestos NESHAP imposes specific requirements to ensure that ACM is treated appropriately in order to minimize risks to human health during such activities. Underground piping also presents less of an exposure risk to humans because it is underground. ACM contained within damaged buildings has some protection from the elements and is less likely to be disturbed inadvertently, thereby presenting less of an exposure risk.

The CSM illustrates the potential human receptors (resident, Resort or NPS worker, and construction worker) and the contaminated media to which each receptor may be exposed; the exposure assumptions, routes, and risks associated with receptors are discussed in Section 3 below.

3. Risk Assessment Summary

Risk assessments provide an estimation of the potential threat to human health and the environment posed by site contaminants. The results of the risk assessment are used to determine if potential risks are unacceptable and, if so, to inform the selection of appropriate cleanup levels and help focus the removal action.

The Risk Assessment Addendum in Appendix C was prepared using data collected from the EE/CA Addendum Investigation. Detailed explanations of risk assessment methods used were included in the May 2021 Risk Assessment Report, which is Appendix C of the EE/CA Report. Similarly, a summary of the general purpose and methods used in the risk assessment was provided in Section 3 of the EE/CA Report and is not repeated in this Addendum.

The following sections are limited to the findings of the Human Health Risk Assessment (HHRA) Addendum and the Screening Level Ecological Risk Assessment (SLERA) Addendum completed using data collected in November 2021 and January 2022.

3.1. Baseline HHRA Addendum

3.1.1. Hazard Identification

NPS identified contaminants of potential concern (COPCs) by comparing maximum detected concentrations in each media to the lowest appropriate human health risk-based screening levels, which were established in the EE/CA Investigation SAP. This step used the United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) (U.S. Environmental Protection Agency, 2021a) and the Virgin Islands UST Rules and Regulations Soil Cleanup Target Levels for soil (Virgin Islands Rules and Regulations, 2014), which only include petroleum constituents. Groundwater analytical results were compared to the USEPA RSLs for tap water (U.S. Environmental Protection Agency, 2021a) and Vapor Intrusion Screening Levels (U.S. Environmental Protection Agency, 2020b).

The RSLs used were based on a target excess lifetime cancer risk of 1 in 1 million (1E-06) and a target non-cancer hazard quotient of 0.1 that are protective of a residential exposure scenario.

NPS assessed risk posed by COPCs for which the maximum concentration in discrete soil and groundwater samples exceeded the RSL. COPCs in subsurface soil are:

- Cottage 7 (subsurface soil): benzo(a)pyrene and dibenz(a,h)anthracene

All groundwater samples were collected from Area 2. COPCs in groundwater are:

- MW-2-07: naphthalene
- MW-2-09: naphthalene and chloroform
- Dug Well 1: arsenic
- Dug Well 2: naphthalene, arsenic, and barium

The asbestos data collected as part of the EE/CA Addendum Investigation were not suitable for inclusion in a quantitative HHRA. Accordingly, the potential health risk from exposure to asbestos was qualitatively evaluated in the HHRA.

3.1.2. Exposure Assessment

The risk assessment estimated current and future potential risk to different human receptor populations. The receptors were the same as those evaluated in the May 2021 HHRA, with the exception of the Site visitor, who is expected to have a lower exposure potential than an NPS Park/Resort Worker. Groundwater was added as an exposure pathway, as summarized below.

- NPS Park/Resort Worker. A Park/Resort Worker could be exposed to groundwater if used as a potable water supply in the future. Currently, the Resort water is supplied via a desalinization plant. Groundwater exposure pathways for the NPS Park/Resort Worker include ingestion, dermal contact, and inhalation of VOCs from washing-related activities (showering, hand washing, dish washing etc.). Vapor intrusion of VOCs to indoor air was ruled out as a complete exposure pathway because all groundwater concentrations were below vapor intrusion screening levels.
- Construction Worker. Construction workers are expected to be involved in excavation-related activities and may be exposed to COPCs in soil in investigated areas. Exposure pathways for this receptor include incidental ingestion of and dermal contact with soil, and inhalation of fugitive dust and volatiles. In addition, this receptor may come into contact with shallow groundwater (less than 10 feet below ground surface) during excavation activities. Potential exposure pathways include dermal contact with groundwater and inhalation of VOCs in ambient air of an excavation pit or trench ("trench air"). Incidental ingestion of groundwater during typical excavation activities is not expected for this receptor and thus considered an incomplete pathway.
- Hypothetical Resident. The hypothetical resident scenario evaluated impacts to someone who lives on the Resort property and may be exposed to groundwater through the same pathways as an NPS Park/Resort Worker.

Human receptor populations are outlined in the human health pathway receptor diagram (see Figure C-1 in Appendix C); complete, incomplete, or not applicable pathways are identified.

Because risk assessments are based on chronic health effects, the most appropriate expression for the exposure point concentration (EPC) is the long-term average concentration within the exposure area. Because samples were only collected once, the maximum detected concentration was conservatively used as the EPC for each COPC. The EPCs for each medium and each exposure area evaluated in the HHRA are presented in Appendix C.

3.1.3. Toxicity Assessment

Toxicity assessments in the HHRA Addendum included evaluating oral/gastrointestinal and inhalation non-cancer effects and oral, dermal, and inhalation carcinogenic effects. Mutagenic effects, which are more toxic in youth, were not evaluated because the single COPC with mutagenic effects, benzo(a)pyrene, only occurred in subsurface soil. Subsurface soil was only identified as a medium of concern for adults, specifically construction workers.

3.1.4. Risk Characterization

The NCP describes a potentially acceptable range of lifetime excess cancer risk between 1E-06 and 1E-04 and expresses a preference for establishing the acceptable target cancer risk at or near the more protective end of this range. Similarly, non-cancer health effects generally should not exceed a hazard index (HI) of 1. NPS generally considers cancer risks exceeding 1E-06 or non-cancer risks exceeding an HI of 1 to be unacceptable, absent compelling site-specific factors that preclude achieving these levels of protection. Selection of a target risk level of 1E-05 may be justified based on considerations of background concentrations for naturally occurring COPCs (i.e., the calculated 1E-05 concentration of a contaminant of concern is circum-background).

Text Table 3.1.4 summarizes the risk results in groundwater for each receptor and indicates which receptor scenarios have potential excess cancer risks greater than 1E-06 or non-cancer HIs greater than 1. All calculated potential excess risk levels are presented in the risk assessment report in Appendix C.

Text Table 3.1.4 Human Health Risk Characterization: Groundwater

Human Receptor	Cancer Risk	HI	Risk Driver
Resident	3E-06	Less than 1	Naphthalene
Adult Park/Resort Worker	Less than 1E-06	Less than 1	None
Construction Worker	Less than 1E-06	Less than 1	None

In summary, the HHRA determined the following:

- Exposure to naphthalene in overburden groundwater used by a resident for potable purposes (including drinking and washing) may result in a 3E-06 increased risk of developing cancer

3.1.5. Asbestos Risk Evaluation

Asbestos generally does not present a health hazard unless asbestos fibers are released from a source material into air, where they can then be inhaled. At the time of the EE/CA Addendum Investigation, the ACMs at the Resort were determined not to be friable. Non-friable asbestos is unlikely to generate airborne fibers and therefore poses little immediate health risk to human receptors. However, much of the ACM at the Site is exposed to the elements and will deteriorate over time due to exposure to wind, rain, sunlight, etc. In addition, these materials may be further disturbed by human activity at the Site, which could accelerate the rate at which the ACM becomes friable. As ACM at the Site degrades, asbestos fibers may be released to the air, posing an inhalation risk to human and ecological receptors. Roofing debris contained the highest percentage of asbestos of all the material sampled on Site. *See* EE/CA Add Table 1.

3.1.6. Uncertainty Analysis

Appendix C describes the uncertainties and assumptions made in estimating exposure parameters relevant to the HHRA for this Site, which are summarized below:

- Analytical Data: Groundwater samples were collected only during the wet season and may not represent patterns over time and space. The data from the hand dug wells were not used to evaluate future groundwater exposures because these wells are open-air wells that may be contaminated by surface runoff and atmospheric deposition.
- Selection of COPCs: Overall, most of the analytical results did not exceed PALs, which are generally based on conservative risk-based screening levels. PAH samples analyzed in January 2022 had an elevated reporting limit because the laboratory erroneously used the incorrect extraction method. Anthracene, naphthalene, phenanthrene, and pyrene have PALs less than the reporting limits, and their exclusion may underestimate cumulative risks.
- Exposure Assessment: Monitoring well purging data indicated very slow recharge at the monitoring wells, and it is unlikely that groundwater in the overburden would be a viable source of tap water for a resident. In light of this and the conservative exposure assumptions described in Section 2.6 of the Risk Assessment Addendum, both the construction worker and the residential scenarios likely overestimate risk.

- Toxicity: The cancer slope factors, reference dose, and reference concentration toxicity values are more likely to overestimate than underestimate potential health hazards.
- Risk characterization: The analyzed constituents that were either not detected or detected at concentrations below PALs were excluded from the risk assessment. These analytes are assumed to pose negligible risk.

While asbestos risk was only evaluated qualitatively, there is uncertainty regarding when ACM at the Site may become friable.

3.2. Ecological Risk Assessment

The scope of the SLERA was limited by local factors described in the May 2021 SLERA, including the absence of streams or ponds at or near the areas investigated, which means the only local surface water is the ocean at Caneel Bay. Therefore, although groundwater is not available to ecological receptors, it was initially evaluated in the risk assessment as if it were surface water.

The May 2021 SLERA established that St. John has a unique set of potential ecological receptors. The birds, bats, amphibians, reptiles, and plants likely to be at the Resort are exposed to surface soil, not subsurface soil. Because surface soil decision unit sample results did not exceed risk-based screening levels or Removal Goals, assessment of soil was not performed for this Addendum.

3.2.1. Problem Formulation

Ecological receptors are generally defined by available habitat. Groundwater is inferred to discharge to surface water at Caneel Bay and the dug wells. The rock wall and narrow ledge surrounding each Dug Well effectively prevents use by wildlife but allows access by flying insects. The following aquatic species were evaluated in the SLERA: benthic (bottom-dwelling) and aquatic invertebrates; and benthic fish (in the ocean at Caneel Bay, only, because no fish would be present in the dug wells).

NPS outlined ecological receptors in the ecological pathway-receptor diagram (see Figure 2-1 in Appendix C), which identifies pathways as complete, incomplete, or not applicable.

3.2.2. SLERA

Exposure and Effects Assessment

NPS initially compared the maximum concentrations of contaminants in groundwater to corresponding surface water ecological screening values (ESVs) (National Park Service, 2018). The groundwater constituents that were above screening levels and required additional consideration were: carbon disulfide, anthracene, pyrene, naphthalene, arsenic, and barium.

Because of the conservative nature of ESVs and to reflect exposure assumptions more representative of future Site use scenarios, NPS further evaluated potential ecological risk by comparing maximum concentrations to the Refined SLERA ESVs in the NPS (2018) Protocol. This evaluation was performed to better refine the list of chemicals that have the potential to pose unacceptable ecological risks and thus warrant further evaluation. The refinement step eliminated all constituents as contaminants of potential ecological concern for the reasons summarized below:

- concentrations of carbon disulfide, anthracene, pyrene, naphthalene, and arsenic were below the Refined ESVs or the applicable risk values, and
- for barium, total metals concentrations were close to dissolved phase conservative screening levels representative of negligible risk, similar to natural levels in groundwater, and likely to decrease through chemical change and dilution upon contact with surface water

3.2.3. Uncertainty Analysis

A summary of the uncertainties inherent to each component of the ecological risk assessment process and how they may affect the quantitative risk estimates and conclusions of the risk analysis is provided here. Details of the specific uncertainties and assumptions made in the ecological risk assessment for the Resort are described in Appendix C. The list below represents a summary of the uncertainties and assumptions made.

- The evaluation of groundwater as representative of surface water overestimates potential future surface water concentrations and the resulting potential for risk by a very large margin. This conservatism, combined with the fact that groundwater concentrations are generally lower than toxicity-based concentrations for surface water, supports the conclusion that groundwater PCOPCs present negligible risk to ecological receptors.
- Analysis for total metals measures both dissolved metals and metals bound to particulates, whereas most ESVs and water quality criteria are derived from and hence applicable to only the dissolved, bioavailable fraction. Since the total metals results are typically higher than the dissolved fraction alone, comparing total metals results from this Site to dissolved fraction ESVs will overestimate the potential for risk.

3.2.4. Baseline Ecological Risk Assessment

This Section is not applicable because a baseline ecological risk assessment was not conducted. NPS has used the refined-SLERA approach to evaluate potential risks to ecological receptors.

4. Identification and Analysis of ARARs

There is no change to the list of ARARs identified in Section 4 of the EE/CA Report, except that additional requirements related to asbestos and lead in building materials and the UST at Cottage 7 must also be considered.

Pursuant to its delegated CERCLA lead agency authority, NPS has identified ARARs for the Caneel Bay Resort EE/CA Addendum. NPS has also requested that the Virgin Islands Department of Planning and Natural Resources identify territory (Virgin Islands) ARARs. This request remains outstanding. Additions to the EE/CA Report's ARARs analysis are summarized in the following Text Table 4.3.

Because the presence of a UST at Cottage 7 was confirmed during the EE/CA Addendum Investigation, Text Table 4.3 has been amended to include information specific to the closed UST.

4.1. Chemical-Specific ARARs

There are no changes to Text Table 4.1 of the EE/CA Report summarizing chemical-specific ARARs.

4.2. Location-Specific ARARs

There are no changes to Text Table 4.2 of the EE/CA Report summarizing location-specific ARARs.

4.3. Action-Specific ARARs

Text Table 4.3 Action-Specific ARARs: Caneel Bay Resort

Standard, Requirement, Criteria, or Limitation	Citation	Requirement Description	Applicable or Relevant and Appropriate or other factors to be considered (TBC)?	Comment
Clean Air Act National Emission Standard for Asbestos	42 U.S.C. §§ 7401, 7412, 7414, 7416, 7601; 40 Code of Federal Regulations (CFR) Part 61 Subpart M, §61.145	NESHAP "specifies work practices for asbestos to be followed during demolitions and renovations of all structures, installations, and buildings (excluding residential buildings that have four or fewer dwelling units). The regulations require the owner of the building or the operator to notify the appropriate state agency before any demolition, or before any renovations of buildings that could contain a certain threshold amount of asbestos or asbestos-containing material." (U.S. Environmental Protection Agency, 2021b)	Applicable to response activities involving demolition or renovation of asbestos-containing material, including emergency renovation operations. Relevant and appropriate for response activities that involve contact with ACM but do not constitute demolition or renovation.	None.
Asbestos Model Accreditation Plan	40 CFR Appendix C to Subpart E of Part 763	Provides training requirements for asbestos professionals, including any worker, contractor, supervisor, inspector, management planner or project designer) working with asbestos-containing building materials in a school, public, or commercial building.	Applicable to response activities involving asbestos-containing material in public or commercial buildings. Relevant and appropriate for response activities that involve contact with ACM not found in public or commercial buildings.	None.

5. RAOs

Removal action objectives (RAOs) define what the removal action is intended to accomplish. Specific RAOs are presented below. Applying an understanding of the CSM (Section 2), risk levels (Section 3), and ARARs (Section 4) to the scope of the EE/CA Investigation Addendum results in the RAOs.

5.1. Identification of RAOs

The RAOs for this EE/CA Addendum are:

- Eliminate unacceptable risks to human health, specifically:
    - Groundwater: Eliminate total cancer risks in excess of 1E-06 to human receptors from Site-related naphthalene in groundwater, if potable
    - Asbestos: Reduce inhalation risk from ACM in debris, which is subject to CERCLA but not governed by NESHAP or other regulatory requirements.
- Eliminate or minimize contaminant-related constraints to the full enjoyment and utilization of park resources for operational, scientific, and interpretive purposes consistent with NPS mandates
- Satisfy federal and territory ARARs and associated cleanup standards

As part of the EE/CA Addendum Investigation, additional background arsenic data were collected that are relevant to the following RAO identified in the EE/CA:

- Eliminate unacceptable risks to human health and the environment, specifically:
    - Soil: Reduce total cancer risks in excess of 1E-06 to human receptors from Site-related arsenic in Areas 1, 2, and 3

5.1.1. Determination of Removal Action Scope

NPS has considered the RAOs in relation to the CSM and has determined that a removal action is required to address risks posed by ACM in debris in this EE/CA Addendum. As explained further below, additional CERCLA removal actions to address issues besides ACM that were evaluated in the EE/CA Addendum Investigation (e.g., groundwater, lead based paint) are not required. All removal actions detailed in the EE/CA Report remain unchanged, although clarity is provided below on the issue of arsenic background levels.

Groundwater

Naphthalene in groundwater may cause a risk to a future resident if the water is relied upon for drinking and as tap water. During the EE/CA Addendum Investigation, two monitoring wells in Area 2, including MW-2-21, which is beside the dug wells, went dry after less than 1 gallon was removed. Normal household activities require consistently higher volumes on-demand; for

example, flushing a toilet and washing one's hands requires about 3 gallons within the span of a few minutes, while showering requires at least 2 gallons per minute (USGS, 2022). Groundwater in overburden (i.e., soil above the bedrock) follows the bedrock surface toward the ocean, and impacts to deeper bedrock wells, if they exist nearby, are unlikely. In addition, NPS confirmed that one bedrock water supply well was historically installed at the Resort; however, that well was closed shortly after installation due to its low yield. The Resort has historically relied on and continues to rely on other sources for potable water – including a rainwater catchment and an ocean water desalination plant. Based on these factors, NPS concluded that groundwater is not a potential future source of potable water, and that further response action is not required for groundwater.

Arsenic in surface soil

Arsenic is present in surface soil across the Resort at concentrations exceeding the tentative RG developed in the EE/CA Report. However, based on the lines of evidence discussed in Section 2.10, NPS concluded that the data are not indicative of a release of arsenic at the Resort and that the concentrations detected in Areas 1 and 2 do not require further response action. Therefore, NPS will not establish a Removal Goal for arsenic.

Asbestos

At the time of the EE/CA Addendum Investigation, observed ACM at the Site was determined to be non-friable. Although the ACM is intact and cannot be crushed by hand to release asbestos fibers, it is exposed to the elements and will weather or deteriorate with time, increasing the potential for asbestos fibers be released and present an exposure risk. ACM that is attached to Site buildings that were damaged by the 2017 hurricanes and ACM associated with the piping system at the Site are subject to NESHAP in the event demolition or renovation occurs. Compliance with the requirements under NESHAP will limit the risk of asbestos fibers being released from these materials during demolition or renovation, which are the most likely means by which ACM associated with these facilities will be disturbed in the near future.

ACM in debris at the Site is subject to CERCLA, but not NESHAP or any other regulatory requirements. The debris has been left unaddressed at the Site since 2017. As explained above, this material also poses the most significant threat to human health or welfare or the environment because it is more likely to be inadvertently disturbed resulting in the release of asbestos fibers to the air. Additionally, roofing debris contained the highest percentage of asbestos of all the material sampled on Site. *See* EE/CA Add Table 1.

Therefore, NPS has identified CERCLA response action alternatives for ACM in on-Site debris as part of this EE/CA Addendum. While a response action is not currently required to address ACM

that is subject to NESHAP, additional CERCLA response action may be necessary in the future if Site conditions change (e.g., if future storm events cause additional ACM to be detached from the partially intact buildings or if non-friable asbestos becomes friable)1.

Lead-Based Paint

The suspected and confirmed lead-based paint currently exposed to the environment at the Resort was limited to columns at the Caneel Beach and Little Caneel Beach Units, a small percentage of which have peeling paint. These columns were initially inside rooms but have been exposed to the environment either by pre-hurricane renovations or hurricane damage, as walls in the Units are missing but the roof is intact. Based on the limited area of soil likely to be affected by peeling paint, the small surface area of peeling paint on the columns, and the relatively low concentration of lead, this material is unlikely to present a threat of a release to the environment. A comparison of lead concentrations in soil (sampled in February 2021) to concentrations in building paint does not indicate that releases to the environment have occurred. To avoid a potential threat of a release in the future, the operator should consider what steps may be appropriate to prevent exposure to lead-based paint by visitors, especially children, or people who work around or maintain this building. If LBP continues to deteriorate in-place and lead is released to the environment, it will be regulated under CERCLA and additional response actions may be required.

6. Identification of Removal Action Alternatives

The purpose of this section is to present the removal action alternatives proposed to achieve the RAOs identified in Section 5.

The selected removal action must meet the RAOs and comply with ARARs. The location of the Site within a unit of the National Park System, the lack of regulatory mechanisms besides CERCLA available to address ACM in debris, the risk of exposure to nearby populations, and weather conditions that may cause asbestos to become friable and release asbestos fibers into the air must be considered when evaluating removal action alternatives. The following removal actions were identified and retained for further consideration: (1) No Action and (2) Removal and Off-Site Disposal of ACM. Each alternative is described in the following subsections. Cost estimates for each alternative are provided in Appendix D.

6.1. Alternative 1: No Action

Consistent with the NCP and CERCLA guidance, a "no action" alternative is considered as a baseline for comparison. Under this alternative, no additional monitoring or maintenance would be performed. The ACM in debris is currently exposed to the environment. It is therefore will become friable due to weathering, human disturbance, or a combination of both, resulting in an inhalation risk to human receptors. As a result, this alternative does not achieve the RAOs.

6.2. Alternative 2: Removal and Off-Site Disposal of ACM

As noted above, the ACM present in debris at the Site is subject to CERCLA but not NESHAP or any other regulatory programs. This material is exposed to the elements and will become friable over time due to weathering or human disturbance. Under Alternative 2, this material would be removed and disposed off-site to eliminate risks to human health or welfare or the environment.

The ACM in debris identified by NPS is summarized in Text Table 6.2. For cost projections, the total quantity of ACM in debris and affected soil was estimated to be approximately 160 cubic yards; because the wastes are mixed, a density of 1 ton per cubic yard is assumed, resulting in 160 tons of ACM requiring disposal. This estimate was made to develop a feasibility level cost estimate; actual costs are expected to range from 30 percent below to 50 percent above the costs presented.

Text Table 6.2 Summary of ACM Debris

Area	Material Description	Approximate Quantity
Roofing materials from or similar to Turtle Bay (Estate Restaurant, Units, Estate House) and Scott Beach Buildings (Units), and Hawksnest (Units)	Roof Material Type II (i.e., asphaltic roofing felt + maximum of 1 inch of soil beneath ACM, if needed	90 cubic yards
Roofing materials from or similar to Main Building	North Roofing + maximum of 1 inch of soil beneath ACM, if needed	60 cubic yards
Partially buried or loose pipe sections West of Resort Front Entrance, Wastewater Treatment Area (Area 1), and Area 2	Asbestos-cement pipe	Multiple ~5 foot sections (10 cubic yards)

Alternative 2 includes placing the abandoned ACM debris and materials identified above in asbestos-containment bags and disposing offsite. Large building materials, such as roofing, will require on-site cutting to reduce the sizes to fit into waste disposal bins. Smaller pieces of debris were also observed on the ground, and those that match the descriptions of identified ACM would also be removed for disposal. Not all debris on the ground contains asbestos; Table B-1 in Appendix B summarizes the asbestos analytical results for all sampled suspected ACM. Additional types of ACM may be present in debris; a qualified asbestos inspector would be on-site to identify suspect ACM that does not match previously sampled materials. The asbestos inspector would decide, based on the quantity, whether to dispose of the material as ACM or to sample and analyze the materials for asbestos.

A licensed asbestos inspector would identify waste requiring disposal as ACM. Work would be conducted under a Site Control Plan prepared by the asbestos removal contractor that includes provisions for controlling access to work areas, and containing ACM and preventing release of fibers during handling.

During completion of ACM debris removal, the contractor would control the generation of dust with water suppression to the extent practicable and conduct personnel and work area perimeter air monitoring for asbestos.

The contractor would load the ACM debris into containers appropriately lined for asbestos waste transport and disposal. Additional excavation and removal of soils is not anticipated, but may need to be completed to a depth of up to 1 inch based on observed conditions. The ACM debris transporter must have qualifications, licenses, permits, and certifications required for residual waste transporters that are in compliance with all rules and regulations related to transport of asbestos-containing waste.

The asbestos inspector would conduct a final inspection for residual ACM to confirm completion.

Following loading of the ACM debris and associated residual soil, the contractor would decontaminate any portions of the equipment that has come into contact with the ACM debris during the removal and loading operations. The decontamination would be accomplished using a non-phosphate detergent and water and/or decontamination with brushes and shovels utilizing dust control. All wash water would be collected in a container and disposed of.

Areas where soil was removed would be raked with surrounding soil and seeded with a native seed mixture approved by VIIS. No backfill or topsoil would be imported to VIIS for this alternative.

If Resort buildings are not renovated to contain or remove ACM, this alternative would include inspecting the ground surface annually at the end of hurricane season for additional ACM debris. NPS assumes this monitoring period would not extend beyond 5 years. Additional ACM debris observed during annual inspections will be removed and disposed of in a similar manner.

This alternative would achieve the RAOs by removing abandoned ACM debris, limiting the potential for asbestos fibers to be released and to affect human and ecological receptors.

7. Comparative Analysis of Removal Action Alternatives

The purpose of Section 7 is to provide a comparative analysis against each of the evaluation criteria of the alternatives presented in Section 6. This will identify the advantages and disadvantages of both alternatives relative to one another.

Pursuant to the NCP, both alternatives described above were analyzed using the following evaluation criteria: effectiveness, implementability, and cost. The effectiveness of each alternative was evaluated by each alternative's protectiveness of human health and the environment, attainment of ARARs; reduction of toxicity, mobility, or volume through treatment; long-term effectiveness and permanence; and short-term effectiveness. The implementability criterion addresses the technical feasibility of implementing the response (including the availability of services and materials), the administrative feasibility, and Territory and community acceptance. Projected costs were calculated using direct capital costs, indirect capital costs, and annual post-removal site control costs. Consistent with guidance, the costs presented are estimated using current cost of labor and materials, and actual costs are expected to range from 30 percent below to 50 percent above the costs presented. The projected costs presented for the EE/CA removal action alternatives are estimates only for the sole purpose of comparing alternatives and should not be considered design-level cost estimates. Details that formed the basis for the removal action cost projections are provided in Appendix D.

7.1. Effectiveness

This section evaluates each alternative's ability to meet the RAOs as identified in Section 5; in particular, its ability to achieve the criterion of protectiveness of human health and the environment and to attain ARARs. Other factors that affect the overall protectiveness of a removal action include preference for treatment to reduce contaminant toxicity, mobility, or volume for principal threats, short-term effectiveness, and long-term effectiveness/permanence. Details regarding the effectiveness evaluation criteria are presented in the following subsections.

Overall Protection of Human Health and the Environment

Debris is not currently controlled or covered, and may be encountered by workers, visitors, and future residents. Sunlight, rain, and wind will degrade the ACM, and the debris may be crushed by lawn mowers or heavy equipment. If the ACM becomes friable through natural or mechanical processes, asbestos fibers will be released to the air where they can be inhaled. Therefore, Alternative 1 (no action) is not protective of human health or the environment.

Alternative 2 (remove and dispose of ACM debris) would reduce risks to human and ecological receptors from asbestos fibers. Removing ACM debris would address the threat of asbestos

fibers being released into the air and soil. Once implemented, this alternative would protect human health and the environment. During implementation, debris removal workers would be exposed to ACM, and engineering controls and personal protective equipment would be required to protect them. Air and dust monitoring and dust suppression during the work would be required to prevent potentially unacceptable exposure risks to workers and visitors during implementation.

Compliance with ARARs

There are no chemical specific ARARs for asbestos fibers contained in building materials and debris.

Because the presence of the abandoned ACM debris is impairing the use and enjoyment of the Park, Alternative 1 will not comply with location-specific ARARs and TBCs related to the use and preservation of the Park, including the NPS Organic Act, the General Authorities Act, the legislation establishing VIIS, and NPS regulations and management policies that prohibit nuisances and restrict certain activities with the potential to impact park resources.

Alternative 2 (remove and dispose of ACM debris) would comply with location-specific ARARs, and specifically, the NPS Organic Act and the legislation establishing VIIS, by removing an uncontrolled source of asbestos fibers. This would limit human and ecological receptor exposure to the potential contamination, allowing use and enjoyment of Park resources.

Reduction of Toxicity, Mobility, or Volume through Treatment

On-site treatment is not contemplated in either alternative. Alternative 1 would not include any active measures to reduce the toxicity, mobility, or volume of contaminants. Alternative 2 would be effective in the long term in reducing the on-Site volume of potential contaminants through removal and off-Site disposal of ACM debris.

Short-Term Effectiveness

Alternative 1 will not be effective in the short term because it does not address the risk of exposure to asbestos fibers posed by degradation of the ACM debris.

Alternative 2 would be effective in the short term because dust management protocols will limit exposure to asbestos fibers during debris handling. It would be challenging to limit impacts to Park visitors due to increased truck traffic for transporting waste containers under this alternative; however, the debris would likely be removed from the Site before these areas of the Park are open to the public after the RUE expires.

Long-Term Effectiveness

Alternative 1 will not be effective in the long term as it does not address the threat of release of asbestos fibers posed by degradation of the ACM debris.

Alternative 2 would be effective in the long term as it addresses the future threat of exposure to asbestos fibers by removing the abandoned ACM debris from the Site. Removal and off-site disposal of additional ACM debris observed during annual inspections would further address the future threat of exposure to asbestos fibers.

7.2. Implementability

This section provides an evaluation of the technical and administrative feasibility of implementing the alternative and the materials and services that would be required for its implementation.

Technical Feasibility

Alternative 1 is the most technically feasible alternative to implement.

Alternative 2 would be technically feasible. Logistical planning is required to find and collect the ACM debris, encapsulate it in plastic, and transport it off-Site. A staging area to support waste container transport from the Site would be required. Work areas would require a water source to wet the debris and prevent generation of airborne dust. This alternative would require seeding or replanting in places where soil disturbance is required to remove small pieces of debris. Establishing vegetation to meet NPS performance standards is not expected to be a challenge.

Administrative Feasibility

This section provides an evaluation of the activities needed for coordination with other offices and agencies. Under CERCLA, federal, state, and local permits are not required for on-site CERCLA response actions; however, the substantive requirements of all permits that would otherwise be required must be met. *See* 40 CFR Section 300.400(e).

Alternative 1 is administratively feasible because there are no regulatory programs for asbestos-containing debris.

Alternative 2 would be administratively feasible. Only certain landfills are permitted to accept asbestos waste, and there are none in the USVI. The asbestos waste would require disposal at a landfill in the continental U.S.

Territory (Support Agency) Acceptance

The Territory has the opportunity to provide input on the alternatives during the public comment period. The Territory has not responded to NPS's request to identify territory-specific ARARs.

Community Acceptance

NPS requests community review and comment on the removal action alternatives under consideration. A notice of availability and a brief description of the EE/CA Addendum will be published in a news release sent to interested parties and the Virgin Islands Daily News, the newspaper preferred by community members according to interviews during the preparation of the Site Community Involvement Plan. NPS will hold a public meeting to convey the EE/CA Addendum findings and proposed cleanup actions followed by a public listening session to solicit public feedback. The public comment period with last 30 days, and one 15-day extension to the public comment period will be granted upon timely request. NPS will consider all public comments received before the deadline and make changes to the EE/CA Addendum where appropriate.

Following receipt and evaluation of public comments, NPS will prepare an Action Memorandum, which as the decision document selecting a Non-Time Critical Removal Action (NTCRA), summarizes the need for the removal action, identifies the selected action for the Site, provides the rationale for the action, and addresses significant comments received from the public, including those from other jurisdictions (e.g., the Territory, USEPA). The Action Memorandum will be placed into the Site administrative record file, which is housed in the information repositories established for the Site as detailed in the Site Community Involvement Plan.

7.3. Cost

This section provides an evaluation of the costs associated with implementing the removal action alternatives. These feasibility-level cost projections are based on currently available pricing and approximate time and materials requirements developed for the sole purpose of comparing alternatives. These cost projections should not be considered design-level estimates. They are representative within −30 to +50 percent. Assumptions used to develop the cost projections are provided in Appendix D.

Alternative 1 has no associated cost.

Alternative 2 would include the cost to clear vegetation to gain access to debris with heavy equipment; cut, where necessary and with dust mitigation wetting procedures, debris into manageable sections; place ACM in 6-mil labeled plastic bags or in appropriate container liners; transport and dispose of containerized contents at an off-Site disposal facility; and establish

vegetation. These costs also include short term-monitoring for five years after remedy implementation. The estimated (undiscounted) and present value cost for Alternative 2 is approximately $500,000. The costs assume that all ACM would be disposed at a licensed landfill in the continental U.S., and that a tipping fee will be required.

7.4. Summary of the Alternatives Comparative Analysis

Text Table 7.4 summarizes the results of the evaluation of the effectiveness, implementability, and cost criteria for each alternative.

Text Table 7.4 Comparison of Alternatives

Alternative	E.1 Protective of Human Health?	E.2 Protective of the Environment?	E.3 Complies with ARARs?	E.4 Reduces Toxicity, Mobility, or Volume	E.5 Effective in Short Term	E.6 Long Term	I.1 Technical Feasibility	I.2 Administrative Feasibility	A.1 Territory Acceptance	A.2 Community Acceptance	Cost (Approx.)
Alternative 1: No action	No	No	No	No	No	No	Good	Good	To be determined (TBD)	TBD	$0
Alternative 2: Remove and dispose of ACM debris	Yes	Yes	Yes	Yes	Good	Good	Good	Good	TBD	TBD	$500,000

Notes: Criteria categories are:

E = Effectiveness

I = Implementability

A = Acceptance

8. Recommendations

The purpose of Section 8 is to describe the recommended removal action alternative and the reason for the selection.

8.1. Removal Action Alternative

Taking into consideration the evaluation criteria presented in the EE/CA Report, the recommended removal action alternative for the Site is removal and off-site disposal of ACM debris that is present above ground and not attached to buildings (Alternative 2). Based on the results of the EE/CA Addendum Investigation, NPS concluded that the data are not indicative of a release of arsenic at the Resort. Therefore, NPS will remove the RG for arsenic tentatively selected in the EE/CA Report. For completeness, a revised list of recommended RGs for the Resort is provided in Text Table 8.1.

Text Table 8.1 Recommended RG Selection for Soil (mg/kg)

Contaminant of Concern	Background	Human Health RBCG	Ecological RBCG	ARAR-Based PRG	Basis for RG	Recommended RG
Barium	83	None	**185**	None	Ecological	185
Copper	85	None	**99**	None	Ecological	99
Zinc	57	None	**147**	None	Ecological	147
DDT-Total*	0.049	None	**0.17**	None	Ecological	0.17
Aldrin	0.014	0.039	**0.018**	None	Ecological	0.018
Chlordane	0.142	None	**1.20**	None	Ecological	1.20
Dieldrin	0.013	**0.034**	0.051	None	Human health	0.034

Notes:

* DDT-Total is dichlorodiphenyltrichloroethane (DDT) plus its metabolites Dichlorodiphenyldichloroethane (DDD) and dichlorodiphenyldichloroethylene (DDE)

RBCG = Risk-Based Cleanup Goal

PRG = Preliminary Removal Goal

RG = Removal Goal

8.2. Separate Items Requiring Management

Based on conditions observed during the EE/CA Addendum Investigation, where LBP was identified, it was generally in fair condition and results did not indicate it was releasing lead to

the environment. Therefore, NPS concluded that an additional response action for LBP is not currently required under CERCLA. However, if LBP continues to deteriorate in-place, releasing lead into the environment, it will be regulated under CERCLA, and additional response actions may be required. Additional response actions may also be required if the condition of ACM that remains on Site changes (e.g., if ACM in damaged buildings becomes friable). While LBP and ACM that is subject to NESHAP do not currently require response action under CERCLA, they should be removed or managed through other mechanisms.

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EE/CA ADDENDUM (EE/CA ADD) TABLES

FIGURES

APPENDICES

Appendix A – Photographic Log

Figure 1, Photo 1 – Top of UST at Cottage 7 exposed; note hole at steel fill piping. Orientation: North. 11/10/21

Figure 2, Photo 2 –View of interior of UST at Cottage 7. Orientation: West.11/10/21

Figure 3, Photo 3 – Soil coring at SC-2-12 adjacent to the gasoline AST in Area 2. Orientation: East. 11/10/21

Figure 4, Photo 4 – Temporary piezometer installed at SC-2-06, near fuel dispenser in Area 2. Orientation: East. 11/10/21

Figure 5, Photo 5 – Dug Well 2. Orientation: South. 11/8/21

Figure 6, Photo 6 – Dug Well 1. Orientation: West. 11/17/21

Figure 7, Photo 7 – JJBA tracing buried asbestos piping near Scott Beach. Orientation: South. 11/15/21

Figure 8, Photo 8 – VHB collecting background surface soil samples in IA-Ref-03. Orientation: West. 11/13/21

Appendix B – EE/CA Addendum Investigation Summary Report

Appendix C – Human Health and Ecological Risk Assessment Addendum

Appendix D – Detailed Cost Estimates